Early childbearing and the option to postpone
(Extended abstract)

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Is there any value for a young woman to postpone childbearing? This is the main question that this paper seeks to answer. We will use a real option model (Dixit and Pindyck D&P (1994)) to explain under which circumstances a young woman would be better off by delaying her first birth. Iyer and Velu I&V (2006) were the first to use the real option approach to model the timing of the women’s decision to have children. In their model, the benefits of children are subject to uncertainty, which determines the ‘value of waiting’ and, therefore, the spacing and delay of bearing. We will use the same approach, but instead of making the benefits of children subject to uncertainty, we will make the costs of children uncertain. Our motivation to do this is to analyse more deeply the opportunity costs of mothers when they experience an early birth. Specifically, we want to make explicit the potential sunk cost in terms of forgone educational investment that a young mother faces (this being an added value compared to I&V contribution).

In our model, women should decide when it is optimal to have their first child, by optimizing the net benefits of this action. A relevant point is that a simple Net Present Value (NPV) evaluation is not enough to carry out the right decision. There might exist a positive ‘value of waiting’ that should be considered as well. Early childbearing is a suitable case to analyse in the context of option value theory, since first, "their costs are at least partly irreversible" (unrecoverable sunk costs), and second, the decision can be delayed so that the woman has the opportunity to wait for new information to arrive about uncertain costs. According to D&P, these characteristics of an investment make NPV analysis insufficient.

In many cases, bearing a child as an adolescent is more an accident than a decision. However, this unplanned event is the result of a sequence of decisions or choices the woman has made before. The first choice is to have sexual intercourse; the second one is to do it without using contraceptive methods. If pregnancy occurs, a woman may choose to interrupt it, either legally where

1In other cases, early entering to motherhood is a normal step for a woman in an environment without educational opportunities and chances to play a different role in life.
this is possible, or illegally as it often happens in countries with prohibitive abortion laws. Following this reasoning, early childbearing may be considered as an unplanned consequence of a sequence of previous decisions. In any case, this analysis is useful to determine the irreversible (or reversible) nature of the effects of an early birth. In general, early childbearing will bring irreversible effects if the woman is obliged to switch her time previously spent on education to child caring. Or if the additional income she receives from family, government or husband is not enough to cover the costs of her own education.

In developing the model, we first derive the option value considering the general costs of children (we do not disaggregate by income or time costs). Here, we follow the directions of D&P (1994), adapting the model to our concerns. In a further step, we will make explicit the cost of the forgone educational investment due to early childbearing. Costs are subject to uncertainty, and they vary across time. Thus, the cost of bearing a child may be represented by a geometric Brownian motion.

\[ dC = -\mu C dt + \sigma C dz \]

Where \( \mu \) is the instantaneous conditional expected change in costs per unit of time, \( \sigma \) is the instantaneous conditional standard deviation per unit of time, and \( dz \) is an increment to a Wiener process.

\[ dz = \epsilon_t \sqrt{dt} \]

With \( \epsilon_t \sim N(0, 1) \). The potential decrease in the costs of childbearing creates a value of waiting. One of the reasons for which the costs diminish with time is, for instance, the decrease in the potential forgone educational investment which will be zero at some point in time.

Let us denote the option value as \( F(C) \), which we aim to maximize. Writing the payoff from having a child at time \( t \) as the difference between the benefit and the cost \( B - C_t \), the objective will be to maximise its expected present value.\(^2\)

\[ F(C) = \max \epsilon[(B - C_t)e^{-\rho t}] \]

There will be a value of \( C \) considered as critical, which will determine when it is worthwhile for a woman to delay or not. The importance of determining this critical point of \( C \) (\( C^* \)), is that we will be able to detect cases of early childbearing which will bring irreversible effects for women, in terms of the closed future opportunities it generates.

\(^2\)Here we are assuming that the benefits of children - happiness, support in old age - are constant. This is done for the sake of simplicity, as our main concern is the potential irreversibility of the costs.
References


