The Economics of Fertility

Some Definitions

Birthrate (BR) - \( \frac{\text{Number of Births in a Year}}{\text{Total Population}} \)

Deathrate (DR) - \( \frac{\text{Number of Deaths in a Year}}{\text{Total Population}} \)

At-Risk Population - Persons or group of persons capable of engaging in the behavior or event being measured.

Fertility Rate (FR) - \( \frac{\text{Number of Births to Women of a Particular Age Group in a Year}}{\text{Total Population of Women in that Age Group}} \)

Total Fertility Rate (TFR) - the number of births 1000 women today would have over their lifetimes (from ages 10 - 49.)

\[
TFR = 5 \cdot (FR_{10-14} + FR_{15-19} + FR_{20-24} + \cdots + FR_{45-49})
\]

Zero Population Growth (ZPG) - the total fertility rate that if sustained would result in no change in the total population.

An Economic Model of Fertility

Assumptions:

1. There a given allotment of Time (T) and it can be spent only on Child services (t) or Labor Market activity (L).

\[
T = t + L \tag{1}
\]

2. Some amount of child services time expenditure must be done by women

3. Women and men earn wages \( W_f \) and \( W_m \) in the labor market. So family Income, I is given by the following equation

\[
I = W_f \cdot L_f + W_m \cdot L_m \tag{2}
\]

4. Production of child services requires both a time expenditure (t) and an expenditure on Market goods (Z).

\[
CS = f(t, Z) \tag{3}
\]

5. Parents utility depends upon consumption of child services (CS) and adult goods (A).

\[
U = g(CS, A) \tag{4}
\]
Utility from child services is made up of two components, Quality ($Q_l$) and Quantity ($Q_n$).

Effect of an Increase in Non-Labor Income

The intercepts on both the A and CS axis increase by the same amount causing a parallel shift of the Budget line.

Effect of an Increase in the Price of Adult Goods

The intercept on the A axis is now closer to the origin since the individual can afford to purchase few units of adult goods with the same amount of income. However, she can purchase the same amount of child services as before. This causes the budget line to rotate around its original intercept on the CS axis and become flatter.

Effect of an Increase in the Price of Child Market Goods

The intercept of the A axis is unchanged, but the intercept on the CS axis becomes closer to the origin as the individual can afford fewer units of child services with the same level of income. This causes the budget line to rotate around its original intercept on A axis and become steeper.
Effect of an Increase in Men’s Wages

If we assume men do not spend any time in the raising of children then a wage increase acts just like an increase in non-labor income. If he spends time raising the children an increase in wage will have a similar impact as an increase in women’s wages.

Effect of an Increase in Women’s Wages

An increase in women’s wages causes the total amount of income to increase so she will be able to consume more adult goods. Therefore, there with be a movement away from the origin up the A axis. For a similar reason there will be a movement away from the origin on the CS axis. However, the increase in wages will also cause women to work more. (we assume that we are operating on the upward sloping section of the labor supply curve.) Given her increase in time devoted to the labor she has less time to devote to raising children. The end result is an increase along the CS axis but it will be smaller than that along the A axis and the budget line becomes a little flatter but also shifts outward from the origin.

Deriving the Demand Curve for Child Services

Determinants of Demand Curve for Child Services

- Price of Child Services \( (P_Z) \) - causes movement along existing curve
- Price of Adult Goods \( (P_A) \) - causes shift of demand curve.
- Non-Labor Income - causes shift of demand curve.
- Women’s Wages \( (W_f) \) - causes shift of the demand curve.
- Men’s Wages \( (W_m) \) - causes shift of demand curve.

The Interaction Between Quality and Quantity

Assumptions:

- Quantity is highly time intensive and quality is less time intensive since market goods can substitute for good parenting. (Eg. private schools, Nanny etc.)
- Preference for Quality increases as income increases likewise the desire for quantity decreases as income decreases.
Note: When Quality is drawn on the Y-axis and Quantity is on X-axis the budget line shifts and rotates like the budget line where Adult Goods and Child services are on the Y and X axis respectively.

Insert Figure 5.5 Here

Results

- An increase in Women’s or Men’s wages will increase the total amount of Child services demanded.
- An increase in Child services can be due to either an increase in Quality or Quantity.
- An increase in Women’s wages will cause an increase in the amount of Quality and decrease the amount of Quantity demanded of children.
- An increase in Men’s wages will cause an increase in the amount of Quality and Quantity demanded of children.
Demonstration of Substitution and Income Effects

The above diagram demonstrates the effect of an decrease in the price of quantity for children. (Eg. A decrease in Hospital costs) We initially start at Point A. The decrease in the price or having children causes the budget line to become flatter as the intercept of on the Y-axis remains unchanged but the intercept on the X-axis occurs farther from the origin.

The substitution effect is determined by holding this woman’s level of utility constant at $U_0$ and finding the point of tangency between the indifference curve and the imaginary budget line at the new relative prices. This occurs at Point B. We see that this individual will substitute away from quality toward having a higher quantity of children. (As demonstrated by the arrows closest to the graph.)

The income effect is determined by holding prices constant and calculating the amount of income this woman would pay to move from indifference curve $U_0$ to indifference curve $U_1$. This is the movement from Point B to Point C. (And is demonstrated by the arrows farthest from the graph.) This person finds that a decrease in the cost of quantity acts almost like she has had an increase in income. We know that as income increases individuals have a natural inclination to substitute quality for quantity. This woman is no different, as the income effect causes her to decrease the quantity of children she desires and increase the level of quality for each child.

The net effect after the substitution and income effects have been taken into account is that this woman will have more children and will decrease the total level of quality of each child.