

# Financial Revolution and Economic Modernization in Sweden

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## ABSTRACT

The development of a well adapted financial system was a main part of the successful Swedish economic modernization in the latter half of the nineteenth century. In this paper it is shown that this development followed the pattern of a financial revolution. Major institutional and organizational changes that took place roughly between the late 1850s and early 1870s led to a rapid increase in liquidity and financial services. This financial revolution preceded the acceleration in economic growth in general and in the modern, industrial sector in particular. Especially the monetization encouraged growth, both in the industrial sector and in GDP as a whole. The basis of the financial system, measured as commercial bank assets and equity capital affected overall GDP growth. The results also clearly promoted the importance of the development of the financial sector and the monetization as an interlinked and complementary process.

JEL: E44; N13; N23; O16

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## Introduction

With this paper I aim to contribute to the ongoing debate on the relationship between finance and growth. To do so I study whether Sweden in the nineteenth century experienced what has been labeled a financial revolution. I define a financial revolution as: *The establishment of the fundamental organizations and institutions required for a successful financial system within a relative short time span*. The idea of the financial revolution implies three things: 1) that there was a strong case of synergies between different parts of the financial sector and institutional change in the total financial development, 2) that the quality of the financial services improved through changing roles for the financial organizations governing financial activities, and 3) that the establishment of this entire financial system was positive for economic growth and modernization.

To test the occurrence of such a financial revolution we expect a number of institutional and organizational changes that governs financial activities to be followed by an increase in financial activities in different financial sectors. We also expect this increase in financial services to be followed by economic growth at large and specifically within newer industries.

As seen below empirical research on the relationship between finance and growth generally ends up testing the connection between one or a few single proxies that represents financial sector development, and general growth in GDP. Thus it usually misses out on three important aspects of the financial revolution: 1) the simultaneous and interlinked development of the financial system as a whole, 2) the qualitative improvement of the financial system and 3) the importance of the financial revolution for creative destruction by forcing structural change through economic modernization.

The idea of a financial revolution has been distilled from the historical experiences of among others England, Japan, the Netherlands and the US. The US example is the extreme in this respect putting all financial foundations into existence within a few years, including a generous possibility for bank establishments.<sup>1</sup>

Rousseau and Sylla points to six basic characteristics, or parts of a successful financial system: 1) Public finance, including its debt management, is run prudently, 2) A stable currency, 3) Private commercial banks involved in international and/or domestic financial business, 4) Monetary authority (-ies) that can act to stabilize domestic finances and manage

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<sup>1</sup> D.C. North & B.R. Weingast "Constitutions and commitment: the evolution of institutions governing public choice in seventeenth century England" in L.J. Alston et al. (Ed.) *Empirical Studies in Institutional Change*. Cambridge University Press (1996); thereafter: North & Weingast "Constitutions and commitment:" and P.L. Rousseau & R. Sylla "Emerging financial markets and early US growth" *Explorations in Economic History*, Vol. 42 pp 1-26 (2005); thereafter: Rousseau & Sylla "Emerging financial markets"

international financial relations, 5) a well functioning securities market, and 6) a rapidly increasing number of corporations.<sup>2</sup>

So far the financial revolution is more of a scheme of the basic parts that a successful financial revolution requires, than a fully consistent theory on how the financial revolution comes into place and how it promotes real economic growth. The idea with the financial revolution is that the vital parts of the financial systems are dependent on institutional factors as well as on each other.

Both empirical and theoretical research supports the positive link between growth in the financial sector and the real economy. Ross Levine points out several functions provided by the financial sector that may facilitate economic growth, such as to lower information and transaction costs, better risk management, pooling of resources (by mobilizing savings), and increasing the possibility to specialize production. This view nurtures the idea that the financial system has to be studied as a whole.<sup>3</sup>

What historical empirics on financial development make clear is that the institutions that are governing the financial system are of utmost importance. Historically it is easy to miss out on the importance of institutions since the development in general went from highly regulated, not to say oppressed, markets to more liberal possibilities to conduct business. In short the basic element of the financial revolution is of institutional nature and manages to successfully combine that of freedom for private initiatives based on institutions and organizations governed by the state.

Rousseau and Sylla show that in the case of the US liberal possibilities to establish financial organizations, for instance banks and equity markets, supported the emerging economy's economic modernization, i.e. a structural transformation to an industrial economy.<sup>4</sup> There are also studies showing the other side of the coin, that limiting the freedom of the financial sector, or by a too strong and unjust competition from the State, led to less lending and investments in newer and thus more risky projects (for instance to finance new technologies).<sup>5</sup>

The definition of a riskier project is a project where the financier *ex ante* has a smaller possibility to estimate the pay off, which is the case for newer less well known technologies.

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<sup>2</sup> P.L. Rousseau & R. Sylla "Financial systems, economic growth and globalization" in M.D. Bordo, A.M. Taylor and J.G. Williamson (Eds.) *Globalization in Historical Perspective*. University of Chicago Press (2003); thereafter: Rousseau & Sylla "Financial systems, economic growth"

<sup>3</sup> R. Levine "Financial Development and Economic Growth: Views and Agenda" *Journal of Economic Literature* **35** (1997), pp. 688-726; thereafter: Levine "Financial Development"

<sup>4</sup> P.L. Rousseau & R. Sylla "Emerging financial markets"

This is of importance since it is reasonable to expect that the economic take-off should take place within newer technologies, i.e. what can be considered as a modern sector. This is, as argued by Schumpeter, why an oppressed financial sector impedes economic transformation and thus structural changes and economic growth in the long run.<sup>6</sup>

But the supply of financial services is not the only part of the story. It is also a question of quality. Any agent can promise and deliver an unlimited amount of credit (for instance in the form of IOUs), but this does not mean that it will be trusted and thus possible to use for transactions or investments. If the agent over-issues credit it will decrease in value or even become completely worthless. The question is how to supply the amount of credit of a quality that will ensure investments in newer technologies, and thus economic growth.

The relationship between the financial system and economic growth in Sweden has been studied before. In 1978 Lars G. Sandberg published the article "*Banking and Economic Growth in Sweden before World War I*". In this paper he linked the success story of the Swedish economy to the relative sophistication of the Swedish banking system. This in turn he argued was a result of the comparably early law on general schooling, providing the main part of the Swedish population with the ability to read and write.<sup>7</sup> The study made by Sandberg was later extended by Fisher and Thurman who showed that Swedish monetization took place before the 1890s.<sup>8</sup>

Pontus Hansson and Lars Jonung more recently studied the relationship between the financial market and economic growth in Sweden. In the 1997 paper "*Finance and economic growth: the case of Sweden 1834-1991*" they tested the cointegration relationship between the volume of commercial bank lending, investments and real GDP in per capita terms. The conclusion for the whole period was that the development of the financial sector and economic growth was a case of mutual interaction. Although for the period 1890 until 1939 it seemed as finance may have had a leading impact on growth. Clearly they assumed that the role of the financial sector at large was to meet the quantitative demand for investments. Thus the driving force of the financial sector during one sub period was simply explained by

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<sup>5</sup> See for instance Temin, P. & Voth, H-J. (2005)

<sup>6</sup> J.A. Schumpeter *The theory of economic development: an inquiry into profits, capital, credit, interest, and the business cycle* (1911 Reprinted Cambridge, MA. 1934)

<sup>7</sup> L.G. Sandberg "Banking and Economic Growth in Sweden before World War I." *Journal of Economic History* **38** (1978), pp. 650-80; thereafter Sandberg "Banking and Economic Growth" and L.G. Sandberg "The Case of the Impoverished Sophisticate: Human Capital and Swedish Economic Growth before World War I." *Journal of Economic History* **39** (1979), pp. 225-41; thereafter: Sandberg "The Case of the Impoverished Sophisticate"

<sup>8</sup> D. Fisher & W.N. Thurman "Sweden's Financial Sophistication in the Nineteenth Century: An Appraisal." *Journal of Economic History* **49** (1989), pp. 621-34; thereafter: Fisher and Thurman "Sweden's Financial Sophistication"

lending working as a proxy for investments.<sup>9</sup> However, this is an interpretation which is not compatible with empirical evidence of the sources of firms funding for the period.<sup>10</sup>

Peter L. Rousseau and Paul Wachtel also found in a study including the US, Canada, UK, Norway and Sweden that the Swedish financial sector in terms of total assets, the monetary base and GDP were cointegrated for the period 1870-1929.<sup>11</sup> However the Swedish data used are problematic: the series on Swedish GDP is old and have been thoroughly revised; their definition of the monetary base is misleading since it also includes private bank notes in circulation that were inside money and not potential reserves for the banking system.<sup>12</sup>

I have used a more complete database which is up to date for this study. Using this new data I find that Sweden roughly from the middle of the 1850s until the early 1870s experienced what can be considered as a financial revolution. An important part of this revolution was the liberalization of bank establishment. This resulted in a rapid boost in financial services, including the monetization, occurring in the late 1860s and early 1870s. The financial revolution represented by the commercial banking system and the monetization, preceded the increased growth in the real economy, including growth in the emerging industrial sector. The industrial sector overtook agriculture as the largest part of GDP by the end of the nineteenth century. And subsequently growth in the industrial sector preceded growth in GDP as a whole.

As source for GDP I use the most recent series estimated by Olle Krantz. This series also has the benefit of being divided into different sectors, why it is possible to identify a series for growth in industry; or the modern sector as it is labeled in this paper. I have also collected data on more accurate series on all monetary variables. This revised data also makes a proper distinction in the case of Sweden between monetary base, private bank notes and liquidity (M0) possible. Liquidity is defined as Riksbank and private bank notes held by the public. The data on the commercial banks is for the years before 1870 gathered from *Post & Inrikes tidning* which was issued daily as the official bulletin of the State. After 1870 the balance sheets of the commercial banks were assembled in *Sammandrag af Bankernas Uppgifter*.

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<sup>9</sup> P. Hansson & L. Jonung "Finance and economic growth: the case of Sweden 1834-1991" Research in Economics **51** (1997), pp. 275-301; thereafter Hansson & Jonung "Finance and economic growth" and P. Hansson & L. Jonung. *Det finansiella systemet och den ekonomiska tillväxten: Svenska erfarenheter 1834-1991*. SOU 2000:11. (Stockholm 2000); thereafter Hansson & Jonung. *Det finansiella systemet*.

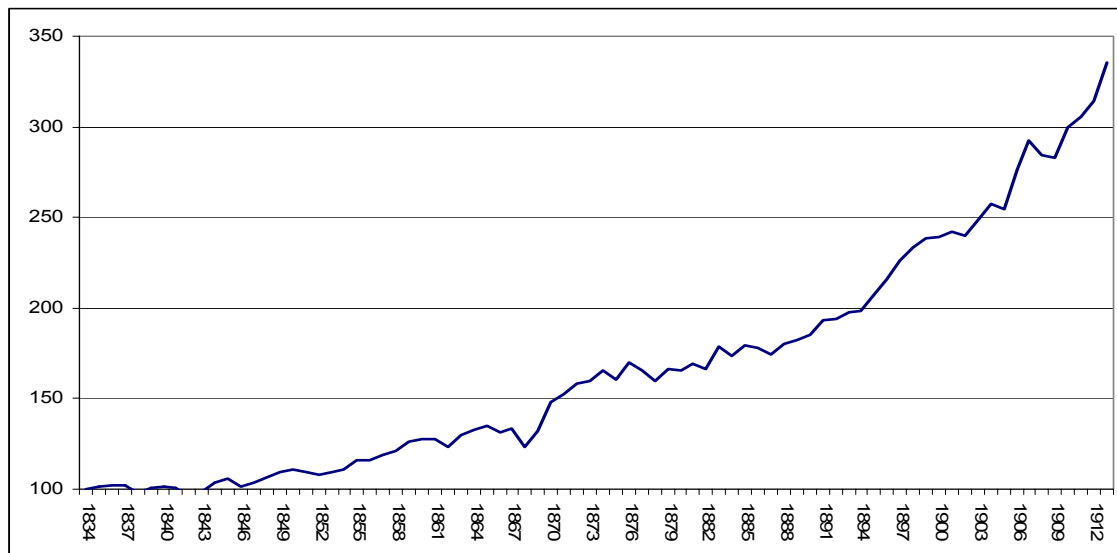
<sup>10</sup> T. Gårdlund *Svensk industrifinansiering under genombrottsskedet 1830-1913* (Stockholm 1947); thereafter: Gårdlund *Svensk industrifinansiering*

<sup>11</sup> P.L. Rousseau & P. Wachtel "Financial Intermediation and Economic Performance: Historical Evidence from Five Industrialized Countries" Journal of Money, Credit and Banking **30** (1998), pp. 657-678; thereafter: Rousseau & Wachtel "Financial Intermediation"

## Economic growth and modernization in Sweden

There are several dates for when Sweden is said to have experienced its industrial breakthrough. Lennart Jörberg in his study of the Swedish industrialization pointed to the 1830s as the starting point of the industrialization, with an acceleration in its growth from the 1870s. Generally the story of Swedish economic growth is attributed to have taken off in the 1870s, but also the 1890s is viewed as an important decade for the Swedish industry and economic growth.<sup>13</sup>

Figure 1: Swedish per capita GDP volume indices, 1834 – 1913 (1834=100)



Sources: Krantz, O. (2001), SCB (1955)

Just looking at the per capita GDP index seem to support both the interpretations that Swedish economic growth went through a positive change in the 1870s as well as 1890s. Average yearly growth during the period 1834 until 1913 was 1.5 percent. Dividing the Swedish GDP growth in accordance with the schedule presented in previous research, shows that a shift in the GDP level occurred around 1870, but this without leading to a continuous higher annual growth rate. From the 1890s per capita GDP growth rate was more than two times higher than before.<sup>14</sup>

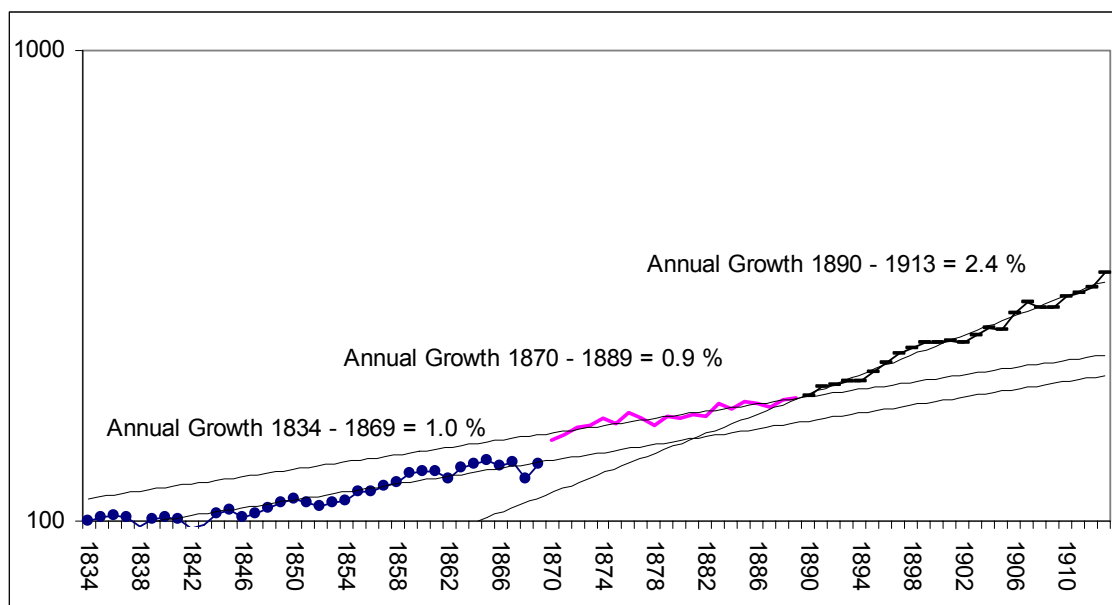
<sup>12</sup> A. Ögren "Free or Central Banking? Liquidity and Financial Deepening in Sweden, 1834 – 1913." *Explorations in Economic History*, Vol. **43** (2006) pp 64-93; thereafter: Ögren "Free or Central Banking"

<sup>13</sup> Hansson & Jonung "Finance and economic growth" and L. Jörberg *Growth and Fluctuations of the Swedish Industry, 1869 – 1912: Studies in the process of industrialisation* (Stockholm 1961); thereafter: Jörberg *Growth and Fluctuations* and Sandberg "Banking and Economic Growth" and L. Schön *En modern svensk ekonomisk historia. Tillväxt och omvandling under två sekel* (Stockholm 2000); thereafter: Schön *En modern svensk ekonomisk historia*

<sup>14</sup> Ignoring the first years of non-growth shows that GDP grew at 1.2 percent per year between 1846 and 1869.

In figure 8 below, the choice to make the distinction between the two last periods the year 1890 is based on previous research.<sup>15</sup> Whatever year that is chosen for when the shift in GDP took place or when the acceleration in began, this took place after the financial revolution had increased the financial services both in quantity and in quality.

*Figure 2: Growth patterns in Swedish Per Capita GDP (in volume index 1834 = 100). Logarithmic scale*



Sources: Krantz, O. (2001), SCB (1955)

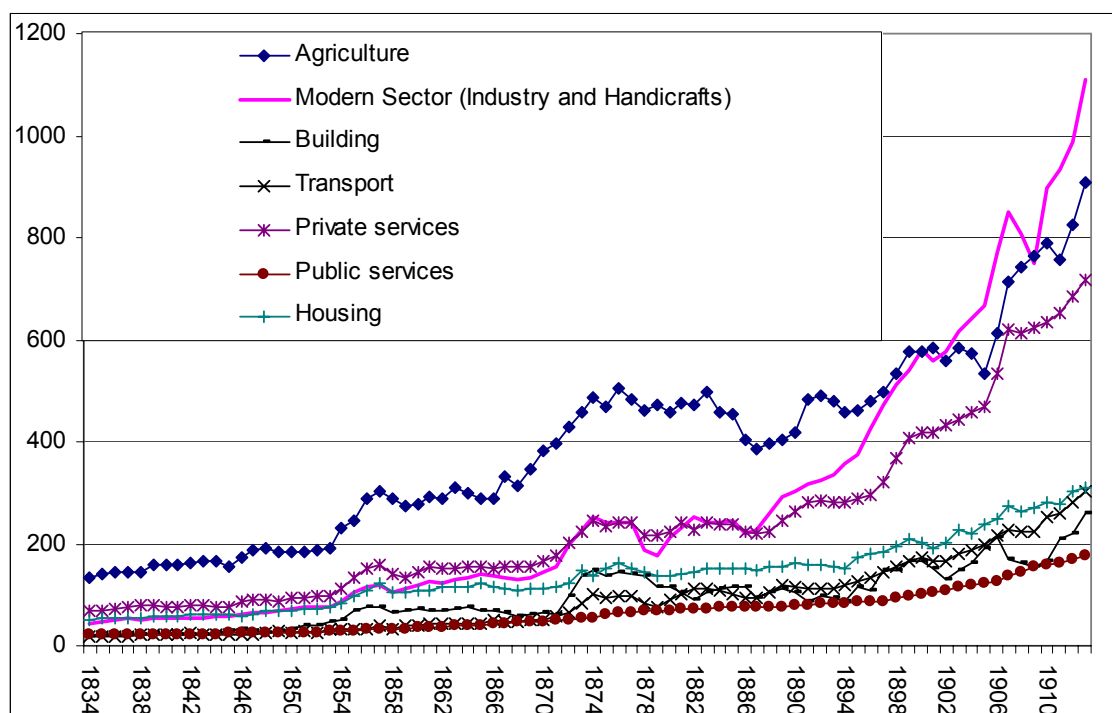
A subsequent question is when the modern industrial sector came to be the dominant sector. As seen in figure 3 below both the agricultural and the industrial sector grew in absolute terms, but the modern sector grew in relative importance. Agriculture was surpassed by the modern sector as the main share of GDP in the middle of the 1890s.

The industrial sector grew in cycles from the 1850s to the late 1870s. In the late 1880s industrial growth started to accelerate rapidly and also the private service sector grew. To some extent this may well have been due to the fact that services that previously had been conducted outside the formal market now became formally priced and paid.<sup>16</sup>

<sup>15</sup> Extending the middle period until 1894 increases growth in the middle period to a yearly average of 1 percent and decreases the average between 1895 and 1913 to 2.35 percent.

<sup>16</sup> There is a possibility that the so called service revolution of the economy is due to this phenomenon, see Schön *En modern svensk ekonomisk historia*

Figure 3: GDP per sector (MSEK), 1834 – 1913



Source: Krantz, O. (2001)

For the entire period the rate of average annual growth in the modern sector was around 2.5 percent. Growth in the modern sector was more volatile in the early period than is visible. The boom in the first half of the 1850s and the following slump during the crisis 1857 and 1858 marked growth in the modern sector. So did the famine in the latter half of the 1860s as well as the boom in the early 1870s and the crisis in the late 1870s. It was during the latter part of the period that the highest growth was experienced. From 1880 growth in the industrial sector was almost four percent per year and from 1887 almost five percent, whereas it before 1865 was somewhat lower than two percent a year, thus average annual growth ratio more than doubled. The distinct drop in the modern sector that happens in the years 1908 and 1909 may be a result of the short but intensive crisis in 1907. Since financial crises and booms were visible in the growth of the sector (with a lag) this suggests a link between the modern sector and the financial sector.

### Did Sweden experience a financial revolution?

It has been shown that the financial deepening in Sweden, measured as the increase in the broad money supply (M2) in relation to GDP, took place in the late 1860s. This financial deepening was very quick during the first five years (1868 – 1872) when the financial deepening almost doubled. The deepening continued somewhat slower for another fifteen



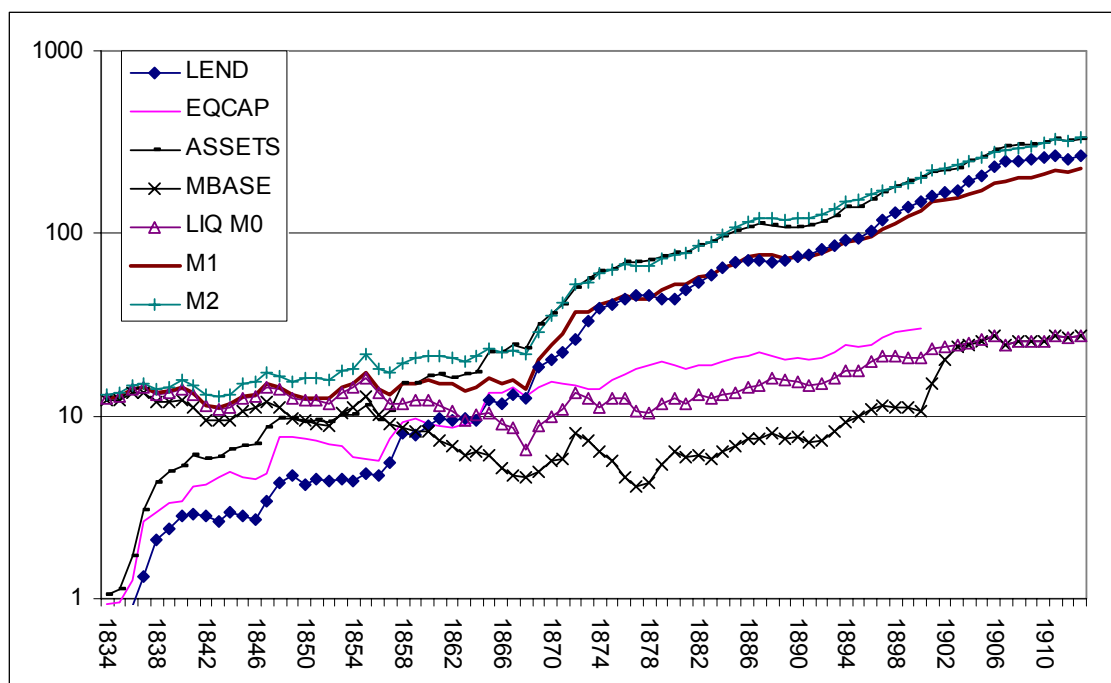
years (1873 – 1887) when it again doubled and then started to decrease modestly for the following twenty five years until WWI.<sup>17</sup> This rapid financial deepening gives rise to the question whether Sweden experienced a financial revolution.

Figure 4 below supports that the financial sector underwent a period of rapid growth that started in the late 1860s. The timing of this growth period seems to have been roughly between 1868 and 1876 with a more modest growth thereafter. There are four observations to be made from figure 4: 1) We can clearly distinguish two periods, the pre 1868 period when the financial system seems to have been more or less equivalent with liquidity and post 1868 when public deposits broke through and which also witnessed a leap in commercial bank lending and assets. 2) Post 1868 there seems to be a virtual identity between commercial bank lending (LEND) and the money supply (M1) including the public's deposits in commercial banks (the same seems to be the case for commercial bank assets (ASSETS) and the broad money supply (M2) measures as liquidity plus public deposits in savings and commercial banks). 3) Commercial bank equity capital was long larger than commercial bank lending but this changes in 1868. 4) Also in line with the logic of the financial revolution the variables that provided the basis of the financial and monetary system, commercial banks' equity capital, the monetary base and liquidity, all remained comparably stable under the period.

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<sup>17</sup> Ögren "Free or Central Banking" pp. 87-8

Figure 4: Growth in Commercial Bank Lending (LEND), Commercial Bank Equity Capital (EQCAP), Commercial Bank Assets (ASSETS), Monetary Base (MBASE), Liquidity (LIQ M0) and Broad Money Supply (M1 and M2) in Mill. SEK, 1834 – 1913. Per Capita and Constant Prices. Semi-logarithmic scale.



Sources: Myrdal, G & Bouvin, S. (1933), Post & Inrikes Tidning 1835 – 1870, Sammandrag af Bankernas Uppgifter 1870 – 1911, SCB (1955), Sveriges Riksbank "Statistiska tabeller" [Statistical tables] in *Sveriges Riksbank 1668-1924. Bankens tillkomst och verksamhet. Part V.* (Stockholm 1931); thereafter: Sveriges Riksbank "Statistiska tabeller" Ögren, A. (2003)

From the middle of the 1850s to the early 1870s Sweden underwent a financial revolution. Although the period 1855 until 1870 might seem arbitrarily chosen if one is looking at changes in individual institutions or organizations, a macro perspective on all the changes that took place during this period supports this period as the period when the financial revolution was taking place. The Swedish financial revolution, as prior had been the case in other economies experiencing a financial revolution, consisted of a successful combination of new institutions governing the financial sector, the establishment of trustworthy monetary and financial authorities and increasing rights for the population to engage in financial businesses. Table 1 captures the importance of complementarities of monetary and financial authorities with liberal possibility for private initiatives.

An illustrative example is how the National Bank, the Riksbank, decreased in relative importance from the 1840s. Still its assets, reserves and the monetary base all increased in absolute terms during the period. What these figures shows are how the role of the Riksbank was redefined during the period. The Riksbank became the monetary authority which notes

served as reserves in the banking sector, instead of being the main commercial bank in terms of assets and lending. This change in conjunction with the growth of private financial enterprises certainly underscores the financial revolution as a change both in institutional and quantitative financial terms.

As part of the State's role in the financial revolution is also the foreign debt which shows the increasing financial internationalization. Such a supply of international capital would not have been there without the proper institutions. This foreign debt was important for two reasons: 1) it provided the economy with capital for investments, and 2) due to the fact that proper institutions existed; the bonds that were issued as liabilities by the National Debt Office to raise this capital became good quality financial instruments (assets) assisting the development of the financial market. In fact most commercial banks would substitute such bonds for legal tender reserves.<sup>18</sup>

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<sup>18</sup> Ögren A. "Lender of Last Resort in a Peripheral Economy with a Fixed Exchange Rate: Financial Crises and Monetary Policy in Sweden under the Silver and Gold Standards, 1834 – 1913" in P. Cottrell et al. (Eds.) *Centers and Peripheries in Banking: The Historical Development of Financial Markets* (Ashgate 2007); thereafter: Ögren: "Lender of Last Resort" and A. Ögren "The Rationale of Private Note Issuance: Note Issuing Commercial Banks in the Economic and Financial Development of Nineteenth Century Sweden" Unpublished Working Paper (EconomiX/Université de Paris X – Nanterre 2008); thereafter: Ögren "The Rationale of Private Note Issuance"

*Table 1: Various financial measures in percent of GDP, 1840 – 1910*

Year	1840	1850	1860	1870	1880	1890	1900	1910
Foreign debt	-2.7%	-3.0%	12.2%	17.9%	20.5%	33.2%	24.3%	38.8%
Riksbank assets	15.8%	12.3%	10.0%	7.6%	8.9%	9.8%	10.0%	11.0%
Riksbank lending	8.1%	6.0%	3.9%	2.0%	1.9%	2.9%	2.0%	1.2%
Riksbank total reserve	6.7%	3.6%	2.9%	2.5%	2.2%	1.5%	2.0%	3.4%
Monetary Base	9.8%	6.7%	5.0%	3.0%	3.0%	3.2%	3.2%	6.5%
Liquid Money Supply (M0 = circulating Riksbank and Enskilda bank notes)	11.3%	8.7%	7.3%	5.3%	6.0%	6.4%	6.3%	6.5%
Broad Money Supply (M2)	12.8%	11.5%	13.0%	19.0%	36.0%	49.9%	61.5%	78.3%
Commercial bank assets	4.3%	6.6%	9.9%	19.6%	36.5%	45.2%	61.7%	79.4%
Commercial bank lending	2.3%	3.0%	5.3%	10.8%	20.6%	30.7%	46.0%	64.8%
Savings bank assets	n.a.	n.a.	n.a.	n.a.	12.1%	20.8%	21.5%	27.6%
Savings bank lending	n.a.	n.a.	n.a.	n.a.	9.3%	16.7%	17.2%	22.9%
Mortgage associations lending	0.4%*	1.4%*	2.2%*	9.9%	17.2%	19.9%	12.4%	9.2%
Mortgage associations bond issuance	0.3%*	1.0%*	1.7%*	10.5%	20.5%	22.4%	13.2%	9.1%
Life insurance companies' net insurance fund	n.a.	n.a.	0.1%	0.6%	2.4%	5.3%	7.1%	9.9%

\* Only the Skåne Hypoteksförening.

Sources: Lindahl, E., Dahlgren, E. & Kock, K. (1937a), (1937b), Krantz, O. (2001), Nygren, I. (1967), (1981), Post & Inrikes Tidning 1835 – 1871, SCB (1960), Schön, L. (1999), Sammandrag af Bankernas Uppgifter 1871 – 1911, Sommarin, E. (1934), Svenska livförsäkringsbolags förening (1958), Sveriges Allmänna Hypoteksbank (1911), Sveriges Riksbank (1931)

Synergies in the financial system mean that financial variables should have grown in harmony after the financial revolution. As seen in table 1 this was largely true in the case of Sweden. Monetary variables not including deposits were relatively stable in relation to GDP during this period. When public deposits in commercial and savings banks are included, the money supply grew from thirteen percent of GDP in 1840 to seventy-eight in 1910. In absolute numbers, the growth was even more impressive, as GDP grew quite rapidly from the 1870s and onwards.

Whereas cross country studies supports the fact that financial depth to GDP is of importance for the economic performance of a country, a longitudinal study of the importance of financial growth for GDP will not benefit from increased financial depth. Nevertheless, the increased financial depth indicates a rapid financial development in the case of Sweden. As quantitative evidence supports that a financial revolution took place around 1870, also qualitative evidence points out that many fundamental institutional factors changed during the period just before; roughly between 1855 and 1870.

### **Political representation**

The necessity of the political system in facilitating the establishment of an efficient financial system has been thoroughly analyzed as one of the main examples of the importance of

institutions for economic growth.<sup>19</sup> Needless to say, this assumes the idea of a well designed financial system as important for economic growth.

The 1809 constitution was largely based on limiting the power of the Crown by increasing the power of the Parliament, and especially the Nobility. The political system was a form of a constitutional monarchy with the Crown acting as Government and the Parliament consisting of male representatives of the four Estates; the Bourgeoisie, the Clergy, the Nobility and the Peasantry. Of special importance in this constitutional design was the forcing of the Government (the Crown) to rely on the Parliament for funding as the latter had the exclusive right for taxation.

From the 1840s it became obvious that belonging to an estate was not sufficient for agreeing in political matters. The groups in society that had the least influence within the Parliament, which also was the majority of the population, started to make its claims for increased representation. As a result a new constitution based on a two chamber Parliament was instigated in 1865. Comparably this change decreased the influence of the tax financed groups in society; the Clergy, the Nobility and of course the Government (the Crown). The 1865 constitution instead increased the representation of property owning males subject to paying taxes.

### **The Riksbank and the issuance of base money**

One of the keys of developing a financial sector is the establishment of a stable currency not only to open for foreign capital markets, but also to be used as an anchor, or as base money in the banking system. In 1834, after a decision in Parliament 1830, Sweden established a specie standard that was kept for eighty years until the outbreak of World War I.

The importance of the stable currency for the financial sector is illustrated by the fact that this decision was the ignition for the first application to establish a commercial bank. No applications had been filed earlier although the Parliament and the Crown had launched special proclamation to promote private banks seven years prior.

Later, as international markets increased in importance for the Swedish economy, the silver standard was changed into a gold standard in 1873. This change was a result of the German Reichsbank's switch to a gold standard in 1871 and was made in connection to the

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<sup>19</sup> North & Weingast "Constitutions and commitment:"

establishment of the Scandinavian Currency Union when the unit of account was harmonized in the Scandinavian countries to the *Krona*.<sup>20</sup>

Despite the problematic track record of the Swedish currency the fixed exchange rate was kept, and it is probable that the faith in the stable currency grew in time. It became clearer over time that the priority of the Riksbank was to protect the fixed exchange rate above all other objectives.

From the late 1850s the public debt increased and the absolutely largest part of this debt was held by foreigners, subsequently the loans were denominated in foreign currencies. The foreign debt thus put increased pressure on the importance of maintaining the fixed exchange rate as a depreciated currency would add to the problems of repaying this debt. As a consequence the Riksbank did not jeopardize the currency by engaging too heavily into lender of last resort activities. If further funds were needed for the banking system, the State represented by the Government and the Parliament stepped in and through the National Debt Office borrowed funds from abroad (i.e. England, France and Germany).<sup>21</sup>

In the 1870s a more formalized cooperation began between the Riksbank and the National Debt Office. This was done with the aim of better coordinating the effects the Office's foreign borrowing had on the possibility of the Riksbank to maintain the specie standard.

The Riksbank was not given note issuing monopoly in practice until 1903 when the right to issue notes for the Enskilda banks was abolished. Although the Swedish money stock from the 1830s partly consisted of private bank notes it was obvious throughout the period that the Riksbank was responsible for the currency. Notes issued by the Riksbank were the main component in the reserves of the banking system (whereas private bank notes never were kept as reserves).<sup>22</sup>

With the outspoken aim of ending the outdated bureaucracy of the Banks' business the organization was fundamentally changed between the 1860s and early 1870s. The staff was downsized, the detailed regulations regarding the activities of the Bank was cut to a third increasing the freedom of the Board and the CEO of the Bank. The previously independent Loan Office became fully integrated into the Bank. Modernizing the loan business meant that funds that previously had been locked for specific purposes were freed. As a result old

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<sup>20</sup> K. Talia *Monetary Integration and Disintegration: Studies in the Scandinavian Currency Union, 1873-1924*. (Stockholm 2004); thereafter: Talia *Monetary Integration*. The Scandinavian Currency Union was established in 1873. It consisted of Denmark, Norway (joined in 1875) and Sweden. Originally it only included coins valued at par, but from 1894 the SCU included notes as well.

<sup>21</sup> Ögren: "Lender of Last Resort"

<sup>22</sup> Ögren "Free or Central Banking"

fashioned subsidized agricultural loans and other outdated loans diminished considerably paving way for commercial lending collateralized for instance in bonds, stocks, bills of exchange, name and current account credit. Thus the Riksbank consolidated its own position at the same time as it circulated more of its notes to be used as reserves by the banking system. As a result of this consolidation the Riksbank in 1872 instigated a fund to be utilized in an outspoken sterilizing manner.

The Riksbank clearly acted as a rudimentary form of central bank issuing base money. The commercial banks utilized the possibility to deposit funds in an interest bearing current account. Since deposits in the Riksbank could be made with Enskilda bank notes from 1869 if the Riksbank had the possibility to instantly exchange these notes for its own, it is likely that the Riksbank was engaged in clearing activities as well.<sup>23</sup>

### **The National Debt Office managing the public debt**

The importance of managing the public debt was twofold: 1) as was the case of the stable currency it served as a signal of trust to lenders, and 2) if the commitment of the State was trustworthy, the public debt in turn became financial assets/securities to be held by investors. For this to work it was essential to have a well structured tax system ensuring investors in the public debt that the State could extract the revenues needed for repayment.

The role of the National Debt Office changed fundamentally when the Parliament of 1853/54 decided to use the Office to raise the funds needed to build the core of the railroad system. The period 1854 to 1866 was a period of trial and error with incomplete organizational and institutional practices.

At first the Office lacked the experience of managing international loans. Due to the internal organization of the Office it did not have continuous contact with the international economy and no contracted long term correspondents abroad. The commercial banking system was not competing about arranging the loans.<sup>24</sup> Because of the organization and history of the Swedish State's financial authorities, the National Debt Office and the Riksbank acted as competitors. From the latter half of the 1860s the National Debt Office

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<sup>23</sup> S. Brisman "Den stora reformperioden 1860-1904" in *Sveriges Riksbank 1668-1924-1931. Bankens tillkomst och verksamhet, part IV*. (Stockholm 1931); thereafter: Brisman "Den stora reformperioden" and A. Ögren *Empirical Studies in Money, Credit and Banking: The Swedish Credit Market in Transition under the Silver and Gold Standards, 1834 – 1913*. (Stockholm 2003); thereafter: Ögren *Empirical Studies* and Ögren "Free or Central Banking"

<sup>24</sup> It has been written that the Office did not cooperate with any Swedish commercial banks, but in the 1860s the Office was criticised for its extremely close ties to one of the major commercial banks, the Skandiaviska Kredit AB, in which's board several of the Office's board members also were represented. This bank was involved in the 1861 loan according to the loan contracts of the National Debt Office.

solved these problems with increased cooperation with the Riksbank and involving more domestic banks. Not only did the Office accumulate knowledge about debt management, new forms of loans were developed to better suit the needs of the State.<sup>25</sup>

As was the case with other countries experiencing a financial revolution, Sweden became a large net importer of capital. The costs of these loans diminished over time, and new loans could be raised to pay for older more expensive loans already in the early 1870s. Foreign loans were however always denominated in the lenders currency.

The loans taken by the National Debt Office were different forms of bond loans, mainly aimed for international markets. The Office's bonds were circulating as securities also on the domestic market. One of the investors in National Debt Office bonds was the Riksbank, who held these bonds as assets that could be turned into reserves when necessary.<sup>26</sup> The banking system also held these bonds as assets in a manner that increasingly came to replace cash reserves.

The market for domestic securities, most notably bonds, became noteworthy in size in the early 1870s. In 1861 the Mortgage Bank of Sweden was established to coordinate the business of the Mortgage companies. The first domestic life insurance company was established in 1855 and the commercial banking system within its legal boundaries started to grow in the 1850s. As repressions on bank establishments were revoked in 1864 these banks could become fully fledged commercial banks. The result of this financial revolution was clearly visible in the rapid increase in financial services that took place in the early 1870s.<sup>27</sup>

### **The Banking system and the Swedish monetization**

The commercial banks functioned in a complementary manner by themselves. The banks turned fixed and indivisible assets into liquid liabilities. These liquid liabilities could consist of demand deposits, or as in the case of Sweden, private bank notes. Thus the commercial banking system was important for the financial revolution as it managed to create financial instruments also to be used as means of payments. The Enskilda bank notes were regarded as safer more trustworthy than what had been used for payments prior (for instance personal

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<sup>25</sup> K. Hildebrand *Riksgäldskontoret 1798 – 1934* (Stockholm 1934); thereafter: Hildebrand *Riksgäldskontoret*

<sup>26</sup> Ögren: "Lender of Last Resort" and A. Ögren "Sweden's Monetary Internationalization under the Silver and Gold Standards, 1834 – 1913" Unpublished Working Paper (EconomiX/Université de Paris X – Nanterre 2008); thereafter: Ögren "Sweden's Monetary Internationalization"

<sup>27</sup> Ögren "The Rationale of Private Note Issuance" and L. Schön "Kapitalimport, kreditmarknad och industrialisering 1850-1910" in E. Dahmén (Ed.) *Upplåning och utveckling. Riksgäldskontoret 1789-1989*. (Stockholm 1989); thereafter: Schön "Kapitalimport"



IOUs and authorized assignments).<sup>28</sup> In an economy suffering from a lack of trustworthy means of payments, the Enskilda bank note issuance thus became an important part of the formal monetization. This monetization was also an important part in the creation of liquid secondary asset (or security) markets.

The necessity to complement the business of the Parliamentary Riksbank by allowing for the establishment of private commercial banks was agreed upon in Parliament, thus an official Royal Proclamation in 1824 guaranteed this right, and as all other businesses banks were to be run under the principle of unlimited liability. The Crown had to agree upon each banks' regulations to grant a time limited (ten year) charter. The importance of the need for an anchor currency for banking business was apparent since it was the decision to reestablish the silver standard in 1830 that led to the establishment of the first commercial bank in Sweden, *Skåne Enskilda Bank*. The Parliament agreed to the note issuing rights of the Enskilda banks, since this was considered as the only way of making it possible to fund banking business in a country suffering from lack of means of payments.<sup>29</sup>

Until the middle of the 1860s, bank establishment was more or less a monopoly affair for those who managed to be granted charters to run banking business. Strong groups in Parliament, and allies to the Crown, had business interests in keeping competition as low as possible. As a result, banking establishment was prevented until political representation changed.

In 1851 the increasing hostility towards the local Enskilda bank monopolies led to an attempt with none note issuing banks relying on Riksbank credit; the so called Filial banks. The attempt with the Filial banks showed how under-established the banking sector was. Initially funds that were meant to support the establishment of three Filial banks had to support eight such banks. Within a few years nineteen Filial banks were established, competing for funds that were only a fraction of what the twelve existing Enskilda banks issued in notes. In addition, the Crown who regulated the charters prevented the Filial banks from the possibility to accept deposits.

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<sup>28</sup> T. Engdahl & A. Ögren "Multiple paper monies in Sweden, 1789-1903: Substitution or complementarity?" *Financial History Review*, **15:1**; thereafter: Engdahl & Ögren "Multiple paper monies" The so called Authorized Assignment was a form of non interest bearing check that was drawn on the issuer's credit (or deposits) in the Riksbank. In accordance with the law, these checks could be issued by the holder of the credit taking the time of circulation into account. In practice this meant that there was no limit to the issuance of checks as long as the issuer was not declared as bankrupt. If this happened the holders of the checks would be the ones to carry the costs. This occurred en masse during the crises of 1848 and the Authorized Assignments lost popular trust. S. Brisman *Sveriges Affärsbanker. Grundläggningstiden*. (Stockholm 1924) pp. 9-11, 18; thereafter: Brisman *Sveriges Affärsbanker*

By the early 1860s the opposing parts in Parliament agreed to end the attempt with Filial banks, at the condition of freer establishment of commercial banks. From 1865 existing Filial banks either merged with existing Enskilda banks or reformed as new Enskilda banks. In addition a number of new Enskilda banks were opened, increasing the number of commercial banks from nineteen to twenty five and the number of note issuing Enskilda banks rose from twelve. The number of bank offices increased as well from fifty in 1860 to hundred and five in 1866, and then actually reached a level of between four and five offices per bank, a level that was kept until after 1900. This rapid bank establishment coincided with the abolishment of the usury law and the possibility to establish none-note issuing limited liability banks.<sup>30</sup>

*Table 2: No of Commercial banks & offices, Money Supply, Bank assets and Bank lending in Mill. SEK per capita (Constant prices 1834 = 1), 1840 – 1910*

Year	Commercial banks	Commercial bank offices	Riksbank and Commercial Bank Notes	Money Supply (M2)	Commercial bank lending	Commercial bank assets	Savings bank lending	Savings bank assets
1840	6	n.a.	14.1	15.9	2.8	5.4	n.a.	n.a.
1850	8	n.a.	12.2	16.2	4.2	9.3	n.a.	n.a.
1860	12	50	12.1	21.5	8.7	16.5	n.a.	n.a.
1870	30	136	9.9	35.4	20.2	36.5	n.a.	n.a.
1880	44	205	12.6	76.4	43.8	77.3	19.6	25.6
1890	43	190	15.4	120.6	74.2	109.2	40.4	50.3
1900	67	269	20.7	200.3	149.9	201.3	56.1	70.2
1910	80	625	25.9	312.6	258.7	316.8	91.3	110.2

Sources: Brisman, S. (1924), Nygren, I. Post & Inrikes tidning 1835 – 1871, Sammandrag af Bankernas Uppgifter 1871 – 1911, SCB (1955), Sveriges Riksbank (1931)

As seen in figure 5 above, the freer bank establishment from the middle of the 1860s immediately led to a notable increase in financial services provided by the commercial banks. Bank assets, lending and the broad money supply all more than doubled, showing the importance of developing a nation wide financial system.

The notes issued by the Enskilda banks were based on the fixed exchange rate maintained by the Riksbank from 1834. Although the Riksbank accepted Enskilda bank notes from banks with an exchange agent or an office in Stockholm from 1869, only notes issued by the Riksbank were kept as reserves by the banking system.

Initially the Enskilda banks funded their business by the issuance of notes without paying much attention to deposits. With the reintroduction of the ‘postal bank bill’ in 1855, deposits became nearly as liquid as notes. Although notes initially might seem as a cheaper source of

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<sup>29</sup> K. Kock *Skånska Privatbanken. Minnesskrift*. (Stockholm 1931); thereafter: *Skånska Privatbanken* and Ögren *Empirical Studies*

funds, the discount costs the Enskilda banks faced for exchanging these notes and increased taxes on note issuance made deposits an equally profitable alternative. Deposits also had other advantages, as the amount of notes a bank could issue was regulated by law which was not the case for deposits. The question of note issuance by the Enskilda banks was regularly monitored and debated in terms of banking business prudence, and consequently even though deposits might have been somewhat more expensive for the banks than note issuance, deposits had its advantages.<sup>31</sup>

The broad money supply stayed fairly stable between 1855 and 1868 but notes in circulation decreased. During this period the Enskilda banks altered their liabilities by substituting deposits for notes. In the late 1860s, from the through year of 1868, both note issuance as well as deposits started to grow again, and from the year 1867, deposits was the main component of the broad money supply. As seen in figure 5 the broad money supply increased enormously during a few years in the late 1860s and early 1870s suggesting a breakthrough in monetization between the years 1868 until 1872.

The shift in money supply was accompanied by a shift in the lending pattern of the commercial banks. Discharging the early years with extreme growth, growth in commercial bank lending for the rest of the period was at an annual rate off seven percent. The more liquidized the economy became, the less cash reserves banks had to hold and the more lending banks could engage in.

Already from the 1820s, savings among the public was encouraged through the establishment of Savings Banks. In a beginning Savings Bank offices were small, isolated and scattered allover the country. As part of the complementarities of the financial system, the importance of the Savings Banks on the credit market increased with the establishment of commercial banks. Although these organizations were meant to be philanthropic institutions supporting the virtue of saving, this meant an increased opportunity for these banks to channel their funds to the loan market through the commercial banks. A common situation was that

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<sup>30</sup> Ögren *Empirical Studies* and Ögren "The Rationale of Private Note Issuance"

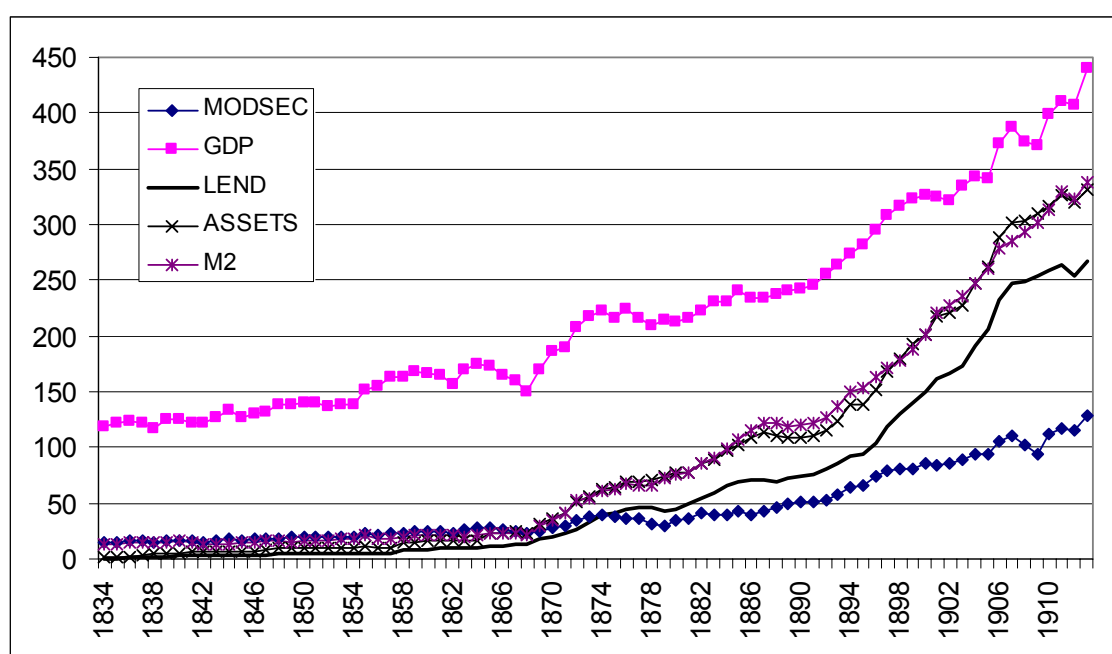
<sup>31</sup> Ögren "Free or Central Banking" and Ögren "The Rationale of Private Note Issuance"

the same persons that sat in the Board of the local Savings Bank also sat in the Board of the local commercial bank, and/or that Savings Banks and Commercial Banks shared office.<sup>32</sup>

### Did the financial system promote economic growth?

Figure 5 below show that a general increase in formal financial services and economic growth took place in the early 1870s. If the financial system, including monetization, was important for the economy, this should be traceable as a link between measures of the financial sector and economic growth.

Figure 5: Per capita Economic growth (GDP), Industry growth, Money Supply (M2) and Commercial bank lending in constant prices (1834=1). 1000's SEK.



Source: Krantz, O. (2001), Myrdal, G. & Bouvin, S. (1933), Ögren, A. (2003)

To study the financial system as a whole I have divided the financial variables into two groups: Financial Basis Variables and Monetary variables. Financial Basis Variables are:

<sup>32</sup>H. Hellgren *Fasta förbindelser: en studie av låntagare hos sparbanken och informella kreditgivare i Sala 1860 – 1910* (Uppsala 2003); thereafter, Hellgren *Fasta förbindelser* and T. Petersson *Framväxten av ett lokalt banksystem: Oppunda sparbank, Södermanlands enskilda bank och stationssamhället Katrineholm 1850 – 1916* (Uppsala 2001); thereafter: Petersson *Framväxten*. The Savings Banks were successful in competing for funds from the public and as the use of deposits grew in importance, the groups in Parliament that had an interest in working for credit market liberalization in the case of the Commercial Banks worked for large restrictions on the Savings Banks' possibility to run banking business. The result of this became a new Savings Bank law in the middle of the 1890s that forced the Savings Banks to end their loan business and return to the "old values" of philanthropically fostering the public in the virtue of saving. As a consequence a large number of Savings Banks reformed into small local joint stock banks, so called Folk Banks (*Folkbanker*) A. Sjölander "Att reglera eller

Commercial Bank Assets (ASSETS), Equity Capital in commercial Banks (EQCAP), Commercial Bank Lending (LEND). The idea is that especially the measure of assets (ASSETS) and to some extent the equity capital (EQCAP) shall capture the growth and consolidation of the financial system. Such a growth should not be possible in the long run without sustained productivity growth. Lending (LEND) as a variable lies somewhere in between as a channel of wealth in the banking system to economic productivity.

Monetary Variables are: Monetary Base (MBASE), Liquidity (LIQ) and Broad Money Supply (M1 and M2). The monetary base (MBASE) is the provision of possible cash reserves to be held by the banking system. It can either be held as liquidity by the public or lie as reserves in the banking system thus serving to increase credit and the money supply through the money multiplier mechanism. Thus if access to credit and means of payments are of importance for economic growth the variable monetary base (MBASE) is expected to positively affect economic growth.

Formal liquidity (LIQ) is means of payments trusted by all parts and directly possible to use for all transactions. It is the main instrument in order to avoid transaction costs. This is of especial importance in an illiquid emerging economy in the process of formalizing and integrating its domestic markets. The Swedish system, combining the Riksbank, an issuer of base money and with the ultimate responsibility for preserving international specie convertibility, with the private Enskilda banks as domestic note issuers, allowed a greater expansion of means of payments than otherwise would have been the case. The choice of the Enskilda banks—supported by the public—to rely more on Riksbank notes than on specie for their reserves led to a greater expansion of liquidity than what otherwise would have been possible.<sup>33</sup> The larger acknowledgement of the means of payments, the more it can be used in larger networks, including as became the case with the Enskilda bank notes, the entire Country (and some neighboring regions in Norway and Denmark). As transaction costs and risks decreases and investments becomes more liquid, more pay offs are available for economic activity. Thus it is a likely hypothesis that the increase in formal liquidity (LIQ) supplied by the Enskilda banks on top of the Riksbank notes was related to economic growth and modernization.

Broad Money Supply is measured as liquidity (LIQ) plus the public's deposits in commercial banks (M1). M2 also includes the public's deposits in savings banks. The broad

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inte reglera – En undersökning av Sparbanksfrågan i Riksdagen 1882 – 1939” Uppsala Papers in Financial History **13** (2000); thereafter: Sjölander “Att reglera”

<sup>33</sup> Ögren “Free or Central Banking”

money supply does not only capture monetization but also the growth of public wealth in the banking system. The measure M1 is in some studies used as a proxy for financial deepening or financial development as a whole. But as the savings banks were important actors on the financial market the measure M2 might be more appropriate. It is seen in figures 4 how closely related M1 is to commercial bank lending (LEND) and M2 to their assets (ASSETS).

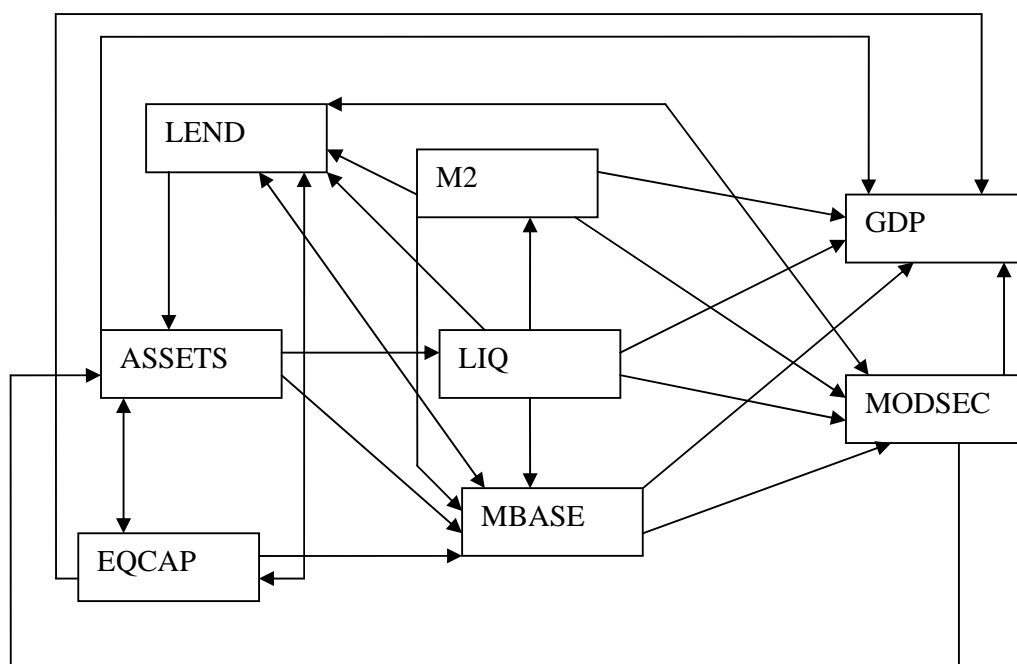
There are two measures of economic growth: Total Economic Growth (GDP) and Modern Sector Growth (MODSEC). The latter is defined as growth in industry and handicrafts and became the largest single sector of productivity just before the end of the century when it surpassed the agricultural sector. This is in line with the hypothesis of creative destruction, that the financial revolution sustains investments in newer more risky technologies.

Since the series are not stationary, that is that they are growing over time, I begin the econometric testing with cointegration tests (see Appendix). The first question is how the different financial and monetary variables were related to each other. Looking at the series of these variables (figure 4) indicates that some of the variables indeed seemed grow in a manner which was closely related to each other. Among the financial basis variable the commercial banks assets and lending took off in the late 1860s, and the same was the case for the broad money supplies (M1 and M2). The importance of the financial and monetary variables for economic growth and modernization is however more difficult to see.

There are three important results of the cointegration tests: 1) First and most important, the growth of the financial and monetary variables were clearly related to economic growth and modernization (see table 4 in the Appendix). 2) Also, the growth of the financial and the monetary variables were interlinked (see table 3 in Appendix) supporting the importance of the development of the financial and monetary system as a whole. 3) There was a distinct difference between the pre- and the post- financial revolution period (see tables 3 and 4 in the Appendix) strengthening the impact of the financial revolution for the growth of the financial system and its impact on real economic growth and modernization.

Granger causality tests further strengthens the importance of the financial and monetary development for economic growth and modernization in the case of Sweden (see Appendix and Table 5). There was a positive causality running from changes in the financial and monetary variables to changes in general economic growth and growth in the particular industrial sector. The significant results (at the 5-percent level) of the Granger causality tests are summarized in figure 6 below.

Figure 6: A Stylized Illustration of the Significant Granger Causalities in Table 5 above.



At 5 % significance level

First and most importantly the results of the granger causality analysis supports that growth was finance-led in the case of Sweden. Changes in the monetary variables granger caused changes in GDP as well as in the modern sector (MODSEC). This result concerning liquidity (LIQ) underlines the importance of creating means of payments with the qualities that makes them accepted for transactions outside small regional networks. The specie standard kept the value of the means of payments, and the Enskilda banks supplied liquidity to an extent that facilitated economic growth. The monetary base (MBASE) and the broad money supply (M2) also granger caused growth in the modern sector as well as in total GDP.

The financial basis in terms of commercial bank assets (ASSETS) and equity capital (EQCAP) affected overall economic growth (GDP). Lending, however, did not affect GDP but had a mutual relationship with growth in the modern sector (MODSEC). The only somewhat puzzling result is that growth in the modern sector granger caused changes in commercial bank assets. All in all the results clearly support the importance of the financial system for growth as well as modernization in the economy.

The financial variables also seemed to affect different sides of the growing economy. All the monetary variables affected growth in the modern sector as well as in overall GDP, whereas the financial basis variables seemed to be related exclusively to growth in overall GDP. This stresses the importance of the complementarity of the financial system and so does

the fact that growth in the modern sector fostered growth in overall GDP, and not conversely. This result highlights the importance of creative destruction for long term economic growth.

But there is more to the picture of the financial revolution than the fact that economic growth and modernization followed on the growth of the banking system, and the money supply. Financial and monetary variables were interlinked in the developing process into a system. The financial basis promoted the most liquid forms of the monetary variables. The monetary variables all supported lending, which in turn positively affected growth in the banking system (represented by commercial bank assets). All this supports the idea of the importance of the development of financial sector as a system where different parts complement each other. Not least the importance of a financial system for a successful monetization.<sup>34</sup>

That among the monetary variables liquidity granger caused growth in the broad money supply is expected. The broad money supply on the other hand caused changes in the monetary base. This result is in line with the monetary approach to the balance of payments, i.e. that increased demand for money eventually forces the monetary authority to adjust the monetary base.<sup>35</sup> Among the financial basis variables lending served to build up the assets of the banking system. There was a mutual relationship between equity capital and lending.

## Conclusions

As was the case in other historical experiences, the Swedish financial revolution was built on complementary between different parts of the financial sector. The synergy effects created the financial revolution and made it important for economic growth. Fundamental financial and institutional changes were made from the middle of the 1850s to the early 1870s.

A stable currency was put into existence in 1834, managed by the Riksbank that prioritized the specie convertibility before all other objectives. Thus the market share of the Riksbank decreased as its role was transformed to more of that of a central bank.

The National Debt Office managed the State's debt and managed from the late 1850s to import capital from international capital markets. The Office became better at both organizing its business and creating high quality financial instruments, bonds, to raise capital. Throughout the nineteenth century bonds were the main security traded. In 1861 the then

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<sup>34</sup> See Ögren "Sweden's Monetary Internationalization" for a deeper study of this issue.

<sup>35</sup> See L. Jonung "Swedish Experience under the Classical Gold Standard 1873-1913", in M.D. Bordo and A. Schwartz (red.), *The Classical Gold Standard in Retrospective*. University of Chicago Press/National Bureau of Economic Research 1984; thereafter: Jonung "Swedish Experience" and Ögren "Sweden's Monetary Internationalization"



existing Mortgage Associations, which funded their lending also by bond issuance, jointly established the Swedish Mortgage Bank.

Changes in political representation made a nation wide establishment of commercial banks possible. This took place in the middle of the 1860s and was based on the tasks of the Riksbank and the National Debt Office as well as the growing security market. The banks that were established, unlimited liability commercial banks, served the purpose of raising funds for their business by issuing notes. Besides being able to invest in local business ventures, these banks managed the monetization by liquidizing fixed assets. This led to the liquidity spiral where banks were able to substitute interest bearing securities for cash reserves, thereby feeding monetization further. In such manner the banks could consolidate more thus lending more.

The financial revolution in Sweden made its mark in the growing financial services and monetization from the late 1860s. Growth in the real economy measured as per capita GDP in stable prices, and growth in the industrial sector of the economy accelerated later in the nineteenth century. Cointegration tests showed that financial variables and economic growth were growing in harmony. It also showed that there existed different periods, one pre- and one post financial revolution period.

The financial revolution preceded the structural transformation that made the industry the leading sector in the economy. Monetization and public wealth in the banking system granger caused changes in the modern (industrial) sector as well as in overall GDP. This demonstrated the role the monetization and the financial system played for the process of creative destruction to take place. Measures of the financial system affected growth in overall GDP. The development of the financial system and monetization were also dependent on each other, showing the importance of the financial revolution occurring as the growth of a system.

## **Appendix**

We should note the fact that some variables are long term stock variables such as commercial bank assets and equity capital, whereas others are more short term flow variables such as liquidity and the monetary base. The measures of economic growth are both more of flow variables but as most “flow” variables in time series they are very dependent on their size in prior periods. Variables such as commercial bank lending and the broad money supply are also possible to regard as flow as well as stock variables. Thus it is difficult to make a clear distinction between these variables in this respect.

## Cointegration

Since all the series are non-stationary I begin with testing if they are cointegrated. Cointegration test is used to discover stable relationship between data series if there are trends in these series. The time series are cointegrated if there exists one (or several) linear combination(-s) between the two non- stationary variables that is stationary. Such a linear combination shows an econometric equilibrium relationship between the variables; that is that the variables do not move randomly in relation to each other over time.

The cointegration test shows that there existed relationship between the financial basis and monetary variables (table 3). In the case of the financial basis variables commercial bank assets and equity capital shared two common vectors. That there existed two vectors is a result of the break between the post and the pre financial revolution. In the early period commercial bank assets and equity capital was almost at the same level indicating one stable relationship. The difference in growth between commercial bank assets and equity capital after the late 1860 shows another relationship. Assets and lending appears to have been close all over the period with one single vector on short term as well.

As liquidity and broad money supply (M1 and M2) were parts of each other it is not surprising that there were cointegration relationships, but the results underline the importance of the financial revolution with two cointegration vectors; one for the series pre the financial revolution and one post. We can also see that there was only one vector for the relationship between the monetary base and the other monetary variables. There was no cointegration vector for the early period but one for the post financial revolution period which shows that the monetary base was more important for the money supply after the financial revolution.

*Table 3: Cointegration vectors and their significance for pair wise cointegration tests between financial basis variables (assets (ASSETS), equity capital (EQCAP) and lending (LEND) of commercial banks) and monetary variables (Monetary Base (MBASE), Liquidity (LIQ) and Broad Money Supply (M1 and M2)), 1834 – 1913 Per capita and in Constant Prices (1834=1). 1000's SEK.*

Monetary Variables No of Lags	MBASE LIQ	MBASE M1	MBASE M2	LIQ M1	LIQ M2	M1 M2	Financial Basis Variables No of lags	ASSETS EQCAP	ASSETS LEND	EQCAP LEND
1		1**	1**	1**,1**	1**,1*	1**,1*	1	1*,1*	1*	
2			1*			1*,1*	2			
3						1*	3			
4	1*						4			
5							5			1*

Monetary and Financial Basis Variables No of Lags	ASSETS MBASE	ASSETS LIQ	ASSETS M1	ASSETS M2	EQCAP M1	EQCAP M2	LEND LIQ	LEND M1	LEND M2
1	1*	1*,1*	1**	1**,1**	1*	1*	1*,1**	1**,1**	1**,1**
2				1**,1**				1*	1*
3				1**,1*				1*	
4						1*			
5						1*			

\* 5% and \*\* 1% significance level

Putting the financial basis variables together with the monetary variables shows that there evidently was a strong relationship between the broad money supply and commercial bank assets and lending. Also we see that there are two cointegration vectors, indicating two different stable relationships between the series over time. Equity capital and the monetary fundaments, i.e. the monetary base and liquidity, were not related.

The two measures of economic growth, overall GDP and the modern sector (MODSEC) represented by industry and handicrafts were sharing one cointegrating vector, i.e. were related. As the modern sector was one of several sectors included in the GDP this is not surprising.

As seen in table 4 below there were significant relationships between the growth of the financial and monetary system and the economy. All three financial basis variables were related to the two measures of growth, GDP and the modern sector. Exclusively this was the case with two cointegrating vectors, which means that the development of the financial system was related to economic growth both before and after the financial revolution.

*Table 4: Cointegration vectors and their significance for pair wise cointegration tests between financial basis variables (assets (ASSETS), equity capital (EQCAP) and lending (LEND) of commercial banks), monetary variables (Monetary Base (MBASE), Liquidity (LIQ) and Broad Money Supply (M1 and M2)) and growth variables (GDP and modern sector (MODSEC), 1834 – 1913 Per capita and in Constant Prices (1834=1). 1000's SEK.*

Financial Basis and Growth Variables No of Lags	ASSETS GDP	ASSETS MODSEC	EQCAP GDP	EQCAP MODSEC	LEND GDP	LEND MODSEC
1	1**,1*	1**,1**	1*,1*	1*,1**	1*,1*	1**,1**
2		1**,1**	1*	1*,1*	1*,1*	1**,1**
3	1*,1*	1**,1**	1*,1*	1*,1*	1*,1*	1**,1**
4	1**,1*	1**,1**	1*	1*,1*	1**,1*	1**,1**
5		1**,1*			1*,1*	1**,1*
Monetary and Growth Variables No of Lags	M1 GDP	M1 MODSEC	M2 GDP	M2 MODSEC	MBASE GDP	LIQ MODSEC

1	1**,1*	1**,1**	1**,1*	1**,1**	1*	
2	1*,1*	1**,1**	1*	1**,1*		1**,1*
3	1*,1*	1**,1**	1*,1*	1**,1**		1*,1*
4	1*,1**	1**,1**	1*,1*	1*,1**		
5		1*,1*				1**,1*

\* 5% and \*\* 1% significance level

Economic growth was also related to the monetary variables. The same pattern emerges for the broad money supply as for commercial bank assets and lending. Liquidity and the monetary base as monetary fundamentals were also related to economic growth but not in the same strong manner. As these provided a basis for the overall expansion of the financial and the monetary system this is not surprising. It is more surprising that liquidity was related to growth in the modern sector before as well as after the financial revolution.

There was apparently a connection in the growth of the financial and monetary system and the economy, not least in the emerging industrial sector. The cointegration analysis is followed up with a Granger causality test to sort out the issue of eventual causality.

### Granger causality

The Granger causality is actually a test of order of occurrence, this means that it tests if variable A changed before or after variable B or vice versa. Since the data series are non-stationary I have differenced them to overcome this problem for the significance test. This means that we look exclusively at changes, i.e. if a change in variable A is preceding a change in variable B the next period. The result of the Granger causality test is listed in table 5 below.

*Table 5: Significant Granger Causalities between Total Assets in the Commercial Banking system (ASSETS), Equity Capital (EQCAP), the Monetary Base (MBASE), the Liquid Money Supply (LIQ), the Broad Money Supply (M1 and M2), Economic Growth (GDP) and Growth in the Modern Sector (MODSEC), 1834 – 1913. All variables in constant prices and per capita (five lags).*

Monetary Variables	Financial Basis Variables	Growth Variables
D(LIQ) → D(M2)* D(M2) → D(MBASE)**	D(LEND) → D(ASSETS)** D(EQCAP)* ↔ D(LEND)**	D(MODSEC) → D(GDP)**
Monetary & Financial Basis Variables	Monetary & Growth Variables	Financial Basis & Growth Variables
D(MBASE)** ↔ D(ASSETS)** D(ASSETS) → D(LIQ)** D(MBASE)** ↔ D(LEND)** D(LIQ) → D(LEND)* D(M2) → D(LEND)**	D(LIQ) → D(MODSEC)** D(M2) → D(MODSEC)** D(M2) → D(GDP)** D(MBASE) → D(MODSEC)**	D(MODSEC) → D(ASSETS)** D(ASSETS) → D(GDP)* D(EQCAP) → D(GDP)** D(LEND)** ↔ D(MODSEC)*

\*\* 1%, \* 5%, significance level

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