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Wages and the standard of living in Europe, 1500–1800

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It is argued that the study of the development of the living standard of large segments of the European population between 1500 and 1800 should make use of the available evidence on prices and wages. On the basis of wage data for about twenty European cities and regions, the geographical patterns in silver and grain wages and their development over time are studied. This leads to the conclusion that there is no clear relationship between economic development (measured for example by the urbanisation ratio) and changes in the standard of living in Europe in this period. This also has implications for the hypothesis that an ‘industrious revolution’ occurred in Western Europe during this period. Alternative explanations for the fact that the *per capita* consumption of certain market goods increased in this period (such as changes in relative prices and an increase in labour effort as a result of falling real wages) are suggested.

1. Optimistic and pessimistic interpretations of early modern economic growth

Since the pioneering work of the International Scientific Committee on Price History in the 1930s, research on the development of the real wage and the standard of living in early modern Europe has been dominated by pessimism. A large number of studies – synthesized by Wilhelm Abel (1966) and Slicher van Bath (1960) – have shown that in the long run real wages declined, especially during the sixteenth and the eighteenth centuries. These trends were interpreted in Malthusian and Ricardian terms: population growth and increased pressures on agricultural land caused a decline in labour productivity in agriculture and a fall in living standards. The general conclusion was that between the ‘golden age of the craftsman’ of the fifteenth century and the ‘crisis of mass poverty’ of the late eighteenth century real income went down (see also Phelps Brown and Hopkins (1981) and Söderberg (1987)). In other words, the consensus view in the 1960s and 1970s was that the early modern economy was unable to generate economic growth.

In recent years this pessimistic interpretation of economic growth before the industrial revolution has increasingly come under attack. Snooks (1990;

1993) has postulated that there was almost continuous growth of GDP *per capita* in a number of studies of the long run performance of the British economy between 1068 and 1800. On theoretical and empirical grounds, Persson (1988) arrived at comparable conclusions in his systematic study of pre-industrial economic growth. Both explicitly criticized what Persson called the 'stagnationist' interpretation of Abel, Postan and Leroy Ladurie. In a recent book Hoffmann (1996) showed that the traditional agriculture of France was able to generate long term growth of total factor productivity between 1450 and 1800. Perhaps the most extreme version of this new optimism has been formulated by De Vries and Van der Woude (1997), who, in their study of the Dutch economy, have put forward the hypothesis that it underwent a process of 'modern economic growth' between 1580 and 1670. Many comparable, more qualitative studies could be cited which all tend to stress the resilience and dynamics of the early modern economy.

This revisionism has been built upon new research on various indicators of economic growth. The contribution of Snooks (1990), who constructed a series of estimates of GDP *per capita* beginning in 1086, may be considered typical of the new approach. Hoffmann (1996), to give another example, based his estimates of the growth of total factor productivity on a detailed reconstruction of the development of rents in the Bassin de Paris (and other parts of France), from which he was able to infer estimates of the growth of productivity. However, the optimists have either ignored the work of the price historians who build up a strong case for the long run decline of real wages or claimed that there is something wrong with the way in which these were calculated for the pre-industrial period (Snooks 1990).

Only De Vries has addressed the issue of how the sharp fall in real wages in western Europe in the period 1500–1800 can be reconciled with an optimistic interpretation of the European economy in this period. In two contributions to the discussion, De Vries has made this question the starting point for an interesting hypothesis on change in the pre-industrial household (De Vries 1993, 1994). He starts with the paradox that on the one hand most studies show a decline in real wages (or at best stagnation, in the case of a dynamic economy like that of Holland), whereas research on the development of material wealth, often based on probate inventories, often shows an increase in the possession of durable consumer goods. These conflicting stories can only be reconciled by assuming that there have been significant shifts in the allocation of work within the household. Household labour supply can possibly be described by a backward sloping supply curve, that is offering more labour when real wages decline; for example, a fall in the real wage might lead to an increase of female and child labour or to a reduction in the number of holidays. But De Vries's main hypothesis is that households were induced by the appearance of new consumer goods to increase their work effort in order to acquire these new goods. The new consumer goods changed the preferences of households in such a way that they

reduced the amount of time devoted to leisure and/or subsistence activities and increased activities for the market. The rise of proto-industry, the specialisation and intensification of labour in agriculture, and the increase in female and child labour, are all integrated in this concept of an 'industrious revolution' (De Vries 1994).

In this article I would like to reintroduce the problem of declining real wages between 1500 and 1800 into the debate on the development of the early modern European economy. Firstly, I will discuss the relevance of studying real wages for understanding long term changes in the standard of living. Recently, real wage studies have gone out of fashion; this is explained and it is argued that there are good reasons to take up this kind of evidence again. Secondly, an overview is given of the long term development of wages in ten countries of Europe between 1500 and 1800. Two concepts are used here: silver wages, i.e. the grammes of silver a labourer earned per day, and grain wages, the litres of rye or wheat he could buy with it. The interpretation of the patterns that are found is central to the rest of the article; within this framework I will also briefly deal with changes in relative prices and in the material wealth of households, in order to put forward a solution for the De Vries paradox. It is concluded that there is no clear connection between the development of grain wages, the standard of living, and economic growth in Europe in the early modern period, which throws doubt on some of the conclusions of the optimists.

2. Why are real wages important?

The first generation of students of prices and wages, the members of the International Scientific Committee on Price History and their followers, did not pay much attention to the complex relationship between real wages and the standard of living. Implicitly, they equated wage with family income, but nowhere does one find a detailed examination of the problem. Hamilton, for example, comes to the conclusion that 'the wage indices probably gauge the trend of the money earnings of the average urban worker with fair precision' (Hamilton 1934, p. 277), without paying much attention to the many problems that have to be solved before such a conclusion is warranted. The most detailed examination of this problem was put forward by Phelps Brown and Hopkins who had to concede that: 'all we have is the rate of pay for a day, and we do not know how many days' work the builder was getting in the year from time to time, nor what other resources he had' (Phelps Brown and Hopkins 1981, p. 13). Next they argued that as a result 'we have not tried to construct any measure of real wages in the modern sense', but tried to answer the question: 'what sort of command over things the builders buy did these pennies (i.e. their day wage) give from time to time?' This, however, is only an elegant formula to evade the real issue.

As the study of household strategies and living standards progressed in

recent decades, the study of wages increasingly came under attack. It was realised that the incomes of households were also determined by changes in employment levels, participation ratios of men, women and children and non market incomes, and that behind this complex mix lay the strategies of households to survive and, if possible, prosper (Schwarz 1989 and Van den Beekhout 1989). Moreover, researchers discovered other indicators of the standard of living: heights became fashionable as an indicator of the 'biological standard of living', demographic data were discovered, and interest in wage levels waned as a result.

This is unfortunate, because in my view wages remain an important source of information on living standards. But the link between the two is less direct than the first generation of wage studies supposed. To show this, we have to define the standard of living more precisely. In textbook welfare economics the standard of living corresponds to the (highest) indifference curve a household (or individual) can attain given his budget and the relative prices in the market. This budget is made up of different sources of income, of which wage income is only one. But we assume it was an important source (and not a marginal one) for the European working classes of the early modern period. Moreover, the wage rate is exogenous for the household: it cannot influence its level in the short or the long run. This means that a rationally acting household will adapt its strategy to this given wage level. It will, for example, change its mix of labour inputs in wage and non-wage activities until the marginal incomes from all activities equal the given wage rate.

This line of thought makes it clear how important the (real) wage will be for the standard of living of households. A decline of real wages will result in a fall in the standard of living because (a) more labour has to be supplied to buy the same amount of goods in the market place and/or (b) the marginal income of other non-wage activities is also bound to decline if we assume that households equalise marginal returns on their activities. Of course, a household can counteract a decline of real wages by working harder or longer, but this will result in a loss of welfare through less leisure or less non-market income. Even if households could maintain their level of consumption (i.e. the consumption of market goods and household services) at previous levels despite a fall in 'real' wages, there is a fall in living standards because they have diminished their consumption of leisure, which is a 'consumption good' with a relatively high income elasticity of demand.

This interpretation considers wages to be the most important exogenous 'input' into the decision making of the household. Of course, other inputs were also important. One can think of the amount of land or capital a household owned, its size and composition, the state of the labour market, the availability of common lands and so on, but the wage level was probably the most uniform and persistent influence on decision making of working class families. If we want to analyse the development of the standard of living

in the long run, or wish to make international comparisons, there are good reasons to turn to the evidence on wages.

Anthropometric and demographic data, and information on levels of food consumption or stocks of material wealth, can be considered to be measures of the 'output' of the decision making process of the household. The problem with these measures is that they also reflect changes in relative prices to which households have adapted and changes in the preferences of households, for example concerning the choice between leisure and labour. These output indicators are therefore imperfect indicators of the standard of living. Of course, the study of wages has comparable drawbacks: when, for example, real wage growth is accompanied by for instance the loss of access to common fields, or increased disamenities of urban life, wage data may give too favourable a picture of the actual development of the standard of living. Ideally, the study of output and of input indicators should therefore complement each other (see Section 6).

3. Silver wages

In order to analyse the relationship between real wages and economic development I have assembled a substantial body of material which includes data on wages, grain prices and the intrinsic value of the relevant coinage of 20 European cities (and regions) for the period 1500–1800. The data have been organised into averages for periods of ten years (1501–10, 1511–20 etc.),¹ although in some instances the average for the decade has had to be calculated from less than ten figures.

The choice of cities has been largely determined by the available studies. An effort has been made to ensure a balanced distribution over western Europe, complemented with data from several Polish towns as examples of wage development in eastern Europe. The Scandinavian material is restricted to data on wages in Stockholm in the seventeenth and eighteenth centuries.² Nor do we have a sustained series covering the entire period for any single Italian city, and I have therefore made use of several partial studies, covering Florence, Venice and Milan.

As far as wages are concerned, I have focused on the daily wages of unskilled building labourers, preferably those of hodmen or bricklayers' assistants. The choice of this professional group was again determined by the available studies (many of which are restricted to the building industry) and by the fact that this type of labour probably represents the lower segments of the labour market. Almost all data relate to the daily wages paid in summer to this more or less homogeneous group of labourers; the most

¹ In some cases the decades 1500–9, 1510–19 etc. were used, following the form of the original publication of the data.

² I have not been able to find data on the silver content of the relevant Swedish coins, and therefore Stockholm is left out of this part of the international comparison.

notable exception is the Venetian data which relate to average daily wages, which were somewhat lower than the wages paid out during the summer.

I have also collected data on the wheat and/or rye prices in the relevant cities. Again, the choice is largely determined by the availability of sources, which is in turn determined by patterns of consumption. In eastern and central Europe, where rye was dominant, it is difficult to find other series than those for rye. In southern Europe and England, on the other hand, wheat monopolised the diet and research into historical grain prices has concentrated on this cereal. In the Low Countries neither grain dominated the other; for this region we thus have relatively good series available for the prices of both (the price of rye fluctuated between 70 and 80 per cent of the price of wheat). Local measures are always converted into hectolitres.

To allow us to make international comparisons of nominal wages and grain prices, local currencies have been converted into grammes of silver. It can be assumed that in the long run there was a link between the rate of exchange and the intrinsic value of the coinage. For the sources, please refer to the Appendix.

Table 1 presents some of the most important findings. Broadly speaking, Europe can be divided into the following zones. Central Europe was a region with relatively low silver wages; in Poland, Germany and (to a lesser extent) Austria a typical daily wage for a labourer at the beginning of the sixteenth century was between 1 to 2 grammes of silver, rising to 2 to 3 grammes in 1600–20. This level was largely maintained until the end of the eighteenth century. Higher levels were only attained in Warsaw and Danzig. The opposite extreme, at least in the sixteenth and early seventeenth centuries, was Spain, where silver wages were three to four times higher than in Cracow and Lvov. Around 1600 the wages in Spain were in fact higher than anywhere else in Europe (appreciably higher than in the most dynamic centre of the time, Holland). The material between these two extremes falls into two groups: one, the countries surrounding the North Sea, and the other, Italy. The North Sea region – Holland, Flanders, northern France and England – already had a relatively high wage level (of around 3 grammes of silver) at the start of the sixteenth century. Broadly speaking, this level doubled in the course of the sixteenth century (only England lagged somewhat behind) after which stagnation emerged in France and Flanders, while wages continued to rise in Holland (slightly) and in England (steeply). While stagnation broadly characterised the seventeenth and eighteenth centuries on the Continent (only after c. 1650 in Holland) silver wages in England more than doubled in this period. Half way through the seventeenth century Holland was the area with the highest silver wage (on about the same level as Seville in fact). In the eighteenth century, this role was taken over by England, and by London in particular.

The development of silver wages thus reflected, up to a point, the economic development of the various parts of Europe. There existed, for

Table 1. *Estimates of the daily wage of unskilled building labourers in grammes of silver, 1500–20 to 1780–1800.*

	1500–20	1600–20	1680–1700	1780–1800
Warsaw	—	2.70	1.98	3.81
Cracow	1.02	2.80	1.69	1.88
Lvov	1.15	2.24	2.04	2.47
Danzig	2.30*	3.26	3.92	3.99
Augsburg	1.49	2.54	2.79	2.42
Leipzig	—	2.90	3.48	—
Frankfurt	2.05	2.26	—	—
Vienna	2.86**	3.53	3.18	2.92***
Holland	3.00	6.52	7.70	8.65
Ghent	2.98	6.38	6.17	4.93
Southern England	2.92	3.68	5.71	9.20
London	3.65	5.41	8.10	11.60
Paris	2.45	6.65	6.19	7.40
Valencia	4.19	8.04	—	—
Barcelona	—	—	—	6.96
Valladolid	2.70	11.19****	—	—
Seville	—	11.32	10.04	6.64
Milan	—	6.13	3.90	2.80
Florence	2.58	4.73	—	—
Venice	—	7.78	—	—
Coefficient of variation 12 cities	0.37	0.52	0.51	0.56

Notes: * 1530–39; ** 1520–29; *** 1770–79; **** 1580–1600.

Sources: see Appendix.

example, a strong positive correlation between silver wages in the different countries and estimates of the urbanisation ratio made by De Vries (1984, p. 39) ($R^2 = 0.65$). The seventeenth and eighteenth centuries showed a clear fall in the silver wage in stagnating countries such as Spain, Italy (probably), Austria, and southern Germany (a modest fall), while the dynamic regions around the North Sea (first Holland and then England) registered a sharp rise.

Italy is in some ways the most problematical case, largely due to the lack of adequate data. Wages in the merchant city of Venice are significantly higher than those in the ‘industrial’ cities of Milan and Florence. In the seventeenth and eighteenth centuries especially, wages in Milan were far below the level being paid around the North Sea, which would seem to undermine the well-known hypothesis which attributes the decline of the Italian economy in the seventeenth century (and the shifting of the economic centre of gravity from southern to north-western Europe) to high

wages in the Italian cities. The only attempt to apply a quantitative test to this hypothesis was based on Venetian data and compared Venice's relatively high wages with those of southern England, which were relatively low at precisely that time (Rapp 1976). Had Rapp compared wages in Florence, for example, with those in other large cities (London or Amsterdam) the difference would have been much less marked. On the other hand, the high-wage hypothesis does seem to provide a clue for the decline of Spanish industry in this period (although there is evidence to suggest that high Spanish wages were in fact the result of very high grain prices and an extremely heavy burden of indirect taxation (Gelabert 1994)).

It seems then that silver wage differences within Europe increased significantly between 1500 and 1800. In 1500–20 wages in Valencia were four times as high as those in Cracow; by 1780–1800 the difference between London and (again) Cracow was as high as a factor of six. The coefficients of variation in Table 1 reflect this increase, which seems to have arisen largely during the sixteenth century.

4. Grain prices

So far, we have found the pattern that could be expected on theoretical grounds: there was a clear relationship between the level of economic development and silver wages. There are, however, a number of reasons to assume that the cost of living showed a comparable pattern. To begin with, the 'core' regions of Europe – Italy and Spain in the sixteenth, Holland in the seventeenth and England in the second half of the eighteenth century – were importers of basic foodstuffs, which meant that prices of grains in these countries were higher than elsewhere. Secondly, 'core status' almost invariably meant high levels of taxation, which further drove up the cost of living. Thirdly, the prices of non-tradables, which were determined by the high level of nominal wages and location costs (rents etc.), probably rose even more in core regions. For example, the study by Lesger (1986) into the development of rents in Amsterdam showed that these important parts of the cost of living increased much more than the general price level.

The fact that in the twentieth century there exists a positive association between the cost of living and the level of economic development is well known from the literature on international comparisons of levels of GDP (Balassa 1964, Heston and Summers 1993). The factors behind this relationship – high wages and high prices for non-tradables (services) in the high income countries – were without doubt at work in the early modern economy as well. The share of non-tradables in total consumption was probably much larger than it is today, and transport costs which determine the differences in prices of tradables between markets were also much higher, which implies that international differences in the cost of living were probably more substantial than nowadays.

Travel accounts present us with impressionistic evidence about these international differences in the cost of living. Antoni Mańczak analysed the accounts of a number of travellers to Italy in the sixteenth century, and showed that living there was much more expensive than in Poland or Germany. For example, an egg cost five to six times as much in Florence as an egg in Poland or Denmark and the cost of living for students in Padua was two or three times higher than in German university towns (Mańczak 1974, p. 332). Seventeenth century travellers to Holland came up with comparable stories; according to one source the cost of living at The Hague was about one third higher than in Paris or London (in 1668–9) (Van Strien 1981). But during the eighteenth century the tables definitively turned, and England became the most expensive country to live in (Uselding 1975).

A more systematic attempt can be made to analyse these differences in the cost of living by comparing grain prices. Because grain was a tradable, one would expect these differences to have been relatively small – much smaller, for example, than differences in the cost of housing or of personal services. But it is very difficult to collect comparable price data for other products; again we are constrained by the availability of sources. A positive reason for concentrating on wheat and rye is that bread formed the staple diet of the working classes; according to a number of sources European workers spent at least 50 per cent of their income on wheat and rye bread (Vigo 1974). Lower percentages are found only in the most developed parts of Europe (Holland and England) in the seventeenth and eighteenth centuries (Shammas 1990, De Vries and Van der Woude 1997).

In order to avoid unnecessary complexity, Table 2 contains data on grain prices in terms of silver in nine countries/cities in four sample periods. The pattern which emerges is a well-known one, thanks to the work of Braudel and Spooner (1967). During the sixteenth century grain prices were very high in southern Europe. In Italy, at that time the most developed economy, the cost of living was much higher than in the rest of Europe. After 1530 (which is also the period when large quantities of American silver began to arrive, debateable though the connection may be) grain prices in Spain began to converge to the Italian level. At the other end of the spectrum, in Poland (the least developed economy) grain prices were very low indeed; in Cracow the price of rye was less than six per cent of the price of wheat in Italy.

In the course of the seventeenth century the focus of economic development shifted to the countries bordering the North Sea – to Holland (in the period 1600–1670) and finally to England (after 1700). The changes which followed this shift confirm the view that economic development led to a rise in the relative price level of the basic foodstuff: after 1740 England became the most expensive country (although differences between English and Continental grain prices remained minor until about 1760). In Amsterdam wheat prices stayed below those in England and France, thanks to the abundant supply of Baltic grain (and generous British export subsidies).

Table 2. Grain prices in nine countries (in grammes of silver per hectolitre), 1500–20 to 1780–1800.

		1500–20	1600–20	1680–1700	1780–1800
<i>Rye</i>					
Poland	(Cracow)	2.3	9.0	8.0	10.3
Germany	(Ausborg)	18.5	44.2	38.6	40.9
Holland		16.2	36.5	43.6	57.5
<i>Wheat</i>					
Holland		21.5	57.2	46.5	87.5
Belgium	(Ghent)	19.9	74.4	82.0	71.0
England	(Exeter)	22.2	61.5	70.6	113.2
France	(Paris)	20.6	73.2	79.7	75.0
Austria	(Vienna)	15.5*	40.0	39.1	51.4
Spain	(New Castille)	22.9	110.1	61.9	107.6
Italy		39.1	103.6	46.8	81.1
Coefficient of variation		0.45	0.51	0.43	0.45

Notes: * 1520–29. Spain: New Castille; Italy: according to Abel (1966).
Sources: See Appendix.

Holland never became a ‘price leader’ in this area, unlike Italy before 1600 and England after 1760.

I have attempted to quantify the relationship between grain prices and silver wages in the following way. Nine sets of data have been selected which are more or less representative of the nine countries in question. The Polish set is from Cracow (but substitute the Lvov data and the results are virtually identical), the German series is from Augsburg, the Austrian from Vienna etc. For Spain the data come from Valencia and Seville, and for Italy from Florence and Milan. This material was fed in for four selected periods (1500–20, 1600–20, 1680–1700 and 1780–1800). On first inspection the results revealed a strong connection between the silver wage and the silver price of grain. This connection can be calculated as follows:

$$w = 1.18 + 0.673 * gr \quad R^2 = 0.65 \quad (1)$$

(2.37) (8.12)

(t statistics)

or, in logarithmic form:

$$\ln w = -0.68 + 0.560 * \ln gr \quad R^2 = 0.69 \quad (2)$$

(2.86) (8.96)

(t statistics)

in which *w* is the wage, *gr* is the grain price and *ln* indicates the logarithm of the wage and the grain price respectively. According to (2), a 10 per cent

increase in the grain price leads to a 5.6 per cent rise in the wage. The introduction of the time variable did not improve the results: evidently the relationship was relatively stable during the period 1500–1800.

Similar calculations, regressing the urbanisation ratio on grain prices, showed that there existed a strong correlation between the two; it could be estimated that an increase in the urbanisation ratio by 10 per cent resulted in a 5.5 per cent higher price of cereals.

5. Grain wages

On the basis of the data on the international levels of silver wages and of cereal prices, it is now possible to reconstruct the geography of grain wages in Western Europe. Table 3 reveals an unexpected picture of the regional structure of real wages measured in this way (especially for the sixteenth century): by far the highest figures are to be found in (the interior) of Poland – the least developed area – and the lowest in highly developed northern Italy. Stockholm, where according to Söderberg (1987) real wages were still in the process of falling during the second half of the sixteenth century, also features positively. This regional structure follows quite logically from the

Table 3. *Estimates of wages in litres of wheat or rye in 15 cities/regions, 1500–20 to 1780–1800.*

	1500–20	1600–20	1680–1700	1780–1800
<i>In litres of rye</i>				
Warsaw	–	38.5	25.3	22.8
Cracow	45.1	31.1	21.1	18.3
Lvov	41.3	10.5	–	–
Danzig	15.1*	10.6	13.1	8.5
Ausburg	8.1	5.7	7.2	5.9
Leipzig	–	6.4	12.1	–
Stockholm	–	14.4	17.0	8.7
<i>In litres of wheat</i>				
Vienna	18.5**	8.8	8.1	5.7***
Holland	14.0	11.4	16.6	9.9
Ghent	15.0	8.6	7.5	6.9
Southern England	13.2	6.0	8.1	8.1
Paris	11.9	9.1	7.9	9.9
Valencia/Seville	13.7	10.0	16.2	6.2
Florence/Milan	6.6	5.3	9.3	6.0
Coefficient of variation ****	0.67	0.70	0.43	0.44
Excl. Cracow	0.28	0.27	0.36	0.23

Notes: * 1530–39; ** 1520–29; *** 1770–79; **** excl. Leipzig, Lvov, Stockholm and Warsaw.

Sources: See Appendix.

analysis of silver wages and grain prices which was presented in the previous sections. There we saw that the 'grain-price elasticity' of the silver wage was 0.56; in other words, that a 10 per cent rise in grain prices led to a rise in the silver wage of 5.6 per cent. The consequence of this is that the structure of grain wages presents an inverted picture of the structure of grain prices (and of silver wages). Where grain prices were high, as in Italy in the sixteenth century, grain wages were low. The opposite end of the spectrum, Poland, where grain prices were very low, had extremely high grain wages. At the start of the sixteenth century, however, the differences between grain wages in the rest of Europe – from Danzig to Valencia – were remarkably small; only in Augsburg did the level lie below the 12 to 15 litre margin.

How should we interpret the high level of rye wages in Poland? It is quite possible that part of the difference was compensated for by the relatively high price of other products. But while it is true that imported spices and textiles were certainly more expensive in Poland than in the production and distribution centres of western Europe, it is highly debateable whether the building workers of Poland consumed a great deal of such imported 'luxury' products.³ More important is probably the relative scarcity of labour in the Polish economy. The pressure of population was much lower in Poland than elsewhere, as is shown (amongst other things) by the extremely low yield-ratios of Polish agriculture (Zytkowicz 1971). Certainly, in the eastern part of the far flung Polish kingdom (Ruthenia) there was an abundance of uncultivated land, which gave Polish society the character of a 'frontier economy' (Maćzak 1974, p. 324). The feudal reaction of the sixteenth and seventeenth centuries, which led to an increase in forced labour, can be seen as an attempt to resist the impending labour shortage by political means (designed to preserve and expand the nobility's stake in agricultural exports) (Wallerstein 1974, p. 99).

There is an interesting article by Jakovcevkij, on wages and prices in Russia from the eighteenth century onwards, which reveals the same regional structure (Jakovcevkij 1967). On the basis of data from 1814–15 he shows how grain prices within Russia diverged very sharply. The highest prices were found in the north-west and the price level fell steadily towards the south and east (a structure which was long established, according to data from 1720). Wages did not display a pronounced regional pattern, and thus grain wages increased enormously the further east and south one goes. In Pskov (to the south of St. Petersburg) the daily wage was c. 14 litres of rye,

³ Recent but yet unpublished research by Bob Allen suggests that the factor of relative prices may have a very strong impact on these international comparisons of real wages (Allen 1998); I have, however, some doubts about the methodology applied by him, because his assumptions and calculations imply that (for example) Polish labourers had a very modern budget and spent a relatively small part of their income on basic foodstuffs, and that English or Dutch workers had a relatively traditional budget, spending much on cereals. This bias perhaps explains the differences in results between our two studies.

while in the eastern town of Sarapol (in the shadow of the Urals) it was 26.5 litres.

On Europe's other early modern frontier, New England, wages were considerably higher than in Old England (or in the rest of western Europe). In the second half of the seventeenth century, skilled workers in New England earned about double, and unskilled labourers about one and a half, the amount earned by similar groups in the south of England (Galenson 1989, p. 89). In the course of the eighteenth century these differences became somewhat smaller, but they continued to run clearly in favour of the 'frontier' economy (cf. Adams 1970). On the other hand, as might be expected, the cost of agricultural land in the colony was only a fraction of the level prevailing in the mother country (Galenson 1989, p. 89). One could perhaps see the relatively low real wages prevailing in western Europe in the seventeenth and eighteenth centuries as part of a general 'trough', nestling in space between areas with relatively high real wages (eastern Europe and North America), and trapped in time between periods with relatively high real wages (the late Middle Ages and the second half of the nineteenth century).

In the early modern period there seems to have been a negative link between economic development and the level of real wages. Komlos found a similar pattern in his research into the height of adult soldiers in Austria-Hungary: the tallest average height in the first half of the eighteenth century was in Galicia (the Austrian part of Poland), followed by Hungary, while the smallest average height was in Lower Austria and above all Bohemia. This implies significant differences in the population's state of nourishment (Komlos 1989, pp. 56–9). His international comparisons fit in nicely with the picture we get from Table 3. In Sweden the soldiers were about as tall as in Austria-Hungary, but in England the average height was appreciably less (164 cm. as against 168.5 cm.). On the other hand, the population of the British colonies in North America, which was much better fed than anywhere in Europe, produced an average of 173 cm. (even slaves born in North America were taller than most Europeans) (Komlos 1989, pp. 93–4). Compare this with the 'top' Europeans around 1740, the soldiers in Galicia, who averaged only 171 cm. Thus in the mid-eighteenth century we are still encountering a negative link between this 'output' measure of the standard of living and the level of economic development (at least if we agree that Galicia and Sweden were less highly developed than England).

The increasing grain wage of labourers in Holland in the seventeenth century seems to be the major exception to this 'rule'. This can be partly ascribed to the fact that Holland's prosperity was largely based on her dominance of Baltic grain imports; the efficiency of trade and transport with this region allowed her to profit from the low grain prices there. Baltic grain was exported on a grand scale via Amsterdam to the surrounding countries, as far down as Italy and Spain. Thus in the seventeenth century grain prices

were actually lower in Holland than in the less economically dynamic countries around her, an inversion of the normal pattern.

But did Dutch workers profit from these low grain prices? As was pointed out in the introduction to this section, grain prices are not necessarily a reliable gauge of bread prices, since the milling of grain and the baking of bread tend to be wholly controlled by specialists and, in the case of seventeenth century Holland, were heavily taxed by the local and central authorities. We know from a number of studies that the price of bread in Holland was driven up both by excise duties and by the powerful influence of the bakers' and millers' guilds. The price of rye bread was considerably higher in Holland (five to 30 per cent) than in the eastern province of Overijssel, despite the fact that the price of rye in Amsterdam differed only marginally from that in Deventer or Kampen. Duties on milling, much higher in Holland (and Utrecht) than in other parts of the Republic (and virtually unknown in other countries), also played an important role in driving up the price of bread and keeping it high. As a result, the difference in wage levels between Alkmaar (in Holland) and Kampen (in the eastern part of the country) was virtually wiped out: in terms of kilograms of rye *bread*, building workers in the two towns earned almost exactly the same (Van Zanden 1993, pp. 127–36).⁴

Following this discussion of the structure of grain wages, we need to pay a little more attention to the way in which that structure developed. The sharp fall in the real wage during the sixteenth century emerges clearly from the data presented in Table 3; no area escaped this erosion of purchasing power, which was especially dramatic in England, but relatively minor in Holland, Spain and Italy (where grain wages were already low). In the seventeenth century there was no clearly pronounced trend. In the second half of the eighteenth century the grain wage again fell sharply, a trend which has also been documented by Söderberg (1987). On balance, the wage in Western Europe fell from c. 12 to 15 litres of grain in 1500–20, to six to ten litres in 1780–1800, a fall of between 33 and 50 per cent. The fall was most dramatic in cities with extreme levels at the start of the period, notably in Vienna and in Poland; it was virtually absent in northern Italy.

6. Relative prices and material wealth

Some of the objections that may be raised against this attempt to chart the long run development and structure of grain wages in early modern Europe

⁴ In a separate study, Leo Noordegraaf and I have presented an international comparison of wages and wheat prices in Holland, Brussels, London, Paris and Milan (Noordegraaf and Van Zanden 1995, pp. 421–4). This study also showed that bread prices elsewhere were never as high as in Holland, despite her relatively low grain prices; in other words, the largest gap between the price of wheat and the price of bread was to be found in Holland; see also Table 4.

are related to the use of grain prices as deflators. As has been explained already, prices of these heavily traded goods probably underestimate international differences in price levels, although a point can be made that prices of manufactured goods (and of colonial supplies) were probably lower in the core regions than in the periphery. But an even more important problem is that in the long run the prices of wheat and rye may have developed differently from those of other commodities. These changes in relative prices will be the topic of this Section.

Given the limitations of this article it is impossible to analyse the many different studies which contain information on changes in relative prices between 1500 and 1800 in any detail. But this body of evidence makes it possible to arrive at a number of conclusions:

- Prices of agricultural products rose relative to almost all other prices; this is evident in Poland (Kula 1976, pp. 116–17), Holland (calculated from Posthumus 1943–64), England (Nef 1937; Phelps Brown and Hopkins 1981, pp. 44–57), Austria (calculated from Pribram 1938) and Tuscany (Malanima 1994);
- This change of the relative prices of agricultural products was especially marked during the sixteenth and again during the eighteenth century, whereas relative prices did not change much during the seventeenth century;
- Prices of manufactured products, especially of textiles, paper and iron products, declined most in relative terms, as did those of a few colonial products (sugar especially).

By focusing on grain wages, the preceding analysis may have overestimated the decline in the standard of living. On the other hand, in the core regions the costs of housing (for which information is very scarce) and the incidence of taxation probably went up even more than grain prices. A check of the previous results can be made by comparing the estimates of the development of grain wages by the much more detailed estimates made by Phelps Brown and Hopkins of the development of real wages, i.e. nominal wages deflated by an index of the cost of living (or a composite unit of consumables as they like to call it). Because the relative prices of cereals tended to go up – especially relative to the prices of industrial products – one would perhaps expect that grain wages would decline more than nominal wages deflated by a more complete cost of living index, but this did not happen in the three cases which were studied carefully by Phelps Brown and Hopkins: Southern England, Augsburg and Vienna (Table 4). To my own surprise, both series showed almost identical patterns of decline in the sixteenth century and similar recoveries in the seventeenth century (the Valencia series also published by Phelps Brown and Hopkins, which ends in 1607 however and is therefore not included in the Table, even shows a

Table 4. *Comparison of the grain wage estimates with the estimates made by other authors (1500–20 = 100).*

	1500–20	1600–20	1680–1700	1780–1800
Southern England				
Grain wages	100	46	61	61
Phelps Brown/Hopkins	100	43	55	62
Ausburg				
Grain wages	100	70	89	73
Phelps Brown/Hopkins	100	62	90	–
Vienna				
Grain wages	100*	48	44	31
Phelps Brown/Hopkins	100*	46	46	–
Holland				
Grain wages	100	81	119	71
New series	100	82	73	60

Note: * 1520–29.

Sources: Appendix and Phelps Brown and Hopkins 1981, pp. 29–31, 95–97.

higher decline of real wages than my estimates do). For Holland I could make use of work in progress on the development of the cost of living in this region which attempts also to include the development of house rents (which is missing in all Phelps Brown and Hopkins series) and of indirect taxation. These additions have a large impact on the outcome of the analysis of the long term development of real wages, as Table 4 shows; it confirms the doubts expressed in the previous section about the rise of grain wages in the seventeenth century. The conclusion from these comparisons is however that by using grain wages I do not seem to overestimate the decline of real wages in Europe in the very long run.

What is perhaps even more important is that households must have adjusted the composition of their budgets to these changes in relative prices. There was throughout Europe an almost uniform tendency to reduce the consumption of meat, as Abel (1966) has already shown. Even in 'prosperous' England Carole Shammas concludes that there are in fact signs of a slight fall in meat consumption and a greater fall in the use of dairy products, especially during the second half of the eighteenth century (for which she had a relative wealth of material at her disposal) (Shammas 1990, pp. 141–4). In eight cities in Holland I found a comparable decline in meat consumption between 1510–14 and 1801–4 (from about 42 kg per head to 27 kg). When figures for the 1470s are included the picture becomes even more pessimistic. In the city of Leiden meat consumption fell from an

estimated 46 kg in this period to 20 kg at the turn of the nineteenth century.⁵ Comparable research into consumption patterns in Sweden (Morell 1987), Hungary (Kisban 1992), Austria (Sandgruber 1982, pp. 154–65), and Italy and France (Aymard 1982) arrives at similar conclusions, i.e. that the *per capita* consumption of these agricultural luxury products declined.

On the other hand, there was probably a relative increase of (real) expenditure on manufactured goods, which helps to explain the increase in material wealth found by De Vries. Paolo Malanima (1994) has already put forward this explanation of the changes in material wealth in a study of probate inventories in Tuscany in the seventeenth and eighteenth centuries. The paradox formulated by De Vries, that declining real wages went together with an increase in material wealth (in the most developed parts of Europe), can at least partially be explained by changing relative prices.

But we should not be too optimistic about the increase in material wealth. The basic problem with studies based on probate inventories is that the working class was usually too poor to have their possessions registered in this way, which means that in general we are not well informed about the development of their material wealth, in spite of the many studies devoted to these sources.

Another prominent feature of the changing position of working class households was their gradual proletarianisation during the early modern period. Tilly (1984) has produced a number of estimates of the growth of the wage-dependent population, partly on the basis of Blaschke's study of the development of population in Saxony. According to these figures the share of proletarians increased from one third of the population of Western Europe around 1500 to two thirds in 1800 (or from 37 million to 100 million). Although a lot can be said about his calculations, they probably do give an impression of the rough trend. This process of proletarianisation was concentrated in the core region. In Holland, for example, it is documented rather well (Van Zanden 1993). In the other centre of merchant capitalism, England, a similar process had taken place. According to Carole Shammas, the budgets of seventeenth century English labourers include the milk of their own cows, but in the course of the seventeenth and eighteenth centuries cattle ownership amongst labourers markedly declined (Shammas 1990, pp. 139–41). At the same time peasant households were losing their rights to common land (due to enclosures), which was a significant factor contributing towards proletarianisation (Humphries 1990, Neeson 1993). Perhaps the labouring classes around the North Sea owned more tin spoons, books and crockery at the end of the eighteenth century than they had in the sixteenth (although this has not yet been finally established by research into

⁵ The most important sources for these statements are tax records published by Fruin (1866) and Marsilje (1985, pp. 251, 271) and estimates of meat consumption in 1800 by Van der Woude 1963.

material culture) but they were almost certainly poorer in terms of the means of production necessary to partially feed themselves and gain a little independence from the demands and uncertainties of the labour market.

7. Conclusion

To summarise the preceding discussion, I have argued that there are good reasons to study real wages as an indicator of the standard of living of that part of the population that was to some extent dependent on wages as a source of income. As probably the most significant exogenous 'input' into the decision making process of these households, it affected all other options faced by the members of the household. Declining real wages invariably meant either increasing the work effort (and the loss of leisure as a result) or losing some real purchasing power – both options meant that the standard of living must have declined.

The attempt to chart the long term geography and development of grain wages in Western Europe between the beginning of the sixteenth and the end of the eighteenth century showed convincingly that there was no clear cut relationship between economic development and real wage growth. In fact, both geography – which showed that grain wages were in general higher in the less developed parts of Europe than in the core regions – and chronology – which was consistent with the well known long term decline in real wages in the early modern period – suggest an inverse relationship between development and the standard of living. The hypothesis of the industrious revolution, put forward by Jan de Vries (1994), is an attempt to reconcile these two conflicting stories. An alternative interpretation is suggested, which focuses more on the way consumers adjusted to changes in relative prices and, it may be added, households probably increased their labour effort as a result of the decline in real wages.

That there is no straightforward connection between economic development and the standard of living is not a peculiar feature of the early modern period. Recent anthropometric research has for example shown that during early industrialisation the 'biological standard of living' (i.e. the heights of boys or girls at a certain age) was falling. This seems to have occurred in the United States, in England and in the Netherlands; in the latter country recent research has shown that on a regional basis there was also a strong inverse relationship between the level of economic development and heights (Noordegraaf and Van Zanden 1995).

It is beyond the scope of this article to analyse the reasons why output *per capita* and indicators of the standard of living have often moved in different directions. Among the obvious explanations for this apparent puzzle are changes in the distribution of income and the costs (for example in terms of higher costs of living) of moving to and living in an urban environment (see

Komlos 1996). The most important conclusion from this article is that the recent revisionism of the performance of the early modern economy, which tended to be very optimistic in spirit and tone, should be qualified, because there are good reasons to assume that large segments of the population of Europe did not profit much from the economic progress that has been documented so well by the revisionist literature.

References

- ABEL, W. (1966). *Agrarkrisen und Agrarkonjunktur*. Hamburg and Berlin: Parey.
- ADAMCYK, W. (1938). *Ceny w Warszawie w XVI i XVII wieku*. Lwow: Sklad Główny.
- ADAMS, D. R. (1970). Some evidence on English and American wage rates, 1790–1830. *Journal of Economic History* 30, pp. 499–511.
- ALLEN, R. C. (1998). The great divergence: wages and prices from the Middle Ages to the First World War. Paper presented at the annual meeting of the EHA, Durham.
- AYMARD, M. (1982). Dietary changes in Europe from the 16th to 20th century, with particular reference to France and Italy. In H. Baudet and H. van der Meulen (eds), *Consumer Behaviour and Economic Growth in the Modern Economy*. London: Croom Helm.
- BALASSA, B. (1964). The purchasing-power parity doctrine: a reappraisal. *Journal of Political Economy* 72, pp. 584–96.
- BAULANT, M. (1968). Le prix des grains à Paris de 1431 à 1788. *Annales E.S.C.* 23, pp. 520–40.
- BAULANT, M. (1971). Le salaire des ouvriers du bâtiment à Paris de 1400 à 1726. *Annales E.S.C.* 26, pp. 461–83.
- BENNASSAR, B. (1967). *Valladolid au Siècle dor*. Paris: École Pratique des Hautes Études.
- BRAUDEL, F. and SPOONER, F. (1967). Prices in Europe from 1450 to 1750. In *Cambridge Economic History of Europe* 4, pp. 374–486. Cambridge: Cambridge University Press.
- CHARTERS, J. A. (1986). Food consumption and internal trade. In A. L. Beier and R. Finlay (eds), *London 1500–1700*. London and New York: Longman.
- CIPOLLA, C. (1975). *Le Avventura della Lira*. Bologna: Il Mulino.
- DE MADDALENA, A. (1974a). Preise, Löhne und Geldwesen im Verlauf der Wirtschaftlichen Entwicklung Mailands vom 17. bis zum 19. Jahrhundert. In I. Bog et al. (eds), *Wirtschaftlichen und sozialen Strukturen im saekularen Wandel* 2. Milano: Banca Commerciale Italiana.
- DE MADDALENA, A. (1974b). *Prezzi e Mercendi a Milano dal 1701 al 1860*. Milano: Banca Commerciale Italiana.
- DE VRIES, J. (1974). *The Dutch Rural Economy in the Golden Age, 1500–1700*. New Haven and London: Yale University Press.
- DE VRIES, J. (1984). *European Urbanization 1500–1800*. London: Methuen.
- DE VRIES, J. (1993). Between purchasing power and the world of goods: understanding the household economy in early modern Europe. In J. Brewer and R. Porter (eds), *Consumption and the World of Goods*. London: Routledge.

- DE VRIES, J. (1994). The Industrial Revolution and the Industrious Revolution. *Journal of Economic History* 54, pp. 249–70.
- DE VRIES, J. and WOUDE, A. VAN DER (1997). *The First Modern Economy*. Cambridge: Cambridge University Press.
- DURAND, Y. (1966). Recherches sur les salaires des maçons à Paris au XVIII^e siècle. *Revue d'Histoire Économique et Sociale* 44, pp. 468–80.
- ELSAS, M. J. (1936/40). *Umriss einer Geschichte der Preise und Löhne in Deutschland*. Leiden: Sijthoff.
- FRUIN, R. (1866). *Informacie up den Staet*. Leiden: Maatschappij der Nederlandsche Letterkunde.
- FURTAK, T. (1935). *Ceny w Gdansk w latach 1701–1815*. Lwow: Sklad Główny.
- GALENSON, D. W. (1989). Labor market behavior in colonial America: servitude, slavery, and free labor. In Galenson (ed.), *Markets in History*. Cambridge: Cambridge University Press.
- GELABERT, J. E. (1994). Urbanisation and deurbanisation in Castile. In I. A. A. Thompson and B. Yun Casalilla (eds), *The Castilian Crisis of the Seventeenth Century*. Cambridge: Cambridge University Press.
- GOLDTHWAITE, R. A. (1980). *The Building of Renaissance Florence*. Baltimore and London: Johns Hopkins University Press.
- HAMILTON, E. J. (1934). *American Treasure and the Price Revolution in Spain, 1501–1650*. Cambridge, MA: Harvard University Press.
- HAMILTON, E. J. (1947). *War and Prices in Spain, 1651–1800*. Cambridge, MA: Harvard University Press.
- HESTON, A. and SUMMERS, R. (1993). What can be learned from successive ICP benchmark estimates? In A. Szirmai et al. (eds), *Explaining Economic Growth*. Amsterdam: Elsevier.
- HOFFMAN, P. T. (1996). *Growth in a Traditional Society*. Princeton: Princeton University Press.
- HOSZOWSKI, S. (1954). *Les Prix à Lwow XVI^e–XVII^e siècles*. Paris: SEVPEN.
- HUMPHRIES, J. (1990). Enclosures, common rights, and women: the proletarianization of families in the late eighteenth and early nineteenth centuries. *Journal of Economic History* 50, pp. 17–42.
- JAKOVCEVKIJ, V. N. (1967). I Prezzi ed il profitto commerciale nella Russia feudale-servile, in *I Prezzi in Europa dal XIII secolo a oggi*. Torino: Giulio Einaudi.
- JANSSON, A., ANDERSSON PALM, L. and SÖDERBERG, J. (1991). *Dagligt bröd i onda tider*. Götene: Institutet för Lokalhistorisk Forskning.
- KISBÁN, E. (1992). Food and foodways as the subject of historical analyses in Hungary. In H. J. Teutebert (ed.), *European Food History*. Leicester: Leicester University Press.
- KOMLOS, J. (1989). *Nutrition and Economic Development in the Eighteenth-Century Habsburg Monarchy*. Princeton: Princeton University Press.
- KOMLOS, J. (1996). Anomalies in economic history: towards a resolution of the 'antebellum puzzle'. *Journal of Economic History* 56, pp. 202–14.
- KULA, W. (1976). *An Economic Theory of the Feudal System*. London: NIB.
- LESGER, C. (1986). *Huur en Conjunctuur in Amsterdam 1550–1850*. Amsterdam: Historisch Seminarium.

- MACZAK, A. (1974). Preise, Löhne und Lebenshaltungskosten im Europa des 16. Jahrhunderts. In I. Bog *et al.* (eds), *Wirtschaftlichen und sozialen Strukturen im saekularen Wandel 2*. Hannover: Schaper.
- MALANIMA, P. (1994). Changing patterns in rural living conditions: Tuscany in the eighteenth century. In A. J. Schuurman and L. S. Walsh (eds), *Material Culture: Consumption, life-style, standard of living, 1500–1900*. Milan: Proceedings of the Eleventh International Economic History Congress, Milan.
- MARSILJE, J. W. (1985). *Het Financiële beleid van Leiden in de laat-Beierse en Bourgondische periode*. Hilversum: Verloren.
- MITCHELL, B. R. and DEAN, P. (1962). *Abstract of British Historical Statistics*. Cambridge: Cambridge University Press.
- MORELL, M. (1987). Eli F. Heckscher, the food budgets and Swedish food consumption from the 16th to the 19th century. *Scandinavian Economic History Review* 35, pp. 67–107.
- NEESON, J. M. (1993). *Commoners: Common Right, Enclosure and Social Change in England, 1700–1820*. Cambridge: Cambridge University Press.
- NEF, J. U. (1937). Prices and Industrial Capitalism in France and England. *Economic History Review* 7, pp. 155–85.
- NOORDEGRAAF, L. (1980). *Daglonen in Alkmaar 1500–1850*. Haarlem: Historische Vereniging Holland.
- NOORDEGRAAF, L. and SCHOENMAKERS, J. T. (1984). *Daglonen in Holland 1450–1600*. Amsterdam: Historisch Seminarium.
- NOORDEGRAAF, L. and VAN ZANDEN, J. L. (1995). Early modern economic growth and the standard of living. In K. Davids and J. Lucassen (eds), *A Miracle Mirrored. The Dutch Republic in European Perspective*. Cambridge: Cambridge University Press.
- PARENTI, G. (1967). Prezzi e Salari a Firenze dal 1520 al 1620. In *I Prezzi in Europa dal XIII secolo a oggi*. Torino: Giulio Einaudi.
- PELC, J. (1937). *Ceny w Gdansk w XVI i XVII wieku*. Lwow: Sklad Główny.
- PELC, J. (1935). *Ceny w Krakowie w latach 1396–1600*. Lwow: Sklad Główny.
- PERSSON, K. G. (1988). *Pre-Industrial Economic Growth*. Oxford: Basil Blackwell.
- PHELPS BROWN, H. and HOPKINS, S. V. (1981). *A Perspective of Wages and Prices*. London: Methuen.
- POSTHUMUS, N. W. (1943–64). *Nederlandsche Prijsgeschiedenis*. Leiden: Brill.
- PRIBRAM, A. F. (1938). *Materialien zur Geschichte der Preise und Löhne in Österreich*. Wein: Ueberreuter.
- RAPP, R. T. (1976). *Industry and Economic Decline in Seventeenth-century Venice*. Cambridge, MA: Harvard University Press.
- RAPPAPORT, S. (1989). *Worlds within Worlds: Structures of Life in Sixteenth-century London*. Cambridge: Cambridge University Press.
- SANDGRUBER, R. (1982). *Die Anfänge der Konsumgesellschaft*. Wien: Verlag für Geschichte und Politik.
- SCHWARZ, L. D. (1989). The formation of the wage: some problems. In P. Scholliers (ed.), *Real Wages in 19th and 20th century Europe*. New York: Berg.
- SCHWARZ, L. D. (1992). *London in the Age of Industrialization*. Cambridge: Cambridge University Press.

- SELLA, D. (1968). *Salari e Lavoro Nelledilizia Lombarda durante il secolo XVII*. Pavia: Succ. Fusi.
- SIEGEL, S. (1936). *Ceny w Warszawie w latach 1701–1815*. Lwow: Sklad Główny.
- SHAMMAS, C. (1990). *The Pre-industrial Consumer in England and America*. Oxford: Clarendon Press.
- SHAW, W. A. (1967). *The History of Currency 1252 to 1896*. New York, reprint: A. M. Kelly [original, Putnam 1896].
- SLICHER VAN BATH, B. H. (1960). *De Agrarische Geschiedenis van West-Europa*. Utrecht/Antwerpen: het Spectrum.
- SNOOKS, G. D. (1990). Economic growth during the last millennium: a quantitative perspective for the British Industrial Revolution. *Working Paper in Economic History no. 140*, Australian National University.
- SNOOKS, G. D. (1993). *Economics without Time*. London: Routledge.
- SÖDERBERG, J. (1987). Real wage trends in urban Europe, 1730–1850: Stockholm in an international perspective. *Social History* 12, pp. 155–76.
- STRIEN, C. D. VAN (1989). *British Travellers in Holland During the Stuart Period*. Amsterdam: Free University.
- TILLY, C. (1984). The demographic origins of the European proletariat. In D. Levine (ed.), *Proletarianization and Family History*. Orlando, FL: Academic Press.
- TOMASZEWSKI, E. (1934). *Ceny w Krakowie w latach 1601–1795*. Lwow: Sklad Główny.
- USELDING, P. (1975). Wage and consumption levels in England and on the Continent in the 1830s. *Journal of European Economic History* 4, pp. 501–13.
- VAN ZANDEN, J. L. (1993). *The Rise and Decline of Holland's Economy*. Manchester: Manchester University Press.
- VAN DEN EECKHOUT, P. (1989). Wage formation: some more problems. In P. Scholliers (ed.), *Real Wages in 19th and 20th Century Europe*. New York: Berg.
- VANDENBROEKE, C. (1984). *Vlaamse Koopkracht, Gisteren, Vandaag en Morgen*. Leuven: Kritak.
- VERLINDEN, C. et al. (1959/65). *Dokumenten voor de Geschiedenis van Prijzen en Lonen in Vlaanderen en Brabant*. Brugge: 'De Tempel'.
- VIGO, G. (1974). Real wages of the working class in Italy: building workers wages (14th to 18th century). *Journal of European Economic History* 3, pp. 378–99.
- VILAR, P. (1962). *La Catalogne dans l'Espagne moderne*. Paris: SEVPEN.
- WALLERSTEIN, I. (1974). *The Modern World System I*. New York: Academic Press.
- WOUDE, A. M. VAN DER (1963). De consumptie van graan, vlees en boter in Holland op het einde van de achttiende eeuw. *AAG Bijdragen* 9, pp. 127–53.
- ZYTKOWICZ, L. (1971). Grain yields in Poland, Bohemia, Hungary, and Slovakia in the 16th to 18th centuries. *Acta poloniae historica* 24, pp. 51–72.

Appendix

General: Abel 1966, pp. 270–90 contains detailed data on wheat and rye prices in grammes of silver and much information about technical coefficients; see also Vigo 1974 and Shaw 1967.

Austria Vienna: Pribram 1938; all data relate to the Bürgerspital (daily wages of a 'Maurerhandlanger'.

Germany and Poland: Elsas 1936–40: Augsburg (daily wages of ‘ungelehrte Bauarbeiter’), Frankfurt (daily wages of ‘Erdarbeiter’, ‘Opperknechte’, ‘Grabenmeisterknechte’) and Leipzig (daily wages of ‘ungelehrte Arbeiter’); Danzig: Pelc 1937 and Furtak 1935; Cracow: Pelc 1935 and Tomaszewski 1934; Warsaw: Siegel 1936 and Adamcyk 1938; Lvov: Hoszowski 1954 (because no systematic price data for rye are available before 1700, I applied the price ratio between oats and rye of Danzig to the Lvov prices of oats to estimate the development of the price of rye). Daily wages of an unskilled worker (‘Robotnik’) (Cracow, Danzig, Lvov) or a helper of the mason (‘Pomocnik Murarski’) (Warsaw).

Belgium (Ghent): Verlinden 1959–65 and VandenBroeke 1984 (daily wages of a ‘metserdiener’).

England: Mitchell and Dean 1962: wheat prices in Exeter; Phelps Brown and Hopkins 1981: wages in Southern England; Rappaport 1989: wages in London, 16th century; Charters 1986: wages in London, 17th century; Schwarz 1992: wages in London, 18th century; all wage data relate daily summer wages of unskilled labourers in building trade.

Holland: Noordegraaf 1980 and Noordegraaf and Schoenmakers 1984: wages in Haarlem (16th century) and in Alkmaar (17th and 18th century) refer to daily summer wages of an ‘opperman’; Posthumus 1943–64: prices. The new series of the cost of living for Holland (1450–1800) used in Table 4 is the result of work in progress by Jan de Vries, Jan Pieter Smits, Arthur van Riel and the author.

Italy: Cipolla 1975: value of different currencies (additional information was supplied to me by Paolo Malanima); Florence: Goldthwaite 1980; Parenti 1967 (daily wages of unskilled labourers (‘manovali’) in construction; Milan: de Maddalena 1974a, b and Sella 1968 (daily wages of ‘garzone muratori’ (18th century) or ‘manovali’ (17th century); Venice: Pullan 1964 and Rapp 1976; average daily wage paid out to ‘lavorante’.

France (Paris): Baulant 1968 and 1971 (daily wages of ‘manoeuvres et aides’); Durand 1966.

Spain: Hamilton 1934 and 1947: prices and wages in Valencia, Seville and Madrid (daily wages of the mason’s helper or the carpenter-journeyman); Barcelona: Vilar 1962 (daily wages of a ‘manoeuvre-maçon’); Valladolid: Bennasser 1967 (daily wages of ‘oficiales’ which are substantially lower than the wages of ‘maitres’).

Sweden: Jansson, Andersson Palm and Söderberg 1991; Söderberg 1987 (daily summer wages of unskilled males ‘hantlangare’).