



# A dilemma of fertility and female labor supply: Identification using Taiwanese twins



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## ABSTRACT

Using micro-data from the Taiwan Population and Housing Census, this study estimates the causal effect of fertility on the labor supply of married women. To address the endogeneity of fertility, we exploit exogenous variations in the number of children caused by twin births, which can be considered a natural experiment. The instrumental variable estimates indicate that an additional child reduces female employment by 10.5 percentage points for those who have at least one delivery, and the effects gradually decline for females who have two or more deliveries, with the effects vanishing when females have three or more deliveries. Also, the effect of fertility varies substantially with the time elapsed since the last childbirth, which has a consequence for differences in estimates across different samples in the literature.

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## 1. Introduction

In the decades since family planning policy was introduced in the 1960s, the growth rate of the Taiwanese population has decreased. In 1951, each Taiwanese woman had approximately seven children over her lifetime. However, in the 21st century, Taiwan's fertility rate has become one of the lowest in the world, falling below one child per woman in 2010. The total fertility rate (TFR) of Taiwan was 1.12 in 2015, only slightly higher than Macau and Singapore<sup>1</sup>, placing the country third from the bottom among 224 countries (Central Intelligence Agency, 2015). In addition to the development of women's human capital, infant mortality has decreased substantially (Chou, Liu, Grossman, & Joyce, 2010), and fertility behavior is changing within Taiwanese society (Freedman, Fan, Wei, & Weinberger, 1977; Freedman, Hermalin, & Chang, 1975). The extremely low birthrates have become an unprecedentedly challenging social issue in Taiwan (Y.-H. Chen, 2012; Lin & Yang, 2009).

Corresponding to a sharp decline in the fertility rate, the labor force participation (LFP) of married women in Taiwan has experienced a high rate of growth. Fig. 1 shows the long-term time series data of TFR and LFP for married women in Taiwan. On the one hand, the TFR had decreased to 1.165 per woman in 2014 from 2.455 per woman in 1981. On the other hand, the LFP of married women had grown to 49.76% in 2014 from a rate of 33.23% in 1980. The strong negative correlation between the two leads to a policy dilemma regarding whether having more children reduces the likelihood of labor market participation among

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<sup>1</sup> Singapore 0.81, Macau 0.94, Japan 1.40, China 1.60, U.S. 1.87, UK 1.89.

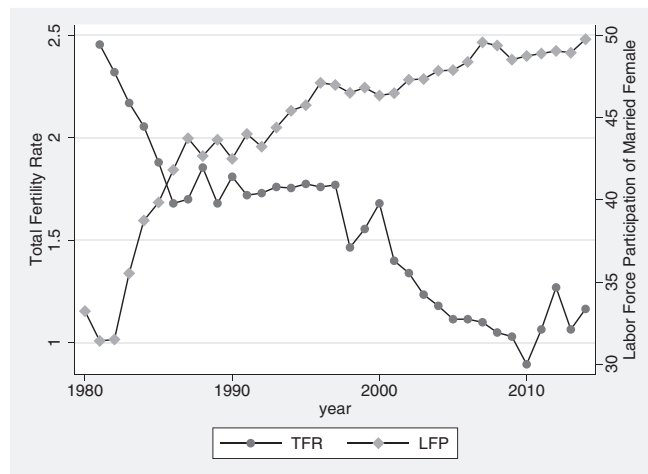


Fig. 1. Time trend of fertility and female labor supply.

Source: (1) Report on the Manpower Utilization Survey and (2) Vital Statistics of Taiwan.

married women. For policy makers, simultaneously increasing the fertility rate and female labor supply is a difficult task, as fertility promotion policy may lead to an increase in the fertility rate but harms female labor supply (Dudel, 2009; Rosenbluth et al., 2002).

Theoretically, economists and demographers have established a variety of models to link fertility and the labor market (Becker, 1985; Gronau, 1973; Mincer, 1962; Rosenzweig & Wolpin, 1980a). They predict a strong negative correlation between the two, as married women could pay more attention to child care and housework. For instance, Mincer (1962) points out that a mother's care of small children is much more difficult to be substituted, compared to food preparation or other houseworks. Labor supply of married women who have small children at present could be affected more than those who have not, or than at other times in the life-cycle. Becker (1985) suggests that child care is more effort intensive than leisure and other household activities, which may further affect women's labor market performance. Empirically, several previous studies show that younger women with lower fertility participate in labor market more frequently and more intensively, which treat fertility decisions as exogenous (Gronau, 1973; Heckman, 1974; Schultz, 1978).

Although the causal link between fertility and labor supply among married women is important, the main difficulty in determining the causality is that fertility decisions and labor market participation are simultaneously determined. Two potential endogeneity issues in this context are as follows. First, unobserved factors such as preferences regarding the number of children and career expectations are heterogeneous across individuals. For example, those who are ambitious at work may have a lower expected number of children while being more likely to participate in the labor market. Any estimates that fail to control for unobserved heterogeneity would be downward biased, as career ambition is negatively correlated with fertility but positively correlated with labor supply, which would overestimate the negative effect of fertility on labor supply. Following Angrist and Evans (1998), several studies have attempted to correct for such bias using mixed sibling-sex composition as an instrumental variable (IV), due to the well-known preference for sons in some Asian countries (Azimi, 2015; Chun & Oh, 2002; Ebenstein, 2009). Following Rosenzweig and Wolpin (1980b), economists also use twin births as a natural experiment for fertility to analyze its effect on labor supply (Bronars & Grogger, 1994; He & Zhu, 2015) or to test the quantity-quality trade-off for children (Angrist et al., 2010; Åslund & Grönqvist, 2010; Black et al., 2005, 2010; Li et al., 2008).

Second, the amount of time passed since the last childbirth is important for the subsequent fertility decision, and the question of whether to have an additional child also affects the labor market activities of married women. The more time that has passed since the last childbirth, the more easily a woman can return to work. Controlling for the youngest child's age as an explanatory variable would attenuate the above-mentioned bias, but the estimates are far from causal because the assumption of a time-invariant preference for the number of children is imposed implicitly. However, the preference for the number of children should be treated as time-variant in the real world when applying either mixed sibling-sex composition or twin births as an instrument. For example, mothers of twins and mothers of non-twins would have different paths (preferences) for having an additional delivery over time, as the burden of caring for children is doubled for mothers of twins. As an alternative approach, this study estimates the effect of fertility using two groups for which the interval since the last childbirth is no more than one year for the first group and no more than three years for the second. The choice of intervals is discussed specifically in the results section.

Other than using exogenous variation in the number of children caused by twin births, this study also effectively compares the difference between mothers of twins and mothers of non-twins using three sub-samples to investigate the causal effect of fertility on female labor supply. Specifically, in each sub-sample, individuals have the same frequency of childbearing

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