Shrinking Dutchman in a growing economy

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Shrinking Dutchmen in a Growing Economy: The Early Industrial Growth Paradox in the Netherlands[1]

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I. Introduction and Summary

This paper is an attempt to investigate whether the 'early industrial growth paradox', or 'ante-bellum puzzle'[2], as the same phenomenon is sometimes labeled in the United States, also applies to the case of The Netherlands in the first half of the 19th century. By now, it is commonly understood among anthropometric historians, that this puzzle refers to a sustained decline of the biological standard of living (commonly proxied as some measure of sex- and age-specific heights) during the early phases of economic modernization, while conventional measures, such as GDP per capita increase at the same time. Komlos, who originally coined the phrase 'early industrial growth puzzle', suggested himself several factors which might account for it[3]. This paper will address both parts of the paradox, i.e. the divergence itself and its possible determinants, tested against the case of The Netherlands during its earliest phase of modernization, that is, the first half of the 19th century. Not withstanding the fact that first attempts generally provide only tentative answers, we shall conclude that The Netherlands can be added to the list of countries that support the paradoxical finding that is at the heart of the 'puzzle'. "..Is there still life in the pessimist case?..", Mokyr asked in 1988[4]. Less than a decade later the question

2 The first empirical evidence of this so called early industrial growth puzzle or paradox (cf.: *J. Komlos*, Modern Economic Growth and the Biological Standard of Living, Paper, presented to the European Social Science History Conference (Economics-session 23: "Biological Standards of Living in Rural Regions During the Early Nineteenth Century"), Noordwijkerhout (The Netherlands), May 9-11, 1996, p. 2) was reported by Margo and Steckel in 1983 for American white men, born between 1830 and 1860 (*R. Margo/R.H. Steckel*, Heights and Native-Born Whites during the Antebellum Period, in: Journal of Economic History 43, 1983, pp. 167-174). Several other, similar cases were collected and discussed by Komlos and Steckel, among others (*J. Komlos*, On the Significance of Anthropometric History, in: Rivista di Storia Economica 11, 1994, pp. 97-109; *J. Komlos (ed.)*, Stature, Living Standards, and Economic Development: Essays in Anthropometric History, Chicago 1994; *R.H. Steckel*, Stature and the Standard of Living, in: Journal of Economic Literature 33, 1995, pp. 1903-1940). A daring attempt to explain the early industrial growth puzzle by applying straightforward economic theory was for the first time presented by Komlos during the European Social Science History Conference, held at Noordwijkerhout, The Netherlands, from 9-11 May, 1996, (*Komlos*, Modern Economic Growth) and subsequently vigorously debated during the Pre-Conference for the A-Session of the XII International Economic History Congress "The Biological Standard of Living and Economic Development: Anthropometric Measures, Nutrition, Health and Well-Being in Historical Perspective", January 18-21, 1997, Munich. The essential characteristics of the e.i.g.-puzzle are summarized in section 2 of this paper.

3 *Komlos*, On the significance, pp. xii-xv; *Komlos*, Stature; *Komlos*, Modern Economic Growth. The commonly accepted names, both for that special branch of economic history that deals with the relation between anthropometric measures and material circumstances in the past - anthropometric history - and for the variable that is at the heart of this new discipline - biological standard of living -, were also introduced by Komlos.

4 *J. Mokyr*, Is there still life in the pessimist case? Consumption during the industrial revolution, 1790-1850, in: Journal of Economic History 48, 1988, pp. 69-92.

mark is fading away more and more, as long as we restrict ourselves to *early* phases of economic modernization.

II. The 'Puzzle' and Komlos's Attempt to Explain it

Margo and Steckel were the first to report in 1983 the famous anomaly of a marked decline in the physical stature of common people (and probably the vast majority of the population) during a time when the economy in which they lived was - according to a wealth of historical evidence - vigourously growing. Similar paradoxical findings were reported in the years that followed: for Swedish recruits, born between 1730 and 1790[5]; for Habsburg soldiers, born between 1740 and 1790[6]; for Bavarian males born between 1755 and 1775[7]; for English and Irish soldiers in the British army between 1740 and 1790, and for English boys between 1740 and 1840[8]; for boys in the Habsburg monarchy, born between the 1760s and the 1790s[9]; for both English adult convicts and British servants in colonial North-America between 1720 and 1755, and finally for English convicts sent to Australia, between 1780 and 1800[10].

While all these cases apply to people born in the 18th century, that is, during the "classical phase" of the Industrial Revolution, the 'early industrial growth puzzle' became even more enigmatic when it became clear that the pattern repeated itself in numerous countries during the first half the 19th century, a period that - for almost all of the countries involved - can be characterized as the onset of modern economic growth, in the sense that modernization was well underway. Both free black males and females became shorter between 1820 and 1840 (decade of birth)[11]; the height of young white convicts, born in the American South and convicted in Georgia decreased between the 1820s and 1860[12]; heights of Bavarian men and women declined between the first years of the 1820s and the 1840s[13], and the same can be said of Scottish and Irish adult convicts, born between 1810 and 1830[14], and of West Point Cadets, born between 1843 and 1858[15]. Recently Drukker and Tassenaar discovered yet another similar case: The nowadays notoriously tall Dutch consripts, who were by the way not exceptionally tall during the first half of the 19th century, shrunk on average by more than 3 cms. between 1830 and

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5   *L.G. Sandberg/R.H. Steckel*, Heights and Economic History: The Swedish Case, in: Annals of Human Biology 14, 1987, pp. 101-110.

6   *J. Komlos*, Nutrition and Economic Development in the Eighteenth Century Habsburg Monarchy: An Anthropometric History, Princeton 1989.

7   *J. Baten*, Ernährung und wirtschaftliche Entwicklung in Bayern, 1750-1850, Stuttgart 1999.

8   *J. Komlos*, The Secular Trend in the Biological Standard of Living in the United Kingdom, in: Economic History Review 46, 1993, pp. 115-144.

9   *Komlos*, Nutrition.

10 *S. Nicholas/R.H. Steckel*, Heights and Living Standards of English Workers during the Early Years of Industrialization, in: Journal of Economic History 51, 1991, pp. 937-957; *J. Komlos*, A Malthusian Episode Revisited: The Height of British and Irish Servants in Colonial America, in: Economic History Review 46, 1993, pp. 768-782.

11 *J. Komlos*, Towards an Anthropometric History of African Americans: The Case of the Free Blacks in Antebellum Maryland, in: *C. Goldin/H. Rockoff (eds.)*, Strategic Factors in Nineteenth Century American History: A Volume to Honor Robert W. Fogel, Chicago 1992, pp. 297-329.

12 *J. Komlos/P. Coclanis*, On the Puzzling Cycle in the Biological Standard of Living: the Case of Antebellum Georgia, in: Explorations in Economic History 34, 1997, pp. 433-459.

13 *Baten*, Ernährung.

14 *J. Riggs*, The Standard of Living in Scotland, 1800-1850, in: *Komlos*, Stature, pp. 60-75.

15 *J. Komlos*, Anomalies in Economic History: Reflections on the Antebellum Puzzle, in: Journal of Economic History 58, 1998, pp. XX-YY.

1857 (conscription-years)[16]. As a result Dutch conscripts in the late 50s of the 19th century were, for instance, smaller than their French counterparts[17].

Perhaps one of the most intriguing aspects of the 'early industrial growth puzzle' is the fact that some groups have been found whose height either increased or remained constant, while most of the people were becoming smaller. These groups include German - upper and middle class - students during the third quarter of the 18th century[18]. Moreover, adult American male slaves and American middle class cadets increased in height between 1820 and 1840[19].

In 1996 Komlos proposed an explanation of the e.i.g.-puzzle within a framework of standard economic theory. To be consistent, he also incorporated the 'exceptions' to the e.i.g.-puzzle into his model. His explanation rests on eleven basic arguments. According to Komlos, on the eve of economic modernization[20]:

(1) Incomes tended to become more unevenly distributed; (2) Food prices rose relative to the prices of other goods, due to a lagging of technological change and capital accumulation in agriculture, compared with industry; (3) The year to year variability of income of common people tended to increase; (4) Large groups of people, who had before been living in a situation of more or less economic selfsuffiency, were gradually integrated into the market economy, and thus, became more vulnerable to rising food prices; (5) Population growth, in combination with diminishing returns to labor in the agricultural sector, contributed to a deteriorating nutritional status; (6) Increased urbanization in itself led to higher food prices for a growing percentage of the population, as long as an insufficient transport technology hampered a reduction of differences between rural and urban food prices; (7) Accelerated industrialization meant substantial sectoral shifts within the labor force, which in turn implied that an ever smaller number of farmers had to produce food for a steadily increasing number of industrial households; (8) Intensification of labor would occur, as the spread of industries provided more opportunities for children to work in factories; (9) Increasing population density, in combination with growing urbanization and a rising trade volume, created a increasingly favorable environment for transmitting diseases.

To these nine arguments that are, so to say, endogeneous or unavoidable factors accompanying the general historical process of modernization, wherever it took place in Europe or in the United States, somewhere during the second half of the 18th and the first half of the 19th century, Komlos added two other arguments of a more exogeneous character:

(10) Weather conditions worsened in Europe during the second half of the 18th century, which had a negative impact on agricultural productivity, thereby worsening the nutritional status of Europeans; (11) The periods of decline in the biological standard of living culminated in major wars in Europe, the first period of declining heights culminated in the Napoleonic

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16 *J.W. Drukker/V. Tassenaar*, Paradoxes of Modernization and Material Well-Being in the Netherlands during the Nineteenth Century, in: *R.H. Steckel/R. Floud (eds.)*, Health and Welfare during Industrialization, Chicago 1997, pp. 331-377.

17 *Drukker/Tassenaar*, Paradoxes, Fig. 9.2, p. 342.

18 *J. Komlos*, Height and Social Status in Eighteenth Century Germany, in: Journal of Interdisciplinary History 20, 1990, pp. 607-621.

19 *Komlos/Coclanis*, On the Puzzling Cycle; *R.H. Steckel*, The Health of American Slaves: New Evidence and Analysis (unpublished manuscript), Ohio 1995.

20 *Komlos*, Modern Economic Growth, pp. 2-11.

FIGURE 1: REAL GNP PER CAPITA AND AVERAGE HEIGHT, 1807-1860
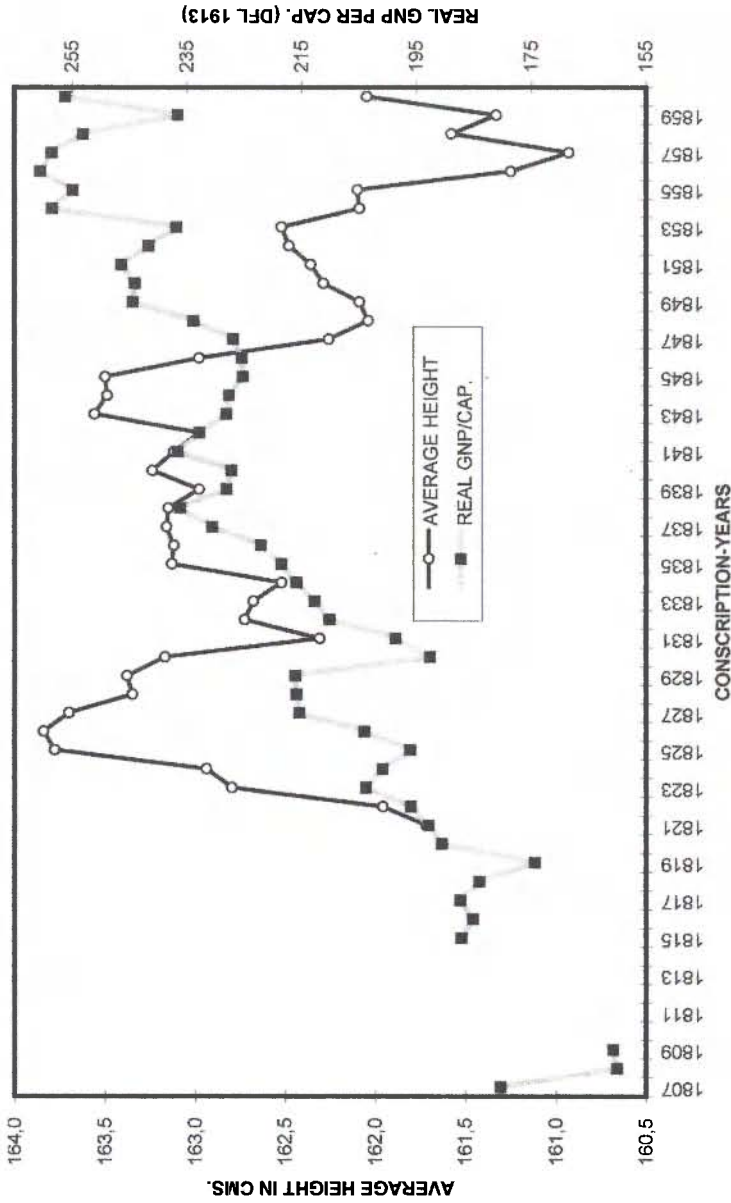
Source:
Statistical Appendix, Columns 1 and 2.

Wars, while the outbreak of the American Civil War marked the end of the second period of worsening material conditions[21].

Given the fact that, as Komlos's explanatory scheme suggests, the majority of the factors cited above, were unavoidable side-effects of the modernization-proces, the question arises whether the same mechanisms were also at work in a country that has not yet been mentioned so far in connection to the early industrial growth puzzle, The Netherlands. It is of particular interest in this respect, as it was the first 'modern economy' in the pre-modern era of the western world, the golden age of the Dutch Republic in the 17th century, while, two centuries later, it was slower to industrialize than most other European countries. In other words, it would be interesting to examine the extent to which the e.i.g.-puzzle pertains to The Netherlands, during its renewed attempt at modernization in the first half of the 19th century. We shall also examine whether Komlos's explanatory scheme fits the experience of The Netherlands.

III. Another Puzzling Example: Shrinking Dutchmen in a Growing Economy

If the 'early industrial growth puzzle' can be characterized by a continuous and substantial decline in the biological standard of living of the majority of the population over a prolonged period - say, 20 years or more - , in which the economy was growing, it becomes evident from Figure 1, that the case of The Netherlands between the late 1820s and the late 1850s is another example of this historical paradox. While the average height of Dutch conscripts rose between 1821 and 1826 (reflecting most probably a rapid improvement of general living conditions after the notouriously bad circumstances during the French occupation in the Napoleonic period), heights began to fall rapidly from 1830 to 1857, only interrupted by a temporary and partial recovery between 1832 and 1844. As a result, 20-years old Dutch conscripts measured in the late 1850s were smaller than their counterparts had been been around the beginning of the 19th century. Yet, Dutch real GNP per capita was growing at an average rate of more than 0.50 percent per year. It is interesting to see that a clear pattern of economic growth and stagnation can be identified for the first half of the 19th century: A decline during the last years of French occupation (1807-1812); Vigourous growth (approximately 1.5 percent per year on average) between 1812 and 1840, that may be interpreted (at least for the first years) as a catching-up process after the extremely depressed period of the French occupation; a short period of decline between 1840 and 1847, followed by a moderate but steady growth-rate of slightly less than 1 percent per year during the two decades between 1847 and 1867. This pattern implies that only the cohorts measured between 1827 and 1831, and those measured between 1847 and 1851 experienced sometime during their lifetime a drop in the real product per capita, and that the decline in physical stature of cohorts, measured after 1851 (so, born after 1831) correlated negatively with the trend of real GNP per capita.

Given that Komlos's explanation of the 'early industrial growth puzzle' centers around the process of economic modernization, we next compare the trend of heights between relatively modern and backward regions. The Netherlands is of special interest in this respect, because

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21 The author himself admits that the last argument (war) cannot possibly have been a major factor in the explanantion of the declining biological standard of living: "...Yet, the beginning of the decline in nutritional status preceeded the onset of both these conflicts, and hence could not have been caused by them. Moreover, the fact that slaves and middle class cadets born in the 1840s, who lived through the Civil War as teenagers did not decline in height is an indication that the war's impact was not general. Moreover, the fact that heights rose among the Ohio National Gueardsmen as well as among West Point Cadets born shortly after the war indicates that its impcat was temporary..." (*Komlos*, Modern Economic Growth, pp. 11-12).

there were clear and distinguished regional differences in economic backwardness during the first half of the nineteenth century.

IV. Regional Differences in Economic Modernization in The Netherlands[22]

Small as the country may be, there were - and to a certain degree, there still are - substantial regional differences in physical geography, economic structure, and social conditions. The most crude regional division is three-fold: urban, modern-agricultural, and traditional-rural. The urban region consists of the provinces of Noord-Holland and Zuid-Holland in the west of the country, and is characterized by relatively large towns, of which some were known as centers of urban industry as early as the Middle Ages, and declined substantially thereafter (for example, Delft or Leyden), while others gained their reputation as international ports during the Golden Age of the Republic (i.e., Amsterdam or Rotterdam). Together with the province of Zeeland in the south-west, Noord- and Zuid-Holland constituted the core of the maritime empire in the 17th century. Of course, agriculture also existed in Holland and Zeeland in the days of the Republic, and it continued to do so when the waning of the Dutch empire began: Agriculture in these regions was dominated by horticulture, and advanced dairy farming. With the decline of the seaports of Zeeland (Middelburg or Veere, for instance) after the 17th century, agriculture grew relatively in importance, so that at the beginning of the 19th century, Zeeland was generally considered to belong to the modern-agricultural regions, of which the other part was in the northern provinces of Groningen and Friesland. Large-scale, specialized, market-oriented, "capitalistic" agriculture, dairy-farming and animal husbandry dominated the picture in these regions, as early as the 17th century, and continued to do so in the following centuries, until the present day. Broadly speaking, the modern-urban and modern-agricultural provinces of the nation consisted of rich, alluvial soils, while the rest of the country, the traditional-rural provinces of Drenthe, Overijssel, Gelderland, Utrecht, Noord-Brabant and Limburg, located in the east and south-east were characterized by poor, diluvial soils. It is important to realize that the famous 'modernity' of the 17th century Republic hardly applied to these so called 'land-locked provinces'. In fact, these regions were rather isolated from the rest of the country, except for the inter-regional export of peat, the main industrial fuel. A traditional rural economy dominated. Local and regional markets played a more important role than the national or international markets. Self-suffiency became even more pronounced when market prices deteriorated. This traditional system persisted well into the first decade of the 20th century.

V. Regional Differences in Height and Mortality

When we examine the regional differences in height in order to explain the contradictory picture of declining heights in a growing economy that prevailed in The Netherlands between 1830 and 1857, the following pattern becomes apparent (Figure 2):

1. Up to 1827 the rising national average height is clearly reflected in the three regional averages that rise also steeply and all at about the same rate;

2. Between 1827 and 1833 all three regional averages declined, but at a markedly different rate: Heights in the traditional-rural regions were hardly affected, while modern-agrarian heights declined much faster. The worst, however, were heights in the urban areas. There the fall in heights was so severe that Dutch city-dwellers in the early 1830s were significantly

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22 A more elaborate treatment of regional economic differentiation and relative backwardness in The Netherlands during the 19th century can be found in: *Drukker/Tassenaar*, Paradoxes.

FIGURE 2: RURAL-TRADITIONAL, MODERN-AGRICULTURAL AND URBAN HEIGHTS, 1821-1860
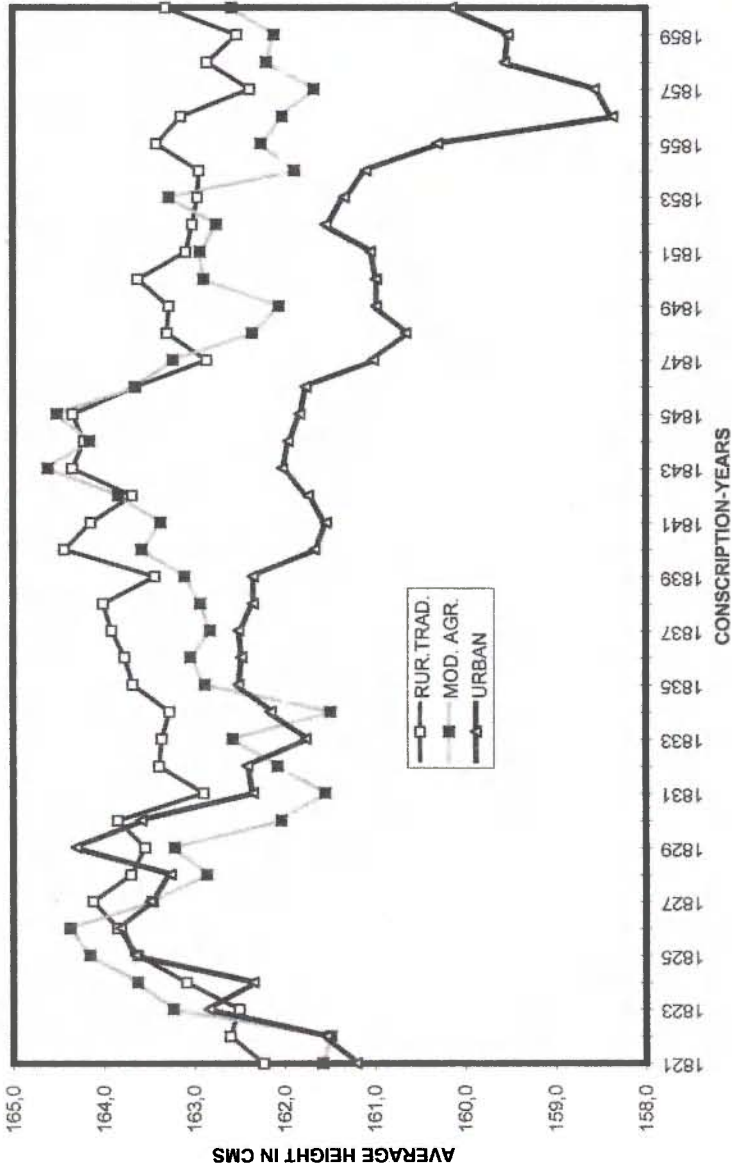
smaller than they had been in the early 1820s, which was not true, either for the traditional-rural, or for the modern-agricultural regions. Elaborating for a moment on the suggestion we made above, namely that the declining (or at least stagnating) real income per capita during the last years of the French occupation, can be held mainly responsible for the decrease in height during these years, it seems that the impact of the occupation on the Dutch economy was most severe on the urban regions, followed by the modern agrarian regions, while the 'backward', relatively self-sufficient regions were hardly affected at all. This is consistent with two of the factors, suggested by Komlos as explanation of the early-industrial-growth puzzle, namely (a) that the more people were integrated into a market-economy during early phases of modernization, the more vulnerable they tended to be to market fluctuations; and (b) that the Napoleonic period had disasterous consequences for the common people that suffered from the French agression during these years.

3. After 1833 the pattern becomes even more intriguing: Regional differences in the development of stature reveal clearly the source of the steadily declining national height figures. Between 1833 and 1843 only the urban heights continue to decline; Both modern-agrarian and rural-traditional heights were, in fact, increasing.

This pattern continued until the mid-1840s, when all regional heights started to decline again, and again at the same rate. By 1847 the urban height penalty was 2.5 cms. The decline in all heights during the late 1840s can easily be explained: A combination of a series of disastrous harvests (the so called "Potatoe Diseases"), and a worsening disease-environment, that hit especially the cities, were most probably mainly responsible for the worsening health and stature during these years, aptly been nick-named "The Hungry Forties".

The pattern of simultaneously declining heights after 1843, is consistent with the influence of growing population density on a deteriorating biological standard of living during early modernization, mentioned by Komlos. Dutch population was, after all, growing at a rate of 0.8 percent per annum during the first half of the 19th century, so population density was indeed increasing[23]. It is unlikely, however, that growing urbanization - as Komlos suggests - played a major role in the worsening of the biological standard of living during these years: Approximately 37 percent of the Dutch people lived in cities with more than 2500 inhabitants around 1800, and this percentage was still less than 39 percent in the middle of the century. Hence, urbanization in The Netherlands essentially remained constant during the first half of the 19th century[24].

There is another point in Figure 2 worth mentioning: If it is true that changes in the stature of conscripts over time can be regarded as the result of prior changes in the material circumstances of the successive cohorts, which, in turn, are to a large extent influenced by changes in real disposable income, then Figure 2 suggests that incomes in The Netherlands tended to

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23 Dutch population was 2.1 million in 1805 and 3.1 million in 1850 (*Drukker/Tassenaar*, Paradoxes, Statistical Appendix, Table 9A.3).

24 According to De Vries and Van der Woude, 40 % of the Dutch population in 1795 lived in cities. However, 7.1 % of the city-dwellers lived in cities that had less than 2500 inhabitants. So: 40 % - (0.071 * 40 %) = 37.2 % lived in cities with 2500 or more inhabitants. The year 1795 was taken as a proxy for 1800 (*J. De Vries/A.M. van der Woude*, Nederland 1500-1815. De eerste ronde van moderne economische groei, Amsterdam 1995, pp. 82-83). According to the official census of December 1849, 36 % of the total population of The Netherlands lived in cities. The same source indicates that 0.9 % of total population lived in cities that had fewer than 2500 inhabitants, but not every urban center had the official status as a city. In these places lived 3.4 % of total population. So, the urbanization rate (percentage) was in 1850 approximately 36.0 % - 0.9 % + 3.4 % = 38.5 %. Cf.: *Steckel/Floud*, Health and Welfare, p. 442.

become more unevenly distributed, since the second quarter of the 19th century. This is illustrated by the fact that the standard deviation of the regional height figures was on average 1.4 cm. between 1823 and 1827; between 1828 and 1843 it rose to 5.4 cm., while it was more than 7.4 cm. on average during the years between 1844 and 1851.

The main pattern indicated by the regional differences in height in Figure 2, is that the biological standard of living of city dwellers was by far the worst in the first half of the 19th century, and that it even worsened over time. This finding is corroborated by the regional differences in mortality (Figure 3). Except for a few years during the second half of the 1820s, the urban mortality rate was always much higher than that of the rural regions. The few years of crisis mortality in the agricultural areas was caused by a flood that devastated the shores of The Netherlands in the winter of 1825, and by the severe malaria-epidemic that followed in the years thereafter[25]. Of course, only the 'wet' sea-provinces were affected by these catastrophes, but all modern-agricultural regions, belonged to the sea-provinces of the the nation. For all the other years, the urban death-rate was not only highest, but clearly also more vulnerable to sudden negative shocks to their material circumstances: the variability of the urban death-rate was much larger than in the moder-agrarian and rural-traditional regions. It should also be noted that the mortality-rates do not decline at all, even by the 1860s. It seems that, the demographic transition was not yet noticeable in The Netherlands before the second half of the 19th century was well under its way.
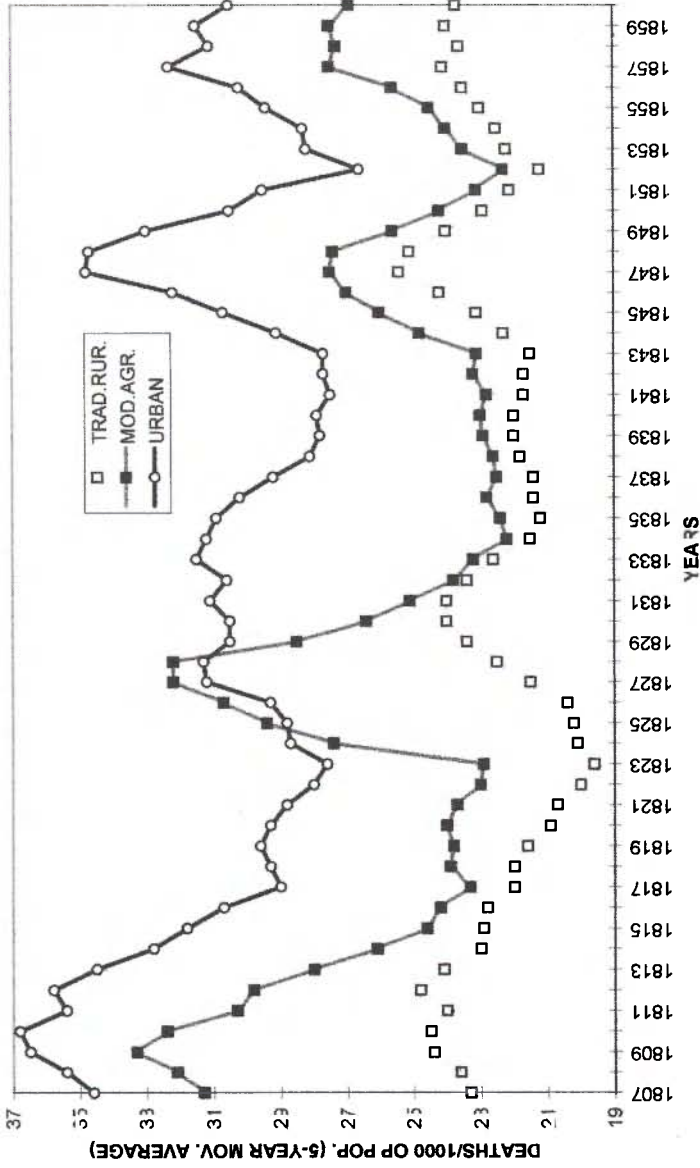
VI. Agricultural and Industrial Prices

An essential part of Komlos's explanation of the early industrial growth puzzle rests on changes in relative prices during early economic modernization: Food prices rose, relative to the prices of all other goods, due to the fact that technological change and capital accumulation in the agricultural sector lagged behind initally, compared to the industrial counterparts. Figure 4 clearly illustrates that this was indeed the case in The Netherlands. After 1825 agricultural prices (inclusive the prices of live-stock and dairy products) rose, while the price of industrial products declined substantially. As a result, the ratio of agricultural to industrial prices rose at a rate of approximately 1 % per year, for at least a quarter of a century. According to Komlos's view, this must have had a doubly negative effect on the biological standard of living: Given the rather rigid nominal wage level that was prevailed in the Dutch cities during the first half of the 19th century, the absolute rise in the prices of agricultural and live-stock products impinged most probably nutritional status directly. However, people in the modern-agrarian - and even more so in the rural-traditional regions could respond to rising food prices by shifting away from the market and becoming more self sufficient. This 'absolute' effect was probaly acerbated by a 'substitution' effect: due to the price increase of food, *relative* to the prices of industrial products, consumer expenditures were lured away from foodstuffs in the direction of non-food items. And of course, this effect was probably stronger in cities, than it was in the countryside.

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25 *W. Tromp*, Een Vliegende Dood. Een onderzoek naar de relatie tussen een overstroming in 1825 en de plotselinge toename van het aantal sterfgevallen in de provincie Groningen (unpublished manuscript), Groningen 1997.That there is already a steep rise in the mortality-rate in the modern-agricultural regions, beginning with 1824 -that is: a year before the flood- is caused by some 'slur' in the numbers on which Figure 3 is based: a 5-year moving average of yearly mortality rates.

FIGURE 3: TRADITIONAL-RURAL, MODERN AGRICULTURA- AND URBAN DEATH RATES, 1807-1860

Source:
Stat'stica Appendix, Columns 6, 7 and 8.

FIGURE 4: TRENDS OF AGRICULTURAL PRICES, PRICES OF LIVESTOCK & DAIRY PRODUCTS AND INDUSTRIAL PRICES, 1810-1850
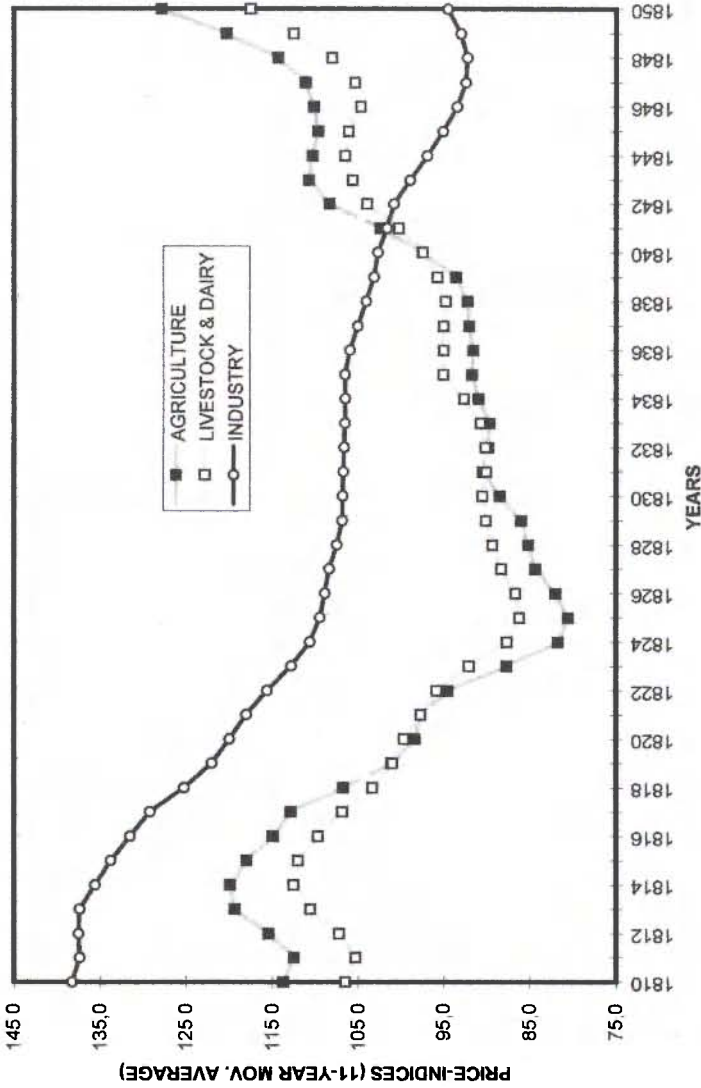
VII. Conclusion

We made an attempt to answer the double question whether the paradoxical pattern of a declining biological standard of living at a time when average real income per capita was rising, also pertained to The Netherlands during the first half of the 19th century. In addition, we tried to ascertain whether the Dutch figures were consistent with the explanation of the 'early industrial growth puzzle', put forward by John Komlos.
Five points, we think, are worthwhile to mention in this regard:

1. We found that that The Netherlands during the first half on the 19th century constitutes another example of the 'early industrial growth puzzle', that can be added to the list;

2. Regional differences suggest that the decline in the biological standard of living was dominated by a worsening of the material circumstances in the 'modern', urbanized areas of Holland, that the modern-agarian regions were less affected, and that the 'economically backward', rural-traditional regions were the least affected, at least until the middle of the century. This pattern is completely consistent with Komlos's explanation.

3. Data on regional mortality-rates corroborate the development of regional height differences. For the few years when this is not the case, there is a straight-forward explanation, based on the historical evidence of the flood of 1825 and the following malaria-epidemic to account for it.

4. Both the long-term, absolute rise in agricultural prices, and the steadily increasing ratio of agricultural to industrial prices, suggest that price developments after 1825 were, indeed, contributing to the worsening of the biological standard of living of the common people, and that these developments were having a more disastrous effect on living conditions in the cities than in the countryside. This, too, is consistent with Komlos' s views on the impact of economic processes on the biological standard of living at the onset of modern economic growth.

5. The last point seems to be the most intriguing, in the sense that the pattern of the 'early industrial growth puzzle' (as the name already indicates), presupposes that there is some noticeable 'early industrial growth' as to set the mechanism of the 'puzzle' to work. However, until recently it was commonly accepted among Dutch economic historians that economic growth (as measured by the rise in real GNP per capita) during the first half of the 19th century, was concentrated in agriculture, and even more so in services, but not in industry. The Netherlands in the 19th centrury, was viewed as a late-comer, and serious modernization, both in the industrial sector, and in infrastructure started only in the second half of the 19th century. The recently completed research-project 'Dutch Historical National Accounts', supervised by Van Zanden, has altered this picture. New sectoral data, stemming from this research project, indicate that productivity in all sectors (agriculture, industry and services) accelerated indeed from the mid-nineteenth century onwards, but that it would be wrong to conclude that there were no productivity gains at all in the industrial sector during the first half of the 19th century. The annual average compound growth rate of real value added per capita between 1807 and 1857 was 0,16 percent for the agricultural sector; 0,60 percent for industry, and 0,87 percent for services[26]. We conclude that there was indeed some early industrial growth in The Netherlands, be it

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26 Value added at constant prices (Dutch guilders of 1913) in 1807 was for the agricultural sector 170.8; for industry 79.7; for services 141.2. In 1857 they were respectively: 282.0; 164.3, and 331.0. Dutch population stood at 2.16 million in 1807 and at 3.29 million in 1857. Data from: *J.P. Smits/E. Horlings/J.L. van Zanden*, The Measurement of Gross National Product and its Components The Netherlands, 1800-1913, Research Memorandum of the N.W. Posthumus Institute 1, 1997, Table II.4, pp. 62-63; Table III.4, p.74.

that the rate of economic modernization in the first half of the 19th century was very modest, compared with the second half. That real value added in services grew faster than in agriculture or in industry during this early phase of Dutch modernization, is less surprising than it seems at first sight. Research by Horlings has shown that productivity growth in this sector was dominated during these years by colonial-related activities, and that the very nature of these activities tended to aggravate the inequality of the income distribution: "....International trade, merchant shipping, and selected export industries grew rapidly in response to the opportunities provided by government in the colonial sector. (...) In many ways the economic expansion of the Golden Age resembled the process of economic growth in the first half of the nineteenth century. Growth was concentrated in a few sectors that were predominantly oriented towards the international market. Real wages stagnated, while the distribution of incomes and wealth became more unequal..."[27]. Again, these points fit seamlessly into Komlos's explanation of the worsening of the biological standard of living during the early phase of economic modernization.

Sources to the Statistical Appendix:

Column 1: Dutch real gross national product (Dutch guilders of 1913) from: *J.P.Smits/E. Horlings/J.L.van Zanden*, The Measurement, Table II.5, Total and per capita gross national product at current and constant prices, 1807-1913. Note: The first printing of this source contains a separate (and disturbingly elaborate) 'Erratum'. We corrected our figures with the data from the 'Erratum', where necessary.

Column 2: Average height of Dutch conscripts (19-3/4 years of age) in cms. (conscription years). These figures are new estimates by Drukker and Tassenaar, calculated as a weighted average from Provincial data. Earlier figures (c.f. *Drukker/Tassenaar*, Paradoxes, Table 9A.1, p. 356) underestimated national height figures over this period, as city dwellers were over-represented in the sources where these earlier estimates were based upon. For details, see: *J.W. Drukker/Vincent Tassenaar*, New National and Regional Estimates of the Height of Dutch Conscripts, 1821-1860, Research Memorandum from the Groningen Growth and Development Centre, Groningen, (forthcoming).

Column 3: Average height of Dutch conscripts (19-3/4 years of age) in cms. (conscription years) in the rural-traditional regions of The Netherlands, calculated as a weighted average of provincial data from the provinces of Drenthe, Noord-Brabant, and Limburg. Provincial numbers of births (20 year lagged) were used as weights for the consecutive cohorts. For details, see: *Drukker/Tassenaar*, New National and Regional Estimates.

Column 4: Average height of Dutch conscripts (19-3/4 years of age) in cms. (conscription years) in the modern-agricultural regions of The Netherlands, calculated as a weighted average of provincial data from the provinces of Groningen, Friesland and Zeeland. Provincial numbers of births (20 year lagged) were used as weights for the consecutive cohorts. For details, see: *Drukker/Tassenaar*, New National and Regional Estimates.

Column 5: Average height of Dutch conscripts (19-3/4 years of age) in cms. (conscription years) in the urban regions of The Netherlands, calculated as a weighted average of provincial data from the provinces of Noord-Holland en Zuid-Holland. Provincial numbers of births (20 year lagged) were used as weights for the consecutive cohorts. For details, see: *Drukker/Tassenaar*, New National and Regional Estimates.

Column 6: Five-year moving average of the crude death rate in the tradiotional-rural regions of The Netherlands per 1000 of total population (yearly; end of year). The data are calculated from: *E. Horlings*, De ontwikkeling van de Nederlandse bevolking in de negentiende eeuw, 1795-1913 (unpublished manuscript), Amsterdam 1993, Appendix 2, pp. 18-22. The yearly mortality figures in the traditional-rural regions are calculated as weighted averages of the figures for Noord-Brabant, Gelderland, Utrecht. Overijssel, Drenthe en Limburg, with yearly total population figures of these provinces as weights. Yearly total population per province from: *Horlings*, De ontwikkeling, Appendix 1.

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27 *E. Horlings*, The Economic Development of the Dutch Service Sector 1800-1850: Trade and Transport in a Premodern Economy, Amsterdam 1995, pp. 300; 309-310.

Column 7: Five-year moving average of the crude death rate in the modern-agircultural regions of The Netherlands per 1000 of total population (yearly; end of year). The data are calculated from: *Horlings*, De ontwikkeling, Appendix 2, pp. 18-22.The yearly mortality figures in the modern-agricultural regions are calculated as weighted averages of the figures for Groningen, Friesland and Zeeland, with yearly total population figures of these provinces as weights. Yearly total population per province from: *Horlings*, De ontwikkeling, Appendix 1.

Column 8: Five-year moving average of the crude death rate in the urban regions of The Netherlands per 1000 of total population (yearly; end of year). The data are calculated from: *Horlings*, De ontwikkeling, Appendix 2, pp. 18-22.The yearly mortality figures in the urban regions are calculated as weighted averages of the figures for Noord-Holland and Zuid-Holland, with yearly total population figures of these provinces as weights. Yearly total population per province from: *Horlings*, De ontwikkeling, Appendix 1.

Column 9: Eleven year moving average of the price index (1831/=50=100) for agricultural products. Original yearly data from: *R.F.J. Paping,* Voor een handvol stuivers. Werken, verdienen en besteden: de levensstandaard van boeren, arbeiders en middenstanders op de Groninger klei, 1770-1860, Groningen 1995, Table G.6, pp. 406-407.

Column 10: Eleven year moving average of the price index (1831/=50=100) for livestock and dairy products. Original yearly data from: *Paping,* Voor een handvol stuivers, Table G.6, pp. 406-407.

Column 11: Eleven year moving average of the price index (1831/=50=100) for industrial products. Original yearly data from: *Paping,* Voor een handvol stuivers, Table G.6, pp. 406-407.

Statistical Appendix 1

Year	Real GNP per Cap. (DFL 1913) (Col. 1)	National Height (CMS.) (Col. 2)	Rur.-Trad. Height (CMS.) (Col. 3)	Mod.-Agr. Height (CMS.) (Col. 4)	Urban Height (CMS.) (Col. 5)
1807	180	--	--	–	–
1808	160	–	–	–	–
1809	161	–	–	–	–
1810	--	–	–	–	–
1811	–	–	–	–	–
1812	–	–	–	–	–
1813	–	–	–	–	–
1814	–	–	–	–	–
1815	187	–	–	–	–
1816	185	–	–	–	–
1817	187	–	–	–	–
1818	184	–	–	–	–
1819	174	–	–	–	–
1820	191	–	–	–	–
1821	193	161,7	162,2	161,6	161,2
1822	196	162,0	162,6	161,5	161,5
1823	204	162,8	162,5	163,2	162,8
1824	201	162,9	163,1	163,6	162,4
1825	196	163,8	163,6	164,2	163,7
1826	204	163,8	163,8	164,4	163,8
1827	215	163,7	164,1	163,5	163,5
1828	216	163,4	163,7	162,9	163,3
1829	216	163,4	163,5	163,2	164,3
1830	193	163,2	163,8	162,0	163,6
1831	199	162,3	162,9	161,5	162,4

Statistical Appendix (continued –2)

Year	Real GNP per Cap. (DFL 1913) (Col. 1)	National Height (CMS.) (Col. 2)	Rur.-Trad. Height (CMS.) (Col. 3)	Mod.-Agr. Height (CMS.) (Col. 4)	Urban Height (CMS.) (Col. 5)
1832	210	162,7	163,4	162,1	162,4
1833	213	162,7	163,4	162,6	161,8
1834	216	162,5	163,3	161,5	162,2
1835	219	163,1	163,7	162,9	162,5
1836	222	163,1	163,8	163,0	162,5
1837	231	163,2	163,9	162,8	162,5
1838	236	163,2	164,0	162,9	162,4
1839	228	163,0	163,4	163,1	162,4
1840	227	163,2	164,4	163,6	161,7
1841	237	163,1	164,1	163,4	161,5
1842	233	163,0	163,7	163,8	161,7
1843	228	163,6	164,3	164,6	162,0
1844	228	163,5	164,2	164,2	162,0
1845	225	163,5	164,3	164,5	161,8
1846	226	163,0	163,7	163,7	161,8
1847	227	162,3	162,9	163,2	161,0
1848	234	162,0	163,3	162,4	160,7
1849	245	162,1	163,3	162,1	161,0
1850	244	162,3	163,6	162,9·	161,0
1851	247	162,4	163,1	162,9	161,0
1852	242	162,5	163,0	162,8	161,5
1853	237	162,5	163,0	163,3	161,3
1854	259	162,1	162,9	161,9	161,1
1855	255	162,1	163,4	162,3	160,3
1856	261	161,3	163,1	162,0	158,4
1857	259	160,9	162,4	161,7	158,6
1858	253	161,6	162,9	162,2	159,6
1859	237	161,3	162,5	162,1	159,5
1860	256	162,1	163,3	162,6	160,1

Statistical Appendix (continued -3)

Year	Rur.-Trad. Deaths	Mod.-Agr. Deaths	Urban Deaths
		(5-Year Mov. Av. per 1000 of Pop.)	
	(Col. 6)	(Col. 7)	(Col. 8)
1807	23,3	31,3	34,6
1808	23,6	32,1	35,4
1809	24,4	33,3	36,5
1810	24,5	32,4	36,8
1811	24,0	30,3	35,4
1812	24,8	29,8	35,8
1813	24,1	28,0	34,5
1814	23,0	26,1	32,8
1815	22,9	24,6	31,8
1816	22,8	24,2	30,7
1817	22,0	23,3	29,0
1818	22,0	23,9	29,3
1819	21,6	23,8	29,6
1820	20,9	24,0	29,3
1821	20,7	23,7	28,8
1822	20,0	23,0	28,0
1823	19,6	22,9	27,6
1824	20,1	27,4	28,7
1825	20,2	29,4	28,8
1826	20,4	30,7	29,3
1827	21,5	32,2	31,2
1828	22,5	32,2	31,3
1829	23,4	28,5	30,5
1830	24,0	26,4	30,5
1831	24,0	25,1	31,1
1832	23,4	23,8	30,6
1833	22,6	23,2	31,5
1834	21,5	22,2	31,2
1835	21,2	22,4	30,9
1836	21,4	22,8	30,2
1837	21,4	22,5	29,2
1838	21,8	22,6	28,1
1839	22,0	22,9	27,8
1840	22,0	23,0	27,9
1841	21,7	22,8	27,5
1842	21,7	23,2	27,7
1843	21,5	23,1	27,7
1844	22,3	24,8	29,1
1845	23,1	26,0	30,7
1846	24,2	27,0	32,2
1847	25,4	27,5	34,8
1848	25,1	27,4	34,7

Statistical Appendix (continued -3)

Year	Rur.-Trad. Deaths	Mod.-Agr. Deaths	Urban Deaths
		(5-Year Mov. Av. per 1000 of Pop.)	
	(Col. 6)	(Col. 7)	(Col. 8)
1849	24,0	25,6	33,0
1850	22,9	24,2	30,5
1851	22,1	23,1	29,5
1852	21,2	22,3	26,6
1853	22,2	23,5	28,2
1854	22,5	24,0	28,3
1855	23,0	24,5	29,4
1856	23,5	25,6	30,2
1857	24,1	27,5	32,3
1858	23,6	27,3	31,1
1859	24,0	27,5	31,5
1860	23,7	26,9	30,5

Statistical Appendix (continued -4)

Year		Trend of Prices in:	
	Agriculture	Livest. & Dairy	Industry
		(11-Year Mov. Av., 1831/'50=100)	
	(Col. 9)	(Col. 10)	(Col. 11)
1810	113,8	106,5	138,3
1811	112,5	105,3	137,4
1812	115,4	107,2	137,5
1813	119,4	110,6	137,4
1814	119,9	112,5	135,6
1815	118,0	112,0	133,8
1816	114,9	109,7	131,5
1817	112,9	106,9	129,2
1818	106,7	103,3	125,2
1819	101,1	101,0	122,0
1820	98,3	99,6	120,0
1821	97,7	97,7	118,0
1822	94,5	95,8	115,6
1823	87,7	92,1	112,8
1824	81,7	87,6	110,6
1825	80,6	86,2	109,5
1826	82,0	86,7	108,9
1827	84,4	88,3	108,4
1828	85,2	89,3	107,5
1829	86,0	90,1	106,9
1830	88,5	90,5	106,8
1831	90,4	90,1	106,8
1832	89,8	90,1	106,7

Statistical Appendix (continued -4)

Year	Agriculture	Trend of Prices in: Livest. & Dairy (11-Year Mov. Av., 1831/'50=100)	Industry
	(Col. 9)	(Col. 10)	(Col. 11)
1833	89,7	90,7	106,6
1834	91,0	92,7	106,5
1835	91,7	95,0	106,6
1836	91,6	95,0	106,0
1837	92,1	95,0	105,0
1838	92,2	94,8	104,0
1839	93,6	95,7	103,1
1840	97,4	97,4	102,7
1841	102,3	100,2	101,6
1842	108,4	103,9	100,8
1843	110,8	105,6	98,9
1844	110,3	106,5	96,9
1845	109,7	106,1	95,1
1846	110,2	104,7	93,5
1847	111,1	105,4	92,4
1848	114,3	108,0	92,2
1849	120,3	112,5	93,0
1850	127,8	117,5	94,5