The Causal Effects of Wages on Labour Supply for Married Women– Evidence from American Couples

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Abstract

Using individual-level panel data from PSID, I consistently estimate the causal effects of own wages on interior labour supply (the hours-wage elasticities) for married women who were between 17 and 55 years old in 2005 and surveyed every two years till 2015.

First, I consider a representative married woman's utility maximisation choice subject to her budget constraint that connects her husband's wages and non-labour income to her labour supply decisions through the factor couple relationship.

Second, suggested by the optimal hours of work equation and comparative statics, I carry out the empirical analysis with the starting-point model - pooled OLS.

Third, I take into account the endogeneity problem due to sample selection and attrition. These issues could be alleviated by adding into the original models the predicted probability of being selected into the labour force and the predicted probability of staying in the surveys.

Fourth, I control for the unobserved individual heterogeneity that is time-invariant, such as the preference for work and the family tradition, by using panel fixed effects models.

Finally, the unobserved idiosyncratic characteristics that are time-varying, such as competency and skills, are taken into account by using instrumental variables (IV) and the method of two-stage least squares. This approach could be illustrated with a graph of the simultaneity of labour supply and labour demand curves.

I find that:

(1) The causal effects of wages on labour supply (the hours-wage elasticities) drop from 0.27 in the pooled OLS to 0.21 in the panel data fixed effects 2SLS model after I account for sample selection, attrition, individual heterogeneity, and unobserved idiosyncratic characteristics.
(2) Holding other factors constant, a 1% increase in married women's wages raises their hours of work by 0.21% on average.
(3) Part-time female workers are more responsive to wage changes than their full-time counterparts.
(4) There is evidence of backwards-bending labour supply curves.

1. Introduction

1.1. Motivation

1.1.1. The graphs of time-series data

To introduce the topic of the paper, let us take a look at two graphs of a seemingly paradoxical relationship between wage and hours of work over time.

Using the data from Current Population Survey (CPS), I find that the time series of country-level average weekly earnings of married women who are full-time workers (over 25 hours of work per week) has an upward trend over time from 2005 to 2015. However, their average hours of work do not show a distinct pattern over time. (Fig.1) It seems that labour supply and wages are not related.

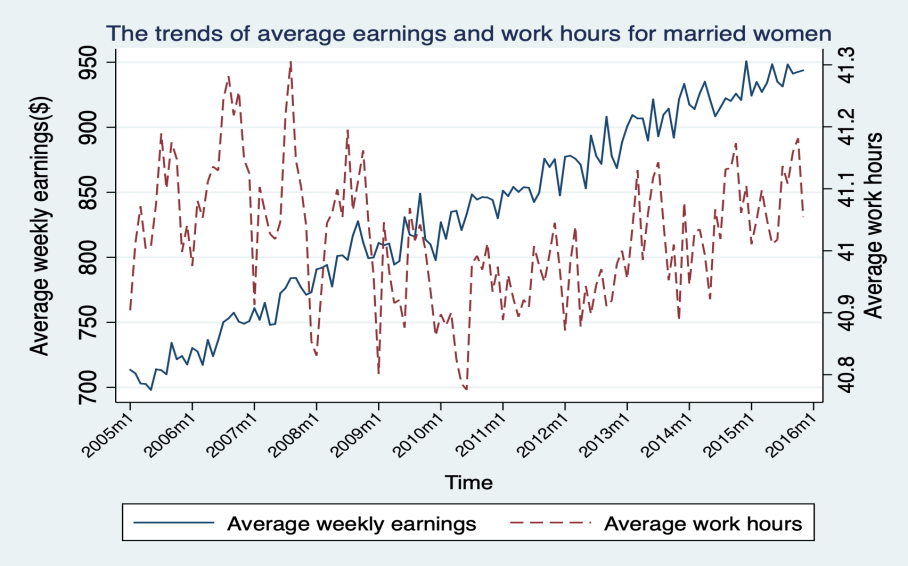

Fig. 1. The trends of the average weekly earnings and work hours for married women (from CPS)

As far as the labour force participation rate and the wages are concerned, the trends of them are opposite. (Fig.2)

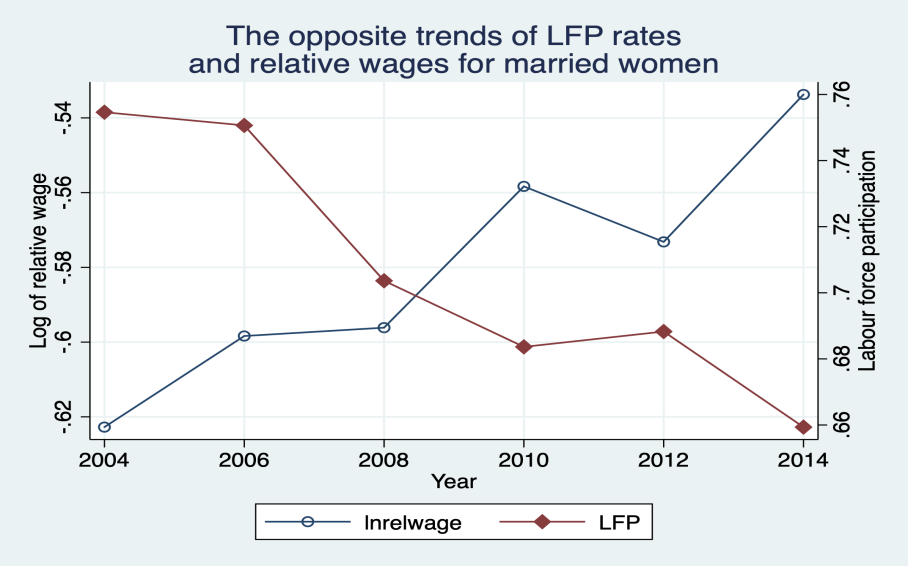

Fig. 2. The opposite trends of the relative weekly earnings and the labour force participation for married women (from PSID)

Does it mean that wages and labour supply are not correlated or the wages have a negative causal effect on the labour supply for married women? The answer is: "No". The reasons are as follows:

(1) The country-level time series data are the aggregate information that does not provide the variation within individuals over time and the variation between individuals as the panel data offer us. Besides, the interaction between couples within families could not be modelled without microdata. If we investigate at the individual level under panel structure, more detailed relation could be found.
(2) In order to obtain the causal effects of wages on labour supply, we should hold other relevant factors behind labour supply fixed and take into account bias due to endogeneity. Only in this way could we obtain the partial effects.

After modelling the interaction between couples, and alleviating self-selection, sample attrition, individual heterogeneity, and unobserved idiosyncratic characteristics bias, I found consistent, significant and positive causal effects of wages on labour supply.

1.1.2. The graph of cross-sectional data

Does the OLS fitted line based on the cross-sectional data of married women's wages and hours of work in 2007 represent the actual labour supply curve? The answer is also "No" because what we observed are points at which the wages and the work hours are in

equilibrium. They are the intersection of labour supply and labour demand. The actual labour supply curve should be separated from the labour demand curve using instrument variables.

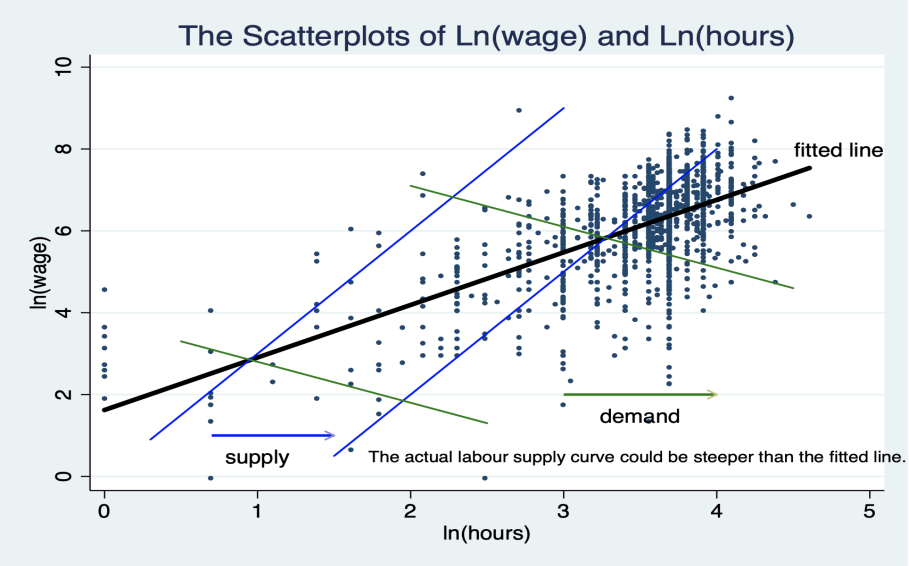

Fig. 3. The scatterplots of wages and hours of work in 2007

1.2. Objectives of the Study

The above leads to the research questions of this paper:

(1) What are the causal effects of own wages on hours of work? In other words, how to consistently estimate the hours-wage labour supply elasticities?
(2) Are the causal effects different between subgroups and changing over time?

Why is it important to study the relationship between labour supply and weekly labour income? The causal effects of labour income on labour supply are crucial to taxation and welfare policies making. The optimal levels of welfare depend on the estimates of the parameter of the response of labour supply to wage changes. In addition, it gives us a better understanding of the mechanism of married women's working decision that underlies the female labour supply.

1.3. Approaches and Outline

The identification challenges I am facing when estimating the causal effects of wages on labour supply include:

(1) Sample selection:

The first challenge arises when the sample used is not representative of the population of interest. The model is supposed to represent the causal effects of wages on hours of work for all married women of working age, whether or not she is working at the time of the survey. It is called the incidental truncation because hours of work and wages are missing as a result of the outcome of another variable, labour force participation. People self-selected into employment, so whether or not we observed wages and hours of work depends on an individual's labour supply decision. The OLS estimates could be biased because of this nonrandom nature of the sample.

(2) Sample attrition:

The second challenge is a unique problem for panel data. During the observation period, some respondents left the survey. If we lost them randomly, then it would not cause a problem. Otherwise, the estimates may be biased. Out of the 3618 married women under survey who were between 17 and 55 in the year 2005, 3423 took part in the survey in 2007, 3279 continued in 2009, 3076 stayed in the survey in 2011, 2,886 in 2013, and finally only 2675 respondents participated in the survey in 2015, which was about 74% of the respondents in 2005. That is to say, about 26% of the respondents dropped out of the survey during the observation period of 10 years, with an attrition rate of approximately 2.6% per year. It would not cause bias of labour supply elasticities if the attrition was random. However, if the leavers had different labour supply elasticities on average from the respondents who stayed in the survey, then the estimates would be biased based only on the stayers.

(3) Unobserved individual-specific characteristics:

For the third challenge, I divide the unobserved individual-specific characteristics that could be correlated with wages into two categories. The first category is the individual heterogeneity that is individual-specific and time-invariant, such as family tradition, preference for work, and habits. The other category is the individual idiosyncratic characteristics that are individual-specific and time-varying (different across individuals and changing over time), such as competency, skills, ability, and intelligence. For the first category, I use a fixed effects panel data model to control for individual heterogeneity; for the second category, I use instruments. Both methods are meant to alleviate the endogeneity issue.

The remainder of the paper is organized as follows. Section 2 gives a review of previous research. Section 3 presents the theoretical model, which is a guide for empirical analysis. The representative married woman chooses her consumption and dedication to her family to maximise her utility. Hypotheses about married women's labour supply are proposed.

Section 4 deals with identification challenges due to endogeneity problems of sample selection, sample attrition, individual heterogeneity, and unobserved idiosyncratic characteristics. Section 5 applies the consistent estimator from section 4 to investigate how the hours-wage elasticities change over time and across different subgroups. In Section 6, the robust analysis is conducted. I compare results between the 2005 cohort and the 1995 cohort. The estimates from using PSID data are contrasted with the results using CPS data. Finally, Section 7 concludes. The brief structure of the paper is illustrated in Fig.4.

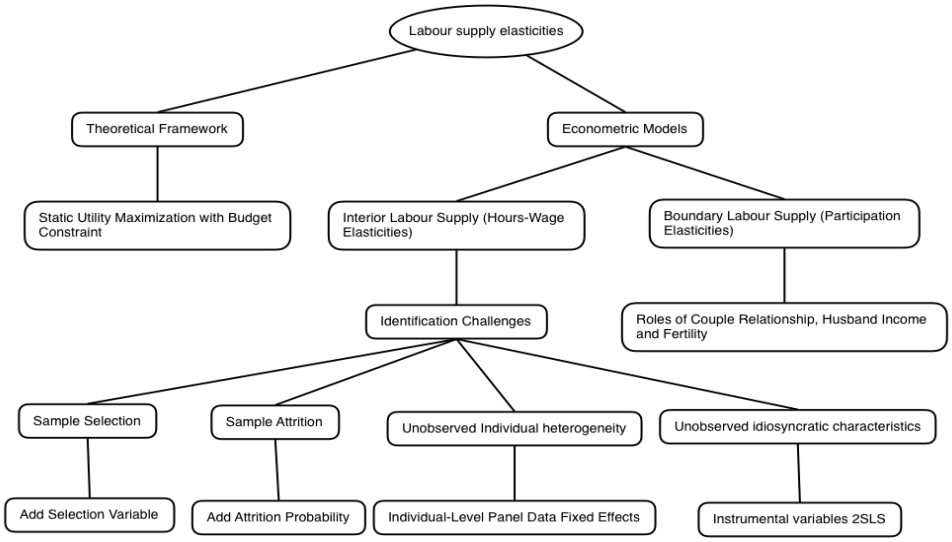

Fig. 4. The outline of the paper