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## How Economics can Contribute to Evolutionary Perspectives on the Family

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**DEVELOPMENT ECONOMICS**

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## Abstract

We outline the great potential of economics to contribute to evolution-based perspectives on marriage and the family. The main argument is that economics can be understood as the study of competition -- how the allocation of scarce resources is mediated by potentially complex forms of social interaction and conflicts of interest -- and that competition for resources is a central component of evolutionary explanations. Our argument is broad, but we illustrate it by focusing on conceptual and empirical approaches to a topic of interest to both economists and evolutionary scholars: polygyny.

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# How Economics can Contribute to Evolutionary Perspectives on the Family

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### Abstract

We outline the great potential of economics to contribute to evolution-based perspectives on marriage and the family. The main argument is that economics can be understood as the study of *competition*–how the allocation of scarce resources is mediated by potentially complex forms of social interaction and conflicts of interest–and that competition for resources is a central component of evolutionary explanations. Our argument is broad, but we illustrate it by focusing on conceptual and empirical approaches to a topic of interest to both economists and evolutionary scholars: polygyny.

## 1 Motivation

An interest in understanding marriage and the family is shared by both economists and evolution-based scholars from a variety of disciplines including biology, anthropology, psychology and sociology. In this paper we propose ways in which the perspectives and methods of economics can contribute to evolutionary approaches.

In general terms, an evolution-based explanation rests on three Darwinian components; variation, competition, and inheritance (Mesoudi (2011)). Economics has great scope to contribute to evolution-oriented scholarship because it is the study of how scarce resources are allocated. It is, in essence, the study of the competition component.[1]

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[1]This assessment is consistent with that of Gibson and Lawson (2015), who describe the distinction as one of seeking ultimate versus proximate causes. As with all generalizations, ours is imperfect. For instance, there is a long history of evolutionary thinking in Economics; foundations of profit-maximization (Alchian (1950)), economic change (Nelson and Winter (1985)), preference formation (Robson (2001), Becker (1976), Eaton et al. (2011), Alger and Weibull (2019)), coevolution of culture

In particular, economics is squarely concerned with understanding social interactions and conflicts of interest. The scope for economics to contribute is particularly large in the context of *human* behavior because "the complexity and variety of social interactions among human individuals is without parallel .... and conflicts of interest are also diverse and complex to an unparalleled degree" (Alexander (1987)). Complexity calls for transparent and precise analysis of competition. Diversity calls for a broad appreciation for the range of ways in which competition can play out. Economics answers both of these calls.

Economists are concerned with informing contemporary policy issues.[2] The desire to avoid unintended consequences of policy naturally moulds a methodology designed to cut through the complexity presented by social interactions. On the conceptual front, this means utilizing formal mathematical models. Doing so forces analysts to describe the competition component in terms that are precise and familiar to other analysts. At a minimum, this means spelling out who the agents are, what actions they can take, what their preferences are, and some notion of equilibrium (i.e. some sense in which agents' choice of actions are mutually consistent). On the empirical front, this means taking pains to identify causal effects even at the expense of a detailed and nuanced understanding of the sub-populations under study.

The remainder of the paper elaborates upon the claim that economics has the potential to contribute to evolutionary perspectives on the family. This claim applies broadly, but we shall illustrate it by focusing on but one issue of common concern to economists and evolutionary scholars: polygyny. We begin with conceptual approaches in Section 2, where we do our best to place all explanations, economic and evolutionary, on a common ground by offering an explicit description of each theory's competition component. We organize this illustration by separating explanations that emphasize the physical environment (distribution of resources) from those that emphasize the social environment (imposition of rules). We illustrate three broad ways in which economics can contribute to evolutionary perspectives on the family:

1. Many relevant interactions (e.g. finding marriage partners) are indeed complex, involving a large number of heterogeneous individuals simultaneously attempting to meet their own objectives. Markets are a powerful lens through which to

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and institutions (Tabellini (2008), Bidner and Francois (2011), Bisin and Verdier (2017)) and all manner of evolutionary game theory (Young (1996), Newton (2018)). Nunn (2021) provides a recent overview of evolutionary thinking in economic development. Nevertheless, our generalization offers a useful starting point for thinking about ways in which closer integration of economics into evolutionary scholarship is likely to be profitable.

[2]This is of course not to suggest that evolutionary scholars are uninterested in policy; e.g. see Gibson and Lawson (2014), Lawson et al. (2015), Gibson and Lawson (2015), and Lawson and Uggla (2014).

organize such complexity, and economics can contribute numerous insights offered by a market perspective.

2. Human interaction is often subject to rules (e.g. against polygyny), and these rules can emerge as attempts to limit inefficiency. Economics can contribute a broad perspective on inefficiency.

3. Rules can also emerge as the result of conflict between social groups with varying degrees of power (e.g. the wealthy and the poor). Economics can contribute insights into the dynamics and use of power.

We follow this up with a discussion of empirical issues in Section 3. Here we emphasize the focus on distinguishing between causality and selection effects. We discuss conclusions in Section 4.

## 2    Polygyny: Conceptual Approaches

We do not attempt an exhaustive survey of polygyny,[3] opting instead to use the topic as an example to illustrate how economics can inform an evolutionary perspective. We divide approaches into two broad categories; those that emphasize the physical environment and those that emphasize the social environment.[4]

By 'physical environment' we primarily mean the availability and distribution of resources. The core issues here will be familiar from biology, and thus there is clear scope to draw inspiration from the mating patterns of non-human species. Yet, humans have capacities to distribute available resources in ways–primarily via markets–that are rarely, if ever, available to other species.

By 'social environment' we primarily mean the set of rules that humans superimpose upon their interactions in the physical environment. Here the core issues are quite different and less directly related to biology.

Naturally, these two approaches are interrelated. The distribution of resources is surely sensitive to prevailing rules, and the set of rules that emerge are surely sensitive to the distribution of resources. Yet, we consider it useful to separate the approaches since they raise distinct issues. Biological evolution and markets are helpful frames when considering the physical environment, whereas cultural evolution and power dynamics are

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[3]For existing surveys from evolutionary perspectives, see Fortunato (2015), Lawson & Uggla (2014), Low (2003, 2007), Schacht and Kramer (2019), and Hames (2015).

[4]Applied to polygyny, this categorization is similar to the notions of 'ecologically imposed monogamy' and 'socially imposed monogamy' of Alexander et al. (1979). We opt for more general terms since the distinction is useful far beyond polygyny, and because we want to be be able to clearly distinguish the insights of Alexander et al. (1979) from that of others.

helpful frames under the social environment approach. In addition, the two approaches ask distinct questions. For instance, consider attempts to understand monogamy. The physical environment approach seeks conditions under which competition leads to males having no more than one spouse. In contrast, the social environment approach seeks conditions under which a society has come to be bound by rules against polygyny.

## 2.1 Physical Environment

### 2.1.1 Early Evolutionary Approaches

Early evolution-based models take heavy inspiration from biology. One key insight from (biological) evolution is that sex differences in the biological investment in offspring produces sex differences in mating strategies (Trivers (1972)). Males seek many partners while females are more selective. The main models for our purposes can be grouped under two broad categories ; 'female choice' and 'male choice'. These theories are typically not formalized, but their competition component is conceptually simple.

Female choice models include the polygyny threshold model (Orians (1969)), resource defense polygyny and male dominance polygyny (Emlen and Oring (1977)). The competition component could be described as follows. Males are heterogeneous with respect to resources whereas all females are identical. Females choose which male to mate with, and the male's resources are divided equally among all females that choose him. Equilibrium occurs when no female would choose a different partner given the choices made by all other females. The key trade-off facing females is that whilst wealthier males are more attractive all else equal, they also attract more females and thus those resources must be shared more widely. The main conclusion is that polygyny arises from resource inequality among males. This inequality itself arises from competition between males for available resources, and Emlen and Oring (1977) assert that variation in quality and location of resources will lead to variation in the resources that males control.[5]

Male choice models are less prominent, but include female (or harem) defense polygyny (Emlen and Oring (1977)). The competition component is similar to female choice, except that males compete directly for females (as opposed to the resources that would attract them). For instance, Betzig (1986/2017) emphasizes "the Darwinian hypothesis that individuals will exploit positions of strength in resolving conflicts in their own interest, and that ultimately they will seek reproductive rewards". The competition component could be described as follows. Males secure access to a given female with

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[5]This conclusion does not seem entirely clear however; higher quality resources will attract more males, leading to relative equality in resources across males. This argument is, ironically, identical to the argument that higher quality males will attract more females.

a probability proportional to how hard they compete for her relative to other males. Males choose how hard to compete for each female, and an equilibrium arises when no male wishes to change their efforts given the choices of all other males. The trade-off for males is that more intense effort depletes resources but raises the probability of securing females. Here too polygyny is promoted by male heterogeneity, and in particular by the existence of powerful males in despotic societies (see Betzig (1986/2017)).

Whilst these models offer simple accounts of competition, they risk being too simple when applied to humans. First, neither side is passive in human attempts to find partners; both males and females (or those acting on their behalf) participate in partner choice. Second, both sides can attempt to attract partners on the basis of competing offers of resources.

### 2.1.2 Economic Approaches

In understanding marriage, economists see stronger analogies to markets than to the mating behaviours of other species. Indeed, the standard model (Becker (1974, 1991)) considers a marriage *market* with males and females that are deciding upon potential partners. In the simplest version, a group consisting of one male and at least one female anticipate that, once married, they will produce a 'household good'. The quantity of the household good varies with the characteristics of group members, and this total can be divided between group members. Preferences are simple: males and females prefer to be allocated more of the household good to less. Unlike the models above, the way in which the household good is allocated across group members is not fixed, but rather is a result of market competition. The market works by proposing a 'price' for each woman, which can be interpreted as the amount of resources that she is to be allocated. This could occur via offering marriage payments (e.g. brideprice, dowry) or by agreements to divide the household good in particular ways. To simplify the explanation, suppose that the females were identical so that there is a single price in the market. Given this price, each male decides how many wives they want and each female decides whether they want to marry. This price adjusts so that the total number of females desired by males (demand) equals the total number of females willing to marry (supply). That is, an equilbrium here describes not only who marries whom but also how each household so formed divides the household good among members.

Nothing of substance changes if females varied in their characteristics. Each female has a particular *type* and each such type has an associated 'price'. These prices adjust so that the total demand for each type of wife equals the total supply of each type of wife. Similarly, the fiction of a 'household good' is convenient but unnecessary. What is important is that each group has flexibility in allocating the surplus utility that it

creates. A female's price is then interpreted as the utility that she commands.

As with the early evolutionary models, this basic version predicts that polygyny is promoted by inequality among males and female-skewed sex ratios. Yet, the extra effort in the modeling process is useful because it illuminates so much more than this.

**Economics offers insights arising from a market perspective**

The market perspective offers at least three broad sorts of insights. The first is that the analysis also tells us how the gains from marriage are allocated between spouses. This is important when males and females have conflicting preferences over how the household should operate (e.g. how many resources to allocate to offspring). Such conflict is pervasive, and indeed is a consequence of evolved sex differences in mating strategies: females seek to secure resources for their offspring, whereas males seek to secure resources in order to attract future mates. The way in which this conflict plays out is of central importance, yet absent in early evolutionary approaches.

Moreover, understanding how the gains from marriage are allocated helps us make sense of a range of related issues. There is an immediate relationship to the direction and magnitude of marriage payments (e.g. brideprice, dowry). Marriage payments introduce other interesting considerations since, as Bergstrom (1996) points out, "males can use the bride prices received for their female relatives to purchase brides for themselves." This gives male relatives a stake in the bride's 'market return' which has implications for how much parents invest in daughters[6] and the strength of norms of female seclusion (since females command a higher 'price' if they can offer greater paternity certainty). Appreciating the relevance of negotiations over marital surplus helps us understand the contractual nature of marriage. For instance, promised future division of marital surplus may not be credible if the household division of labor leads to an erosion of a wife's future bargaining position (Anderson et al. (2021)).

The second broad insight delivered by a market perspective concerns female heterogeneity. Assuming that females varying in quality limits the plausibility of the female choice model[7] but is easily handled by Becker's market model. Female heterogeneity is indispensable if we want to understand who marries whom–e.g. do high quality males tend to marry high quality females?[8]

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[6]This itself has implications for the efficacy of other policies such as the expansion of schooling opportunities (Ashraf et al. (2020)).

[7]For instance, what if the highest quality male finds that he has attracted a group of the lowest quality females? For non-human species, such as the birds that inspired the polygyny threshold model, this may just be bad luck for the male. But this seems implausible for humans given our ability to negotiate.

[8]This issue is not straightforward when marital surplus is divisible (e.g. see Legros and Newman (2007)). Furthermore, the issue plays an important role in understanding the evolutionary fitness of

Even if females are equally fertile, female heterogeneity is particularly relevant in settings where parents strive for quality over quantity in their offspring. Indeed the extent of female heterogeneity, as with male heterogeneity, is a crucial factor in determining the extent of polygyny. Gould et al. (2008) shows that, unlike the male counterpart, greater inequality among females *reduces* the extent of polygyny. The authors use this insight to argue why monogamy has declined in rich countries despite increases in male inequality. The argument is that modernity raises the return to child quality, which acts to amplify inequality among females, which in turn acts to reduce polygyny.

The third broad insight, although not limited to a market perspective, is that extensions are readily accessible. Although many features of the market model appear unrealistic or incomplete, the formality and generality provide a common foundation that allows us to add features or relax assumptions in a transparent way. For instance, if polygyny is promoted by inequality among males then it is useful to understand where this inequality comes from. It is particularly insightful if male inequality is itself, at least partially, a *consquence* of polygyny. Without a model, it is prohibitively difficult to grasp, for instance, how polygyny, wealth inequality and economic development co-evolve. Lagerlöf (2005) embeds polygyny in a model of long-run economic development. (polygyny and heterogeneity jointly determined) Inequality among males arises because of inequality of landholdings, but the wealthy drive technological progress owing to their surplus resources which allow for 'thinking'. Technological progress eventually makes land relatively less important in income generation, and this tends to equalize wealth. Polygyny declines as a result.

Rather than adding more structure, it is often useful to relax the model assumptions. For instance, the basic Becker model is static in that the passage of time plays no role. Relaxing this assumption is relevant for polygyny; Neelakantan and Tertilt (2008) and Tertilt (2005) note that polygyny arises if men marry younger women and there is population growth (even if the sex ratio is unity at each age or if there is no inequality among males). We briefly discuss Similar extensions in Section 4.

### 2.1.3   Modern Evolutionary Approaches

Formal models are more common among modern evolutionary approaches to polygyny, and this has allowed researchers to analyze more nuanced perspectives on polygyny. For instance Fortunato and Archetti (2010) considers how issues of number of partners interacts with issues of intergenerational wealth transmission. The competition component considers homogenous males and homogeneous females. Each male is characterized

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traits such as altruism (e.g. see Alger and Weibull (2013)).

by how many wives they seek as well as how to transmit wealth across generations (give to wife's offspring or to sister's offspring). Females are characterized by the degree of paternity certainty they offer. Matching is random. The relative frequency of types in the population depends on relative inclusive fitness, and equilibrium arises when the type frequencies are such that no rare 'mutant' type is able to achieve a greater inclusive fitness. The most interesting result is that monogamy can arise as a result of a population of males that give their resources to their wife's offspring if and only if the wife offers high paternity certainty, and females offer high paternity certainty if and only if husbands are monogamous. The intuition is that a mutant male that chooses to seek many wives will suffer in terms of inclusive fitness since his wives' offspring are less likely to be his.

The formality of the theory is helpful, especially in terms of understanding how the analysis could be extended by incorporating elements from the economics approach. For instance, one could introduce market competition for partners (e.g. males could attract females by offering to give their offspring resources) and heterogeneous males and females (e.g. in order to understand the role of inequality).

As a second example, Ross et al. (2018) offer a closer examination of the relationship between polygyny and male inequality. The competition component features heterogeneous males and homogeneous females. The setting adopts aspects from economics–individuals seek partners in a marriage market–and from evolution–preferences are given by fitness. The formal analysis adds relevant nuance to the claim that 'male inequality promotes polygyny', demonstrating that it matters how one measures inequality (and polygyny). For instance, very few males will have more than one wife if wealth is concentrated in the hands of a few males and there are diminishing fitness returns to extra wives.

These models showcase the promise of expanding the competition component in evolutionary settings. Formality facilitates the analysis of non-trivial interaction and this in turn reveals the relevance of inclusive fitness, intergenerational wealth transmission, and of transparently defining inequality and polygyny.

## 2.2 Social Environment

By 'social environment' we mean the suite of rules that are superimposed on interaction, including formal laws, (injunctive) social norms, customs and so on. These rules can be deliberately crafted, or can emerge and change autonomously via evolutionary forces of selection. Adherence can be motivated by specialized enforcers (e.g. by courts) or by other community members. The important common feature is that rules shape the

consequences of actions and therefore shape behaviour.

Economists attach immense significance to such rules, seeing their nature as being a primary determinant of a society's material success (e.g. see Acemoglu and Robinson (2012)). Indeed, the very existence of markets relies on rules to, for example, establish and protect property rights). Less appreciated is the central role of rules in governing marriage (Anderson and Bidner (2022)). The requirements of the ceremony, the obligations to kin, the conditions under which divorce is permitted, the associated inheritance rights–all these point to the central role of rules.

The value of having certain rules governing marriage is clear from some of the issues discussed above, including paternity uncertainty and husband commitment. But where do rules come from? Scholars have proposed many possibilities (see Acemoglu et al. (2005) for a general taxonomy, and Anderson and Bidner (2022) for an adaption to the domain of the family) but here we focus on two: efficiency and social conflict.

### 2.2.1 Efficiency View

The efficiency view sees rules as emerging in order to minimize inefficiencies. The efficiency view is natural from an evolutionary perspective: the argument is that selection pressures at the level of the group will favour groups that use resources more efficiently.[9]

Following this line of argument, evolutionary approaches see a rule against polygyny as arising because it "is a way of leveling the reproductive opportunities of men, thereby reducing their competitiveness and increasing their likelihood of cooperativeness" (Alexander (1987)). The argument that monogamy reduces the intensity of male competition is expanded upon by Henrich et al. (2012). They argue that this reduced intensity of competition should manifest itself in lower crime and increases in income per capita (for reasons laid out in Tertilt (2005)). They also argue that monogamy reduces intra-household conflict because of the absence of co-wives, a narrower spousal age gap, greater genetic relatedness within the household, and greater paternity certainty. Henrich et al. (2012) lay out evidence from a variety of sources that are supportive of these predictions.

**Economics offers insights into sources of inefficiency**

The evolutionary approaches above already suggest, even implicitly, some descriptions of the competition component that will deliver the group-beneficial properties

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[9]There is disagreement over whether such mechanisms are usefully considered evolutionary in nature. For instance, Pinker (2015) asserts that there is "no end to the possibilities for pointlessly redescribing ordinary cause and effect sequences using the verbiage of natural selection". Nevertheless, the arguments presented here do not depend on how this disagreement is resolved.

of monogamy. For instance, competition may unfold by males exerting effort in trying to attract females (much like male choice models, except the female chooses her most preferred male among those competing for her). Male efforts are socially wasteful, so a rule against polygyny may reduce the intensity of competition and thereby allow males to redirect their energies to more productive ends. One could of course append an opportunity for male cooperation (to produce a public good such as denfense, say) where willingness to cooperate is jeopardized by competition for wives. The issue of intra-household conflict is more subtle; if the conflict costs are contained within the household then there is no externality for rules to remedy.

Economists have produced some other possibilities. Even if competition for wives is costless, polygyny produces inefficiencies if males exert effort to engage in extra-marital sex ('cheating') and to guard their wives against such attempts of other males ('guarding'). Simply, polygyny leaves some males unmarried and such males engage in extensive cheating since they have no need to guard. This in turn raises the guarding efforts of those males with wives. The social waste from cheating and guarding efforts is reduced under monogamy (Francesconi et al. (2016)). Monogamy can improve efficiency even if competition for females is costless for males. For instance, rules that restrict mating opportunities raise paternity certainty and this increases males' willingness to invest in offspring (Bethmann and Kvasnicka (2011)). In a society with homogeneous males and homogeneous females, such rules make everyone better off and therefore are plausibly adopted. When individuals are heterogeneous with respect to genotype, the group-beneficial benefits of such rules depend on the extent to which genotype affects productivity (Saint-Paul (2015)).

Economists have been generally sympathetic to efficiency view and its underlying evolutionary logic. For instance, Alchian (1950) invokes evolution to defend the economists' assumption that firms maximize profits; firms need only act as if they maximize profits because market competition induces selection on profitability. However, recent work casts doubt on the usefulness of this view given that imposing a rule will generally produce winners and losers. There are various reasons why winners cannot compensate losers (see Acemoglu (2003)). This means that whether a rule is adopted is sensitive to the relative *power* of winners and losers. This leads us to the social conflict view.

### 2.2.2 Social Conflict View

The social conflict view posits that rules are adopted as the result of conflict between different segments of society. A natural social conflict arises from polygyny whereby the poor, weak and wifeless have reason to enthusiastically support rules against polygyny whereas the wealthy, powerful and wived have reason to oppose. The poor and weak are

generally in no position to impose society-wide rules, so the emergence of rules against polygyny call for explanation.

One class of explanation emphasises factors that increase the power of the poor. For instance, industrialization and the expansion of markets enhances the power of workers; not only because labor is more valuable but also because increased specialization among workers creates new forms of interdependency across society. Betzig (1986/2017) speculates that these forces "may also have brought on reproductive concessions" by "hierarchy heads in positions to make them, in power, legal privilege, productive resources."

Another class of explanation instead emphasizes conflict between powerful groups, such as Church and State. The main argument here is that rules against polygyny are imposed by the Church as part of a larger attempt to limit the accumulation of power, wealth and influence of secular groups (Goody (1983), MacDonald (1995), Henrich (2020)).[10]

Once again, these accounts implicitly rely on a competition component (this time between social groups). The plausibility of such accounts depends heavily on the specifics of this competition component, but the intended specifics are easily obfuscated without a formal model. For instance, one may ask why industrialization brought benefits to the poor in the form of access to wives. Why would higher incomes not be sufficient? Similarly, one may ask why the Church relied on concocting rules of the family to increase their influence, especially given that they were powerful enough to ensure adherence to such rules. We do not doubt that there are satisfying answers to such questions; the point is that a more systematic consideration of the competition component will deliver new accounts of how rules are imposed as the result of social conflict.

**Economics offers insights into the dynamics and use of power**

Political economy is a field of economics which is explicitly concerned with, among other things, how groups wield and compete for power. Research in this field is rarely concerned with issues of the family, but the small number of exceptions offers optimism that this could change.

The competition component modeled in Lagerlöf (2010) offers a useful illustration. There are two social groups, elites and non-elites. The elites hold disproportionate resources, but non-elites are able to 'rebel' and seize such resources. Polygyny naturally arises as a consequence of resource inequality, leaving some non-elite without a wife. Such a state motivates the non-elites to attack the elite. As a result, the elite

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[10]See Betzig (1995) for counterarguments to this position.

impose monogamy rules *upon themselves* as a means to pacify the non-elite. This conclusion bears a surface resemblance to the arguments of Alexander (1987) and Betzig (1986/2017), yet the clarity afforded by a formal model reveals important distinctions. First, the elite are motivated by the immediate and ever-present threat of conflict from within their *own* society; there is no need for external threats, nor for the relatively modern conditions of industrialization or democracy.[11] Second, there is a clear sense why a rule is required: the non-elite are not pacified by any individual member of the elite eschewing polygyny alone. The elite, being far more populous and decentralized than a despot and his associates, require a coordinated effort. Third, the analysis reveals new insights. For instance, the extent to which the elite are willing to impose a monogamy rule depends on whether the rule is expected to persist in the event that the elite are replaced via rebellion. This result allows for a new perspective on the role of the Church as a means to prolong the longevity of rules (if it is costly for a new ruling elite to switch religions). Finally, the full analysis suggests reasons why the elite pacify the non-elite with monogamy rules rather than, say, resources. For instance, giving resources to non-elites may only enhance their means to mount a successful rebellion.

More generally, political economy scholars have thought extensively about how power shifts across groups. For instance Acemoglu and Robinson (2000, 2001) address democratization, whereby a rich elite give their political power to citizens. Their key insight is that the elite will sometimes find it optimal to pacify rebellious citizens by granting them political power, as opposed to transfers of resources, because of a commitment problem. Other scholars have sought reasons for why men granted political power (e.g. voting rights) to women. The general insight here is that weak rights for wives harm the interests of males. In particular, this is because weak rights for wives entails insufficient incentives for wives to exert effort (Geddes and Lueck (2002)), insufficient incentives for households to invest in human capital (Doepke and Tertilt (2009)), and an implicit tax on transmitting wealth to daughters (Fernández (2014)). Analyses along these lines hold great promise for generating new hypotheses about rules imposed by social conflict.

One challenge in theorizing about rules from the social conflict perspective is that it may not be clear who the relevant powerful groups are. One fruitful way to proceed is to adopt a methodology known as structural estimation. In essence this involves taking a formal model and finding those model parameters which best match real-world data. This then allows the researcher to simulate the effect of any policy. For instance, Tertilt (2005, 2006) develops a rich model of the marriage market, combined

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[11]For a model in which monogamy (and divorce) rules are set under democratic conditions, see De La Croix and Mariani (2015).

with data from sub-saharan Africa, in order to understand the consequences of banning polygyny in that region. One benefit of this approach is that she is also able to estimate which sub-populations are most likely to gain and lose from a polygyny ban. This provides indirect evidence of which sub-populations are responsible for the absence of rules against polygyny. The analysis reveals that it is older men who have the most to lose from imposing rules against polygyny; among other effects, such a rule lowers the brideprice (which accrues to the older male relatives of the bride). We now turn to a broader discussion of empirical approaches of economists and how these can contribute to the evolution-based perspectives on the family.

# 3  Polygyny: Empirical Approaches

The empirical work by economists, ultimately concerned with policy, is largely focused on identifying the consequences of polygyny where it is still being practiced, so as to understand better the implications of altering the societal restrictions placed on the number of wives. Although historically polygyny was pervasive, where it is estimated that the practice appeared in 85% of societies (Henrich et al. (2012)), today it is relatively rare. Only 2% of the global population live in polygynous households, it is legally banned in a majority of countries and the UN Human Rights Committee has called for it to be abolished. However, it is still widespread in a cluster of countries primarily in West and Central Africa and legal in a majority of countries in North and Sub-Saharan Africa, as well as South and West Asia (Anderson and Bidner (2022)).

Because of the emphasis on policy implications, economists endeavor to establish a causal link from polygyny to household behaviour. This primarily implies that they aim to distinguish between causal and selection effects. There are numerous studies establishing an overall negative correlation between the incidence of polygyny and welfare outcomes using large-scale observational data such as: poverty, child well-being, household cooperation, intimate partner violence, as well as increased societal conflict. However, an overall positive correlation between child mortality, for example, and the incidence of polygyny could simply emerge because less educated individuals select into polygynous marriages. So that, it is not the institution of polygyny per say that leads directly to lower health investments in children, it is instead that lower educated parents are less able to care for their children's health. In other words, polygynous household structures do not cause otherwise similarly educated individuals to behave differently. It is rather that lower educated individuals tend to select into polygynous marriages compared to monogamous ones, and this is what is driving the positive correlation between polygyny and child mortality found in the data.

If the positive correlation between child mortality and polygyny is indeed due to these selection effects (by education of parents), then a policy to eradicate polygyny would have no direct impact on child health outcomes. That is to say, although, membership in polygynous households may be a way to identify at-risk children, polygyny as a marital institution is unlikely to directly cause child mortality. So, if the focus of policy makers is to improve child health outcomes, resources are better spent on improving women's access to education and public health more generally, rather than prohibiting the institution of polygyny.

In their empirical work, economists endeavor to distinguish between these causal (or direct) effects from polygyny and these alternative selection effects, and they engage with various empirical strategies to this end. In this section, we discuss some of these regression techniques which are employed using the example of polygyny. We will see from these studies, that isolating these two types of effects can be quite context specific. This very micro-level approach is quite related to that taken by researchers outside of economics, such as Lawson et al. (2015) among others, which draw on data from more specific field studies, where it is often found that the original findings from the larger-scale cross-national studies tend to be more nuanced and often challenged. The trade-offs are apparent, on the one hand, it is difficult to generalize from a policy perspective using only a few context-specific findings, and on the other hand identifying causal channels is of upmost importance. Subsequent to the "identification revolution", which now characterises most of empirical work in economics, economists studying the family tend to focus their efforts on the latter.

Several cross-national studies document a significant negative correlation between child health outcomes and the incidence of polygyny (Wagner and Rieger (2015)). Lawson and Gibson (2018) provide a critical review of this literature and highlight the variation in findings that is apparent and how such conclusions can be context-specific. They further emphasize the empirical challenges that need to be addressed such as isolating confounding factors and distinguishing between causality and selection. This is precisely where economists focus their energies. Arthi and Fenske (2018) aim to gain some insight on this by comparing historical with contemporary data on polygyny and child mortality among the Igbo in Nigeria. In particular, they find an insignificant correlation between child mortality and polygyny in the historical data, but demonstrate a strongly positive and significant and policy-relevant magnitude in the contemporary data. This finding on its own could point to evidence against the institution of polygyny leading directly to poor child health outcomes, as if so, we would expect to also observe the correlation in the historical data. However, we would want to take care in drawing such conclusions given plausible differences in the measurement of child mortality in the his-

torical and contemporary data, and furthermore how reliable historical measures are at all. The authors move on to explore whether the correlation found in the contemporary data could be explained by selection effects. They first test for which observable characteristics of polygynist parents differ significantly from those of monogamists. They find that children of polygynists are more likely to be born to mothers who are older, less educated, married early, poor, and married to older and less educated partners. In a regression analysis, they demonstrate how each of these characteristics are indeed also significant determinants of child mortality, but when they include them as control variables in the estimations, the significant relationship between polygyny and child mortality remains robust, thus suggesting that these characteristics on their own are not fully explaining the positive correlation between polygyny and child mortality. Hence, although there are likely selection effects at play, there is still a robust empirical relationship between polygyny and child mortality, which needs to be taken seriously.

More generally, it is consistently found that polygynous households tend to be poorer overall. Identifying causality from selection remains the core empirical challenge. To address this carefully, we typically need to focus in on specific outcomes and contexts. Akresh et al. (2012, 2016) explore the implications of polygyny for production efficiency among rural households in Burkina Faso.[12] To identify the causal effects, the authors exploit that rural households in this context tend to cultivate several crops on multiple plots, whereby women often have decision-making power over their own plots. Further to this, household members are expected to contribute labour to other household plots. The authors estimate plot yields on a given crop for a given household as a function of plot characteristics and cultivator characteristics. Household cooperation maximizes joint farm production and equalizes the marginal productivity of inputs across plots controlled by cooperating individuals. The authors therefore consider the yield differences across cultivator pairs to uncover whether polygynous households are better able to cooperate and thus equalize production efficiency across plots. They find that yield differentials between husbands and wives are smaller when the husband has multiple wives. This can be indicative of either greater cooperation among co-wives or between husbands and wives in polygynous households. To differentiate these two mechanisms, the authors can limit their empirical analysis to specific cultivator pairs and they find suggestive evidence that it is improved cooperation among co-wives which is driving the main increase in productive efficiency in polygynous households, compared to monogamous ones. By comparing yields for specific crops, they can rule out selection effects whereby monogamous and polygynous household plant different crops.

This finding, that although polygynous household tend to be poorer overall, it does not

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[12]Refer also to Hidrobo et al. (2021) and Damon and McCarthy (2019).

seem to be the case that they have less efficient household production. Dessy et al. (2021) extend this research to further consider how polygynous households respond to drought induced crop failure in rural Mali. The authors seek to identify the causal effect of the interaction of drought incidence and polygyny on crop yields. The authors posit that polygynous households are more resilient to the adverse impacts of droughts, because they have larger households and hence higher risk-sharing potential. The empirical identification challenge lies with a possible correlation between polygyny and crop output, supposing that polygynous communes tend to locate in more fertile areas, then the authors could be (wrongly) attributing the yield differential as the impact of polygyny, rather than the soil characteristics of the commune. To address this, the linear regression model compares only households residing in the same enumeration area. So that, average differences in geographic, economic, and cultural factors are held fixed and do not vary over time. In other words, we are comparing yields across monogamous and polygynous household, differentially affected by drought shocks within a small geographical area. The authors find that polygyny has no buffering effects on current droughts on crop yields, but does so with past droughts. They conjecture that because polygyny raises fertility, it enables households in drought-prone rural communities to harness the size and composition of the family workforce to leverage diversification of crop production in the subsequent periods.

The above two studies do not shed light on the positive correlation between poverty and polygyny, since, all else equal it appears instead that polygynous households are more productively efficient and better able to manage risk in some specific poor contexts. However, it is conceivable that cooperative behaviour could occur in productive activities in polygynous households, while conflict might still occur over distribution (Becker (1981)). Barr et al. (2019) aim to investigate the inherent dynamics between a husband and co-wives.[13] They address this issue directly by implementing carefully designed experimental games among the Nupe in Kwara State, Nigeria. In particular, they invite married adults to play a series of two-person public goods games, with real monetary consequences. They find that polygynous husband-wife pairs contribute significantly less than monogamous husband-wife pairs, and even lower contribution rates among co-wife pairs. They also invite married men and women, from both monogamous and polygynous households, to play the same games against adults from other households. In this case, there are no significant differences across household types. Thus suggesting, that selection effects, whereby less cooperative individuals tend to select into polygynous marriages, are not driving their core findings, and instead there is a causal relationship from polygynous household structures to lower levels of overall

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[13]Refer also to Munro et al. (2019) and Rossi (2019).

cooperation.

From a policy perspective, it is also relevant to know how poverty reducing strategies can interact with household structures. Heath et al. (2020) analyse the introduction of a cash transfer program by the Government of Mali aimed at reducing poverty and improving human capital accumulation. In order to allow for a rigorous impact evaluation, the government collaborated with research partners to implement a two-stage randomized control trial in five regions of the country. A randomly selected subset of communes in the study regions received the program initially and the remaining set received the program two years after. So that for two years, there was effectively a "treatment group" (which received the program) and a control group (which did not). The randomized assignment ensures that baseline characterisitcs of households across the treatment and control groups are on average the same, so as to minimize selection concerns whereby poorer households (and those that are polgygynous) were more likely to be selected into the program. This implies that the estimated effect of the cash program on outcomes of interest cannot be due to differences in baseline individual characterisitcs (i.e. selection effects) and instead is an accurate estimate the program's direct causal impact. The authors main outcome of interest is women's experience of intimate partner violence (IPV), and they estimate the impact of the program on IPV separately for polygynous and monogamous households. Among women in monogamous marriages, they find no statistically significant impacts of treatment on IPV, whereas for women in polygynous marriages, treatment significantly reduces all prevalence and index measures for physical and emotional violence, and controlling behaviours. These findings are more pervasive for second (or later) wives compared to first wives. The authors further uncover that these findings are explained by a larger reduction in men's stress and anxiety, as well as marital disputes, in polygynous households due to the injection of cash into the households. They also explore whether these findings are explained by observable correlates of polygyny rather than the institution of polygyny per say. To do this, the authors first assess which correlates appear relevant, by identifying which variables are both correlated with IPV and are significantly different across polygynous and monogamous households. They next assess whether the inclusion of these variables, along with their interactions with the treatment variable meaningfully changes their estimates of the treatment effect on polygynous households. The results reveal that there is no longer a significant treatment effect among polygynous households when baseline correlates and their interaction with treatment are included. This implies that observable correlates of polygyny, like low education and poverty, largely explain the differential reduction in men's stress and anxiety, with access to increased cash. From a policy perspective, this implies that cash transfer programs should not

necessarily target polygynous households per say rather they are a good proximate measure for locating disadvantaged households more generally. That was is central is not how the cash transfer interacts with polygynous family structures per say, rather how it interacts with poverty levels which is relevant.

Aside from a focus on household or individual-level outcomes, there is significant concern that the institution of polygyny is detrimental to societal outcomes (Henrich et al. (2012)), in particular conflict incidence. With the increasing availability of geo-located spatial data, the analysis of conflict is a growing research area in empirical economics and there is some work on the interlinkages with family structures (Moscona et al. (2020)). Rexer (2022) focuses on polygyny, testing the hypothesis that societies can be destabilized when a large mass of young men are excluded from the marriage market.[14] The outcome of focus is the number of Boko-Haram deaths within communities across Northern Nigeria. The explanatory variable of interest is a measure of marriage market inequality due to polygyny within a community. To demonstrate a causal effect from marriage market inequality to conflict, the authors exploit the fact that positive rainfall shocks in girls' pre-marital adolescence increases marriage inequality in polygynous marriage markets and reduces it in monogamous ones. When young women experience good income realizations in the years before they enter the marriage market, they raise their standards over the types of men they are willing to marry. In polygynous places, women can match with wealthier already-married men, which increases marriage inequality in that local. The regression estimates demonstrate how an unexpected increase in rainfall during the adolescent period of the average women leads to a differential increase in Boko Haram related deaths annually in polygynous villages. Because the regression analysis exploits the variation in pre-marital weather shocks, and not contemporary shocks (which could impact economic outcomes today and in turn conflict directly) these effects of polygyny on conflict are causal.

The discussion above represents only a small selection of the empirical work by economists on the topic of polygyny. It is meant to highlight the empirical approaches used by economists. What is immediately apparent though is how similar the questions asked in this research are to the focus in other disciplines. In the past, economists have tended to rely on large-scale cross-sectional data to draw conclusions, but over the last few decades the work has become more micro-focused and context specific. The future cross-discipline synergies appear vast.

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[14]Refer also to Krieger and Renner (2020).

# 4    Conclusions

The perspectives and methodology from economics has great potential to contribute to evolution-based approaches to the family. Whilst we have illustrated this case using polygyny, the possibilities are far broader. Economists have studied related issues, which include but are not limited to age gaps between spouses (Bergstrom and Bagnoli (1993)), age at marriage (Wahhaj (2018)), marriage markets with search frictions (Burdett and Coles (1997)), divorce (Hiller and Recoules (2013)), endogamy (Bidner and Eswaran (2015)), and marriage payments (Anderson (2003), Anderson and Bidner (2015)).[15]

Our argument is based on the observation that economics specializes in the analysis of one key Darwinian component: competition. Although but a single Darwinian component, it is a vital one. The fitness value of a particular trait is not intrinsic; it is entirely dependent upon the nature of competition. A broader appreciation for the various ways that competition can unfold will open more possibilities for understanding the fitness value of traits and thus the evolutionary basis for the outcomes that we observe. This appears particularly promising in the domain of the family and marriage; evolutionary scholars have identified a shift in "focus toward the interplay of the marriage system with a broader range of ecological and social factors" (Fortunato (2015)). We hope to have highlighted specific ways in which Economics is well-placed to offer insights into such factors.

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# 6    Author Contributions

Siwan Anderson and Chris Bidner, with equal contributions, conceived of and wrote the manuscript.

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[15]For an elaboration upon economic approaches to these, and related issues, see Anderson and Bidner (2022).

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# 8 Conflicts of Interest

There are no conflicts of interest.

# 9 Research Transparency and Reproducibility

N/A

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