The neoclassical theory of labor supply, presented in Chapter 4, provides both an appealing and simple framework for understanding the major factors governing the work–leisure choices made by individuals. For example, it yields significant insights into the consequence of changes in both the wage rate and the level of wealth on the supply of labor. Moreover, as shown in Chapter 9, it sheds light on the consequences of a host of policy interventions, such as the effects of the recent overhaul of the welfare system.

Yet, despite its evident strengths, the framework suffers from three principal limitations. First, it is grounded on the premise that individuals allocate their available time between only two competing uses: paid work and leisure. As an immediate consequence, many of the activities that must then be classified as leisure time are, in reality, a form of unpaid home production. Manifest examples include cleaning the house, looking after children, and cooking. In each of these cases, the service in question could be procured from the market by (respectively) hiring a cleaner, a nanny, or eating at a restaurant (or, for that matter, hiring a cook). Genuine leisure cannot be enjoyed vicariously and so cannot readily be traded on the market. For instance, it is ridiculous to imagine that a sports fan could derive much enjoyment by hiring someone else to watch a live game for him or her. It is estimated that the value of U.S. home-production activities is huge: equal to between 30% and 50% of the measured gross domestic product, which is calculated on the basis of observed market transactions.¹

Second, it ignores the fact that most labor-supply decisions are jointly made within the broader context of a family unit. In a more realistic setting, which accounts for this interdependency, changes in the opportunities available to one family member are liable also to affect

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**LEARNING OBJECTIVES**

After reading this chapter, you should be able to:

- Recognize the notion of a home-production technology and understand the factors governing the choice between market work and homework.
- Recognize how marriage allows two partners to exploit comparative advantage benefits that accrue from the division of their labor.
- Recognize the broad trends in U.S. fertility rates over the last 70 years or so.
- Understand the main tenets of the Malthusian and Beckerian models of fertility.
- Understand the primary forces that have shaped female labor-supply decisions over the past 50 years.
the behavior of other family members. Finally, the theory says nothing about fertility. This omission is significant since the fertility decisions of one generation are an integral determinant of the future size of the population. Moreover, the labor-supply decisions of current labor-market participants—especially women—are inexorably bound to their fertility choices. Hence explaining the proximate causes of changes in fertility is crucial for better understanding both the long-run supply of labor and the labor-supply decisions of women.

In short, if we may be forgiven for paraphrasing Oscar Wilde, the failure to account for one core aspect of labor-supply behavior may be regarded as a misfortune; the failure to account for three of them looks like carelessness. In fact, by gathering together the various sins of omission, it is possible to paint a relatively clear picture of the key features that the standard neoclassical model is incapable of explaining—and by extension the significance of the material to be presented in this chapter.

On this score, perhaps the most profound social change in contemporary U.S. history has been the marked secular increase in participation rates of married women. As Costa (2000) observes,

In the United States, only 20 percent of all women worked for pay in 1900. Less than 6 percent of all married women older than 15 labored for pay. . . . By the century’s end, the labor force participation of all women older than 16 had risen to 60 percent, participation of all married women older than 16 had risen to 62 percent.

Much of this increase appears to have resulted from profound changes in the technologies of both home production (e.g., the microwave, dishwasher, washing machine, and so on and so forth) and contraception (e.g., the pill). The former group of innovations reduced the relative value of time spent at home and the latter gave women much more control over their fertility—and hence career—choices.

Moreover, over the last century, the United States has witnessed a profound demographic transformation that saw fertility rates plummet. This change exerted a pronounced effect on not only the population growth rate but the age distribution as well. Given that the basic neoclassical framework is completely silent on both the issues of home production and fertility, it is obviously of little value in helping us to understand them.

Economists have taken great strides over the past 40 years or so toward a better understanding of both these issues. The resulting literature falls under the general rubric of the economics of the family, which is now both a vast and vibrant area of modern labor economics. In view of the enormity of the field, in this chapter we focus on those aspects of the new literature that offer the greatest traction for shedding light on the supply of labor (especially women) and changes in fertility rates.
29.1 Home Production: The Nuts and Bolts

Unemployment is capitalism’s way of getting you to plant a garden.
—Orson Scott Card

In this section, we present the central building blocks of the home-production approach. In the next one, we show how home production affects the individual supply of labor and in the one after that how it influences joint labor-supply decisions that are made within the broader context of the family.

U.S. Home Production

The level of an economy’s economic activity is measured by its gross domestic product (GDP), which is calculated on the basis of the (final) value of recorded market transactions that occur over a given (usually 3-month) time period. Hence nonmarket home-production activities—such as doing the laundry, cleaning, childcare, cooking, and so on—fly under the statistical radar, as it were. These transactions are not included as part of measured GDP and so are not counted as part of the overall economic activity. Nevertheless, some estimates suggest that the dollar value of U.S. GDP would be as much as 50% greater were these activities properly accounted for. This would, at the stroke of a pen, take the United States from a mammoth 14-trillion-dollar economy to a titanic one that churns out 21 trillion dollars of goods and services every year.

Investments made by the household sector are also enormous. For example, Greenwood and Hercowitz (1991, Table 1) report that expenditures on domestic capital (i.e., purchases of consumer durables and residential structures) exceed investments in business capital (i.e., purchases of producer durables and nonresidential investments) by as much as 15%. It is clear from this evidence that household production is a major facet of the U.S. economic landscape.

Time Allocation. Other evidence that looks at how agents allocate their time confirms that home production is an extremely important component of U.S. economic activity. For example, using time-survey data, Greenwood, Rogerson, and Wright (1993) report that the average married couple spends 33% of their discretionary time doing paid work, and spends about 25% of it working in the home (on activities such as cooking, cleaning, and childcare). More recently, economists have had access to a bounty of data, generated from the American Time Use Survey (ATUS). The survey data are drawn from the time-use diaries of over 20,000 individuals. ATUS collects data on a wide spectrum of activities that individuals carry out during the course of a typical day, including information on both the amount of work and homework they do. According to recent ATUS survey results (2006),
• On the days they worked, employed men worked about an hour more than employed women (8.47 hours vs. 7.41 hours).
• On a typical day, 84% of women and 64% of men spent some time doing household activities, such as housework, cooking, gardening, and household management chores.
• Conditional on carrying out household activities, on average, women spend about 2.7 hours on these activities, and men spend 2.1 hours on them.

In Table 29.1, we summarize some of the recent evidence, taken from the Bureau of Labor Statistics (BLS) 2006 ATUS summary, concerning how employed persons spend their time. The data are differentiated according to whether there is a child aged between 6 and 17 in the household or whether there is no child under 18 in the household.

The home production category refers to a variety of time uses such as housework, shopping time, and caring for others. It is clear that home production occupies a sizable portion of the average person’s day. Notice that men do more market work than women, but women undertake more home production than men. This effect is particularly pronounced in the case in which there is a child aged between 6 and 17 in the household: women engage in over 4 hours of home production but have a somewhat dismal 3.63 hours of leisure.

In summary, the basic themes that emerge from analyzing this evidence are (1) home-production activities are important for both sexes (though, more so for women); (2) on average, men do more paid market work than women; (3) after combining housework with market work, women tend to work longer hours than men; and finally (4) children call for substantial time inputs from both sexes (though, once again, more so for women).

<table>
<thead>
<tr>
<th>Gender/Activity</th>
<th>Personal Care</th>
<th>Work</th>
<th>Home Production</th>
<th>Leisure</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Men</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No children under 18</td>
<td>8.89</td>
<td>6.26</td>
<td>1.97</td>
<td>4.84</td>
<td>2.04</td>
</tr>
<tr>
<td>Children aged 6–17</td>
<td>8.79</td>
<td>6.44</td>
<td>2.69</td>
<td>4.17</td>
<td>1.91</td>
</tr>
<tr>
<td><strong>Women</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No children under 18</td>
<td>9.38</td>
<td>5.45</td>
<td>2.92</td>
<td>4.08</td>
<td>2.17</td>
</tr>
<tr>
<td>Children aged 6–17</td>
<td>9.37</td>
<td>4.86</td>
<td>4.07</td>
<td>3.63</td>
<td>2.07</td>
</tr>
</tbody>
</table>

Notes: Work = work + work-related activities; home production = household activities + time spent purchasing goods and services + caring for others; and other includes education, eating and drinking, telephone calls, and computer use.

Next, the theory of home production is presented, which has revolutionized the way economists think about the family, in general, and the determinants of the allocation of time between home-production activities and market work, in particular.

**The Home Production Technology**

In Chapter 4, we examined the consumption–leisure choices of a solitary, Robinson Crusoe-like, individual. Recapping, the individual is assumed to derive utility, \( u(c, \ell) \), from consumption, \( c \), and from leisure \( \ell \), which he or she maximizes subject to the budget constraint \( c = w \cdot (T - \ell) + A_0 \) and the time constraint \( T \geq \ell \), where \( w \) is the wage, \( A_0 \) is initial wealth, and \( T \) is the length of the time period. Most important, leisure is simply defined as time that is not spent working for pay.

**Richer Uses of Time.** Once home production enters the picture, it is necessary to modify the basic neoclassical model in two fundamental ways. First, some account must be made for the utility provided by the goods and services produced at home.

Second, it is critical to provide a more finely grained characterization of the individual’s alternative use of time. The reason for this latter concern is simple enough: Few of us regard an hour engaged in a cleaning frenzy, during which time we find ourselves prostrate over the privy, as edifying as, say, an hour spent watching a good movie.

Suppose that the individual allocates his or her residual time endowment, \( T \), between market work \( (m) \), housework \( (h) \), and leisure \( (\ell) \) according to:\(^{12}\)

\[
T = m + h + \ell
\]  

(29.1)

As in the standard neoclassical labor-supply model, each individual can allocate time, \( m \), toward working for pay. For simplicity, we assume that the market wage is a constant $w per hour and that the individual is endowed with a level of unearned income \( A_0 \). (Given that the model is static, \( A_0 \) could equally well be interpreted as the individual’s savings.) It follows that an individual who works \( m \) hours can afford to purchase a quantity of market goods, \( x_m \), given by:

\[
x_m = w \cdot m + A_0
\]  

(29.2)

The quintessence of the home production approach is that the individual also has access to a *home production technology*:

\[
x_h = H(h)
\]  

(29.3)

where \( x_h \) equals the value of goods and services he produces at home, using time devoted to these activities, \( h \). In what follows, the **marginal product of home production**, which is measured in dollars per hour, is defined by \( MH(h) \equiv \Delta H(h)/\Delta h \). Intuitively, \( MH(h) \) equals the additional value of home produced
output generated from an additional homework hour given the individual is currently allocating $h$ hours to these activities. Let’s assume that $MH(0) > w$, which is harmless enough. As we shall see, it is sufficient to ensure that, among other things, even the ecdysiast chooses to get dressed before going to work.

In Figure 29.1, the household production technology is depicted by the schedule $x_h = H(h)$. It is drawn back-to-front, in what might seem, at first glance, to be an act of slight eccentricity: housework hours increase from right to left. As we will shortly demonstrate, however, this approach actually simplifies the presentation. After one finds one’s bearings, it is easy to see that $H(\cdot)$ is increasing and concave in the hours of housework $h$. Intuitively, the concavity of the relationship reflects diminishing returns to housework.

To understand why this is quite reasonable, think of the individual as having a list of home production tasks—arranged in order of their importance—that he potentially could carry out during the day. It is natural, given such a list, to expect that he would allocate his first few housework hours to the most important tasks (e.g., getting dressed, feeding the children—or the cat—and so on and so forth). Additional housework hours would then be assigned to tasks that become progressively less and less valuable at the margin (e.g., changing a blown bulb in the attic). It is these considerations that account for the diminishing returns to housework apparent in $H(\cdot)$. In general, the quantity of home produced goods, $x_h$, will depend on not only time, $h$, but also the value of the household’s capital stock $k_h$. Household capital includes items such as the individual’s residence, the microwave, the dishwasher, and the garden.\(^{13}\)

**Utility**

A basic tenet of the household production approach is that market goods, $x_m$, household production goods, $x_h$, and leisure, $\ell$, are basic inputs that are used to produce a basic commodity output $z$. It is this final commodity that is the ultimate source of the individual’s utility. For example, a market procured novel is entirely useless until some leisure time, $\ell$, is devoted to reading it.

**The Basic Commodity, $z$** From the remarks just made, suppose that utility depends on the basic commodity, $z$, according to $u = u(z)$, where $u(\cdot)$ is increasing in $z$. As for the basic commodity itself, this is produced according to the following technology:

$$z = z(x_m, x_h, \ell) \quad (29.4)$$
where $z(\cdot)$ is increasing in $x_m$, $x_h$, and $\ell$. The idea is that the individual combines his or her leisure, $\ell$, with goods procured on the market, $x_m$, and goods produced at home, $x_h$, to manufacture the commodity $z$.

It is clear from the equation that the individual faces several basic tradeoffs. For example, he might find that spending 8 hours ($\ell = 8$) reading a $4.75 novel ($x_m = 4.75$) provides an experience, $z$, that is just as valuable as one in which he spends 1 hour ($\ell = 1$) eating a superb meal cooked at home ($x_h = 45$). The various tradeoffs are most easily seen if Assumption 29.1 is imposed:

**Assumption 29.1**

**Perfect Substitutes**

Home produced goods, $x_h$, and market procured goods, $x_m$, are perfect substitutes in the production of $z$. Thus:

$$z = z(x, \ell) \quad \text{where} \quad x \equiv x_m + x_h \quad (29.5)$$

Assumption 29.1 not only simplifies the analysis but is, in many instances, also quite plausible. For example, let $x$ represent the cleanliness of our apartment. For many of us, the ultimate enjoyment of our clean surroundings is—ceteris paribus—independent of how our apartment was cleaned: that is whether it was cleaned by a hired cleaner ($x = x_m$) or whether we cleaned it ourselves ($x = x_h$).

Figure 29.2 depicts the production possibilities associated with different combinations of leisure $\ell$ and the home-produced and market-procured goods, $x = x_h + x_m$. The level of output, $z$, increases in the direction indicated by the arrow—which reflects the fact that $x$ and $\ell$ are both productive inputs. The curves $z_0$, $z_1$, and $z_2$ are called **production isoquants**. They represent the combinations of goods, $x$, and leisure, $\ell$, that produce the same value of the basic commodity, $z$. Each of the isoquants is negatively sloped and is convex to the origin. The negative slope reflects the fact that an increase in leisure, $\ell$, or goods, $x$, (or both) raises $z$. Thus, in the figure, points $A$ and $B$ generate the same level of the commodity $z_0$. Returning to the earlier remarks, think of point $B$ as corresponding to spending 8 hours ($\ell = 8$) reading a ($x = 4.75$ novel, while point $A$ corresponds to spending 1 hour ($\ell = 1$) eating a superb meal ($x = 45$).

The convexity of each curve is symptomatic of diminishing returns to each factor. Intuitively, it says that averages are better than extremes. This notion is captured by the chord $AB$ in the figure. Notice that point $C$, which lies at its midpoint, is associated with a greater
level of $z$ than is obtained at either of the extreme points $A$ and $B$. Model 29.1 is designed to help fix ideas concerning the meaning of the various concepts encountered so far.

### 29.2 Home Production: Optimal Behavior

In this section, we show how all of the elements of the home production model fit together, and how the resulting framework can be used to study an individual’s time-allocation choices in a variety of settings.

**MODEL 29.1**

**Home Production: The Basic Concepts**

Suppose that Dougal spends 10 hours of any given day sleeping, commuting back and forth to work, and on personal maintenance. This gives him 14 hours that he can allocate to work, leisure, and home production activities.

Assume that, on some particular day, he works for 8 hours and spends half an hour shopping—during which time he purchases 2 Dolly Parton CDs. Upon returning home, he cleans his apartment for 1.5 hours and orders a take-out meal. After it arrives, he spends the remaining 4 hours of the day enjoying his leisure time. He does this by eating his sumptuous meal, in a clean house, with Dolly’s mellifluous strains in the background.

Let us take stock. The time available to Dougal is $T = 24 - 10 = 14$ hours. Dougal works for $m = 8$ hours. He spends $h = 1.5 + 0.5 = 2$ hours in home production and enjoys the remaining $\ell = 4$ hours as leisure time.

Needless to say, the ability to enjoy a clean house and to listen to his CDs is predicated on having somewhere to live and a music system. These items constitute his household capital stock $k_h$. Dougal’s market goods, $x_m$, include his take-out meal and his two CDs. Dougal uses his home production technology to produce a clean house, which is included in $x_h$. Ultimately, Dougal combines his leisure $\ell$, the market goods, $x_m$, and the home produced goods, $x_h$, to produce another commodity $z$, which is a fine meal at home, in a clean house, listening to Dolly Parton. It is $z$ that ultimately provides him with utility $u = u(z)$.

### The Decision Problem

Taking stock, the core conditions that we have derived thus far are,

\[
\begin{align*}
    u &= u(z) \\
    z &= z(x, \ell) \\
    x &= x_m + x_h \quad \text{where } x_m = A_0 + w \cdot m \text{ and } x_h = H(h) \\
    T &= m + h + \ell
\end{align*}
\]
The individual in question is assumed to choose $m$, $h$, and $\ell$ to maximize his utility $u(z)$. Fortunately, this problem is much simpler than it might appear at first glance, since it is possible to break it down into two relatively simple parts. The first involves determining the combinations of $x$ and $\ell$ that are feasible for the individual in question. The second part then determines the agent’s optimal choices.

**The Feasible Set.** Figure 29.3 depicts what is afoot. To understand its central message, it is helpful to begin at point $A$ (which is located in the lower right part of the figure). Notice, this option must be feasible: the individual can always set $\ell = T$ and simply live off of his unearned income, $A_0$. Now suppose that, starting from point $A$, he gradually reduces his leisure and supplies labor exclusively to the labor market in return for pay (i.e., he carries out zero home production). In this case, the relationship between $x$ and $\ell$ is described by the standard labor-leisure budget constraint $UAT$.

In contrast, suppose that (starting again from point $A$) he gradually reduces his leisure and supplies labor exclusively to home production activities (i.e., he carries out zero paid work). In this case, the relationship between $x$ and $\ell$ is given by the
curve \( VAT \), which equals the output produced by his home production technology, \( x_h = H(h) = H(T - \ell) \), plus the goods he can purchase using his unearned income \( A_0 \).

The goal is to combine the schedules \( UAT \) and \( VAT \), so as to determine the feasible combinations of \( \ell \) and \( x \). To do so, it is helpful to begin at point \( A \) again. At this point, let us ask the following question: if the individual works for 1 hour, should he work for pay in the market or should he spend it on home production? The answer is easy enough to see. The home production line, \( VAT \) lies above the market line \( UAT \) near point \( A \). This reflects the earlier assumption that \( MH(0) > w \), which, in turn, says that home production initially has a very high return (thus confirming the earlier claim that even the ec dysiast gets dressed before going to work).

What about the second hour? The answer is that, provided \( MH(h) > w \), he accrues a greater quantity of \( x \) through housework than through market work. As \( h \) further increases, however, then diminishing returns to home production eventually take their toll. Ultimately a situation arises in which \( MH(h) = w \), as shown at point \( B \) in the figure. Notice that, at this point, the slope of the home production technology equals the slope of the market budget constraint, \( UAT \), which, in turn, equals the wage \( w \). Once this point is reached, it is optimal for the individual to allocate each and every additional hour he works to the market, rather than to home production. The reason is that, to the left of point \( B \), the returns are greater in the former sector than in the latter: \( w > MH(h) \).

Together, these considerations lead to the feasible set of \((x, \ell)\) combinations that is delimited by the (boundary) of the set \( CBAT \) depicted in the figure. As illustrated, the possibility of market work augments the individual’s set of opportunities (relative to home production alone) by an amount that equals the shaded wedge \( VCB \).

**The Optimal Choice.** Armed with the feasible set of \((x, \ell)\) combinations, \( CBAT \), the second part of the problem is to determine which of them maximizes the value of \( z \), and by extension the individual’s utility. (Recall that \( u(\cdot) \) is increasing in \( z \).) To address this problem—and to avoid potentially fatal pedagogic clutter—we depict only three production isoquants in Figure 29.3.

As shown, the individual maximizes his utility by selecting point \( E \), which is characterized by a point of tangency between his highest attainable production isoquant, \( z^* \), and the feasible locus \( CBAT \). The explanation is perhaps by now familiar: point \( G \) and others like it provide a greater level of \( z \) (and hence utility) than is available at either points \( E \) or \( F \); nevertheless, they are infeasible and hence no more than pie-in-the-sky. In contrast, point \( F \) is certainly feasible, since it lies on the boundary \( CBAT \). Yet, it is not optimal, for the simple reason that point \( E \) is also feasible and is associated with a greater level of \( z \). From these considerations, point \( E \) must be the optimal choice. It is feasible and it produces more \( z \) than all of the other feasible options.
The solution possesses several rather interesting features. The individual in question enjoys $\ell^*\,$ hours of leisure and spends $m^*\,$ hours working for pay. Given these choices, he is predicted to spend $h^* \equiv T - \ell^* - m^*\,$ hours engaged in home production activities. Notice that because $m^* > 0$ the individual is a labor-force participant.

Finally, in the interests of completeness, point $E'$ depicts the choices made by another person who faces precisely the same constraints. (In the interests of clarity, we have not depicted her production isoquants). Notice that she does not work in the labor market and is hence a nonparticipant. She does, however, do some homework.

### Comparative Statics

Given the richness of the model, it is possible to conduct a wide array of comparative-static exercises. Examples include analyzing the effects of the following changes on individual's time allocation choices:

- An increase in the market wage $w$, unearned income $A_0$, and the stock of household capital $h_k$.
- Technological advances that increase the productivity of either the home production technology, $H(h)$, or the consumption technology $z(x, \ell)$.

Providing a detailed analysis of each of these effects would take us too far afield. This said, it is possible to go far with little. The basic theoretical insight is that each of these changes just outlined potentially unleash both **income** and **substitution** effects. *Ceteris paribus*, the income effect encourages individuals to increase their leisure time, and the substitution effect induces them to switch toward relatively less costly activities.

#### An Increase in Unearned Income

Bearing in mind the basic principles just described, consider first the effect of an increase in the level of unearned income from $A_0$ to $A_0'$. This, perhaps not surprisingly, is associated with a pure income effect; it affects neither the relative return to market work nor housework.

Figure 29.4 depicts the effects of the posited increase in unearned income, $A_0'$, on two different people who, for expositional convenience, have the same initial budget constraint $CBAT$. It is derived in the same...
manner as Figure 29.3 but, in the interests of simplicity, is devoid of all of the details underlying its construction. One of them (Dougal) is a labor-force participant (point $E$); the other (Betsy) is not (point $F$). The increase in wealth vertically displaces their common budget line by $\Delta A_0 \equiv (A'_0 - A_0)$, which causes it to shift to $C'B'A'T$.

As shown, the increase in wealth shifts Dougal’s optimal choice from $E$ to $E'$. He therefore responds to an increase in his wealth by reducing his hours of market work but maintains the same level of home production: $h_0^* = T - \ell_0$. In contrast, the same increase in wealth shifts Betsy’s optimal choice from $F$ to $F'$. Notice that she responds to the increase in her initial wealth by reducing her housework and increasing her leisure.

**Changes in the Wage.** In Figure 29.5, we depict the consequences of a reduction in the market wage, $w$. All else equal, the induced income effect encourages the individual to reduce his demand for leisure.

Notice that, in contrast to the simple neoclassical labor-supply framework, there are now two substitution effects: the reduction in the market wage reduces the relative cost of devoting time toward leisure (as in the standard neoclassical model) and housework. For greater concreteness, we refer to the former of them as the *leisure substitution effect* and to the latter as the *housework substitution effect*.

For the particular person who is illustrated in Figure 29.5, the income and leisure-substitution effects just happen to exactly offset each other, so that the total amount of leisure he enjoys—and hence the total number of hours he works (market plus housework)—remains unchanged. Notice, however, that (although his leisure remains completely unchanged) the decline in the wage induces an enormous substitution response between housework, $h$, and paid market work, $m$. As illustrated by the shift of the tangency point, from $E$ to $E'$, the individual’s response is so pronounced that ultimately he drops out of the labor force altogether!

Going into reverse gear, it is instructive to consider the effects of an increase in the market wage, $w$. This change is associated with a positive income effect (which tends to raise the individual’s demand for leisure). However, it also unleashes the two distinct substitution effects just described: the individual is predicted to substitute away from...
both leisure and housework toward market work. Even if the income and the leisure-substitution effects roughly cancel out—implying that his leisure remains approximately constant—there is potentially a huge switch away from housework toward market work that is induced by the second housework substitution effect.

These findings have three substantive implications. First, the model can help account for the dramatic increase in female labor supply over the past half century or so. (In particular, see Figures 2.4 and 28.5.) During this period, the female wage increased substantially—due, in part, to a reduction in discrimination, and, in large part, to greater female human-capital investments. To the extent that women traditionally devoted much of their time to home production activities, they had considerable scope for switching to market work. Therefore, as their wages increased, the housework model predicts that they would substitute away from home work activities toward market work, which could account for the observed increase in their participation rates.

Second, the framework can also account for the decline in the male participation rate that was observed over the same period. Although men also witnessed a sizable increase in their wages, they had traditionally worked full time for pay and, as a corollary, carried out little housework. Consequently, any attempt to further reduce their housework activities (in response to the increase in their wages) is akin to the proverbial attempt to squeeze water from a stone.

It follows that with little potential adjustment along the housework margin, this left only the income and leisure substitution effects described earlier. The former effect encouraged men to increase their leisure, and the latter encouraged them to reduce it. If the income effect were the stronger of the two, then the increase in the wage could account for the observed reduction in their labor supply over the period.

Finally, one of the great success stories of the home production framework is explaining the sizable fluctuations in employment witnessed over the course of the business cycle. Economic Application 29.1 considers some recent work in this area.

**ECONOMIC APPLICATION 29.1**

**Macroeconomic Implications**

To my mind, the greatest contribution of the theory of home production in the past decade was in its service to the better understanding of consumption behavior and changes in labor supply over the business cycle.16

**Business Cycles**

In Chapter 28, we outlined the main tenets of a revolutionary new branch of macroeconomics called real business cycle (RBC) theory, which builds on the early pioneering work of the 2004 Nobel laureates Fin Kydland and Edward...
Chapter 29: The Family

Prescott (1982). The hallmark of this novel research program is a careful adherence to the principles of economic theory. In particular, the fluctuations in output, employment, and unemployment, witnessed over the course of the business cycle, reflect agents’ optimal equilibrium responses to myriad real shocks (such as from policy innovations, technological advances, and preference shifts) that perennially buffet the economy.

The willingness of workers to adjust their leisure choices, in response to temporary shocks, depends on the size of the intertemporal elasticity of substitution (IES). Although the early work offers a satisfactory characterization of many of the empirical features of the U.S. economy, it suffers from a glaring problem: it cannot explain the observed large-scale fluctuations in the supply of labor without appealing to an implausibly large value of the IES.

In a seminal contribution, Benhabib, Rogerson, and Wright (1991) made important progress toward rectifying this problem by introducing home production into the standard RBC framework. The innovation proved to be decisive. The reason is that housework provides an additional dimension whereby workers can respond to temporary shocks. More specifically, the authors stressed that workers respond to shocks, in large part, by substituting between housework and market work—rather than between leisure and market work as in traditional RBC models. As a result of this insight, it became possible to reconcile the fact that individuals’ leisure choices are rather sticky with the large labor-supply fluctuations witnessed over the course of the business cycle.

Empirical work by Rupert, Rogerson, and Wright (2000) examines the effects of home production on the estimated IES. They find that those estimates that ignore home production are often small and sometimes negative. However, once this possibility is admitted, the estimated IES is enormous—on the order of 0.45.

Economic Development

One of the central problems of our time concerns understanding the reasons for the observed enormous cross-country differences in living standards. Some estimates suggest that income per worker is 30 times greater in the richest countries than in the poorest ones (see Summers and Heston 1991). Economists have formulated an assortment of models that provide insights into this important issue. Many of them stress that a large part of the cross-country differences in economic performance can be traced back to factors that affect the cost of capital. Despite the basic soundness of the argument, the snag is that the implied cost differences are too big. For instance, it is estimated that explaining a tenfold difference in output per worker calls for a one-hundredfold capital-cost differential.

Parente, Rogerson, and Wright (2000) reexamine this important issue, but in a setting that admits home production. They find that policies that hinder capital accumulation also affect the output mix of market and nonmarket activity. As a result, part of the enormous disparity in observed differences in output per worker reflect the fact that so much more unmeasured home production takes place in
developing economies than in developed ones. By admitting home production they show that the capital-cost required to explain the evidence declines from 100:1 to a much more plausible 3:1.

29.3 Marriage

In his now classic paper, Becker (1973) revolutionized the way we think about the family, in general, and marriage, in particular, by bringing it within the ambit of traditional economic analysis. As a discipline, economics is equipped with a formidable arsenal of weaponry that can be used to shed light on both the inner workings of the family, as well as the processes responsible for the formation and dissolution of marriages. As Bergstrom (1997) remarks,

To a labor economist or an industrial organization economist, a family looks like a “little factory.” To a bargaining theorist, a husband and wife are “two agents in a relation of bilateral monopoly.” To an urban economist or a public choice theorist, a family looks like a “little city,” or perhaps “a little club.” To a welfare economist, a family is an association of benevolently interrelated individuals.

These are meaty analogies indeed. Nevertheless, to focus on the essentials of the subject, in this text we concentrate on the “little factory” approach that emphasizes families are formed on the basis of a voluntary agreement between two partners, and, in fact, they arise to facilitate joint production and consumption.

As we will show, the approach not only provides significant illumination into the reasons for the gender-based specialization of the traditional family but also why this familial structure has waxed and waned over the years. As such, it provides penetrating insights into the causes of the startling increase in female participation rates witnessed over the last half century or so.

The Family as a “Little Factory”

In this section, we pursue the analogy of the family as a little factory that facilitates joint production and consumption. We focus on the exploitation of comparative advantage differences in each family member’s market and home production capabilities. As we shall see, the approach not only provides fundamental insights into the gender-based division of labor, so characteristic of the traditional family, but also the reasons it has changed so markedly over time.

The Home Production Technology. In the previous two sections, we presented the home production model as it pertains to an individual. There the focus was on how a decision maker optimally allocates his available time between leisure, $\ell$, market work, $m$, and home production, $h$, so as to maximize the utility he derives
from consuming some basic commodity, \( z \). Let’s now extend the basic approach to analyze the gains that accrue to two individuals when they combine their resources through the union of marriage.

The basic theme that emerges from the analysis is that marriage permits the division of labor between the two partners in a manner that enables them to exploit comparative advantage differences in their abilities to generate market and home-produced goods. As such—in this panoply of analogies—the approach is a direct descendent of the international-trade literature, which emphasizes the gains that accrue to countries when they trade and they specialize in producing those goods for which they have a comparative advantage in production.

To keep the analysis relatively simple, it is helpful to begin by focusing on just one person—Dougal—and to consider a simplified version of the home production model that ignores leisure. For convenience, the main assumptions are presented in Model 29.2.

**Model 29.2**

**Dougal’s Home Production Technology**

(a) Dougal (D) has a fixed amount of time \( T \) that he must divide between home production \( (h) \) and market work \( (m) \), according to \( T = m + h \).

(b) The hourly market wage is \( $w \). Consequently, if Dougal works for \( m \) hours he can purchase goods worth \( x_m = w \cdot m \).

(c) Dougal’s constant hourly value of home production activities is \( $v \). Consequently, if he carries out \( h \) hours of housework, then he produces goods worth \( x_h = v \cdot h \).

(d) Dougal has access to a technology that uses market procured goods, \( x_m \), and home produced goods, \( x_h \), to manufacture a basic commodity \( z = Z(x_m, x_h) \). The technology \( Z(\cdot) \) exhibits **constant returns to scale**. Dougal’s utility is given by \( u = u(z) \), which increases with \( z \).

Part (a) of Model 29.2 says that Dougal devotes a fixed number of hours (i.e., \( 24 - T \)) to leisure, sleep, and personal care. This differs from the basic home production model considered earlier, in which variations in leisure were an integral part of the story. Part (b) is standard. In the interests of simplicity, let’s also assume away initial savings, implying \( A_0 = 0 \). Part (c) says his hourly home productivity, \( $v \), is constant. This also differs from the earlier analysis, which emphasized the importance of diminishing returns.

Assumptions (a)–(c) are relatively innocuous and they are adopted so that the analysis is amenable to the simple graphical representation that is offered in Figure 29.6. The line \( DG \), shown in panel (a), depicts the feasible combinations of the market, \( x_m \), and home produced, \( x_h \), inputs that are available to Dougal.
It is constructed in three steps. First, notice that if he spends all of his available time, $T$, working, then he can obtain $x_m = w \cdot T$ of market goods (which leads to point $D$ on the vertical axis).

Second, if, instead, he spends all of his time in home production, then he accrues $x_h = v \cdot T$ of home-produced goods (which leads to point $G$ on the horizontal axis). Finally, by properly allocating his time between home production and market work he can attain any point along the straight line $DG$.

The slope of the line $DG$ is $-w/v$. Intuitively, a unit increase in $x_h$ calls for an additional $1/v$ hours of housework and (hence) $1/v$ fewer hours of market work. Consequently, a unit increase in $x_h$ reduces the level of $x_m$ by $(1/v) \times w = (w/v)$.

According to part (d) of Model 29.1, Dougal possesses a standard technology that he uses to combine market and home produced goods (inputs) to manufacture the basic commodity $z$, from which he ultimately derives utility $u(z)$. The constant returns to scale (CRS) assumption is a great convenience for the graphical approach presented here. It implies that doubling $x_m$ and $x_h$ doubles $z$; tripling $x_m$ and $x_h$ triples $z$; and so on, and so forth, for all multiples. It leads to the production isoquants $z_0$, $z_1$, and $z_2$ depicted in panel (b) of Figure 29.6.\footnote{The reason that the CRS assumption is so graph friendly is that it implies the quantity of $z$ that is produced can be determined at a glance from the various rays $OP$, $OQ$, and $OR$ depicted in the figure.}

To see why this is so, consider the ray $OP$ (similar arguments apply to the other rays). As shown, the various segments $OA$, $AB$, and $BC$ are all equal in length. It is therefore immediate that point $B$ is twice as far from the origin as point $A$. Consequently, $x_m = 2 \times x_{m0}$ and $x_h = 2 \times x_{h0}$. But given that $z_0 = 100$ units, the constant returns to scale assumption implies that $z_1 = 2 \times z_0 = 200$ units. Similarly, point $C$
is three times the distance from the origin as point $A$. Hence $z_3 = 3 \times z_0 = 300$ units. This is a useful property, and it generalizes to any ray and any scale factor that we might want to consider.

So much for rays, what is Dougal's optimal choice? The answer is shown in Figure 29.7. Dougal's goal is to maximize his utility, which he does by maximizing $z$. His optimal choice is located at point $E$ in the figure. It is given by the familiar tangency condition in which the slope of his budget line $DG$ equals the slope of his highest attainable isoquant, $z^*$. As shown, he chooses $x_m^*$ market goods and $x_h^*$ home-produced goods.

**Comparative Advantage.** Let us now turn to the subject matter of this section: marriage. Suppose that Dougal meets Betsy ($B$), and that after a while they decide to get married. What are the gains, if any, that accrue from their union? To keep the analysis simple, we assume that all of the features of Model 29.2 are identical for both Betsy and Dougal except that Betsy’s market wage is $w_B$, and her productivity at home is $v_B$. We also impose Assumption 29.2.

**ASSUMPTION 29.2**

**Betsy’s Abilities**

(a) Absolute advantage: $w > w_B$ and $v_B > v$

(b) Comparative advantage: $w/v > w_B/v_B$.

According to Assumption 29.2a, Dougal has an **absolute advantage** working for pay $w > w_B$, and Betsy has an **absolute advantage** in home production $v_B > v$. Part (a) of the assumption immediately implies part (b), which says that Dougal has a **comparative advantage** over Betsy in market work (or equivalently that Betsy has a comparative advantage in home work).

The essence of comparative advantage is that it determines the opportunity cost of market-produced goods in terms of home-produced goods (and vice versa). To see why this is so, suppose the facts are as follows: $w = 12$, $v = 3$, $w_B = 10$, and $v_B = 5$. (It is easily checked that these numbers satisfy the conditions set out in Assumption 29.2.)

Now suppose that Dougal attempts to increase $x_h$ by exactly $1$ through devoting more of his time to home production and (as a corollary) less of his time to market work. To produce an extra $1$ of $x_h$, he must devote $1/v = 1/3$ hour to home production. Since he is paid $w = 12$ per hour, this change reduces $x_m$ by $12 \times (1/3) = 4 = (w/v)$. Therefore, for Dougal, each additional $1$ of $x_h$ **costs** the family $4$ worth of $x_m$. Performing precisely the same calculations...
for Betsy shows that $2 = $10 \times (1/5) = \left(\frac{w_B}{v_B}\right)$. It follows that the same $1$ increase in $x_h$ costs the family only $2$ worth of $x_m$. This difference reflects—and is the essence of—Betsy’s comparative advantage in home production.

The Joint Opportunity Set

The next goal is to determine the combined opportunities that are available to Betsy and Dougal after they marry. This is done in Figure 29.8. Dougal and Betsy’s individual budget sets are represented, respectively, by the lines $DG$ and $BY$. Dougal’s comparative advantage in market work is captured by the fact that the slope of his budget line is steeper (in absolute value) than Betsy’s. Their different absolute advantages are captured by the different positions of the intersection points along the two axes. In particular, point $D$ lies above $B$, and point $Y$ lies to the right of $G$. Their combined opportunities are represented by the line $FNH$, which is constructed in four steps.

First, notice that if Betsy and Dougal choose to specialize in home production, then they can obtain $OH = OG + OY$ worth of home produced goods. Second, for similar reasons, if they choose to specialize in market work, then they can obtain $OF = OB + OD$ worth of market goods. Third, assume that Dougal and Betsy are initially located at point $H$, where they are completely specialized in home production activities. Suppose that they decide to lower $x_h$ by $1$, and use the time they free up to obtain some of the market good. It is easy to see that it is Dougal who should do the lowering. The reason is that he has the comparative advantage in market work, and hence gets the greatest bang for the buck for his efforts. Yet, what is true for $1$ is true for all of Dougal’s housework capabilities. In other words, as $x_h$ is gradually lowered from point $H$, it is optimal for Dougal to exclusively work for pay in the marketplace.

This exercise leads to the segment of the opportunity set $NH$. The fourth and final step recognizes that once point $N$ is reached then Dougal is devoting all of his time to market work and Betsy is devoting all of her time to home production: they are completely specialized. Starting from this point, to increase $x_m$ even further it is then necessary for Betsy to enter the workplace; Dougal is already working flat out. This leads to the portion of the opportunity set $FN$. 

![Figure 29.8 Combining Dougal and Betsy’s Opportunity Sets](image)
It is easy to work backward from points on the frontier $FNH$ to determine what precisely each party is up to. For example, at point $Q$, Dougal specializes in market work, whereas Betsy splits her time between the two activities. Her contribution to each of them is depicted at the corresponding point $Q'$ on the triangle $OBY$.

**The Gains from Specialization.** Let us now turn from opportunities to choices. Figure 29.9 depicts two distinct possible opportunity sets $FNH$ that might be available to Betsy and Dougal. In Figure 29.9a they enjoy a large comparative advantage from specialization because the slopes of their individual opportunity sets differ greatly. In panel (b), the gain is quite small for similar but opposite reasons. In each case, Betsy and Dougal seek to maximize the value of the basic commodity, $z$.

The highest attainable isoquant, $z^*$, is located at point $N$ in each of the panels of Figure 29.9. Notice that Dougal specializes in market work and Betsy specializes in home production. This, of course, is the economic representation of the behavior of the traditional family. The main message captured by Figure 29.9, however, is that it establishes that the economic gains, $g$, from their marital union hinges on comparative advantage benefits made possible by the division of their labor.

To see why this is so, suppose they do not get married. They can then each produce $z_0$ of the basic commodity, as shown at point $Q$ in both panels of Figure 29.9. Hence, as two single persons, their combined output of the basic commodity is $2 \cdot z_0$, which is represented at point $P$. The convenient CRS assumption implies that the distance $OP$ is twice the distance $OQ$. It is then readily seen that
the gains from marriage are $g = z^* - 2 \cdot z_0$, which is the amount of $z$ they generate as a couple ($z^*$) minus the amount they would generate were they two single persons ($2 \cdot z_0$).

In the context of Figure 29.9, the marital gain $g$, equals the distance $PN$. It is readily seen that the gain is much greater in panel (a), where there is a considerable difference in their skills, than in (b), where their skills are very similar. In a nutshell, we have derived an economic foundation for the well known maxim: *opposites attract*.

**Joint Labor-Supply Decisions.** One of the primary insights offered by the marriage model is that it suggests that each partner’s labor-supply decisions are inexorably bound together. Figure 29.10 depicts the outcome of two comparative static exercises. In each case, Betsy and Dougal initially choose point $N$ on the frontier $FNH$, where Dougal works full time and Betsy is a homemaker.

In the absence of their union, then both Betsy and Dougal would split their time between market work and home production. Marriage, however, allows them to realize the gains accruing from specialization and the division of their labor.

Figure 29.10a depicts the effects of an increase in Betsy’s wage. As indicated, this causes her individual opportunity set to pivot out from $BY$ to $B'Y$. In turn, this causes their joint opportunity set to expand to $F'NH$. Notice that the couple’s optimal response to the increase in the wage is that Besty begins to participate in the labor market, reducing her home production activities in the process. (The optimal choice shifts from point $N$ to $P$.) This result is of fundamental
importance: it suggests that the dramatic increase in female labor-force participation rates, witnessed over the past 50 years or so, might have resulted from the increase in female earnings and employment opportunities over the period.22

Panel (b) of the figure depicts the effects of an increase in Betsy’s home productivity. This might reflect technological advances at home—such as the widespread use of the dishwasher, the microwave, and the washing machine. As indicated, this change expands Betsy’s individual opportunity set from \( BY \) to \( BY' \), and the couple’s joint opportunity set to \( FN'H' \). The couple’s optimal choice shifts from point \( N \) to point \( P \), where once again Betsy is induced to participate in the formal labor market.

As for Dougal, in this simple framework, his labor supply remains unchanged after Betsy joins the labor force. Nevertheless, richer models do admit interesting joint or cross effects. For example, contrary to our current assumptions, Dougal might respond to the changes depicted in Figure 29.10 by adjusting his leisure time and hence the number of hours he works. One possibility is that, because of the income effect, he might respond to the increase in the family’s overall well-being by reducing the number of hours he works.

Another possibility is that he might actually increase his work hours. This might arise if, for example, the utility he derives from leisure is predicated on spending time with Betsy. The fact that she is now at work (i.e., not at home) may lead him to reduce his leisure time and work longer hours. Therefore, the signs of these cross effects are theoretically ambiguous and they must be determined through careful empirical analysis.

The Evidence

In a rich study, Lundberg (1988) examines joint labor-supply decisions within the family and uncovers strong interaction effects among those that have small children. (In particular, she finds an increase in the earnings of one partner reduces the hours worked by the other).

Juhn and Murphy (1997) have also estimated the size of these cross effects. They note that, over the past 30 years or so, there has been a small increase in the earnings of men, a dramatic increase in female participation rates, and a reduction in male participation rates. One explanation for the observed changes in participation rates is grounded in the joint familial responses considered in this section. For example, married women may have increased their labor supply to compensate for the dismal earnings growth of their husbands over the period. Likewise, married men may have responded to their wives’ increased labor-market earnings by reducing the hours they work (and enjoying more leisure time).

To accommodate these possibilities, Juhn and Murphy (1997) carefully control for the behavior of different families stratified by the husband’s wage. They find that, although the decline in male employment and earnings were greatest for low-wage men, employment and earnings gains were greatest for the wives
of middle-wage and high-wage men. As a result, their evidence casts doubt on the hypothesis that the decrease in male labor supply and the increase in female labor supply are just different sides of the same coin.\textsuperscript{23} Despite this negative finding, the joint-labor-supply model is still essential for understanding the labor-supply choices of married women.

**The Marriage Premium**

Cross-sectional evidence consistently shows that the earnings of married men exceed the earnings of men who are currently not married. The size of the resulting *marriage premium* is striking: ranging from 10\% to 50\% of earnings. Economists have advanced two main hypotheses to account for this premium:\textsuperscript{24}

- **[H1] Causal** Marriage makes men more productive because it allows them to specialize in market work, which increases the returns to their human-capital investments.
- **[H2] Spurious** There are certain characteristics, not observed by the econometrician, that both make men more productive in the labor market and more attractive in the marriage market.

Although both of these hypotheses can potentially account for the observed marriage premium, they differ in a fundamental way: according to **H1**, the relationship between marriage and earnings is *causal*, whereas under **H2** it is *spurious*. The distinction is important. Under **H1**, the average man might be expected to (eventually) enjoy an increase in earnings of between 10\% and 50\% because he marries. In contrast, under **H2**, he would expect to see no earnings increase resulting from his marriage per se.

**The Evidence.** There have been a large number of studies that have sought to empirically distinguish these two hypotheses.\textsuperscript{25} Yet, since unmeasured differences are (well) unmeasured this task has proven to be no simple matter and there remains a heated disagreement concerning the origins of the marriage premium.

For example, Antonovics and Town (2004) use data drawn from identical twins to control for unobserved ability differences. The idea is that because a married man and his unmarried twin brother possess identical genetics (and so abilities), it should be possible to use these workers to isolate the marriage premium. Their baseline findings suggest a huge *causal* marriage premium—on the order of 27\% of earnings. Most interesting, they find that unmeasured ability differences play only a minor role and also find little evidence that wage premium stems from household specialization.\textsuperscript{26}

Gray (1997) notes that the marriage premium declined by 40\% during the 1980s. His results suggest that—as predicted by **H1**—much of the decline is attributable to a reduction in the average degree of specialization among
households. Finally, Cornwell and Rupert (1997) find strong support for H2: the marriage premium results from unobservable individual effects. An interesting aspect of their study is that they use data that tracks individual workers over an extended period of time. As a result, they have access to observations on the earnings of unmarried men who do subsequently marry. They find that the earnings of the (currently unmarried) members of this latter group are about the same as the earnings of those men who are currently married, which provides additional support for H2. Thus the evidence runs the complete gamut of possibilities: from strong support for H1 to strong support for H2. Further empirical work will no doubt shed light on this interesting issue.

29.4 Fertility

The fertility rate is a direct determinant of the overall size of the population and hence the long-run supply of labor. Furthermore, the labor-force participation decisions of current participants—especially women—are closely bound together with their fertility choices. It follows that explaining the proximate causes of the observed changes in fertility rates is essential for understanding the supply of labor in general and women’s labor-supply decisions in particular.

Figure 29.11 depicts the behavior of the U.S. fertility rate, measured by the number of births per 1,000 women aged 15–44, for the period 1800–1990. The secular decrease in the fertility rate is readily apparent, as is the bulge that corresponds to the baby boom that occurred between 1937 and 1971.

As is evident from the figure, the aggregate fertility rate is evidently not the outcome of some capricious random process; rather, it varies systematically over time, presumably in response to changes in certain social and economic causal factors. The primary goal of the economic analysis of fertility is to identify what these causal factors might be. Let’s begin with one of the best known theories of all: the Malthusian model of population growth.

The Malthusian Model of Fertility

In 1798 the Reverend Thomas Malthus published his revolutionary tract, An Essay on the Principle of Population. In it, he identified the following three core principles that govern the population growth rate:
(1) Population is necessarily limited by the means of subsistence. (2) Population invariably increases where the means of subsistence increase, unless prevented by some very powerful and obvious checks. (3) These checks, and the checks which repress the superior power of population, and keep its effects on a level with the means of subsistence, are all resolvable into moral restraint, vice and misery.30

A Malthusian Framework. For our current purposes, the key point to note is that Malthus advanced a theory in which fertility and mortality rates are endogenous; they respond to economic conditions. Nevertheless, Malthus painted a rather bleak picture of mankind’s prospective well-being. He envisioned a future in which the population would only stop increasing once it reached a point where certain checks were unleashed, which would stymie further population growth. These checks included famine, pestilence, war, and moral restraints, engendered by a world in which people are forced to eke out a subsistence living.

Fortunately, history has not proven to be too kind to Malthus’s central thesis. Nevertheless, his work was revolutionary for the time and the close examination of his thesis shortly will pay important dividends, when we study the modern theory of fertility.

Figure 29.12 depicts the essential features of his argument. In Figure 29.12a, the schedule \( b(w) \) represents the average fertility rate in the overall population \( P \). (Because men cannot bear children, the fertility rate of women is approximately \( 2 \times b \).) As shown, the fertility rate increases with the wage, \( sw \). This captures the Malthusian notion that couples marry earlier and that they engage in more frequent sexual intercourse as their standard of living rises. (Similar, but
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opposite, considerations apply to the effects of a reduction in the wage.) The death rate, \( \delta(w) \), decreases as the wage rises. This reflects the intuitive notion that the quality of life—and health more generally—increase with average incomes.

**The Equilibrium.** Starting with some given population, \( P \), the change in the population over a given interval of time, denoted \( \Delta P \), is \( \Delta P = \text{births} - \text{deaths} \). If, for simplicity, we assume that a constant fraction \( b \) of the population gives birth to one child during the period and a constant fraction, \( \delta \), of the population dies, then:

\[
\Delta P = b(w) \cdot P - \delta(w) \cdot P = (b(w) - \delta(w)) \cdot P \quad (29.6)
\]

It is immediate from this formulation that if \( b(w) > \delta(w) \), then the population is increasing over time because births exceed deaths. Similar but opposite remarks apply if \( b < \delta \).

Notice, however, that if \( b(w) = \delta(w) \), then the size of the population \( P \) is stationary: it remains constant over time. This outcome is depicted in Figure 29.12 at point \( E \), where \( w = w^*_0 \) and \( b^* = \delta^* \). For any wage that exceeds \( w^* \) (see, for example, \( w^*_1 \)) the population grows over time. Similar but opposite remarks apply to any wage that is less than \( w^*_1 \). This observation is important for the construction of Figure 29.12b, which depicts the outcome in the labor market.

The labor-demand schedule, \( D(w) \), depicted in panel (b) is entirely standard. Its negative slope is symptomatic of diminishing marginal returns to labor. As for the labor-supply curve, this too is standard—but with one slight twist. It is that the supply of labor is explicitly shown to depend on the size of the population, \( P \), which is, of course, plausible enough.

The population and the labor market are initially in equilibrium at point \( E \) in both panels of the figure. The reason is that the equilibrium wage \( w^*_0 \) possesses the properties that \( b^* = \delta^* \); this indicates that the population \( P_0 \) (and hence the supply of labor) is constant and the demand for labor equals the supply of labor (implying there is no tendency for the wage to change over time). In other words, after the wage settles down at \( w^*_0 \), there is no tendency for any further change.

The figure also depicts the effects of a technology shock, such as a major innovation, that shifts the labor-demand schedule from \( D(w) \) to \( D(w)' \). Since the size of the population—and hence the labor force—is fixed in the short run, the increase in the demand for labor leads to a shortage at the initial equilibrium wage \( w^*_0 \). This shortage causes the wage to quickly rise from \( w^*_0 \) to \( w^*_1 \) (see point \( F \)), so as to realign the supply of labor with its demand. Yet, there is more to the story. The resulting increase in wages and earnings induces young couples to throw caution to the wind, leading to an increase in the birth rate (see point \( G \)). Furthermore, the increase in their real incomes and the concomitant improvement in the overall standard of living reduces the death rate (see point \( H \)). These forces unleash a fundamental imbalance in the long-run properties of the economy: the birth rate exceeds the death rate, which implies that the population grows over time.
As shown in panel (b), the effect of the increase in the population is to gradually shift the labor supply to the right. As it does so, the economy moves along the new labor-demand schedule $D'(w)$, which leads to a gradual reduction in the wage. Eventually, equilibrium is restored at point $E'$. The wage, once again, returns to its initial value $w_0^*$, and the equilibrium size of the population increases from $P_0$ to $P_1$.

It follows that in the Malthusian framework, the technological improvement—which could have increased per capita incomes—is entirely dissipated by the induced increase in the size of the population.

Malthus’s essay was revolutionary for the time. His most important contribution was emphasizing that fertility and mortality rates are not simply given but are determined endogenously within the economic system. Nevertheless, as just noted, much to everyone’s relief, history has not been too kind to the main predictions of the Malthusian model. Real incomes have witnessed a dramatic increase over the past two centuries, rather than hovering around some miserable subsistence level, $w_0^*$. Moreover, as shown in Figure 29.11, despite the secular increase in real incomes, the fertility rate has decreased over time, not increased.

**The Beckerian Model**

In a fundamental contribution, Gary Becker (1960) revolutionized our understanding of the determinants of fertility rates. Although Becker maintained the Malthusian assumption of a positive ceteris paribus relationship between fertility and income, he stressed the importance of (properly) accounting for the costs of raising children. Thus Becker (1988) argues

Does a negative relation between fertility and per capita income imply that children are an “inferior” good (to use the economist’s infelicitous language)? The answer is no because the cost of rearing children increases when . . . per capita income rises since wage rates and the value of parents’ time spent on children rise.32

From this vantage point, women’s wages and fertility rates are not only related, but the rapid growth in the female wage rate, over the last 100 years or so, is potentially responsible for the observed decline in the overall fertility rate depicted in Figure 29.11.

**The Economic Environment.** Model 29.3 is designed to explain the link between women’s labor-market opportunities and their fertility decisions:

**MODEL 29.3**

**Becker’s Model of Fertility**

(a) The household’s utility depends positively on its consumption $c$, and the number of children $n$, according to $u = u(c, n)$. 

(b) Direct outlays on caring for each child (food, clothing and so on) equal $p_0$. The mother must spend $h_0$ hours looking after each child.

(c) The father works full time and accrues an income of $Y$. The mother spends $m = T - n \cdot h_0$ hours working for pay at the constant hourly wage $w$. The maximum number of children she can bear is $n_0 = T / h_0$.

As stressed by Becker, in practice, families care about both the quantity and quality of children. For simplicity, we ignore this complication by assuming, in part 29.3a, that parents care about only the number of children and their own consumption levels. Although part (b) is unrealistic—in practice, the average costs of looking after each child decrease with the number of children in the family (for example, the elder children can look after the younger ones)—it is relatively benign in the analysis that follows.

**Analysis.** The principal features of the model are depicted in Figure 29.13. The vertical line $n_0$ represents the maximum number of children that the mother can bear over her lifetime. The line $ABC$ depicts the household’s budget set, which determines the trade-off between the parent’s consumption, $c$, and the number of children, $n$.

The budget line is derived as follows. The family’s combined income equals the father and mother’s joint earnings: $(Y + w \cdot m)$. Since, $m = T - n \cdot h_0$, it follows that $(Y + w \cdot m) = Y + w \cdot (T - n \cdot h_0)$.

As for expenditures, the mother and father consume goods worth $c$ and spend $p_0 \cdot n$ on their children. Consequently,

$$c + p_0 \cdot n = Y + w \cdot (T - n \cdot h_0) \quad (29.7)$$

Rearranging this later equation yields:

$$c + (p_0 + h_0 \cdot w) \cdot n = Y + w \cdot T \quad (29.8)$$

The right-hand side of this expression is the family’s *full income*. It represents the amount available to them if they have no children.

The term $(p_0 + h_0 \cdot w)$ is the true cost of each child. Notice that it includes the direct outlays on each child, $p_0$, and the value of the mother’s forgone earnings, $w \cdot h_0$. This feature of the model is central because it forges a link between the mother’s wage and the costs of raising children.

At point $A$ in the figure, given that $n = 0$, the mother spends all of her time working for pay, implying that $c = Y + w \cdot T$. In con-
At point $B$, the mother spends all of her time looking after her $n_0$ children (i.e., she spends none of it working for pay), implying that total parental consumption is $$(Y - n_0 \cdot p_0),$$ which we assume, in the interests of simplicity, is strictly positive.

The slope of the budget line is $- (p_0 + h_0 \cdot w)$ because each additional child calls for outlays of $p_0$, and reduces the mother’s income by $w \cdot h_0$. The family picks a level of consumption, $c$, and a number of children, $n$, to maximize its utility $u(c, n)$—subject to the budget constrained $ABC$. As shown, this occurs at point $E$, where the indifference curve $u^*$ is tangential to the budget line $ABC$.

**The Effect of an Increase in the Mother’s Wage.** Figure 29.13 also depicts the effect of an increase in the mother’s wage, from $w$ to $w'$. As shown, this causes the budget line to pivot out around point $B$, to $A'B$. The reason the line pivots around $B$ is that, here, the mother spends all of her time looking after her children, so does not participate in the labor force. Obviously, a nonparticipant still has zero earnings even if the wage rises. The increase in the mother’s wage raises the opportunity cost of bearing additional children.

Notice that, in the case illustrated, the family responds to the wage increase by having fewer children. The figure breaks down the movement from $E$ to $E'$ into its constituent income and substitution effects.

As shown by the movement from $E$ to $I$, children are normal goods (i.e., the demand for them increases in the move from $E$ to $I$). Nevertheless, the substitution effect (depicted by the movement from $I$ to $E'$) reduces the fertility rate, reflecting the increased opportunity cost of having additional children because of the mother’s higher wage.

In the case depicted in Figure 29.13, the substitution effect dominates the income effect, so the increase in the mother's wage reduces the family's demand for children and hence her fertility rate.35 This is one of the major insights of the Beckerian approach: it says that the increase in female earnings (more generally employment opportunities) may explain the decrease in fertility rates and the increase in female labor supply.

**29.5 Fertility and Labor Supply**

The major cause of the increased participation of married women during the twentieth century appears to be the increased earning power of married women as Western economies developed. . . . The growth in their earning power raised the forgone value of their time spent at childcare and other household activities, which reduced the demand for children and encouraged a substitution away from parental, especially mothers', time.36

A basic insight of the fertility model is that fertility choices and familial labor-supply decisions are jointly determined. As a result, changes in home production
The Family

Capabilities, contraceptive technologies, and labor-market opportunities are liable to affect both fertility rates and labor supply—in particular, female labor supply.

The Baby Boom

In an interesting study, Greenwood, Seshadri, and Vandenbroucke (2005) attempt to determine the proximate causes of the baby boom—and subsequent bust (Figure 29.11). According to conventional wisdom, the baby boom was a product of the Great Depression and the onset of World War II (WWII). In particular, it is commonly argued that fertility rates declined because of economic hardship and a pessimistic view of the future. After the war ended, however, fertility rates increased because of renewed economic vigor and a sense of optimism.

Nevertheless, as the authors astutely point out, the conventional wisdom suffers from several fatal weaknesses. First, in the United States, the baby boom began in the 1930s, before the outbreak of WWII. Second, countries such as Ireland and Switzerland, which were neutral during WWII, also witnessed a baby boom. Finally, the cohort of women who had the greatest impact on fertility rates during the baby boom were between 20 and 24 years of age. They were not even born during the Great Depression and were only 9 years old at the end of the hostilities. In other words, they were too young to be directly affected by these events.

After launching a serious challenge to the conventional view, the authors construct an interesting economic model designed to illuminate the observed changes in fertility in general, and the baby boom in particular. The basic gist of their approach is that they integrate a household production model with a Beckerian fertility model, of the sort described earlier in this chapter. They attribute the secular decline in fertility rates—à la Becker—to the inexorable growth in real wages that increased the opportunity cost of having children.

As for the baby boom itself, Greenwood, Seshadri, and Vandenbroucke (2005) argue that it resulted from an atypical burst in the productivity of the household sector during the mid part of the 20th century:

The fully automated washing machine did not appear until the 1930s. . . . Refrigerators entered household service in the 1920s. They replaced the icebox. . . . Frozen foods, which changed the way of life, appeared only in the early 1930s and began to take off in the 1940s. Between 1929 and 1975 the household appliance-to-GDP ratio increased by a factor of 2.5.37

Crucially, the increase in household productivity led to a relative decline in the cost of having children. They argue that it was this burst of household productivity that led to the baby boom. As for the bust, this occurred because of the inexorable rise in wages, which raised the opportunity cost of having children.
The Pill
According to the fertility model just described, families optimally choose the number of children to have. As a corollary, they must also choose an appropriate method of family planning. Economic Application 29.2 discusses some recent interesting work that has examined the effects of changes in the technology of contraception.

Fertility and Female Labor Supply
A basic tenet of the endogenous theory of fertility is that a woman’s fertility choices and her labor-supply decisions are inexorably bound together. This observation is important on several counts. First, policy interventions targeted at improving the well-being of women—such as subsidized childcare and maternity leave—may affect both their fertility and labor-supply decisions.38 Second, as observed at several points in this text, an important goal of economic analysis is explaining one of the most striking changes in contemporary U.S. social history: the dramatic increase, over the past 50 years or so, in female labor-force participation rates. Most interesting, since the early 1970s, there has also been a striking decrease in fertility rates (Figure 29.11). This hints at the possibility that the two events may be related. Consequently, it is important for economists to quantify the causal effect of fertility on female labor supply. By doing so, they can then predict the labor-market consequences of policies that may affect the overall fertility rate. Let’s begin by analyzing a topic that has attracted considerable attention: the causes and consequences of teenage childbearing.

Teenage Fertility Rates. After a period of relative tranquility, the rate of teenage childbearing soared during the latter part of the 1980s. The rate increased by 20%—from about 50 births per 1,000 teenagers, aged 14–17, in 1985 to almost 60 in 1990.39

Understanding the proximate causes of childbearing among teens is often deemed to be an issue of national importance. The reason is that there is a very strong statistical association between the age at which the mother has her first child and an assortment of socioeconomic indicators of her subsequent well-being. Young mothers tend to have low educational attainment levels, are more likely to be unmarried, have low earnings, and are more likely to be on welfare.40 These observations immediately raise the following two questions: why are teenage fertility rates so high (in view of the dismal labor-market outcomes), and what is the true causal impact of a child on a teenage mother’s subsequent economic opportunities?

As stressed by Lundberg and Plotnick (1995), the prevailing view among policy makers is that the answer to the first question either rests with imperfect information or irrational behavior. Accordingly, the thrust of recent policy initiatives
has been directed toward bridging this supposed informational gap by providing better sex education and establishing both family life and self-esteem programs.

**ECONOMIC APPLICATION 29.2**

**The Power of the Pill**

Before the introduction of the first birth control pill, which was approved by the Food and Drug Administration (FDA) in 1960, family planning was often a rather hit-or-miss affair. The pill changed all of this. It is cheap; does not interfere with sexual intercourse; is highly effective if used appropriately; and is reversible. As a result, the pill provided women with unprecedented control over their own fecundity.

In an interesting study, Goldin and Katz (2002) explore the effects of the pill on women's career choices. The basic theme they explore is grounded in the observations that (1) pursuing a professional career entails costly and time-consuming investments in human capital, (2) the returns to these investments accrue later in the life cycle through concomitant higher earnings, and (3) an unplanned pregnancy during the human-capital accumulation stage or early in the woman's career can substantially reduce the returns to her human-capital investments.

Drawing together the threads of the argument, the introduction of the pill allowed women to exert much greater control in stage (3), which increased the expected benefits of pursuing a professional career (2) relative to the costs (1). In turn, this encouraged greater numbers of women to pursue professional careers. For example, among the cohorts of women born in the 1950s—and hence those most liable to be affected by the pill—they report that in 1970 only 10% of first-year law students were women; by 1980 this number had increased to a remarkable 36%.

Although a precise discussion of their empirical strategy is beyond the scope of this text, the basic gist of their approach (and the others described later) is that they use statewide variations in legal restrictions on the availability of the pill to younger women. To see what is afoot, suppose that, for illustrative purposes, between 1968 and 1969 women are granted access to the pill in Connecticut (CT), but not in neighboring Massachusetts (MA). If, in 1969, we observe a sudden subsequent burst of young women enrolling in college in CT, but not in MA, this would provide some evidence indicating that the pill was responsible. By exploiting data on many states and in many years, the authors use this strategy to isolate the effects of the pill. Their findings are striking. They suggest that about 1.7 percentage points—or about one third—of the five percentage point increase in women's professional employment between 1970 and 1990, is attributable to the pill. (Most interesting, the legalization of abortion had a similar quantitative impact.)

Bailey (2006) revisits the issue, examining a much wider group of women. She finds that legal access to birth control led to a pronounced reduction in the likeli-
hood of having a child before the age of 22 (by 14%–18%), an increase in female labor-force participation (by about 8%, for those in the 26–30 age group), and an increase in the average hours worked by women (by approximately 68 hours in the 26–30 age group).

In related work, Hock (2007) finds that access to the pill not only increased the enrollment rate of college-age women (by almost 5 percentage points) but also increased the completion rate (by about one percentage point). He also finds interesting cross effects, in which male schooling options—in particular college completion rates—were favorably affected by the pill.

Nevertheless, an alternative economic viewpoint is that premarital childbearing represents an optimal response by a teenager within her economic environment. As suggested by the Beckerian approach to fertility, a significant cost of having a child is the earnings the mother forgoes. As an immediate corollary, those mothers who either have low abilities or (because of discrimination) few employment opportunities are more likely to bear children because they have relatively low fertility costs. (Moreover, mothers are often entitled to welfare benefits, which also encourages childbearing at the margin.)

In their rich study, Lundberg and Plotnick (1995) carefully model the sequence of yes–no decisions (premarital pregnancy, abortion, marriage) that ultimately result in a premarital birth. Their evidence provides strong support for the economic approach: among white adolescents, welfare benefits, abortion options, and family planning policy variables are all significant causal factors in explaining premarital births. (However, they find that for Black adolescents these policy variables are statistically insignificant.)

Providing a satisfactory answer to the second question just posed—what is the causal impact of a child on a teenage mother’s subsequent economic opportunities?—is no simple matter. The reason is that the observed correlations are consistent with (at least) two distinct hypotheses:

- **[H1] Causal effect** There is a causal effect of childbearing on subsequent economic opportunities.
- **[H2] Spurious correlation** The observed correlations are spurious and are driven by unobserved heterogeneity.

The mechanism underlying **H1** is simple enough: it is difficult for a young mother to accumulate human capital and acquire valuable work experience because looking after a young child is extremely time-consuming. Her resulting lack of skills adversely affects her subsequent labor-market prospects.

Although the story underlying **H2** is also simple enough, it is less obvious. The idea is that certain factors (unobserved by the economist/policy maker) explain both why some teens become mothers and their subsequent poor labor-market outcomes. For example, a teen may be reluctant to finish high school either because she has an extremely low innate ability (high cost) or because
(say) discrimination limits her employment opportunities (low benefits). In turn, these factors reduce the relative cost to her of having a child, which increases the likelihood that she will do so. Thus, in this case, causation runs from ability/opportunities to labor-market outcomes and fertility choices.

It is important to stress that the distinction between $H_1$ and $H_2$ is a profound one. According to $H_1$, a policy that successfully reduces the teenage fertility rate would improve the (labor market) prospects of those women it deterred from bearing children, but according to $H_2$ it would not.

Currently, there is a heated debate on the relative importance of $H_1$ and $H_2$ in explaining the evidence. For example, Ribar (1994), and Hotz, McElroy, and Sanders (2005) adduce evidence that strongly supports the importance of unobserved heterogeneity $H_2$.41 The recent study by Hotz, McElroy, and Sanders (2005) is notable because it documents enormous adaptability over the mother’s life cycle. In particular, although teen mothers are less likely to obtain a high-school diploma, they tend to make up for this by acquiring additional human capital when they are older. They find, “[T]een mothers may actually achieve higher levels of earnings over their adult lives than if they had postponed motherhood.”42 In contrast, Klepinger, Lundberg, and Plotnick (1999) uncover evidence that supports $H_1$, indicating that policies that reduce teen fertility rates do promote the well-being of young mothers.

**Children and Female Labor Supply.** As emphasized at various points in this chapter, the past 50 years witnessed both a striking decrease in the fertility rate and a pronounced increase in women’s labor-force participation rates. Their simultaneous occurrence suggests that they may be related in some way. Consequently, it is natural to seek answers to the following questions: what are the effects of an additional child on a woman’s labor-market options? On her supply of labor? These are ponderous questions indeed; however, providing satisfactory answers to them is no simple matter.

The reason is that, according to the theory developed in this chapter, both fertility and labor-supply decisions are jointly determined. It follows that the reduction in the fertility rate may have little to do with the increase in female participation. Instead, both the changes in fertility and participation may have been driven by other developments that occurred over the period. For example, Angrist and Evans (1998) report that,

> The probability of having more than two children for women aged 21–35 with at least two children fell by 16.5 percentage points between 1930 and 1990, a drop of about 30 percent. At the same time, labor-force participation rates rose by 21.8 percentage points, a 49-percent increase.43

Nevertheless, they show, using sophisticated econometric methods, that declining fertility accounts for only two percentage points of the increase in employment. Thus “Even though childbearing clearly affects labor supply, the increase
in female labor-force participation has been so large that declining fertility can explain only a small fraction of the overall change.44

**Subsidized Childcare and Maternity Leave**

Inadequate maternity-leave provisions and childcare support are often argued to represent significant impediments to both women’s labor force participation and their overall well-being.45 Without maternity leave, the decision to bear a child may result in the loss of her current job and lead to the loss of valuable specific human capital investments. Likewise, inadequate childcare may force her to remain at home to look after her children and, in the process, her skills may atrophy because of the use-it-or-lose-it principle.

**Childcare.** To determine the efficacy of using tax dollars to subsidize childcare programs, it is important to understand the likely effects of doing so on the supply of (female) labor. Fortunately, it is possible to analyze the main issues using the simple static neoclassical labor-supply model developed earlier.

Figure 29.14 depicts what is afoot. Before the introduction of the childcare subsidy, the mother’s budget line is represented by the kinked budget line $BQP$, which (and this is most important) includes point $P$ itself.

The distance $PQ = $k$_0$, depicted in Figure 29.14, represents the fixed cost of childcare; it is incurred regardless of how much care is actually provided.46

The idea is that by setting $\ell = T$ (and not working), a mother can look after her children at home, avoid the child day-care cost $k$, and consume $A_0$ (see point $P$). If, however, she works, then she incurs the childcare cost $\$k$, which explains the portion of the budget line $BQ$. Notice that the individual in question maximizes her utility at point $E$ itself. This means that initially she is a nonparticipant. Intuitively, the fixed cost of care is so high—relative to the benefits from working—that it is optimal for her to remain at home and to look after her children there.

Now consider the effect of a childcare subsidy that fully covers the fixed cost $\$k_0$. This leads to the new budget line $B'PQ$. As shown, the effect of the program is to iron out the kink in her budget set. Moreover, it is now optimal for her to participate in the labor market (see points $E$ to $E'$). It follows the childcare subsidy encourages participation by those who are initially nonparticipants. (Participation is not, however,
guaranteed. It is perfectly conceivable that another individual—not illustrated—may have indifference curves that are so steep, that choosing point $E$ remains optimal.)

The effect of subsidized childcare on the behavior of a current participant is quite different. As shown, she initially chooses point $F$ on the original budget line $BQP$ (to avoid clutter, her indifference curves are not illustrated). Notice that for this person, the childcare subsidy shifts her budget line to $B'PQ$, and, in the process, unleashes a pure wealth effect—her budget line is vertically displaced by the amount $k_0$. Yet, since leisure is a normal good, this induces her to supply less labor!

For completeness, it is instructive to also consider the case (not illustrated) in which there is no fixed cost, $k_0$, but in which there is an hourly fee $sk$ (which results in a variable cost). In this case, the woman’s net hourly wage is $(w - k)$. If the government provides a childcare subsidy that covers the childcare cost, then the hourly wage rises to $w$. As we have seen many times before, for labor force participants this unleashes both a substitution and an income effect. The former tends to increase the supply of hours, and the latter effect tends to reduce them. The overall effect depends upon their relative strengths. For nonparticipants, the income effect is zero. This leaves only the substitution effect, which encourages participation in the labor force. These important findings are summarized in Major Result 29.1.

The evidence suggests that childcare subsidies exert a strong effect on women’s labor supply. In a comprehensive study, Ribar (1992) examines the familial demand for childcare and the effect of childcare on women’s labor supply.

His baseline finding is that increases in the costs of childcare exert a strong negative effect on female labor participation. Moreover, childcare is costly, with costs ranging between $3K and $5K annually. Most interesting, he finds that the costs of childcare fall disproportionately on the working poor and on single parent families. Whereas nonpoor families who use childcare spend 8% of their income on the service, the working poor are estimated to spend 21% to 25% of their income on it. Finally, just like the case depicted in Figure 29.14, it appears that there is a significant fixed cost element involved in using childcare services. As an immediate corollary, according to Major Result 29.1, subsidized childcare may exert a strong positive effect on the labor-supply decisions of current nonparticipants. This is particularly significant in view of the high rates of poverty (and welfare dependency) among families headed by a single female.

**MAJOR RESULT 29.1**

**The Effects of a Childcare Subsidy**

(a) A childcare subsidy encourages labor-force participation by current nonparticipants whether childcare entails a fixed cost or whether it entails a variable cost.

(b) For current participants, the subsidy reduces their labor supply if the fixed cost dominates and has an ambiguous effect otherwise.
Maternity Leave. The Family Medical Leave Act was signed into law by President Bill Clinton in 1993. The act’s main provision is that it gives mothers, who are employed by eligible firms, the right to take unpaid leave for a period of 12 weeks. The legislation was passed in the belief that the lack of maternity leave protection imposed substantial costs on mothers and their children. On the one hand, those women who decide to remain at home to look after their children might lose their jobs. On the other hand, those women who opted to immediately return to work might jeopardize both their own health and both the health and development of their children. The legislation was designed to address both of these problems.

Nevertheless, analyzing the labor-market effects of maternity leave policies, in general, and those proposals that both increase coverage and provide paid maternity leave, in particular, are extremely complicated undertakings. First, more generous maternity leave may raise the family’s demand for children, which would impose significant costs on employers. This might make employers less inclined to hire women.

Second, maternity leave, whether paid or unpaid, is, in essence, a fringe benefit. Consequently, mandating that employers must provide it, may lead them to respond by reducing other components of their compensation packages.

Finally, Ruhm (1998) investigates the economic consequences of programs offered by several European countries that give families the right to take paid parental leave. His main finding is that although maternity leave raises female employment, it leads to a sizable 2%–3% reduction in their earnings relative to men.

**SUMMARY**

- Estimates suggest that the value of home production activities in the United States is enormous: amounting to between a third and a half of measured GDP.
- In richer models of labor supply, workers divide their time between working for pay, enjoying leisure, and home production activities.
- A basic tenet of the home production approach is that market goods, $x_m$, home produced goods $x_h$, and leisure $\ell$, are inputs that are used to produce a basic commodity $z$, from which individuals ultimately derive their utility.
- One of the central insights of the home production model is that, in addition to the income effect, an increase in the market wage unleashes two substitution effects: individuals substitute away from both leisure and home production.
- If the income effect and the leisure-substitution effect offset each other, then an increase in the wage would have little effect on leisure. It may, however, induce a huge switch from housework to market work.
- Because of comparative advantage differences, a marital union allows two partners to enjoy
the gains from trade that result from specialization and the division of labor.

- According to the Malthusian model, the population increases until consumption per capita is driven down to its subsistence level. In contrast, the Becker’s fertility model stresses that families care about both their consumption level and the quantity (and the quality) of their children.

PROBLEMS

P1. What are the primary limitations of the simple static neoclassical model of labor supply? What are its principal strengths?

P2. Give some examples of home production activities. Outline how technological advances have affected them.

P3. Use the home production framework to examine the effect upon an individual’s labor supply resulting from technological advances in the home production sector.

P4. What are the major macroeconomic insights of the home production approach?

P5. Suppose that an individual allocates his time between paid work (m), home production (h), and leisure (l) according to l + m + h = T = 24. He possesses the home production technology \( x_h = K \cdot \sqrt{h} \) and can purchase \( x_m = w \cdot m \) market goods, where \$w is the wage (he has zero savings, \( A_0 = 0 \)). Assume that his utility is \( u = x \cdot l \), which depends on his leisure and \( x = x_m + x_h \)—the combined value of market procured and home produced goods.

(a) What is the outcome if (i) \( K = 0 \) and \( w = 4 \), and (ii) \( K = 24 \) and \( w = 0 \)?
(b) How does he behave if \( K = 24 \) and \( w = 4 \)?
(c) What happens if \( K = 24 \) and \( w = 6 \)?

P6. The “Wages for Housework” movement has argued that women should be paid for their housework activities. Should they and, if so, how much? What would be the implications of such a scheme? Should single men and women also be paid? (Rosen 1997 offers an insightful discussion of the Swedish system, in which the state pays women to look after the other people’s children.)

P7. It is said that opposites attract, which presumably explains why Betsy married Dougal. Her wage is a handsome \( w_B = $100 \) per hour, and her hourly home productivity is also \( v_B = $100 \). As for Dougal, his hourly wage is a meager \( w_D = $10 \) and his housework capabilities are dreadful, \( v_D = $5 \) per hour. The combined home-produced, \( x_h \), and market-procured, \( x_m \), goods produce a basic commodity \( z = x_h \cdot x_m \).

After sleep, personal care, and leisure, they each have \( T = 10 \) hours of time. How should they allocate it?

P8. What is meant by the marriage premium? What factors might account for it?

P9. Outline the main trends in U.S. fertility rates over the past 100 years or so. What factors might explain these trends?

P10. What happens in the Malthusian model of fertility if there is a reduction in the mortality rate? What are the principal limitations of this model, and why does the Beckerian approach help to resolve them?

P11. Describe some of the policies that might help reduce teenage fertility rates? Why is teenage child-bearing regarded as such a problem?

P12. What are the primary reasons for the startling increase in female labor supply witnessed in the United States over the past 50 years or so?

P13. Analyze the case in which there are both fixed and variable cost components to childcare. Use the framework to analyze the effects of a childcare subsidy on female labor supply. What is the effect on fertility?
NOTES

2. Another problem is that the framework is static (see Chapter 28).
7. See Benhabib, Rogerson, and Wright (1991).
9. Home production may be even more important in less developed economies, where markets are far less extensive than they are in the United States. Juster and Stafford (1991) provide an excellent survey of time used both in the United States and a number of other countries.
11. Juster and Stafford (1991) argue that diaries are far superior to simple questionnaires for eliciting accurate information about how people spend their time.
12. In contrast to the earlier chapters of this book, $h$ now stands for hours of housework, rather than hours of (market) work. The residual time endowment, $T$, refers to the time available to the individual, after he or she performs essential activities such as sleep and personal care.
13. We treat household capital, $k_h$, as exogenously determined rather than modeling how it is chosen by the individual. We also suppress it from $H(\cdot)$ to avoid cluttering the exposition. Needless to say, more advanced models also consider the determination of $k_h$. See, for example, Greenwood and Hercowitz (1991).
14. Clearly, the ceteris paribus part of this statement is essential. Obviously, most of us would prefer that someone else clean our apartment.
15. Thus much better to spend an hour and a half in a quality restaurant than either 5 minutes in a fancy one or 3 hours in a fast-food joint. (Though, admittedly, opinions can differ on this.)
19. There are other benefits from forming a marital union, including consumption insurance and sharing public goods. The former possibility reflects one party’s ability to rely on the other’s income in the event of some misfortune, such as ill health or involuntary job loss. The latter captures the idea that marriage allows two partners to share certain items such as the house, the refrigerator, and heating.
20. Although standard—and used here as a simplifying assumption—it may not always be realistic. For example, Becker (1985) emphasizes that since women have traditionally spent so much time working at home, this may have reduced their ability to exert high levels of effort in the workplace and thus lowered their earnings. In fact, Hersch and Stratton (1997) find that, on average, married women’s housework time is three times greater than men’s and controlling for this difference accounts for a sizable part of the observed male–female wage gap.
21. For convenience only three isoquants are shown; it is important to bear in mind that there is an isoquant that passes through each point.
22. The importance of the increase in female earnings in explaining the growth of female labor-force participation is emphasized in Becker (1981, 1985).

23. In a subsequent related study, Juhn and Kim (1999) examine whether the shift in female labor supply over the past 40 years or so is the smoking gun, explaining the increase in male wage inequality and the decline in the real wages of less skilled males during the 1980s. They find that the evidence does not support this hypothesis. Instead, the wage changes of male workers appear to be driven by shifts in the relative demand for male and female workers.

24. There is even a third hypothesis: employers discriminate in favor of married men. However, for simplicity, we focus on the two presented in the text.

25. Korenman and Neumark (1991) find a huge causal premium of 15%.

26. Hersch and Stratton (2000) also adduce evidence which casts doubt on the specialization hypothesis (H1), since they find that married men spend virtually the same amount of time on home production as single men.

27. See also Chun and Lee (2001), who finds little support for H2 and strong support for H1. In contrast, Loh (1996) finds strong support for H2.

28. Lee (2003) discusses the demographic changes in the United States over the last 200 years.


30. Malthus (1789), Book 1, chapter 2.


33. See, for example, Becker (1973, 1976, 1988).

34. We assume that the number of children, n, is continuous. This is less ridiculous than it might appear at first sight. The reason is that n can be interpreted as the expected number of children who survive to adulthood.

35. In an influential study, Heckman and Walker (1990) use Swedish data to examine female fertility over the life cycle. Their principal finding is that higher female wages both delay times to conception and reduce total conceptions.


38. As shown in Chapter 9, some arguments suggest that changes in the welfare system encouraged nonmarital childbearing by low-income mothers.


40. See, for example, Upchurch and McCarthy (1990).

41. In an early study, Geronimus and Korenman (1992) also provide support for H2.


44. Ibid.


46. For example, the commute to a childcare center is equally costly regardless of whether one deposits a son or daughter there for 5 minutes or for 5 hours. Furthermore, like private gyms, many care centers charge a fixed monthly fee regardless of how much—or how little—the facility is used.

47. One of the earliest studies in this area is Heckman (1974).

48. Blau and Robins (1988) find that the labor supply of young mothers and other family members respond to the market price of childcare. Kimmel (1998) reported that subsidized childcare may be an important weapon in the war on poverty. They note that, in 1991, although less than a half of single
mothers work full time, over 80% of female heads who worked full time did not live in poverty.

49. Thus Ribar (1992, p. 560) finds that, in 1988, women who worked less than 10 hours per week paid an average of $6.06 per hour for care. However, those who worked 10 or more hours paid an average of only $1.78 per hour.


51. Baum (2003b) finds that the legislation increases the number of mothers who eventually return to their pre-childbirth jobs.

52. Baum (2003a) notes more mothers engage in marketplace work today than ever before, with over 33% of them returning to work by the time their child is 3 months old. He examines the effect of work, during the initial months of an infant’s life, on the child’s cognitive development. His results suggest that it has detrimental effects. Nevertheless, some of the negative effects are partially offset by positive effects of increased family income. Berger, Hill, and Waldfogel (2005) also uncover negative effects of early return to work on child well-being. Chatterji and Markowitz (2005) find that longer leave is beneficial to the mother’s health.

53. Indeed, Averett and Whittington (2001) find that the probability of having children increases with maternity leave provisions.

REFERENCES


