Religious institutions, intergenerational conflict, and fertility: Theory and evidence from the Amish*

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Abstract

What is the social function of religion? We argue that many religious institutions are designed in part to promote spending on children, especially through high fertility. We explain these institutions in a model in which older and younger generations disagree about younger generations' child-related choices. Older generations use their political power within religious communities to impose rules that induce younger generations to conform to the high-fertility preferences of the old. We present qualitative and quantitative evidence from a case study of the Amish. Quantitatively, we show that Amish institutions have a large, positive effect on fertility.

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"Children are a blessing and a gift from the Lord."
Psalms 127:3

1 Introduction

One of the most important functions of religious institutions is to regulate human reproduction. Religious institutions impose countless rules and moral injunctions related to sex, marriage, and child-raising. What purpose do these rules and institutions serve? Whom do they harm and whom do they benefit? Our goal in this paper is to answer these questions.

We argue that many religious institutions are designed in part to respond to a conflict between older and younger generations within the same family lineage. We begin by developing a model that shows how older and younger generations may disagree about younger generations' optimal fertility. Our main assumption is that grandparents value interacting with their grandchildren. This benefit is independent of any altruistic benefit that parents get from the same children. Because grandparents get independent benefits from grandchildren in addition to any benefits that parents receive from the same children, grandparents typically want parents to allocate more resources to child-raising than parents want to allocate themselves. However, because grandparents will be dead when their grandchildren reach adulthood, grandparents typically want parents to make smaller future-oriented investments in child quality than parents want to invest themselves. Putting these results together yields that grandparents typically want parents to choose higher fertility than parents want for themselves. Agey et al. (2023) present a qualitative study of marriage and fertility choices in Nepal that contains a quote that concisely summarizes this conflict. They quote an informant who says, "There is pressure [on newlywed couples] from parents to have kids as soon as they get married because they want to play with their grandkids before they die." We believe that this kind of conflict between older and younger generations is very common.[1]

[1]Our model builds on results in Saez-Marti and Weibull (2005) and Galperti and Strulovici (2017). Like Saez-Marti and Weibull (2005) and Galperti and Strulovici (2017), we assume that people are directly altruistic towards their grandchildren as well as towards their children. Unlike Saez-Marti and Weibull (2005) and Galperti and Strulovici (2017), we include time preference as a separate parameter from altruism and study how both time preference and altruism affect intergenerational disagreements. Also unlike Saez-Marti and Weibull (2005) and Galperti and Strulovici (2017), we explicitly study fertility and include a quality-quantity tradeoff, and we study how different generations may disagree about this tradeoff.

Our assumption that grandparents value interacting with their grandchildren contrasts with the assumptions in the canonical economic theory of fertility due to Becker and Barro (1988). Becker and Barro assume that people get direct altruistic value only from their children and not from their grandchildren or any more distant future generations. The Becker-Barro assumption implies, contrary to our results, that grandparents and parents always agree about parents' optimal child-raising choices. We also compare our results to the canonical evolutionary biology theory of parent-offspring conflict in Trivers (1974). Trivers predicts that when different generations disagree, older generations typically prefer that younger generations have *fewer* children than younger generations prefer for themselves.[2]

We use our model of intergenerational conflict to understand religious institutions. We argue that the old often hold disproportionate political power relative to the young in religious communities. The old use this power to impose religious rules that induce the young to shift resources from their own consumption to spending on children, and from investment in education to higher fertility. These rules benefit the old at the expense of the young by inducing the young to make choices that conform to the preferences of the old. Because religious rules are detrimental to the young, the young may want to leave the religious community to avoid being subject to the rules. The old may impose punishments on young people who leave the community in order to prevent young people from leaving.[3]

We provide both qualitative and quantitative evidence for our theory from a case study of one high-fertility religious community, the Amish. We first discuss qualitative facts about Amish institutions. We show that 1) Amish communities have very high fertility, 2) Amish institutions impose many seemingly irrational rules on their members, including

[2]More precisely, Trivers (1974) predicts that grandparents want parents to devote fewer resources to child-raising than parents want to devote themselves. Trivers' model does not distinguish between investments in child quality and investments in child quantity.

[3]Religious institutions are diverse and do not always support the old against the young. For example, de Moor and van Zanden (2010) argue that the medieval Catholic church reduced the power of the old to control the marriage decisions of the young by promoting the idea that marriage required the consent of the spouses themselves and not only the consent of the spouses' parents. They argue that by empowering the young to make their own decisions, the Catholic church increased the age at first marriage and reduced fertility. Thus their argument is consistent with our claims that the old want the young to choose higher fertility than the young want for themselves and that religious institutions are designed in part to affect this conflict. In this case, however, religious institutions intervened on the side of the young rather than on the side of the old. See also Schulz et al. (2019).

rules that discourage both adult consumption and investment in children's education, and 3) Amish institutions impose punishments on people who leave the Amish church, and that more severe punishments are associated with a lower probability of leaving. We argue that these qualitative facts are consistent with our model.

We consider possible alternative explanations of these qualitative facts about the Amish, including explanations based on the club goods theory of Iannaccone (1992) and Berman (2000), the old-age support theory of Caldwell (1982), and the cultural theory of Carvalho, Koyama, and Williams (2024). We argue that our theory explains qualitative facts that are not explained by these other theories. However, we emphasize that our theory is a complement rather than a substitute to existing theories and that other theories may also explain some aspects of Amish institutions.

Next, we present quantitative evidence using newly assembled data covering nearly the entire Amish population of the largest Amish settlement in the world. We compare the fertility of Amish church members to the fertility of people who grow up in the Amish church and then leave. To address selection bias, we compare siblings who leave the church to siblings who stay. Siblings have preferences and endowments that are more similar to each other than randomly chosen people, and so comparing siblings provides evidence about the importance of selection bias.

We show that people who leave the Amish church have lower fertility than people who stay, and that this difference is large and is robust to accounting for selection bias. Our results contribute to the debate about whether "institutions" or "culture" are more important for explaining observed differences across societies. A difficulty in this debate is that both "institutions" and "culture" are vague terms, and their definitions are contested. Recently, the literature has begun to converge on a definition of "institutions" as the features of a society that can change quickly, while "culture" is defined as the features of a society that can only change slowly over many generations (Alesina and Giuliano 2015; Besley and Persson 2019). Our results show that there are large changes in fertility within a single generation when a member of a family lineage decides to leave the Amish church. This result suggests that a large fraction of observed high Amish fertility is explained by

Amish institutions rather than by Amish culture, consistent with our theory.[4]

In the literature, our paper is most closely related to Choy (2020), who also studies the Amish. Choy (2020) argues that religious rules are designed to strengthen family ties but does not specifically discuss spending on children or distinguish between child quality and child quantity. Empirically, Choy (2020) does not consider fertility.

The remainder of the paper is as follows. Section 2 presents our model. Section 3 describes Amish society and institutions and argues that the facts about these institutions are qualitatively consistent with our model. Section 4 presents our data. Section 5 presents our empirical strategy and quantitative results. Section 6 concludes.

2 Theory and qualitative predictions

2.1 An abstract model

Consider a model in which there are an infinite number of time periods indexed by $t \in \{0, 1, 2, ...\}$. In each time period, a new generation is born. Members of each generation live for T periods, and then they die. Unless we state otherwise, we assume that $T = 3$. In this case we sometimes refer to the three periods of life as childhood, adulthood, and old age. For one application we will assume instead that $T = 1$. Our initial goal in presenting the model is to illustrate two distinct ways in which members of different generations may disagree about child-related choices. To illustrate these disagreements in the clearest possible way, we begin by abstracting from specific questions about fertility and human capital investment. Instead, we assume that each generation consists of only one member, and that each agent consumes a certain amount during each time period that the agent is alive. We consider abstractly how different agents value transfers from one agent to another and from one time period to another. Later, we apply the principles illustrated by this abstract model to a more concrete setting in which members of different generations make choices about fertility and human capital investment.

[4]Our results are in a sense the opposite of the results in the literature using the "epidemiological approach" to study culture (Fernandez and Fogli 2009). This literature shows that many outcomes (including fertility outcomes) among members of immigrant family lineages are correlated with average outcomes in the country of origin. These results are interpreted to indicate that culture matters, since culture persists across generations and through changes in institutional environment. In contrast, we emphasize the change in outcomes when a person leaves the Amish institutional environment. We claim that the speed of this change indicates that institutions explain a large part of the relevant outcome.

Let x_t^τ be the consumption of the agent born in period t during period τ. Thus, for example, x_1^2 is the consumption of the agent who is born in period 1 during period 2, when that agent is in adulthood. We set $x_t^\tau = 0$ for all $\tau < t$ and for all $\tau > t + 2$. That is, agents do not consume before they are born or after they die. Let $u(x)$ be the utility that an agent gets from consuming amount x at a particular point in time.

Let U_t^τ be the spot utility that the agent born in period t gets from events that occur in period τ. The utility that an agent gets from events that take place in a given time period depends on the agent's own consumption in that time period, as well as altruistic utility that the agent gets from other agents in the same time period. Agents do not get utility from events that take place prior to their births. Specifically, we assume that U_t^τ takes the following form:

$$\begin{aligned} U_t^\tau &= 0 \text{ if } \tau < t \\ &= u(x_t^\tau) + \sum_{i=1}^{\infty} \alpha_i U_{t+i}^\tau \text{ if } \tau \geq t \end{aligned} \tag{1}$$

Here α_i is the degree of altruism that an agent feels towards the agent's i-th degree removed descendants.

Let U_t be the total utility of the agent who is born in period t. A agent's total utility is composed of a weighted sum of the utilities that the agent gets from the events in each time period, with weights that depend on how much the agent values utility that is experienced at a given length of time after the agent's birth. We assume that U_t takes the following form:

$$U_t = \sum_{j=0}^{\infty} \beta_j U_t^{t+j} \tag{2}$$

Here β_j represents the degree to which an agent values utility received from events that take place in the j-th period after the agent is born. Notice that while agents do not get utility from events that take place prior to their births, agents may get utility from events that take place after their deaths. In particular, agents may receive altruistic utility after their own deaths from the consumption of their descendants.

Our utility weights β_j differ from the standard definition of discount factors in that we define utility weights relative to the distance in time from an agent's birth, rather than

relative to the distance in time from the present moment. These utility weights define a total utility function U_t for an agent born at time t that is the same when viewed from any time period τ. Because the object that each agent maximizes, U_t, does not change over time, our assumption guarantees that each agent's behavior is intertemporally consistent. We assume that agents are intertemporally consistent in order to focus on the intergenerational inconsistency that is the main contribution of our model.

It will be helpful to define V_t to be the total lifetime utility that an agent born in period t receives *from the agent's own consumption* as follows:

$$V_t = \sum_{j=0}^{\infty} \beta_j u(x_t^{t+j}) \tag{3}$$

2.2 Intergenerationally consistent preferences

We now consider some additional assumptions that define special cases of the model. We will focus on assumptions that ensure intergenerational consistency. Preferences are intergenerationally consistent if members of past and present generations always agree about how resources should be allocated between present and future generations.

Consider the following assumptions:

Assumption 1. *There exists α such that $0 < \alpha < 1$ and such that $\alpha_1 = \alpha$. For all $i > 1$, $\alpha_i = 0$*

Assumption 1 states that agents are directly altruistic towards their children but not towards any more distant descendants.

Assumption 2. *There exists β such that $0 < \beta < 1$ and such that $\beta_j = \beta^j$ for all j.*

Assumption 2 states that agents discount the future using standard exponential discounting.

Some simple rearrangements of (2) yield the following proposition:

Proposition 1. *Suppose that assumptions 1 and 2 hold. Then each agent's utility U_t can be written as*

$$U_t = V_t + \alpha\beta U_{t+1} \tag{4}$$

Iteratively substituting yields the equivalent formula

$$U_t = \sum_{k=0}^{\infty} \alpha^k \beta^k V_{t+k} \tag{5}$$

The utility function in (5) is a version of the dynastic intergenerational utility function originally introduced by Barro (1974), adapted to allow for agents who live for multiple time periods.

Assumptions 1 and 2 together imply that preferences are intergenerationally consistent. To see this, consider four generations r, s, t, and t', and two time periods ρ and σ, such that the following conditions hold:

- $\rho \geq r$
- $r \geq t$
- $r \geq t'$
- $\sigma \geq s$
- $s \geq t$
- $s \geq t'$
- $s - r = a$
- $\sigma - \rho = b$

Given assumptions 1 and 2, it is straightforward to show from (5) that:

$$\frac{\partial U_t / \partial x_s^\sigma}{\partial U_t / \partial x_r^\rho} = \frac{\partial U_{t'} / \partial x_s^\sigma}{\partial U_{t'} / \partial x_r^\rho} = \alpha^a \beta^b \frac{u'(x_s^\sigma)}{u'(x_r^\rho)} \tag{6}$$

The marginal rate of substitution between (r, ρ) consumption and (s, σ) consumption is the same for any two generations t and t' such that (r, ρ) and (s, σ) are in the present or the future with respect to both t and t'. Thus, any two generations t and t' agree about how resources should be allocated between (r, ρ) consumption and (s, σ) consumption. This is our definition of intergenerational consistency.

One further assumption is useful to clarify the relationship between our model and the

models of Barro (1974) and Becker and Barro (1988):

Assumption 3. *Each agent lives for only one time period, that is,* $T = 1$.

From (5), assumptions 1, 2, and 3 together yield that each agent's utility can be expressed as follows:

$$U_t = \sum_{k=0}^{\infty} \delta^k u(x_{t+k}) \tag{7}$$

Here $x_t = x_t^t$ is amount consumed by generation t and $\delta = \alpha\beta$.

Altruism α and time preference β enter symmetrically into (7) and hence can be conflated into a single parameter δ. Thus something like assumptions 1, 2 and 3 underlie the modelling choices in Barro (1974) and Becker and Barro (1988). Both Barro (1974) and Becker and Barro (1988) include a single parameter that simultaneously indexes altruism and time preference.

2.3 Challenging the assumptions

Although assumptions 1 and 2 are the foundation for the canonical models of intergenerational altruism in Barro (1974) and Becker and Barro (1988), both assumptions are questionable. Consider first assumption 1. Assumption 1 states that each generation t is directly altruistic towards generation $t+1$, but is not directly altruistic towards generation $t+2$ or any more distant future generation. In reality, it seems likely that people are directly altruistic not only towards their children, but also towards more distant future generations.

To account for the likelihood that people are directly altruistic not only towards their children but also towards more distant descendants, we consider the following assumption as a modification of assumption 1:

Assumption 1′. *There exist positive real numbers* α *and* γ *such that*

- U_t *can be written as:*

$$U_t = V_t + \gamma \sum_{i=0}^{\infty} \alpha^i U_{t+i} \tag{8}$$

- $\alpha < 1/(\gamma + 1)$

Assumption 1′ posits a specific functional form for the altruism that people feel towards their descendants. This functional form is introduced in Saez-Marti and Weibull (2005). Galperti and Strulovici (2017) show that (8) is the unique functional form that satisfies certain intuitive axioms. Intuitively, α^i is the degree of altruism that a person feels towards his i-th degree removed descendants, and γ is a factor that measures the difficulty of imagining other people's qualitative experiences. Notice that $\gamma = 1$ is an allowed special case of the model. We use this functional form here for concreteness, but the principles illustrated by this functional form are more general. The assumption that $\gamma < 1/(\alpha + 1)$ is necessary to ensure that the infinite sum in (8) converges.[5]

Assumption 2 is also questionable. Assumption 2 implies that people discount events that occur after their deaths in the same way that they discount events that occur prior to their deaths. We believe that this assumption is unrealistic when applied to altruistic value. Part of the reason that people value their descendants' utility is that they value interactions with their descendants.[6] These interactions allow people to experience their descendants' utility vicariously. After death, interaction is no longer possible, and so the value that people get from their descendants' utility is reduced.

To model the value that people get from interaction with their descendants, we consider the following assumption as a modification of assumption 2:

Assumption 2′. *There exist real numbers β and ϕ such that $0 < \beta < 1$, $0 < \phi < 1$, and such that $\beta_j = \beta^j$ for $j \leq 2$ and $\beta_j = \phi\beta^j$ for $\beta > 2$.*

Assumption 2 states that in addition to the pure time discount factor β, people also discount events that occur after their deaths by an additional factor ϕ. The factor ϕ measures the amount by which people value interactions with their descendants over and above the value of their descendants' mere existence.

[5] We have switched the definitions of α and γ used in Saez-Marti and Weibull (2005) and Galperti and Strulovici (2017) to maintain the role of α as the altruism parameter.

[6] The following thought experiment helps to show how people value interactions with their descendants. Imagine that you have a child who grows up and decides to move to a faraway country. You know that your child will be happy, but you will never see her again. How do you feel about this? Most people would, we submit, be at best ambivalent about this situation. This ambivalence suggests that people value interactions with their descendants over and above the mere fact of their descendants' happiness.

2.4 Relaxing assumption 1

Iterative substitution and some rearrangements of (8) yield the following proposition, which is similar to results in Saez-Marti and Weibull (2005):

Proposition 2. *Suppose that assumptions* $1'$ *and 2 hold. Then (8) can be rewritten as*

$$U_t = V_t + \theta \sum_{i=1}^{\infty} \delta^i \beta^i V_{t+i} \tag{9}$$

where $\theta = \gamma/(\gamma+1)$ *and* $\delta = \alpha(\gamma+1)$.

The formula (9) is a version of a utility function with quasi-hyperbolic discounting. Like other utility functions with quasi-hyperbolic discounting, (9) implies inconsistency, in this case intergenerational inconsistency. In particular, for any σ and τ such that $\sigma \geq t$, $\tau \geq t+1$, and $\tau - \sigma = b$ we have

$$\frac{\partial U_t/\partial x_{t+1}^{\tau}}{\partial U_t/\partial x_t^{\sigma}} = \theta\delta\beta^{b-1} \tag{10}$$

$$\frac{\partial U_{t-1}/\partial x_{t+1}^{\tau}}{\partial U_{t-1}/\partial x_t^{\sigma}} = \delta\beta^{b-1} \tag{11}$$

Equations (10) and (11) describe a conflict between grandparents (generation $t-1$) and parent (generation t) over how consumption should be allocated between parents' consumption and children's (generation $t+1$) consumption. The equations state that grandparents put more value on children's consumption relative to parents' consumption than parents themselves put on children's consumption relative to parents' consumption. Thus, grandparents want parents to allocate more resources to children than parents want to allocate themselves.

2.5 Relaxing assumption 2

Now suppose that both assumption $1'$ and assumption $2'$ hold. In this case, it is not possible to derive a closed form expression for U_t in terms of V_t analogous to the expressions derived in propositions 1 and 2. Instead, some rearrangements of (2) yield the following:

Proposition 3. *Suppose that assumptions* $1'$ *and* $2'$ *hold. Then (8) can be rewritten as:*

$$U_t = V_t + \sum_{n=1}^{\infty} \theta\delta^n \sum_{k=0}^{\infty} \beta_{n+k} u(x_{t+n}^{t+n+k}) \tag{12}$$

Here β_j *is defined as in assumption* $2'$*, and* $\theta = \gamma/(\gamma+1)$ *and* $\delta = \alpha(\gamma+1)$ *as in proposition 2.*

Taking derivatives yields the following:

$$\frac{\partial U_t / \partial x_{t+1}^{t+2}}{\partial U_t / \partial x_t^{t+1}} = \theta\delta\beta \tag{13}$$

$$\frac{\partial U_{t-1} / \partial x_{t+1}^{t+2}}{\partial U_{t-1} / \partial x_t^{t+1}} = \phi\delta\beta \tag{14}$$

Like equations (10) and (11), equations (13 and (14) describe a conflict between grandparents (generation $t-1$) and parents (generation t). Equations (13) and (14) specifically describe a conflict about how to value the consumption of children (generation $t+1$) when those children have reached adulthood (time period $t+2$). If $\phi > \theta$, grandparents value children's consumption in adulthood relatively more than parents, for the reasons discussed in section 2.4. On the other hand, if $\phi < \theta$, then grandparents value children's consumption in adulthood relatively less than parents, because when children are in adulthood, grandparents will be dead and hence unable to interact with the children.

2.6 Summary and discussion

It is useful to summarize the intuitions developed in the previous model about disagreements between grandparents and parents related to children's consumption. We summarize these intuitions as follows:

Intuition 1. *Grandparents value children's consumption during childhood relatively more than parents value children's consumption during childhood, because grandparents effectively count children's consumption twice. Grandparents' utility functions count children's consumption once directly, and once indirectly through the effect that children's consumption has on parents. As a result, grandparents want parents to allocate more resources to children's consumption during childhood than parents want to allocate themselves.*

Intuition 2. *Grandparents may value children's consumption during adulthood relatively more than parents value children's consumption during adulthood for the same reasons as in intuition 1. However, grandparents may also value children's consumption durinng adulthood relatively less than parents value children's consumption during adulthood, because unlike parents, grandparents do not survive to interact with children during adulthood. As a result, grandparents may want parents to allocate fewer resources to increasing children's adult consumption than parents want to allocate themselves.*

Intuitions 1 and 2 together describe an important asymmetry between altruistic attitude and time preference. Grandparents value children's *present* consumption relatively more than parents, but they may value children's *future* consumption relatively less than parents. This asymmetry contrasts with symmetry between altruistic attitude and time preference that is assumed by Barro (1974) and Becker and Barro (1988).

2.7 A concrete model

In this subsection, we explore some concrete implications of the intuitions discussed above for understanding disagreements between parents and grandparents regarding decisions about fertility and about investment in children's human capital. Under our assumptions, it is technically very challenging to model investments in children's human capital in an infinite generation setting.[7] In order to avoid these technical challenges, from now on we consider a model with only three generations, which we refer to as (g)randparents, (p)arents, and (c)hildren. Each generation lives for three periods, which we refer to as (c)hildhood, (a)dulthood, and (o)ld age. We will also consider the utility of the grandparents generation in a fourth period when the grandparent is (d)ead.

We assume that there is only one grandparent and only one parent. There may be multiple children. The model begins when the grandparent has already reached old age, the parent is an adult, and the children's generation has just been born. Time continues into a second period period, when the children's generation reaches adulthood. At this point, the model ends.

Let x_i^j be the consumption of a representative member of generation i in life period j.

[7] The problem of optimal investment in children's human capital in our setting is analogous to the problem of optimal savings under quasi-hyperbolic discounting (Phelps and Pollak 1968; Laibson 1997). Krussell and Jr. (2003), Bernheim, Ray, and Yeltekin (2015), and Cao and Werning (2018) discuss some of the technical challenges associated with solving this model.

Thus, for example, x_c^a is the consumption of the children's generation during adulthood. We assume for simplicity that $x_i^o = 0$ for all i, that is, that people do not consume in old age. We also assume that people consume a fixed amount k in childhood. Utility from consuming an amount x is $u(x)$, where u is increasing and concave. We assume that $u(0) = 0$.

The parent is exogenously endowed with income y. The parent chooses a quantity $n \geq 0$ of children to have. As is conventional in this literature, we assume that n can vary continuously. Each parent also chooses to invest an amount h in each child's human capital, $h \geq 0$. Finally, each parent must provide each child with the fixed quantity of consumption k that each child needs to survive. We normalize the units of human capital so that the price of a unit of human capital is equal to the price of one unit of present consumption. We assume that savings are not technologically feasible. The parent's budget constraints are therefore:

$$x_p^a + n(h+k) \leq y_p \tag{15}$$

$$h \geq 0 \tag{16}$$

$$n \geq 0 \tag{17}$$

Each child receives income in adulthood as a function of the parent's human capital investment $y_c = f(h)$, where f is increasing and concave. Children spend all of their income on adult consumption, that is, $x_c^a = y_c$.

The grandparent's income and consumption are exogenously set to zero. For the moment, the grandparent makes no choices. Later, however, we will suppose that the grandparent holds political power and can decide the form of institutions for the community. We will consider what institutions are optimal for the grandparent.

Let U_i^j be the spot utility that a member of generation i receives in life period j, and let U_i be the total lifetime utility of a member of generation i. Since children are the last generation, children receive utility from consumption but do not receive any altruistic utility from the consumption of their descendants. Thus we have

$$U_c^c = u(k) \tag{18}$$

$$U_c^a = u(x_c^a) = u(f(h)) \tag{19}$$

The total utility of each member of the children's generation is then

$$\begin{aligned} U_c &= U_c^c + \beta U_c^a \\ &= u(k) + \beta u(f(h)) \end{aligned} \tag{20}$$

Here $\beta < 1$ is the time preference parameter.

The parent receives utility from her own consumption and altruistic utility from the consumption of her children. The utility of the parent in each time period is:

$$U_p^a = u(x_p^a) + \alpha n U_c^c = u(x_p^a) + \alpha n u(k) \tag{21}$$

$$U_p^o = u(x_p^o) + \alpha n U_c^a = \alpha n u(f(h)) \tag{22}$$

The parent's total utility is then:

$$\begin{aligned} U_p &= U_p^a + \beta U_p^o \\ &= u(x_p^a) + \alpha n[u(k) + \beta u(f(h))] \end{aligned} \tag{23}$$

As before, β is the time preference parameter and α measures the strength of parent's altruism towards children.

Since the grandparent does not consume in old age, the grandparent only receives altruistic consumption from the consumption of the parent and the children. The grandparent's utilities in each time period are:

$$U_g^o = \alpha U_p^a + \alpha^2 n U_c^c \tag{24}$$

$$U_g^d = \alpha U_p^o + \alpha^2 n U_c^a \tag{25}$$

As in assumption 1′, we assume that the grandparent directly values both the parent's and children's utility. The grandparent values the parent's utility at rate α and the grandparent values the children's utility at rate α^2. The grandparent's total utility is then:

$$\begin{aligned} U_g &= U_g^o + \phi\beta U_g^d \\ &= \alpha u(x_p^a) + 2\alpha^2 n[u(k) + \phi\beta u(f(h))] \end{aligned} \tag{26}$$

As in assumption 2′, the grandparent discounts periods after the grandparent's death by

a factor $\phi < 1$. The parameter ϕ measures the degree to which people value interactions with their descendants, over and above any altruistic utility that people get from their descendants' mere existence. After death, the grandparent is no longer able to interact with his descendants, and so the altruistic utility that the grandparent receives from his descendants is reduced by a factor ϕ in addition to the time discount β.

Denote the parent's optimal choice of x_p^a, n, and h by $\hat{x}_p^a, \hat{n}$, and $\hat{h}$. Solving the parent's problem, $\hat{x}_p^a, \hat{n}$, and $\hat{h}$ satisfy

$$u'(\hat{x}_p^a) = \alpha\beta u'(f(\hat{h}))f'(\hat{h}) \tag{27}$$

$$u'(\hat{x}_p^a) = \frac{\alpha}{k+h}[u(k) + \beta u(f(\hat{h})] \tag{28}$$

On the other hand, suppose that the grandparent could make choices for the parent, subject to the parent's budget constraint. Denote the grandparent's optimal choice of x_p^a, n, and h by $\tilde{x}_p^a, \tilde{n}$, and $\tilde{h}$. Then $\tilde{x}_p^a, \tilde{n}$, and $\tilde{h}$ satisfy

$$u'(\tilde{x}_p^a) = 2\phi\alpha\beta u'(f(\tilde{h}))f'(\tilde{h}) \tag{29}$$

$$u'(\tilde{x}_p^a) = \frac{2\alpha}{k+h}[u(k) + \phi\beta u(f(\tilde{h}))] \tag{30}$$

Inspection of (27), (28), (29), and (30) yields the following:

Proposition 4. *For k sufficiently large and ϕ sufficiently small, the following results hold:*

1. $\tilde{x}_p < \hat{x}_p$, *that is, grandparents want parents to allocate more resources to child-raising than parents want to allocate themselves*
2. $\tilde{h} < \hat{h}$, *that is, grandparents want parents to provide less human capital per child than parents want to provide themselves.*

If $\tilde{x}_p < \hat{x}_p$ and $\tilde{h} < \hat{h}$, then it must be the case that $\tilde{n} > \hat{n}$, that is, it must be the case that grandparents want parents to choose higher fertility than parents want to choose for themselves.

The intuition of proposition 4 is that grandparents value children's present consumption relatively more than parents because grandparents effectively double-count children's utility (Intuition 1) but grandparents value children's future consumption relatively less than parents, because in the future grandparents will be dead (Intuition 2). High fertility

increases the altruistic utility that grandparents get from children in both the present and the future, whereas investment in children's education only increases the altruistic utility that grandparents get from children in the future. Thus, grandparents may simultaneously want parents to choose higher fertility and less education per child than parents want to choose for themselves.

2.8 Relation to evolutionary theories

Proposition 4 describe two ways in which grandparents may disagree with parents about fertility and child-raising decisions. Trivers (1974) also develops an evolutionary theory of intergenerational conflict within family lineages. In this subsection, we compare our theory to Trivers' theory.

Trivers' theory depends on sexual reproduction. When an organism reproduces sexually, the offspring only share half of each parent's genes, and so what is fitness maximizing for the offspring may not be fitness maximizing for the parent. Thus, the parent and offspring may be in conflict.

One example of parent-offspring conflict discussed in Trivers (1974) is conflict between grandparents and parents over how many resources parents should allocate to their children. Suppose that a parent must decide whether to provide a benefit to the parent's child or to the parent's nephew. Let B_c be the fitness value that the child gets from receiving the benefit, and let B_n be the fitness value that the nephew gets from receiving the benefit. Since the child shares half of the parent's genes, but the nephew only shares one quarter of the parent's genes, the parent's inclusive fitness is maximized by giving the benefit to the child rather than to the nephew if and only if $B_c > \frac{1}{2}B_n$. In contrast, the child and the nephew both share one quarter of the grandparent's genes, and so the grandparent's inclusive fitness is maximized by giving the benefit to the child rather than to the nephew if and only if $B_c > B_n$. Thus, whenever $\frac{1}{2}B_n < B_c < B_n$, the grandparent prefers that the benefit be given to the nephew while the parent prefers that the benefit be given to the child. More generally, Trivers' theory predicts that grandparents typically want parents to allocate *fewer* resources to their children than parents want to allocate themselves, so that more resources can be reserved for nephews and nieces. This prediction contrasts sharply with our prediction that grandparents typically want parents to allocate *more* resources to their children than parents want to allocate themselves.

Our theory differs from the theory in Trivers (1974) because our theory does not depend on sexual reproduction. Instead, our theory depends on the idea that choice utility is not identical to evolutionary fitness. Choice utility may diverge from evolutionary fitness if a particular choice is fitness enhancing in most but not all circumstances. For example, a common explanation for the fact that ice cream tastes good is that consumption of high fat foods has been fitness enhancing on average throughout the human evolutionary past, and so humans have evolved a preference for high fat foods, even though under present conditions consumption of high fat foods may reduce fitness by causing heart disease.[8] Similarly, we argue that interacting with one's grandchildren has been fitness enhancing on average throughout the human evolutionary past, and hence people have evolved a preference for interacting with their grandchildren. Because this preference is not identical to evolutionary fitness, however, this preference can cause conflict between grandparents and parents, even if grandparents and parents have identical fitness interests (as would be the case, for example, in an idealized asexually reproducing species). We return to these evolutionary arguments in the conclusion.

2.9 Religious institutions and empirical predictions

Suppose that there are a number of families, each of which consists of grandparents, parents, and children, as in the previous subsection. The families collectively form a religious community. Grandparents hold political power in the community.[9] Grandparents collectively use their political power to impose religous rules. As in Iannaccone (1992), these rules restrict or ban certain actions and forms of consumption for community members. In particular, we suppose that grandparents can choose rules that set a maximum level of consumption for parents $\bar{x}_p$ and a maximum level of education per child $\bar{h}$. Given these rules, parents who are members of the religious community then face two additional constraints, $x_p \leq \bar{x}_p$ and $h \leq \bar{h}$.

After grandparents choose religious rules, parents can choose whether to leave the community. Parents who leave the community do not need to follow any rules chosen by the community. Leaving the community entails a moving cost κ. In addition, grandparents may impose an additional punishment π_p on parents who leave. Imposing the punish-

[8] See Samuelson and Swinkels (2006) for a formal economic model presenting this argument.

[9] In the conclusion, we discuss in more detail why grandparents may hold disproportionate political power.

ment also entails a cost π_g for grandparents. This cost may represent the physical costs of imposing the punishment, or it may represent the fact that grandparents are altruistic towards parents and so grandparents lose utility from punishing parents. The following is then a straightforward corollary of proposition 4:

Proposition 5. *Suppose that the conditions of proposition 4 hold. Then it is optimal for grandparents to choose binding rules $\bar{x}_p = \tilde{x}_p$ and $\bar{h} = \tilde{h}$. Given these rules, parents who remain in the religious community choose fertility $\tilde{n} > \hat{n}$. Following these rules reduces parents' utility. If the leaving cost κ is sufficiently large, then grandparents do not to impose the additional punishment π. If the leaving cost κ is small, then grandparents may impose the additional punishment π_p to prevent parents from leaving. Grandparents impose the additional punishment if the cost to grandparents π_g of imposing the punishment is sufficiently small.*

Proposition 5 explains why religious communities might impose rules limiting adult consumption and parental choices related to child-raising in ways that superficially appear to be irrational. The purpose of these rules in our model is to redirect spending from adult consumption towards spending on children, and to redirect spending on children from investment in education to high fertility. These rules harm parents but benefit grandparents. Grandparents may impose a punishment on parents who choose to leave the community to force parents to stay and follow the rules. Grandparents are more likely to impose these punishments if the cost of leaving is low and if imposing the punishment is not too costly for grandparents.

The assumptions of our model and the results in proposition 5 suggest several empirical predictions about religious communities. We test these predictions below in a case study of the Amish. We start with qualitative predictions, which we test in section 3 below. We discuss quantitative predictions in sections 4 and 5.

Our first prediction is that one of the key assumptions of our model, namely that grandparents hold sufficient political power to impose rules, holds in Amish communities:

Prediction 1. *The old hold disproportionate political power in Amish communities.*

Our next three predictions are derived from the results in proposition 5:

Prediction 2. *Amish communities have high fertility.*

Prediction 3. *Amish communities impose rules that shift consumption away from adult con-*

sumption and away from investment in children's education.

Prediction 4. *Amish rules reduce the utility of young community members, and as a result some young people prefer to leave. Some Amish communities impose punishments on young people who leave the community. Young people are less likely to leave communities in which these punishments are imposed.*

2.10 Education as consumption

We argue that Amish institutions are designed by grandparents to increase fertility but to reduce investments in education. Other researchers, studying different religious communities, have argued that these other religious institutions are designed to increase investments in education. In particular, Becker and Woessman (2009) and Botticini and Eckstein (2012) argue that 19th century German Protestants and ancient Jewish communities respectively imposed rules requiring parents to teach children how to read, and that these rules increased investment in children's education. Both Becker and Woessman (2009) and Botticini and Eckstein (2012) argue that their respective religions viewed education as a consumption good rather than an investment, and more specifically that parents (and grandparents) valued education because they valued being able to read scripture with their children.

Our theory can also explain these pro-education religions. Suppose in our model education is a consumption good that provides benefits in the present, rather than an investment meant to increase children's wages in the future. In this case, in our model grandparents are likely to want parents both to choose higher fertility and to choose more education per child than parents want to choose themselves. We demonstrate this result formally in the appendix.

3 Qualitiative and descriptive evidence from Amish society and institutions

In this section we present some background information on Amish history, society, and institutions. We argue that qualitative facts about Amish institutions are consistent with our model. Our overview of Amish history, society, and institutions is drawn from Hostetler (1993), Kraybill (2001), Hurst and McConnell (2010), and Kraybill, Johnson-Weiner, and

Nolt (2013), as well as personal communications from Donald Kraybill and David L. McConnell. Some parts of our overview closely follow the overview in Choy (2020).

3.1 Amish history

The Amish are one of several Protestant sects, collectively known as Anabaptists, that emerged in Switzerland and southern Germany in the aftermath of the Protestant reformation. Unlike other Protestant groups, Anabaptists rejected professional clergy and concomitant state control over religious life, instead forming independent religious communities that elected lay religious leaders. Ethically, Anabaptists emphasized humility and separation from worldly goods, as well as pacifism. The Amish denomination was founded in 1693 in Switzerland by Jakob Amman, who split from existing Anabaptist congregations due to his desire to enforce a more stringent form of shunning. We discuss shunning in more detail below.

In the 18th and 19th centuries, some Amish people emigrated to the United States and Canada. The Amish faith eventually died out in Europe, but in North America, the Amish community survived and prospered. It is nearly impossible for outsiders to join the Amish, and so essentially all contemporary Amish people are the descendants of a few hundred initial immigrants. One reason why it is difficult for outsiders to join the Amish is that among themselves the Amish speak a dialect of German known as Pennsylvania German. Most contemporary Amish people are also fluent in English and speak English with outsiders.

As a result of high Amish fertility, the Amish population in North America has grown very quickly. Table 1 shows Amish population estimates from 1900 through 2012. Table 2 shows more recent estimates of the Amish total fertility rate, taken from Stone, Anderson, and Thiehoff (2025). These fertility rates are calculated from CAPED, a database derived from the Amish directories for nearly all North American Amish settlements and covering nearly the entire Amish population (see section 4 for a more detailed description of the Amish directories).

As discussed in more detail below, children who grow up in the Amish church sometimes choose to leave. People who leave the Amish have a number of options. Some people join the Mennonites, another Anabaptist denomination which is theologically very similar to the Amish but which does not impose nearly as many rules. Other people join other

Table 1: North American Amish Population Estimates, 1901-2012

Year	Estimated population
1901	6300
1911	6600
1921	9960
1931	14,300
1941	21,100
1951	27,675
1961	36,855
1971	50,280
1981	77,955
1991	123,025
2001	189,335
2012	273,710

Source: Kraybill, Johnson-Weiner, and Nolt (2013)

Table 2: Amish Total Fertility Rates, 2000-2012

Year	Total fertility rate
2000	6.56
2001	6.45
2002	6.39
2003	6.29
2004	6.15
2005	6.06
2006	6.02
2007	6.13
2008	5.98
2009	5.97
2010	5.91
2011	5.89
2012	5.76

Source: Stone, Anderson, and Thiehoff (2025)

Christian denominations or become atheists, and assimilate into the larger American culture. There are many non-Amish people who have Amish family names in areas near Amish communities, providing evidence of this kind of assimilation in the past.

3.2 Amish community organization

Contemporary Amish society is organized into settlements, affilations, and districts. A settlement is a geographical area with many Amish people. Our study focuses on the Holmes county, Ohio settlement, which is the largest Amish settlement. In 2005, the year from which we draw our primary dataset, this settlement had 26,722 members. Settlements do not have well-defined borders, and both Amish people and non-Amish people live together within the geographical area of each settlement.

Traditionally, all Amish people were farmers. However, in recent years, urban growth has encroached on Amish settlement areas, making farmland unaffordable to many Amish people but also opening up opportunities for new occupations. In the Holmes county settlement, many men work as craftsmen in areas such as woodworking or masonry, or as small business owners in areas such as retail or construction. Other men work as unskilled or semi-skilled laborers, including for non-Amish employers. Finally, some men remain in the traditional occupation of farming. Married women rarely work outside the home.

Amish governance takes place at the level of the district. A district is a group of 20–40 households that meets in a member's house or barn once every two weeks for church services. Each district is responsible for making its own rules, which we discuss in more detail below. In principle, the rules are decided by consensus among the adult members of the district, including both male and female members. In practice, the district leader, known as the bishop, exerts disproportionate influence due to his ability to set the agenda. The bishop is chosen for life from among the adult male members of the church. The bishop must also have previously served as a "minister", a lower ranking district official. Bishops are chosen through a complex procedure that is partly an election but that also involves an element of chance.

Although each district is responsible for choosing its own rules, districts form links with other districts that have similar rules. A group of districts with similar rules is called an affiliation. In the Holmes county settlement, there are four main affiliations, the Swartzen-

trubers, the Andy Weaver affilation, the Old Order, and the New Order. The Old Order are largest and oldest affiliation. The Swartzentrubers split from the Old Order in the 1910s, the Andy Weaver affiliation split from the Old Order in the 1950s, and the New Order split from the Old Order in the 1960s. The Swartzentrubers are not included in our main dataset, and so our analysis covers only the Andy Weaver affiliation, the Old Order, and the New Order. Moving between affiliations is sometimes possible, but is rare. Most parents prefer that their children marry within the same affiliation, and districts may not accept prospective members seeking to join from different affiliations.

3.3 Amish rules

Amish districts impose many rules on their members. These rules fall into four main categories. The first set of rules are rules related to technology. Amish rules limit the use of many technologies, most notably internal combustion engines, electricity from the grid, and certain kinds of information and communication technology. There is variation across districts in the strictness of these rules. One distinction made by many districts is between technologies used for production and technologies used for consumption, or relatedly, between technologies used in the workplace and technologies used in the home. Production technologies and technologies used in the workplace are more likely to be allowed than consumption technologies and technologies used in the home. For example, all Amish districts ban private automobiles, but many districts allow the use of tractors for farming. Similarly, all districts ban computers in the home, but some districts allow the use of computers at work.

The second set of rules are rules related to family life. Many Amish rules in this domain are similar to the rules imposed by other socially conservative religious communities. For example, the Amish forbid pre-marital sex, encourage early marriage, and strongly discourage separation and divorce. Amish rules also encourage traditional gender roles in marriage. One very important rule in this domain is that the Amish forbid children from receiving formal education beyond the age of fourteen. As a result of this rule, all Amish people have the same amount of education. The Amish were specifically exempted from state mandatory education laws by the Supreme Court in the case *Wisconsin v. Yoder*. Although all Amish districts impose the same rules regarding the quantity of education, there is variation across districts in the degree to which the rules dictate the quality of education. In some districts, the rules require that parents send their children to Amish

schools, which cover a limited curriculum focused on religion and Amish culture and are typically taught by unmarried Amish women in their teens or early twenties. In other districts, parents are allowed to choose between Amish schools and standard public schools that also enroll non-Amish students. Amish parents often choose standard public schools because these schools are perceived as providing higher quality education that is more relevant for the labor market.

The third set of Amish rules govern dress and appearance. Amish districts require distinctive hair and clothing styles for both men and women. There are subtle differences between the clothing styles required by different affiliations, and Amish people are able to recognize these differences.

Finally, Amish rules are enforced through a punishment known as shunning. An Amish person who has been shunned is not allowed to interact with other community members in certain ways. Minor infractions of the rules typically result in temporary shunning lasting for 2–6 weeks. More severe infractions, or failure to show remorse for infractions, may result in permanent shunning. Information about shunning is shared across districts within the same affiliation to ensure that all members of the affiliation respect the ban on interaction. People who refuse to respect the ban may be shunned themselves.

In some districts, a person who voluntarily leaves the church may be shunned, even if that person has not otherwise done anything wrong. The question of whether to shun someone who has voluntarily left the church is one of the most contentious issues in Amish society, and was one of the main causes of the schisms that led to the formation of the Andy Weaver and New Order affiliations. In the Andy Weaver affiliation, people who leave the church are almost always shunned, while in the New Order affiliation, people who leave are rarely or never shunned. The Old Order falls somewhere between these extremes. In the Old Order, whether a person who leaves is shunned depends on the specific district, as well as the subsequent behavior of the person who leaves. For example, a person who leaves may be less likely to be shunned if the person joins a related Anabaptist denomination such as the Mennonites.

Figure 1 shows the probability of having left the church by 2005, among people born into the Amish church who are aged 40 or older in 2005 and who appear in our dataset. People who leave the Amish church typically do so during young adulthood, and so by age 40 most people have decided permanently whether to stay or leave.

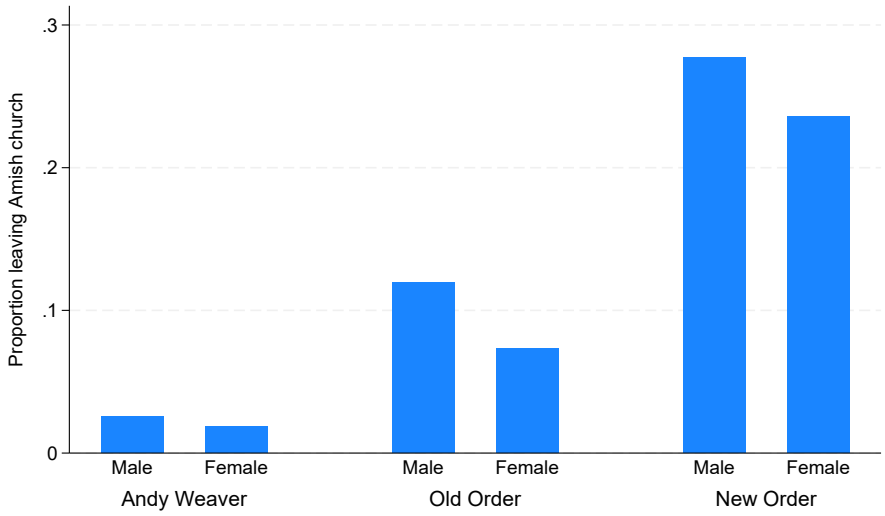


Figure 1: Proportion of people born into the Amish church and aged 40 and above in 2005 who have left the Amish church

3.4 The Amish in theoretical context

In this subsection, we revisit the predictions presented in section 3 above.

Prediction 1: The old hold disproportionate political power within Amish communities.

As discussed in section 3.2 above, the leader of each district, known as the bishop, holds disproportionate power to choose district rules through his ability to set the agenda. Because bishops are appointed for life, and because the bishop must previously have served as a minister, serving bishops are typically middle-aged or older men. The identity of the bishop thus ensures that older members of the district hold disproportionate political power.

Prediction 2: Amish communities have high fertility. As shown in figure 2 above, the Amish total fertility rate is approximately 6 children per woman. This is a very high fertility rate compared to the total fertility rate in the broader US population of approximately 2 children per woman.

Prediction 3: Amish communities impose rules that shift consumption away from adult consumption and away from investment in children's education.

Amish rules about technology place sharp limits on adult consumption. The Amish themselves describe these rules as being designed to force adults to stay close to the home, where adults spend time taking care of children, and as being designed to prevent distractions from family life within the home. Thus Kraybill and Nolt (2004) quote an Amish man explaining technological rules that encourage farming over other occupations by saying "We're family centered, and the farm is the best place to raise a family." Another man explains technological rules that prevent rapid growth of Amish-owned businesses, saying "There is always a need for community-oriented shops, but once again, the setting should be such that a father can be at home with the family" (p. 94). Similarly, in the BBC documentary, "Amish: A Secret Life", an Amish man explains Amish rules against electricity, saying "Rather than having television and video games and all kinds of gadgets that run off of electricity... it's to keep out distractions. So that you can focus on principles of life like family time together" (Alleway 2012) (4:10).

Amish rules prohibiting education after the age of 14 clearly reduce spending on child quality relative to child quantity. As discussed in section 4.3 above, all Amish districts enforce the rule prohibiting education after the age of 14, but many districts allow Amish parents to choose to send their children to non-religious public schools that are perceived to yield higher labor market returns. Hard age limits on education but softer rules about school choice are consistent with our claim that rules are meant to limit the quantity of resources that parents spend per child. Public schools are free for parents, and so allowing parents to send their children to public schools instead of Amish schools does not increase per child expenditure. Older children and teenagers are able to work, and so sending older children to school has an opportunity cost for parents that is not incurred for younger children.

Prediction 4: Amish rules reduce the utility of young community members, and as a result some young people prefer to leave. Some Amish communities impose punishments on young people who leave the community. Young people are less likely to leave communities in which these punishments are imposed.

Figure 1 shows that in the affiliation that is least likely to shun leavers, the New Order affiliation, approximately 25% of people age 20-40 in 2003 have left the church by 2005. Thus, a significant fraction of people who are born into the Amish church prefer to leave, suggesting that Amish rules and institutions are detrimental to many young people. In

contrast, in the affiliation that is most likely to shun leavers, the Andy Weaver affiliation, less than 5% of people age 20-40 in 2003 have left the church by 2005. Thus, the punishment of shunning seems to be effective in preventing young people from leaving the church even if they would prefer to leave.

3.5 Alternative theories

In this subsection we compare our theory to some other theories in the literature and argue that these alternative theories cannot account for all of the qualitative facts about Amish institutions.

3.5.1 Club goods theories

Iannaccone (1992) also studies seemingly irrational religious rules that penalize certain categories of consumption. In our model, the purpose of these rules is to divert spending from adult consumption to spending on children, but in Iannaccone's model, the purpose of these rules is to divert spending from private consumption to spending on club goods that benefit the entire religious community. For example, religious rules might induce religious community members to spend more time volunteering at church, or they might induce members to donate more money to a community alms fund. Iannaccone shows that religious rules of this form can benefit all members of the community because club goods are inefficiently under-supplied under purely voluntary contribution. In contrast, in our model religious rules benefit the old at the expense of the young.

The predictions of the club goods model with respect to fertility depend on whether expenditure on children is a private good for parents or a club good that benefits the community as a whole. Suppose first that expenditure on children is a private good for parents. Then the club goods model predicts that religious communities impose rules that reduce fertility, instead of increasing fertility as in our model. An example of an anti-fertility religious community that is organized according to this principle is a monastery. Monasteries require members to be celibate so that family obligations do not distract members from the work of the community.

Berman (2000) argues that religious institutions organized according to the club goods model may be pro-fertility, even if expenditure on children is a private good for parents, if in the process of diverting resources from non-child-related consumption to club

goods, these institutions accidentally divert some resources to child raising as well. Thus Berman argues that ultra-Orthodox Jewish communities penalize wage labor in order to encourage community members to spend less time working and more time volunteering for community activities, but that these rules also have the unintended side effect of encouraging women to spend more time on child raising. According to this argument, religious institutions are pro-fertility essentially by mistake. We believe that this argument is inconsistent with the evidence, discussed under prediction 3 in section 3.4 above, that the Amish describe their rules as being intentionally designed to induce parents to spend more time at home interacting with their children. The Amish emphasis on rules that specifically protect and encourage home-based family activities is consistent with our theory, but inconsistent with the emphasis on community-oriented activities suggested by the club goods model.

Berman (2000) also suggests a different empirical distinction between our model and the club goods model. Berman (2000) argues that religious communities organized according to the club goods model impose costs on people seeking to join the community in order to screen out prospective members who are less committed to collective community goals. Our model implies the opposite, namely that religious communities impose costs on people who leave the community to prevent young members from leaving. The fact that Amish communities impose costs on people who leave the community is consistent with our model but not with Berman's extension of the club goods model.

Now suppose that expenditure on children is not a private good for parents but is in fact a club good that benefits all members of the community. **Folbre1994** and **Jones2022** discuss some possible external benefits of high fertility.[10] If high fertility has external benefits, then the club goods model may predict that religious institutions impose rules that increase fertility.

Although a club goods model with external benefits to fertility may explain high fertility in some religious communities, this model has difficulty explaining Amish institutions. The problem is that Amish rules are chosen at the level of the district, but any external benefits of high fertility are felt primarily at the level of the settlement, because children typically do not stay in the same district when they grow up. In 2005 the Holmes county

[10] A related argument comes from Norenzayan et al. (2016). They argue that high-fertility institutions are selected by cultural evolution because of the survival benefits that these institutions create for the group as a whole, over and above the evolutionary benefits of high fertility for individuals.

settlement contained 239 districts, and so the contribution made by each individual district to the overall fertility of the settlement is minimal. Thus, it seems unlikely that Amish district rules are motivated primarily by external benefits of fertility.

We conclude that club goods models do not, by themselves, explain high Amish fertility. We emphasize, however, that club goods models may explain other aspects of Amish institutions. Amish church members contribute large amounts of time and money towards club goods, and Amish rules and institutions may play a role in encouraging these donations. Thus, our claim is not that the club goods model is *incorrect* as a description of Amish institutions, but that it is *incomplete*. Our model is necessary *in addition* to the club goods model to explain how Amish institutions affect fertility.

3.5.2 Parent-centered theories

Another alternative set of theories that may explain some aspects of Amish society and institutions are arguments that depend only on parents' preferences and that do not make reference to grandparent-parent conflict. Caldwell (1982) argues that people in societies like the Amish choose high fertility because institutions in traditional societies require children to support their parents in old age. Carvalho, Koyama, and Williams (2024) argue that parents in societies like the Amish choose to provide their children with low levels of education because parents want their children to remain in the cultural community, and because highly educated children are more likely to leave the cultural community.

We argue that while parent-centered theories may explain some aspects of Amish society, there are other aspects of Amish society that are not explained by these theories. In particular, parent-centered theories do not explain why Amish institutions impose rules that constrain parents' choices. We argue that conflict between parents and grandparents is the most plausible explanation for these rules.

4 Data

We now turn to quantitative evidence for our theory. We compare Amish fertility rates to fertility rates among people who grow up in the Amish church and then leave. To address possible selection bias, we compare fertility rates between same-gender siblings, one of whom remains in the church and one of whom leaves. In this section we describe

the construction of our dataset.

Our primary data source is the Amish Directory for the Holmes county, Ohio Amish settlement. The Amish Directories are listings of members of the Amish church in a given settlement, along with their children. In the Holmes county settlement, listing is voluntary and members may choose to opt out. However, nearly all members of the three main affiliations we study, namely the New Order, the Old Order, and the Andy Weaver affiliation, choose to be listed in the directory.

Each listing in the Amish directory is a household. Importantly, all children of a given household continue to be included in a household's listing even after the children have grown up and moved away. Adult children who continue to live in the Holmes county settlement are therefore typically listed twice in the directory, once as part of their parents' households and once in their own households. Each child in each household is given a code in the Amish directory that describes that child's status. Children can be coded as living with their parents, as members of the Amish church and living away from their parents but in the Holmes county settlement, as members of the Amish church and living in a different Amish settlement, or as no longer members of the Amish church. Married children are listed along with their spouses, and, in most cases, their addresses.

The Amish directories are issued irregularly roughly every 5 years. Our primary dataset is the 2005 edition of the Holmes county Amish directory. Thus, when we describe someone as having left the Amish church, this typically means that the person has left the church during or before the year 2005. We do not know exactly when people choose to leave the Amish church. We discuss this issue in more detail below. In some regressions, we use data from the 2000 edition of the Holmes county Amish directory instead of the 2005 directory. In these cases, we identify people who have left the church during or before the year 2000. There are no editions of the Amish directory published between 2000 and 2005 and so we have no information about intermediate years.

We construct our dataset by matching entries for adult children, listed as part of their parents households, to additional sources of information that tell us how many children each adult child has had. For adult children who are members of the Amish church and who are still living in the Holmes county settlement, this additional information comes from other entries in the Amish directory where adult children are listed as members of their own households. We match entries for adult children listed as part of their parents'

households to entries for those same children listed as members of their own households by matching children's exact names and dates of birth.

We supplement our database with data from ancestry.com, which we use to get information on adult children who grow up in the Amish church but who then leave. Ancestry.com provides a complete database of all birth certificates issued in the state of Ohio through the year 2003. This birth certificate information contains information on the names of the parents (including maiden names for women) of each child.

We match adult children listed in the Amish directory to birth certificate data from ancestry.com to find out, for each adult child listed in the directory, how many children that adult child has. We use the following procedure to match adult children listed in the Amish directory to the children of those children listed in the ancestry.com data. For each adult child who is listed in the Amish directory as having left the Amish church, and who is also listed with a spouse, we search for birth certificates in ancestry.com that include both the adult child's name and the spouse's name as parents. In case of ambiguity we also match the mother's maiden name. We count only those birth certificates that match on all of these characteristics. In the appendix we describe our matching procedure in more detail, including various robustness checks to ensure that our matching procedure is correct.

For our primary dataset, we use all adult children listed in the Amish Directory who are age 20-40 in 2003, who are married, and who are living either in the Holmes county settlement, for children who are members of the Amish church, or who are living in Ohio, for children who are not members of the Amish church. We exclude people living outside of Ohio because ancestry.com does not provide birth certificate data for children born outside of Ohio.

Table 3 shows the total number of adult children in our dataset by Amish church membership, sex, marital status, and whether they are living in the Holmes county settlement or in Ohio. As discussed above, we will be especially interested in comparing fertility between same-gender sibling pairs, one of whom remains in the Amish church and one of whom leaves the church. The final column of table 3 reports the number of leavers who have same-gender siblings who remain in the church, and likewise the number of remainers who have same-gender sibligns who have left the church.

One important takeaway from table 3 is that most of our identification is coming from the

Table 3: Sample size

Members of Amish church in 2005, aged 20-40 in 2003

		Total	Of these, married	Of these, living in the Holmes county settlement	Of these, has eligible same-gender sibling who has left church
Andy Weaver	Male	643	510	501	7
	Female	606	508	494	7
Old Order	Male	2650	2029	1987	170
	Female	2631	2084	2050	159
New Order	Male	322	236	220	27
	Female	341	237	217	16

People who have left the Amish church by 2005, aged 20-40 in 2003

		Total	Of these, married	Of these, living in Ohio	Of these, has eligible same-gender sibling who remains in church
Andy Weaver	Male	25	14	13	2
	Female	12	8	7	3
Old Order	Male	346	229	211	114
	Female	230	182	171	108
New Order	Male	134	92	85	35
	Female	106	78	70	15

An eligible same-gender sibling is a sibling who is married and who is living in the Holmes county settlement (in the case of siblings who remain in the Amish church) or in Ohio (in the case of siblings who have left the Amish church).

Old Order. The Andy Weaver affiliation is relatively large, but very few members of the Andy Weaver affiliation choose to leave the church. A substantial fraction members of the New Order affiliation choose to leave, but the New Order is the smallest affiliation. The Old Order affiliation is the largest affiliation and a relatively large proportion of the Old Order chooses to leave, so the Old Order accounts for most of the variation in our sample.

5 Results

We run regressions of the form

$$Y_{iha} = \alpha Leave_i + \beta \mathbf{X_i} + \gamma_h + \delta_a + \epsilon_{iha} \tag{31}$$

Here $Leave_i$ is an indicator that is equal to 1 if person i from origin household h and affiliation a has left the Amish church by 2005 and 0 otherwise, $\mathbf{X}_i$ is a set of individual-level control variables that includes birth order and a fixed effect for age in years, γ_h is a fixed effect for origin household, and δ_a is a fixed effect for affiliation. Origin household and affiliation fixed effects are separately identified because people sometimes change affiliations, although this is rare. When one sibling has changed affiliations, it is possible for two people to come from the same origin household but to belong to different affiliations. For people who have left the Amish church, we define their affiliation as the affiliation of their parents.

Tables 3 through 5 present results. The outcome variable in each table is an indicator for whether a person had a child in the years 2003, 2002, and 2001, respectively. In each year the sample is the set of married people living in the Holmes county settlement, for members of the Amish church, or in Ohio, for people who have left the Amish church, and who were aged 20-40 in the relevant year.

Columns 1 and 3 of each table show the difference in fertility between people who leave the church and people who remain in the church, for women and men respectively. In all cases this difference is statistically significant and very large, with people who leave the church having fertility between 38% and 56% lower than people who remain in the church. For comparison, **Milligan1996** studies a pro-natalist policy in Quebec that paid up to C$8000 to families having a child. The effect of this program, which Milligan de-

Table 4: Effect of leaving Amish church on fertility in 2003

	Dependent variable: Child born in 2003			
	Married women age 20–40		Married men age 20-40	
Left Amish church by 2005	-0.149***	-0.119**	-0.157***	-0.139***
	(0.0303)	(0.0511)	(0.0277)	(0.0489)
Controls?	YES	YES	YES	YES
Origin Household FE?	NO	YES	NO	YES
R-squared	0.065	0.528	0.056	0.516
Oster's δ		1.118		1.152
Implied lower bound		-0.037		-0.066
Observations	2,821	2,821	2,797	2,797
Leavers	248	248	309	309
Mean of dependent variable	0.290	0.290	0.287	0.287

Controls include birth order, a fixed effect for age in years, and a fixed effect for affiliation. Robust standard errors in parentheses.

Table 5: Effect of leaving Amish church on fertility in 2002

	Dependent variable: Child born in 2002			
	Married women age 20–40		Married men age 20-40	
Left Amish church by 2005	-0.125***	-0.106**	-0.101***	-0.0582
	(0.0292)	(0.0508)	(0.0261)	(0.0471)
Controls?	YES	YES	YES	YES
Origin Household FE?	NO	YES	NO	YES
R-squared	0.065	0.492	0.065	0.490
Oster's δ		1.197		0.661
Implied lower bound		-0.050		N/A
Observations	2,825	2,825	2,886	2,886
Leavers	257	257	330	330
Mean of dependent variable	0.272	0.272	0.265	0.265

Controls include birth order, a fixed effect for age in years, and a fixed effect for affiliation. Robust standard errors in parentheses.

Table 6: Effect of leaving Amish church on fertility in 2001

	Dependent variable: Child born in 2001			
	Married women age 20–40		Married men age 20-40	
Left Amish church by 2005	-0.131***	-0.0955**	-0.139***	-0.140***
	(0.0286)	(0.0469)	(0.0251)	(0.0437)
Controls?	YES	YES	YES	YES
Origin Household FE?	NO	YES	NO	YES
R-squared	0.059	0.529	0.059	0.513
Oster's δ		1.048		1.431
Implied lower bound		-0.011		-0.139
Observations	2,811	2,811	2,906	2,906
Leavers	267	267	344	344
Mean of dependent variable	0.265	0.265	0.248	0.248

Controls include birth order, a fixed effect for age in years, and a fixed effect for affiliation. Robust standard errors in parentheses.

scribes as "strong" was to increase the probability that reproductive-age women had a child in a given year by 5.6%.

In columns 2 and 4 of each table, we add household-of-origin fixed effects. Thus, instead of comparing all people who leave the church to all people who remain in the church, the regressions in columns 2 and 4 compare only same-gender pairs of siblings, one of whom remains in the church and one of whom leaves. In most cases the coefficient on the indicator for leaving the church in these regressions is somewhat lower than in the regressions without household fixed effects. This indicates that some of the lower fertility of people who leave the church is due to selection on household characteristics such as household endowments or common preferences within households. However, in all but one case, the coefficient on the indicator for leaving the church remains large and statistically significant. Thus, even after accounting for selection into Amish church membership on household-of-origin characteristics, the effect of Amish church membership on fertility is large.

Although household fixed effects account for many factors that may influence selection into the Amish church, other unobserved factors may remain that differ between siblings, that affect selection into Amish church membership, and that also affect fertility. If these unobserved selection effects are sufficiently strong, the true effect of Amish church membership on fertilty may be zero. In order to assess the importance of these other factors, we calculate Oster's δ (Oster 2019). This quantity measures how much unobserved factors that vary between siblings would have to matter relative to factors that are constant within households-of-origin in order for the true effect of Amish church membership on fertility to be equal to zero. A number greater than 1 indicates that unobserved factors that vary between siblings would have to matter more than factors that are constant within households-of-origin to make the true effect of Amish church membership equal to zero. Oster argues that if $\delta > 1$, then we should accept the hypothesis that the variable of interest, in this case Amish church membership, has a true causal effect. In all but one of the regressions reported in tables 3-5, δ is in fact greater than one. We conclude that selection due to unobserved factors that vary between siblings most likely is not a strong enough effect to explain our results, and that Amish church membership has a true causal effect on fertility. We also report the implied size of the effect of leaving the Amish church if $\delta = 1$. In most cases this effect remains quantitatively significant.

We interpret our results within the literature on whether "institutions" or "culture" are more important for explaining differences in outcomes across societies. Recent literature has defined "culture" as those aspects of a society that can only change slowly over many generations, while "institutions" can change quickly (Alesina and Giuliano 2015; Besley and Persson 2019). People who grow up in the Amish church but then leave are no longer subject to Amish institutions, but they remain strongly influenced by Amish culture. Our results show that people who leave the Amish church experience a very large drop in fertility relative to people who stay. We interpret these results as showing that Amish institutions have a large positive effect on fertility that is independent of Amish culture. This result supports our theoretical argument that Amish religious institutions are designed in part to increase fertility.

As a robustness check, in the appendix we present the same regressions as in tables 3 through 5, using as our independent variable whether a person has left the Amish church by 2000 instead of by 2005. We construct this variable using the 2000 edition of the Holmes county Amish directory, which is the most recent edition of the directory prior to 2005. The results are broadly similar. For the years 2002 and 2003, the effects of leaving the church are slightly smaller when using 2000 church membership data than when using 2005 church membership data, but for the year 2001 the effects of leaving the church are larger when using 2000 church membership data than when using 2005 church membership data. These results are consistent with the hypothesis that there is some error in our measurement of church membership status leading to attenuation bias, but that this measurement error is smaller when church membership status is measured closer to the period of interest.

6 Concluding discussion: Grandparents, political power, and fertility in human evolution

In this paper, we developed a theory of disagreements between grandparents and parents about child-raising decisions. Grandparents want parents to choose higher fertility than parents want for themselves. Grandparents use their political power to impose rules that induce parents to choose higher fertility. At least in some societies, these rules take the form of religious rules. We provide qualitative and quantitative evidence for our theory in a case study of the Amish.

We conclude by situating our argument within a broader evolutionary account of human nature. For the vast majority of human evolutionary history, humans have lived in small hunter-gatherer bands. Small-scale human societies differ from bands of related species such as chimpanzees in several ways. First, small-scale human societies are relatively egalitarian, unlike chimpanzee bands in which an alpha male dominates the others (Boehm 2001). An important aspect of human egalitarianism is that humans form monogamous male-female pair bonds, again unlike chimpanzee bands in which the alpha male monopolizes mating opportunities and excludes all other males. Monogamous pair bonding in turn allows for the development of the family, in which both mothers and fathers participate in child-raising. Grandparents in human societies also play an important role in helping to raise children (Hrdy 2009). Anthropologists argue that the role of grandparents in raising grandchildren helps to explain why humans have such long life-spans relative to chimpanzees (Hawkes et al. 1998; Kaplan et al. 2000).

Although small-scale human societies are egalitarian in comparison to chimpanzees, differences in political power still exist in small-scale human societies. However, the basis of political power differentials in small-scale human societies differs from the basis of political power differentials among chimpanzees. Henrich and Gil-White (2001) argue that political power in small-scale human societies is based primarily on *prestige*, that is, expertise derived from knowledge and experience. Humans freely choose to defer to prestigious members of their social group, enabling prestigious group members to acquire disproportionate political power. In contrast, political power among chimpanzees is based on *dominance*, that is, the threat of physical force. Henrich and Gil-White (2001) argue that in small-scale human societies, the old tend to have greater prestige and hence greater political power due to their superior knowledge and experience. The finding that the old tend to hold political power in small-scale human societies is confirmed by von Rueden and van Vugt (2015).

What do the old do with their political power in small-scale societies? Caldwell (1982) argues that the old use their power to extract resources from the young. More recent evidence, however, suggests to the contrary that the net flow of material resources in small-scale societies is from the old to the young, not from the young to the old. Hooper et al. (2015) find that people in small-scale societies consume more calories than they produce from birth until approximately age 20. However, adults produce more calories than they consume from age 20 through at least age 70, with net calorie production peaking

relatively late in life around age 45. The old transfer their surplus to their children, their grandchildren, and their children-in-law.

If the old do not use their political power to extract resources from the young, how do they use their power? One of the most important ways the old use their political power in small-scale societies is to influence the marriage and reproductive decisions of the young. Apostolou (2007) surveys the anthropology literature on small-scale societies and finds that in almost all surveyed societies, parents exert some degree of control over children's marriage choices, and, by extension, over children's reproductive choices. Apostolou (2007) notes that one way parents exert control over children is by arranging early marriages, with children often being married at puberty or even before. One effect of early marriage is to speed up the onset of procreation and hence to increase completed fertility. Apostolou (2010) shows that people prefer their children to marry at an earlier age than they prefer for themselves, and Apostolou (2012) shows that people prefer that their children begin to procreate at an earlier age than their children prefer for themselves. These results are consistent with our argument that grandparents prefer parents to choose higher fertility than parents prefer for themselves.

Based on the previous discussion, we hypothesize that the key elements of our model, namely grandparental political power and grandparental influence over decisions related to reproduction and child-raising, have been central organizing principals of human society from the beginning of human evolutionary history. Conflict between grandparents' and parents' preferences over parents' fertility has likely also played an important role in human evolution. In evolutionary time, we hypothesize that humans have converged on an equilibrium in which parents have fertility preferences that are below what is evolutionarily optimal, while grandparents have fertility preferences for parents that are above what is evolutionarily optimal. Conflict and bargaining between grandparents and parents then result in an evolutionarily optimal level of fertility being chosen.

Religion is closely to connected both to political power and to reproductive decisions, and so it seems likely that religion plays a role in mediating intergenerational conflicts about fertility in many societies. Bellah (2011) argues that in small-scale societies, religion supports the political power of the old. For example, Bellah describes the political organization of small-scale Aboriginal societies in Australia as "gerontocracy", upheld by special religious privileges and duties allocated to elders (p. 180). However, Bellah

argues that the social function of religion may change as societies develop larger-scale institutions.

Spears and Geruso (2025) show that in many contemporary societies, fertility is far below the replacement rate. Our theory suggests a new explanation for this phenomenon. Although grandparents have exercised power over parents' fertility throughout much of human evolutionary history, in the contemporary world grandparental power has declined precipitously. The rise of market employment and geographical mobility and the decline of traditional social structures, including the declining role of religion in supporting the political power of the old, have dramatically reduced grandparents' ability to influence parents' fertility choices. Our theory suggests that in the absence of grandparental pressure, parents may prefer levels of fertility that are below what is evolutionarily optimal. This hypothesis may help to explain below-replacement fertility levels in many contemporary societies.

If we decide that below-replacement fertility is a problem, what can be done to increase fertility rates? Geruso and Spears (2026) survey the literature and conclude that there are no policies that have quantitatively significant, persistent, positive effects on fertility. They argue that even extremely draconian policies, such as Romania's near total ban on abortion and contraception during the Communist era, have not increased fertility in a quantitatively significant way. We show that the suite of policies that constitute Amish institutions do have a quantitatively significant positive effect on fertility rates. Thus, we show that it is possible to raise fertility through policy. However, the policy intervention required to have these effects is very large. Whether societies are willing to impose these kinds of policies will be an important question in the future.

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—Online Appendix—

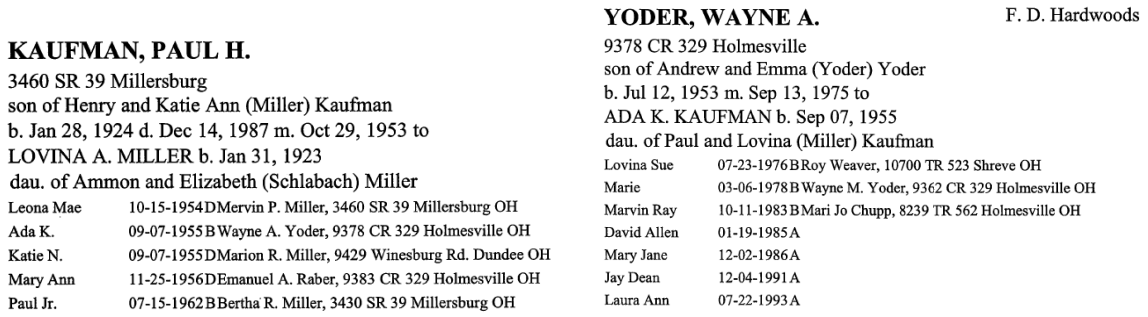
A Education as a consumption good

TBD

B Data construction

In this section we provide additional details about the construction of our data.

Our primary dataset is the 2005 Amish directory. The Amish directory is organized by household and district. Each household listing contains information on the current household head and the current spouse of the household head, any deceased former spouses of the current household head and spouse, and all children of the current household head and spouse as well as all children of any deceased spouses of the current household head and spouse. The 2005 directory contains 239 districts, X households, and Y living members. Figure 2 shows two sample household entries.



KAUFMAN, PAUL H.
3460 SR 39 Millersburg
son of Henry and Katie Ann (Miller) Kaufman
b. Jan 28, 1924 d. Dec 14, 1987 m. Oct 29, 1953 to
LOVINA A. MILLER b. Jan 31, 1923
dau. of Ammon and Elizabeth (Schlabach) Miller

Leona Mae	10-15-1954 D Mervin P. Miller, 3460 SR 39 Millersburg OH
Ada K.	09-07-1955 B Wayne A. Yoder, 9378 CR 329 Holmesville OH
Katie N.	09-07-1955 D Marion R. Miller, 9429 Winesburg Rd. Dundee OH
Mary Ann	11-25-1956 D Emanuel A. Raber, 9383 CR 329 Holmesville OH
Paul Jr.	07-15-1962 B Bertha R. Miller, 3430 SR 39 Millersburg OH

YODER, WAYNE A. F. D. Hardwoods
9378 CR 329 Holmesville
son of Andrew and Emma (Yoder) Yoder
b. Jul 12, 1953 m. Sep 13, 1975 to
ADA K. KAUFMAN b. Sep 07, 1955
dau. of Paul and Lovina (Miller) Kaufman

Lovina Sue	07-23-1976 B Roy Weaver, 10700 TR 523 Shreve OH
Marie	03-06-1978 B Wayne M. Yoder, 9362 CR 329 Holmesville OH
Marvin Ray	10-11-1983 B Mari Jo Chupp, 8239 TR 562 Holmesville OH
David Allen	01-19-1985 A
Mary Jane	12-02-1986 A
Jay Dean	12-04-1991 A
Laura Ann	07-22-1993 A

Figure 2: Sample Amish directory entries

Our first task in constructing our dataset is to construct links between adult children listed under their parents' households with those same children listed under their own households. Figure 2 shows an example of this. Consider Ada K. Kaufmann, listed as the daughter of Paul Kaufmann and Lovina (Miller) Kaufmann in the entry on the left of figure 2. Ada's entry contains the code "B", which means that Ada is married and living separately from her parents, but that she is a member of the Amish church and is living in the Holmes county settlement. Thus, Ada has her own household entry somewhere else in the 2005 Holmes county Amish directory. The entry on the right of figure 2 shows what we identify to be Ada's own entry. This entry lists an Ada K. Kaufmann who is married to Wayne A. Yoder. Both the Ada K. Kaufmann in the left hand entry of figure 2 and the Ada K. Kaufmann in the right hand entry of figure 2 were born on September 7, 1955. Thus we identify both entries as representing the same person, and link the two entries in our dataset. Using this link, we can identify both how many children Ada Kaufmann has, as well as all of Ada Kaufmann's siblings.

We construct all links between children listed under their parents households and children listed under their own households in the 2005 directory, matching on first, middle, and last name and on date of birth. We are able to match **X%** of children who are identified under their parents households as living in the Holmes county settlement.

Our next task is to construct links between adult children listed under their parents names who have left the Amish church and birth certificate data from ancestry.com. Consider Katie N. Kaufmann, who is listed in the entry on the left side of figure 2 with the code "D". This code means that Katie N. Kaufmann is no longer a member of the Amish church. Figure 2 also shows that Katie is married to Marion R. Miller, and that she lives in Ohio.

To find the children of parents who have left the Amish church, we manually search the Ohio, U.S. Birth Index, 1908-2003 database on ancestry.com for children of the parent and the parent's spouse, using the parent's and spouse's full names including middle initials. Thus, in the example above, we search for children of Katie N. Kaufmann and Marion R. Miller. In cases of ambiguity we also match on the mother's maiden name.

Figure 3 shows the results of a search for children Katie Kaufmann and Marion Miller in ancestry.com. The search returns five hits. Based on parents' middle initials, we conclude that Clifford Marion Miller and Lois Ann Miller are not children of the same Katie Kaufmann listed in the Amish directory. By inspecting maiden names (which can be viewed by clicking "View Record") we conclude that Ryan Eric Miller is a child of the same Katie Kaufmann listed in the Amish directory, and that the middle initial "M" in the ancestry.com records is a mistake that should be "N". Thus we conclude that Katie Kaufmann has three children. This example shows that some human judgment is required to match the Amish directory data to the ancestry.com data. For this reason, we perform all of the matching between the Amish directory and ancestry.com manually. As part of our manual search, we also search for variants of parents' names (such as "Katherine" or "Catherine" for "Katie").

There are two main ways in which our matching procedure for children of parents who have left the Amish church can fail. First, we are not be able to find children who are born outside the state of Ohio, since ancestry.com does not provide comparable birth certificate data for states other than Ohio. Second, we are not able to find children who are born to a person listed in the Amish directory and a partner other than the current spouse of the person listed in the Amish directory, because we match on both parents' names. To

View Record	Name	Birth Date	Birth Place	Certificate Number	Relatives
View Record	Stacey Lynn **Miller**	15 Aug 1981		1981102218	**Marion** R, **Katie** N
View Record	Ryan Eric **Miller**	2 Mar 1983		1983029788	**Marion** R, **Katie** M
View Record	Clifford **Marion Miller**	24 Jul 1984		1984078189	**Marion** C, **Katie** Ann
View Record	Lois Ann **Miller**	27 Jun 1982		1982066056	**Marion** C, **Katie** Ann
View Record	Michael Jay **Miller**	16 Jul 1978		1978094770	**Marion** R, **Katie** N

Figure 3: Sample ancestry.com search

the extent to which these issues are important, our matching procedure undercounts the children of people who have left the Amish church.

In order to validate our procedure for matching Amish directory data to ancestry.com data, we carry out the same matching procedure to find children in ancestry.com of people who have remained in the Amish church. Because all children of each Amish head of household are listed in the Amish directory, we know how many children each person who remains in the Amish church has. We randomly sample 100 heads of household listed in the Amish directory and try to replicate the number of children of the head listed in the Amish directory by searching ancestry.com.[11] Using ancestry.com data, we are able to replicate exactly the number of children of each head of household listed in the Amish directory in 100% of cases. This test does not fully address the concern that our procedure undercounts children of people who have left the Amish church, since people who leave the Amish church may be more likely than people who remain in the Amish church to have children born outside of Ohio or children born to partners other than their current spouse. However, this test provides at least some evidence that our matching procedure is accurate.

C Robustness checks

[11] Due to a change in the way birth certificate data is reported in ancestry.com, it is not possible to accurately match children born before 1963 to their parents in the ancestry.com birth certificate data to their parents. Thus, we restrict our validation sample to heads of household whose children are all born after 1963.

Table 7: Effect of leaving Amish church on fertility in 2003

	Dependent variable: Child born in 2003			
	Married women age 20–40		Married men age 20-40	
Left Amish church in 2000	-0.113***	-0.0742	-0.141***	-0.129**
by 2000	(0.0279)	(0.0525)	(0.0240)	(0.0510)
Controls?	YES	YES	YES	YES
Origin Household FE?	NO	YES	NO	YES
R-squared	0.061	0.527	0.052	0.515
Oster's δ		0.884		1.206
Implied lower bound		N/A		-0.082
Observations	2,821	2,821	2,797	2,797
Leavers	186	186	245	245
Mean of dependent variable	0.290	0.290	0.287	0.287

Controls include birth order, a fixed effect for age in years, and a fixed effect for affiliation. Robust standard errors in parentheses.

Table 8: Effect of leaving Amish church on fertility in 2002

	Dependent variable: Child born in 2002			
	Married women age 20–40		Married men age 20-40	
Left Amish church by 2000	-0.125***	-0.0902*	-0.0952***	-0.0270
	(0.0256)	(0.0507)	(0.0245)	(0.0575)
Controls?	YES	YES	YES	YES
Origin Household FE?	NO	YES	NO	YES
R-squared	0.064	0.492	0.064	0.490
Oster's δ		1.014		0.661
Implied lower bound		-0.003		N/A
Observations	2,825	2,825	2,886	2,886
Leavers	195	195	266	266
Mean of dependent variable	0.272	0.272	0.265	0.265

Controls include birth order, a fixed effect for age in years, and a fixed effect for affiliation. Robust standard errors in parentheses.

Table 9: Effect of leaving Amish church on fertility in 2001

	Dependent variable: Child born in 2001			
	Married women age 20–40		Married men age 20-40	
Left Amish church by 2000	-0.135***	-0.173***	-0.146***	-0.153***
	(0.0262)	(0.0505)	(0.0226)	(0.0475)
Controls?	YES	YES	YES	YES
Origin Household FE?	NO	YES	NO	YES
R-squared	0.059	0.529	0.059	0.513
Oster's δ		2.636		1.477
Implied lower bound		-0.252		-0.176
Observations	2,811	2,811	2,906	2,906
Leavers	208	208	280	280
Mean of dependent variable	0.265	0.265	0.248	0.248

Controls include birth order, a fixed effect for age in years, and a fixed effect for affiliation. Robust standard errors in parentheses.