# Business cycles in the Netherlands, 1815-1913

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**SOM-theme C     Coordination and growth in economies**

## Abstract

This article exploits a unique new dataset containing information on the economy of the Netherlands to date business cycles turning points in the 19th century (1815-1913) using a modern econometric technique. The business cycle in the Netherlands is compared to the international (UK and US) business cycle for the second half of the sample. We conclude that business cycles do exist in the Netherlands in the 19th century – even before 1870. The Netherlands follows the international business cycle before 1870 and after 1890. In the in-between period the Dutch production could not meet both domestic demand and export demand.

## 1.  Introduction[*]

Nowadays, quantitative economic historical research often focuses on structural aspects of economic growth, in particular on the question what are the driving forces of the process of growth. Business cycle phenomena receive less attention. Although elder generations of economists and historians debated the subject of economic fluctuations fiercely, academic interest vaned at least in the Netherlands.[1]

This article explicitly deals with the cyclical patterns that accompany the process of economic growth. On the basis of a unique data set covering two centuries of socio-economic history, we are able to describe the long-run economic development of the Netherlands.[2] Rather than having to rely on partial indicators (like imports and exports or consumption data), we now have a full set of national income series at our disposal on the greater part of the last two centuries.

[1] The seminal works on business cycle aspects in the economic development of the Netherlands are: J. Ridder, *Een conjunctuur-analyse van Nederland 1848-1860* (Amsterdam, 1935), I.J. Brugmans, *Paardenkracht en mensenmacht. Sociaal-economische geschiedenis van Nederland 1795-1940* (Den Haag, 1961) en J.A. de Jonge, *De industrialisatie in Nederland tussen 1850 en 1914* (Amsterdam, 1968). In a recent textbook on economic development in the Netherlands in the nineteenth century (J.L. van Zanden en A. van Riel, *Nederland 1780-1914. Staat, instituties en economische* ontwikkeling (Meppel, 2000)) the entry business cycle is not even listed in the index.
[2] The data on the nineteenth century are from: J.P. Smits, E. Horlings en J.L. van Zanden, *Dutch GNP and its components, 1800-1913* (Groningen Growth and Development Centre monograph series no. 5, 2000). The series are combined with data sets of Statistics Netherlands. The complete data set is published: R. van der Bie en J.P. Smits, *Tweehonderd jaar statistiek in tijdreeksen* (Voorburg/Amsterdam, 2000).

A first analysis of this extensive data set reveals that the process of economic growth has become more and more stable over time. Years with low and even negative growth are observed more frequently in the nineteenth century than in the twentieth century. This observation fits in Simon Kuznets's theories on the process of long-run economic growth.[3] In his opinion a process of *modern economic growth* came into existence in the western world in the nineteenth century, which is characterised by a gradual increase in production without economic crises.

This article examines business cycles in the Netherlands in the nineteenth century (1815-1913). We date turning points on the basis of fluctuations in the level of economic activity. Section 2 describes how we measure business cycles. After a short overview of the historical literature on the cyclical development of the Netherlands in the (long) nineteenth century in Section 3, we apply our measure of economic activity, the gross domestic product series, to a non-linear series analysis in Section 4. The outcomes show that gross domestic product behaves differently in years with growth exceeding 0.7 per cent compared to years with growth below 0.7 per cent. We identify the low growth years, or more precisely years with growth below 0.7 per cent. In addition we determine the business cycle turning points as the years in which the economy switches from one regime into the other.

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[3] S.W. Kuznets, *Modern economic growth. Rate, structure and spread* (New Haven/Londen, 1966).

What explains the turning points? Are the cyclical fluctuations a result of incidental – or coincidental factors, or do they fit in a pattern of increasing international interdependence? The outcomes are confronted with the ideas of prominent Dutch economic historians. It appears that their ideas on the cyclical aspects of economic developments in the long nineteenth century need to be revised fundamentally in several respects. The Netherlands felt the effects of international business cycles already before 1870. However, between 1870 and 1890 the Dutch economy did not follow the international business cycle. Section 5 presents a new view on these matters paying special attention to the development of domestic demand to explain the divergence of the domestic and international business cycles.
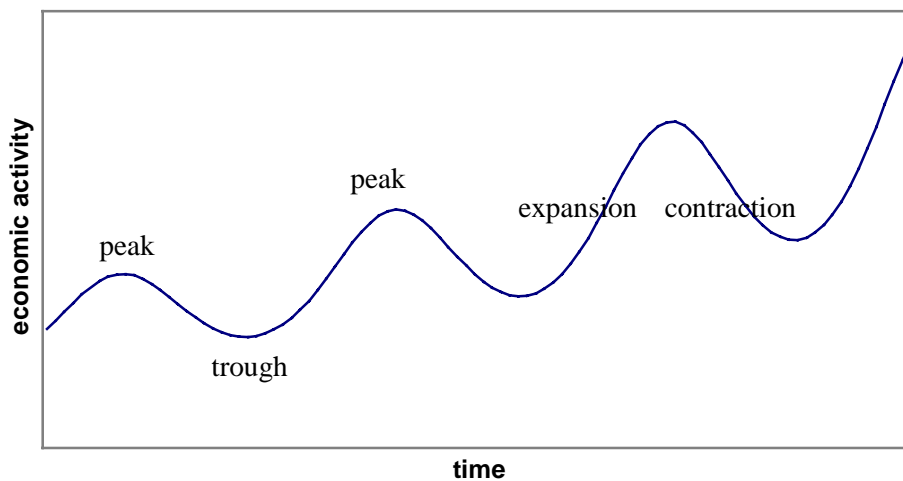
## 2. Measuring business cycles[4]

Business cycles are more or less regular patterns in fluctuations of macroeconomic variables, such as output, unemployment, consumption, prices or interest rates. A more sophisticated definition is given by Burns and Mitchell: "Business cycles are a type of fluctuations found in the aggregate economic activity of nations that organise their work mainly in business enterprises: a cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals which merge into the expansion phase of the next cycle; this sequence of changes is recurrent but not periodic; in duration business cycles vary from more than one year to ten to twelve years; they are not divisible into shorter cycles of similar character

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[4] This section draws on J. Bonenkamp, J.P.A.M. Jacobs en G.H. Kuper, "Measuring business cycles in the Netherlands, 1815-1913: a comparison of business cycle dating methods", *SOM Research Report* No. 01C25, (Groningen, 2001).

with amplitudes approximating their own."[5] So, a business cycle consists of a peak in economic activity, a contraction followed by a trough, and an expansion. Figure 1 shows a stylised example. In this paper we think of business cycles in terms of turning points. Measuring business cycles is here equivalent to dating turning points.

**Figure 1.** Business cycles: terminology



Measuring business cycles requires having a measure of aggregate economic activity: a reference series that describes the state of the economy. In this paper we capture economic activity by a single variable, real GDP. Early business cycle researchers did not have reliable data on real GDP, so they had to construct a reference series from a set of observed variables. Since we have access to a newly constructed data set on the Netherlands in the nineteenth century, we feel no need to construct a separate reference

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[5] A.F. Burns en W.C. Mitchell, *Measuring Business Cycles* (New York, 1946, p. 3).

series. Below our reference series real GDP in natural logarithms is denoted by the symbol $y$. Because the series is in natural logarithms, first differences $\Delta y_t \equiv y_t - y_{t-1}$ are growth rates.

How do we find peaks and troughs in business cycles? In case of a continuous process finding turning points would be simple: setting the first derivative of $y$ with respect to time (denoted by the symbol $t$) equal to zero $dy/dt$=0. Macroeconomic time series are typically observed at discrete intervals. Our reference series is observed annually. For our series of economic activity an appropriate dating rule would attribute a peak to a year $t$ if a year with positive growth is followed by a year with negative growth $\Delta y_t > 0$, $\Delta y_{t+1} < 0$, and a trough if a year of negative growth is followed by a year of positive growth $\Delta y_t < 0$, $\Delta y_{t+1} > 0$. In our empirical analyses below we employ a variation on this rule. We note that our dating rule implies the minimal duration of the cycle equals two years. The maximum duration is not set.

A further issue is whether one should look at fluctuations in the level of economic activity or at fluctuations around some trend. *Classical cycles* are based on fluctuations in the level, while *deviation cycles* are based on fluctuations around some trend.[6] Deviation cycles have become quite popular and widely used especially since classical cycles have not been observed regularly after World War II. In this article we adopt the classical business cycle concept. For the nineteenth century this concept is intuitively more appealing. And, we avoid having to determine the long run or growth component which is necessary to analyse the fluctuations around a trend.

### 3. The Netherlands in the nineteenth century: a modern business cycle?

Economic development always comes in waves. The question is whether the rises and declines in activity can be attributed for the greater part to exogenous factors and coincidence, or whether the cycles are caused by immanent factors which result in regular patterns in peaks and troughs. In his seminal *Paardenkracht en mensenmacht* Brugmans argues that business cycles can exist in a modern economy only. He rules out business cycles in a premodern economy for three reasons.[7] First, in a premodern economy technological knowledge is lacking to bring production to a large scale. In addition, well-developed capital goods industries and a modern banking sector do not exist in such an economy.

It will not come as a surprise that Brugmans dated the starting point of business cycles in the Netherlands around 1870. In all his work he wrote that modernisation of economic life in the Netherlands began not until around 1870. According to him there are no indications of business cycles in the first half of the nineteenth century. The international crises of 1825, 1836 and 1847 did not hit the Netherlands. The recessions of 1857 en 1866 were felt, but in his view these were 'diverted' crises which had impact only because the Netherlands began to trade internationally more and more in this period.[8]

After 1870 the influence of the international business cycle on the Dutch economy became larger and larger. The Netherlands did not follow the international cycle

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[6] In the literature deviation cycles are usually refered to as growth cycles. The dating rule for classical business cycles employs the growth of economic activity. To avoid confusion we prefer the label deviation cycles instead of growth cycles.
[7] Brugmans, *Paardenkracht,* 272.
[8] Brugmans, *Paardenkracht*, 273.

perfectly though. On the contrary, Ridder shows that the Dutch economy grew in periods of international recession and shrank in international booming periods.[9] Central element in the work of Ridder is the fact that entrepreneurs are confronted with rising prices of raw material in a hausse and price cuts in a baisse. He believes that modern, mechanised firms are able to benefit from price rises in a hausse, because the ratio of fixed costs and variable costs becomes more favourable. The greater the increase in sales, the lower the fixed costs per unit of product. For traditional firms this does not hold. Here overhead costs are low, so their profitability is determined by the difference between on the one hand sales prices and on the other hand costs of raw materials and wages. In other words, in recessions traditional firms can increase their sales because fixed costs are negligibly low.

So far the standard view on business cycles in the Netherlands in the long nineteenth century as sketched by Ridder and Brugmans. How does our research affect the standard view? Our analysis is based on the time series of real gross domestic product (GDP), one of the indicators for economic development. Figure 2 shows this series for the Netherlands 1815-1913. The series is in constant prices; corrections are made for price changes (inflation and deflation). We have chosen to show natural logarithms rather than absolute levels. Because of this GDP growth can be read off directly, since GDP growth is equal to the change in the natural logarithm of GDP by definition.

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[9] Ridder, *Een conjunctuur-analyse*.

**Figure 2.** GDP in the Netherlands, 1815-1913 (constant prices; natural logarithms)
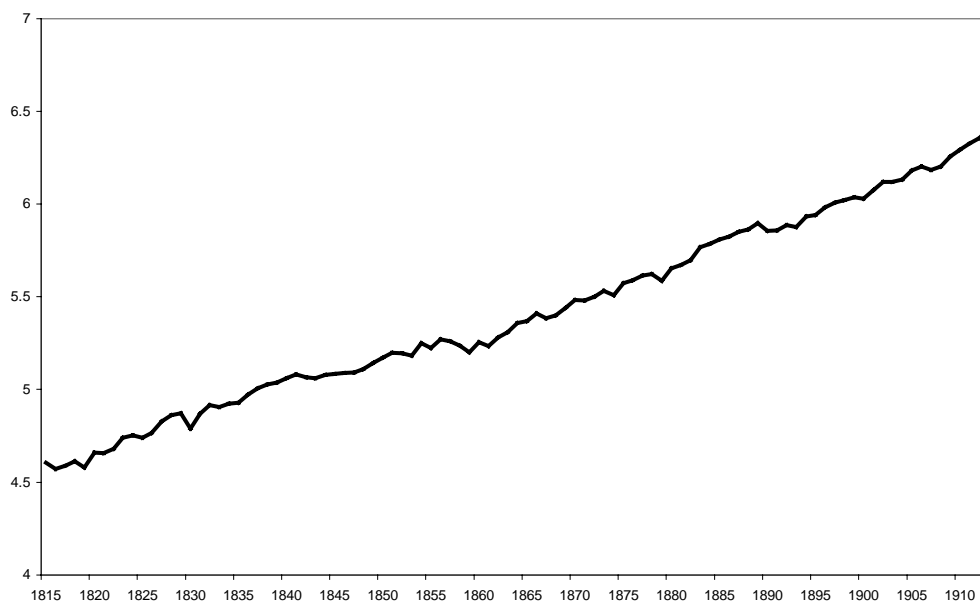


Source: Smits et al., *Dutch GNP*.

The figure shows that the Dutch economy is on a more or less stable growth path since 1820. In the literature it has even been suggested to characterise the economic development in the Netherlands in the long nineteenth century as a process of *balanced growth*.[10] The regular development in the gross domestic product series seems to confirm the ideas of Brugmans en De Jonge, who believed that the Netherlands started to follow the international business cycle rather late.

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[10] R.T. Griffiths, *Achterlijk, achter of anders? Aspecten van de economische ontwikkeling van Nederland in de 19$^e$ eeuw* (Amsterdam, 1980).

## 4. Empirical analysis

*Business cycles in the Netherlands in the nineteenth century*

In Section 2 we explained that a dating rule for a business cycle peak in year *t* is that the economy grows in this year but shrinks in the following year. The economy moves from positive to negative growth. We first answer the question whether different regimes can be distinguished in the GDP series, in particular whether our reference series behaves differently in periods of boom or crisis. We build a non-linear time series model in which GDP is explained from its own past, with parameters that depend on the business cycle regime. For a description of the method see Appendix A. The regime is determined by a threshold variable for which we take GDP growth. For various time series models of GDP we test for threshold effects allowing for lags in the threshold variable between zero and twelve years. The specification with contemporary GDP growth as threshold variable gives the best results.[11]

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[11] Note that 25% of the observations with high threshold values and 25% with low threshold values are trimmed in the estimations. Test outcomes indicate that we do not need to correct for heteroscedasticity.

**Table 1.** Linear and non-linear time series models of GDP, 1828-1913

| Variable | Linear model | | Non-linear model | | | |
| | Estimate | St. error | Regime I: $y_t \leq 0.0073$ | | Regime II: $y_t > 0.0073$ | |
| | | | Estimate | 95% interval | Estimate | 95% interval |
| --- | --- | --- | --- | --- | --- | --- |
| Constant | -0.006 | 0.032 | -0.042 | [-0.161;0.066] | 0.038 | [-0.020;0.098] |
| $y_{t-1}$ | 0.749 | 0.099 | 1.044 | [0.745;1.377] | 0.768 | [0.578;0.955] |
| $y_{t-2}$ | 0.256 | 0.099 | -0.142 | [-0.372;0.257] | 0.232 | [0.041;04231] |
| Obs. | 97 | | 29 | | 68 | |
| SSE | .074 | | .010 | | 0.019 | |
| $R^2$ | .997 | | .998 | | .999 | |

Table 1 lists the outcomes of the preferred non-linear time series model of GDP in the Netherlands in de long nineteenth century. The model has two lags.[12] The linear model is included for comparative reasons. The non-linear model is however to be preferred: the null hypothesis of linearity is rejected (with an F-statistic of 152.4). The ordinary least squares estimate of the threshold value is equal to 0.0073 (approximately 0.7 percent) with a 95% confidence interval of [0.000; 0.022]. The outcomes of the non-linear model indicate that in Regime I, in which growth is below 0.7%, the parameter of the first lag differs from zero significantly. In Regime II, years with growth exceeding 0.7 per cent, the parameters of both lags differ from zero. We conclude that two regimes can be distinguished in the explanation of the time series of GDP in the Netherlands in the long nineteenth century: boom periods with GDP growth rates higher than 0.7 per cent, and slump periods with growth lower than 0.7 per cent.

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[12] The maximum lag is determined on the basis of statistical criteria.

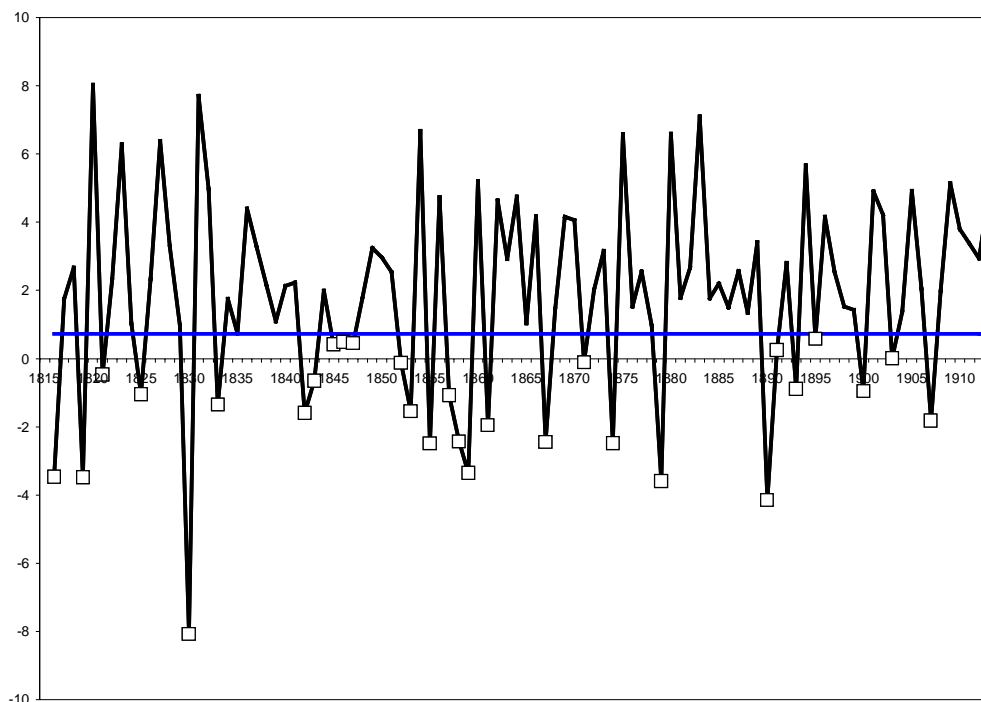**Figure 3.** Low growth years in the nineteenth century



Figure 3 shows the growth rates of real GDP in the long nineteenth century together with a horizontal line at the threshold level of 0.7 per cent. Cubes denote years with growth rates below the threshold value. For some years the low growth can be caused by incidental factors. This seems to be the case for 1830. The extreme low growth rate in 1830 is clearly related to the separation of Belgium and the resulting economic problems.

We exploit the information gained in the estimations in the dating of business cycles. Turning points occur when the economy moves from one regime into the other: the cycle has a peak when the economy leaves a 'high' growth state for a 'low' growth one; a trough when the economy moves the opposite direction. Here we classify the regimes according to the threshold variable and the threshold value. The economy is in the high growth regime when economic growth exceeds 0.7 percent and in the low growth regime when the growth rate is less than 0.7 per cent. Therefore our dating rule becomes: there is a peak in year *t* when growth in year *t* is higher than 0.7 per cent and the growth rate in the following year (t+1) is less than 0.7 per cent. The first column of the table in Appendix B lists the dates of the turning points obtained by our rule.

The outliers in Figure 3, which describes the pattern of the GDP growth rate in the nineteenth century, do not correspond to the peaks and troughs of the business cycle. Turning points are determined by the intersection of the growth rate line and the threshold value, and from which side. For example, the year 1854 obviously is a peak, since the 1854 growth rate of 6.7 per cent is followed by a negative growth rate of 2.5 per cent in 1855. Figure 3 also clarifies the difference between our dating rule and the standard rule which assumes a threshold growth rate value of zero per cent and defines a peak in year *t* if $\Delta y_t > 0$ and $\Delta y_{t+1} < 0$. Years with growth rates between our threshold value of 0.7 per cent and zero per cent, do not imply a switch in regime under the standard rule and hence do not result in a business cycle turning point under this rule. With our dating rule we find two extra business cycles with peaks in the years 1894 and 1902 and troughs in 1895 and 1903. In addition, the trough in 1891 is one year earlier under the standard rule.

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*Comparison to the international business cycle*

We end this section with a comparison of the business cycle turning points in the Netherlands to the international business cycle. Our measure of the international business cycle is the series of turning points in the United States and the United Kingdom. Unfortunately, it is not possible to include Germany in this comparison. The quality of German historical time series is rather poor; the data hardly show business cycle patterns. The lack of time series data on Germany is not a serious drawback. The United Kingdom and the United States are commonly regarded leading countries in the period 1800-1913. The United Kingdom played a central role in the international economy up to 1870, the United States thereafter.

The US peaks and troughs dates are obtained from a database of the NBER (National Bureau of Economic Research).[13] The UK turning points dates are from Prins.[14] Although the NBER and Prins date business cycles on the basis of a reference series that consists of several variables, a comparison of turning points is justified in our opinion. Their reference series is a measure of economic activity like ours. Moreover, both the NBER and Prins measure business cycles as fluctuations in the level of economic activity. They also adopt the classical business cycle concept. Unfortunately, both the UK and the US series of business cycle turning points only start in the middle of the nineteenth century. This illustrates once again the uniqueness of the data set constructed

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[13] The information is available on internetpage: http://www.nebr.org/cycles.html.
[14] C.J. Prins, *De conjuncturele ontwikkeling van het Verenigd Koninkrijk 1855-1965* (Groningen, 1980) 136.

in the project Reconstruction National Accounts, which covers the first half of the nineteenth century too.[15]

**Table 2.** Business cycle turning points in the Netherlands, the UK and the US

| **Troughs in the Netherlands** | | **Peaks in the Netherlands** | |
|---|---|---|---|
| | | 1854 | trough US |
| 1855 | *trough US* | 1856 | peak US |
| 1859 | *trough US, trough UK* | 1860 | peak US, *peak UK* |
| 1861 | *trough US*, peak UK | 1866 | *trough US* |
| 1867 | trough US, *trough UK* | 1870 | trough US |
| 1871 | | 1873 | peak UK, peak US |
| 1874 | | 1878 | trough US |
| 1879 | trough UK | 1889 | |
| 1891 | | 1892 | peak US |
| 1893 | trough UK, trough US | 1894 | |
| 1895 | peak US | 1899 | peak UK |
| 1900 | trough US | 1902 | peak US |
| 1903 | | 1906 | peak US |
| 1907 | trough US | | |

Note: italics refer to turning points that deviate by one year.

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[15] Most international datasets with information on the nineteenth century start in 1870. See for example: S. Basu en A.M. Taylor, "Business cycles in international historical perspective", Working Paper 7090 (National Bureau of Economic Research, Cambridge MA, 1999).

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Table 2 compares the business cycle turning points of the Netherlands, the US and the UK.[16] The comparison is somewhat hampered by the fact that the dates of the business cycle turning points are distilled from data with different frequencies. The US turning points chronology is based on monthly information. The business cycles in the Netherlands and the UK are obtained from annual observations.[17] Because information in the pre-telegraph era before 1870 spreaded slowly and the UK and US series are less refined in this period, Table 2 not only summarises the correspondence between peaks and troughs in the Netherlands with turning points in the UK and the US. To capture possible delays in the transformation of international business cycles we include, in italic, the years for which the turning points in the Netherlands deviate from international ones by one year. For the period after 1870 we list only years with exact correspondence.

The outcomes are striking in the light of the standard view on business cycles as sketched by Brugmans and De Jonge. Even before 1870 the economic development in the Netherlands was closely linked to the international business cycle. Only two peaks in the Netherlands did not coincide with US peaks. In addition, there is mild evidence of the contracyclical relationship suggested by Ridder. For two (or three if we take into account the delayed spread of information) out of five Dutch peaks in this period, we observe an American peak too. With respect to the troughs in the Netherlands, we note a striking correspondence to the UK and US series, although often with a one-year difference. So,

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[16] See Appendix B for a more detailed survey on the relation between on the one hand the peaks and troughs in the Netherlands, and on the other hand the business cycle turning points in the US and the UK.

[17] The American monthly information is converted to an annual chronology in the following way: a turning point in the months July to December is attributed to the current year; a turning point in the first half of the year to the previous year.

the economy of the Netherlands has been much more sensitive to international developments than assumed until now.

After 1870 the cyclical interrelationship became less. In the 1870s and the 1880s the economy of the Netherlands stayed outside international developments.[18] A noteworthy detail in this respect is that the international depression that lasted from 1882 until 1886 does not show up in our data on the Netherlands. In contrast, the economy of the Netherlands peaked a few times in the 1870s. These peaks were not observed in the UK and the US.

Only from the 1890s onwards, a relation with the international business cycle is found again. In the 1890-1913 period we observe five peaks in economic activity in the Netherlands, four of which correspond to US peaks. Furthermore, four out of six troughs are in the same year. In other words, from the 1890s onwards the Netherlands followed the international economy more closely. However, the correspondence was far from perfect: the international business cycle between 1908 and 1910 was not felt in the Netherlands.

The question arises whether international business cycles are passed through unambiguously to the economy of the Netherlands or not. In the former case there exists a procyclical relation between the Netherlands and the international cycle, in the latter the relation is contracyclical. Ridder suggested that a contracyclical relationship should be found, indicating that the economy of the Netherlands had not matured into a modern capitalist economy. Comparing the peaks in the Netherlands to the US business cycles reveals that before 1870 there are signs of a weak contracyclical relationship. For the

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[18] A comparison with UK data reveals also that the international depression of the 1880s hardly affected the economy of the Netherlands.

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1870-1913 period we observe a contracyclical relationship between the Netherlands and the US for one year only, 1878.

To summarise, the economy of the Netherlands was viable to the international business cycle even before 1870. In the 1870s and the 1880s the economy of the Netherlands develops independently of the international business cycle. After 1890 the similarity between economic fluctuations in the Netherlands and the international business cycle becomes tighter again.

## 5.  A new view on the cyclical development in the period 1850-1913

The observation that the economy of the Netherlands followed the international business cycle even before 1870 fits into the broad reappraisal of the pre-1870 period in the recent literature. Research of Smits *et al.* shows that the Dutch economy was on a fairly stable growth path since 1820.[19] The gloomy picture sketched in the older literature is a direct consequence of the type of data that were used. In the first place earlier generations of historians did not possess national incomes series. They had to manage with indirect information like highly unreliable import and export series. Secondly, economic modernisation was taken equivalent to the development of the large industrial firm. In their quest for the international business cycle researchers like Ridder, Brugmans and De Jonge focused on large firms, and especially on sectors with fairly high investment quotes.[20]

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[19] Smits, Horlings en Van Zanden, *Dutch GNP*.

[20] See in particular: De Jonge, *De industrialisatie*. His analysis of the process of growth breathes the `take off' theory as formulated by Rostow: W.W. Rostow, *The stages of economic growth: a non-communist manifesto* (Cambridge, 1960).

This equivalence does not do justice to the economic development in the Netherlands. Modern economic growth and industrialisation may not be regarded as identical notions. Already in his public lecture published in 1980 Griffiths pointed out that the Dutch economy did not follow the British model of industrialisation but had its own development process.[21] Although the nature of the growth process deviates, the economy of the Netherlands can be regarded as well developed in the nineteenth century. The agriculture and services sectors, responsible for the economic success of the Republic in the Golden Age,[22] became also bigger in the nineteenth century. And these sectors were disciplined by the international market from an early stage.

With respect to agriculture we call attention for the effects of the trade liberalisation which took place from the 1840s onwards.[23] After the liberalisation of trade between the UK and the Netherlands, the exports of Dutch agricultural goods to the UK were magnified. The services sector also has several branches of industry that are closely connected to developments in the international market. The international transport sector is a prominent example. Trade over sea, Rhine shipments and other transit traffic to the German hinterland were all mainly driven by international economic factors.[24]

It should not come as a surprise that the economy of the Netherlands was under the influence of the international business cycle even before 1870. However the lack of a

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[21] Griffiths, *Achterlijk, achter of anders?*

[22] J. de Vries and A. van der Woude, *Nederland 1500-1800: de eerste ronde van moderne economische groei* (Amsterdam, 1995).

[23] J.L. van Zanden, *De economische ontwikkeling van de Nederlandse landbouw in de negentiende eeuw, 1800-1914* (Wageningen, 1995); M. Knibbe, *Agriculture in the Netherlands: production and institutional change* (Amsterdam, 1993).

[24] E. Horlings, *Economic development of the Dutch service sector 1800-1850: trade and transport in a premodern economy* (Amsterdam, 1995); J.P. Smits, *Economische groei en structuurveranderingen in de Nederlandse dienstensector1850-1913: de bijdrage van handel en transport aan het proces van 'moderne economische groei'* (Amsterdam, 1995), Chapter 5.

relation in the following two decades is puzzling. How to explain the fact that the small, open economy of the Netherlands was on a relatively autonomous growth path in a period of free trade, in other words experienced GDP growth rates with limited relations to the international business cycle?

**Figure 3.** The share of Dutch exports in world trade, 1870-1995 (in %)
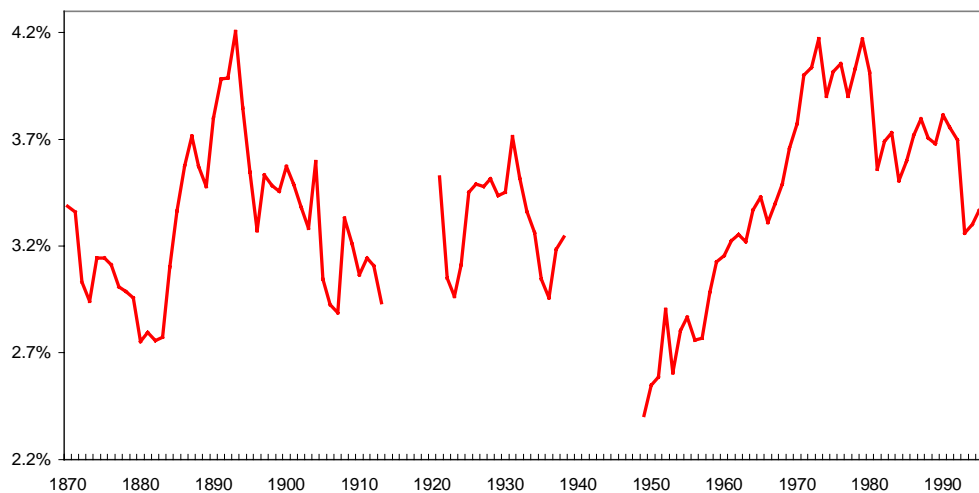


An analysis of Dutch exports brings relief here. After all, trade is one of the main transfer mechanisms for international business cycles. One may expect that Dutch exports increased strongly in years of international prosperity and showed a small decrease or even contracted in periods of depression. Figure 3 shows the share of Dutch exports in world trade.[25] The figure illustrates that the share of Dutch export goods in world trade

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[25] For a discussion of the market share of the Netherlands in world trade, see: J.P. Smits, 'Economische ontwikkeling 1800-1995', in: R. van der Bie en P. Dehing, eds., *Nationaal goed. Feiten en cijfers over onze samenleving, (ca.) 1800-1999* (Den Haag/Amsterdam, 1999) 16-17.

decreased in the 1870s and the 1890s, and in the 1900-1913 period (high growth periods in the Netherlands, and international booms). The exports share became higher between 1882-1991, a period of depression. Lindblad and Van Zanden already noted that exports in the Netherlands did not follow the international business cycle before the Great War.[26] They explain this from the strong domestic demand growth in that period. Apparently, the absorption of goods in the domestic market gained importance. The share of Dutch products in world trade increased considerably in the crisis years 1882-1886.

The thesis that the deviating development of Dutch exports can be attributed to a strong increase of domestic demand is plausible. However, Lindblad and Van Zanden do not provide an empirical underpinning. Horlings and Smits showed with an analysis of relative prices that demand factors had indeed determined the growth pattern of the economy of the Netherlands in the second half of the nineteenth century.[27] Additionally, Smits found that in years of international prosperity Dutch products were more and more sold in the domestic market, while the export quote rose in the depression of the 1880s.[28] Therefore, the conclusion seems to be justified that demand factors were an important determinant of the process of economic growth and that the domestic demand increase was at times that high that export demand could not be met. Consequently, the development of the Netherlands was more or less independent of international economic fluctuations.

It remains to be seen whether indications exist that industries were not able to meet both domestic demand and export demand. By this we enter the field of *economies*

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[26] J.Th. Lindblad en J.L. van Zanden, 'De buitenlandse handel van Nederland, 1872-1913', *Economisch- en sociaal-historisch jaarboek* 52 (1989) 231-269.
[27] E. Horlings en J.P. Smits, 'Private consumer expenditure in the Netherlands', *Economic and Social History in the Netherlands* 7 (1996) 15-40.
[28] Smits, *Economische groei*, Chapter 4.

*of scale*, or the scale effects of management. In the early nineteenth century Dutch firms can be characterised as small-scale.[29] The industry in general applied traditional, labour-intensive production techniques with low productivity levels. The introduction of new technologies like the steam engine was held up because the scale of production was rather small.[30] Cost price calculations indicate that the introduction of the steam technology became profitable only if large lots were produced.[31]

However large-scale production was not feasible in the period before 1860, because the demand for industrial goods was insufficient.[32] The small size of the domestic demand can be explained as follows. Until the middle of the nineteenth century industrial enterprises exported the larger part of their production to the world market. In this era of trade-capitalism the development of industry and exports went hand in hand at the expense of the domestic market. So, economic growth in the Republic was accompanied by an increase in income inequality, with low spending impulses of the labour class.[33] Moreover the economy was poorly integrated spatially. This model of specialisation proved very successful as long as the Republic dominated world trade and hence industrial entrepreneurs could export their goods. In the course of the eighteenth and nineteenth century the Netherlands lost its influence on international trade for political-military and economic reasons. Dutch industrial entrepreneurs lost important

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[29] De Jonge, *De industrialisatie*, 461-462.
[30] J.P. Smits, 'The determinants of productivity growth in Dutch manufacturing, 1815-1913', *European Review of Economic History* 4 (2000) 223-246.
[31] H.W. Lintsen et al., *Geschiedenis van de techniek in Nederland. De wording van een moderne samenleving, 1800-1890* (Zutphen, 1995).
[32] This part of the exposition draws heavily on Smits, 'Economische ontwikkeling', 18-20.
[33] See not (yet) published research of Van Zanden, De Vries, Van Riel en Smits. As a result of the construction of a new index of the standard of living, real wages in the Golden Age hardly rose. The economic growth in this period went hand in hand with a strong increase in income inequality.

markets especially as a result of the mercantilist policy of a large number of European countries. They could not switch to the domestic market, though, which had not matured enough. The purchasing power of labour families in the Netherlands was very low till the middle of the nineteenth century,[34] and the poor quality of infrastructure and the existence of several tariff walls at the local and provincial level resulted in a fragmented domestic market.[35]

The situation improved in the 1850-1870 period. The revision of the tax system in the 1850s and 1860s implied a relative price decrease of (primary) food, enabling labourers and their families to spend a great share of their budget on luxurious goods, cloths and other industrial products.[36] This tendency became stronger in the 1870s with the increase in nominal wages due to increased tightness on important segments of the labour market.[37] The increase in real wages led to important changes in the structure of spending. The Dutch industry, strong in the food sector and in the textiles sector, managed to profit from this situation and enlarged its capacity considerably in those years. After 1870 the scale of production was increased further because of a rise in export demand and the spatial integration of the economy as a direct consequence of the construction of a national infrastructure network.[38]

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[34] E. Horlings and J.P. Smits, 'The quality of life in the Netherlands 1800-1913. Experiments in measurement and aggregation', John Komlos and Joerg Baten, eds., *The biological standard of living in comparative perspective. Volume 2: Europe* (Stuttgart, 1998)

[35] Smits, *Economische groei*, hoofdstuk 6.

[36] Horlings and Smits, 'Private consumer expenditure'.

[37] A. Vermaas, 'Real industrial wages in the Netherlands 1850-1913', in: P. Scholliers and V. Zamagni, red., *Labour's reward* (Aldershot, 1995) 138-150.

[38] P.D. Groote, *Infrastructure and Dutch economic development. A new long-run data set for the Netherlands, 1800-1913* (Utrecht/Groningen, 1996).

The development in relative prices of foods and textiles indicates that demand for products was larger than supply at least until 1890.[39] This observation can be partly motivated from demand factors. From the 1890s onwards families gradually changed their consumption from industrial goods to services as a result of increasing purchasing power. The increase in real wages did no longer lead to a rise in domestic demand of food and textiles as observed in earlier decades. Moreover the scale of industrial production was magnified significantly from approximately 1890 onwards.[40] Consequently, production capacity was not restricted any more and firms could meet domestic demand and export demand. The Netherlands followed the international business cycle more and more closely in the early part of the twentieth century.

## 6. Concluding remarks

This paper investigated whether the economy of the Netherlands experienced business cycles in the nineteenth century (1815-1913) using a modern econometric technique on a brand new data set and how business cycles in the Netherlands relate to the international business cycle. Contrary to the usual claim in the Dutch economic history literature, we found that business cycles did exist in the Netherlands before 1870. The Netherlands followed the international (UK and US) business cycle already before 1870. Oddly enough, international developments hardly affected Dutch GDP between 1870 and 1890. In this period the economy of the Netherlands went through a relatively autonomous growth process, driven mainly by domestic factors like the revision of the tax system and the typical wage structure with relative high wage increases of unskilled labour.

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[39] Horlings and Smits, 'Private consumer expenditure'.

Aggregate demand rose significantly, which enabled economies of scale in the industrial sector. After 1890 entrepreneurs became more successful in collecting the revenues of the economies of scale. From the middle of the 1890s they succeeded in meeting domestic demand as well as export demand. Gradually, the business cycle in the Netherlands moved synchronously with the international cycle.

The analysis showed that the process of economic modernisation couldn't be characterised simply in terms of the economy of the Netherlands becoming more open. The process was much more complex and dynamic. Various indicators (like the share of Dutch exports in world trade and the export quote of agricultural and industrial goods) point at the influence of the domestic demand increase on the economic growth pattern. A number of fundamental changes had to be carried through in the domestic market (the revision of the tax system and the implementation of a well-functioning infrastructure network), so that the scale of production could be increased. This enabled firms to produce for the domestic and the international market in peak periods too.

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[40]  De Jonge, *De industrialisatie*.

## Appendix A    The method

This article investigates whether we can distinguish two regimes in the time series of GDP in the Netherlands (1815-1913). To that purpose we build a so-called Self-Exciting Threshold AutoRegressive (SETAR) model, a type of model introduced by Tong.[41] Recently, Bruce Hansen developed the statistical theory of SETAR models further in a series of articles.[42] In addition he made computer programs available, which we used for this study. The label *autoregressive* comes from the property that the variable $y_t$ is explained from its own past, $y_{t-1},\dots,y_{t-p}$. The process has a *threshold*: different regimes exist with different parameter values in the regimes depending on the threshold. The process is *self exciting* since the threshold variable $q_t$ is a function of the endogenous variable: $q_t = y_{t-d} - y_{t-d-1}$. We checked whether a threshold effect exists for various lags $d$. The SETAR process used here takes the following form:

$$y_t = \theta_0^1 + \sum_{i=1}^{p} \theta_i^1 y_{t-i} + e_t \qquad\qquad q_t \le \gamma \qquad\qquad\qquad (1a)$$

$$y_t = \theta_0^2 + \sum_{i=1}^{p} \theta_i^2 y_{t-i} + e_t \qquad\qquad q_t > \gamma \quad , \qquad\qquad\quad (1b)$$

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[41] H. Tong, *Threshold models in non-linear time series analysis*, Lecture Notes in Statistics 21 (Berlijn, 1983) en H. Tong, H., *Non-linear time series: a dynamical system approach* (Oxford,1990).

[42] B.E. Hansen, "Inference in TAR models", *Studies in Nonlinear Dynamics and Econometrics*, vol. 2 (1997) no. 1, pp. 1-14, B.E. Hansen, "Testing for linearity", *Journal of Economic Surveys,* vol. 13 (1999), pp. 551-576 en B.E. Hansen, "Sample splitting and threshold estimation", *Econometrica,* vol. 68 (2000) no. 3, pp. 575-603.

where $e_t$ is the regression error. The parameters in the equations, $\theta_0^1, \theta_1^1, \ldots, \theta_p^1,$ $\theta_0^2, \theta_1^2, \ldots, \theta_p^2$ and the threshold parameter $\gamma$, can be estimated by the method of Ordinary Least Squares (OLS). For all values of the threshold variable we compute the OLS estimates of the $\theta$'s and the accompanying sum of squared residuals. The optimal threshold value is found at the minimum of the sum of squared residuals and the optimal parameter estimates are the estimated $\theta$'s which belong to this threshold value.

An important question is whether the SETAR model of Equations (1a-1b) is better than the alternative linear model in which has the same $\theta$'s in both regime. Testing this null hypothesis is not trivial since the threshold parameter $\gamma$ is not identified under the null. Hansen proposes a test that is based on a standard F-statistic (defined as the number of observations multiplied by the difference between the sum of squared residuals of the linear model and sum of squared residuals of the SETAR model divided by sum of squared residuals of the SETAR model).

The confidence interval for the threshold value can be based on the Likelihood Ratio (or $F$) statistic

$$LR_n(\gamma) = n \frac{\hat{\sigma}_n^2(\gamma) - \hat{\sigma}_n^2(\hat{\gamma})}{\hat{\sigma}_n^2(\hat{\gamma})}, \qquad (2)$$

which tests the null hypothesis that the threshold value $\gamma$ equals the optimal threshold value $\hat{\gamma}$. Here $n$ is the number of observations, $\hat{\sigma}_n^2(\gamma)$ and $\hat{\sigma}_n^2(\hat{\gamma})$ are the residual sums of squares of the SETAR model with threshold value equal to $\gamma$ en $\hat{\gamma}$, respectively. The null hypothesis is rejected for high values of the test statistic. It is easy to see that $LR_n(\gamma)$ is equal to zero if the threshold value $\gamma$ equals the optimal threshold value $\hat{\gamma}$. The confidence intervals for the other parameters in the SETAR model, the $\theta$'s, can be

constructed in the conventional way if the threshold value is known with certainty. If this is not the case, then the uncertainty in the estimation of the threshold value affects the confidence intervals of the other parameters. Hansen proposes the following procedure: construct a confidence interval for $\gamma$; for all $\gamma$'s in this interval compute the confidence intervals for the $\theta$'s; and take the confidence intervals for $\theta$'s together.

**Appendix B: Peaks and troughs in business cycles of the Netherlands, UK and US**

| The Netherlands | | United Kingdom | | United States | |
|---|---|---|---|---|---|
| *trough* | *peak* | *trough* | *peak* | *trough* | *peak* |
| | 1854 | | | December 1854 | |
| 1855 | | | | | |
| | 1856 | | | | |
| | | | | | June 1857 |
| | | 1858 | | December 1858 | |
| 1859 | | | | | |
| | 1860 | | | | October 1860 |
| 1861 | | | 1861 | June 1861 | |
| | | 1862 | | | |
| | | | 1863 | | |
| | | | | | April 1865 |
| | 1866 | | | | |
| 1867 | | | | December 1867 | |
| | | 1868 | | | |
| | | | | | June 1869 |
| | 1870 | | | December 1870 | |
| 1871 | | | | | |
| | 1873 | | 1873 | | October 1873 |
| 1874 | | | | | |
| | 1878 | | | | |
| 1879 | | 1879 | | March 1879 | |

| The Netherlands | | United Kingdom | | United States | |
|---|---|---|---|---|---|
| *trough* | *peak* | *trough* | *peak* | *trough* | *peak* |
| | | | | May 1885 | |
| | | 1886 | | | |
| | | | | | March 1887 |
| | | | | April 1888 | |
| | 1889 | | 1890 | | July 1890 |
| 1891 | | | | May 1891 | |
| 1893 | 1892 | 1893 | | | January 1893 |
| | | | | June 1894 | |
| 1895 | 1894 | | | | December 1895 |
| | | | | June 1897 | |
| | | | 1899 | | June 1899 |
| 1900 | 1899 | | | December 1900 | |
| | | | | | September 1902 |
| 1903 | 1902 | | | | |
| | | 1904 | | August 1904 | |
| 1907 | 1906 | | | | May 1907 |
| | | | | June 1908 | |
| | | | | | January 1910 |
| | | | | January 1912 | |

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