Sibling Rivalry over Parental Care. Intra-Household Conflict and Child Investment*

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Abstract

Deviating from previous economic approaches to child investment where child outcomes are outputs from a child production function, I propose a parsimonious model that allows for sibling interactions. Drawing on theories from developmental psychology and economics of conflict, I posit that conflict between siblings causes reallocation in favor of more dominant siblings, oftentimes older siblings or boys. Conflict is more intense when they are symmetrical, e.g. when siblings are closely spaced, when there are more boys, or when there are younger boys and older girls. The model offers a novel explanation for birth order-effects in particular, and shows how family size-effects may be generated without assuming credit constraints or limited information on parents.

1 Introduction

Since the seminal papers on family economics starting in the late 1960’s (see Becker, 1991), the inner workings of families have been extensively studied in the economics literature. An important topic has been how parents affect the adult prospects of children, by way of human capital investments, fertility decisions and intergenerational transfers, in particular. While the literature on child development has focused almost exclusively on children as outputs from a production function, children form part of their own developmental environment, and will respond to the choices made by their parents. Understanding the

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impact of child actions and reactions on the economics of the family should be an important research topic.

Allowing conflictual interactions between the spouses in a household, has been an important field of research the last 25 years, and has generated many important insights beyond the traditional unitary framework (see for instance Lundberg and Pollak (1996)). In this paper, I change the focus in considering a household interaction where children are active participants in their own formation. Conflict, defined as mutual opposition between two simultaneous but incompatible feelings, between siblings is a normal developmental pattern, that defines sibling relationships (Howe et al., 2002). Because children spend a large amount of their time with siblings (McHale and Crouter, 1996; Dunn, 1983), such conflicts constitute important influences in their socio-cognitive development (Dunn and Dale, 1984). Sibling conflicts may also be particularly salient because the relationship generally cannot be terminated regardless of the outcome (Howe et al, 2002). Of course, conflicts between siblings may be positive or negative for the child's development: Being exposed to and having to resolve conflicts prepares children for an important part of both childhood, adolescence and adulthood. However, conflicts may also take on a destructive quality, particularly when they persist and become frequent or intense (Kruger, 1993). This suggests a non-monotonous relationship between child development and characteristics that promote conflict between siblings. Because conflicts often involve a “winner” and a “loser”, to some extent, the interactions among siblings may also be expected to contribute more positively to siblings that are more dominant in the relationship. The surprisingly large differences between siblings, given their strong genetic similarities, have indeed been argued to be a product of the different roles assumed in sibling relationships (Dunn, 1983).

Dunn and Munn (1987) argue that sibling conflicts in early childhood are often centered on possessions, personal property and access to the mother. Indeed, many inputs in the production of child quality are not easily excludable by the parents. It may for instance be hard for the parents to control the precise sharing of a toy, a video game or a rec room. In particular, parental time may be an asset in limited supply that is much coveted by all siblings, and that children can make demands on over and above their parents’ preferred allocation. Especially in early childhood, children in the bonding phase may have difficulty accepting that a younger sibling occupies parents over extended periods.

The object of the paper is to study the effects of sibling rivalry on child outcomes. In particular, I focus on the birth order effect (see Black et al., 2005): why child outcomes are better at higher parities, that is for the older siblings. Second, I show how family size effects may be generated without reference to a budget constraint. I also aim to characterize the types of families in which these effects are likely to be large, in an attempt to provide testable empirical predictions. The theoretical starting point is the classic
quantity–quality-framework of Becker and Lewis (1973). Drawing on the literature on the economics of conflict, I first and foremost add a second stage where siblings may contest some productive resource, in the model assumed to be parental time.

In a simple framework of such intra-household conflict, child effort into sibling rivalry is increasing in the number of siblings and in the symmetry of conflict. If conflicts are detrimental after some point, then the family size effect, already present from the investment decision of parents, may therefore be exacerbated through conflict between siblings. Importantly, family size-effects may be generated without reference to the budget constraint. This yields a plausible explanation for the observation of family-size effects also among children from richer families with large budgets and slack credit constraints.

Assuming that older siblings have an edge, positive birth order effects result from the competition for parental care. Gaviria (2002) shows that sibling inequality appears to be independent of parental wealth in the US, which is difficult to reconcile with a traditional tradeoff between quantity and quality. Since the scale of conflict is affected by the symmetry of conflict, the spacing between children and the sex composition also reasonably matters for child outcomes.

Finally, parents, aware of their children’s conflict and the advantage it gives the more dominant child, will compensate by 1) underinvesting in the contestable resource, and 2) allocating a larger share of the uncontestable resource to the younger (weaker) children. This implies that parental investment of contestable resources should be decreasing in conflict, while the investment of uncontestable resources should be increasing. Furthermore, even when parents care equally for all children, and all children respond equally to investments in child quality, investments will be asymmetric: The less dominant child will tend to be allocated more uncontestable resources. One possible interpretation is that parents will buy more time in market-based child care when conflicts are likely to be more intense.

2 Siblings and child development

There is a long standing debate in developmental psychology over the effects on children’s outcomes of birth order and family size. In recent papers controlling plausibly for selection, Black, Devereux and Salvanes (2005), and Mogstad and Wiswall (2009) show that there are substantial effects of birth order on children’s long-run education in Norway, older doing better. While theory suggests negative effects of family size, the empirical evidence is mixed: While Black et al. (2005) report no family size effects, Mogstad and Wiswall (2009) find substantial but non-monotonic effects, first strong positive marginal effects on education, before the marginal effects turn negative beyond two children.¹

¹In line with Black et al. (2005), Angrist, Lavy and Schlosser (2006) and Caceres-Delpiano (2006) also report positive birth order-effects and weak effects of family size.
In the classic quantity–quality-model of Becker and Lewis (1973), parents trade off high investment in each child with a larger number of children, causing a negative family size effect. By contrast, no effect is generated for birth order. Building on a similar idea, Birdsall (1991) argues that mothers are time constrained and must share time between children. The source of birth order-effects is that early-borns receive more individual care than later-borns, who must share parental attention with a larger number of children. She finds that there are no significant birth order effects for working mothers, whom she argues are not time constrained because they have time to work.

Most related to the current paper, is perhaps Zajonc and Markus (1975), who argue that children’s development is determined first and foremost by the intellectual environment in the household, and secondly from the presence of younger siblings that must/may be tutored. The first born arrives in a family of only adults, and benefits from developing in this relatively intellectual environment. Second borns arrive in an environment including one child, and therefore has a lower learning curve. Therefore, higher parities fare better than lower. Further, the arrival of a new sibling impedes the development of the older sibling, accounting for the family size effect.

Finally, Ejrnæs and Portner (2004, REStat) argue that birth order effects are truly negative, and the empirical estimation of them as positive is due to an aggregation failure where family size effects are mistaken for birth order effects. In a model of endogenous fertility, the authors analysis an optimal stopping problem, and argue that parents consider the genetic endowments of the first born to determine its absorptive capacity. In their model, a “good” child has a higher marginal response to investment. Therefore, if the previous child is of low quality, the optimal investment in it is also low. The parents are therefore richer, and have a stronger preference for an additional child. Parents that have higher quality children are similarly more likely to stop having children, investing more heavily in the early born.2

This theory finds little support in the data, where plausibly accounting for selection is unable to reverse birth order effects (Black et al., 2005). Also, the theory indicates that last borns should generally be of significantly higher quality, since they have proven to trigger the parents to stop reproducing. This dissonates strongly with existing evidence.

3 Parental investment without conflict

I first model a simple version of the quantity–quality-framework, in which unitary parents care about their own consumption and the individual quality of their \( n \) children. To prevent inherent bias in the model, I assume that the parents care equally for all children. Quality is produced with consumption goods and time, where the children are assumed

\[ 2 \text{Inequality averse parents would prefer to compensate less endowed children, but will never choose to have more than one child.} \]
to be equally responsive to investment.

Parents seek to maximize utility over consumption of a generic common good, $c$, and child quality, $(q_1, \ldots, q_n)$. For simplicity, let parental utility be unitary and additively separable between consumption and child quality.

$$U = \nu(c) + v(q_1, q_2, \ldots, q_n)$$

Following standard practice, the quality of each child is produced according to a concave production function, homogenous across children. Say that child quality is produced with parental time only. On the one hand, the parents spend dedicated time with the children individually, denoted $y_i$ for child $i$. On the other hand, the family spends time together, which I will refer to as public time, $X$. For now, we say that parents are able to target also the public time to individual children. That is, there is no interaction between the children, such that child $i$ may be given attention in a defined time denoted by $x_i = p_i X$, where $p_i$ is the share of public time devoted to child $i$. Final child quality is then produced according to,

$$q_i = g(x_i, y_i)$$

Assume that parents have a time endowment equal to one, and that they may earn a fixed income per time unit $w$, and let the price of consumption be normalized to one. The budget constraint of the parents then becomes,

$$c \leq w \left[ 1 - X - \sum_{i=1}^{n} y_i \right]$$

Optimizing with respect to consumption and the inputs $(x_i, y_i)$ for all children 1 through $n$, using that $X = \sum_{r=1}^{n} x_r$, yields the usual optimality conditions: Firstly, optimal parental consumption is determined such that its marginal benefit in quality units equals its alternative cost, i.e. the marginal return from quality investment.

$$\frac{w\nu'(c)}{v'_q} = \frac{g'_x}{y_i} = \frac{g'_y}{x_i}$$

Second, optimal time investment in the individual children is set such that the marginal benefit from reallocating time from child $j$ to child $i$ equals the marginal cost of the reallocation, in terms of the reduction in utility from lower quality of child $j$.

$$\frac{\partial U / \partial q_i}{\partial U / \partial q_j} = \frac{g'_q}{g'_y} = \frac{g'_x}{g'_z}$$
As usual, this also implies productive efficiency, since

\[ \frac{g'_y}{g'_{x_i}} = \frac{g'_y}{g'_{x_j}} \]

This gives parental consumption and the optimal input levels for the children as functions of the wage and family size, implying in turn the optimal quality of each child chosen by the parents. Throughout, I let asterisks indicate optimality.

\[ q^*_i = q_i(w,n) \]

The optimal quality and resource inputs are increasing in consumer prices and income, indicating a lower alternative cost of child investment. Further, since the marginal value of parental consumption is increasing as they invest more in their children, the average investment in the children must be decreasing in the number of children. This decreases the average quality, and therefore suggests a negative family size effect. Notice that the negative effect on average child quality of the arrival of additional children, is coming through the budget constraint, by way of resource dilution.

Example: Two siblings – Parental first-best. Since I will be returning to an example of a two-child family below, I introduce the example in this straightforward case for reference. Figure 1 draws a standard production possibilities frontier for the quality of the two children, for a given level of parental consumption. As usual, the optimal parental allocation of time is on this frontier, in the tangency point with an indifference curve of the parents. Since parents by assumption care equally for both children and production functions are identical, the optimal point lies on the 45 degree-line.

4 Sibling conflict

So far, we have followed existing literature in considering children simply as outputs from a production function. However, children form part of their own developmental environment, and will respond to the choices made by their parents. In particular, conflict is a normal developmental pattern, that defines sibling relationships (Howe et al., 2002; Dunn, 1993). In a study of 40 children 7–8 years old interacting with a sibling, Howe et al. (2002) observe only one 15-minute interaction without conflict, while the average number of conflicts was four and the maximum ten. Similarly, Dunn (1993) observed up to 56 conflictual interactions between siblings within just one hour. Further, Dunn (1983) reviews evidence from several countries, showing that children as young as one years old spend about the same amount of time with siblings as with the mother. McHale and Crouter (1996) report that 11-year olds spend more time with siblings (33%) than with the
mother (23%) or the father (19%). Because children spend such a large amount of their time with siblings, their interactions form important influences in their socio-cognitive development, in particular the conflicts they go through (Dunn and Dale, 1984). Sibling conflicts may also be particularly salient because the relationship generally cannot be terminated regardless of the outcome (Howe et al, 2002).

Of course, conflicts between siblings may be positive or negative for the child’s development. Being exposed to and having to resolve conflicts prepares children for an important part of both childhood, adolescence and adulthood. Indeed, evidence suggests that siblings often benefit from their interaction: Perner et al. (1994) show results suggesting that only children have a substantially less developed understanding of others than children with 1–2 siblings at age 3–4. Further, Jiao et al. (1986) observe higher levels of cooperation and persistence among children with siblings, while Dunn (1988) argues that conflicts within the family stimulates moral development, and promotes the understanding of empathy, principles and authority.

However, conflicts may also take on a destructive quality, particularly when they persist and become frequent or aggressive. Kruger (1993), for instance, argues that opposition and disagreement is beneficial to child development, but that outright conflict is detrimental. This suggests that, while the opportunity for some contest or conflict

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3 The remainder is split equally between time alone and time spent with friends.

4 An early review of constructive and destructive sibling relationships can be found in Dunn (1983).
between siblings may be beneficial to child development, sibling relations that promote the intensity and frequency of conflict may be detrimental. We might therefore expect a non-monotonic relationship between conflict and child development, where conflict is positive for child development up until some point, and detrimental thereafter. Another important property of conflict is that they most often involve to some extent a “winner” and a “loser”: A child that is more dominant, stronger or more sophisticated in conflict, should have higher gains from conflict than a less advantaged siblings. The interactions among siblings should therefore contribute differently to siblings according to their relative advantage in conflict.

Dunn and Munn (1987) argue that sibling conflicts in early childhood are often centered on possessions, personal property and access to the mother. Indeed, many inputs in the production of child quality are not easily excludable by the parents. In particular, public time that the parents spend together with several children, may be such that the children can make demands on it over and above their parents’ preferred allocation. Especially in early childhood, children in the bonding phase may have difficulty accepting that a younger sibling occupies parents over extended periods when they are present.

In the above model of parents’ investment in their children, parents may therefore be unable to allocate public time directly to individual children. Instead, they may be confined to reserving a given number of hours for public activities, and then allow the kids to compete for the allotted time. In practice, this may imply conflicts over which specific activities to engage in, or fighting for the attention of a parent.

To crystallize the argument, we let public time be completely contestable by siblings. As above, I denote the share of parental time captured by sibling \( i \) by \( p_i \), but now let the shares allocated to each child be determined in a conflictual interaction between siblings. To solve the problem appropriately, we must first consider how children respond and interact. In the literature, the standard approach to conflicts between spouses has been some form of bargaining protocol, as introduced by McElroy and Horney (1980) and Manser and Brown (1981). This is flexible insofar as it allows for differences in bargaining power, objectives and threat points. However, the bargaining framework is essentially a way of reducing different objectives into one common objective. Therefore, assuming bargaining in essence eliminates the conflict by collapsing the dimensionality in a particular structured way. In the context of sibling conflicts, we said above that the conflict itself, both its occurrence and its intensity, should be a potentially important determinant of the outcome. While drawing a path for solving the allocation problem, the bargaining framework does not give insight into the form or intensity of the conflict.

Instead, I turn to the economics of conflict, where the tradition has been to consider the conflict effort put down by the individual players directly, and then let the allocation be determined by the distribution of efforts (see Garfinkel and Skaperdas (2007) for a review of the literature). The qualitative results for allocation are the same in a bargaining
framework. In the below, I interpret the competition between siblings as a direct contest to appropriate resources. That is, a child can be thought to steal parental time away from the other, shifting parental attention from a sibling to him- or herself. The central assumption is that the child has preferences directly over the amount of parental time it appropriates.\(^5\) I follow Mehlum and Moene (2002) closely in the model design.

Say that the siblings must expend effort to appropriate a share of the public time \(X\), and denote this conflict effort by \(F_i\). Further, define the contestability of public time such that if one sibling is the only to expend a positive conflict effort, then he or she gets the full share, while if the sibling expends no conflict effort, he or she gets nothing. The complementary shares \(p_i\) appropriated can then be formulated as a contest success function, of which I apply the simplest and most standard formulation.\(^6\)

\[
p_i = \frac{F_i}{\sum_{r=1}^{n} F_r}
\]

Assume, reasonably, that children have preferences directly over the number of hours of public time they capture, and say that the effort they expend in conflict has some personal cost to them. Letting sibling \(i\) have an individual cost of conflict effort \(\gamma_i > 0\), the children’s objective function given risk neutrality can be expressed as

\[
V_i = p_i X - \gamma_i F_i
\]  

Optimizing \(V_i\) with respect to \(F_i\), assuming a slack resource constraint on \(F_i\), gives the optimal shares as functions of the relative conflict advantages.

\[
\frac{\partial V_i}{\partial F_i} = X \frac{1 - p_i^*}{Q} - \gamma_i = 0
\]

\[
\iff p_i^* = 1 - \frac{\gamma_i Q}{X}
\]

where we denote the intensity of fighting \(Q = \sum_{r=1}^{n} F_r\) for convenience. Since the share of parental time dominated by a child is given by \(p^*\), we see that, as expected, the time appropriated by a child is decreasing in his or her costs of conflict. Indeed, as the cost of conflict of the weakest sibling grows large relative to the costs of the other siblings,

\(^5\)As a side note, the conflict could well be over other types of goods, say toys or books that the other is or would be using. Also, instead of direct appropriation, we could consider the conflict to be more indirect, diluting the available resources. For instance, we may imagine that the child considers the parental investment as a bad, and struggles to avoid it. Since this essentially reduces the absorptive capacity of this particular child, it increases parental investment in the child and hence diverts investment away from siblings. This should essentially be equally well captured in the below.

\(^6\)Skaperdas (1996) shows that a contest success function under symmetric conflicts between parties \(i = 1, 2, \ldots, n\) must take the form \(p_r = F_r^\alpha / \sum_{r=1}^{n} F_r^\alpha\), where \(\alpha \leq 1\), under reasonable axioms. Our interpretation of the contest success function must be in the form of shares, since the interpretation as a winner-takes-all contest would be nonsensical. Clark and Riis (1998) extend the axiomatization to asymmetric conflicts.
the weakest sibling is left without any parental attention during public time, the entirety being captured by the stronger siblings.

A crucial question concerns the intensity or extent of the conflict: How much conflict do siblings engage in, and how large are the associated costs? We can summarize the frequency and intensity of conflict by considering the equilibrium effort put down by the children. Summing equation 5 over the individual children, and using the fact that \( \sum_{r=1}^{n} p_r = 1 \), we find that the extent of fighting must satisfy,

\[
Q(n, \bar{\gamma}; X) = \frac{X}{\bar{\gamma}} \frac{n-1}{n}
\]  

(6)

where \( \bar{\gamma} = \sum_{r=1}^{n} \gamma_i/n \) is the mean conflict cost among siblings. This summarizes how much effort the siblings put down in conflict in total, which I will refer to as the extent of fighting. We see immediately that the extent of fighting is larger when the number of children is larger, when the average costs of conflict are low, and when the number of contestable public hours are larger.

To consider the actual costs of the conflict effort, we must take into account that the opportunity costs differ across siblings. Following Mehlum and Moene (2002), we can show that the optimal fighting effort of child \( i \) satisfies,

\[
F^*_i = F(\gamma_i, n, \bar{\gamma}) = Q(n, \bar{\gamma}; X) \left[ 1 - \frac{n-1}{n} \frac{\gamma_i}{\bar{\gamma}} \right]
\]  

(7)

The effort put down in conflict by a child is therefore proportional to extent of fighting, and decreasing in the child’s advantage in conflict relative to the average among siblings.  

From equations 7 and 6, total costs incurred by the children in their competition for public time, are then

\[
\sum_{r=1}^{n} \gamma_r F_r = \bar{\gamma}Q(n, \bar{\gamma}; X) \left[ 1 - (n-1)\eta_\gamma^2 \right] \]

(8)

\[
\equiv \bar{\gamma}Q(n, \bar{\gamma}; X)P(n, \eta_\gamma^2)
\]

(9)

where \( \eta_\gamma = \sqrt{\text{var(\gamma)/\bar{\gamma}}} \) is the coefficient of variation for conflict costs across siblings. \( P \) is defined from the expression in square brackets, and I will refer to this as the intensity of conflict. The intensity of conflict is high when the number and the similarity of siblings is high. If there is no variance in costs between the siblings, then the intensity of conflict is independent of the number of siblings, and maximized at 1. In summary, the conflict framework then delivers the following results:

1. Siblings dominate a larger share of contestable parental time if they have low conflict

\[\text{Notice that the optimal conflict effort is not in general bounded above zero: A child with very high costs relative to siblings, may optimally choose to withdraw from the conflict. Though this case is not necessarily implausible in some families, I ignore it in the below.}\]
costs relative to their siblings.

2. The more similar are the conflict costs of siblings, the more intense is conflict and the more equal are their captured shares.

3. The larger is the number of siblings, the higher is the extent of conflict, and the lower is the intensity of conflict.

Phinney (1986) suggests that older siblings have more sophisticated conflict strategies, making them more likely than younger siblings to prevail in conflict. In experimental studies from developmental psychology, both Howe et al. (2002) and Minnett et al. (1993) find support for older siblings and boys being more dominant in sibling conflicts. Howe et al. also observe that the resolution of conflict differs depending on whether the instigator of conflict is the older or younger sibling: In the former case, resolutions are often passive with the younger sibling relenting to the demands of the older. In the latter case, however, resolutions often involve the younger sibling calling for help from a parent. If older siblings are more dominant in the sibling relationship, then we would expect birth order effects as a result of the inequitable sharing of parental time in conflict.

Moreover, Minnett et al. (1983) show evidence that the spacing between siblings matters, observing that closely spaced siblings seem to be more aggressive with each other. Further, Howe et al. (2002) report that girls seem more submissive than boys, and in particular that younger boys are more likely to stand up to an older sister than an older brother, supporting the contention that boys are socialized to be more conflictual than girls (Ruble and Martin, 1998). We might therefore suspect that conflicts should favor in particular children that are older relative to their siblings, making the birth order effect particularly large in favor of these siblings. Further, conflicts would tend to favor boys, causing larger birth order effects where the boy is already favored (e.g. the older siblings) and smaller birth order effects in the opposite case.

**Example: Two siblings – Conflict.** To get some more intuition behind the result, consider our example of a two-child family, and assume that sibling 1 is the stronger in conflict, because he or she is older. Under the framework above, the allocation of public time realized in conflict now takes the straight-forward form (from equation 5)

\[
p^*_i = \frac{\gamma_j}{\gamma_i + \gamma_j} = 1 - p^*_j
\]

In figure 2, the supply of contestable parental time—\(X\)—defines the budget line for costless allocation between the siblings, represented by the solid straight line. As we saw above, parents with symmetric preferences across siblings prefer the allocation in point \(A\), sharing their public time equally between siblings. However, the equilibrium sharing realized in conflict, implies that actual parental attention is divided as in point \(B\), where the more dominant sibling 1 captures a larger share of the allotted time.
5 Parental investment with conflict

Having derived the individual inputs for any given parental supply of care time, we may now turn back to the parental allocation problem. Parents, of course, would perceive of the conflict and the implicit allocation rule it creates, and take this into account in determining the supply. In this case, since parents realize that they cannot target the individual children as above, they instead solve the following maximization problem.

\[
\max_{c,X,\{y_i\}_{i=1}^n} U(c,q_1,\ldots,q_n) \\
\text{s.t. } c \leq w \left[ 1 - X - \sum_{i=1}^n y_i \right] \\
q_i = g(x_i,y_i) \\
x_i = p_i X
\]  

(11)

Now, instead of allocating time individually to each child, setting \(x_i\) directly as above, parents set aside a total number of hours for all the children, denoted \(X\). During this time they then let the siblings compete for attention, realizing share \(p_i\) to child \(i\), determined in the conflict above. Notice how this implies that the cost of investment in a given child depends on his or her aptitude in conflict: A sibling that is able to capture a large share in contest responds more to parental investment in public time. Meanwhile, responsiveness
to dedicated time is the same for all siblings. Therefore, it is now cheaper for parents to invest in siblings that are stronger rather than weaker in the conflict.

Solving the parents’ maximization problem from equation 11 above, taking into account the sharing through sibling conflict in equation 5, yields the first-order conditions

\[ \sum_{r=1}^{n} p_r v'_i g'_{x_i} = w v'(c) = v'_i g'_{y_i}, \quad \text{for all } i = 1, \ldots, n \]  

(12)

The first equality is the key difference from the traditional framework above, and reflects the tradeoff between parental consumption and investing in children using public time: Unless siblings have identical conflict costs, i.e. \( p_i = p_j \) for all \((i, j)\), the realized allocation of public time between siblings is inefficient. We saw above that parents would prefer to allocate the same number of hours to all children. In the sibling contest for attention, however, the more dominant siblings are capturing a larger share, leaving the weaker siblings with less. This allocative inefficiency determined in conflict, decreases the marginal benefit of investments in public time, causing parents to reduce this investment.

The second equality in equation 12 reflects the tradeoff between parental consumption and investments in the individual children using dedicated time. While this tradeoff is not directly affected, the substitution away from public time as a child input, indicates that we should expect a substitution into dedicated time. The actual end effect will, however, depend on the complementarity of public and dedicated time in child development: If the two are close complements, the decrease in the ability to use public time may cause a decrease also in the total dedicated time. On the other hand, as long as parents have some preference for equality in the outcome of siblings, they will tend to shift the allocation of dedicated time in favor of less dominant siblings, to compensate them for their lack of proficiency in capturing parent attention.

In end result, if the older child is more dominant in conflict, then investing in the older child is now effectively cheaper than investing in the younger. This implies that parents will generally not be compensating the younger sibling sufficiently, but are implicitly (adversely) investing more in the older child, giving it higher quality as a consequence. This generates birth order effects. In summary, we would therefore predict that parents, compared to their preferred choices without conflict, will tend to

1. increase their own consumption, decreasing total child investment
2. decrease their investment in public time
3. shift the allocation of dedicated time in favor of children that are weak in conflict
4. invest more in the children that are strong in conflict than in the children that are weak in conflict.
Example: Two siblings – Parental allocation. Turning back to our example of a two-child family, consider again that child 1 is the older and therefore more dominant sibling. For a given level of parental consumption, the parental possibilities frontier without conflict, also seen above in Figure 1, is the outer solid curve in Figure 3. The initial parental investment characterized above, is in the point $A$, where the parents have optimally chosen allocations of public and dedicated time. As we have seen, parents in this case invest equally in both children, through both public and dedicated time.

Any conflict sharing-rule is associated with an alternative child quality possibility frontier, illustrated by the dotted inner curve in the figure. Given the production function, this frontier may be tangent to the outer in exactly one point, where the shares of public time are those given in conflict, while the allocation of dedicated time and the level of public time are optimally chosen. In the figure, this is true in the point $B$. To the right of this point, the frontier is always steeper, since the shares of public time to the individual children are locked by the outcome in conflict. Similarly, the frontier is always less steep to the left of this point, for the same reason. Since we know that sibling 1 is stronger and gets a larger share in conflict, we now also know that the frontier with sibling conflict must be steeper at the 45 degree-line than the frontier without sibling conflict. This indicates that the price of quality now is higher for the younger child, relative to the older. The optimal parental investment will therefore be in a point like $C$, where the older sibling receives more total attention than the younger sibling. Since this point is interior, it also implies that the total quality of the children is now lower than it would be without conflict.

This illustrates how, relative to the first-best, the superiority of the older child in conflict causes overinvestment in dedicated time for the younger child, and a related underinvestment for the older child. Further, the inefficiency realized in conflict is illustrated by the fact that the realized point is always in the interior of the initial frontier. Both because of the decrease in the total quality produced, given consumption, and because of the concavity of parental preferences, parents get less utility from their children, causing them to increase their total consumption, compared to the situation without conflict. In the Figure, I assumed that this was already taken into account.

6 The direct effects of conflict

It is clear from the above that contestability of resources that are part of the formation of children’s development, causes inefficiencies both across different inputs and across siblings. The latter in turn causes birth order effects, where older siblings receive a higher total investment than the younger. However, we have not yet considered the impact of the conflict itself: The literature discussed above suggests that conflict should have a direct effect on child development, over and above the allocative inefficiencies it creates.
Figure 3: The child production possibility frontier overall (solid), and given the equilibrium sharing rule from conflict (dashed).

To be precise, say for simplicity that the conflict has a direct impact on the efficacy of public time, increasing or decreasing the number of hours actually captured by the children. When we studied the sibling conflict, we summarized the nature of the conflict in terms of the extent and intensity of the conflict. As an example, say now that the effective public time captured by child $i$ depends on both these parameters through the function $h(QP)$, where I let the intensity magnify the effect of the extent of the conflict. The product between the two in effect gives a measure of the total contest effort, where the individual efforts are weighted by the cost share, $\gamma_i/\bar{\gamma}$. For simplicity, I assume that the conflict has the same direct effect on the public time use of all siblings.\(^8\)

$$x_i = p_iX + h(QP)$$

Rewriting the first order condition in equation 12, and using the definitions of $Q$ and $P$ from equations 6 and 8, we now get

$$\sum_{r=1}^{n} v'_r g'_r [p_i + h'\frac{QP}{X}] = w\nu'(c) = v'_i g'_i,$$

for all $i = 1, \ldots, n$  \hspace{1cm} (13)

In general, the effects compared to the allocation without conflict, depend on the marginal

\(^8\)It would be simple enough to allow different effects depending on the conflict effort, for instance. This would, however, make the graphical presentation below significantly more cluttered.
effect of conflict on child development. In equilibrium, if conflict is sufficiently beneficial to the children on the margin, of course, then parents prefer to increase the number of public hours. Notice, however, that even if conflict is marginally positive for child development in equilibrium, the conflict allocation decreases allocative efficiency suggesting an increase in parental consumption.

In my view, the case of large positive equilibrium effects of conflict on the margin, seems rather unlikely, considering the large number of conflictual interactions observed between just two siblings in a short period of time (Howe et al., 2002; Dunn, 1993; see above). We saw above that while some conflict might be beneficial to child development, frequent and intense conflict might harm all children. For instance, children may waste parts of the allocated time to unconstructive arguments and fighting, or the return from the parental interaction may be decreased by not being able to give proper attention. It therefore seems that \( h' \) should be positive when the total conflict effort is not too high, before turning negative above some level of conflict.

If conflict in equilibrium is detrimental on the margin, public time has an even lower marginal productivity in child development than it had when we took account of conflict above. The parents will therefore choose to increase their purchase of consumption goods further, decreasing the total investment in child development. Realizing the inefficiencies generated in conflict, parents in effect exacerbate the family size effects observed in the standard quantity–quality-framework and in the conflict framework above.

Lowering the level of conflict costs and thereby increasing the total conflict effort by raising the extent of sibling competition, then has the unequivocal effect of further increasing family size effects. If, as suggested, boys have lower costs of conflict than girls, this result implies that family size effects should be particularly large when a larger proportion of children are boys. Since the level of these costs does not influence the outcome of the conflict, the effects on birth order should be second order. Meanwhile, increasing conflict intensity by spacing siblings out, and thereby increasing the variance in conflict costs, will change the outcome in favor of the older sibling, and therefore have a first order effect of increasing birth order effects. Since the intensity of conflict is assumed to scale up the effects of the extent of conflict, the spacing of children further exacerbates family size effects when the marginal effect of conflict is negative.

Also, we note two additional sources of a family size-effect. Firstly, while determining the optimal level of conflict is an empirical question, it seems clear that detrimental conflict should be more likely when the number of siblings is large, and increasing in intensity with family size. Mogstad and Wiswall (2009), for instance, show a small negative effect of going from two to three children, indicating that the margin may well be negative already with two siblings. Secondly, the effect of resource dilution should be stronger when we allow for sibling conflict, causing an inefficient allocation of time: For a given number of contestable hours, children’s marginal benefit is larger the more thinly spread out is
the parental time. In large families, the more dominant siblings will therefore capture resources that have higher developmental value on the margin, compared to the captured resources in smaller families.

**Example: Two siblings – Direct effect of conflict.** Consider again our two child-family. Figure 4 redraws the budget of public time for the two children, the preferred parental allocation without conflict, point A, and the allocation realized in conflict, point B. An example of an effective budget line is drawn around the time budget, giving the direct effect of conflict for different intensities. The figure takes into account that the equilibrium points on the budget line realized in conflict are associated with a particular value of relative conflict costs. Therefore, each point is also associated with a particular intensity level, while the extent of conflict is unaffected. The realized point in our example, is determined by starting from the conflict sharing derived above, that is point B in the figure, and then moving along a 45 degree-line to the effective budget line. In effect, we are using the actual budget line as the horizontal axis, where intensity of conflict is increasing as we approach the symmetric point A, and drawing an example of $h(QP)$ as a function of the intensity $P$, in accordance with the above discussion.\(^9\)

If the competition is highly tilted towards the older sibling, realizing a point on the budget line close to the $y$-axis, then we know from equation 8 that the intensity of conflict is low, causing low total conflict effort. Because some conflict is beneficial, the effective budget line is now outside the initial budget. As conflict becomes more symmetrical, causing the realized allocation to shift towards the $x$-axis, conflict becomes increasingly intense and total effort grows. From point D, conflict is detrimental to child development on the margin, though still for a while beneficial overall. As we approach the 45 degree-line, indicating perfect symmetry in conflict, conflict intensity is maximized, and conflict is detrimental overall in the figure.

The example gives two important insights: Firstly, the assumption of negative direct effects of conflict on the margin in equilibrium, is less strong than it may seem, since the conflict may well still be substantially beneficial overall. Second, whether the conflict is beneficial or detrimental to child quality, siblings get different outcomes due to the difference in the number of parental hours that they capture. This gives birth order-effects, almost as soon as we concede that the older sibling is more dominant than the younger.

\(^9\)Notice that the interpretation as a budget line only holds if the direct effect of conflict is symmetric. If not, then the point C may be thought to delimit an effective budget line parallel to the initial budget line.
Figure 4: Non-monotonic effects of conflict. The budget line for allocation of contestable parental time between the siblings (solid line), and effective investment after accounting for conflict (dashed line).

7 Conclusion

Allowing interactions between the spouses in a household, has been an important field of research which has generated many important insights beyond the traditional unitary framework. In this paper, I change the focus in considering a household interaction where children are active participants in their own formation. While siblings are vying for the attention of their parents, I assume that they crowd out the other siblings, attempting to capture a larger portion of the benefits for themselves. Since older siblings are typically found to be more dominant in sibling relationships, this inherently generates birth order effects. While conflict between siblings in itself can be either beneficial or detrimental to siblings, I argue that when conflicts become intense, they may be likely to be detrimental, at least on the margin. In this case, the framework can also generate negative effects of family size on the average child development in the family directly.

Further, the attention captured by the individual siblings does not correspond to the allocations preferred by the parents. This implies, on the one hand, that the marginal productivity of contestable parental time is decreased, causing parents to decrease their investment via this channel. On the other hand, the disadvantages of siblings that are less dominant in the conflict, will cause parents to compensate by shifting market goods in their favor, and may cause them to increase the overall non-contestable investment
level. While this will mediate the negative effects of birth order somewhat, the higher productivity of time investment in older siblings will imply that parents optimally prefer to invest more in their early-borns, confirming the birth order effects.

Expanding on the traditional models of household decision-making by allowing for new avenues of interactions within the household, should be an important path for future research. In particular, taking the predictions to empirical data to test the models and quantify their influence is a current project. As an example, comparing the long-run effects on children of the large expansion in child care in Norway following the 1975-reform (see Havnes and Mogstad 2009), the current model would predict that intra-household rank and characteristics, such as family size, should become less important. When a large part of the day is spent in relatively mixed child groups often sorted by age, a child’s birth order should be less determinant of the child’s development. Similarly, competing for resources in the home would be expected to define a lesser part of the child’s time, and therefore be less determinant of outcomes. If birth order and family size becomes less important as a result of entering formal child care arrangements, the effects of child care should be less positive for early-borns, being deprived of their conflict advantage vis-a-vis their younger siblings, and more positive for children from larger families.

References


