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Fertility and female wages: A new link via house prices*



Creina Day^{a,*}, Ross Guest^b

^a The Australian National University, Australia

^b Griffith University, Australia

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ABSTRACT

The analysis in this paper explains a new link between fertility and female wages that occurs through the effect of house prices. It is well known that higher female wages have an ambiguous effect on fertility: the positive income effect is offset by a negative substitution effect due to the higher opportunity cost of the maternal time required for child-rearing. Here it is shown that housing costs add a new dimension to this relationship. If the housing needs of children are a sufficiently important cost of child-rearing, then other costs of child rearing such as the opportunity cost of maternal time are rendered relatively less important. Hence the negative substitution effect of higher female wages on fertility is weaker, implying that higher female wages are more likely to boost fertility. This effect is stronger when the housing supply elasticity is high since house prices, and hence the costs of child rearing and house prices in a number of countries. For governments concerned about low fertility, policies to increase housing supply elasticity in order to keep house prices in check would be helpful.

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1. Introduction

The analysis in this paper connects two streams of literature on fertility. One is the well-established literature on the effect of economic growth on fertility. This effect is ambiguous a priori given that children are a normal good (Black et al., 2013), since higher household wages make children more affordable but raise the opportunity cost of maternal time. The negative opportunity cost effect, or substitution effect, is stronger the more that economic growth raises female wages relative to male wages (Barro and Becker, 1988; Cigno and Rosati, 1996; Galor and Weil, 1996). This literature has been extended to show that the substitution effect is weakened if households can substitute paid child care for maternal time (Apps and Rees, 2004; Day, 2004; Martinez and Iza, 2004; following Galor and Weil, 1996). Similarly, government-funded child care allowances unambiguously raise fertility (Ishida et al, 2015; Yasuoka and Goto, 2011). The purpose of this paper is to explore how fertility responds to rising female relative wages if other cots of child rearing are taken into account. The particular cost here is housing costs of children.

The case for incorporating housing costs into models of endogenous fertility is strong. Housing costs comprise a greater portion of annual

childrearing costs than do childcare or education (Lino, 2014). And intuitively, household decisions about having children and housing expenditure are made jointly, since children require housing as well as other implicit and explicit costs.¹

In analyzing the role of housing costs the model here also connects with the literature on the links between demography and house prices, the early examples being Mankiw and Weil (1989) and Poterba (1991). A recent stream of empirical papers shows that rising house prices are associated with declining fertility in some high income countries but rising fertility in others. Yi and Zhang (2010) find that high house prices account for approximately 65% of fertility decline in Hong Kong. Pan and Xu (2012) find a strong negative correlation between house prices and urban fertility in China. Also, countries where home ownership is most difficult also have the lowest fertility (McDonald, 2008; Mulder and Billari, 2010; Ost, 2012). On the other hand, Dettling and Kearney (2014) find a 10% increase in house prices in the United States has led to a 4% increase in births among home owners and a 1% decrease among non-owners. And Lovenheim and Mumford (2013) find that house price increases have a positive wealth effect on the fertility of existing home owners. The ambiguity of this empirical literature on the relationship between house prices and fertility suggests the need for analytical support from endogenous fertility modeling, as noted by

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^{*} Corresponding author at: Arndt-Corden Department of Economics, Crawford School of Public Policy, The Australian National University, Coombs 7128, Canberra, Australia. Tel.: + 61 6125 2681.

E-mail address: Creina.Day@anu.edu.au (C. Day).

¹ An important cost is high quality education. Economic growth raises the relative return to education per child, encouraging households to choose fewer but better educated children (Becker et al, 1990). Developing the model in this paper to incorporate a child quantity-quality tradeoff is an interesting direction for future research.

others (Malmberg, 2010; McDonald, 2008). The endogenous fertility model here provides such a contribution.

The analysis here has potentially important policy implications, since it provides a better understanding of both the determinants of fertility and the effects of rising house prices. Persistent low fertility remains a concern for policy makers in many advanced economies. Referring to Fig. 1, high income Asian economies continue to experience below replacement total fertility rates, whereas the total fertility rate is climbing back to replacement rate in Australia, France, United Kingdom and United States. Recent evidence suggests that economic development can reverse fertility decline when it is accompanied by increasing gender equality and opportunities for women to combine work with family life (Luci-Greulich and Thevenon, 2014). This accords with analysis that gender inequity explains low fertility in Asia (McDonald, 2008). The analysis in this paper offers a complementary explanation for fertility upturn in some developed economies and persistently low fertility in others through the contribution of house prices to the cost of childrearing.

Fig 2 plots the real house price index for the same countries as in Fig. 1. House prices increased significantly in the two decades prior to the global financial crisis in all countries except Japan. As Fig. 1 shows, during the same period the long run decline in fertility halted and indeed reversed for some countries (Australia, France, United Kingdom and United States), while it continued its downward trend for other countries (Hong Kong, Singapore and Japan). Hong Kong and Singapore have witnessed the steepest rise in real house prices over the last decade, with strong appreciations since the depth of the global financial crisis in late 2008. Our model shows how the fertility behavior of both groups of countries can be consistent with their house price trends, underpinned by growth in wages and working age populations. Fig. 3 shows that working age population shares of total population have held up in most countries over the period, except for Japan where demographic pressure existed until the mid 1990s. Working age population shares are highest in Hong Kong and Singapore, with Hong Kong experiencing a particularly strong recent peak.

The core result from the analytical model developed in this paper can be explained intuitively as follows. Households' fertility decisions are affected by female wages both positively – as the income supports the cost of children - and negatively as the female's income imposes an opportunity cost on child-rearing time. However, if the housing needs of children are a sufficiently important cost of child-rearing, then the opportunity cost of maternal time becomes less important. In that case the negative effect of higher female wages on fertility is weaker, implying that higher female wages are more likely to boost fertility. This relationship is more complicated in the case of a growing economy, in particular driven by a rise in the working age population share. In this case, housing costs of children, which depend on current house prices, expected future prices and real lending rates, are important. Depending on the elasticity of housing supply, house prices may be bid up and the costs of children may rise which tends to lower fertility. All of this suggests that fertility decline depends on the gender wage gap, home lending rate and working age population share. The theoretical results are supported by econometric estimation of an error correction model for the illustrative case of Japan.

Section 2 of the paper provides the household intertemporal optimizing model used to analyze the effect of rising female relative wages and house prices on fertility. Section 3 models the determination of house prices in a market for housing with housing supply price elasticity. Section 4 provides a qualitative analysis of fertility decline under endogenous house prices and an econometric estimation for the case of Japan.

2. Model

The model here builds on analytical models in Deaton and Laroque (2001) and Garino and Sarno (2004) which explain rising house prices in a household optimization framework. Deaton and Laroque (2001) is a two period, constant population growth model and Garino and Sarno (2004) is a three period, fixed population model. These models are



Fig. 1. Total fertility rate (births per woman), 1960–2010.

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