The Economics of the Family

Chapter 2: The gains from marriage

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1 Introduction

From an economic point of view, marriage is a partnership for the purpose of joint production and joint consumption. However, consumption and production are broadly defined to include goods and services such as companionship and children. Indeed, the production and rearing of children is the most commonly recognized role of the family. But there are other important gains from marriage, both economic and emotional.[1] Although the economic gains may not be the most important motivation for living together with someone ('marrying'), we focus on them here and examine five broad sources of potential material gain from marriage, that is, why "two are better than one":[2]

1. The sharing of public (non rival) goods. For instance, both partners can equally enjoy their children, share the same information and use the same home.

2. The division of labor to exploit comparative advantage and increasing returns to scale. For instance, one partner works at home and the other works in the market.

3. Extending credit and coordination of investment activities. For example, one partner works when the other is in school.

4. Risk pooling. For example, one partner works when the other is sick or unemployed.

5. Coordinating child care, which is a public good for the parents.

[1] In this book we shall often make a distinction between the material gains and the non-material gains and assume that the latter do not impinge upon valuations of the latter. This is done mainly for tractability. Generally, the two sets of factors need not be additive and the economic gains could interact with the "quality of match".

[2] According to of Ecclesiastes (4: 9-10) ; "Two are better than one, because they have a good reward for their toil. For if they fall, one will lift up the other; but woe to one who is alone and falls and does not have another to help. Again, if two lie together, they keep warm; but how can one keep warm alone?"

We emphasize that the gains discussed here are only potential - if they are realized to their full extent and who benefits from them is the subject matter of much of the rest of this book. We shall cast our discussion in terms of two agents who choose to live together but many of the points apply generally to a many person household. We also note that the gains for one person may be different depending on the potential partner. In later sections of the book we shall expand and elaborate on many of the issues presented in this chapter.

2 Public goods

We begin with the most obvious potential gain, the publicness of some consumption, that is, some of the consumption goods of a family are public (non-rival) and both partners can consume them equally; expenditures on housing, children and heating are clear examples.[3] The sharing of housing clearly requires that the partners live in the same household. However, parents may enjoy their children (not necessarily equally) even if the parents live in different households. In this respect, children continue to be a public good for the parents even if the marriage dissolves. In practice, most goods display some publicness and some privateness. For example, housing has a strong public element in that both partners share the location and many of the amenities of the house. Nonetheless there is some private element if, for example, one or both of the partners requires a room of their own or if there is some congestion.[4]

To illustrate some of the issues, we begin with a simple situation in which we have two agents, a and b, and two goods.[5] One of the goods is a purely public good, Q, and the other is a single purely private good, q. We denote the incomes of these persons y^a and y^b, respectively, and normalize the prices of the two goods to unity. To focus on the issues associated with sharing, we shall also assume that the two agents do not care for each other

[3] 'Public' refers to the point of view of the two partners only. Such goods are sometimes known as collective goods or local public goods.

[4] As famously noted by Virginia Wolfe in "A room of one's own".

[5] In all that follows we assume that a is female and b is male.

and each has a private utility function that is used to order their own levels of private and public goods; in the next chapter we return to this issue. Let q^s denote the consumption of the private good by person s and let the felicity (private utility) functions be given by $u^s(Q, q^s)$ for $s = a, b$.

If the two agents live apart then each individual s solves

$$\max_{Q,q^s} u^s(Q, q^s)$$
$$\text{subject to } Q + q^s = y^s \tag{1}$$

Let the optimal choices be $\left(\hat{Q}^s, \hat{q}^s\right)$ respectively. If the agents live together, they can pool their income and their joint budget constraint is

$$Q + q^a + q^b = y^a + y^b. \tag{2}$$

If the preferences of both partners are increasing in the level of the public good then the two will always be potentially better off by living together in the sense that we can find feasible allocations that Pareto dominate the separate living case. Suppose, for example, that $\hat{Q}_a \geq \hat{Q}_b$; then the couple can set:

$$Q = \hat{Q}^a, \;\; q^b = \hat{q}^b \text{ and } q^a = \hat{q}^a + \hat{Q}^b \tag{3}$$

Such an allocation is feasible given the joint income and it maintains or improves the welfare of both b and a. This demonstration can be generalized to any number of private and public goods. A couple can always replicate the private consumption of the two partners as singles, purchase the *maximal* amount of each public good that the partners bought as singles and still have some income left over.

This result relies on the assumption that both partners have positive marginal utility from Q. Although a standard assumption, one can think of realistic situations in which preferences are not monotone in the public good; for example, for heating, too much may be as bad as too little and the partners may differ in what is the optimal level of heating. Then, there may be no gains from marriage at all, despite the reduced costs resulting from sharing. An obvious example is one in which the public good is beneficial for one partner and a nuisance to the other. Then publicness can be a curse rather than a blessing, because it may be impossible to avoid the jointness in consumption. Clearly, potential partners with such opposing preferences would not marry. In general, some concordance of preferences is required to generate gains from marriage (Lich-Tyler, 2003). Positive gains from marriage require that the preferred sets for each partner, relative to the situation when single, have a non-empty intersection on the budget line if they live together. This is illustrated in Figure 1 for two people who have the same income. In the left panel the two partners have preferences such that, *if there are no other gains*, they will not choose to live together. In the right panel they can find feasible allocations if they live together which give both more than if they live apart.

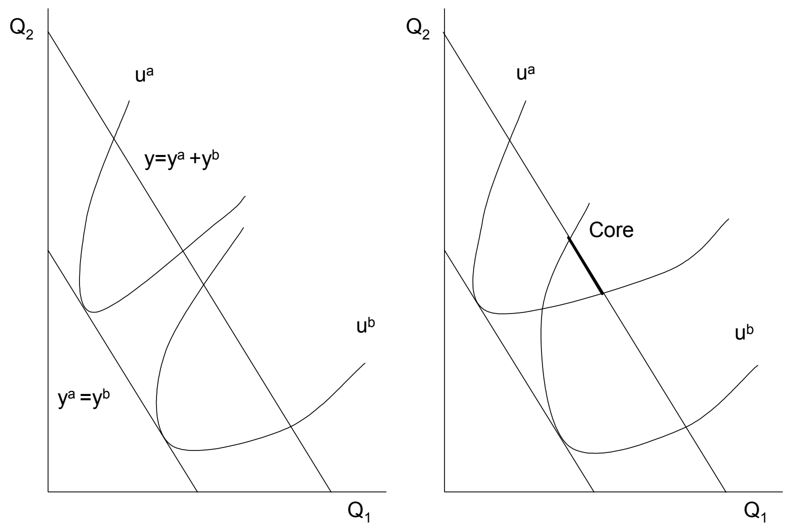

Figure 1: Preferences over two public goods

In the example above, we do not have any private goods; if we do have a private good then there may be possibilities for compensation to achieve positive gains from marriage. To see the nature of the requirements, suppose we have two public goods (Q_1, Q_2) and one private good. The program is:

$$\begin{aligned} &\max u^a\left(Q_1, Q_2, q^a\right) \\ &\text{subject to } Q_1 + Q_2 + q^a + q^b \leq y^a + y^b \\ &\text{and } u^b\left(Q_1, Q_2, q^b\right) \geq u^b\left(\hat{Q}_1^b, \hat{Q}_2^b, \hat{q}^b\right). \end{aligned} \tag{4}$$

We need to show the solution of this program exceeds the utility of a as single, $u^a\left(\hat{Q}_1^a, \hat{Q}_2^a, \hat{q}^a\right)$. Because the minimum cost required to obtain the level of welfare that b had as single is y^b, it is possible to give a private consumption level of at most y^a without hurting b. Thus, a sufficient condition for positive gains from marriage is

$$u^a\left(\hat{Q}_1^b, \hat{Q}_2^b, y^a\right) > u^a\left(\hat{Q}_1^a, \hat{Q}_2^a, \hat{q}^a\right). \tag{5}$$

That is, it is possible to 'bribe' a to conform to b's preferences for public goods by giving her additional private consumption. By a similar logic

$$u^b\left(\hat{Q}_1^a, \hat{Q}_2^a, y^b\right) > u^b\left(\hat{Q}_1^b, \hat{Q}_2^b, \hat{q}^b\right) \tag{6}$$

is also a sufficient condition. Which of these two conditions is relevant depends on the initial wealth of the parties. If b is wealthier and public goods are normal goods then he would consume more public goods when single, and it would be easier to satisfy condition (5) and attract a into the marriage.

We return now to the simple case with one public good and one private good and monotone preferences and illustrate some further issues associated with sharing. Specifically, suppose that $u^a\left(Q, q^a\right) = q^a Q$, $u^b\left(Q, q^b\right) = q^b Q$. If the two live separately then we have $\hat{Q}^s = \hat{q}^s = \frac{y^s}{2}$ and $u^s = (\frac{y^s}{2})^2$ for $s = a, b$. If they live together, they have household income of $y^a + y^b$. The efficient program is to set $\hat{Q} = \frac{y^a + y^b}{2}$ and then divide the remaining household income so that $q^a + q^b = \frac{y^a + y^b}{2}$. This gives a utility possibility frontier of:

$$u^a = (\frac{y^a + y^b}{2})^2 - \bar{u}_b \text{ where } \bar{u}_b \in \left[0, (\frac{y^a + y^b}{2})^2\right]. \qquad (7)$$

Figure 2 illustrates the case when $y^a = 3$ and $y^b = 1$. The Pareto frontier in this case is given by $u^a + u^b = 4$. Not all points on this frontier will be realized, because each partner has some reservation utility to enter the marriage (if the gains from sharing public goods are the only gain). Alone, partner a obtains $u^a = \frac{1}{4}$ and partner b obtains $u^b = \frac{9}{4}$. Clearly, these individual utility levels are well within the frontier and any choice of $\bar{u}_b$ between $\frac{9}{4}$ and $\frac{15}{4}$ will give *both* partners more than they would receive if they lived separately.

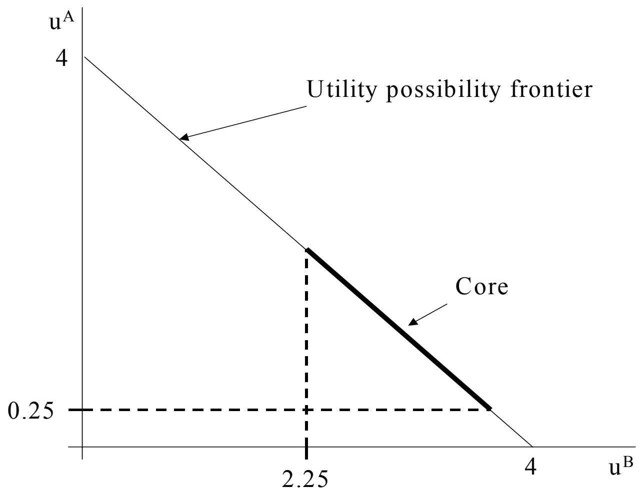

Figure 2: Gains from public goods.

This example has two related special features that are due to the assumed preferences. First, the level of the public good is independent of the distribution of the private good but this will not generally be the case. Second, the utility possibility frontier is linear (with a slope of -1) but generally it will be nonlinear (see Bergstrom, Blume and Varian, 1986).[6] Despite this simplicity, this example brings out a number of important ideas. First, there are potentially large gains from the publicness of goods, which arises from the *complementarity* between the incomes that the partners bring into marriage. Second, although the distribution of the gains may not be uniquely determined, there may exist a unique efficient level of the public good, which depends only on the joint income of the partners. Thus the partners may agree on the level of the public good and restrict any disagreement to the allocation of private goods. Third, if there are cultural or legal constraints that limit inequality within the family then the high income person may not want to marry. For example, equal sharing in this example gives b a utility level of 2, which is lower than his utility level if single. Thus the gains from publicness are outweighed by the requirement to share with the partner. Finally, even if the final allocation is *not* Pareto efficient it may still pay to live together (if the allocation gives utility levels inside the UPF but above the singles levels).

That there are potential gains from the publicness of some consumption is uncontroversial. We would like to quantify how large these gains are. To do this we use the concept of 'equivalent income' which is the amount of income needed by two singles to achieve the same outcome as when they live together. There are two outcomes of interest: buying the same bundle and achieving the same utility levels (see Browning, Chiappori and Lewbel (2003)). For the former, we compute the cost of buying the bundle that the couple buys and the cost of the same bundle for each of partners if single. The ratio of what the two partners would spend if single to what the couple pays is the '*relative cost of an equivalent bundle*'. For our example this bundle is $Q = 2$ and q^a and q^b are such that $q^a + q^a = 2$. Whatever the distribution of the private good, the same bundle of goods would cost 6 units since each has to be given a level of public good equal to 2. The

[6] It is possible for the public good to be independent of the division of income also when the Pareto frontier is concave. This is the case, for instance, when $u^i = \ln Q + \beta \ln c^i$. Then $Q = \frac{y^a+y^b}{1+\beta}$ and, for $0 < c^a < \frac{\beta(y^a+y^b)}{1+\beta}$, the slope of the utility frontier is $\frac{du^a}{du^b} = 1 - \frac{\beta(y^a+y^b)}{(1+\beta)c^a}$.

relative cost of an equivalent bundle is thus 1.5 so that the couple, if single, would need 50% more income to buy the bundle they consume as a couple.

Although the calculation of the relative cost of an equivalent bundle gives the two agents the same bundle and hence the same utility as when living together, the cost of achieving the same utility level may be lower since agents may choose to substitute away from the bundle they had when married. In our example, the utilities when together are $u^a = 2q^a$ and $u^b = 2(2 - q^a)$. If a is single then she spends half her money on the public good and half on the private good. Hence she needs an income y^a that solves:

$$2q^a = u^a = \left(\frac{y^a}{2}\right)\left(\frac{y^a}{2}\right) \Rightarrow y^a = \sqrt{8q^a} \tag{8}$$

Similarly, b needs an income of $y^b = \sqrt{8(2 - q^a)}$ so that the relative cost of equivalent utilities is:

$$\frac{y^a + y^b}{3 + 1} = \frac{\sqrt{8q^a} + \sqrt{8(2 - q^a)}}{4} \tag{9}$$

For example, if $q^a = 0.5$ then $y^a = 2$ and $y^b = \sqrt{12} \simeq 3.46$ so that the cost of achieving the same utilities when single as when together is 5.46 and the *relative cost of equivalent utilities* is 1.375.

To use the 'relative cost of an equivalent bundle' with household expenditure data, we need to identify which goods are public and which are private and also to estimate budget shares for these goods for couples. To compute the 'relative cost of equivalent utilities' we need more information. Specifically, we need to know both the distribution of the private good in the couple household and preferences when single. This is a significantly higher informational level.

Rather than distinguishing goods into being entirely private or public, one can use a parameter η_j that indicates how 'public' is each particular good. Thus, if the quantity of good j bought in the market is q_j, then together the two partners can obtain $q_j^a + q_j^b = \eta_j q_j$ units of consumption where η_j is between 1 and 2. We refer to η_j as the *degree of jointness* of good j. If $\eta_j = 2$ then good j is purely public and $2q_j$ is available for consumption which is necessarily the same for the two agents: $q_j^a = q_j^b = q_j$. If $\eta_j = 1$ then good j is purely private and any allocation $q_j^a + q_j^b = q_j$ is feasible. Generally, the share that each one receives of this total must satisfy the restrictions that $q_j \geq q_j^a \geq (\eta_j - 1)\, q_j$ and $q_j \geq q_j^b \geq (\eta_j - 1)\, q_j$ to allow for the non-exclusion of each person from the public element of the good. As η_j rises and the good becomes more public, the utility frontier shifts up and, at the same time, the set of possible divisions narrows. In the demand literature this is known as Barten scaling (formally the Barten scale for good j equals the inverse of the degree of jointness $(\eta_j)^{-1}$); see, for example, Deaton and Muellbauer (1980), chapter 8. In the next chapter we shall discuss household production in more detail; for now it suffices to note that Barten scaling defines a simple household production technology in which n market goods are transformed into n household commodities in a linear and non-joint way. The cost of giving each partner the consumption they have when together is $\sum_{j=1}^n \eta_j q_j$ and an index of the degree of publicness is

$$\eta = \frac{\sum_{j=1}^n \eta_j q_j}{x} = \sum_{j=1}^n \eta_j \omega_j \tag{10}$$

where q_j is the couple's demand for good j, ω_j is the budget share for good j in the married household (recall that all prices are normalized to unity) and x is total expenditure. This index will vary from household to household even if all households have the same technology (the same η_j's) since different couples spend in different ways. It gives an upper bound on the cost of providing the same level of utility when the partners are single as when they were together because, as discussed above, the actual cost may be lower since the singles may optimize and choose different bundles than when together. In the example given above we have $\eta_1 = 2$, $\eta_2 = 1$ and $\omega_1 = \omega_2 = 0.5$ so that the relative cost of an equivalent bundle is 1.5, as derived above.

Although we can conceptually formulate precise measures of the gains from the jointness of goods, in practice we have very little idea of how important these gains are. As an informal application of the Barten approach, we consider the expenditure patterns of US households in taken from the Consumer Expenditure Survey (2003) and assign a degree of jointness to each of the composite commodities such as food, housing, clothing, etc.. Table 1 gives details for a nine commodity grouping.[7] For each commodity we assign a minimum and maximum for the jointness of the good (η_j) and then we compute the minimum and maximum values of the jointness of total expenditure ('consumption'). We do this for three different income groups (gross household incomes of \$10,000-\$20,000, \$30,000-\$40,000 and \$50,000-\$70,000, respectively) to allow that demand patterns differ between rich and poor. Of course, the bounds for jointness are somewhat arbitrary but they capture the idea that food, for example, is mostly private and housing is largely public. The implied scales for rich and poor do not vary much; this reflects the fact that public goods are a mix of necessities (housing) and luxuries (durables, transport and cars). The relative costs are bounded between singles needing one third and two thirds as much as couples to buy the equivalent bundles.

The bounds in Table 1 are rather wide. To pin down the values more precisely we need to make additional (and strong) assumptions and use the data more carefully. Lazear and Michael (1980) use a single cross-section family expenditure survey and estimate that two single individuals can almost double their purchasing power by forming a union. However, their identification rests on very strong identifying assumptions. Browning, Chiappori and Lewbel (2003) use Canadian nondurable expenditure data on cross-sections of single people and two person households and employ a Barten scheme of the variety outlined above. This exploits the variation in relative prices that arises from changes over time and variations across provinces. The estimates are only for nondurables and services and exclude housing and durables. They estimate that a couple who share private expenditures equally when married require 41 percent more total expenditure to replicate the bundles when single; that is, the relative cost of an equivalent bundle, η, is 1.41. This is at the low end of the bounds given in Table 1, perhaps

[7] Housing includes the costs of housing plus utilities and house operations. Durables are white goods, furniture and small durables. Electronic goods are included under entertainment. Transportation includes all transportation costs except for the purchase of cars. We exclude health and education expenditures.

			Low income	Medium income	High income
Net hhold income	-	-	$12,761	$33,381	$56,360
	Degree of jointness				
	Min	Max	Budget shares (×100)		
Food	1	1.2	19.7	17.9	16.3
Alcohol and tobacco	1	1.2	3.1	2.5	2.8
Housing	1.5	1.9	38.6	34.2	33.7
Durables	1.5	1.9	3.8	4.8	4.8
Clothing	1	1.2	5.6	4.9	4.6
Transportation	1.3	1.7	11.9	13.8	14.2
Car purchases	1.5	1.9	10.3	12.4	14.1
Entertainment	1.3	1.8	5.2	7.8	7.5
Personal care	1	1.5	1.8	1.8	1.7
Relative cost of an equivalent bundle					
Minimum			131.5	132.2	133.0
Maximum			166.5	168.1	169.2

Table 1: Bounds for the relative cost of equivalent bundles

because housing and durables are not included.

3 Specialization and Increasing Returns to Scale

The idea that agents can gain by specializing in different tasks is one of the most venerable and useful in economics. Becker, in particular, has emphasized this when considering the gains from marriage (see Becker, 1991). To illustrate its application within the family we consider a very simple household production model. Suppose that we have two people a and b who can spend their time in market work or home production of a single non-market good denoted by z. For a single person the household production function is:

$$z = xt \tag{11}$$

where t denotes time spent on production and x denotes purchased goods. This production function displays increasing returns to scale in the sense that doubling the inputs of home production time and market purchases raises output by a factor of more than two (see Crossley and Lu (2005) for evidence on the returns to scale for food preparation). Expenditure on the market good is given by $x = w(1-t)$, where w_s is the market wage for person s.

We assume that agents only derive utility from the amount of z consumed. This assumption implies that any agent is indifferent between time spent on household production and time spent in market work. We assume that other uses of time (leisure and personal care) are held fixed and normalize the total amount of work time to unity. Given this, an agent living alone will choose to maximize the output of the home produced good subject to $0 \leq t \leq 1$ and person s, when single, sets:

$$t_s = \frac{1}{2}, z_s = \frac{w_s}{4} \tag{12}$$

If the couple lives together, we assume that the household production function is given by:

$$z = x\left(t^a + t^b\right) \tag{13}$$

so that a and b are perfect substitutes in home production. Observe that total output is determined by the aggregate time spent at home by both partners and the total amount of goods purchased by the family in the market. The household budget constraint is

$$x = w^a(1 - t^a) + w^b(1 - t^b) \tag{14}$$

Thus the agents living together can produce aggregate output:

$$z = \left(t^a + t^b\right)\left(w^a\left(1 - t^a\right) + w^b\left(1 - t^b\right)\right) \tag{15}$$

We assume that z is a private good which can be divided between the two partners and that the partners agree to maximize the total output available to both of them. If they set the time allocation to the optimal levels for singles their total output will be $\frac{w^a+w^b}{2}$, which is larger than the aggregate output if they live separately, $\frac{w^a+w^b}{4}$. This outcome, which is due to increasing returns, is similar to the gains from jointness discussed in the previous section. However, the couple acting together can improve even on this higher output if their wages differ. To see this, suppose that $w^a > w^b$ and set $t^a = 0$ and $t^b = 1$; thus the higher wage person specializes in market work and the lower wage person specializes in home production. This gives a total output of the home produced good of w^a which is, of course, greater than the output with no specialization $\frac{w^a+w^b}{2}$. It can be shown that this choice maximizes aggregate output. Comparing the results for a single person household and a couple, we see that there is always a positive gain from marriage of $\max\left(w^a, w^b\right) - \frac{w^a+w^b}{4}$. The gain due to *specialization* according to *comparative advantage* is given by $\max\left(w^a, w^b\right) - \frac{w^a+w^b}{2}$ which is zero if and only if the wages are the same.

This example illustrates the potential gains from specialization but the specific implications depend on a number of special features of this model. First, the two partners are assumed equally productive at home production.

This can be trivially extended to allow for different fixed productivities in which case specialization will depend on the ratios of productivity in the market (that is, the wage) to productivity at home of the two partners. Second, the technology is linear in the time inputs. If, instead, we allowed for some concavity and complementarity between partners time use, specialization need not occur and interior solutions would arise. Yet we would still expect the high wage spouse to work more in the market when wages differ.

As emphasized by Becker (1991, chapter 2), comparative advantage can be developed via differential investments or learning by doing. Within marriage or in the market each party can use their own human capital to a larger extent, yielding convexity and dynamic increasing return. In particular, if one partner may specialize in home production while the other specializes in market work then both of them acquire skills relevant to their specific activity. Thus, a small innate difference can be magnified, and strengthen the incentives to specialize (see Chicilinsky 2005, Pollak 2007).

There is ample evidence for a division of labor within the household (see Chapter 1). Married men work longer hours in the market and have substantially higher wages than unmarried men. Married women have lower wages and work more at home than unmarried women; see Gronau 1986, Korenman and Neumark, 1992 and Daniel, 1992.

4 Imperfect Credit Markets

Consider two potential partners denoted by a and b. Each person lives for two periods which we denote by 1 and 2. Utility in period t is derived from consumption and the per period utility is

$$u(c_t) = \ln c_t. \tag{16}$$

For simplicity, we assume that the discount factor is unity and the real rate is zero. Each person has an initial wage of 1 that he/she can augment by spending the first period in school, obtaining a second period wage of w.

If there is a perfect capital market, a person can smooth his consumption through borrowing and will set $c_1 = c_2 = c$. Thus, with investment in schooling, one can obtain $c = \frac{w}{2}$ each period, while without investment consumption each period will be 1. Investment is profitable if the increase in wage is sufficient to compensate for the earnings forgone in the first period, that is if the second period wage w exceeds 2. However, if borrowing is impossible there is no investment in schooling since consumption in the first period would be zero.

Now assume that a and b marry each other. Under a perfect capital market, marriage will not influence their investment choices. However, if there is an imperfect capital market, marriage allows a couple to partially overcome the no borrowing constraint. This is accomplished by extending credit *within* the family, whereby one partner (b, say) works in the market while the other goes to school. To evaluate the potential gains from marriage, consider an efficient program that maximizes the utility of partner a given that partner b receives the lifetime utility he would have in the single state, without schooling. With our choice of units, life time utility in the absence of investment is 0. We thus solve

$$\begin{aligned} & \max \{\ln c_1^a + \ln c_2^a\} \qquad (17) \\ \ln c_1^b + \ln c_2^b &\geq 0 \\ c_1^a + c_1^b &= 1 \\ c_2^a + c_2^b &= 1 + w \end{aligned}$$

A necessary condition for efficiency is that consumption in each period is distributed between the partners so as to equalize the ratios of their marginal utilities from consumption in the two periods

$$\frac{u'(c_1^a)}{u'(c_2^a)} = \frac{u'(c_1^b)}{u'(c_2^b)}. \qquad (18)$$

With a logarithmic utility function, this implies that the consumption of both partners must grow at the *same* rate, $1+w$. Using the requirement that the lifetime utility of partner b remains zero, we obtain that $c_1^b = (1+w)^{-\frac{1}{2}}$ and $c_2^b = (1+w)^{\frac{1}{2}}$. Because the consumption of a grows at the same rate, her lifetime utility will be positive if and only if the first period consumption, $c_1^a = 1 - (1+w)^{-\frac{1}{2}}$, exceeds that of b. A brief calculation will confirm that this is true whenever $w > 3$.

We conclude that the potential for coordination of investment activities through credit can motivate marriage when credit markets are not operative. Notice that marriage does not completely eliminate the borrowing constraint, because only one person will invest in schooling and he/she will do so only at higher rates of return from schooling than in the case of perfect capital market. An important aspect of this example is that individuals who are ex-ante identical may voluntarily agree to pursue different careers, allowing both partners to share in the gains from this efficient program. Obviously, specialization in investment activities can also be motivated by differences in innate abilities. Typically, the family will choose to invest in the person with the higher return from human capital investment. In either case, *commitments* are crucial for the implementation of such a program, see Dufwenberg (2002). A woman will be hesitant to support her husband through medical school if she expect him to break the marriage (and marry a young nurse) when he finishes.

Evidence of implicit credit arrangements within marriage is sometimes revealed at the time of divorce, when the wife claims a share of her ex-husband's earnings on the grounds that she supported him in school; see Borenstein and Courant (1989). However, recent empirical work casts doubt on the importance of liquidity constraints for schooling choices see Carneiro and Heckman (2003). However, this important issue is still a matter of controversy; see Acemoglu and Pischke (2001).

5 Risk sharing

Individuals who face idiosyncratic income risk have an obvious incentive to provide mutual insurance. This can be done within the family. Here we present a simple example. Consider two risk averse partners with random incomes, y^s, $s = a, b$. Acting alone, if there are no possibilities for saving or borrowing, each partner will have an expected utility given by $E(u^s(y^s))$ respectively. Acting together, they can trade consumption in different states of nature. To see the potential gains from trade, consider the maximization:

$$\max E(u^a(c^a))$$
$$\text{subject to } E(u^b(y^a + y^b - c^a)) \geq E(u^b(y^b)).$$

Clearly, setting in each state $c^a = y^a$ and $c^b = y^b$, is a feasible solution which will replicate the allocations in the single state. However, the optimal risk sharing rule is

$$u'(c^a) = \lambda u'(c^b) \tag{19}$$

where λ is a positive constant. That is, the slope of the utility frontier, given by $-\frac{u\prime(c^a)}{u\prime(c^b)}$ is equalized across all states, where a state is defined by the realized sum of the individual incomes, $y^a + y^b$, that is, total family income. Otherwise, both partners can be made better off by transferring resources to a person in a state where his marginal utility of consumption is relatively high, taking resources away from him in another state where his marginal utility is relatively low. Following this optimal rule, both partners can be made strictly better off, provided that their incomes are not perfectly correlated (or that risk aversions differ).

A strong testable implication of efficient risk sharing is that the consumption of each family member varies only with *family income.* That is, holding family income constant, the idiosyncratic shocks to individual incomes will induce transfers between the partners, but consumption levels will remain the same.

Depending upon the particular risk, the potential gains from mutual insurance can be quite large. For instance, Kotlikoff and Spivak (1981) who consider the risk of uncertain life, in the absence of an annuity market, estimate that the gains that a single person can expect upon marriage are equivalent to 10 to 20 percent of his wealth. In a different application, Rosenzweig and Stark (1989) show that marriages in rural India are arranged between partners who are sufficiently distant to significantly reduce the correlation in rainfall, thereby generating gains from insurance. Hess (2004) finds that couples with a higher correlation in incomes are more likely to divorce, suggesting that effects of mutual insurance on the gains from marriage are higher when the partners' incomes are less correlated. Shore (2007) finds that the correlation in spouses' earnings respond to the business cycle; it is higher for couples whose marriage spans longer periods of high economic activity.

6 Children

6.1 Technology and preferences

One of the principal gains from marriage is the production and rearing of children. Although the biological and emotional gains may dominate here, we can also consider the economic aspects. In particular, we wish to discuss the gains to the child that arise from living with their natural parents in an intact family. Consider two partners, a and b, who choose to have a child (or some other fixed number of children) denoted by k. We allow that the two partners have alternative uses for their time; in this case they can spend time in child care, t^a and t^b, respectively or in market work at the wages w^a and w^b. In this example we shall assume that there is a single private good with market purchases of q of this good being allocated between the three family members in amounts c^a, c^b, c^k. The utility of children depends additively on their consumption of goods and the time spent with each of the parents:

$$u^k = c^k + \alpha t^a + \beta t^b, \tag{20}$$

where the parameters α and β represent the efficiency of parents a and b, respectively, in childcare. This is, of course, a very special assumption and implies that consumption can fully compensate the child for the absence of parents and that the two parents' childcare time are perfect substitutes. Usually we assume that α and β are positive (perhaps an arguable assumption for teenagers). The utility of each parent is assumed to be multiplicative in their own consumption and the child's utility level:

$$u^s = c^s u^k \text{ for } s = a, b. \tag{21}$$

Thus, children are assumed to be a public good to their natural parents and *both* care about their welfare.

We consider here situations in which parents differ in their earning capacity and efficiency in child care. The linearity of the parents' utility functions in their own consumption implies that the parents would agree on an efficient program that maximizes the joint "pie" that is available for distribution between them.[8] That is, the parents would agree to:

$$\max_{t^a, t^b, c^k} \left\{ w^a \left((1 - t^a) + w^b \left(1 - t^b \right) - c^k \right) (c^k + \alpha t^a + \beta t^b) \right\} \tag{22}$$
$$\text{subject to } 0 \leq t_s \leq 1, \text{ for } s = a, b$$

6.2 Intact families

We have three regimes, depending on the parameter values. We always assume:

$$w^b > w^a, \alpha > \beta$$

implying that the high wage spouse, b, has a *comparative* advantage in market work and the low wage person a has comparative advantage in home production:

$$\frac{w^b}{\beta} > \frac{w^a}{\alpha} \tag{23}$$

If both wages are high relative to efficiency at home production, (if $w^a > \alpha$ and, consequently, $w^b > \beta$) then both parents will work full-time in the market and use only market goods for caring for the child. Conversely, if both wages are low relative to efficiency at home production (if $w^b < \beta$ and $w^a < \alpha$) then parents will use only time to care for the child. An

[8] Thus, the amount of time spent on the child is determined by efficiency considerations, independently of the distribution of the consumption good. The two stage decision process, whereby production and distribution are separable, is an important consequence of transferable utility that will be discussed later in the book.

intermediate case is the one in which the high wage partner, b, has *absolute* advantage in market work and the low wage person a has *absolute* advantage working at home ,

$$\alpha > w^a, \beta < w^b$$

For this intermediate case b will spend all his time in market work and a will spend all her time looking after the child. This intermediate case has two distinct sub-cases that differ in the expenditures on the child. For case 1 we have:

$$w^b > \alpha. \tag{24}$$

In this case, the intact family spends part of its income on child goods, $c^k > 0$. Specifically, $t^a = 1$ and $t^b = 0$ and $c^k = \frac{w^b - \alpha}{2}$. The utility of the child is then $u^k = \frac{w^b + \alpha}{2}$ and the utility possibility frontier facing the parents is given by

$$u^a + u^b = \frac{(w^b + \alpha)^2}{4}. \tag{25}$$

In case 2 we have the converse:

$$w^b < \alpha, \tag{26}$$

which gives $c^k = 0$. In this case, the utility of the child is $u^k = \alpha$ and the UPF facing the parents is then given by

$$u^a + u^b = w^b \alpha. \tag{27}$$

6.3 Divorce with no transfers

What happens if the partners split and one of the partners receives custody, *without any transfers*? It is quite likely that if the marriage breaks up and the parents live in separate households, the utility of the non custodial parent from the child is reduced. Nevertheless, it is only natural that the non-custodial parent continues to care about the child and for simplicity we shall continue to assume that the utility of both parents is given by (21). We shall further assume that only the custodial parent can spend time with the child. If custody is assigned to parent b he will work fulltime in the market ($t^b = 0$ since $w^b > \beta$) and will set $c^k = 0.5w^b = u^k$. If custody is assigned to parent a she will work part time to finance her own consumption, setting $t = 0.5$, but will spend no money on child goods (since $\alpha > w^a$). In this case, the child's utility is $u^k = 0.5\alpha$. If we now choose the custodial parent to maximize the welfare of the child, we obtain a very simple rule for the assignment of custody. In the absence of post divorce transfers, the high wage parent b should obtain custody if and only if his\her wage, w^b, exceeds the efficiency of the low wage spouse a at home, α.

Table 2 compares the utility of the child when the parents are married and separated, when custody is assigned optimally for the two cases discussed above. We also show the utilities of each parent when they are separated and the *sum* of their utilities when they are married. Examining the entries in the table, it is seen that the child is always worse off when the parents split, because the custodial parent spends less time with the child or less goods on the child. We also have that at least one of the parents is worse off materially when the parents live apart, because their post divorce payoffs are below the utility possibility frontier in an intact family. That is:

$$(\frac{w^a}{2})^2 + (\frac{w^b}{2})^2 < \frac{(w^b + \alpha)^2}{4}. \tag{28}$$

Such results are quite typical and can be traced to the inefficient allocation of time following divorce. For example, for case 2 the custodial parent is pushed into the labor market, despite her comparative advantage in child care. The custodial parent who chooses how much time to spend with the child does not (or cannot) take into account the interests of the other parent, which is the source of the inefficiency. Following separation, the non- custodial parent can be better off than the custodial parent, because they can free ride on the custodial parent who takes care of the child. This is the case if the low wage parent a is the custodial parent and also holds if the high wage parent b is the custodian and $2w^a > w^b$. Thus, although the child is better off under the custody of the parent who is more efficient in caring for it, this parent may be better off if the *other* parent had the custody. The

Case 1: $w^b > \alpha$, b is the custodian				
	Married		Separated	
Family member	Work at home	Utility	Work at home	Utility
a	1	$\frac{(w^b+\alpha)^2}{4}$	0	$\frac{w^a w^b}{2}$
b	0		0	$(\frac{w^b}{2})^2$
k	–	$\frac{w^b+\alpha}{2}$	–	$\frac{w^b}{2}$
Case 2, $w^b < \alpha$, a is the custodian				
Family member	Work at home	Utility	Work at home	Utility
a	1	$w^b\alpha$	$\frac{1}{2}$	$\frac{\alpha w^a}{4}$
b	0		0	$\frac{\alpha w^b}{2}$
k	–	α		$\frac{\alpha}{2}$
Note: when married the utility of a and b is shared.				

Table 2: Work patterns and material welfare of family members

most natural way to deal with this "hot potato" problem, as well as with the low welfare of the child, is to force the non custodian parent to pay child support. Post divorce transfers will be discussed in detail in a subsequent chapter, but it should be noted at the outset that, in practice, custodial mothers often receive no transfer from the ex-husband and when they do the transfer is often quite small.

There is ample evidence that children with single or step parents are worse off than children in intact families (see Argys *et al*, 1998, Hetherington and Stanley-Hagan, 1999), suggesting that the break up of marriage can be quite costly. However, Piketty (2004) and Bjorklund and Sundstrom (2006) show that much of the differences in child attainments precede the divorce, so that the reduction in the child's welfare is caused by a bad quality of the match (e.g., fights between the parents) rather than the divorce itself. In either case, the risk of separation may reduce the incentives to produce children and to specialize in home production.

7 Concluding remarks

None of the gains that we have discussed in this chapter actually require the traditional family institution. If all goods and work activities are marketable, there is no need to form marriages to enjoy increasing returns or to pool risks. In fact, the role of the family varies depending on market conditions and vice versa. For instance, with good medical or unemployment insurance one does not need to rely on his spouse. Similarly, sex and even children can be obtained commercially. Nevertheless, household production persists because it economizes on search, transaction costs and monitoring. However, to fully exploit these advantages requires a durable relationship. This shifts attention to the question which types of partnerships are likely to last.

Gains from human partnerships need not be confined to a couple of the opposite sex. One also observes "extended families" of varying structures which coordinate the activities of their members and provide self insurance. The prevalence of male-female partnerships has to do with sexual attraction which triggers some initial amount of blind trust. (The Bible is quite right in puzzling over why "shall a man leave his father and mother and cleave unto his wife"[9].) Equally important is a strong preference for own (self produced) children. These emotional and biological considerations are sufficient to bring into the family domain some activities that could be purchased in the market. Then, the accumulation of specific "marital capital" in the form of children, shared experience and personal information increases the costs of separation and creates incentives for a lasting relationship. In this sense, there is an accumulative effect where economic considerations and investments reinforce the natural attachment. Other glues, derived from cultural and social norms also support lasting relationships. But in each case customs interact with economic considerations. The weaker is the market, the more useful is the extended family and social norms (commands) are added to the natural glue.

Keeping these considerations in mind, we can now address the question

[9] Genesis 2: 24.

which activities will be carried out within the family. One argument is that the family simply fills in gaps in the market system, arising from thin markets, or other market failures [see Locay (1990)]. Another line of argument [see Pollak (1985)] is that the family has some intrinsic advantages in monitoring (due to proximity) and in enforcement (due to access to non-monetary punishments and rewards). A related but somewhat different argument is that family members have already paid the (sunk) costs required to acquire information about each other [see Ben-Porath (1980)]. Thus, credit for human capital investments may be supplied internally either because of a lack of lending institutions or because a spouse recognizes the capacity of her partner to learn and is able to monitor the utilization of his human capital better than outsiders. Similarly, annuity insurance is provided internally, either because of lack of annuity markets or because married partners have a more precise information on their spouse's state of health than the market at large. It is clear that these three considerations interact with each other and cannot be easily separated. The main insight is that the gains from marriage depend on the state of the market and must be determined in a general equilibrium context.

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