Dear Professor Guner,

MS#5438 Marriage and Divorce since World War II: Analyzing the Role of Technological Progress on the Formation of Households

I now have three reports on your paper with Jeremy Greenwood. Two of the referees are very positive about the paper and recommend I request revisions. The third referee is however very negative and recommends rejection. I find myself in the middle. I agree with the positive referees that this is an innovative and ambitious paper, which could engender further interesting research. However, I think that you do not put enough effort in showing that the model is capable of explaining longer-term trends. This comment was made not only by the negative referee but also by one of the positive ones as well. In addition you do not do enough to draw out the lessons from the paper. At the end one is left wondering what has been learnt by the exercise.

In view of the above, I would like to invite you to submit a revision. In the revision you should make an effort to show that the model can explain longer-term trends and not just the postwar period. If of course the model cannot do this you should attempt to investigate why and attempt to draw the necessary conclusions, leading to suitable modifications. On the presentation side you should cut down the theory simplifying the exposition, as suggested by one of the referees. In addition, the referees make a number of further comments to which you should carefully respond.
Thus in conclusion, I would like to invite you to submit a revision responding to the above comments and those in the reports. Obviously at this stage I cannot guarantee eventual publication.

With many thanks for submitting to Econometrica,

Yours sincerely,

Costas Meghir

Costas Meghir
1 Content

The paper documents the reduction in marriage (both its incidence and the fraction of time spent married) since 1950 as well as the increase in market time relative to time spent in the home for both singles and married (especially for the latter). The paper then poses a simple yet powerful model, in the sense that it can naturally be mapped to data, where the allocation of time and the choice of marriage are the only relevant choices. In the model technological change in the form of a reduction in the relative price of the goods that are used as household production inputs provides a mechanism for changes in time allocation and in the marriage decision over time.

The paper matches the model with the data by doing two sets of things. A subset of the parameters are chosen to match certain features such as life expectancy, productivity growth rate, local returns to scale to couples as measured by the OECD. Another subset of parameters are estimated so that ALL the changes in time allocation and in marriage rates are generated by the technological change in the household production inputs. The relevant parameters are those that determine the fixed cost for household maintenance, the elasticity of substitution between inputs in the home production technology, the rate of change of the cost of home goods, the weight of market goods in the utility, and the non-economic aspects of marriage. Among the targets of the model are the consideration of both 1950 and the year 2000 as different steady states in terms of the rate of marriage incidence, the divorce rate and the marriage rate. The paper then discusses in the section results how well the estimation procedure worked.

2 Discussion

I like this paper a lot: it documents an important fact, one of the most central facts in modern economics and it provides a coherent and plausible theory for why it happens. This suffices to put the paper in the leading journal of the profession. Still, I am a little bit uneasy at the lack of description of what can go wrong with the authors theory. Certainly, the authors do not pretend to measure the role that technical change (of two types, a general increase in productivity and a relative change in the price of inputs of the home technology) has in shaping the formation of households in the second half of the twentieth century, instead it states that the changes in the formation of households can be traced to changes in relative prices of home goods. After reading the paper, I come out with the sense that it is a plausible
theory, but I am not in a position of stating whether it is a convincing one. Maybe a paper as innovative as this is does not have the obligation of challenge its own views, but I would like it if it did so even to a limited extent. I would like to know of all the modeling choices of the authors which ones are the most crucial ones in getting the result that the model can replicate the changes in the allocation that is observed.

3 Comments

I do not find the propositions and lemmas and corollaries useful. The model is designed for the purpose to have those properties in the numerical calculations. That they also hold for all parameter values is not really a very large extension given how special the model is. Those properties can be described more lightly, and especially, more briefly.

I think instead that the statement that the equilibrium only requires as state variables the quality of the match is very interesting and should be placed centrally instead of as a footnote. Specially with the addition of whatever restrictions (if any) are needed on asset markets to have this result. If no restrictions are needed, then the model should describe the equilibrium behavior of interest rates that ensures that agents do not want to either borrow or lend.

The lack of fit of the time allocation of singles indicates that there may be some other things going on besides changes in relative prices. In the paper, the authors just state the possibility of selection as the culprit, which is not so useful. Perhaps a way of measuring the role of technological change is to calibrate the model to the behavior of singles between 1965 and 2000 and then see what it predicts for married couples.

I think that the section of mapping the model to data is crucial and should be written much better. It should have tables and specify how what is the minimization problem that is solved. In particular, I do not like the separation of objective functions that is described. I think that the whole process should be reported in a far more transparent way.

4 Summary and Recommendation

Consistent with my comments I would recommend that a suitable revision be published in Econometrica. This revision should entertain the possibility that there maybe other possible theories of the same phenomena and perhaps discuss how to use the model to shed some light on what is the best explanation in addition to cheering for the explanation proposed.
The authors propose a model in which people can either live alone or form couples. There are economies of scale to the formation of unions of two types: (1) there is a fixed cost of maintaining a household (which is the same for couples and singles) and (2) there are economies of scale in consumption of both market and non-market goods. Singles allocate one unit of time between home production and market work, while couples have two units of time to allocate.

The model is calibrated/estimated to fit U.S. data on hours of work for couples and singles, marriage rates, divorce rates, etc., in 1950 and 2000. The driving forces that enable the model to fit a rising fraction of hours devoted to work by couples, and a falling rate of marriage, are (1) an increasing wage rate and (2) a decline in the price of inputs into household production. These forces reduce the influence of the fixed cost of maintaining a household (eroding incentives for marriage), while also allowing substitution of goods for labor in household production (enabling more hours of market work).

The main problem I have with the paper is that the forces that drive the model evolved very smoothly over the 1950-2000 period. As a result, the model predicts smooth changes in market work, marriage and divorce rates. Yet, if we look at Figure 2, we see that the bulk of the changes the authors are trying to fit occurred over a rather brief interval. For instance, the increase in the divorce rate occurred almost entirely in the 1968-1977 period. The decline in the marriage rate occurred mostly from about 1971-1985.

If we were to examine a longer period the model would look much worse. That is, the increase in wages and decrease in cost of household inputs from 1900-1950 was probably at least as great as that from 1950-2000 (e.g., the percentage of U.S. households with refrigerators went from 0% in 1900 to 80% in 1950, the number with washing machines went from 0% to 47% and it is now about 80%). Yet, over this period, divorce rates didn’t increase very much in the U.S.. Furthermore, the percentage of white women who were married increased from about 57% in 1900 to 70% at the peak of the baby boom in 1960. The fall in the percentage of women who are married from 1960 to 2000 only brought it back down to about the same level as in 1900. The model that the authors describe has no hope of explaining this pattern.

I can accept the authors’ argument that they shouldn’t have to explain all the details of what happened from 1950-2000, since other factors were at work. But it seems a bit too much that their model would even get the overall trend in the marriage rate backwards from 1900-1960. And the fact that the marriage rate was about the same in 1900 as in 2000 seems quite awkward for a story where changes in technology are the key factor driving the marriage rate.
Marriage and Divorce since World War II: Analyzing the Role of Technological Progress on the Formation of Households
Jeremy Greenwood and Nezih Guner

Overview of Paper
The paper offers an explanation for the (i) decrease in the marriage rate, (ii) the increase in the divorce rate, and (iii) an increase in market hours worked by married households. According to the authors, the main driving force behind these changes is technological progress. The authors implement these ideas in a search model with home production. They then derive some analytical results, and then parameterize the model and simulate it.

Intuition for Findings
There are four key elements to the theory:

1. Fixed cost to maintaining a home. The theory assumes that there is a fixed cost to maintaining a home. The fixed cost is modeled in terms of the market consumption good and enters the agent’s utility as a subsistence term.

2. Strong diminishing utility in the home good relative to the market good. The theory assumes that market consumption goods and home goods enter the household’s utility as separate inputs. Additionally, the authors assume that there is stronger diminishing utility (more curvature) associated with the home production good.

3. Substitutability between labor and marked goods in home production. The theory assumes that the home good according to a CES production function that uses a household’s time input and goods produced in the market. Additionally, the authors assume that the elasticity of substitution exceeds one.

4. Two sources of technological change: The theory assumes an increase in technological change that leads to an increase in the real wage. At the same time there is a second source of technological change that leads to a decline in the price of the market good used in home production.

The marriage rate decreases and the divorce rate increases as technological change reduces the benefits of being married through two channels.

a. A fall in the price of the input into home production bought in the market increases market work effort since time and market input are substitutes. The strong diminishing utility to the home produced good implies that single households spend a greater fraction of their income on the purchased of household inputs. For this reason, they gain by more when the price of the input decreases.

b. The fixed cost constraint becomes less important with the rise in the real wage. With the rise in the real wage, a household does not have to work as much in the market to cover the fixed cost. Married households, because of their greater
absolute income, are less affected by the fixed cost constraint. Single households, therefore, benefit more from the increase in the real wage.

The market time allocation for married households increases with technological progress because the price of the market input to home production declines. Since home work and the market input are substitutes, households work more in the market.

The theory also explains the observation that married couples worked fewer hours per person compared to single households. Here the fixed cost to maintaining a household is the key feature of the model that generates this prediction. In particular, when the market wage rate is low, the fixed cost is more binding for single households, as a married household has twice the time endowment. A single household, therefore, will be forced to work more in the market to cover the fixed cost.

Overall Assessment of the Paper
This is a very interesting and ambitious paper. I find the work to be creative and original. As such, some features of the model are not standard. I think the authors need to do more to justify the novel aspects of their model economy. Additionally, it seems that the authors could do more by way of testing their theory. Doing both these things would make the theory more convincing. Additionally, I think that the exposition of the paper could be improved in a number of areas.

The complete list of my concerns and suggestions is listed below.

Specific Comments and Concerns:
1. Justification for functional form for Preferences.
   a. Home and market goods as separate arguments in household utility - This is certainly not the standard home production setup. Household utility is defined over the market consumption good and the home good, instead of a composite consumption good that is a CES aggregator of the home good and the market good. It would help the reader if the authors motivated this approach better. They could provide some examples of what they have in mind here, as well as discuss why a standard set-up is insufficient.
   b. Fixed cost in terms of home good - There is a fixed cost associated with the market good, but not the home good. Is there some justification of this, other than if the fixed cost is on the home good, you would not get the desired results?
   c. Fixed cost and household size – The fixed cost of maintaining a household is the same regardless of whether the household is single or married. The economies of scale are, thus not scale dependent. This seems counterintuitive. Singles, as opposed to divorcees, live in homes or apartments with a lot less rooms, and smaller yards.
   d. Leisure- Leisure does not enter household utility. This paper shows that the leisure is not important for understanding the three aforementioned observations, especially the time allocations to markets. Still, it is hard to think that leisure is not important for
understanding these observations. I am not sure how adding leisure would change the results. Presumably, you couldn’t derive the theoretical results.

2. Justification for parameter values. The authors assume from the outset that the relative rate of risk aversion parameter governing the market good is less than the relative rate of risk aversion parameter governing the home good. Additionally, the authors assume the elasticity of substitution parameter in the home production function is less than one. It would help the authors’ case if they could come up with some independent evidence that would justify (1) the stronger diminishing utility associated with home goods and (2) the elasticity of substitution greater than one.

3. Two market goods. A more extensive description of the market goods, particularly the market good that is an input in home production is required. I had no idea reading the paper if there was a single final good with two uses in household utility, or two distinct final goods. Given that the decline in prices is not equal to the rise and wages, it must be that there are two goods. The authors should be more explicit and add a separate section for this good. It would be helpful if the authors stated what the empirical counterparts of the two goods are. Should I think of the market input into home production as durable goods and the market consumption good as non-durables?

4. Numerical experiments. By the nature of the parameterizations, the numerical experiments are not aimed at answering how much of (i)-(iii) can be accounted for technological change. The numerical experiments pick the parameter values to match vital statistics on marriage and divorce in 1950 and 2000, plus to minimize the sum of the squared errors between the hours worked of married households and married singles in 1950, 1960, 1970, 1980, 1990, 2000. The authors are careful to never claim that this is a calibration exercise. Still, I wonder to what extent the numerical exercises could not be done more in the nature of a true calibration. Ideally, one would calibrate to 1970 observations, plug in processes for technological change using real wage growth and the price decline of market goods, and determine the model’s predictions?

5. Inconsistencies with the Data. The model predicts that over time both single and married households work more in the market. Single households do show any rise in their market hours until 1970, and actually exhibit a decline between 1950 and 1970. This enigmatic U-shaped pattern for single households makes me wonder to what extent changes in marginal tax rates are at play. Prescott (2003) claims that the 1990 marginal income tax rate in the United States was much lower compared to 1970. The authors might want to say something about this in this paper. They also might want to consider this type of change in this model in a future paper, since the progressivity of tax rates is surely to affect the incentives of being married.

Additionally, the model predicts that the fraction of household time worked in the market for married households and single households is essentially the same in 2000. As the authors document, married households in 2000 work more than single households on a per person basis. The authors are honest about this failure and offer some explanations.
for what might be causing this result. Still, the failure of the model to replicate this
reversal in market time allocations makes their explanation for the higher market time
allocations of singles in 1950 less plausible.

6. Additional tests of theory.
a. Cross-Section comparisons: The authors might want to look at some cross-sectional
observations for married households, and for single households so as to test their theory
more extensively. The theory does make predictions for time allocations for rich married
households and poor ones, as well as rich single households and poor ones

b. Longer time Horizon- The rise in the real wage is not a post World War II
phenomenon. I am not sure what the trend has been for the price of the market input to
home production (in part because I do not know the empirical counterpart of this good). I
would be curious to know if the predictions of the model accord with the trends of
marriage rates, divorce rates, and market hours. I have been told that in the 1920’s, less
people got married, but those who did stayed married longer. Can this theory offer
insight into this observation?

7. Expand the introduction – The introduction does not say all that much. There are 3
pages describing the relevant facts and a page and a quarter describing the basic idea.
The authors might want to think about expanding this section and providing a more
thorough description of the authors’ thesis, the model, and their findings. In effect, the
current introduction fails to make the paper’s contribution apparent. The authors might
want to add a review of the literature to the introduction. Doing this would make the
seems like a natural paper to discuss, particularly since it attempts to get at some of these
same observations but assumes that labor and market inputs to home production are
complements.
Dear Nozil,

MS65438-2 Marriage and Divorce since World War II: Analyzing the Role of Technological Progress on the Formation of Households

I now have the responses of the three referees to your revision. Unfortunately their views are mixed. However, even the positive referees have problems with the way the paper is presented and with its overall focus, although they do differ in their final recommendations. The key problem remains what we learn from this exercise. You have demonstrated that a reasonably simple model of household production can be capable of reproducing trends in work, marriage and divorce that bear some similarity to the data. You then show that if the model is to explain longer term data it has to be extended to include the decision to leave home and be single. At the same time, neither of the models seems to be very good at reproducing the events as they actually occurred. The most negative referee sings out the inability of the model to explain the timing of the decline in marriage and the increase in divorce. In addition the fact that implied price declines have to be backed out from the data makes the exercise less credible. Although the overall logic of the model makes sense, the kind of hard empirical evidence required to claim that it offers key insights is unfortunately lacking. One suspects that as one adds more detail and institutional/policy changes the ability of rejecting the model will increase and we may well find that other factors are important. In fact the estimation of the model has shown precisely this.
Much as I dislike rejecting papers on revision, I have not been convinced that the paper is substantive enough for Econometrica. The negative referee has convinced me that the exercise is lacking empirically and the two more positive ones have not convinced me that there is enough there to justify publication in Econometrica. I have thus reluctantly decided to reject the paper. I am very sorry for this outcome.

Best wishes,

[Signature]

Costas Meghir
Report on the second version: Marriage and Divorce since World War II: Analyzing the Role of Technological Progress on the Formation of Households by Jeremy Greenwood and Nezih Guner

On this second version there are a few changes in the direction that I liked. Perhaps a couple of things could be used to improve the paper.

- While I certainly welcome the statement that “the goal of the analysis is not to simulate an all-inclusive model of household formation and labor-force participation. Rather, the idea here is to see whether or not the simple mechanisms put forth have the potential quantitative power to explain the postwar observations on household formation and labor force participation.”, I still feel that it could be stated a little bit more forcefully throughout the text and the abstract.

- The value function is not properly written. The period, or the level of technology are state functions. The notation used hides this feature. Please rewrite it more clearly.

- Discuss more the empirical support of home-based technical change. Is the increase in the real wage taking into account the changes in the basket of goods?

- Discuss a little bit more the implications of the estimates (that the home utility is more concave, that the market good displays non-linear Engel curves with more curvature for singles.

- I certainly welcome the addition of footnote 24, and I think that its content should be more central and part of a whole section. I find the out of sample additions less interesting and still do not see the point of the propositions. So I would exchange space in favor of a different calibration strategy.
I still look at this and don’t see anything that moves my opinion from the first round. For instance, looking at Figure 6, I still see that the decline in marriage is very concentrated in the mid-60s to late 70s, while the model predicts a very gradual decline. Similarly, looking at Figure 8, I see a dramatic spike in divorce in the mid-60s to late 70s, while the model predicts a very gradual increase. I don’t see how one can look at these figures and argue that the model gives much insight into what was going on during the 1950-2000 period.
Ms. 5438
Jeremy Greenwood and Nezih Guner
Marriage and Divorce since World War II: Analyzing the Role of Technological Progress on the Formation of Households.

The manuscript is vastly improved. The authors have satisfactorily addressed my main concerns and objections. The analysis in Section 6 is much more thorough, and honest in its reporting. The introduction is greatly improved by the additional discussion. Nevertheless, it would be nice if the authors added a paragraph at the end of this section describing the paper’s organization to help the reader. Also, I would like to see the authors elaborate on page 5 which aspects of the data their model can and cannot match.

For sure, the most significant change in the revision is the addition of Section 7 in response to my and Referee # 2’s comments. Here the authors extend the model to allow singles to live with their parents and examine the model’s predictions for 1920, 1950, and 2000. I am not sure whether the addition of this section represents a positive change, however. There is now a sense that the focus and analysis of the paper are misplaced. In particular, it seems that the authors should have simply started with the Section 7 model and not studied the model of Section 2. The main calibration/estimation should have been done within the context of this more general model, and comparisons should have been made with respect to the entire period, as well as the two sub-periods, and not along just 3 years of the entire period as is currently done. The paper’s title would also have to be changed. For these reasons, I think it is better to remove this section and talk about the longer period and the importance of living at home in the conclusion.