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3 **What Can We Learn from a Race with One Runner?**
4 **A Comment on Foreman-Peck and Zhou, ‘Late Marriage as a Contributor to the**
5 **Industrial Revolution in England’[•]**
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9 The European Marriage Pattern, characterised by late marriage for women, high
10 proportions never marrying, and predominantly nuclear families, has been put forward as a
11 major cause of European economic growth by a number of authors.¹ However, as Dennison
12 and Ogilvie pointed out in their analysis of 4,705 observations for 39 European societies, the
13 evidence does not support this idea: in fact, the most extreme versions of the European
14 Marriage Pattern were found in slow-growing economies such as those in Central and Nordic
15 Europe.² Nevertheless, Foreman-Peck and Zhou (henceforth FPZ), while accepting that the
16 European Marriage Pattern was not a sufficient condition for economic development, argue
17 that the late age of female first marriage was a major contributor to the Industrial Revolution
18 in England.³ The purpose of the present comment is to make two points about that argument:
19 first, contrary to their claim, FPZ do not actually test their hypothesis; second, evidence from
20 other European economies makes it extremely implausible.
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29 FPZ write that ‘It is unlikely that any single institution or event was responsible for a
30 transformation of society – such as the English industrial revolution ... Rather, there must
31 have been an interaction of a considerable number of elements’.⁴ We share this view, and in
32 principle we are sympathetic to the approach that FPZ claim to use, which they describe as
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37 The approach here is therefore to embed the idea to be tested in a model, a
38 simplification of reality, that conforms with the salient evidence. The central
39 hypothesis is that the late age of female first marriage was a major contributor to
40 England’s industrial revolution because of the contribution to human capital
41 accumulation ... [broadly defined as] advances in useful knowledge, from schooling,
42 from successful technological innovations, from parenting, and from many other
43 sources.⁵
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45 In practice, however, FPZ do not use this approach. A test of the importance of late female
46 age at first marriage (henceforth FAFM) requires its contribution to be compared with that of
47 other possible influences on the Industrial Revolution. Such an analysis will certainly need to
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51 [•] We thank three anonymous referees for their helpful comments.

52 ¹ Voigtländer and Voth, ‘Why’; eisdem, ‘How’; Greif, ‘Family’; De Moor and Van Zanden, ‘Girlpower’; Greif
53 and Tabellini, ‘Cultural’.

54 ² Dennison and Ogilvie, ‘Does’.

55 ³ FPZ, ‘Late’.

56 ⁴ FPZ, ‘Late’, p. 2.

57 ⁵ FPZ, ‘Late’, p. 2.
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3 make simplifications in order to focus clearly on the different influences whose contributions
4 have to be evaluated. But the simplifications cannot be so far-reaching that no other possible
5 influences on the English Industrial Revolution are analysed in the model. Yet this is what
6 FPZ do: their model, by construction, excludes any contribution from these other influences.
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8 The only non-stochastic influence on the growth of output and real wages in the FPZ model is
9 female marriage age. Apart from shocks, there is no other mechanism by which output and
10 real wages can rise. The FPZ model is therefore incapable of evaluating the importance of late
11 FAFM relative to any other influence, so it cannot provide a test of whether late FAFM was a
12 major contributor to English industrialisation.
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18 In the FPZ model, the economy's production technology, as represented by an
19 aggregate production function, is assumed to be constant over their sample period, the 570
20 years from c.1300 to c.1870.⁶ The growth in output over this period is modelled as resulting
21 from two things: growth in labour supply, reflecting population growth; and growth in human
22 capital, broadly defined to include, *inter alia*, technological innovations. The growth in
23 human capital is assumed to result from parents' choice of child quality, which FPZ envisage
24 as reflecting the informal education provided to children by mothers.⁷ In the FPZ model, as
25 FAFM rises, the price of child quality falls. This is the crucial mechanism that links female
26 marriage age and economic growth: later FAFM leads to more human capital accumulation.
27 The FPZ justification for this key relationship is that later marriage meant that young women
28 spent more time as servants and in so doing added new skills to those they had absorbed from
29 their parents.⁸ The greater skills that later marriage gave women then enabled them to be
30 better providers of informal education to their own children and hence resulted in more rapid
31 accumulation of broadly-defined human capital.⁹ In the FPZ model, therefore, technological
32 innovations, a component of their broad definition of human capital, are due to late FAFM.
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42 The FPZ model allows both mortality and productivity shocks to influence the growth
43 rate of output and real wages, but the only non-stochastic mechanism in the model is that later
44 FAFM increases broad human capital accumulation. When this model is applied to the data
45 for the English economy from c.1300 to c.1870, it is no surprise that later female marriage
46 age appears to play a critical role in economic growth. Over this period, there was a
47 substantial rise in per capita output. Given the FPZ assumption of an unchanging production
48 function, the only way in which the innovations that are widely agreed to have been a key
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54 ⁶ FPZ, 'Late', p. 15.

55 ⁷ FPZ, 'Late', p. 10.

56 ⁸ FPZ, 'Late', pp. 9–10.

57 ⁹ FPZ, 'Late', p. 10.
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determinant of the rise in output can be reflected in the FPZ model is through human capital, which they define to include successful technological innovations. The accumulation of human capital therefore has to provide a great deal of the proximate explanation of the rise in per capita output. Since the key determinant of human capital accumulation in the FPZ model is late FAFM, it is inevitable that late female marriage age appears to be a major contributor to the Industrial Revolution. But this conclusion is not the result of evaluating the impact of several different influences and establishing that late FAFM was one of the most important. Rather, it is because the FPZ model is so simplified that there is no other way in which the observed rise in English output can be made consistent with the model. It is analogous to announcing that a certain person is the fastest runner in the world on the basis of a race in which that person was the only competitor.

It is therefore incorrect for FPZ to claim that, once their model has been fitted to English data, it can be used to demonstrate the importance of late FAFM for the Industrial Revolution. The procedure by which they purport to do this is to remove the effect of FAFM on the price of child quality in their model and simulate what happens to economic growth, as measured by increases in real wages.¹⁰ When they do this, their model predicts hardly any economic growth between 1300 and 1870.¹¹ The problem with this procedure is that when the model is fitted to the English data it is, as we have seen, compelled to assign an important influence to late FAFM. Once the effect of FAFM on the price of child quality is removed, there is nothing else in the model that will allow it to be consistent with the observed rise in per capita output. Thus the only thing the simulation tells us is that, when the sole mechanism which enables the FPZ model to fit the data well is eliminated, the model will fit the data much less well. It does not tell us anything about the importance of late FAFM for the English Industrial Revolution. The importance of late FAFM for the Industrial Revolution is assumed by FPZ in the way that they construct their model. It does not have to be demonstrated by simulation.

In their conclusion, FPZ acknowledge that other European economies had marriage patterns similar to the English one but did not experience a similar pattern of economic growth.¹² They suggest that this might be because the human capital accumulation induced by the marriage pattern began later in other countries, but they do not present any evidence that this was the case. Their failure to discuss the difference between England and these other

¹⁰ FPZ, 'Late', pp. 2, 3, 21.

¹¹ FPZ, 'Late', p. 18, Figure 5.

¹² FPZ, 'Late', p. 24.

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3 European economies might not matter if they had, in fact, shown that late FAFM was a major
4 contributor to the English industrial revolution. But, as we have seen, FPZ do not show this.
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6 In order to assess whether late FAFM and high female servanthood played an important role
7 in English industrialisation, as FPZ claim, it is therefore essential to consider the experience
8 of other European economies that also had these characteristics.
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11 We know from Dennison and Ogilvie that many slow-growing European economies
12 had higher FAFM than did England. In addition, while life-cycle servanthood was certainly
13 prevalent among young women in England and Wales, it was also important in Denmark,¹³
14 Iceland,¹⁴ Norway,¹⁵ and Sweden,¹⁶ none of which experienced rapid economic growth or
15 early industrialisation. Servanthood, especially for females, was also widespread in Flanders
16 (modern Belgium)¹⁷ and the Netherlands.¹⁸ Female servants were particularly numerous in
17 urban centres because of the high productivity of female workers in secondary- and tertiary-
18 sector occupations, but they were also widespread in rural regions afflicted by high male out-
19 migration because of stagnant economic opportunities. High rates of female life-cycle service
20 were thus associated both with economic growth and with economic stagnation in pre-modern
21 Europe.
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30 Did England accumulate more human capital than these other European economies
31 with late FAFM and widespread female servanthood? Answering this question is difficult,
32 because FPZ's concept of human capital is a broad one which they admit to be hard to
33 measure, covering as it does a wider range of skills than literacy, numeracy, and schooling.¹⁹
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35 However, as far as the narrower components of human capital are concerned, the answer is
36 no: Dennison and Ogilvie show that many slow-growing European economies had more of
37 them than England.²⁰
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41 It might still be argued that high FAFM and female servanthood ensured that women
42 invested in their own human capital informally in the labour market, even if their level of
43 formal education varied greatly. But a further serious weakness in the FPZ model emerges
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46 ¹³ Elklit, 'Household', p. 118; Moring, 'Nordic', p. 82.

47 ¹⁴ Gunnlaugsson, 'Living', p. 104; Garðarsdóttir, 'Residence', p. 9.

48 ¹⁵ Moring, 'Nordic', pp. 82-3.

49 ¹⁶ Gaunt, 'Pre-industrial', p. 200; Lundh, 'Households', pp. 40, 52; idem, 'Social', p. 62; Moring, 'Nordic', p. 82.

50 ¹⁷ Wall, 'Composition', p. 448; Leboutte, 'Saving', p. 148; Lambrecht, 'Unmarried', p. 3.

51 ¹⁸ Van de Woude, 'Variations', pp. 306-8, 314; Bras, 'Maids', p. 221; idem, 'Social', p. 248; Kok and
52 Mandemakers, 'Life-course', p. 289; Van Nederveen Meerkerk and Paping, 'Beyond', p. 460; A. Bouman and T.
53 De Moor, 'The commercial household: servants and lodgers as alternatives to intergenerational support in town
54 and countryside (the Netherlands, 17th Century)', paper presented at the Economic and Social History seminar
55 (University of Utrecht, 21 March 2013), p. 18.

56 ¹⁹ FPZ, 'Late', p. 9.

57 ²⁰ Dennison and Ogilvie, 'Does', pp. 678-9.
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3 when it is confronted with the evidence on women's economic opportunities in different
4 European societies. Whether being a servant (or being in the labour force at all) enabled
5 women to invest in their skills depended partly on what kind of work they were allowed to
6 do.²¹ Where guilds of craftsmen, proto-industrialists, tradesmen, and other service
7 occupations barred maidservants and other unmarried females unrelated to guild masters from
8 engaging in skilled work, such human capital investment was inevitably lower. In England,
9 guilds were weaker and less able to exclude females, so the informal human capital
10 investment women could obtain through learning by doing in skilled occupations was
11 probably higher. This was caused not by the pattern of late marriage and widespread
12 servanthood for females (which existed in both England and other parts of northwest, central,
13 and nordic Europe, and was more intense in many of these other societies) but by the
14 comparative weakness of guild restrictions on women's work in England.²² Likewise, where
15 manorial and communal restrictions limited the kinds of work women were allowed to do, as
16 in many parts of central Europe, women were either excluded from the labour force altogether
17 or restricted to menial, unskilled activities which provided them with less opportunity or
18 incentive to invest in their own human capital through learning by doing.²³ It was these
19 factors that led early modern foreign travellers to remark on the astonishing economic
20 autonomy of English women, as in 1592 when the heir to the Duchy of Württemberg
21 remarked that

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34 the women [in England] have much more liberty than perhaps in any other place; they
35 also know well how to make use of it, for they go out dressed in exceedingly fine
36 clothes ... [England is] a paradise for women, a prison for servants, and a hell or
37 purgatory for horses ... for the females have great liberty and are almost like masters,
38 whilst the poor horses are worked very hard.²⁴

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Neglect of the wider institutional framework also vitiates the FPZ treatment of technological innovation as the source of economic growth and industrialisation. FPZ treat innovation as one of the components of their broad concept of human capital, which they view as arising from late FAFM. Thus the only possible influence on innovation in their model is FAFM. This is inconsistent with everything that is known about the history of technological innovation in a long and rich literature on the subject. Lively debate still rages

²¹ Dennison and Ogilvie, 'Does', pp. 672–6; eisdem, 'Institutions', pp. 207–8.

²² Snell, *Annals*, p. 306 with n. 81; Laurence, 'How', pp. 129, 133–4; Prior, 'Freedom', pp. 138–40; Wiesner, 'Guilds'; Ogilvie, *Bitter*, pp. 328–34.

²³ Ulbrich, *Shulamit*, pp. 35, 138, 306; Rippmann, 'Frauenarbeit', p. 35; Ryter, 'Geschlechtsvormundschaft', p. 506; Ogilvie and Edwards, 'Women'; Ogilvie, *Bitter*, pp. 333–4, 338, 344–6.

²⁴ Quoted in Rye, *England*, pp. 7, 17.

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3 about why England should have experienced the first industrial revolution, with some
4 scholars emphasizing high wages and cheap coal,²⁵ others the industrial application of
5 Enlightenment science,²⁶ and still others the emergence of bourgeois values.²⁷ A further
6 important influence was the wider institutional framework. The gradual weakening in
7 England of traditional institutional constraints imposed by powerful manorial landlords,
8 strong village communities, privileged towns, and occupational corporations slowly improved
9 the operation of factor and product markets over a period of centuries. People who devised
10 technological innovations could obtain the necessary inputs in the required quantities at the
11 lowest possible cost, without opposition from entrenched interest-groups. And they could rely
12 on being able to sell the output at a price and in a quantity that would gain them enough for it
13 to be worth their while incurring the costs and risks of experimenting. This may help to
14 explain why path-breaking ‘macro-inventions’ were devised in many places in Europe, but
15 the ‘micro-inventions’ that made them work in practice were concentrated in just a few. As
16 the Basel calico-printer, Jean Ryhiner, remarked in 1766, ‘the English cannot boast of many
17 inventions, but only of having perfected the inventions of others; whence comes the proverb
18 that for a thing to be perfect it must be invented in France and worked out in England’.²⁸

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None of these wider influences on innovation was brought into being by late female
marriage and widespread female servanthood. The evidence suggests that whether a society
experienced economic growth depended not on its marriage pattern, but on its wider
institutional framework. In early modern England, late marriage and high servanthood for
women existed within a framework in which there were few barriers to entry so that factor
and product markets functioned well; economic growth was typically positive and eventually
dramatic. In the early modern Netherlands, late marriage and high servanthood for women
initially existed in a similar framework of well-functioning markets and impressive economic
growth; but after c.1700 the economy stagnated and industrialisation was delayed, for reasons
that remain unclear. In German-speaking central Europe and the Scandinavian societies, late
marriage and high servanthood for females existed in a very different framework of
interlinked factor markets, mobility restrictions (including, in some areas, serfdom), and
significant entry barriers (for most women and many men) created by corporative, communal,
and manorial privileges; until these institutional obstacles were removed, economic growth
remained sluggish.

54 ²⁵ Allen, *British*.

55 ²⁶ Mokyr, *Enlightened*.

56 ²⁷ McCloskey, *Bourgeois*.

57 ²⁸ Quoted in Wadsworth and Mann, *Cotton*, p. 413.

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3 Late age at first marriage may only have been possible in a framework of strong non-
4 familial institutions that could substitute for families in providing labour, insurance, welfare,
5 and old age care to unmarried individuals and fragile nuclear families.²⁹ But non-familial
6 institutions were highly variegated. Some of them, such as well-functioning markets and
7 impartial public institutions, benefited human capital investment and innovation. Others did
8 not. Occupational guilds, closed corporative communities, strong manorial institutions,
9 restrictive religious institutions, and absolutist states tended to restrict human capital
10 investment to privileged groups and block innovations that threatened entrenched producers.
11 A final weakness of FPZ, we suggest, is that they wholly neglect the non-familial institutional
12 framework that circumscribed both demographic and economic decision-making before and
13 during European industrialization.
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16 In conclusion, FPZ's claim that late FAFM was a major contributor to the Industrial
17 Revolution in England is fatally flawed by the absence of any comparative dimension in their
18 analysis. They consider neither the other European economies which had late FAFM
19 throughout the early modern period but industrialised a century or more after England, nor
20 any possible influences on English industrialisation other than late FAFM. FPZ appear to
21 believe that, because their claim is only that late FAFM was a major contributor to
22 industrialisation, not that it was a sufficient condition for it, the former lacuna does not matter.
23 But, as we have explained, FPZ fail to show that late FAFM was indeed a major contributor.
24 Consequently it is important to ask a question to which FPZ provide no answer: if late FAFM
25 and widespread servanthood were major contributors to English industrialisation because
26 these features generated the accumulation of broad human capital, why did this only happen
27 in England? The answer suggested by the experience of other European countries is that the
28 premise of this question is wrong: late female marriage and widespread servanthood were not
29 major contributors to English industrialisation.
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56 ²⁹ Laslett, 'Family', pp. 154–6, 160, 174; Solar, 'Poor'; Dennison and Ogilvie, 'Does', pp. 686–7; eisdem,
57 'Institutions', pp. 206–7, 216–17.
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