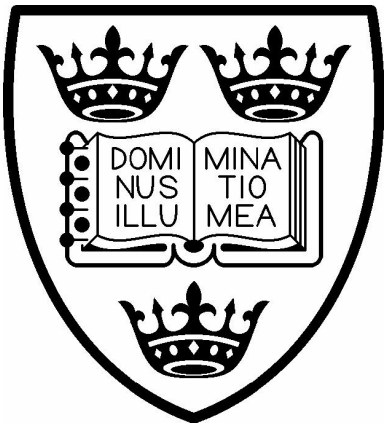


UNIVERSITY OF OXFORD

Discussion Papers in Economic and Social History

Number 67, November 2007

FROM PREVENTIVE TO PERMISSIVE CHECKS: THE CHANGING NATURE OF THE MALTHUSIAN RELATIONSHIP BETWEEN NUPTIALITY AND THE PRICE OF PROVISIONS IN THE NINETEENTH CENTURY

Paul Sharp and Jacob Weisdorf

For a full list of University of Oxford
Discussion Papers in
Economic and Social History
see pages 27–30

FROM PREVENTIVE TO PERMISSIVE CHECKS: THE CHANGING NATURE OF THE MALTHUSIAN RELATIONSHIP BETWEEN NUPTIALITY AND THE PRICE OF PROVISIONS IN THE NINETEENTH CENTURY[1]

Paul Sharp
(University of Copenhagen)
Contact: <paul.sharp@econ.ku.dk>

Jacob Weisdorf
(University of Copenhagen)

[1]. The authors gratefully acknowledge the feedback from seminar participants at the University of Copenhagen and the University of Oxford and an anonymous referee.

Abstract

The Malthusian "preventive check" mechanism has been well documented for pre-industrial England through evidence for a negative correlation between the marriage rate and the price of wheat. Other literature, however, speculates that the correlation was in fact positive from the early nineteenth century. This paper uses the cointegrated VAR model and recursive estimation techniques to document the changing relationship between nuptiality and the price of wheat from 1541–1965. The relationship is indeed positive from the early nineteenth century to the First World War. A simple theoretical model shows that this result is not in fact inconsistent with a stylized Malthusian mechanism, and can be understood within the context of an increasing dominance of shocks to aggregate demand rather than to aggregate supply.

JEL Classifications: J1, N3

1. Introduction

Since Malthus (1798), scholars have been fascinated by the evidence for a negative correlation between marriage rates and what Malthus termed the "price of provisions", for which a usual proxy is considered to be the price of wheat. This relationship seemed to provide evidence of a "preventive check" mechanism, at least in the pre-industrial period, whereby marriage and hence childbirth was postponed in the expectation of hard times ahead. Most studies have at least implicitly assumed that this relationship ceased to be significant with the onset of industrialization, and, intuitively, it would seem unlikely that the price of wheat has any important impact in modern times, at least on marriage rates.

However, in the late nineteenth and early twentieth centuries, economists and statisticians, starting with Ogle (1890), noted that there was now a *positive* relationship between marriage rates and wheat prices. This revelation, first reported by Ogle at a meeting of the Royal Statistical Society in London on March 18, 1890, and announced to the country by *The Times* on the following day (*The Times*, March 19, 1890, p. 10) seems to have caught the public imagination. The satirical magazine, *Punch*, in a parody of a popular nineteenth century song[2] had the singer announce that

The "quarter" stands at fifty, love,
Which for Mark Lane is dear.
Our wedding day is coming, love,
Our married course is clear.

In the chorus he therefore asks his love to

... meet me, meet me at the Altar,
When the price of wheat rules high!

(*Punch*, Vol. 99, September 27, 1890)

However, despite becoming "conventional wisdom" in the interwar years, the relationship proposed by Ogle seems to have been almost completely forgotten after the Second World War. Our aim in this paper is thus first to establish, using state-of-the-art empirical methods, whether a relationship ever existed and then to document how it changed over time. Although a positive relationship between nuptiality and the price of provisions would appear to contradict Mal-

[2] *My Pretty Jane* by Sir Henry Bishop and Edward Fitzball.

thus' prediction, we use a simple theoretical model to demonstrate that it is, in fact, possible for it to be understood within a simple Malthusian framework.

Section 2 presents a brief overview of the literature on the relationship between the marriage rate and the price of wheat. Section 3 uses the cointegrated VAR model and recursive estimation techniques to examine the change in this statistical relationship over time. Section 4 gives details of a simple theoretical basis for the relationship and the change from a negative to a positive correspondence. Section 5 concludes.

2. Summary of the literature

Malthus (1798) seems to have been the first to suggest a relationship between the price of food, which he termed "provisions" and the marriage rate. He wrote that in times of distress caused, he believed, by overpopulation, "the price of provisions would … tend to rise. The labourer therefore must work harder to earn the same as he did before. During this season of distress, the discouragements to marriage, and the difficulty of rearing a family are so great, that population is at a stand". (Malthus 1798, II.25) In later work, Malthus (1830) concluded that for many countries "the principal check which at present keeps the population down to the level of the actual means of subsistence is the prudential restraint on marriage." (Quoted in Schofield 1983, p. 267)

For many years, however, it was impossible to test the validity of Malthus' theory for his own country, since the first English census was in 1801, and annual marriage statistics were not recorded on a nationwide basis until well into the nineteenth century. Following in the wake of Wrigley & Schofield's (1981) "reconstruction" of marriage rates going all the way back to 1541, however, a large literature sprang up documenting the negative relationship between marriage rates and the price of wheat (used as a proxy for "price of provisions") for the pre-industrial English society.

The first such investigation was by Ronald Lee in Chapter 9 of Wrigley & Schofield (1981). He found a significant negative effect of prices on nuptiality, although in the last period he looked at, 1746-1834, the effect is weaker. Similar results are reached for a number of European countries by Galloway (1988) and again for England by Bailey & Chambers (1998) using some sophisticated econometrics and real wages instead of wheat prices.[3]

However, this modern work largely ignores an older literature which focuses on the modern period. In 1890 Ogle presented his simple statistical analysis, suggesting a positive relationship between the marriage rate and the price of wheat. He cited a number of scholars, including J. Stuart Mill, who assumed the reverse, but noted that "… neither these writers, nor those other authorities in political economy who have made similar statements, give, so far as I have been able to ascertain, the actual figures on which their statements are based; so that it remains doubtful whether they have themselves personally examined into the

[3] The authors admit that given inflexible nominal wages and that the price index was dominated by the price of wheat, the two are almost interchangeable. (op. cit., p. 421) In fact the latter might be preferable, since the Phelps Brown-Hopkins (1981) real wage series is unsuitable for accounting for short-run fluctuations — see the discussion in Lindert (1985, p. 618).

facts, or whether they have merely adopted, without personal investigation, an article of general belief." (Ogle 1890, pp. 256–7) Ogle pointed out that civil registration only began in 1839, and estimates from before this date only went back to 1820, and that for these years, a clear positive correlation was apparent.[4]

Nevertheless, Ogle accepted that a positive relationship is, on the face of it, a paradox, since although the Malthusian negative relationship might be expected to become insignificant with an increase in the standard of living "… it does not explain why they [marriage rates] increase when food, or rather when wheat, is dear".

Ogle nevertheless provides a simple theoretical solution: "Men marry… in greater numbers when trade is brisk, and when the value of exports increases; but when the exports increase, so also do freights, and this rise in freights causes a corresponding rise in wheat, the largest part of our wheat being imported from abroad". So, as he explains, the dominant relationship is between the marriage rate and the "briskness of trade" and thus indirectly through transport costs with the price of wheat.

Hooker (1901) tested Ogle's theory using contemporary state-of-the-art statistical methodology (Pearson correlation coefficients) to show that the marriage rate was more highly correlated with trade than with the price of wheat[5] and this conclusion was reinforced with similar methodology by Thomas (1927, Chapter III).

By 1920 Arthur C. Pigou felt able to write that "It is well known that the English marriage rate was negatively correlated with wheat prices in the earlier part of the nineteenth century and was positively correlated with exports … in the latter part". (Pigou 1920, I.IX.2) Even as late as 1931, Beveridge (1931, p. 42) included the marriage rate as one of his indicators of the "pulse of the nation", noting that "… [t]he tendency to matrimony … is undoubtedly related to the comparative prosperity or adversity of the times".[6] However, with, to our knowledge, one exception,[7] this relationship, apparently "conventional wisdom"

[4] He charitably suggests that the confusion of other scholars must be due to their data being "derived from foreign sources". (op. cit., p. 257)

[5] This early literature is summarized by Westermarck (1925, pp. 390-1) in his famous *History of Human Marriage*.

[6] Modern economists, so used to relying on GDP data to illustrate the health of the economy, might envy the host of indicators used by the pre-war economist, such as Beveridge's marriage rate and data for the consumption of beer per head in gallons!

[7] Southall & Gilbert (1996) cite the aforementioned literature as justification for using marriage rates as indicators of local economic distress.

in the interwar years, has been entirely neglected since the Second World War.[8] Moreover, the timing and nature of the change from a negative to a positive relationship has not been examined.

[8] In fact, the last discussion of the impact of prosperity on the marriage rate in modern times was in 1938, when Glass (1938) demonstrated that marriages rates and real wages were still highly correlated in the interwar period.

3. From Malthus to Ogle: An empirical investigation of the change from a negative to a positive relationship

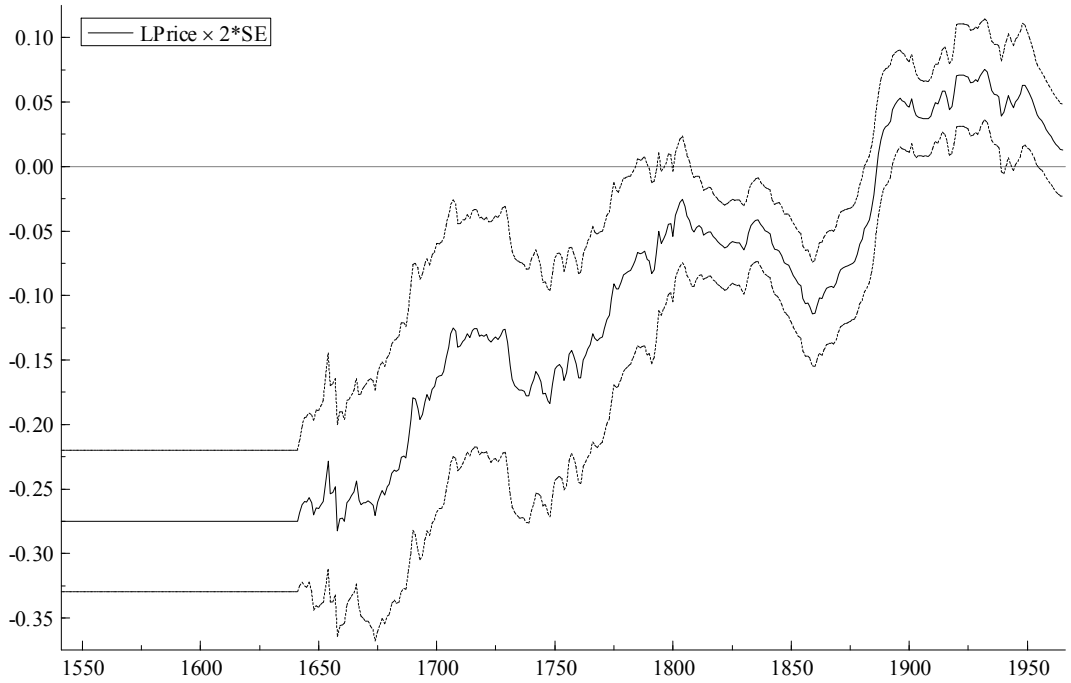
Ogle (1890) accepted that his finding seemed to be "… so paradoxical … that it is necessary before seeking for its explanation to show that it is an actual fact". With modern econometrics it is possible to do so.

The variables used in the subsequent analysis are *lcmr*, which is the natural logarithm to the crude marriage rate (marriages per 1000 head of population), and *lprice*, which is the natural logarithm to the price of wheat. The data run from 1541 to 1965.

We start by illustrating the changing correlation of the crude marriage rate with the price of wheat using a simple OLS framework and sequential regression. Figure 3.1 illustrates the change in the beta-coefficient from an OLS regression of *lcmr* on *lprice*. The sample at each point is 100 observations, so for example the first regression is for the years 1541–1640 and the final regression is for the years 1866 to 1965. The coefficient becomes positive for the sample running from approximately 1801–1900, but before this period nearly all samples result in negative coefficients. Adding a trend makes no difference to this conclusion.

Figure 3.1

From negative to positive:
100 year sequential regressions of the marriage rate on the price of wheat



Of course, although this simple analysis is useful to illustrate the point that the simple correlation between the marriage rate and the price of wheat did change, it is not necessarily a robust conclusion and certainly cannot be used to make any statements about causality. To do so we therefore turn to a cointegration analysis, based on the methodology suggested by Juselius (2006).[9]

In order to model the long-run relationship between the crude marriage rate and the price of wheat the following model is estimated:

$$\Delta X_t = \alpha\beta' X_{t-1} + \Gamma\Delta X_{t-1} + \mu + \Phi D_t + \alpha\beta_0' t + \varepsilon_t, \qquad (1)$$

where $X_t = \left(lcmr_t, lprice_t\right)'$ and t is the trend.

This model assumes that the $p = 2$ variables in X_t are related through r equilibrium relationships with deviation from equilibrium $u_t = \beta' Z_t$, and α characterizes the equilibrium correction. It holds that α and β are $p \times r$ matrices and the rank of $\Pi = \alpha\beta'$ is $r \le p$. The autoregressive parameter, Γ, models the short-run dynamics, and throughout it is assumed that $\varepsilon_t \sim iid.N_p\left(0,\Omega\right)$. D_t is a vector of dummies.

In order for the assumptions of the model to be fulfilled, in particular that residuals are *iid* and normally distributed, it is necessary to control for special or "extreme" events which are not otherwise captured by the model. These are detected through a detailed analysis of the residuals, and are classified as either having transitory or permanent effects on the levels of the variables. Special events which have only transitory effects, from period T_0 to T_x are modelled by dummies of the form $Di_t = 1_{\{t=T_0\}} - 1_{\{t=T_x\}}$. A dummy of the form $Dp_t = 1_{\{t=T_0\}}$ allows for the special event to have permanent effects on the levels of the variables. By controlling for the above it is possible to uncover the underlying long-run model for "normal" observations. As will be demonstrated below, it turns out to be necessary to control for a number of special events, which are almost exclusively wars.[10]

Since the model assumes constant parameters, and there is strong evidence of the relationship changing around about the year 1800, the sample is split in two: 1541–1799 and 1800–1965. This division is also consistent with work on the "end of the Malthusian era", which suggests a break at around 1800. (Schofield 1983, Clark 2007)

---

[9] The results were obtained using CATS in RATS, version 2.

[10] It turns out, perhaps surprisingly, that legislative changes, such as the Marriage Act of 1753, which abolished common-law marriage, and the Marriage Act of 1836, which introduced civil marriage, do not have an impact on the statistical relationship between the two variables.

All subsequent analysis relies on the choice of a lag-length of 2 in the model in equation (1) being correct. Using information criteria, it is found that k=2 lags are in fact sufficient to characterize the systematic variation in the model in both periods after controlling for special events. This assumption was then verified at various points during the subsequent analysis.

3.1 Pre-industrial England, 1541–1799

Although the negative relationship between the marriage rate and the price of wheat is well documented for the pre-industrial world, we demonstrate it again here for the sake of completeness.

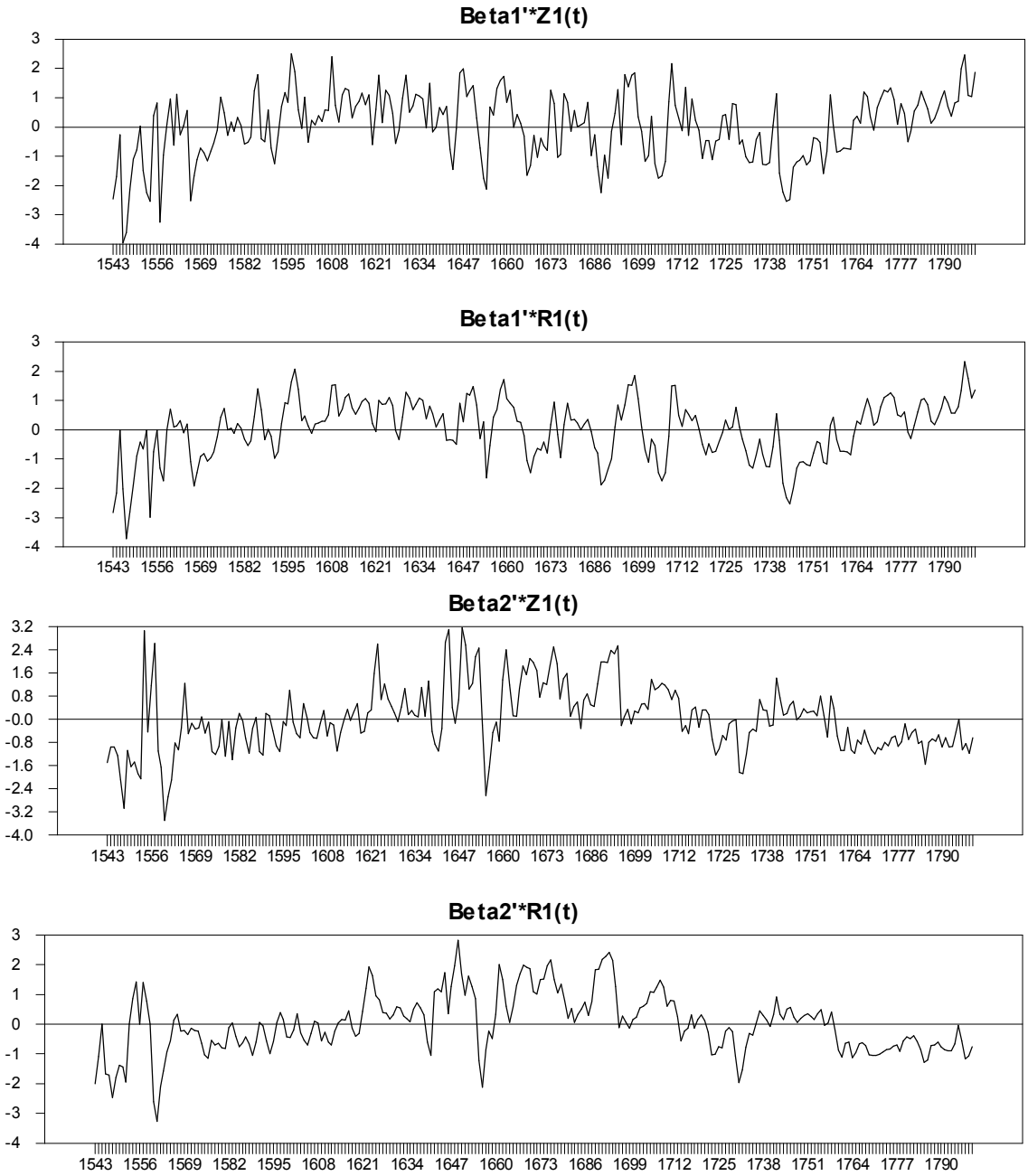
As explained, dummies are introduced to control for special events. These are a permanent negative impact on prices of peace with France in 1546 after the Italian War of 1542–46 and the successful Spanish and English invasion of France in 1557 as part of the Italian War of 1551–9; a permanent negative impact on the marriage rate in 1554, possibly due to Wyatt's Rebellion of 1554; a permanent positive impact on the marriage rate in 1560 attributable to peace after the final Italian War of 1551–59; and finally temporary negative effects on the marriage rate from 1643–5 and 1648–54. These last seem likely to be due to uncertainty surrounding the First English Civil War (1643–5); and the Second and Third English Civil Wars (1648–9, 1649–51) and the period of the Commonwealth (1649–53).

After introducing the dummies, the model appears to fulfil the *iid*-normality assumption. The F-test for (no) autocorrelation up to second order is accepted with a p-value of 0.54. The Doornik & Hansen (1994) test for normality is accepted with a p-value of 0.26. The univariate tests for the individual variables are likewise accepted.

A crucial step in the analysis is to determine the number of equilibrium relationships, r, but this causes some difficulties, since, as it turns out, the model is poorly specified for the final years. We thus rely on a number of other methods, two of which are reported below. First, it is clear from figure 3.2 that the first relation is far more clearly stationary than the second and that any non-stationarity is largely attributable to the period from the early eighteenth century. Second, the largest root of the companion matrix is 0.76 while the second is 0.62. Imposing one unit root removes the largest unit root and the second is reduced to 0.61. In summary, an assumption of one unit root seems appropriate and is justified in as much as it allows for greater ease of interpreting the estimation results.

Figure 3.2

Graphs of the cointegrating relations



After the assumption of $r = 1$, a number of tests are performed using recursive estimation[11] in order to test the assumption of parameter constancy. The important test for constancy of the log-likelihood suggests a structural break from around about 1700.

The structural break is clearly associated with a movement towards exogeneity of the marriage rate, as shown in the graph for the alpha (adjustment) coefficients in the second panel of figure 3.3. This is consistent with the movement from a negative correspondence between prices and the marriage rate, through a period of no significant correspondence to one of a positive relationship, as will be demonstrated in the next section

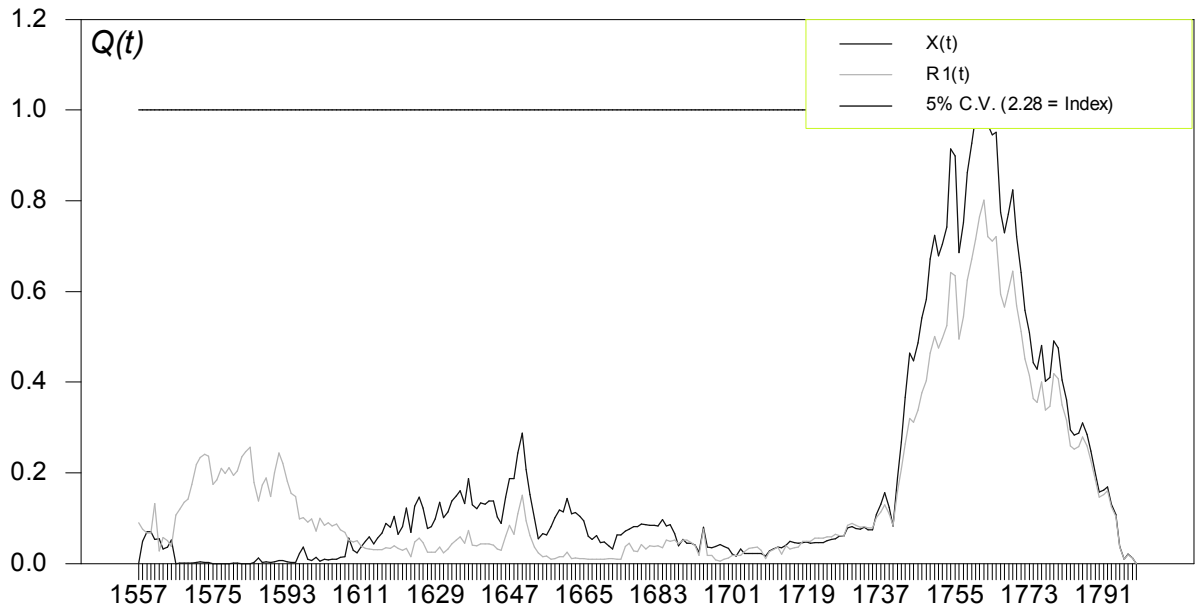
The coefficient beta, which can be interpreted as the elasticity of the marriage rate with respect to the price of wheat, is found to be –1.52 with a t-value of 8.94. This seems very high, but a more representative elasticity of around -0.5 prevails until the late 1600s, at which point, as already noted, the marriage rate seems to become exogenous, giving the beta-coefficient a spurious interpretation. Indeed, Kelly (2007) finds that while the elasticity of marriages with respect to the real wage (using weather as an instrument) is strongly significant from 1541–1700 with an elasticity of 1.4, it is insignificant for the years 1701–1800. (Kelly 2007, p. 11) The results here are thus clearly compatible with his.

[11] In contrast to the sequential estimation used for the OLS analysis, the recursive estimation here starts with a base sample, and then adds one observation at a time.

Figure 3.3

Some tests for parameter constancy

Test of Beta Constancy



Alpha 1 (R1-model)

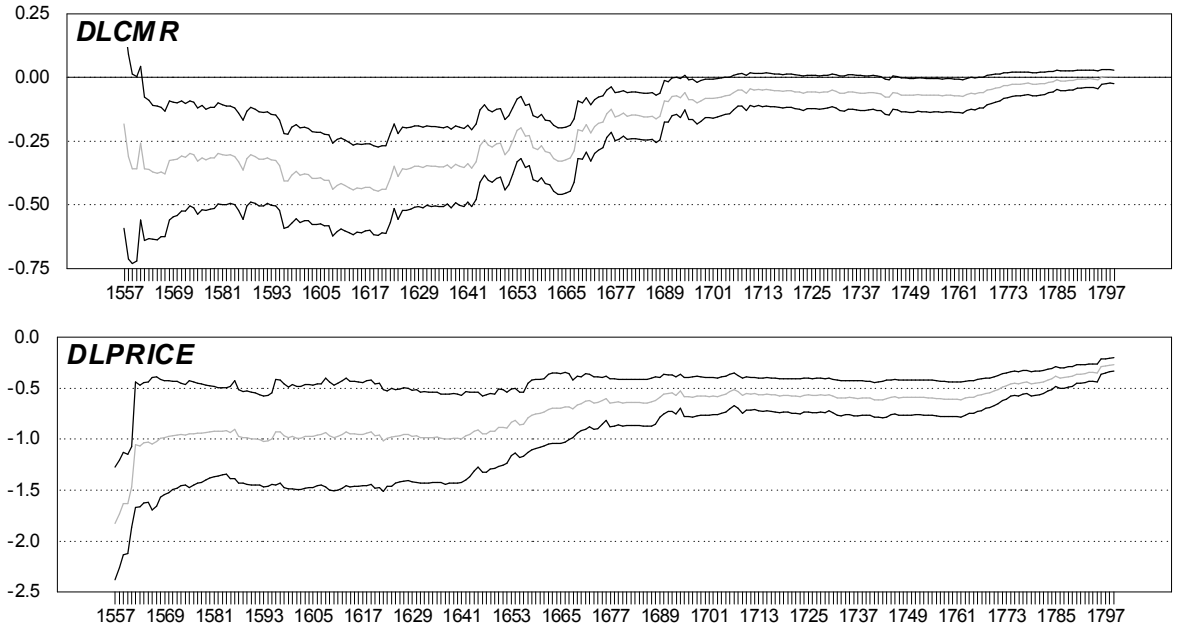
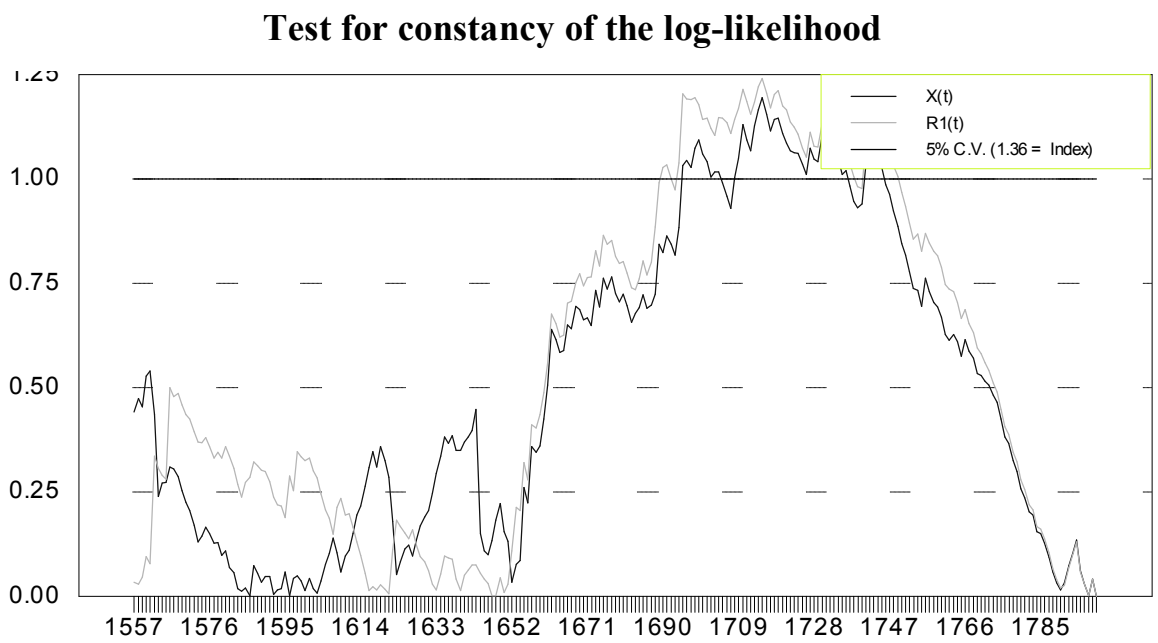
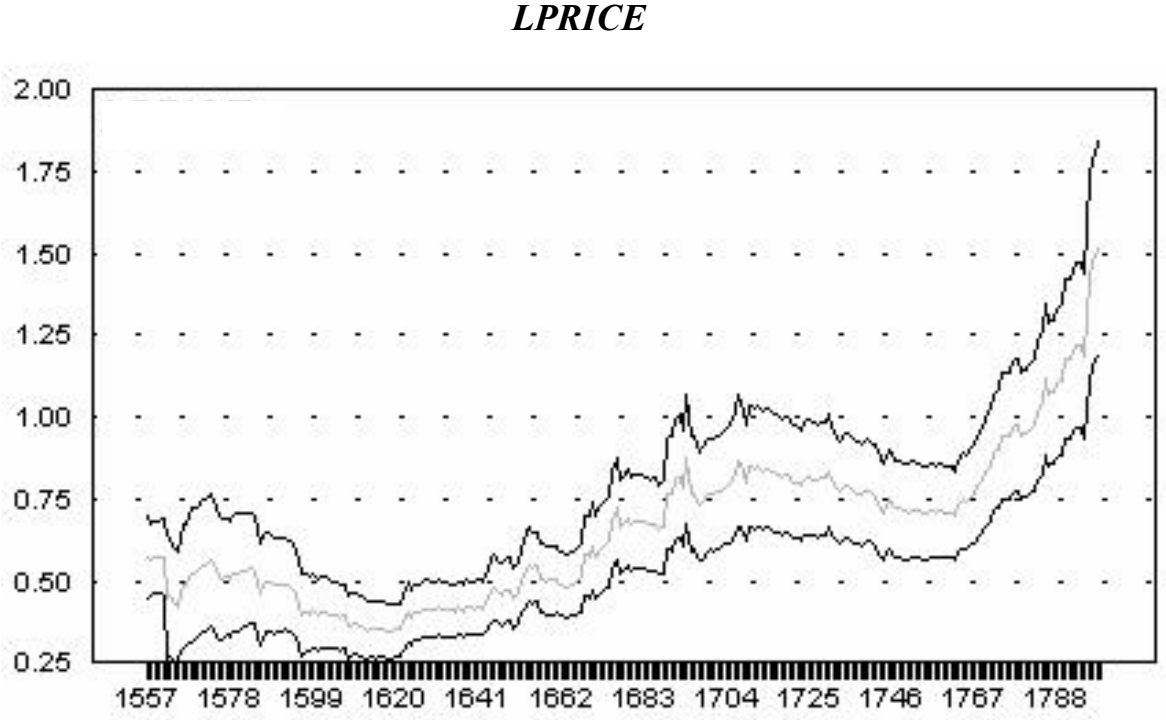


Figure 3.3 (continued)





3.2 Modern England, 1800–1965

For this period, the trend *t* was found to be insignificant and was thus excluded. Special events were controlled for in a similar fashion to in the preceding section. A temporary period of very high wheat prices from 1800–2 associated with the Napoleonic wars is found to have a transitory effect as did the First World War, which caused a temporary increase in the marriage rate in 1915.[12] The end of the First World War, however, is found to have a permanent and positive effect on the marriage rate; and the onset of the Second World War is found to usher in a period of permanently high prices, controlled for using a permanent blip dummy for 1940. Marriages are also affected, such that the level is temporarily high from 1939 to 1943 and permanently high from the end of the war in 1945.

After introducing the dummies, the model appears to fulfil the *iid*-normality assumption. The F-test for (no) autocorrelation up to second order is accepted with a p-value of 0.25. The Doornik & Hansen (1994) test for normality is accepted with a p-value of 0.07. The univariate tests for the individual variables are likewise accepted.

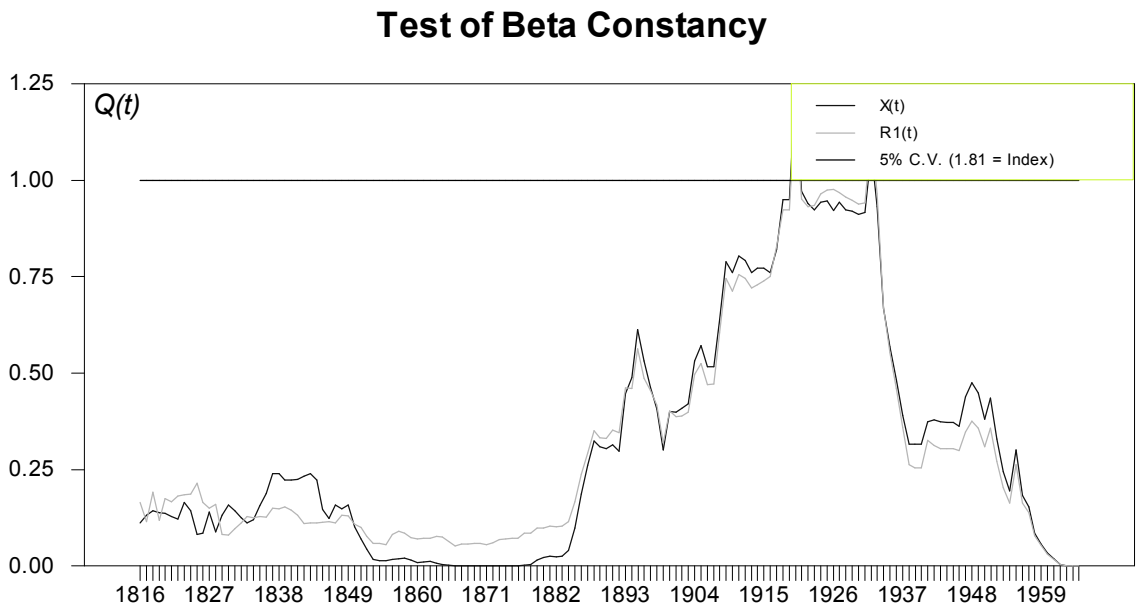
For this period, the choice of cointegration rank is simple. There is one very large root of the companion matrix (0.91), and the next highest is just 0.48 and stays at approximately this level with one unit root imposed. It is therefore assumed that $r = 1$.

A number of tests are again performed using recursive estimation in order to test the assumption of parameter constancy. The beta-coefficient, which again can be interpreted as the elasticity of the crude marriage rate with respect to the price of wheat, despite being constant at around 0.1 for the majority of the period, becomes significant in the first half of the nineteenth century, and can then be seen to be declining in importance and becoming insignificant with samples longer than until the 1930s, as seen in the second panel of figure 3.4.

[12] Marriages were stimulated by the offer of a generous separation allowance and pensions, and by the policy of taking single men first in the first period of the war. (Westermarck, p. 391)

Figure 3.4

Some tests for parameter constancy



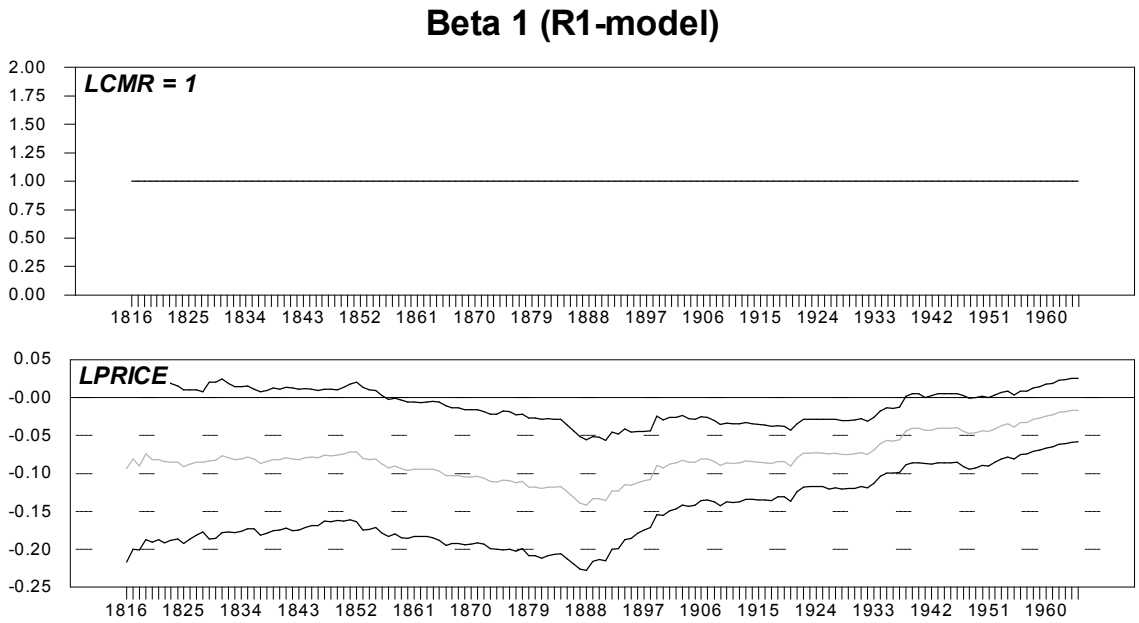
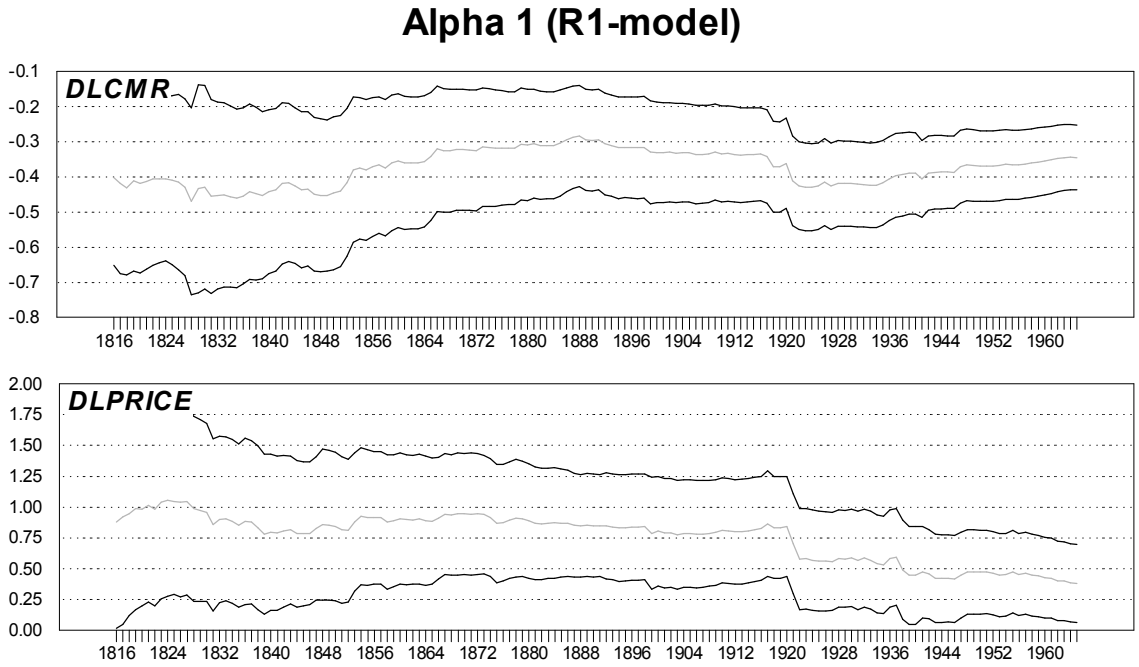


Figure 3.4 continued



The variable *lcmr* is significantly adjusting throughout the period, whereas the variable *lprice* becomes increasingly exogenous, as illustrated by the third panel of figure 3.4. This is consistent with a movement from the 1820s towards free trade and a price determined by the law of one price on world markets.

4. A simple theoretical framework: Towards an explanation for Ogle's Paradox

It is tempting to interpret the positive relationship between prices and marriages observed after 1800 as evidence for the collapse of Malthus' hypothesis and indeed a paradox in terms of his model. However, the positive relationship would then remain to be explained, so it would be far more satisfactory if it was possible to understand the change within the context of Malthus' position. The following presents a simple model where this is the case.

As previously explained, Ogle (1890) considered that an increase in the price of wheat might suggest that exports are on the rise, which Ogle saw as evidence of mounting economic prosperity. More broadly speaking, what Ogle meant was that the English economy experienced an economic boom. An economic boom would imply not only that exports are on the rise but that the economy's total output is on the rise. In addition, rather than thinking about higher prices as resulting from a rise in freights, as Ogle did, a price increase more generally can be thought of as resulting from an uncompensated increase in aggregate demand or a drop in supply.

This can all be seen more clearly in the context of a regular supply-demand analysis. Such an analysis would consist of two components. The first component would concern the aggregate demand for marriages (i.e. the marriage rate) and its relationship with the economy's total output. Following Malthus (1798), marriage means children with whom the family's resources must be shared. If such anticipated sharing means living below one's expected life-style, then marriage will be delayed until economic conditions improve. Under an economic recession, therefore, people would have fewer resources, resulting in fewer people getting married and fewer early marriages taking place.

To put this more rigorously, an economy's marriage rate, symbolically denoted *M*, would be given by the functional relationship

$$M_t = M\left(Y_t\right), \qquad (2)$$

where it is assumed that $M(\cdot)$ is continuous and monotonic, with *Y* measuring aggregate output in real terms.

The second component of the framework would be a standard *AS-AD* model, comprising the economy's aggregate demand and supply of goods. As usual, the supply curve is upward-sloping, while the demand curve is downward-sloping. Together supply and demand determine the aggregate output, *Y* and the general

price level, *P*. The *AS-AD* model on the one hand, and the relationship between output and marriages on the other, are illustrated in Figure 4 below.

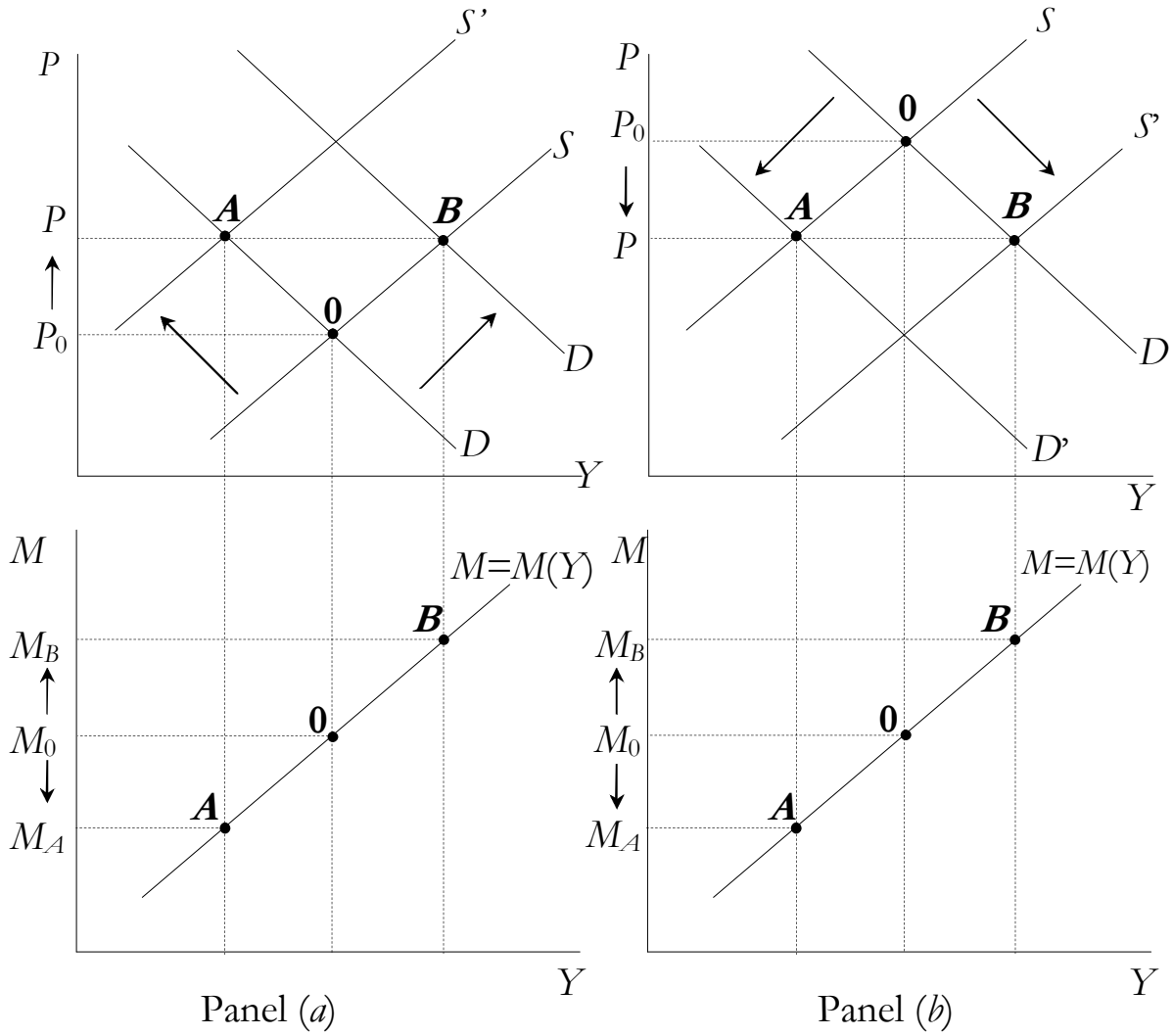
We can now turn to the analysis.

Analysis

In the analysis below, we look for shocks to supply and demand to examine the relationship between prices and marriages.

Figure 4

The effects to the marriage rate of shocks to supply and demand



Panel (*a*) Panel (*b*)

From the initial equilibrium (points marked **0** in Figure 4), two types of shocks are responsible for a price *increase* (Panel (*a*)): an upward (rightward) shift in the *AD*-curve (i.e. a positive demand shock) and an upward (leftward) shift in the *AS*-curve (i.e. a negative supply shock). It follows that the impact on the marriage rate depends on the type of shock: a negative supply shock *reduces* the marriage rate (the point marked **A** in Panel (*a*)); a positive demand shock *increases* the marriage rate (the point marked **B** in Panel (*a*)). Whereas the first observation supports Malthus' conjectures (a price increase causes a marriage rate decrease), the second observation is in favour of Ogle's speculations (a price increase causes a marriage rate increase).

Next, two types of shocks are responsible for a price *reduction* (Panel (*b*)): a downward (rightward) shift in the *AS*-curve (i.e. a positive supply shock) and a downward (leftward) shift in the *AD*-curve (i.e., a negative demand shock). Again, the impact on the marriage rate depends on the type of shock: a positive supply shock *increases* the marriage rate (the point marked **B** in Panel (*b*)); a negative demand shock *reduces* the marriage rate (the point marked **A** in Panel (*b*)). Again, whereas the first observation supports Malthus conjectures (a price reduction causes a marriage rate increase), the second observation favours of Ogle's speculations (a price decrease causes a marriage rate decrease).

Taken together, therefore, Panels (*a*) and (*b*) of Figure 4 demonstrate that *supply shocks imply a negative correlation between prices and marriage rates*, as Malthus imagined it. On the other hand, *shocks to demand imply a positive correlation between prices and marriage rates*, as Ogle (1890) was able to observe. This suggests that supply shocks were more pronounced when Malthus studied the economy, whereas demand shocks were more prevalent a century later when Ogle studied the economy, a prediction which can be made subject to testing.

There is, however, an obvious reason why we might expect the above prediction to be founded in historical fact. In the nineteenth century, England moved from a dependence on domestic production to an increasing dependence on foreign imports, and thus became less susceptible to supply shocks: if the American harvest failed, for example, it was possible to import from elsewhere. Demand shocks—which in any case had probably been less prevalent in the pre-industrial society, when many people were living close to subsistence level—would thus have come to dominate.

5. Conclusion

Is the positive relationship between prices and marriages observed after 1800 to be taken as evidence of a collapse of Malthus' hypothesis? Or can it be explained within the context of his theory?

The analysis performed above suggests that Malthus' position—if we interpret it as a positive relationship between output and marriages—leaves ample room for a positive relationship between prices and marriages. Conveniently, then, as the above analysis also established, this interpretation of Malthus' theory makes Ogle's apparent paradox—that prices and marriages are *positively* correlated—perfectly compatible with the Malthusian story.

The timing of the end of the Malthusian era has been subject to much debate. A key part of Malthus' story was the preventive check mechanism. If this is identified with a negative relationship between prices and marriages, then the Malthusian era ended by the beginning of the nineteenth century when the positive relationship between prices and marriages emerged. If, on the other hand, we recognise Malthus' hypothesis by a positive relationship between output and marriages, then the Malthusian era would have persisted up until the early twentieth century and maybe even longer.

In any case, an obvious implication of this current work is that marriage rates can be understood to be indicative of economic distress in England from at least the sixteenth century until the early twentieth century. In addition, the price of wheat is seen to be an important determinant of a key demographic variable until very recent times. Although this latter at least might initially seem as unlikely as Malthus' famous ostrich theory,[13] we feel that the evidence is conclusive.

[13] "A writer may tell me that he thinks man will ultimately become an ostrich. I cannot properly contradict him. But before he can expect to bring any reasonable person over to his opinion, he ought to shew that the necks of mankind have been gradually elongating, that the lips have grown harder and more prominent, that the legs and feet are daily altering their shape, and that the hair is beginning to change into stubs of feathers." (Malthus 1798, I.13)

References

Clark, G. (2007). *A Farewell to Alms: A Brief Economic History of the World.* Princeton: Princeton University Press

Galloway, P.R. (1988). Basic Patterns in Annual Variations in Fertility, Nuptiality, Mortality, and Prices in Pre-industrial Europe. *Population Studies* **42**, pp. 275–303

Glass, D.V. (1938). Marriage Frequency and Economic Fluctuations in England and Wales, 1851 to 1934. In Hogben (1938)

Hendry, D.F. & Morgan, M.S. eds. (1995). *The Foundations of Statistical Analysis.* Cambridge: Cambridge University Press

Hogben, L. ed. (1938). *Political Arithmetic: A Symposium of Population Studies.* London: George Allen & Unwin Ltd.

Hooker, R.H. (1901). Correlation of the Marriage-Rate with Trade. *Journal of the Royal Statistical Society* **64**, pp. 485–92 [Reprinted in Hendry & Morgan (1995)]

Juselius, K. (2006). *The Cointegrated VAR Model: Methodology and Applications*. Oxford: Oxford University Press

Kelly, M. (2007). *Living Standards and Population Growth: Malthus was Right.* Mimeo

Lindert, P.H. (1985). English Population, Wages, and Prices: 1541–1913. *Journal of Interdisciplinary History* **15:4**, pp. 609–34

Malthus, T.R. (1798). *An Essay on the Principle of Population.* London: J. Johnson

Malthus, T.R. (1830). *A Summary View of the Principle of Population.* London

Mitchell, B.R. & Deane, P. (1962). *Abstract of British Historical Statistics.* Cambridge: Cambridge University Press

Mitchell, B.R. & Jones, H.G. (1971). *Second Abstract of British Historical Statistics.* Cambridge: Cambridge University Press

North, D. (1958). Ocean Freight Rates and Economic Development 1750–1913. *The Journal of Economic History* **18:4**, pp. 537–55

Ogle, W. (1890). On Marriage-Rates and Marriage-Ages, with Special Reference to the Growth of Population. *Journal of the Royal Statistical Society* **53:2**, pp. 253–89

Phelps Brown, H. & Hopkins, S.V. (1981). *A Perspective of Wages and Prices.* London: Methuen

Pigou, A.C. (1920). *The Economics of Welfare.* London: Macmillan and Co.

Schofield, R.S. (1983). The Impact of Scarcity and Plenty on Population Change in England, 1541–1871. *Journal of Interdisciplinary History* **14:2**, pp. 265–91

Southall, H. & Gilbert, D. (1996). A Good Time to Wed?: Marriage and Economic Distress in England and Wales, 1839–1914. *The Economic History Review* **49:1**, pp. 35–57

Sharp, P.R. (2006). *1846 and All That: The Rise and Fall of British Wheat Protection in the Nineteenth Century.* Department of Economics, University of Copenhagen Discussion Paper 06–14

Thomas, D.S. (1927). *Social Aspects of the Business Cycle.* New York: Gordon and Breach

Westermarck, E. (1925). *The History of Human Marriage, Vol. I.* London: Macmillan and Co. Ltd.

Wrigley, E.A. & Schofield, R.S. (1981). *The Population History of England 1541–1871: A reconstruction.* London: Edward Arnold Ltd.

Data

Crude Marriage Rates:

1541–1836: Wrigley & Schofield (1981, Table A3.3)
1837–1965: UK Office of National Statistics (http://www.statistics.gov.uk)

Price of Wheat:

From Mitchell (1962, pp. 486–9) and (1971, p. 193):
1541–1593 "Exeter" series
1594–1629 "Eton College" series
1630–1770 "Winchester College" series
1771–1965 *Gazette* series

University of Oxford Discussion Papers in Economic and Social History

1 Hans-Joachim Voth and Tim Leunig, *Did Smallpox Reduce Height? Stature and the Standard of Living in London, 1770–1873* (Nov. 1995)

2 Liam Brunt, *Turning Water into Wine – New Methods of Calculating Farm Output and New Insights into Rising Crop Yields during the Agricultural Revolution* (Dec. 1995)

3 Avner Offer, *Between the Gift and the Market: the Economy of Regard* (Jan. 1996)

4 Philip Grover, *The Stroudwater Canal Company and its Role in the Mechanisation of the Gloucestershire Woollen Industry, 1779–1840* (March 1996)

5 Paul A. David, *Real Income and Economic Welfare Growth in the Early Republic or, Another Try at Getting the American Story Straight* (March 1996)

6 Hans-Joachim Voth, *How Long was the Working Day in London in the 1750s? Evidence from the Courtroom* (April 1996)

7 James Foreman-Peck, *'Technological Lock-in' and the Power Source for the Motor Car* (May 1996)

8 Hans-Joachim Voth, *Labour Supply Decisions and Consumer Durables During the Industrial Revolution* (June 1996)

9 Charles Feinstein, *Conjectures and Contrivances: Economic Growth and the Standard of Living in Britain During the Industrial Revolution* (July 1996)

10 Wayne Graham, *The Randlord's Bubble: South African Gold Mines and Stock Market Manipulation* (August 1996)

11 Avner Offer, *The American Automobile Frenzy of the 1950s* (December 1996)

12 David M. Engstrom, *The Economic Determinants of Ethnic Segregation in Post-War Britain* (January 1997)

13 Norbert Paddags, *The German Railways – The Economic and Political Feasibility of Fiscal Reforms During the Inflation of the Early 1920s* (February 1997)

14 Cristiano A. Ristuccia, *1935 Sanctions against Italy: Would Coal and Crude Oil have made a Difference?* (March 1997)

15 Tom Nicholas, *Businessmen and Land Purchase in Late Nineteenth Century England* (April 1997)

16 Ed Butchart, *Unemployment and Non-Employment in Interwar Britain* (May 1997)

17 Ilana Krausman Ben-Amos, *Human Bonding: Parents and their Offspring in Early Modern England* (June 1997)

18 Dan H. Andersen and Hans-Joachim Voth, *The Grapes of War: Neutrality and Mediterranean Shipping under the Danish Flag, 1750–1802* (September 1997)

19 Liam Brunt, *Nature or Nurture? Explaining English Wheat Yields in the Agricultural Revolution* (Oct. 1997)

20 Paul A. David, *Path Dependence and the Quest for Historical Economics: One More Chorus of the Ballad of QWERTY* (Nov. 1997)

21 Hans-Joachim Voth, *Time and Work in Eighteenth-Century London* (Dec. 1997)

22 Tim Leunig, *New Answers to Old Questions: Transport Costs and The Slow Adoption of Ring Spinning in Lancashire* (Feb. 1998)

23 Paul A. David, *From Keeping 'Nature's Secrets' to the Institutionalization of 'Open Science'* (July 2001)

24 Federico Varese and Meir Yaish, *Altruism: The Importance of Being Asked. The Rescue of Jews in Nazi Europe* (May 1998)

25 Avner Offer, *Epidemics of Abundance: Overeating and Slimming in the USA and Britain since the 1950s* (Nov. 1998)

26 David Stead, *An Arduous and Unprofitable Undertaking: The Enclosure of Stanton Harcourt, Oxfordshire* (November 1998)

27 Oliver Grant, *The Diffusion of the Herringbone Parlour: A Case Study in the History of Agricultural Technology* (December 1998)

28 Antonia Taddei, *London Clubs in the Late Nineteenth Century* (April 1999)

29 Liam Brunt, *Estimating English Wheat Production in the Industrial Revolution* (June 1999)

30 Matthew Braham, *Volunteers for Development: A Test of the Post-Materialism Hypothesis in Britain, c.1965–1987* (June 1999)

31 Paul A. David and Gavin Wright, *General Purpose Technologies and Surges in Productivity: Historical Reflections on the Future of the ICT Revolution* (September 1999)

32 Liam Brunt, *An Arbitrage Model of Crop Rotation* (September 1999)

33 Paul A. David and Gavin Wright, *Early Twentieth Century Productivity Growth Dynamics: An Inquiry into the Economic History of 'Our Ignorance'* (October 1999)

34 Avner Offer, *Economic Welfare Measurements and Human Well-Being* (January 2000). Rev. version, March 2000.

35 Liam Brunt, *'Where there's Muck, There's Brass.' The Market for Manure in the Industrial Revolution* (February 2000).

36 Alasdair Crockett, *Variations in Churchgoing Rates in England in 1851: Supply-Side Deficiency or Demand-Led Decline?* (August 2000).

37 Martin West, *State Intervention in English Education, 1833–1891: A Public Goods and Agency Approach* (October 2000).

38 George Speight, *Who Bought the Inter-War Semi? The Socio-Economic Characteristics of New-House Buyers in the 1930s* (December 2000)

39 Peter Temin, *A Market Economy in the Early Roman Empire* (March 2001)

40 Michael Biggs, *Positive Feedback in Collective Mobilization: The American Strike Wave of 1886* (April 2001)

41 Charles H. Feinstein and Mark Thomas, *A Plea for Errors* (July 2001)

42 Walter Eltis, *Lord Overstone and the Establishment of British Nineteenth-Century Monetary Orthodoxy* (December 2001)

43 A. B. Atkinson, *Top Incomes in the United Kingdom over the Twentieth Century* (February 2002)

44 Avner Offer, *Why has the Public Sector Grown so Large in Market Societies? The Political Economy of Prudence in the UK, c.1870–2000* (March 2002)

45 Natàlia Mora Sitjà, *Labour and Wages in Pre-Industrial Catalonia* (May 2002)

46 Elaine S. Tan, *'The Bull is Half the Herd': Property Rights and Enclosures in England, 1750–1850* (June 2002)

47 Oliver Wavell Grant, Productivity *in German Agriculture: Estimates of Agricultural Productivity from Regional Accounts for 21 German Regions: 1880/4, 1893/7 and 1905/9* (August 2002)

48 Oliver Wavell Grant, *Does Industrialization Push up Inequality? New Evidence on the Kuznets Cure from Nineteenth-Century Prussian Tax Statistics* (September 2002)

49 Alexandre Debs, *The Source of Walras's Idealist Bias: A Review of Koppl's Solution to the Walras Paradox* (January 2003)

50 Robert Dryburgh, *'Individual, Illegal, and Unjust Purposes': Overseers, Incentives, and the Old Poor Law in Bolton, 1820–1837* (March 2003)

51 David R. Stead, *Risk and Risk Management in English Agriculture, c.1750–1850* (October 2003)

52 Pablo Astorga, Ame R. Bergés, and Valpy FitzGerald, *Productivity Growth in Latin America during the Twentieth Century* (December 2003)

53 Teresa da Silva Lopes, *Evolution of Corporate Governance in Global Industries: The Case of Multinationals in Alcoholic Beverages* (February 2004)

54 Pablo Astorga, Ame R. Bergés, and Valpy FitzGerald, *The Standard of Living in Latin America during the Twentieth Century* (March 2004)

55 Regina Grafe, *Popish Habits vs. Nutritional Need: Fasting and Fish Consumption in Iberia in the Early Modern Period* (May 2004)

56 Nicholas Dimsdale: *Unemployment and Real Wages in Weimar Germany* (October 2004)

57 Pablo Astorga, Ame R. Bergés, and Valpy FitzGerald, *The Standard of Living in Latin America During the Twentieth Century* (March 2005)

58 Richard H. Steckel, *Fluctuations in a Dreadful Childhood: Synthetic Longitudinal Height Data, Relative Prices, and Weather in the Short-Term Health of American Slaves* (April 2005)

59 Federico Varese, How Mafias Migrate: The Case of the `Ndrangheta in Northern Italy (July 2005)

60 Avner Offer, *The Markup For Lemons: Quality And Uncertainty in American and British Used-Car Markets c.1953–1973* (September 2005; reprinted with revisions June 2007)

61 Natalia Mora-Sitja, *Exploring Changes in Earnings Inequality during Industrialization: Barcelona, 1856–1905* (April 2006)

62 Camilla Brautaset and Regina Grafe, *The Quiet Transport Revolution: Returns to Scale, Scope and Network Density in Norway's Nineteenth-Century Sailing Fleet* (June 2006)

63 Mohammad Niaz Asadullah, *Educational Disparity in East and West Pakistan, 1947–71: Was East Pakistan Discriminated Against?* (July 2006)

64 Jane Humphries, *'Because they are too menny…' Children, Mothers, and Fertility Decline: The Evidence from Working-Class Autobiographies of the Eighteenth and Nineteenth Centuries* (September 2006)

65 M. A. Irigoin and R. Grafe, *Bargaining for Absolutism: A Spanish Path to Nation State and Empire Building* (November 2006)

66 Jane Humphries and Tim Leunig, *Cities, market integration and going to sea: stunting and the standard of living in early nineteenth-century England and Wales* (March 2007)

67 Paul Sharp and Jacob Weisdorf, *From Preventive To Permissive Checks: The Changing Nature of The Malthusian Relationship between Nuptiality and the Price of Provisions in the Nineteenth Century* (November 2007)

University of Oxford
Discussion Papers in
Economic and Social History

are edited by:

Jane Humphries
All Souls College, Oxford, OX1 4AL

Avner Offer
All Souls College, Oxford, OX1 4AL

Papers may be downloaded from
http://www.nuff.ox.ac.uk/Economics/History/