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Effects and the Transmission of Culture**

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Nurture vs. Nurture: Endogenous Parental and Peer Effects and the Transmission of Culture*

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Abstract

I propose a model of cultural transmission where children interact strategically with each other with the only desire to fit in, and parents purposefully socialize their children to their own culture. In the empirical section I estimate parental and peer effects using US teenager data on religious attitudes and alcohol consumption from the Add Health study. I find that, controlling for individual and school observables, children attitudes are a weighted average of their parents' and peers' attitudes, with the latter generally dominating. I then show that these are stable in time with now signs of fading away in the transition from adolescence to adulthood. Finally, the comparative statics allow me to separate endogenous from exogenous parental effects.

Keywords: Cultural transmission, endogenous preferences, Add Health study, preference for conformity, endogenous socialization.

JEL Classification: D19, J13, J15.

Resumen

Propongo un modelo de transmisión cultural en donde los niños interactúan estratégicamente con el único deseo de pertenecer y en donde los padres desean socializar a los niños a su propia cultura. En la parte empírica estimo los efectos de los padres y los amigos utilizando datos de actitudes religiosas y consumo de alcohol para adolescentes en Estados Unidos de la encuesta Add Health. Encuentro que, controlando por factores individuales y de la escuela, las actitudes de los adolescentes son un promedio ponderado de la de los padres y amigos, donde los amigos generalmente tiene una mayor ponderación. Adicionalmente, estos efectos son estables en el tiempo y no parecen decaer en la transición de la adolescencia a ser adultos. Finalmente, la estática comparativa permite separar efectos endógenos y exógenos de los padres.

Palabras Clave: Transmisión cultural, preferencias endógenas, estudio Add Health, deseo de conformidad, socialización endógena.

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1 Introduction

Two topics that have been traditionally neglected by the economics profession have gained ascendance in recent years: first, it is now clear that the social environment— i.e. the quantity, quality and structure of interactions with other individuals— has important effects on our choice behavior.¹ Second, researchers have consistently shown the long-lasting effects that childhood and early childhood interventions have on future economic outcomes.²

Drawing on a large number of findings in the developmental psychology literature, in this paper I propose a simple model that integrates both of these literatures. Theoretically, I take the social environment to consist of parental and peer strategic interactions. Childhood is defined as the stage where preferences are being formed, individuals are myopic and their only desire is to fit in, balancing the tradeoff between being like their parents and being like their peers.³ Adulthood is defined as the stage where individuals have well-defined preferences and are not susceptible to peer pressure.⁴ Knowing that their children’s social environment may affect their choices, parents purposefully socialize them to their own choice behavior.⁵ Due to the quadratic nature of the preferences assumed during the childhood stage, the equilibrium outcome of this set of strategic interactions between children, parents and children *and* parents yields first-order conditions that coincide with the standard linear-in-means regression used in the peer-effects literature, *augmented* by parental effects, i.e. the framework provides a simple microfoundation of the standard methodology used in this literature.

With this socialization model in mind, my empirical objectives are threefold: first, using data from the Add Health longitudinal study on two religious variables (religious importance and frequency of praying) and frequency of alcohol consumption, I estimate parental and peer effects. Second, I argue that parental effects can be decomposed into exogenous and endogenous components, the former associated with a role-model effect, and the latter with endogenous parental socialization choices by the parents. Third, I argue that these effects are enduring in time, showing that parents and peers are indeed important in the transmission of cultural traits.

¹The literature on peer and neighborhood effects is large. Recent reviews can be found in Blume, Brock, Durlauf, and Ioannides (2011) and Epple and Romano (2011) and other chapters in the Handbook of Social Economics.

²See for example Currie (2001) and Heckman (2006).

³Developmental psychologists have shown that the desire to conform is important in understanding children’s socialization processes and outcomes. See for example the references in Grusec and Davidov (2007, pp.297-298), Bukowski, Brendgen, and Vitaro (2007) and Rubin, Bukowski, and Parker (2006).

⁴Needless to say this extreme characterization of adulthood is a simplifying assumption.

⁵My treatment of socialization is standard and follows the general treatment in developmental psychology. For example, Maccoby (2007, pp.13) defines socialization as “processes whereby naïve individuals are taught the skills, behavior patterns, values, and motivations needed for competent functioning in the culture in which the child is growing up.” Similarly, Grusec and Davidov (2007, pp.284) include in their definition “(...) the acceptance of values, standards, and customs of society as well as the ability to function in an adaptive way in the larger social context.”

Each component in the model serves a specific role to attain my main empirical objectives: while the children's component of the model maps nicely to the growing econometric literature on peer effects, the parental socialization component generates testable predictions that allow me to disentangle endogenous and exogenous parental effects. To clarify the language from the outset, I take parental choices or outcomes to be exogenous with respect to the socialization process of their children, forbidding, for example, that they can *credibly* deviate from their optimal actions to set an example for their children. It is in this very specific sense that I say that parental choices have an exogenous role-model effect. Nonetheless, parents can endogenously socialize their children by affecting the relative weights they put on parental and peer conformity; this I call endogenous socialization.⁶

Empirically, I first find that contrary to what some developmental psychologists claim, peer effects generally dominate parental role-model effects.⁷ While this finding is not new in the economics literature on social interactions, the estimates for peer effects I present here are considerably larger than those generally found in the literature, a result that can be explained if children utility (loss) functions are separable, so that parental and peer effects are magnitudes relative to each other.⁸ Put differently, when parental and peer effects enter separably in a child's utility function, one can only identify one effect *relative* to the other. For this reason I restricted the empirical analysis to outcomes where exactly the same question has been asked to children and parents in the Add Health data.⁹

Also in contrast to other findings in development psychology, exogenous parental effects are positive, even for the case of alcohol consumption where these are almost negligible.¹⁰ Moreover, using the comparative statics of the parental socialization problem, I show that the

⁶To the best of my knowledge the developmental psychology literature on socialization is mute on the veracity of this assumption—that parents cannot or do not deviate from their optimal choices to socialize their children—rather focusing more on the mechanisms of socialization. In their review of the literature, Grusec and Davidov (2007) emphasize that one dimension of socialization involves behavioral and psychological control that includes rule-setting and monitoring, as well as “the use of guilt-inducing strategies, withdrawal of love, and parental intrusiveness.” This type of socialization strategy corresponds to the class of endogenous socialization schemes I use in the model. See also the historical overview on socialization research by Maccoby (2007).

⁷In their review of the literature, Grusec and Davidov (2007) argue that “(p)arents, siblings, teachers, peers, and the media all function as agents of socialization of children. We would argue, however, that parents are the most important in their impact.”

⁸For example, in their analysis of drug use, alcohol consumption, smoking, church attendance and the likelihood of dropping out, Gaviria and Raphael (2001) include some parental controls such as the type of household (single-parent or not), parental educational attainment, family income and parental use of drugs. Their IV estimates for peer effects are between 0.16 (dropping-out) and 0.35 (alcohol consumption). Clark and Lohéac (2007) report larger peer effects estimates for smoking (0.25), alcohol consumption (0.483), drunkenness (0.46) and marijuana use (0.251). However, both of these papers use dichotomous variables as dependent variables, so it is unclear that these estimates are directly comparable.

⁹In the Add Health data that I use, other variables such as cigarette and marijuana smoking are measured as frequencies for children, but only as an indicator variable for parents.

¹⁰For example, Harris (1995) and Harris (1999) argues that (i) parental effects are generally not important, (ii) genes play an important role, but (iii) the main channel for socialization is the desire to conform to their peers. A thorough review can be found in Bukowski, Brendgen, and Vitaro (2007, pp.359-360).

estimates are consistent with the view that parents endogenously socialize their children in the way suggested by the model, i.e. by making them put more weight on parental conformity relative to peer conformity.

Finally, I use data from four waves of information (a period of fourteen years) and show that parental and peer effects are stable in time. In terms of the lifespan of the interviewed children, I show below that parental and peer effects do not vary systematically for respondents between 12 and 31 years of age. This result is more striking by noting that the peer group consists of all children within the school *during the first wave of information*, that is, the results show that a child's peers within a school during adolescence has enduring effects on her behavior, even when they may no longer interact with the same group of people. To the best of my knowledge this is the first paper in economics reporting the stability of parental and peer effects. That parental and peer effects do not fade out in time is crucial in my argument that this is in fact a description of the transmission of culture and preferences.

These results are robust to a variety of measures that are interesting by themselves and are therefore worth briefly summarizing here. First, I find that parental (peer) effects in both religious variables are larger (smaller) for women, a finding that is consistent with the view of gender-based parental role-models.¹¹ Also, using three alternative methods to assess the potential effect created by parental neighborhood sorting, I do not find evidence that parental and peer effects are biased. I then test if the strength of parental or peer effects is affected by the size of the school, individual characteristics of the respondent such as how physically attractive, popular or independent they are, or their position in the family (adopted, first-born child or only child) and find no systematic evidence that this is indeed a source of concern. These set of robustness checks are important because in the theoretical model I assume that families consist of one parent and one child, excluding potentially important parental socialization strategies that vary across siblings.

Theoretically and methodologically this paper contributes to the literature in several ways. While it is certainly not the first paper to provide microfoundations for the standard linear-in-means model,¹² to the best of my knowledge, it is the first emphasizing the fundamental role that parents play. Recall that in a linear-in-means regression one estimates individual choices as a linear function of the sample of mean of her reference group's choices, i.e.

¹¹Gender-based effects have been extensively studied by developmental psychologists; see for example the reviews on parental effects in Grusec and Davidov (2007), Dunn (2007) and Rubin, Bukowski, and Parker (2006) (sibling and peer effects, respectively). In economics, Dardanoni, Forcina, and Modica (2009) found evidence of gender-based role-model effects in the transmission of education. Using the same data I use here, Clark and Lohéac (2007) also present some evidence that peer effects are larger for men than for women.

¹²See, for example, the literature review in Blume, Brock, Durlauf, and Ioannides (2011).

$$y_i = X_i' \beta + \alpha_g \bar{y}_{s(i)} + \epsilon_i \quad (1)$$

where y_i and $\bar{y}_{s(i)}$ denote individual i 's and average reference group's choices, and X_i is a vector of controls (possibly including a constant term), and the researcher is usually interested in estimating the peer effect α_g .

The distinction between endogenous and exogenous socialization generates important methodological insights: first, exogenous socialization implies that parental effects should be included as a control, i.e.

$$y_{i,t+1} = X_{i,t+1}' \beta + \alpha_p y_{i,t} + \alpha_g \bar{y}_{s(i)} + \epsilon_i \quad (2)$$

where the time subindex denotes choices by the children ($t + 1$), and parents (t). Since parental influence has a direct positive effect on their own children outcomes and these are positively correlated to the average choice in the reference group, it is clear that estimating Equation (1) and omitting parental choices upwardly biases the estimated peer effect. More importantly, if parents affect only their own children, the average of parental choices at the reference group level is a valid instrument that allow the econometrician to circumvent Manski (1993) reflection problem. I will argue below that the psychological literature on *nonparental adults* allows one to defend the validity of this exclusion restriction— explicit in Equation (2) if other parental choices are excluded from the set of additional controls X . Moreover, I will show that standard data sets used in peer-effect estimation such as the Add Health study usually allow the researcher to empirically check if it may hold or not.

Second, endogenous socialization implies that parental and peer effects in first-order conditions vary across children in a systematic way that has not been explored in the literature yet, as it depends on deep parameters that are partly affected by parental socialization. Using reduced-form regressions I show that this can be tested and find evidence consistent with the story provided in the model: parents affect the relative weight that children put on parental and peer conformity in such a way that their equilibrium choices do not deviate too much from their own. As a corollary, it is immediate then, that researchers are estimating average peer effects.

This paper first contributes to the theoretical literature on cultural transmission. Focusing on endogenous parental socialization, Bisin and Verdier (2001) microfound and enrich a model of the transmission of discrete cultural traits originally proposed by evolutionary biologists.¹³ I follow them and allow parents to purposefully socialize their children, but in contrast to their

¹³See Cavalli-Sforza and Feldman (1981) or Boyd and Richerson (1985).

work, I also explicitly model the incentives that children have when they interact with parents at home and with their peers at the school, which allows me to also provide a microfoundation of the corresponding dynamic equation for *continuous* cultural traits that was proposed and studied by Cavalli-Sforza and Feldman (1973). Relative to them, not only am I concerned with a different and arguably more general object (continuous vs. discrete cultural traits),¹⁴ but I also take advantage of the fact that the children's problem maps very nicely into the growing econometric literature on estimating peer effects.^{15,16}

While they do not explicitly model the parental purposeful socialization, the model in Kuran and Sandholm (2008) is similar to the one I propose for the children. However, there are several important differences between the two approaches. First, here children face a tradeoff between being like their parents or being like their peers (the sample average of the actions simultaneously chosen by the children they interact with at the school), and in their framework at each time t children are randomly matched with another (single) agent and they face a tradeoff between cooperating with her or acting according to what her own preferences dictate. In addition, the dynamics (in actions) in this paper arise naturally from the fact that current choices by children depend on parental choices (through the exogenous role-model effect), while they follow the approach used in evolutionary game theory and propose dynamics (in a preference parameter) that rely on the assumption that preferences for the children react to reduce the difference between *parental* actions and what would be optimal according to their own preferences. These differences give rise to different equilibrium strategies for the children in both papers, and therefore different dynamics.¹⁷

The link between the two literatures is even stronger since, as first noticed by Glaeser, Sacerdote, and Scheinkman (1996) and recently exploited by Graham and Hahn (2005), whenever peer effects are present and positive, the between-peer groups variance is in excess of the within-group variance in a process modulated by the *social multiplier*.¹⁸ Analogously, the standard approach used by applied econometricians to control for cultural or ethnic group effects is to include a set of culture-specific dummy variables; these dummy variables are significant

¹⁴A discrete cultural trait can only take a finite number of values, but most importantly need not be linearly ordered. The archetypical example is that of religious denomination, e.g. whether a person is catholic or not catholic.

¹⁵The claim that the study of continuous traits is more general follows from the observation that discrete traits that lack an order structure— e.g. religious denomination— can in principle be studied with continuous latent traits analogously to the random utility methods used in applied microeconometrics (e.g. McFadden (1981)). The converse is not true, however.

¹⁶In an unpublished paper, Pichler (2010) also studies the transmission of continuous cultural traits. Following Bisin and Verdier (2000) he assumes that the main channels for cultural transmission are the vertical (parents) and oblique (other adults), and following Cavalli-Sforza and Feldman (1973) he assumes an exogenously given dynamic equation.

¹⁷Nonetheless, because of the simplifying assumption that loss functions are weighted quadratic used in both papers, the long-run properties of the model are the same in that both predict cultural convergence or assimilation.

¹⁸On the social multiplier see Becker and Murphy (2000) or Glaeser and Scheinkman (2003).

whenever the between group variance of the partialled-out dependent variable of interest sufficiently exceeds the corresponding within group variance, a fact that serves as testing procedure used in analysis of variance methods (ANOVA).

Related to the methodological contribution, I find systematic evidence that parental and peer effects are negatively and strongly correlated, a result in line with the motivating idea that children face a tradeoff between being like their parents and being like their peers. The evidence also shows that peer (and parental) influences have long-lasting effects on the behavior of teenagers. To the best of my knowledge, this paper is the first to document these systematic patterns.

This paper is organized as follows. The next section develops a model of endogenous parental and peer effects, describes its main properties and explores the comparative static results that will be used to answer the empirical questions. In the third section I discuss the empirical implementation and estimate peer and parental effects for different ethnic groups and dependent variables, discuss the stability of the effects, and test the main predictions coming from the comparative static analysis of the problems. The final section concludes.

2 A Stylized 2-Groups Model

Consider a stationary population of N (asexual) adults and their corresponding children. For ease of exposition, in this section I will assume that at time zero, the adult population is partitioned into two groups ($M = 2$) with identical individuals in each group and denote population shares by $\omega_g = n_g/N$, with n_g the size of group g for $g = 1, 2$ I will make the necessary assumptions to ensure that these population shares remain constant across time, so in practice I will be describing the transmission process of two different dynasties. I present in the Appendix a general version with heterogeneous agents, i.e. $M = N$ individuals and groups.

I am interested in studying the social transmission of outcome $e \in [0, 1]$; it will become apparent in the sequel that bounding the object to the closed unit interval is a normalization that generates no loss of generality. In abstract, e is any object of choice with the following characteristics: (i) it is chosen by children in their formation years, (ii) it remains relatively stable during adulthood, and (iii) during childhood e has no intrinsic value in itself, i.e. children desire more or less only because they want to belong to a social group. In the empirical section I will argue that religious outcomes and preferences such as how frequently children pray (an object of choice, i.e. an outcome), how important is religion for them (akin to a preference parameter) and how frequently they consume alcohol (an object of choice) generally satisfy these three properties.

At each time t a the following tripartite game is played: in the first stage parents get to choose actions that affect the socialization outcomes of their children. Given these strategic

choices, in stage two children play a conformity game where the value of their preferences is chosen; moreover children and parents play an intergenerational sequential game. Figure (1) depicts the timing of decisions.

Figure (1) around here

2.1 Children's Conformity Game

As Figure (1) shows, in the second stage of each time t children play a *conformity game* that I now describe. I assume that each child is driven by the desire to belong, and chooses e in such a way that she does not deviate too much from her parents and her peers. Formally, child $i = 1, \dots, N$ solves the following problem

$$[C] : \min_{e_{i,t+1} \in [0,1]} \alpha_{i,t+1}(e_{i,t+1} - e_{i,t})^2 + (1 - \alpha_{i,t+1})(e_{i,t+1} - \bar{e}_{t+1})^2$$

where $\bar{e}_{t+1} = (1/N) \sum_{j=1}^N e_{j,t+1}$ denotes the sample average of the choices of *all* children in both groups, i.e. the reference peer group includes all children and not only those of each group, and $e_{i,t}$ denotes the choice made by parent i that serves as an exogenous role model for her child. Since I restrict my analysis to symmetric equilibria where all children and parents within each group are identical and make identical choices, in this section I will abuse notation by letting individual subscripts $i \neq j$ also denote the two groups.

Problem [C] states that outcome e does not have an intrinsic value for children, but only the extrinsic value given by the feeling of belonging to a social group that includes the parents and the peers. Choosing their action e entails a clear tradeoff between being like their parents and being like their peers. In this paper I assume that this preference for conformity characterizes the childhood and adolescence stages. Since there are only two groups, and preferences are quadratic and separable the next result straightforward result follows:

Proposition 1 (Existence and Uniqueness of Symmetric Nash Equilibrium). A necessary and sufficient condition for the existence of a unique symmetric Nash Equilibrium of the conformity game for any time $t > 0$, is that $\alpha_i > 0$ for at least one of the groups. \square

Proofs of all propositions can be found in the Appendix, but three cases arise in the study of the conformity game. First, whenever both groups have $\alpha_i = 0$ there is a continuum of equilibria where all children choose the same $e \in [0, 1]$, i.e. this corresponds to a *beauty contest*.¹⁹ It arises whenever children only care about the actions of their peer, arguably a good representation of several choices made during adolescence. Second, whenever $\alpha_i = 0$ and $\alpha_j \in (0, 1]$ the unique

¹⁹See Nagel (1995) or Camerer (1997) for a general description of the beauty contest.

symmetric Nash equilibrium is $e_{i,t+1} = e_{j,t+1} = e_{j,t}$, i.e. all children choose the outcome of parents of the group that puts some positive weight on parental conformity. Finally, an interior unique Nash equilibrium exists whenever $\alpha_i > 0$ for both groups, given by

$$e_{i,t+1} = \gamma_i e_{i,t} + (1 - \gamma_i) e_{j,t} \quad (3)$$

where $\gamma_i = A_i / (A_i + A_j(1 - A_i))$, and $A_i = \alpha_i / (\alpha_i + (1 - \alpha_i)(1 - \omega_i)^2)$ for $i \neq j \in \{1, 2\}$. The qualitative long-run properties of the dynamic process implied by Equation (3) have been studied by Cavalli-Sforza and Feldman (1973) so the model in this paper can be viewed as providing microfoundations for such analysis. Importantly, the parameters γ_i that prove critical for the qualitative behavior of the process depend on deep parameters.

Since in equilibrium the outcome of any child is given by a convex combination of the outcome of parents of both groups, it is evident from Equation (3) that whenever $\gamma_i \in (0, 1)$, the process of preference transmission converges to a steady state where all children converge, i.e. one where *both* groups completely assimilate to each other. To obtain a stronger characterization of the steady state, assume without loss of generality that initial preferences for each group are $\mathbf{e}_0 = [e_{10}, e_{20}]' = [0, 1]'$.²⁰

Proposition 2 (Blending-type Steady State). Assume that $\alpha_i \in (0, 1)$, $i = 1, 2$. Given initial conditions \mathbf{e}_0 , there exists a unique interior stable steady state equilibrium $\mathbf{e} = (e, e) \in (0, 1)^2$. Furthermore the equilibrium will be unbiased, i.e. $(1/2, 1/2)$, whenever

$$(1 - \alpha_1)(1 - \omega_1)/\alpha_1 = (1 - \alpha_2)(1 - \omega_2)/\alpha_2 \quad (4)$$

biased towards type 1's ethnic trait whenever $(1 - \alpha_1)(1 - \omega_1)/\alpha_1 < (1 - \alpha_2)(1 - \omega_2)/\alpha_2$ and biased towards type 2's ethnic trait when the inequality is reversed. \square

The proof of the proposition can be found in the Appendix, but it is instructive to see the role played by Equation (4). From Equation (3) it is straightforward to check that

$$(e_{1,t+1} - e_{2,t+1}) = (\gamma_1 + \gamma_2 - 1)(e_{1,t} - e_{2,t}) \quad (5)$$

$$(e_{1,t+1} - e_{1,t}) = (1 - \gamma_1)(e_{2,t} - e_{1,t}) \quad (6)$$

Equation (5) provides a test of *horizontal convergence*; since under the assumptions of the proposition $0 < \gamma_1 + \gamma_2 - 1 < 1$ (see Appendix), it follows that in a steady-state conformity game generates intra-cohort convergence. Also, since $\gamma_i \in (0, 1)$, Equation (6) implies that there

²⁰ $[a, b]'$ denotes a column vector with elements a and b .

is also vertical or intergenerational convergence. Moreover, using Equation (6) for each time t one can also verify that

$$\begin{aligned} |e_{1,t+1} - e_{1,t}| > |e_{2,t+1} - e_{2,t}| &\Leftrightarrow \frac{1 - \gamma_1}{1 - \gamma_2} > 1 \Leftrightarrow A_2 > A_1 \\ &\Leftrightarrow \frac{(1 - \alpha_1)(1 - \omega_1)}{\alpha_1} > \frac{(1 - \alpha_2)(1 - \omega_2)}{\alpha_2} \end{aligned}$$

from where the qualitative properties of the steady-state discussed in Proposition (2) follow: at each time t , other things equal, the outcome for children of the relatively larger ethnic group is relatively less distant from their parental outcomes (ie. the equilibrium is biased towards the majority group). Since this holds for any time t , it must also be true for the steady-state. An analogous condition holds for groups that put relatively more weight on their parents. Graphically, these conditions are shown in Figure (2): in the right panel, a symmetric steady state where both groups have the same population weights and parameters α is shown. The left panel shows the case of equally sized groups but differential parental parameters α . While groups blend with each other (“the melting pot”), the final mixture looks more like the original parent of the group with a larger parental weight α . In the empirical application of the model this proposition will be used to show that children from different ethnic groups converge into what appears to be a *Local Melting Pot*, i.e. within the school.

Figure (2) around here

Having derived the properties of the second-stage Conformity Game, I proceed now to solve for the first-stage socialization game equilibrium.

2.2 Parental Socialization Game

I assume that parents prefer having children with outcomes closer to their own, and purposefully socialize their children by directing the transmission process towards the value of their own trait. To this end, parents can affect the relative weight that their children put on parental conformity α by exerting a costly socialization effort; to make things simple, I assume that parents can directly choose α .²¹

Formally, recalling that children’s optimal strategies depend on the relative weight $\alpha_{i,t+1}$, the

²¹This is a simplifying assumption, since the results are qualitatively the same if one assumes that parents choose socialization effort $s \in (0, \bar{s})$, such that relative parental weights are a monotonic function of s , i.e. $\alpha = f(s)$. Moreover, it is plausible that the technology $f(s)$ is such that $0 < f(0) < f(\bar{s}) < 1$ so that the extreme cases are never attainable.

parental socialization problem is:

$$[\text{P}] : \quad \max_{\alpha_{i,t+1} \in [0,1]} -(e_{i,t} - e_{i,t+1})^2 - c(\alpha_{i,t+1})$$

with the cost function satisfying the following assumption:²²

Assumption A. 1. The cost function $c : [0, 1] \rightarrow \mathbb{R}$ is of the class C^3 , strictly convex on $[0, 1]$, increasing and satisfying $c(0) = 0$.

Now that each cohort's game has been defined I am ready to define an equilibrium for the class of games studied here.

Definition 1 (Equilibrium). For each time $t \geq 0$, an *equilibrium* is a profile $(\alpha_{1,t+1}^*, \alpha_{2,t+1}^*, e_{1,t+1}^*, e_{2,t+1}^*)$, that (1) arises as a subgame perfect equilibrium to the intergenerational game, and (2) is a Nash equilibrium for each of the intracohort games played by parents and children.

A first observation is that $(\alpha_{1,t+1}^*, \alpha_{2,t+1}^*, e_{1,t+1}^*, e_{2,t+1}^*) = (0, 0, e, e)$ can only arise as an equilibrium when parents have already blended with each other. In fact, this is the unique equilibrium when parents have completely converged, i.e. $e_{1,t} = e_{2,t} = e$. The first claim follows by noticing that given $\alpha_j = 0$, parents of group i will only choose $\alpha_i = 0$ if they believe that the outcome in the corresponding beauty contest is such that all children will choose $e_{i,t+1} = e_{j,t+1} = e_{i,t}$. But for this to be an equilibrium, it must be that parents of group j also believe that $e_{j,t+1} = e_{i,t+1} = e_{j,t}$. These beliefs are inconsistent with each other whenever $e_{i,t} \neq e_{j,t}$ so it cannot be an equilibrium when parents have not converged. To see that it is the unique equilibrium, recall that whenever $\alpha_j > 0$, and $\alpha_i = 0$, all children will choose to be like type j parents, i.e. $e_{i,t+1} = e_{j,t+1} = e_{j,t}$. Since parents have already converged, type i parents have no incentive to deviate, and because of the monotonicity of the cost function, parents of type j will choose any smaller socialization effort α_j . In the limit, they will choose $\alpha_j = 0$ too, since $(0, 0, x, x)$ with $x \neq e$ cannot be an equilibrium (parents of any type can unilaterally deviate by choosing α_i small enough).

With this observation at hand, I can focus only on the case where $\alpha_j > 0$ for parents of both types, and substitute children's Nash equilibrium (3) to obtain the following version of the parental problem:

$$\max_{\alpha_{i,t+1} \in [0,1]} -\Delta_t(1 - \gamma_{i,t+1}(\alpha_{i,t+1}, \alpha_{j,t+1}))^2 - c(\alpha_{i,t+1})$$

²²One can interpret the cost function as representing economic or psychological costs of children's socialization. The cost function is also an abstraction for different parenting styles studied in developmental psychology, such as Baumrind (1967) partition of parenting styles into authoritative, permissive and authoritarian (Maccoby, 2007). See also the discussion of psychological and behavioral control exercised by parents in Grusec and Davidov (2007, pp.292-293).

where $\Delta_t = (e_{i,t} - e_{j,t})^2$, and $i \neq j \in \{1, 2\}$.²³ Dropping the time subscript to simplify notation, type i parents' first-order conditions are given by

$$2\Delta(1 - \gamma_i) \frac{\partial \gamma_i}{\partial \alpha_i} - c'(\alpha_i) = 2\Delta \left[\frac{(1 - \alpha_i)k_i^2}{(k_i + \alpha_i(1 - k_i))^3} \right] - c'(\alpha_i) = 0 \quad (7)$$

where $k_i = A_j(1 - \omega_i)\psi_N$, $\psi_N = (N - 1)/N$. Using Assumption (1) and the first-order condition it is straightforward to verify that for any $\alpha_j \in (0, 1]$ an interior solution $\alpha_i \in (0, 1)$ always exists, since the first term is always positive for $\alpha_i \in (0, 1)$, is equal to zero when $\alpha_i = 1$, and the marginal cost is increasing by assumption.

Second-order conditions are given by

$$\begin{aligned} & -2\Delta \left[\left(\frac{\partial \gamma_i}{\partial \alpha_i} \right)^2 - (1 - \gamma_i) \frac{\partial^2 \gamma_i}{\partial \alpha_i^2} \right] - c''(\alpha_i) \\ & = -\frac{2\Delta k_i^2 [1 + 2(1 - \alpha_i)(1 - k_i)]}{(k_i + \alpha_i(1 - k_i))^4} - c''(\alpha_i) < 0 \end{aligned}$$

satisfied for all $(\alpha_1, \alpha_2) \in (0, 1]^2$, since $k_i \in (0, 1)$ for all $\omega_1 \in (0, 1)$. It follows from the Implicit Function theorem that best-reply functions are well defined on $(0, 1]$.²⁴ In the Appendix it is shown that by carefully restricting the action space, a standard fixed-point theorem can be used to prove existence of a Nash Equilibrium for the socialization problem.

Proposition 3 (Existence of an Equilibrium of the Parental Socialization Game). For any time t such that $\Delta_t > 0$, under Assumption (1), the first-stage parental socialization game has at least one symmetric Nash Equilibrium. \square

Solving the model numerically one can also verify that at least for class of quadratic cost functions the equilibrium is unique.²⁵ This discussion, along with Propositions (1)-(3) show that at least for the class of quadratic cost functions and under Assumption (1) the general preference formation game has a unique interior equilibrium.

I end this discussion by noting that with endogenous parental socialization, there is still a unique blending-type steady state where both groups completely and dually assimilate to each other. The intuition for this result is straightforward: if groups have not converged parents will always choose $\alpha \in (0, 1)$. Equations (5) and (6) then show that intracohort ($e_{1,t+1} - e_{2,t+1}$) and intergenerational differences ($e_{1,t+1} - e_{1,t}$) are decreasing. Once convergence is achieved the

²³As the problem in (7) shows, one alternative way to model the parental problem is that for fixed and exogenous α , parents choose the parents of the peers of the children (in Δ). I study this extension in Vaughan (2011).

²⁴As noted above, when $\Delta_t > 0$ the best-reply function is not defined at zero. This follows from the fact that when type j parents choose $\alpha_j = 0$ any small enough α_i guarantees that all children have $e_{i,t+1} = e_{j,t+1} = e_{i,t}$, and by continuity and monotonicity, the cost can be made as small as desired.

²⁵The general class includes quadratic cost functions $c(\alpha) = k\alpha^2$ and exponential cost functions.

unique Nash equilibrium sustains the blending-type steady state indefinitely. However, endogenizing parental effects affects the speed of convergence: intuitively, parents tend to retard the convergence process at the beginning, but it is easy to show that $\partial\alpha_{i,t+1}/\partial\Delta_t > 0$, so that parental incentives to socialize their children decrease as parents converge to each other, thus speeding up the process.

2.3 Comparative Statics

I now collect a series of results that will be useful in the empirical section of the paper, and specifically, are instrumental in separating endogenous and exogenous parental effects. Since the relevant parameters for the parental socialization game are population weights ω and parental differences $\Delta_t = (e_{j,t} - e_{i,t})^2$, rewrite children Nash equilibrium strategies as in Equation (6).

Start by noting that:

$$\frac{\partial(e_{i,t+1} - e_{i,t})}{\partial(e_{j,t} - e_{i,t})} = (1 - \gamma_i) - (e_{j,t} - e_{i,t}) \frac{\partial\gamma_i}{\partial(e_{j,t} - e_{i,t})}$$

In the absence of endogenous parental effects the last term in the right-hand side is zero,

$$\frac{\partial\gamma_i}{\partial(e_{j,t} - e_{i,t})} = \frac{\partial\gamma_i}{\partial\alpha_i} \frac{\partial\alpha_i}{\partial\Delta_t} \frac{\partial\Delta_t}{\partial(e_{j,t} - e_{i,t})} = 0$$

so the effect is bounded to the unit interval, as $1 - \gamma_i \in (0, 1)$. After noting that $\partial\gamma_i/\partial\alpha_i > 0$ and $\partial\alpha_i/\partial\Delta_t > 0$ one can verify that if parental effects are endogenous the sign is still positive. To get a sense of the relative magnitudes, Figures (16)-(17) plot corresponding marginal effects when $(e_{j,t} - e_{i,t}) \gtrless 0$ for alternative parametrizations of the model.

A stronger test of the endogeneity of parental effects is obtained by taking the second partial derivative. If parental effects are exogenous this term is zero, otherwise it is

$$\frac{\partial^2(e_{i,t+1} - e_{i,t})}{\partial(e_{j,t} - e_{i,t})^2} = -\frac{\partial\gamma_i}{\partial(e_{j,t} - e_{i,t})} - (e_{j,t} - e_{i,t}) \frac{\partial^2\gamma_i}{\partial(e_{j,t} - e_{i,t})^2}$$

Using alternative parameterizations, one can check numerically that the sign depends on the sign of parental differences $(e_{j,t} - e_{i,t})$. Figures (18)-(19) show that when $(e_{j,t} - e_{i,t}) > 0$ the sign is negative in general; otherwise for small enough parental differences, and depending on population weight ω_i , the term can be positive. However, as a test of the absence of endogenous parental socialization, it suffices to check that it is nonzero.

Turning now to the effects of population weights, from the children's conformity game (see the discussion of Proposition 2) it can be readily seen that if γ_i does not depend on population weight ω_i the partial derivative $\partial(e_{i,t+1} - e_{i,t})/\partial\omega_i = 0$. Alternatively, the expression depends on

the sign of parental differences ($e_{j,t} - e_{i,t}$) since

$$\frac{\partial(e_{i,t+1} - e_{i,t})}{\partial\omega_i} = -(e_{j,t} - e_{i,t}) \left(\underbrace{\frac{\partial\gamma_i}{\partial\omega_i}}_{Exo.Effects(+)} + \underbrace{\frac{\partial\gamma_i}{\partial\alpha_i} \frac{\partial\alpha_i}{\partial\omega_i} + \frac{\partial\gamma_i}{\partial\alpha_j} \frac{\partial\alpha_j}{\partial\omega_i}}_{End.Effects(+/-)} \right) \quad (8)$$

The first term inside the brackets captures the direct effect of ω_i on children's Nash equilibrium strategies. The second term captures the endogeneity of parental effects. If these are absent, this term is zero, and since $\partial\gamma_i/\partial\omega_i > 0$ —an increase in a child's group share reduces the child-parental differences as children interact more with children of parents of the same type—in general

$$\text{sgn}\left(\frac{\partial(e_{i,t+1} - e_{i,t})}{\partial\omega_i}\right) = -\text{sgn}(e_{j,t} - e_{i,t})$$

If parental effects are endogenous, one needs to find the sign of $\partial\alpha_i/\omega_i$. In the Appendix it is shown that this sign can be positive or negative depending on the sign of $\alpha_i - k_i/(2 + k_i)$, which itself depends on the shape of cost function.

Proposition 4. $\partial\alpha_i/\partial\omega_i < 0$ if and only if $\alpha_i > k_i/(2 + k_i)$. □

Figure (3) depicts reaction curves for the parental socialization game and the effect that an increase in ω_1 has on the Nash equilibrium strategies for parents whenever an increase in the population weight decreases parental socialization effort.²⁶

Figure (3) around here

It follows that the second term inside the brackets in Equation (8) can be positive or negative. If positive ($\partial\alpha_i/\partial\omega_i > 0$) the same condition as in the case of exogenous parental effects applies, otherwise the sign can be positive, negative or zero.

3 Empirical Exercise

In the next subsections I use each component of the model to attain the different objectives described in the Introduction: the conformity game maps clearly to a class of recent econometric methods used to identify peer effects. The socialization game generates predictions that allows me to test for the endogeneity of parental effects.

²⁶Bisin and Verdier (2001) label this case *cultural substitution*, since parents allow the social environment to socialize their children for them.

3.1 Data

The National Longitudinal Study of Adolescent Health (Add Health) is a random sample of high schools in the United States, with students from grades 7 to 12 interviewed in school and at home in several waves, starting in 1994, with follow-ups in 1996, 2001 and 2008.²⁷

In this paper I estimate parental and peer effects for three variables: religious importance (*How important is religion for you?*), religious activity (*How often do you pray?*), and alcohol consumption (*During the past 12 months, how often did you get drunk?*). As described in the Introduction, the main restriction is that exactly the same question must be asked to children and parents in order to consistently estimate the relative parental and peer effects. In what follows I will take the answers to these questions and interpret them to be the outcomes e in the model.

Recall that, other than being continuous (linearly ordered) variables, theoretically, we require that these are (i) chosen by the children, (ii) relatively stable during adulthood, and (iii) have no intrinsic value during childhood. While the latter two are clearly objects of choice for the children (condition i), I will argue below that results suggest that this could also be the case for the first variable, i.e. that results are consistent with the story that children choose how important is religion for them.²⁸ Moreover, I will show below that condition (ii) is satisfied, and I also argue that condition (iii) holds, i.e. that the weighted quadratic loss function is correctly specified.

In the analysis that follows I run pooled regressions and also regressions on subsamples for Hispanics, non-Hispanic Whites, Blacks and Asians. Ethnic regressions serve as a robustness check along at least two dimensions, since not only there is a clear stratification along the socioeconomic dimension—Asians and Whites have the highest average income of all, statistically indistinguishable with each other but statistically different from that of Blacks and Hispanics—²⁹, but also, since each of these groups is associated with a specific religious denomination.³⁰ Table (1) shows that Hispanics are mainly Catholic, Whites and Blacks are mainly Protestant, and Asians are more evenly split between the two general denominations.

Table (1) around here

Religious Importance (Relimpo) takes four equally spaced values from 0 to 1, 0 being *Not Important* and 1 being *Very Important*, while praying frequency (Pray) and alcohol consumption

²⁷A thorough description of the survey can be found online at <http://www.cpc.unc.edu/projects/addhealth>.

²⁸The results I present suggest that preferences may not necessarily precede choices, as is customarily assumed in economics. However, a more general discussion about where preferences come from is out of the scope of this paper.

²⁹Unweighted averages (thousands of 1994 dollars) and 95% confidence intervals in our samples are: Hispanics, 34.01 [32.13, 35.89]; Whites, 52.68 [51.51, 53.85]; Blacks, 34.09 [32.81, 35.38]; Asians, 55.20 [50.83, 59.58].

³⁰Additionally, there may be differences in parenting and socialization patterns across ethnic groups (e.g. Barrett and Weinstein (2000) or Mosier and Rogoff (2003)).

(Drink) were recoded to measure the fraction of days per month and year, respectively. To study the stability of parental and peer effects I use information on the four waves of information. The median ages for each of these waves are 15, 16, 22 and 29 years old, respectively, but since all children in grades 7 to 12 were interviewed the age range is larger. Table (2) presents descriptive statistics for all dependent variables across the four waves information.

Table (2) around here

Importantly, the corresponding parental questions were asked only in Wave 1, and this forbids me from running panel data regressions where I can control for individual-level additive unobserved heterogeneity; following closely the theoretical assumption that once adulthood has been reached preferences are stable, I assume that parental choices remain fixed across waves of information. Using 2002 data from the Exploring Religious America survey and 2010 data from the National Health Interview Survey, Figures (13) and (14) in the Appendix show that the assumption is not unrealistic: average adult alcohol consumption and the importance that adults give to religion remain relatively stable during the period in life covered in the data. It is also important that the information for the parents corresponds most closely to the mother of the children sampled in the Add Health Study: overall, 85% of the parents interviewed are the mothers of the corresponding children; corresponding numbers across ethnic groups are 88.4% for Hispanics, 86.6% for Whites, 83.3% for Blacks and 77% for Asians.

Figure (4) summarizes the information on intergenerational differences across ethnic groups and waves of information, and Figure (15) in the Appendix shows attrition rates for each ethnic group and dependent variable. It can be readily seen that in the transition from adolescence to adulthood, the respondents in the sample consider religion to be less important (Column 1 in Figure (4), their frequency of praying increases to levels close to their own parents'. Finally, across all ethnic groups, alcohol consumption converges to the levels that are reported by their parents during the first wave of information.

Figure (4) around here

3.2 Estimating Parental and Peer Effects

In order to estimate the model I now make two assumptions: first, I introduce a source of heterogeneity $\tilde{\epsilon}_{i,t} \stackrel{iid}{\sim} N(0, \sigma^2)$ for each child i in school $s(i)$, assumed to be observed by the children but not by the econometrician, and let $v_{i,t} = \tilde{\alpha}_{s(i)} + X'_{i,t}\tilde{\beta} + \bar{X}'_{s(i),t}\tilde{\gamma} + \tilde{\epsilon}_{i,t}$, where $X_{i,t}$ and $\bar{X}_{s(i),t}$ denote vectors of child-specific controls and the corresponding school averages, and $\tilde{\beta}$ and $\tilde{\gamma}$ are the corresponding parameter vectors. In the Appendix I show that the qualitative

properties of the model with heterogeneity (and complete information) with $N = M$ groups still hold.³¹

Most importantly, in this section I focus only on the conformity game, and assume that the relative weights on parental and peer effects are homogenous across all children, i.e. $\alpha_i = \alpha$. Later I will relax this assumption when I estimate reduced-form regressions, but for the present time I will be content by estimating *average* parental and peer effects.

The problem for each child is then³²

$$\min_{e_{i,t+1} \in [0,1]} \alpha_i (e_{i,t+1} - (e_{i,t} + v_{i,t+1}))^2 + (1 - \alpha_i) (e_{i,t+1} - \bar{e}_{s(i),t+1})^2$$

where $\bar{e}_{s(i),t+1} = (1/(N_{s(i)})) \sum_{j \in s(i)} e_{j,t+1}$ denotes the sample average across all children in school $s(i)$.

Solving and algebraically manipulating the first-order condition one obtains the standard linear-in-means regression used to estimate peer effects which can be conveniently expressed as^{33,34}

$$e_{i,t+1} = \alpha_{s(i)} + \alpha_p e_{i,t} + X'_{i,t+1} \beta + \bar{X}'_{s(i),t+1} \gamma + \alpha_g \bar{e}_{s(i),t+1} + \epsilon_{i,t+1} \quad (9)$$

where α_p denotes the direct parental effect, and α_g denotes the endogenous peer effect, and $\epsilon_{i,t+1}$ is a heteroskedastic idiosyncratic shock.³⁵ As observed by Manski (1993), one must control for exogenous (contextual) effects $\bar{X}_{s(i),t+1}$, and unobserved correlated effects common to all children in each school $\alpha_{s(i)}$ in order to estimate endogenous social-interaction effects $\bar{e}_{s(i),t+1}$. I now describe my identification strategy.

³¹Since preferences are quadratic and separable, there still exists a unique equilibrium to the tripartite game under an analogous setting with incomplete information, i.e. when the shocks $\tilde{\epsilon}_{i,t}$ are not observed by children or parents. These results are available from the author upon request.

³²Needless to say, one can introduce heterogeneity using other channels, e.g. through preference heterogeneity. Our choice not only simplifies the analysis (since the more important parameters α are independent of controls), but allows us to map the class of dynamic systems studied here to those in Cavalli-Sforza and Feldman (1973).

³³The linear-in-means peer effects model has been extensively studied, especially since the seminal work of Manski (1993) was published. Conditions for (non)identification under this model have been further described and extended in Manski (1995), Manski (2000), Brock and Durlauf (2001), Glaeser and Scheinkman (2003), Moffitt (2001) and Graham and Hahn (2005). See also Graham (2008).

³⁴Notice that the parameters α_p and α_g in Equation (9) are themselves functions of other parameters α, N . As mentioned above, for estimation purposes in this section I focus only on the average parental and peer effects across children and schools.

³⁵Under complete heterogeneity and endogenous parental socialization relative parental and peer effects α_p, α_g are heterogeneous, so we seek to estimate average parental and peer effects.

3.2.1 Identification Strategy

I use the identification strategy proposed by Graham and Hahn (2005). Intuitively speaking, whenever there are positive interaction effects, the variation between groups should be in excess of the within variation, in a process modulated by the *social-multiplier*. Graham and Hahn's (GH, thereafter) identification strategy consists of estimating a within-school regression using the first-order condition of the children's problem, and a between-school regression of the reduced-form equation, and use the multiplier effect as the extra source of information to credibly identify the endogenous and exogenous interaction effects.

Averaging across children's first-order conditions within a school we can solve for equilibrium average choices:

$$\bar{e}_{s(i),t+1} = \frac{\alpha_p \bar{e}_{s(i),t} + \bar{X}'_{s(i),t+1}(\beta + \gamma) + \alpha_{s(i)} + \bar{\epsilon}_{s(i),t+1}}{1 - \alpha_g} \quad (10)$$

Notice that at the school level, whenever $\alpha_g \in (0, 1)$ the marginal effect of any exogenous variable on the equilibrium school average choice is magnified relative to the corresponding marginal effect at the individual level, giving rise to a *social multiplier*. Substituting this expression in (9) one derives the reduced-form equation

$$\begin{aligned} e_{i,t+1} &= \alpha_p e_{i,t} + X'_{i,t+1} \beta + \frac{\alpha_p \alpha_g}{1 - \alpha_g} \bar{e}_{s(i),t} + \bar{X}'_{s(i),t+1} \frac{\gamma + \beta \alpha_g}{1 - \alpha_g} + \frac{\alpha_{s(i)}}{1 - \alpha_g} + \epsilon_{i,t+1} \\ &\quad + \frac{\alpha_g}{1 - \alpha_g} \bar{\epsilon}_{s(i),t+1} \end{aligned} \quad (11)$$

Using the first-order condition (9) parental effects can be estimated consistently from the within-schools regression:

$$\tilde{e}_{i,t+1} = \alpha_p \tilde{e}_{i,t} + \tilde{X}'_{i,t+1} \beta + \tilde{\epsilon}_{i,t+1} \quad (12)$$

where for any variable $z_{i,t}$, $\tilde{z}_{i,t} := z_{i,t} - \bar{z}_{s(i),t}$, denotes the deviation from the school sample mean. Finally, averaging across children within each school the reduced-form equations we obtain the between-schools regression

$$\bar{e}_{s(i),t+1} = \frac{\alpha_p}{1 - \alpha_g} \bar{e}_{s(i),t} + \bar{X}'_{s(i),t+1} \frac{\beta + \gamma}{1 - \alpha_g} + \frac{\alpha_{s(i)}}{1 - \alpha_g} + \frac{\bar{\epsilon}_{s(i),t+1}}{1 - \alpha_g} \quad (13)$$

Comparing Equations (12) and (13) it can be seen that the social multiplier $(1/(1 - \alpha_g))$ provides the extra source of information needed to identify both the endogenous and exogenous interaction effects.

My identification assumption is:

Assumption A. 2 (Identification Assumption). Parental variables $e_{i,t}$ are excluded from the set of child-specific variables that have school effects, $X_{i,t+1}$.

Two comments are in place. First, the assumption does not rule out that children may interact occasionally with the parents of their peers, but merely that adults do not act as role models for other children. Second, while the identification assumption appears to be rather extreme, there is a growing literature in sociology and development psychology on *non-parental adults*, or “adults who have had a significant influence on the adolescent and on whom the adolescent can rely for support” (Chen, Greenberger, Farrugia, Bush, and Dong, 2003, p.35). Galbo and Demetrulias (1996) show that for a sample of 285 college students in the United States, only 4.6% of the subjects report a friend’s parent being a significant adult, while 56.3% declared parents being such. Of the reported nonrelated significant adults, teachers, coaches and counselors are the most widely identified by the students (59.8%). In their survey of the existing literature, they report a study by Garbarino, Burston, Raber, Russell, and Crouter (1978) where 60% of suburban children do not report any significant nonparental adult. They also report a study by Blyth, Hill, and Thiel (1982) where they find that out of 2800 public school students, only 10% report having nonrelated significant adults. A more recent paper by Chen, Greenberger, Farrugia, Bush, and Dong (2003) studies cross-cultural differences in the roles played by non-parental adults, for the specific case of China and the United States. Out of 201 American students, only 8 report a friend’s parent as a significant adult; of 502 Chinese students, only 2 report having such a significant adult.

In the Add Health data, out of 15,142 children interviewed during the third wave, 75% (11434) declare having had a significant non-parental adult.³⁶ Of these, only 442 children declare that a friend’s parent was significant, that is, less than 3% of the sample. Overall, this suggests that the identification assumption is unlikely to be a cause of concern.

3.2.2 Control Variables

The Add Health Study includes a rich battery of children, family and school questions that could potentially be used as exogenous controls. Control variables are listed in Table (5) and Table (6) shows those that are significant in each ethnic-group regression.

³⁶The exact wording of the question is: “Other than your parents or step-parents, has an adult made an important positive difference in your life at any time since you were 14 years old?” Importantly, this question was only asked in the third wave of interviews.

3.2.3 Results

As a first step, I estimate parental and peer effects using the GH method pooling the data and across ethnic subsamples. Ethnic group regressions are run using the corresponding subsample of children, but I assume that the reference group denoted by the sample average ($\bar{e}_{-i,t+1}$) in Equation (9) is the average for *all students* in each school, i.e. I do not assume that the reference group for each ethnic group is the average action for children within each group. All results are presented in Table (8) in the Appendix, and presented graphically in Figure (5).

Figure (5) around here

These results show that peer effects dominate parental effects for all variables, across all ethnic groups and pooling the data and across waves of information. For both religious variables parental effects are generally half as large as peer effects and for alcohol consumption, parental effects are very close to zero. Even though the corner solution when parental effects are zero is interesting from a theoretical point of view since it corresponds to the case of a beauty-contest in the children's conformity game— and therefore, any outcome where children coordinate is an equilibrium— it creates problems in order to identify peer effects, so the reader should be cautious interpreting the results for those cases where parental effects are not statistically significant different from zero.³⁷ Since parental effects are generally statistically significant in the pooled regressions, I will only focus on these subset of results for alcohol consumption.

Figure (5) also shows that there are no systematic differences across ethnic groups in estimated parental and peer effects. This result is interesting because it is in contrast to the findings in the sociological and psychological literature that studies traits such as familialism, and how this varies across ethnic groups.³⁸ Going back to the stylized model, if ethnic groups correspond exactly to the groups in the model and parents purposefully socialize their children as assumed, we would expect parental and peer effect to vary across ethnic groups; this evidence as well as that presented below using reduced-form regressions suggest that at least for the religious and alcohol consumption dimensions, while there is evidence consistent with endogenous parental socialization, the matching between ethnic groups and groups in the model does not follow.

To facilitate comparison across waves of information, Figure (6) plots the results in Table 8. While there might appear to be an increasing or decreasing trend for peer and parental effects,

³⁷Formally, when parental effects are close to zero peer effects are weakly identified, in the sense described in Stock, Wright, and Yogo (2002) and Stock and Yogo (2005). To see that this is actually the case, recall that it is necessary for identification the existence of a child-specific variable— the corresponding parental outcome— that does not have a group effect.

³⁸See Marin (1993), Phinney, Ong, and Madden (2000) and Dijkstra and Fokkema (2010). There is also evidence that parent-child relationships vary across ethnic and cultural groups (e.g. Barrett and Weinstein (2000) or Mosier and Rogoff (2003)). In economics, Alesina and Giuliano (2010) show how the strength of family relationships affect economic decisions such as labor participation and fertility.

respectively, for some of the estimates, the main conclusion is that both effects are relatively stable across time for the three variables. A similar finding is depicted in Figure (7), where estimated parental and peer effects are plotted against the median age for students in each grade. These last set of results are obtained by applying the GH method on grade-level subsamples, as defined on the first wave of information, and tracking the same reference groups across waves of information. The resulting picture allows us to assess the variation of parental and peer effects along the transition from adolescence to adulthood, and to conclude that parental and peer effects remain stable.

Figure (6) around here

Figure (7) around here

Before going on, it is worthwhile exploring the effects of estimating peer effects using OLS. Figure (8) plots parental (left panel) and peer effects (right panel) estimated with OLS and the GH method, along with a 45 degrees line; results are presented in Table (7) in the Appendix. As the left panel shows, GH and OLS estimates of parental effects do not deviate too much from each other. In contrast, the right panel shows that OLS tends to overestimate peer effects, relative to the GH method, as expected when there are positive social interactions.

Figure (8) around here

As the previous results show, parental and peer effects appear to be mirror images of each other, suggesting that these are linearly related. To see this more clearly, Figure (9) plots estimated peer effects against the corresponding parental effects for each of the 12 pooled-regression estimates using the GH method.³⁹ It can be readily seen that estimates are very close to satisfy the relationship $\alpha_p + \alpha_g = 1$.

Figure (9) around here

Figure (10) summarizes graphically the results of testing Table (9) in the Appendix by plotting the sum of estimated coefficients, along with 95% confidence intervals, for each dependent variable, wave of information and ethnic group. It is interesting that sums are estimated with a great degree of certainty for religious variables, while confidence intervals for alcohol consumption are considerably larger. The small confidence intervals for religious variables are consistent with the fact that the variance of a sum of random variables will be zero if their sum is equal to a deterministic constant. Interestingly, the sum of parental and peer effects generally exceed one

³⁹There are four waves of information for each of the three dependent variables. The GH method was applied to each of these, and Figure (9) report the corresponding sets of estimated parental and peer effects.

for religious variables, with the exception of estimates from waves 1 and 2 for the frequency of praying. As discussed above, results for alcohol consumption must be read with caution since peer effects are identified only when parental effects are significantly different from zero. Focusing only on the results for the pooled sample (and whites) we see that we cannot reject the hypothesis that parental and peer effects add up to one at the 95% confidence levels for waves 1, 3 and 4.

Figure (10) around here

At this point it is worth discussing the significance of this result. In the model presented above, both effects add up to one because loss functions for the children are (i) weighted quadratic functions, and (ii) children care only about deviations from their parents and peers. Needless to say this choice is rather arbitrary, and one could have alternatively assumed any other functional form such as:

$$u(e_{t+1}) = -\alpha(e_{t+1} - e_t)^2 - \beta(e_{t+1} - \bar{e}_{t+1})^2 - \gamma(e_{t+1} - \bar{e}_t)^2 \quad (14)$$

$$u(e_{t+1}) = -\alpha(e_{t+1} - e_t)^2 - \beta(e_{t+1} - \bar{e}_{t+1})^2 - \gamma(e_{t+1} - e_{g,t+1})^2 \quad (15)$$

$$u(e_{t+1}) = -\alpha(e_{t+1} - e_t)^2 - \beta(e_{t+1} - \bar{e}_{t+1})^2 + \beta V(e_{t+1}) \quad (16)$$

$$u(e_{t+1}) = V(e_{t+1}; e_t, \bar{e}_{t+1}) \quad (17)$$

Equation (14) corresponds to a conformity model where children dislike deviating from parents (vertical effect), peers (horizontal effect) and other adults (oblique effect); as discussed above, our identification assumption forbids that peers' parents have an oblique effect, but this type of interaction is theoretically possible and has been explored in the literature on cultural transmission.⁴⁰ Equation (15) captures the idea that children dislike deviating from parents and peers, but also from what their genes dictate ($e_{g,t+1}$), and Equation (16) corresponds to a behavioral model with forward-looking children who also desire to conform to parents and peers. Equation (17) takes a general functional form; it is straightforward to see that both marginal effects add up to one whenever $\frac{-(V_{e_{t+1}\bar{e}_{t+1}} + V_{e_{t+1}e_t})}{V_{e_{t+1}e_{t+1}}} = 1$, where subindexes denote partial derivatives.⁴¹

It is instructive to consider the case where genetic effects are present, since the standard linear model used in the behavioral genetic literature can be obtained from a behavioral model such as Equation (15).⁴² Under the assumption that this is the true data-generating process,

⁴⁰See Bisin and Verdier (2000) or Cavalli-Sforza and Feldman (1973).

⁴¹To see that that neither the separability nor the quadratic assumptions are necessary for this condition to hold take, for example, the case where $u(e_{t+1}) = k(e_{t+1} - e_t)(e_{t+1} - \bar{e}_{t+1})$ for a negative constant k . As in the separable, quadratic case, first-order conditions are linear in parental and peers outcomes and marginal effects add up to one, but here marginal effects are restricted to be the same.

⁴²The additive ACE model is the workhorse of most behavioral genetic analysis. See, for example, Walsh (2001) or Neal and Maes (2004).

since $e_t \neq e_{g,t+1}$ it follows that corresponding parental and peer effects *must* add up to less than one. If genetic effects are present but omitted from the econometric specification, it also follows that their sum will be biased upwards: estimated parental effects will be biased upwards whenever the covariance between children genetic effects and the parental outcome is positive, ie. $\text{Cov}(e_{g,t+1}, e_t) > 0$, and peer effects will be biased upwards whenever parents sort out in schools (neighborhoods) based on observables that are partly transmitted genetically, or when children self-select into peer groups based on observables that are partly transmitted genetically.⁴³ To summarize, under the assumption that genetic effects enter linearly as in Equation (15), the sum will *not* be biased upwards when there is no genetic correlation between parents and children—the case of adopted children that have been randomly assigned, and parents do not choose the schools or neighborhoods based on genetically transmitted characteristics. In our robustness analysis we will be able to partly test for these plausible sources of concern.

3.2.4 Robustness

As discussed above, by estimating ethnic-groups parental and peer effects it is possible to check the robustness of the estimates along at least two dimensions where ethnic groups significantly vary, i.e. the religious and socioeconomic dimensions. In this section I present the results from running an additional set of robustness checks on fourteen different dimensions, summarized in Table (3). In each robustness check I separate the sample using a dichotomous variable and estimate parental and peer effects using the GH method on each subsample. Results are presented in Table (10) in the Appendix, and a graphical summary can be found in Figure (11), where for each robustness check, I plot the *difference* between the estimates across subsamples along with the 95% confidence interval around this difference.

Table 3 around here

A natural starting point is to test for gender differences, since there is a long literature showing that preferences for conformity vary across genders.⁴⁴ The first two checks test for gender differences (Female) and the interaction between gender differences and gender of the parent that was interviewed, since in 85% of the cases ($N = 14801$) the parental outcome was measured for the biological mother only (Fem \times Moth); unfortunately we only have information on biological father in 4.3% of the cases ($N = 748$) so we cannot test properly for gender-based role-model effects within the family, i.e. the differential effect that fathers and mothers have

⁴³Since in our application peer groups are schools or grades the second potential bias will not be present.

⁴⁴A summary of experimental economics results on gender differences can be found in Croson and Gneezy (2009). Social psychologists have generally found that women tend to have stronger preferences for conformity than men (Eagly (1983), Eagly and Chryala (1986)). Maccoby (2007) also cites Freudian theories of same-sex parental identification as plausible explanations of gender differences in socialization outcomes.

on male and female children. The first two panels in Figure (11) show that parental effects are significantly larger for women for our religious variables across all waves of information, and consistent with the previous finding that peer effects are a mirror image of parental effects, the inverse relationship holds for peer effects. For alcohol consumption gender differences are not statistically significant, and no clear pattern emerges. Moreover, the interaction with the mother indicator does not provide any additional evidence on gender-based role model effects within the family.

As discussed above, two types of self-selection biases are of concern when estimating peer effects: parents may sort into neighborhoods and children may sort into peer groups.⁴⁵ Because of our choice of the school as the reference group we need only be concerned about neighborhood sorting, i.e. the endogenous parental choice of a school.⁴⁶ We use two questions from the Add Health survey to see whether this is a source of concern: first, parents were explicitly asked if their choice of the neighborhood took into consideration the quality of the schools (Neighborhood), for which 39% of the sample answered in the affirmative. Following Gaviria and Raphael (2001), I also divide the sample into those that have moved to the current residence in recent years, and those who have been there for at least half of their lives, i.e. children that moved into their current residence when they were 6 years old or younger (Move Old). The rationale for this is that if parents choose the schools or neighborhoods based on a distribution of characteristics, and if this distribution changes fast enough we can get an estimate of the bias by comparing the estimates using those individuals that have been longer in the neighborhood.⁴⁷

The results suggest that the type of self-selection that may be captured with the two measures is not a cause of concern, since with the exception of the results for religious importance, the difference in the two estimates for each subsample is not statistically significant. The results for religious importance are interesting since for both measures and all waves information, parental (peer) effects are consistently and significantly larger when parents have based their choice of the neighborhood in part because of the quality of the school (Neighborhood) than otherwise, and when only those children that moved into their current residence when they were young enough are taken into consideration. One may suspect that these statistically significant differences may signal self-selection, but I will now argue that is not the case. First, the results are in contradiction with each other, since the corresponding dichotomous variables in Table (3) take different values when there is geographic sorting, i.e. $D_{Neighborhood} = 1$ in the sample selection scenario, while $D_{MoveOld} = 0$ (recent movers); for neighborhood sorting to be

⁴⁵See e.g. Moffitt (2001) or Blume, Brock, Durlauf, and Ioannides (2011).

⁴⁶Compare this with the recent literature on identification of peer effects through the use of non-overlapping networks of friends (e.g. Bramoullé, Djebbari, and Fortin (2009)). If there is information on the actual network of friends of child this method provides an elegant way to estimate peer effects under the assumption that children do not self-select into their peer groups.

⁴⁷But see the critique of this method in Moffitt (2001).

a problem, the differences in Figure (11) or Table (10) should have opposite signs, and this is clearly not the case. Second, if parents sort themselves based on an observable characteristic that is *positively correlated* with the underlying outcome of interest, one should expect estimated peer effects to be biased upwards; intuitively, the correlation across children in the same school will be large not because of the presence of endogenous social interactions, but because children take their parents as reference models who are themselves relatively similar to other parents in the neighborhood or school. For this reason, only the results of the second measure (Move Old) are consistent with a story of self-selection, under the assumption that either parents choose the school based on average parental religious importance or based on some other variable positively correlated average religious importance.

We next check if neighborhood effects act as a confounding factor of peer effects within the school. For this we divide the sample between those children that say that would be a little happy or happy to move out of the neighborhood (Move Happy). While an imperfect measure of neighborhood effects on each of the independent variables, it is instructive to see whether some characteristic (e.g. crime rates) that may be correlated with these may bias our estimates. Again, we find that differences across subsamples are not statistically different.

Using information on school size, we now check if parental or peer effects vary for schools with less than 400 students (Small School) or with more than 1000 students (Large School). Estimated parental and peer effects may vary across the school size distribution. For example, it is possible that using the school as reference group (i.e. sample averages in Equation (13) are computed at the school level) biases the estimates due to measurement error. To see this, suppose that children interact with each other via non-overlapping peer groups within the school, but the network of peer relationships is complete, i.e. there are no subgroups of children that interact, directly or indirectly, only between themselves. The corresponding first-order condition for child i in group $g(i)$ is

$$e_{i,t+1} = \alpha_0 + \alpha_p e_{i,t} + \alpha_g \bar{e}_{g(i),t+1} + X_i' \beta + \epsilon_{i,t+1}$$

Suppose we do not observe $\bar{e}_{g(i),t+1}$ but only the school average $\bar{e}_{s(i),t+1}$, and let $\hat{\alpha}_g$ be the corresponding estimated peer effect under this misspecification, then, using the standard formula for

measurement error

$$\begin{aligned}
\text{plim } \hat{\alpha}_g &= \alpha_g + \frac{\widetilde{\text{Cov}}(\bar{e}_{g(i),t+1}, \alpha_g(\bar{e}_{g(i),t+1} - \bar{e}_{s(i),t+1}))}{\widetilde{\text{Var}}(\bar{e}_{g(i),t+1})} \\
&= \alpha_g + \frac{\widetilde{\text{Cov}}(\bar{e}_{g(i),t+1}, \alpha_g \left(\frac{N-n_{g(i)}}{N}\right)(\bar{e}_{g(i),t+1} - \bar{e}_{-g(i),t+1}))}{\widetilde{\text{Var}}(\bar{e}_{g(i),t+1})} \\
&= \alpha_g \left(1 + \left(\frac{N-n_{g(i)}}{N}\right) - \frac{\widetilde{\text{Cov}}(\bar{e}_{g(i),t+1}, \bar{e}_{-g(i),t+1})}{\widetilde{\text{Var}}(\bar{e}_{g(i),t+1})}\right) \tag{18}
\end{aligned}$$

where $\widetilde{\text{Cov}}(z, w)$ and $\widetilde{\text{Var}}(z)$ denote the covariance and variance of the residuals of the regression of z, w on all of other regressors $e_{i,t}$ and X_i , and we have substituted the fact that $\bar{e}_{s(i),t+1} = (n_{g(i)}/N)\bar{e}_{s(i),t+1} + ((N-n_{g(i)})/N)\bar{e}_{-g(i),t+1}$, and $-g(i) := N/g(i)$ denotes all children in the school excluding those in the peer group of child i .

Equation (18) shows that unless the two last terms are zero, estimated peer effects are inconsistent. Whenever children interact with all children within the school $n_{g(i)} = N$, both terms become zero and the bias disappears; this corresponds to the assumption used in the first part of this paper, where I take the network of peer relationships to include all children within the school. Moreover, depending on the network structure within the school, the last term will vary. For example, if peer groups are components of the network, i.e. they do not interact with each other, the last term becomes zero since in equilibrium, average outcomes in two unconnected peer groups are independent, once we partial out all other common effects. An analogous expression shows that estimated parental effects are also inconsistent under this type of misspecification whenever parents can affect the choice of peer group of their children within the school and this is related to their own outcome.

By comparing all of the estimated effects for small and big schools we do not find a consistent result, suggesting that this dimension may not be a source of concern. For example, parental (peer) effects appear to be larger (smaller) for religious importance for a small school, but the difference is not statistically significant for any wave of information. For the frequency of praying we consistently find that peer effects are larger in smaller schools (Small School), but the difference is only statistically significant for the estimates corresponding to the first wave of information. Comparing the results with those obtained for large schools (Large School) we find the opposite result (as expected) but differences stop being statistically significant; this last observation is also found for alcohol consumption.

Figure (11) around here.

Our third set of robustness checks have to do with individual characteristics that may affect the preference for conformity that children exhibit. For instance, it is likely that more attractive,

popular or independent children act as role models in the school, thereby exhibiting a lower relative preference for conformity to their peers. Under this assumption, the correct model is not one where the network of peer relationships consists of all children in the school— as explicitly assumed in the model and econometric specification, but one where peer relationships are not symmetric, i.e. where the network is undirected. To measure physical attractiveness of the children we average the interviewers assessment across the four waves of information, and divide our sample between those who are considered attractive or very attractive (56%) and those classified as “about average”, unattractive and very unattractive. Similarly, in Wave 3 children were asked if they consider themselves very popular (16%) and very independent (37%).

The results show that there are no statistical differences in parental and peer effect estimates when one discriminates between the interviewers’ average physical attractiveness assessment for all variables and waves of information. Peer effects in religious importance are generally larger for those who consider themselves very popular, but the difference is only statistically significant in the last wave of information; for frequency of praying differences are generally not significant (with the exception of that for wave 2). Finally, there is some evidence that peer effects are stronger for children that consider themselves very independent for both religious variables and alcohol consumption. To understand this result, notice that as before, estimated differences in parental effects are the mirror image of peer effects, so that on average, parental effects are smaller for very independent children. These results suggest that if the self-assessment is capturing any underlying dislike for conformity, it appears to be relatively stronger for parents than peers.

As discussed above, our parental and peer effect estimates are inconsistent whenever genetic effects are present: parental effects are biased upwards whenever (i) genetic effects are omitted and have a positive effect ($\gamma > 0$ in Equation (15)) and (ii) children and parents are genetically related, i.e. $\text{Cov}(e_{g,t+1}, e_t) > 0$; the latter will be zero for adopted children that have been randomly assigned to their foster parents. Peer effects are biased upwards whenever condition (i) is met, and $\text{Cov}(e_{t,t+1}, \bar{e}_{t+1}) > 0$.⁴⁸ The latter will be positive whenever condition (ii) is met and parents sort out in neighborhoods (schools) based on any characteristic related to the outcome of interest (religious outcomes or alcohol consumption) that is at least partially transmitted genetically.

The Add Health data includes a small sample of children that report being adopted (3.4% or $N = 689$), of which 22% ($N = 157$) were adopted by a blood relative. Even though the sample of adoptees is very small and we do not have information (other than the 22% that

⁴⁸Formally speaking, these covariances denote the covariances between the two corresponding variables after partialling out any other influences, i.e. between the residuals of the corresponding regressions of each variables on other covariates.

know that were adopted by a blood relative) on how random was their assignment to their foster parents, we estimated parental and peer effects for both subsamples.⁴⁹ With only two exceptions (religious importance, first two waves of information), the results show that peer (parental) effects are larger (smaller) for adoptees than for non-adoptees, even though the differences are only significant for one variable (frequency of praying, wave 4). Under the (strong) assumption that the subsample of adoptees was randomly assigned to their foster parents, the result that parental effects are smaller is consistent with conditions (i) and (ii) above. Given that in 22% of our sample of adoptees this is not the case, it is unlikely that genetic effects explain the differences. Other explanations may be valid, and should be further explored in future research where more data on adoptees is available. For instance, it has been found that adopted children are more likely to move out earlier of their (foster) parents' homes suggesting that parental-child ties may be stronger for genetically related children than for adoptees (Aquilino, 1991). This could explain the differences found without appealing to a genetic explanation.

In our next robustness check we divide the sample into those children born in the first quarter of their corresponding year (Quarter of Birth). The rationale for this is explained by the fact that in our sample, age is positively related with the quarter of birth: average ages in the first wave of information and 95% confidence intervals for each quarter of birth in our sample are 14.90(14.85, 14.95), 14.92(14.87, 14.97), 15.15(15.10, 15.20) and 15.60(15.55, 15.64), respectively.⁵⁰ This exogenous source of variation may affect the patterns of conformity within the family or school, e.g. older children being role models for younger children or younger children relying more extensively on their parents. With the exception of religious importance (waves 2 and 3) where parental (peer) effects are larger (smaller) for the younger children, differences in ages are not significant. The finding for religious importance is consistent with the idea that younger children rely *relatively* more on their parents than on their peers, but the results for all other outcomes and waves of information do not support this interpretation.

In line with this last rationale, we finally checked whether being an only child or the older child in the family had a differential effect in the structure of parental and peer effects. The results for religious importance are particularly interesting since we find that relative peer (parental) effects are consistently larger (smaller) for only children, in contrast to a common finding in social psychology where only children display stronger ties with their parents.⁵¹

⁴⁹Several studies in economics study the differential parental effect for adoptees, generally with the objective of disentangling nature and nurture effects. See for example Holmlund, Lindahl, and Plug (2011) and Sacerdote (2011).

⁵⁰This corresponds to the finding in Angrist and Krueger (1991) that children born in the last quarter of birth are almost a year older than those born in the first quarter. See also Angrist and Krueger (2001).

⁵¹While the metastudy in Falbo and Polit (1986) showed that only children are not statistically different in sociability (i.e. "peer acceptance" and "affiliation need/extraversion" they did find that "indicating that only borns had more positive relationships with their parents than did others". McHale, Updegraff, Helms-Erikson, and Crouter (2001) find differences in the strength and quality of parental effects for first and second-born siblings; see also references in Dunn (2007). In economics, see Behrman and Taubman (1986).)

A similar pattern is found of frequency of praying, where peer (parental) effects are larger (smaller) for only children, but differences are generally not statistically significant, and no pattern is present for alcohol consumption.

Focusing now on whether the child is the older sibling in the family (Older Child), we find that parental (peer) effects for both religious outcomes are generally larger (smaller) for the oldest sibling, but the difference is only significant in the last two waves of information. As before, in alcohol consumption we do not find any clear pattern of differences.

3.3 Reduced-Form Regressions: Comparative Statics

I now summarize the findings presented in Section (2.3) for the stylized case of $M = 2$ groups:

$$\frac{\partial(e_{i,t+1} - e_{i,t})}{\partial(e_{j,t} - e_{i,t})} = \begin{cases} (1 - \gamma_i) \in (0, 1) & \text{absence of endogenous parental effects (NPE)} \\ (1 - \gamma_i) - (e_{j,t} - e_{i,t}) \frac{\partial\gamma_i}{\partial(e_{j,t} - e_{i,t})} & \text{presence of endogenous effects (PE)} \end{cases} \quad (19)$$

$$\frac{\partial^2(e_{i,t+1} - e_{i,t})}{\partial(e_{j,t} - e_{i,t})^2} = \begin{cases} 0 & \text{(NPE)} \\ -\frac{\partial\gamma_i}{\partial(e_{j,t} - e_{i,t})} - (e_{j,t} - e_{i,t}) \frac{\partial^2\gamma_i}{\partial(e_{j,t} - e_{i,t})^2} & \text{(PE)} \end{cases} \quad (20)$$

$$\frac{\partial(e_{i,t+1} - e_{i,t})}{\partial\omega_i} = \begin{cases} 0 & \text{if } \gamma \text{ is independent of } \omega \\ -(e_{j,t} - e_{i,t}) \left(\underbrace{\frac{\partial\gamma_i}{\partial\omega_i}}_{\text{Exo.Effects}(+)} + \underbrace{\frac{\partial\gamma_i}{\partial\alpha_i} \frac{\partial\alpha_i}{\partial\omega_i} + \frac{\partial\gamma_i}{\partial\alpha_j} \frac{\partial\alpha_j}{\partial\omega_i}}_{\text{End.Effects}(+|-)} \right) & \text{if } \gamma \text{ depends on } \omega \end{cases} \quad (21)$$

I show in the Appendix that for the case of complete heterogeneity (ie. $N = M$ groups), an analogous expression to Equation (3) is found:

$$e_{i,t+1} = \gamma_{ii} e_{i,t} + \sum_{j \neq i} \gamma_{ij} e_{j,t}$$

with $\gamma_{kl} \in (0, 1)$ for all $k, l = 1, \dots, N$ and $\sum_j \gamma_{kj} = 1$ for any child k . It now follows that

$$e_{i,t+1} - e_{i,t} = (1 - \gamma_{ii})(\tilde{e}_{i,t} - e_{i,t})$$

where $\tilde{e}_{i,t} = \sum_{j \neq i} \tilde{\gamma}_{ij} e_{j,t}$ with $\tilde{\gamma}_{ij} = \gamma_{ij}/(1 - \gamma_{ii})$ for all $j \neq i$, is a weighted average of all other parents preferences. Since child-specific weighted averages $\tilde{e}_{i,t}$ are not observed, I use the corresponding sample average $\bar{e}_{-i,t} = (1/(N_{s(i)} - 1)) \sum_{j \neq i} e_{j,t}$, potentially creating a problem of measurement error ($\tilde{e}_{i,t} - \bar{e}_{-i,t}$).

I now estimate the following child-specific regression pooling the data across all ethnic

groups:⁵²

$$e_{i,t+1} - e_{i,t} = \beta_0 + \beta_1(\bar{e}_{-i,t} - e_{i,t}) + \beta_2(\bar{e}_{-i,t} - e_{i,t})^2 + \beta_3\omega_{g(i),s(i)} + \beta_4\omega_{g(i),s(i)}^2 + X_i'\eta + \epsilon_{i,t+1} \quad (22)$$

where $\omega_{g(i),s(i)}$ denotes the share of child i 's ethnic group in school $s(i)$.

Results are presented in Table (4), where each panel includes results for each dependent variable across all waves of information and for two specifications with and without ($\eta = 0$) controls.

A first result is that across all specifications $\hat{\beta}_1 \in (0, 1)$. In the absence of parental effects (and measurement error)—(NPE) in Equation (19)—this value is an estimate of $1 - \gamma_{ii}$. Estimates for the quadratic effect of parental differences β_2 are positive and statistically significant for religious importance, and negative for frequency of praying (significant only for the last two waves of information) and alcohol consumption. As Equation (20) shows, these results are consistent with the existence of endogenous parental effects, and the signs can be rationalized by the theory, as Figures (18-19) in the Appendix show for a two-groups case. Moreover, this also suggests that the estimate $\beta_1 \neq 1 - \gamma_{ii}$.

After including individual and school-specific controls, an ethnic group's population share within each school (β_3) and its quadratic effect (β_4) are in general not statistically significant. This is consistent with the finding that the ethnic dimension is not a source of heterogeneity in estimated parental and peer effects, and should not come as a surprise since, in the stylized model with several groups $M < N$, what defines a group is the similarity of parents within each group (assumed identical in the stylized model, but in the more general setting this could be relaxed as long as initial parents from different groups are drawn from different distributions) and their difference between groups, so that ethnic groups need not be a reasonable counterpart at the empirical level for these specific religious and alcohol consumption outcomes.

Table (4) around here

I now discuss the potential bias of the estimates caused by this specification problem. Note first that under the assumption of within-school parameter homogeneity, $\gamma_{ij} = \gamma_{s(i)}$ for all i, j in school $s(i)$ there will be no measurement error, i.e. $\tilde{e}_{-i,t} = \bar{e}_{-i,t}$, a result that follows from the restriction that weights must add up to one. The above discussion on robustness showed that with a few exceptions, heterogeneity of estimates across different subgroups is not a major source of concern, suggesting that the same is true for this specific source of measurement error.

Second, estimates will be upwardly (downwardly) biased depending on $\text{Cov}(\bar{e}_{-i,t} - e_{i,t}, \bar{e}_{-i,t} - \tilde{e}_{-i,t}) > (<)0$ (after partialling out effects of any other regressors). Suppose that parents sort into

⁵²In results not presented here, I have estimated cubic and quartic expansions with no considerable effects on the estimates.

neighborhoods where similar parents live, i.e. $|\bar{e}_{-i,t} - e_{i,t}|$ is small, then it follows that parents will choose similar (and small) socialization efforts α_i , so that, because of the first remark $|\bar{e}_{-i,t} - \tilde{e}_{-i,t}|$ will also be small. This suggests that in absolute value terms, the two are positively correlated in the presence of parental sorting. In the discussion of robustness we showed that parental sorting is not an important source of concern.

Third, even if estimates were biased, as long as estimates have the right sign the test for endogenous parental socialization effects will still be valid, since in this section I am not concerned about point estimates.

4 Conclusions

Recent empirical findings have forcefully shown that culture and identity have important long-lasting effects on economic outcomes of interest, such as trust, time and risk preferences, fertility and education decisions. While this should not come as a surprise— since by definition culture affects the primitives in economic models— the actual mechanisms of cultural change and transmission have only recently started to be understood, both at the theoretical and empirical levels.

In this paper I contribute to this literature by developing a model where cultural change and transmission is driven by the pattern of interactions that children have when their preferences and identities are being formed, and specifically, by their desire to fit in their corresponding social environments. In the Introduction I document the evidence coming from developmental psychology suggesting that indeed a model of socialization should include interactions with the parents and the children, in line with assumptions made in this paper. In addition, the model has at least two advantages: first, it rationalizes a dynamic equation proposed in an early paper on the transmission of continuous cultural traits by Cavalli-Sforza and Feldman (1973). Second, it maps nicely to the recent econometric literature on peer effects so that given the right data it is relatively straightforward to test.

As an important byproduct, the theoretical framework suggests a general method to circumvent the reflection problem, responsible for the main nonidentification results in the literature: as long as (1) parents act as role models for their children, and (2) other parents of children in the peer group do not act as role models, peer effects can be identified by using this indirect effect that other parents have on the children as an exogenous source of variation. An example will help clarify this: suppose that there are only two children, with their two corresponding parents. In general, one can pose that children's outcomes are generated from the following

first-order condition:

$$\begin{aligned}
 e_{1,t+1} &= \alpha_0 + \alpha_1 e_{1,t} + \alpha_2 e_{2,t} + \alpha_3 e_{2,t+1} + \alpha_4 x_{1,t+1} + \alpha_5 x_{2,t+1} + \epsilon_{1,t+1} \\
 e_{2,t+1} &= \alpha_0 + \alpha_1 e_{2,t} + \alpha_2 e_{1,t} + \alpha_3 e_{1,t+1} + \alpha_4 x_{2,t+1} + \alpha_5 x_{1,t+1} + \epsilon_{2,t+1}
 \end{aligned}$$

Here α_1 corresponds to each child's own parental effect and α_3 denotes the peer effect. Condition 1 implies that $\alpha_1 > 0$, and my identification assumption (condition 2, above) corresponds to the exclusion restriction that $\alpha_2 = 0$ i.e. that parents of a child's peers do not have a direct effect on her outcomes.

I also take from the work by Bisin and Verdier (2000) and allow for parents to purposefully socialize their children by affecting their relative importance with respect to their children peers. With this in mind, the model not only allows me to include exogenous parental role model effects and endogenous peer effects, but also endogenous parental socialization. From the comparative statics results in the parental socialization game I derive testable predictions that allow me to separate exogenous role-model effects and endogenous parental nurturing choices.

I further perform several robustness checks that overall suggest that heterogeneity of the estimates are not a source of concern. When estimating peer effects such robustness checks are necessary, since the choice of the peer group (school, grade, or actual network of friendships), parental neighborhood sorting, genetic effects, and individual characteristics such as gender, physical attractiveness, age and family structure are likely to affect the estimates in predictable ways. I discuss such potential effects and show that in the current exercises it is unlikely that these are a source of concern.

As the discussion of convergence to a steady state where all groups blend with each other shows, one interesting feature of the model is that from cross-sectional data we can infer the likely long-run properties of the system. Specifically, in the discussion on the assimilation of immigrants in the United States, the finding that the sum of parental and peer effects is close to one implies that children within a school converge in what I have called a *local melting pot*.^{53,54} Importantly, a *global melting pot* where immigrants and natives blend with each other will not necessarily follow, a view consistent with the type of segmented assimilation proposed by Portes and Zhou (1993).⁵⁵

⁵³The condition that effects add up to one is by no means necessary for convergence.

⁵⁴The literature on immigrants' assimilation is so large that a review is out of the scope of this paper. A classic reference is Gordon (1964), and in economics a review of the research can be found in the volume compiled by Borjas (2007) for the specific case of Mexican immigration in the United States. An alarmist view can be found in Huntington (2004).

⁵⁵A limited list of sufficient conditions is provided by Vaughan (2011). Clearly, a connected network of schools will suffice, but other conditions are that schools are not ethnically segregated, or that there is intergenerational spatial mobility for all ethnic groups.

I have assumed throughout that parental outcomes are exogenous to the socialization process, ie. that parents do not try to set up an example for their children by choosing actions that deviate from their own preferences. In the empirical application that I presented here, this implies that parents are not changing their frequency of praying and alcohol consumption or how important is religion for them in order to socialize their children to this supposedly superior choices. To the best of my knowledge there is no evidence coming from developmental psychology denying the validity of this assumption but my interpretation of the results, and most importantly, the statistical properties of the estimates depend crucially on this assumption.

Finally, it is worth discussing several potential avenues of future research. First, up to now three research agendas have been advancing somewhat independently that should be unified: as Equation (15) shows, parental, genetic and peer effects could in principle be present at the same time, but to this moment it has been hard to separate the causal effects. Twin and adoptees samples have been used, but it is hard to interpret these as causal effects.⁵⁶ One possible avenue is to impose some structure in order to causally estimate the corresponding effects. Second, one would like to study the transmission of a much larger list of outcomes than the one studied here. As discussed above, I restricted the analysis to those outcomes where parents and children were asked exactly the same question during the interviews. Finally, the stability of parental and peer effects generate a whole new set of questions: how is it that peers during the early adolescence have such an enduring effect? How do we go from peer and parental effects in actions to preference formation? Kuran and Sandholm (2008) suggest how this can in principle take place, but more empirical work is needed in order to test several of their assumptions and results.

⁵⁶Examples of the use of behavioral genetics methods in economics can be found in Wallace, Cesarini, Lichtenstein, and Johannesson (2007) or David Cesarini and Johannesson (2007). See also reviews in Holmlund, Lindahl, and Plug (2011) and Sacerdote (2011).

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Appendix: Proofs

Proposition 1: Existence and Uniqueness of a Nash Equilibrium for the Conformity Game

A necessary and sufficient condition for the existence of a unique symmetric Nash Equilibrium of the conformity game for any time $t > 0$, is that $\alpha_i \neq 0$ for at least one of the groups.

Proof. For any time t , second-order conditions are satisfied whenever $\alpha_i > -\frac{(N-1)^2}{2N-1}$, $i = 1, 2$, valid under our assumptions. Since the problem is quadratic and we restrict the analysis to the class of symmetric equilibria, from the first-order conditions we get reaction functions that are linear in the parents' and other group's preference:

$$e_{i,t+1}^* = A_i e_{i,t} + (1 - A_i) e_{j,t+1}^* \quad (23)$$

where $A_i = \alpha_i / (\alpha_i + (1 - \alpha_i) \psi_N (1 - \omega_i))$, $\psi_N := (N - 1) / N$, for $i \neq j = 1, 2$. The reaction curves (23) constitute a system of two linear equations

$$\begin{pmatrix} 1 & -(1 - A_1) \\ -(1 - A_2) & 1 \end{pmatrix} \begin{pmatrix} e_{1,t+1}^* \\ e_{2,t+1}^* \end{pmatrix} = \begin{pmatrix} A_1 e_{1,t} \\ A_2 e_{2,t} \end{pmatrix}$$

A necessary and sufficient condition for existence and uniqueness of a Nash Equilibrium is that the matrix in the left-hand side is invertible. The determinant of this matrix is $A_i + A_j(1 - A_i)$. After some algebra, it is easy to see that:

$$A_i + A_j(1 - A_i) = \frac{\alpha_i \alpha_j (1 - \psi_N) + \psi_N (\alpha_i \omega_i + \alpha_j \omega_j)}{(\alpha_i + (1 - \alpha_i) \psi_N (1 - \omega_i)) (\alpha_j + (1 - \alpha_j) \psi_N (1 - \omega_j))}$$

For the denominator to be non-zero it suffices that for at least one group, $\alpha_i > \psi_N (1 - \omega_i) / (1 - \psi_N (1 - \omega_i))$, satisfied in our case since we restrict the analysis to α_i in the closed unit interval, and for the numerator to be non-zero it is necessary and sufficient that $\alpha_i \geq 0$ with a strict inequality for at least one group.

This analysis can be summarized by noting that there are three cases of interest:

1. $\alpha_i, \alpha_j > 0$, then Nash equilibrium strategies for both children are weighted averages of the value of the traits for each parent:

$$e_{i,t+1} = \gamma_i e_{i,t} + (1 - \gamma_i) e_{j,t}$$

2. $\alpha_i = 0, \alpha_j > 0$, then since $\alpha_i = 0 \rightarrow A_i = 0$, by inspecting Equation (23) it is clear that both children will have the value of a group j parent, i.e. $e_{i,t+1} = e_{j,t+1} = e_{j,t}$.

3. $\alpha_i = \alpha_j = 0$: Children play a beauty-contest where any outcome where coordinate perfectly is an equilibrium, i.e. $e_{i,t+1} = e_{j,t+1}$.

□

Proposition 2: Existence and Uniqueness of a Blending-Type Steady State

Assume that $\alpha_i \in (0, 1)$, $i = 1, 2$, and that initial conditions (in vector form) are $\mathbf{e}_0 = [e_{1,0}, e_{2,0}]' \in [0, 1]^2$. Then there exists a unique interior stable steady state equilibrium $\mathbf{e}^* = (e, e) \in (0, 1)^2$.

Proof. It is straightforward to verify that $\alpha_i \in (0, 1)$ implies $A_i, \gamma_i \in (0, 1)$ and $\gamma_1 + \gamma_2 > 1$, $i = 1, 2$. Nash Equilibrium strategies generate a system of linear difference equations:

$$\begin{pmatrix} e_{1,t+1} \\ e_{2,t+1} \end{pmatrix} = \begin{pmatrix} \gamma_1 & 1 - \gamma_1 \\ 1 - \gamma_2 & \gamma_2 \end{pmatrix} \begin{pmatrix} e_{1,t} \\ e_{2,t} \end{pmatrix}$$

for which a general solution is $\mathbf{e}_t = \lambda_1^t c_1 \mathbf{v}_1 + \lambda_2^t c_2 \mathbf{v}_2$, where $\lambda_i, \mathbf{v}_i, i = 1, 2$ are the eigenvalues and eigenvectors of the matrix $\Gamma = [\gamma_{i,j}]$ and c_1, c_2 are constants determined by the initial conditions. Since Γ is a stochastic matrix, it follows from the Perron-Frobenius theorem that

$$\lim_{t \rightarrow \infty} \mathbf{e}_t = c_1 \mathbf{v}_1$$

where \mathbf{v}_1 is the eigenvector corresponding to the unit vector, showing that a steady state exists. To see that it is interior, by recursive substitution it can be seen that for any time t , $e_t = \Gamma^t e_0$ and since Γ^t is a stochastic matrix,⁵⁷ it follows that time t children's traits are weighted averages of initial parental traits. □

Proposition 4: Existence and Uniqueness of a Nash Equilibrium for the Conformity Game when $M = N$

Assume that $M = N$ and that $\alpha_i \in (0, 1)$ for all $i = 1, \dots, N$. Given initial conditions $\mathbf{e}_0 = (e_{10}, e_{20}, \dots, e_{N0})'$: (i) there exists a unique interior Nash equilibrium to the conformity game; and (ii) there exists a unique interior stable steady-state $\mathbf{e} = e\mathbf{i}$, for $e \in (\min_j e_{j0}, \max_j e_{j0})$ and \mathbf{i} denotes a vector of ones.

Proof. While existence and uniqueness of a Nash equilibrium can be shown by invoking Proposition 3 in Glaeser and Scheinkman (2003), I will now use a different method since it allows me to establish easily the dynamic properties of the transmission process.

⁵⁷ $\mathbf{A}_{N \times N}$ is a stochastic matrix whenever $a_{ij} \geq 0$ for all i, j and $\sum_j a_{i,j} = 1$ for each $i = 1, \dots, N$.

Under the assumptions of the proposition, for each child $i = 1 \dots, N$ it can be verified the problem is globally concave, and the unique interior solution is given by

$$e_{i,t+1} - (1 - A_i) \frac{\sum_{j \neq i} e_{j,t+1}}{N - 1} = A_i e_{i,t}$$

where as before, $A_i = \alpha_i / (\alpha_i + (1 - \alpha_i) \psi_N^2)$. Note that in this case $\omega_i = 1/N$. Rewrite the system of N equations in matrix form

$$\mathbf{A} \mathbf{e}_{t+1} = \mathbf{B} \mathbf{e}_t$$

where $a_{ii} = 1$ and $a_{ij} = -(1 - A_i)/(N - 1)$ for $i \neq j$, $\mathbf{B} = \text{diag}(A_1, A_2, \dots, A_N)$ and $\mathbf{e}_t = (e_{1t}, \dots, e_{Nt})$;

A unique Nash equilibrium exists if and only if the matrix A is nonsingular. We show that this is the case whenever $\alpha_i \in (0, 1)$ for all i . Notice first that $A = I - \tilde{A}$, with $\tilde{a}_{ij} = (1 - A_i)/(N - 1)$ and all diagonal entries equal to zero. A sufficient condition for the inverse of A to exist is that the norm of \tilde{A} , $\|\tilde{A}\| := \max_i \sum_j |\tilde{a}_{ij}|$ is less than one, true under the hypothesis of the proposition since

$$\|\tilde{A}\| = \max_i \sum_j |\tilde{a}_{ij}| = \max_i \sum_j (1 - A_j)/(N - 1) < (N - 1)/(N - 1) = 1$$

where in the last inequality I have invoked the assumption that $\alpha_j \in (0, 1)$ so that $(1 - A_j) \in (0, 1)$, for all j . This shows that a unique Nash equilibrium exists if $\alpha_i \in (0, 1)$, since $e_{t+1} = A^{-1} B e_t$.

We now show that $\Gamma = A^{-1} B$ is a stochastic matrix, ie. that $\gamma_{ij} \geq 0$ and $\sum_j \gamma_{ij} = 1$. Under the assumptions of the proposition B is nonsingular, so we can write $Q = B^{-1} A$. A direct calculation shows that $\sum_j q_{ij} = 1$, and since Q is nonsingular, it follows from Proposition 5.1 in Dantzig and Veinott (1970, p.81), that $\sum_j \gamma_{ij} = 1$.⁵⁸ Using Neumann's expansion for $A^{-1} = (I - \tilde{A})^{-1} = I + \tilde{A} + \tilde{A}^2 + \dots$, since $\tilde{a}_{ij} > 0$ for all i, j , the limit has positive entries, and since by hypothesis $b_{ii} > 0$ it follows that $\gamma_{ij} > 0$. It now follows that Γ is an irreducible and aperiodic transition matrix, so by the Perron-Frobenius theorem the largest eigenvalue is one, and all other eigenvalues belong to the unit disc. A direct calculation now shows that a steady-state exists, since $\lim e_{t+1} = c_1 \mathbf{v}_1$, with $\mathbf{v}_1 = \mathbf{i}$ the corresponding unit right eigenvector, and c_1 a constant determined by the initial conditions. Moreover, $\lim_{t \rightarrow \infty} e_{i,t} = \pi' \mathbf{e}_0$, for all i , where π is the unique left eigenvector of Γ corresponding to the unit eigenvalue and $\sum_i \pi_i = 1$.⁵⁹ This shows that there is a unique steady-state where all dynasties blend with each other. □

⁵⁸Proposition 5.1 in Dantzig and Veinott states that for any invertible matrix A with rows summing to one, the rows of $B = A^{-1}$ sum to one.

⁵⁹In the Markov Chain literature, π is the unique invariant distribution.

Proposition 4: Existence of a Nash Equilibrium: Socialization Game

For any time $t \geq 0$ such that $A_t > 0$, under Assumption (1), the first-stage parental socialization game has at least one symmetric Nash Equilibrium.

Proof. Since second-order conditions are satisfied on $(0, 1]^2$, continuous best-reply functions are well-defined on this interval for each parent i , which we denote by $\alpha_i = g_i(\alpha_j)$. Let $G(\alpha_1, \alpha_2) := [g_1(\alpha_2), g_2(\alpha_1)]'$ be the best-reply function, continuous and a self-map on $(0, 1]^2$. To invoke Brouwer's fixed-point we will choose a small enough $\epsilon > 0$ such that the restriction $G_\epsilon : [\epsilon, 1]^2 \rightarrow \mathbb{R}^2$ is a continuous self-map on $[\epsilon, 1]^2$, so that a fixed point exists. This will show that an interior Nash equilibrium exists. However, as Lemma 1 shows, best-reply functions need not be monotonic increasing, so the choice of ϵ needs to be small enough so that the restriction is indeed a self-map.

The slope of the reaction function for a type i parent is given by:

$$\frac{\partial g_i}{\partial \alpha_j} = \frac{2A(1 - \alpha_i)k_i(\partial k_i / \partial \alpha_j)(\alpha_i(2 + k_i) - k_i)}{2Ak_i^2[1 + 2(1 - \alpha_i)(1 - k_i)] + D_i c''(\alpha_i)}$$

where $D_i = (k_i + \alpha_i(1 - k_i))^4$. Since $\lim_{\alpha_j \rightarrow 0} \alpha_i(\alpha_j) = \lim_{\alpha_j \rightarrow 0} g_i(\alpha_j) = 0$, both the numerator and denominator go to zero as $\alpha_j \rightarrow 0$, but it is straightforward to check that the denominator is a polynomial of higher order in α_j than the numerator from which it follows that as long as $c''(\alpha_i) > 0$, the slope of the best-reply function is unbounded (from above) in a sufficiently small neighborhood of zero. For each player of type i , we can therefore choose $\epsilon_1^i > 0$ small enough such that $\partial g_i(\alpha_j) / \partial \alpha_j > 1$ for all $\alpha_j \in (0, \epsilon_1^i)$. This condition guarantees that $\epsilon_1^i < g_i(\epsilon_1^i)$; if each best-reply function g_i were monotonic increasing it will follow that for any $\alpha_j > \epsilon_1^i$, $\epsilon_1^i < g_i(\epsilon_1^i) < g_i(\alpha_j) < 1$, then we could take $\epsilon = \min\{\epsilon_1^1, \epsilon_1^2\}$ and the conditions of Brouwer's fixed-point theorem will be satisfied. As already mentioned, Lemma 1 shows that this need not be the case.

The Implicit Function theorem guarantees that $g_i(\alpha_j)$ is continuous on $(0, 1]$ so, in particular, the restriction on $[\epsilon_1, 1]$ is also continuous and has a positive minimum. Denote by $\alpha^{m_i} = \arg \min_{\alpha_j \in [\epsilon_1, 1]} g_i(\alpha_j) \in (0, 1]$. Let $\epsilon_i = \min\{\epsilon_1^i, g_i(\alpha^{m_i})\}$, and $\epsilon = \min\{\epsilon_i, \epsilon_j\}$. From the above discussion, it follows that the restriction $G_\epsilon((\epsilon, 1]^2) \subseteq (\epsilon, 1]^2$ is a continuous selfmap, and therefore has a fixed point. This guarantees that the parental socialization game has an interior, symmetric Nash Equilibrium. \square

Lemma 1: Monotonicity of Best-Reply Functions in the Socialization Game

Under Assumption (1)

$$\frac{\partial \alpha_i(\alpha_j)}{\partial \alpha_j} > 0 \iff \alpha_i > k_i / (2 + k_i) \text{ for } i \neq j \in \{1, 2\}$$

Proof. After total differentiation of the first-order condition, it is straightforward to show that

$$\frac{d\alpha_i(\alpha_j)}{d\alpha_j} = \frac{2A \left[(1 - \gamma_i) \frac{\partial^2 \gamma_i}{\partial \alpha_i \partial \alpha_j} - \frac{\partial \gamma_i}{\partial \alpha_j} \frac{\partial \gamma_i}{\partial \alpha_j} \right]}{2A \left[\left(\frac{\partial \gamma_i}{\partial \alpha_j} \right)^2 - (1 - \gamma_i) \frac{\partial^2 \gamma_i}{\partial \alpha_i^2} \right] + c''(\alpha_i)}$$

From the second-order conditions, we know that the denominator is well-defined and positive for $\alpha_k \in (0, 1]$, $k = 1, 2$, so we need only check the sign of the numerator. After some algebra, it can be shown to be

$$\frac{2A}{D_i} (1 - \alpha_i) k_i (\partial k_i / \partial \alpha_j) (2\alpha_i - k_i(1 - \alpha_i))$$

where $D_i = (k_i + \alpha_i(1 - k_i))^4$ and $\frac{\partial k_i}{\partial \alpha_j} = \psi_N(1 - \omega_i) \frac{\partial A_j}{\partial \alpha_j} > 0$, yielding the desired condition. \square

Proposition 5: Comparative Statics

Depending on the exact functional form of the cost function c , an increase in the fraction of parents of group i may increase or decrease optimal parental socialization effort. Formally, $\partial \alpha_i / \partial \omega_i < 0$ if and only if $2\alpha_i - k_i(1 - \alpha_i) > 0$.

Proof. Totally differentiating the first-order conditions for both players we get

$$\frac{\partial \alpha_i}{\partial \omega_i} = \frac{2A \left[(1 - \gamma_i) \frac{\partial^2 \gamma_i}{\partial \alpha_i \partial \omega_i} - \frac{\partial \gamma_i}{\partial \alpha_i} \frac{\partial \gamma_i}{\partial \omega_i} \right]}{2A \left[\left(\frac{\partial \gamma_i}{\partial \alpha_i} \right)^2 - (1 - \gamma_i) \frac{\partial^2 \gamma_i}{\partial \alpha_i^2} \right] + c''(\omega_i)}$$

Since the denominator is positive (from the second-order condition), the sign of the partial derivative depends only on the sign of the numerator. After some algebra we can verify that

$$\begin{aligned} \frac{\partial^2 \gamma_i}{\partial \alpha_i \partial \omega_i} &= (1/D_1) \frac{\partial k_i}{\partial \omega_i} (\alpha_i - k_i(1 - \alpha_i)) \\ \frac{\partial k_i}{\partial \omega_i} &= -(1/D_k) \alpha_j \psi_N (\alpha_j + (1 - \alpha_j) \psi_N) < 0 \\ \frac{\partial \gamma_i}{\partial \alpha_i} &= \frac{k_i}{(k_i + \alpha_i(1 - k_i))^2} \\ \frac{\partial \gamma_i}{\partial \omega_i} &= \frac{-\alpha_i(1 - \alpha_i) \frac{\partial k_i}{\partial \omega_i}}{(k_i + \alpha_i(1 - k_i))^2} \end{aligned}$$

where $D_1 = (k_i + \alpha_i(1 - k_i))^3$, $D_k = (\alpha_j + (1 - \alpha_j) \psi_N \omega_i)^2$. Substituting these it is straightforward

to check that the sign of the numerator depends on the sign of

$$(1 - \alpha_i)k_i \frac{\partial k_i}{\partial \omega_i} (2\alpha_i - k_i(1 - \alpha_i))$$

so that

$$2\alpha_i - k_i(1 - \alpha_i) > 0 \iff \frac{\partial \alpha_i}{\partial \omega_i} < 0 \quad (24)$$

for $i = 1, 2$. These conditions correspond to the ones derived for the monotonicity of the best-reply functions. \square

Proposition 6: Existence of a Nash Equilibrium to the Socialization Game: General case $M = N$

Assume that $M = N$. For any time $t \geq 0$ such that $A_t > 0$, under Assumption (1), the first-stage parental socialization game has at least one Nash Equilibrium.

Proof. Notice first that since for any parent i $\sum_j \gamma_{ij} = 1$, the parental problem can be rewritten as

$$\max_{\alpha_i} -k \left(\sum_{j \neq i} \gamma_{ij} \Delta_{ji}^t \right)^2 - c(\alpha_i)$$

where $\Delta_{ji}^t := e_{j,t} - e_{i,t}$.

Corresponding first and second-order conditions are

$$[\text{FOC}] : \quad -2k \left(\sum_{j \neq i} \gamma_{ij} \Delta_{ji}^t \right) \left(\sum_{j \neq i} \frac{\partial \gamma_{ij}}{\partial \alpha_i} \Delta_{ji}^t \right) - c'(\alpha_i) = 0$$

$$[\text{SOC}] : \quad -2k \left[\left(\sum_{j \neq i} \frac{\partial \gamma_{ij}}{\partial \alpha_i} \Delta_{ji}^t \right)^2 + \left(\sum_{j \neq i} \gamma_{ij} \Delta_{ji}^t \right) \left(\sum_{j \neq i} \frac{\partial^2 \gamma_{ij}}{\partial \alpha_i^2} \Delta_{ji}^t \right) \right] - c''(\alpha_i) < 0$$

Since $c'(\alpha_i) > 0$ and $c''(\alpha_i) > 0$, it suffices to show that for any Δ_{ji}^t and any $\alpha_j \in (0, 1]$, $i, j = 1, \dots, N$

$$\text{sgn} \left(\sum_{j \neq i} \gamma_{ij} \Delta_{ji}^t \right) = -\text{sgn} \left(\sum_{j \neq i} \frac{\partial \gamma_{ij}}{\partial \alpha_i} \Delta_{ji}^t \right) \quad (25)$$

$$\text{sgn} \left(\sum_{j \neq i} \gamma_{ij} \Delta_{ji}^t \right) = \text{sgn} \left(\sum_{j \neq i} \frac{\partial^2 \gamma_{ij}}{\partial \alpha_i^2} \Delta_{ji}^t \right) \quad (26)$$

I will show below that whenever $\alpha_i = 1$, $\gamma_{ij} = 0$ for all $j \neq i$, so that the conditions (25)-(26) in effect suffice for a unique interior solution to each parent's socialization problem to exist. I proceed by showing the next sequence of results.

Result 1. For any parents $i \neq j$, any $\alpha_i \in (0, 1)$ and $\alpha_{-i} = [\alpha_1, \dots, \alpha_{i-1}, \alpha_{i+1}, \dots, \alpha_N] \in (0, 1]^{N-1}$, γ_{ij} is a rational function of α_i with polynomials in the numerator and denominator of degree 1.

Proof. For any $i = 1, \dots, N$, and $\alpha_i \in (0, 1)$, $1 - A_i = \frac{(1 - \alpha_i)\phi_N^2}{\phi_N^2 + \alpha_i(1 - \phi_N^2)}$ is a rational function of α_i with polynomials in numerator and denominator of degree 1. Since $\Gamma = A^{-1}B$, $A^{-1} = I + \tilde{A} + \tilde{A}^2 + \dots$ and $B = \text{diag}(A_1, A_2, \dots, A_N)$, it follows that for $i \neq j$, $\gamma_{ij} = \sum_{k=1}^N a^{ik}b_{kj} = a^{ij}A_j$, where a^{ij} denotes the ij th element of A^{-1} , so that γ_{ij} depends on α_i only through the infinite sum.

Also, using the matrix multiplication formula, for any $m \in \mathbb{N}_+$, $\tilde{a}_{ij}^{m+1} = \sum_{k=1}^N \tilde{a}_{ik}^m \tilde{a}_{kj} = \sum_{k \neq j} \tilde{a}_{ik}^m \frac{1 - A_k}{N - 1}$, showing that \tilde{a}_{ij}^{m+1} depends on α_i only through the dependence of \tilde{a}_{ij}^m on α_i , so recurring backwards we see that the dependence on α_i enters through the i th row of the matrix \tilde{A} , and specifically, through $(1 - A_i)$. This shows that γ_{ij} is a rational function of α_i with numerator and denominator polynomials of degree 1. \square

Result 2. For any parents $i \neq j$, any $\alpha_i \in (0, 1]$, and $\alpha_{-i} = [\alpha_1, \dots, \alpha_{i-1}, \alpha_{i+1}, \dots, \alpha_N] \in (0, 1]^{N-1}$, $\partial\gamma_{ij}/\partial\alpha_i < 0$ $\partial^2\gamma_{ij}/\partial\alpha_i^2 > 0$.

Proof. As shown in Result (1), $\gamma_{ij} = (\tilde{a}_{ij} + \tilde{a}_{ij}^2 + \dots)A_j$, where \tilde{a}_{ij}^m denotes the ij th element of the matrix \tilde{A}^m is a rational function of α_i , it follows that except for the poles, the first and second-partial derivatives exist and are continuous, so that

$$\frac{\partial\gamma_{ij}}{\partial\alpha_i} = \lim_{M \rightarrow \infty} A_j \sum_{m=1}^M \frac{\partial\tilde{a}_{ij}^m}{\partial\alpha_i} \quad (27)$$

$$\frac{\partial^2\gamma_{ij}}{\partial\alpha_i^2} = \lim_{M \rightarrow \infty} A_j \sum_{m=1}^M \frac{\partial^2\tilde{a}_{ij}^m}{\partial\alpha_i^2} \quad (28)$$

are well-defined.⁶⁰

Since $A_j \in (0, 1]$ whenever $\alpha_j \in (0, 1]$ and is independent of α_i , the signs of (27)-(28) depend only on the sign of the infinite sum. Moreover, since this sum converges, and all terms are positive, there must be an \tilde{M} such that for any $M' > \tilde{M}$ the terms $\tilde{a}_{ij}^{M'}$ are very close to zero,

⁶⁰The poles of a rational function are the roots of the polynomial in the denominator.

so for a large enough but finite \tilde{M} we can use mathematical induction on the terms of the finite summation.

The proof will follow by induction on m : we will show that for $m = 1$, $\partial \tilde{a}_{ij} / \partial \alpha_i < 0$ and $\partial^2 \tilde{a}_{ij} / \partial \alpha_i^2 > 0$, and then that if these conditions hold for $m = k$ then they also hold for $m = k + 1$. This shows that for any finite \tilde{M} the conditions hold.

First step: $m = 1$:

It was shown above that $\tilde{a}_{ij} = (1 - A_i) / (N - 1)$, so it follows that

$$\begin{aligned} \frac{\partial \tilde{a}_{ij}}{\partial \alpha_i} &= -\frac{\partial A_i / \partial \alpha_i}{N - 1} < 0 \\ \frac{\partial^2 \tilde{a}_{ij}}{\partial \alpha_i^2} &= -\frac{\partial^2 A_i / \partial \alpha_i^2}{N - 1} > 0 \end{aligned}$$

as $\partial A_i / \partial \alpha_i = \psi_N^2 / (\alpha_i + (1 - \alpha_i) \psi_N^2)^2 > 0$ and $\partial^2 A_i / \partial \alpha_i^2 = -2\psi_N^2 / (\alpha_i + (1 - \alpha_i) \psi_N^2)^3 < 0$ whenever $\alpha_i \in (0, 1]$.

Second step: $m = k + 1$:

Since $\tilde{A}^{k+1} = \tilde{A}^k \tilde{A}$, it follows that the ij th term is $\tilde{a}_{ij}^{k+1} = \sum_{l=1}^N \tilde{a}_{il}^k \tilde{a}_{lj}$. Then

$$\frac{\partial \tilde{a}_{ij}^{k+1}}{\partial \alpha_i} = \sum_{l=1}^N \left[\frac{\partial \tilde{a}_{il}^k}{\partial \alpha_i} \tilde{a}_{lj} + \tilde{a}_{il}^k \frac{\partial \tilde{a}_{lj}}{\partial \alpha_i} \right] < 0$$

since from the induction hypothesis $\frac{\partial \tilde{a}_{il}^{(k)}}{\partial \alpha_i} < 0$ and we have already shown that $\tilde{a}_{lj}, \tilde{a}_{lj}^{(k)} > 0$ and $\frac{\partial \tilde{a}_{lj}}{\partial \alpha_i} < 0$. Similarly

$$\frac{\partial^2 \tilde{a}_{ij}^{(k+1)}}{\partial \alpha_i^2} = \sum_{l=1}^N \left[\frac{\partial^2 \tilde{a}_{il}^{(k)}}{\partial \alpha_i^2} \tilde{a}_{lj} + 2 \frac{\partial \tilde{a}_{il}^{(k)}}{\partial \alpha_i} \frac{\partial \tilde{a}_{lj}}{\partial \alpha_i} + \tilde{a}_{il}^{(k)} \frac{\partial^2 \tilde{a}_{lj}}{\partial \alpha_i^2} \right] > 0$$

where we have used the induction hypothesis and results proven above. It now follows that for any finite $\tilde{M} \in \mathbb{N}$ the corresponding inequalities hold, and since the sequence of partial sums of \tilde{a}_{ij}^m converges the inequalities $\frac{\partial \gamma_{ij}}{\partial \alpha_i} < 0$ and $\frac{\partial^2 \gamma_{ij}}{\partial \alpha_i^2} > 0$ hold. \square

Result 3. For any parents $i \neq j$ and any $\alpha_{-i} = (\alpha_1, \dots, \alpha_{i-1}, \alpha_{i+1}, \dots, \alpha_N) \in (0, 1)^{N-1}$, and Δ'_{ji} , whenever $\alpha_i = 1$ then $\gamma_{ij} = 0$.

Proof. It was shown abof that for $i \neq j$, $\gamma_{ij} = (\tilde{a}_{ij} + \tilde{a}_{ij}^{(2)} + \tilde{a}_{ij}^{(3)+\dots}) A_j$. Note first that, whenever $\alpha_i = 0$, the i th row of matrix \tilde{A} has $\tilde{a}_{ij} = 0$. Proceeding by mathematical induction, it is easy to

show that for any large enough, but finite M , $\tilde{a}_{ij}^{M+1} = \sum_{k=1}^N \tilde{a}_{ik}^M \tilde{a}_{kj} = \sum_{k \neq j} \tilde{a}_{ik}^M \frac{1 - A_k}{N - 1} = 0$, showing that $\gamma_{ij} = 0$. \square

Result 4. For any parents $i \neq j$ and any $\alpha_i \in (0, 1)$, any $\alpha_{-i} = (\alpha_1, \dots, \alpha_{i-1}, \alpha_{i+1}, \dots, \alpha_N) \in (0, 1)^{N-1}$, and Δ_{ji}^t , conditions (25)-(26) are satisfied.

Proof. From Results (1)-(3) it follows that for any $i \neq j$ and $\alpha_i \in (0, 1)$, the first and second partial derivatives $\frac{\partial \gamma_{ij}}{\partial \alpha_i} < 0$ and $\frac{\partial^2 \gamma_{ij}}{\partial \alpha_i^2} > 0$ are rational functions of α_i that converge to 0 as $\alpha_i \rightarrow \infty$ and never change sign. It follows that $(\sum_{j \neq i} \gamma_{ij} \Delta_{ji}^t)$, $(\sum_{j \neq i} \frac{\partial \gamma_{ij}}{\partial \alpha_i} \Delta_{ji}^t)$ and $(\sum_{j \neq i} \frac{\partial^2 \gamma_{ij}}{\partial \alpha_i^2} \Delta_{ji}^t)$ are also rational functions of α_i .

Assume first that parent i has the smallest (largest) value of the outcome, so that $\Delta_{ji}^t > (<)0$ for all $j \neq i$ and conditions (25)-(26) are trivially satisfied.

Whenever $\Delta_{ji}^t > 0$ for some parents j and $\Delta_{ki}^t < 0$ for some parents k , since first and second partial derivatives have opposite signs and the summations are rational functions, then (i) at the poles these functions will be of opposite sign, (ii) whenever $\alpha_i \rightarrow \infty$ the functions converge to zero, and (iii) do not change sign, it follows that for all α_i either $(\sum_{j \neq i} \frac{\partial \gamma_{ij}}{\partial \alpha_i} \Delta_{ji}^t) < 0$ and $(\sum_{j \neq i} \frac{\partial^2 \gamma_{ij}}{\partial \alpha_i^2} \Delta_{ji}^t) > 0$ or viceversa. The case where $N = 10 = M$ is displayed Figure (12).⁶¹ \square

Figure 12 around here

Given that second-order conditions are satisfied on $(0, 1]^N$, continuous best-reply functions exist on $(0, 1]^N$, and we can now use the same strategy for the case of $M = 2$, and show that we can remove the discontinuity point $\alpha_i = 0$ for all $i = 1, \dots, N$ by restricting the action space $\mathcal{A} = [0, 1]^N$ in such a way as to guarantee that the restricted best-reply function $G_\epsilon : [\epsilon, 1]^N \rightarrow \mathbb{R}^N$ is a continuous self-map on $[\epsilon, 1]^N$. The proposition then follows by invoking Brouwer's fixed-point theorem. Whenever $\alpha_i \in (0, 1]$, since $\sum_j \gamma_{ij} = 1$ for all i , Nash equilibrium strategies can be written as $e_{i,t+1} = \gamma_{ii} e_{i,t} + (1 - \gamma_{ii}) \tilde{e}_{-i,t}$, where $\tilde{e}_{-i,t} = 1/(1 - \gamma_{ii}) \sum_{j \neq i} \gamma_{ij} e_{j,t}$ is an average over all other parental traits, weighted by $\tilde{\gamma}_{ij} = \gamma_{ij}/(1 - \gamma_{ii})$. The parental problem can thus be rewritten as

$$\max_{\alpha_i} -k(\tilde{e}_{-i,t} - e_{i,t})^2(1 - \gamma_{ii})^2 - c(\alpha_i)$$

⁶¹To plot the graphs in Figure (12) we have solved the model for the case $N = 10$, drawing $N - 1$ independent random $\alpha_j \sim U(a, b)$, and N independent values for the parental outcomes $e_{i,t} \sim U(c, d)$, with $a = c = 0$ and $b = d = 1$, and $\kappa = 1$.

for which, the first-order conditions are:

$$-2k(\tilde{e}_{-i,t} - e_{i,t})(1 - \gamma_{ii}) \left[(1 - \gamma_{ii}) \frac{\partial \tilde{e}_{-i,t}}{\partial \alpha_i} - \frac{\partial \gamma_{ii}}{\partial \alpha_i} (\tilde{e}_{-i,t} - e_{i,t}) \right] - c'(\alpha_i) = 0 \quad (29)$$

Assume now that $\alpha_j = \epsilon \in (0, 1)$ for all parents $j \neq i$. Let $A_\epsilon = \epsilon / (\epsilon + (1 - \epsilon)\psi_N^2)$, then $\gamma_{ij} = a^{ij}A_\epsilon$ is the same for all $j \neq i$, and $\tilde{e}_{-i,t} = \sum_{j \neq i} e_{j,t} / (N - 1)$ is independent of α_i , so the first term inside the square brackets in Equation (29) is equal to zero; it follows that the first-order condition is the same as the one for two players i and $-i$, with parental values $e_{i,t}, (1/(N - 1)) \sum_{j \neq i} e_{j,t}$. From the special case $M = 2$ (Proposition (3)), it now follows that for player i there exists and $\epsilon_i \in (0, 1)$ such that $\alpha_i = g(\epsilon_i, \epsilon_i, \dots, \epsilon_i) > \epsilon_i$. The same procedure applies now for all agents and we can choose $\epsilon = \min\{\epsilon_i : i = 1, \dots, N\}$. By construction, it now follows that the restricted best-reply correspondence is a continuous self-map $G : [\epsilon, 1]^N \subset [\epsilon, 1]^N$, and from Brouwer's Fixed-Point theorem we conclude that at least one Nash equilibrium exists. \square

Figures

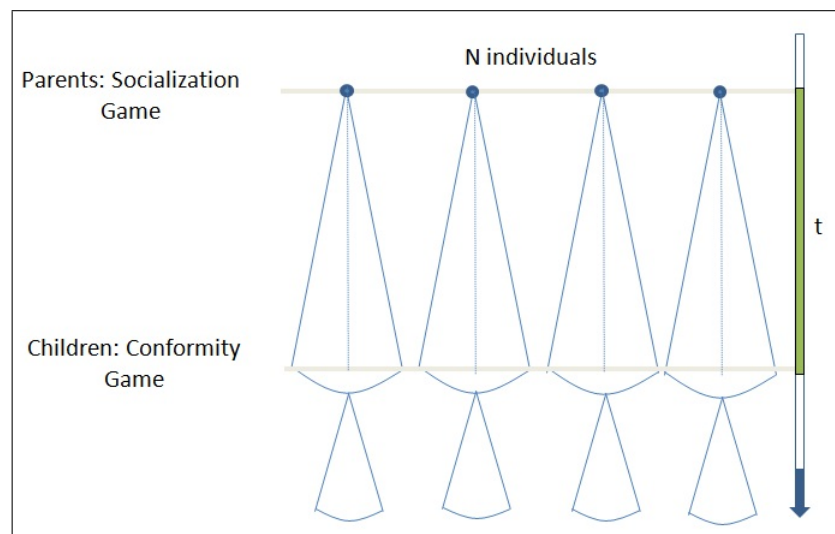


Figure 1: Timing of Decisions

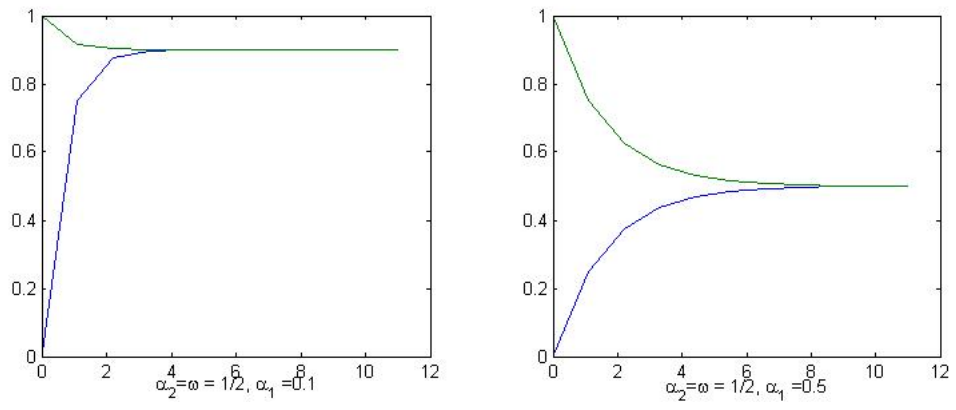


Figure 2: Equilibrium steady state and Transition

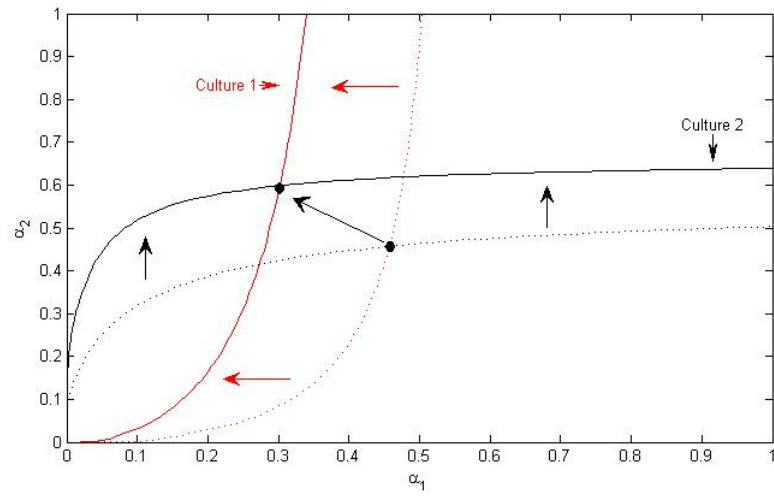


Figure 3: Reaction Curves for the Socialization Game and An Increase in ω_1

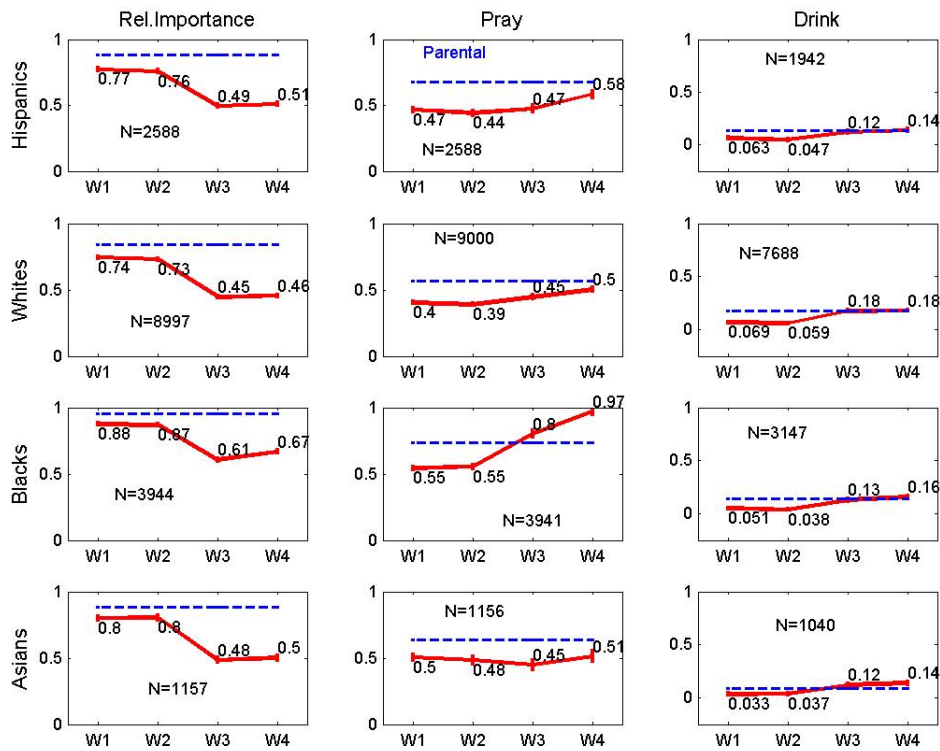


Figure 4: **Means and Standard Errors for Parents and Children:** For each ethnic group (rows) and each dependent variable (columns), the graph displays average children outcomes along with 95% confidence intervals (using standard errors, continuous lines) and corresponding parental outcomes (dotted line). Parental outcomes (dotted horizontal lines) were only asked in Wave 1 and remain fixed across all waves of information.

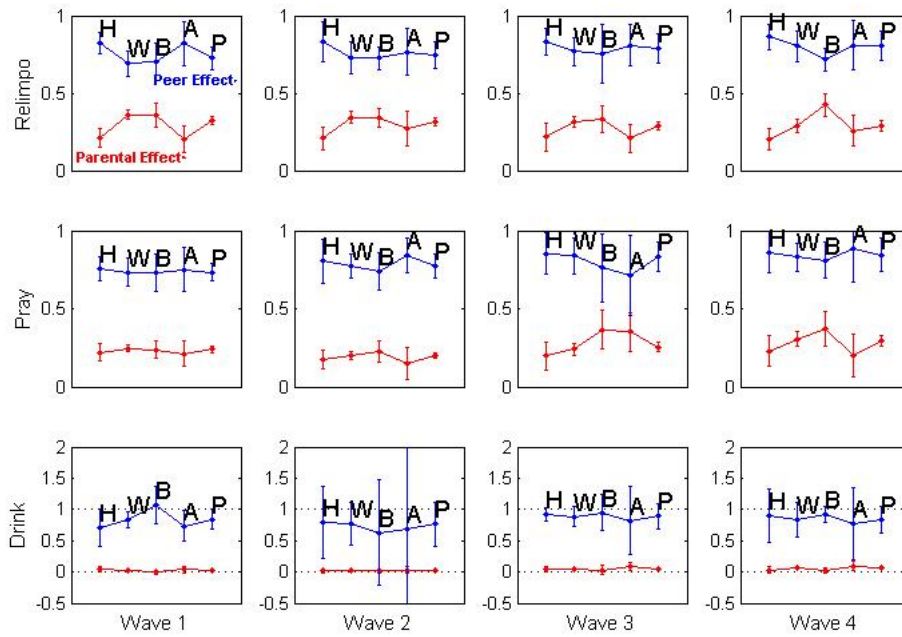


Figure 5: Comparison of Peer and Parental Effects Across Ethnic Groups: Each panel plots estimated peer effects across ethnic groups for each dependent variable (rows) and wave of information(column). For alcohol consumption (drink) dotted line corresponds to the case where estimated effect is equal to zero or one. 95% robust confidence intervals are included. Specification includes controls (Table 8).

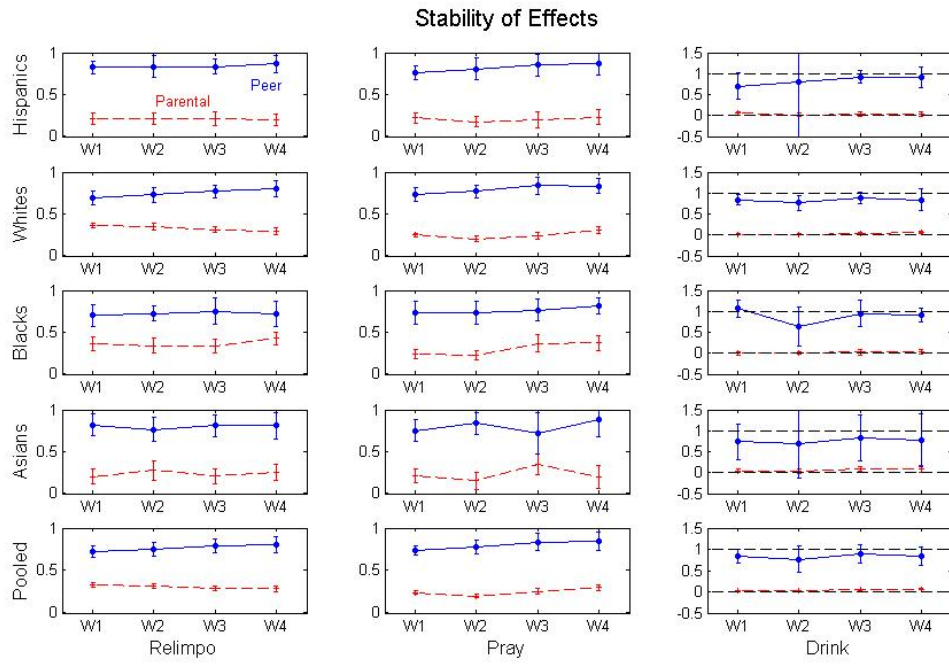


Figure 6: Stability of Parental and Peer Effects Across Waves: Each panel plots estimated parental (dotted) and peer (continuous) effects across waves of information for each ethnic group (rows) and each variable (column). 95% robust confidence intervals are included. Specification includes controls (Table 8).

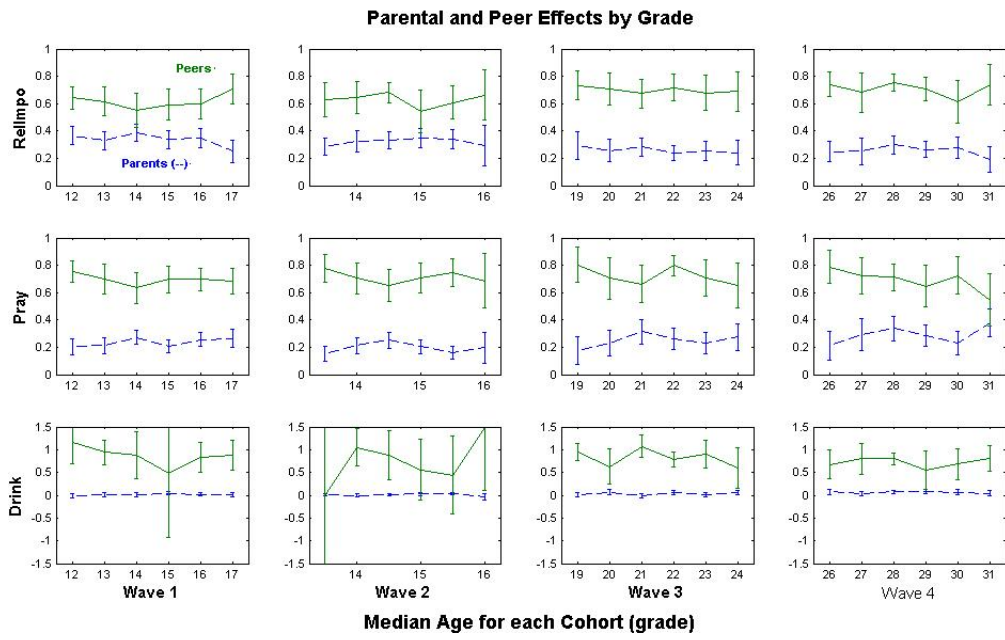


Figure 7: Stability of Parental and Peer Effects Across Cohorts: Each panel plots estimated parental effects across cohorts for each ethnic group (rows) and each variable (column). Dotted line corresponds to the case where estimated effect is equal to zero. 95% robust confidence intervals are included. Specification includes controls (Table 8).

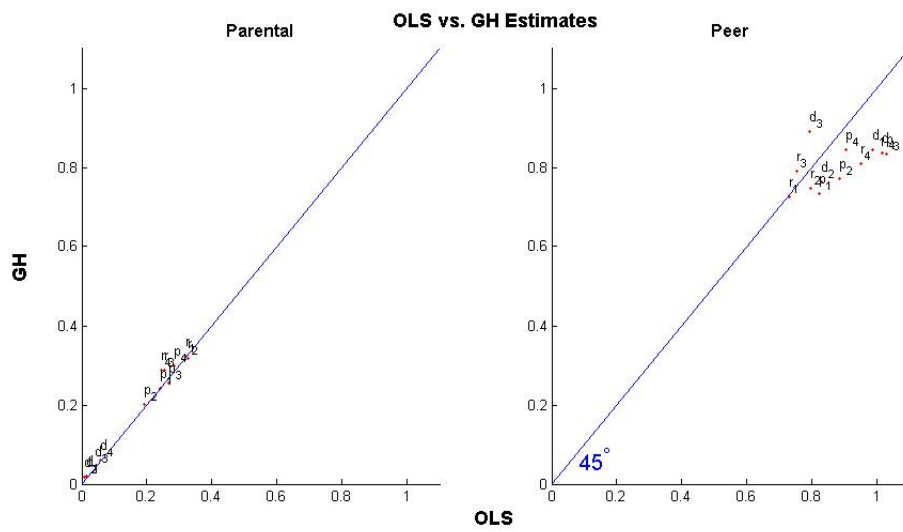


Figure 8: **Comparison of OLS and GH Estimates:** Each panel plots parental and peer effects estimates using the GH method against corresponding estimates using OLS. See Table (7).

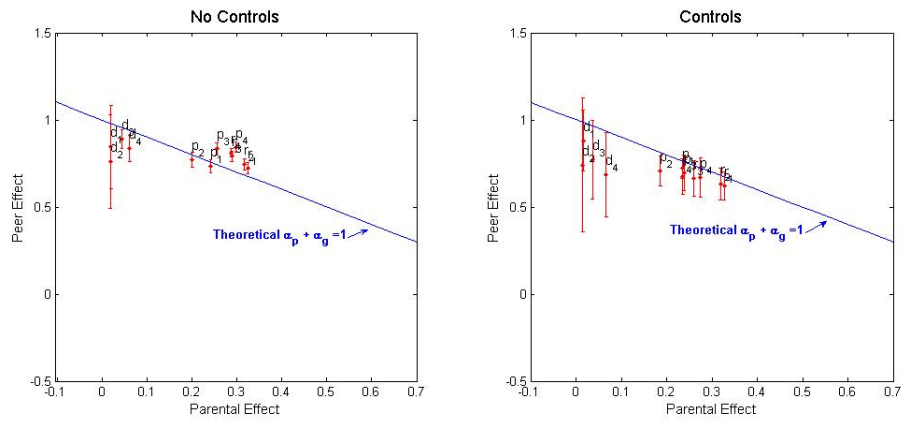


Figure 9: Peer Effects vs. Parental Effects: Left and right panels plots parental and peer effect estimates (α_p, α_g) obtained from pooled-regression estimates using the GH method and reported in Table (8) for specifications excluding and including controls, respectively. Straight line corresponds to the theoretical $\alpha_p + \alpha_g = 1$. 95% cluster-robust confidence intervals for peer effects are also plotted.

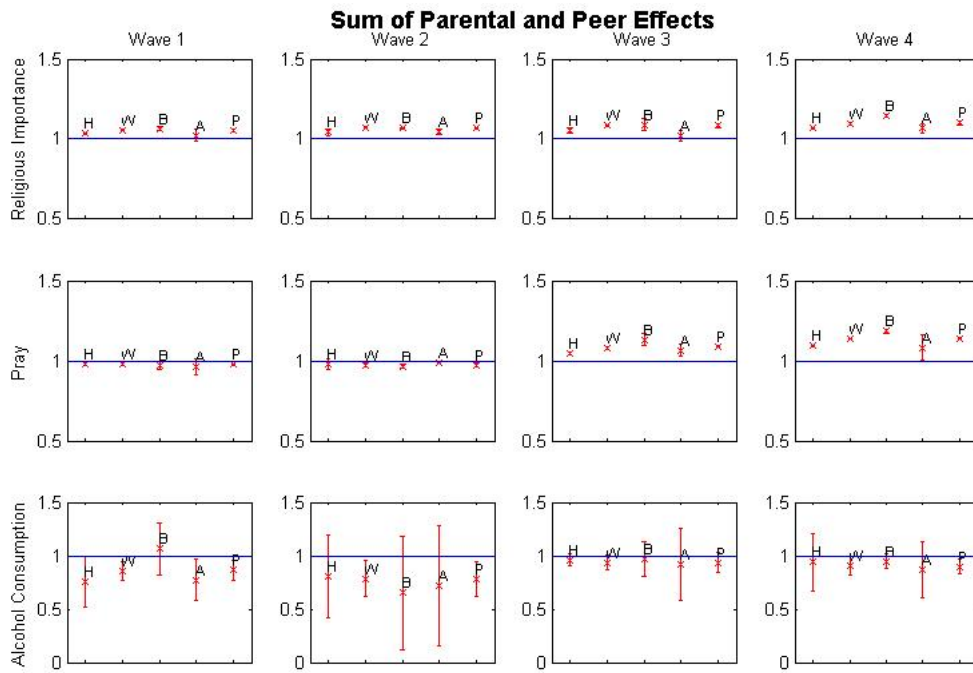


Figure 10: **Sum of Coefficients:** Each panel plots the sum of parental and peer effects estimates, across waves of information (columns) and dependent variable (rows), along with 95% robust confidence intervals. See Table (9) in the Appendix.

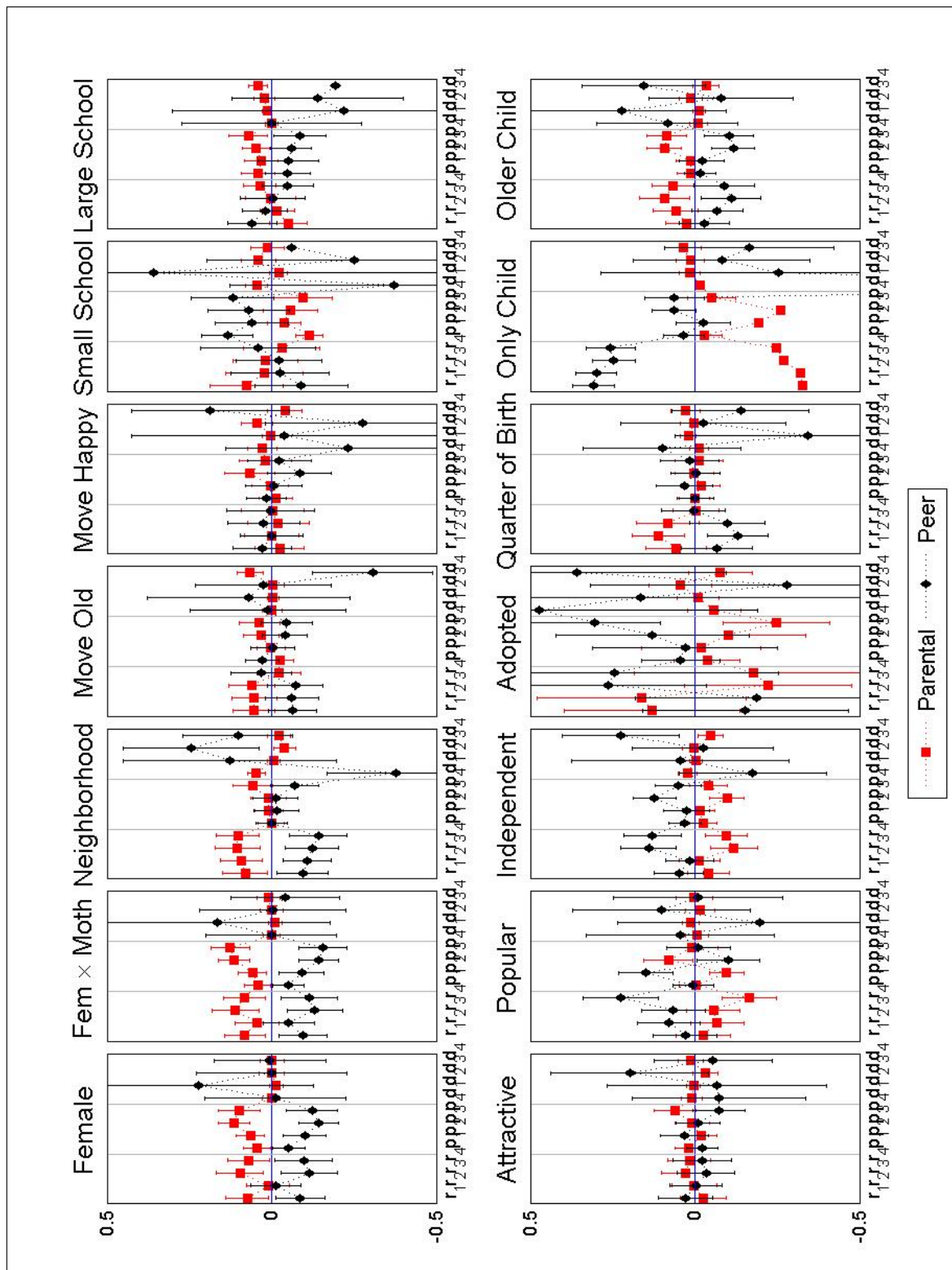


Figure 11: Differences in Parental and Peer Estimates Across Robustness Specifications: Denote parental and peer effects estimates for each subsample defined by each robustness check in Table (3) by (α_p^D, α_g^D) , $D = 1, 0$. Each panel plots the difference in parental and peer estimates $\alpha_x^{D=1} - \alpha_x^{D=0}$, $x = p, g$ along with 95% robust confidence intervals, for each dependent variable and wave of information $(r_{w,p}, d_{w,p}, w = 1, 2, 3, 4)$.

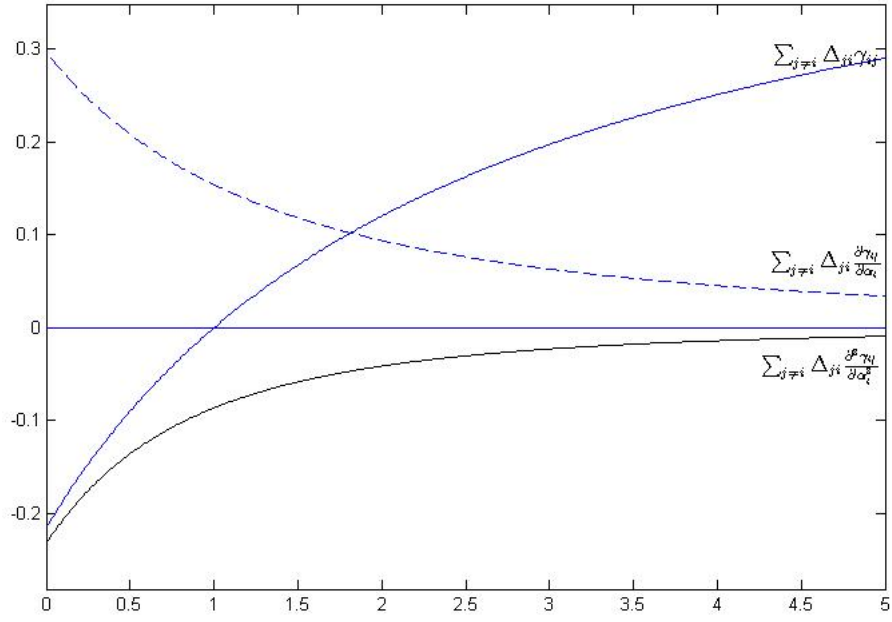


Figure 12: The graph plots $\left(\sum_{j \neq i} \gamma_{ij} \Delta_{ji}^t\right)$, $\left(\sum_{j \neq i} \frac{\partial \gamma_{ij}}{\partial \alpha_i} \Delta_{ji}^t\right)$ and $\left(\sum_{j \neq i} \frac{\partial^2 \gamma_{ij}}{\partial \alpha_i^2} \Delta_{ji}^t\right)$ for parent i as a function of own $\alpha_i \in (0, 5]$ for fixed independent uniformly distributed random $\alpha_j \in (0, 1)$, $j \neq i$, and independent random parental differences $e_{k,t} \sim U(0, 1)$, $k = 1, \dots, N$ with $N = 10$.

Tables

Table 1: **Religious Denomination Across Ethnic Groups**

	Hispanics	Whites	Blacks	Asians	Pooled
Protestant	21%	49%	71%	33%	48%
Catholic	62%	23%	5%	40%	26%
None	8%	14%	10%	13%	12%
Muslim	0%	0%	1%	1%	0%
Jewish	0%	1%	0%	0%	1%
Other	9%	14%	15%	14%	13%
Nobs	2859	10694	4481	1353	20272

Notes: Columns may not add up to 100% due to rounding errors. *Nobs* denotes the sample size of each ethnic group in the total.

Table 2: **Descriptive Statistics for Dependent Variables Across Waves of Information**

	N	Mean	Std	Min	Max	q25	q50	q75	q99
<i>Religious Importance</i>									
Wave 1	17397	0.78	0.25	0.00	1.00	0.67	0.67	1.00	1.00
Wave 2	12219	0.77	0.27	0.00	1.00	0.67	0.67	1.00	1.00
Wave 3	14679	0.49	0.28	0.00	1.00	0.33	0.67	0.67	1.00
Wave 4	15296	0.51	0.29	0.00	1.00	0.33	0.67	0.67	1.00
<i>Praying</i>									
Wave 1	17396	0.45	0.37	0.00	0.83	0.07	0.17	0.83	0.83
Wave 2	12226	0.44	0.37	0.00	0.83	0.07	0.17	0.83	0.83
Wave 3	14709	0.53	0.60	0.00	1.67	0.02	0.33	1.00	1.67
Wave 4	15307	0.62	0.65	0.00	1.67	0.02	0.33	1.00	1.67
<i>Alcohol Consumption</i>									
Wave 1	14392	0.06	0.18	0.00	1.00	0.00	0.00	0.03	1.00
Wave 2	14180	0.05	0.14	0.00	1.00	0.00	0.00	0.03	1.00
Wave 3	11206	0.16	0.21	0.00	1.00	0.03	0.08	0.21	1.00
Wave 4	12083	0.17	0.23	0.00	1.00	0.03	0.08	0.21	1.00

Notes: Table shows descriptive statistics for each dependent variable and wave of information. Last four columns present corresponding percentiles.

Table 3: Robustness Checks

Label	Description	Frequency
Female	1 if Child is female, 0 otherwise	0.50
Fem × Moth	1 if Child is female and parent is biological mother, 0 otherwise	0.37
Neighborhood	1 if Parents "live here because the schools here are better than they are in other neighborhoods"	0.39
Move Old	1 if family moved to current residence when child was 6 years old or younger.	0.34
Move Happy	1 if child would be a little happy or very happy if for any reason they moved out of the neighborhood.	0.18
Small School	1 if school is small (1-400 students)	0.14
Large School	1 if school is large (1001-4000 students)	0.49
Attractive	1 if student is attractive or very attractive (interviewers' assessment). [†]	0.56
Popular	1 if student considers him or herself very popular (wave 3)	0.16
Independent	1 if student considers him or herself very independent (wave 3)	0.37
Adopted	1 if student claims he or she is adopted.	0.034
Quarter of Birth	1 if student was born on the first quarter of the year	0.23
Only Child	1 if student is an only child	0.19
Older Child	1 if student is the oldest child (excluding only children)	0.29

[†] Average of interviewers' assessment of each child's attractiveness across all waves of information. Attractiveness was measured as 1 Very unattractive, 2 Unattractive, 3 About average, 4 Attractive and 5 Very attractive.

Table 4: Comparative Statics - Individual Level Regressions

Religious Importance								
	Wave 1		Wave 2		Wave 3		Wave 4	
<i>ParDiff</i> (β_1)	0.607 (0.0086)	0.605 (0.0213)	0.629 (0.0138)	0.597 (0.0222)	0.659 (0.0099)	0.666 (0.0234)	0.666 (0.0103)	0.691 (0.0257)
<i>ParDiff</i> ² (β_2)	0.234 (0.0198)	0.24 (0.0493)	0.187 (0.0295)	0.295 (0.0689)	0.159 (0.0193)	0.223 (0.0476)	0.137 (0.0282)	0.223 (0.0561)
<i>EthShare</i> (β_3)	0.057 (0.0165)	-0.003 (0.0438)	0.145 (0.0251)	0.074 (0.0467)	0.006 (0.0294)	-0.025 (0.0621)	0.065 (0.0281)	-0.012 (0.0726)
<i>EthShare</i> ² (β_4)	-0.071 (0.0159)	-0.019 (0.0388)	-0.159 (0.0251)	-0.099 (0.0425)	-0.024 (0.0291)	0.001 (0.0498)	-0.101 (0.0288)	-0.035 (0.0623)
R^2	0.233	0.268	0.219	0.247	0.221	0.267	0.213	0.274
N	14340	6126	10322	5830	11844	5644	12359	5045
Controls	N	Y	N	Y	N	Y	N	Y
Pray								
	Wave 1		Wave 2		Wave 3		Wave 4	
<i>ParDiff</i> (β_1)	0.757 (0.0078)	0.737 (0.0162)	0.815 (0.0117)	0.802 (0.016)	0.863 (0.02)	0.798 (0.0234)	0.926 (0.0226)	0.81 (0.02)
<i>ParDiff</i> ² (β_2)	-0.014 (0.0264)	0.078 (0.045)	-0.08 (0.0368)	-0.021 (0.0478)	-0.443 (0.0577)	-0.233 (0.0643)	-0.811 (0.0739)	-0.314 (0.0663)
<i>EthShare</i> (β_3)	-0.006 (0.0294)	-0.089 (0.0434)	0.113 (0.039)	0.032 (0.055)	0.058 (0.0633)	-0.126 (0.0731)	0.12 (0.0709)	-0.069 (0.0769)
<i>EthShare</i> ² (β_4)	-0.023 (0.0295)	0.048 (0.0426)	-0.123 (0.0377)	-0.053 (0.0484)	-0.071 (0.0638)	0.071 (0.0678)	-0.168 (0.0712)	-0.032 (0.0724)
R^2	0.311	0.347	0.333	0.356	0.146	0.194	0.126	0.2
N	14328	9350	10318	7848	11851	8680	12356	9465
Controls	N	Y	N	Y	N	Y	N	Y
Drink								
	Wave 1		Wave 2		Wave 3		Wave 4	
<i>ParDiff</i> (β_1)	0.844 (0.0135)	0.849 (0.0194)	0.842 (0.0101)	0.84 (0.0137)	0.816 (0.0228)	0.793 (0.0261)	0.792 (0.0184)	0.778 (0.0296)
<i>ParDiff</i> ² (β_2)	-0.227 (0.023)	-0.225 (0.033)	-0.231 (0.016)	-0.241 (0.0215)	-0.231 (0.0317)	-0.269 (0.0406)	-0.242 (0.0295)	-0.25 (0.0431)
<i>EthShare</i> (β_3)	-0.003 (0.0333)	0.07 (0.0382)	-0.022 (0.0217)	-0.004 (0.0313)	0.021 (0.0363)	0.096 (0.0444)	0.034 (0.0335)	0.071 (0.051)
<i>EthShare</i> ² (β_4)	0.001 (0.0324)	-0.061 (0.0373)	0.017 (0.0217)	0.001 (0.031)	0.002 (0.0342)	-0.07 (0.0427)	-0.023 (0.0315)	-0.047 (0.0489)
R^2	0.688	0.711	0.775	0.793	0.621	0.642	0.578	0.572
N	8944	5368	9051	6508	7371	5518	7856	5590
Controls	N	Y	N	Y	N	Y	N	Y

Notes: Table presents results from estimating Equation (22) for each dependent variable using only the first wave of information. Columns (1) do not include controls, (2) include controls and own ethnic group's school population share, and (3) include controls, all ethnic groups' shares (excluding Asians) and quadratic terms of these. Cluster-robust standard errors in parenthesis.

Data Appendix

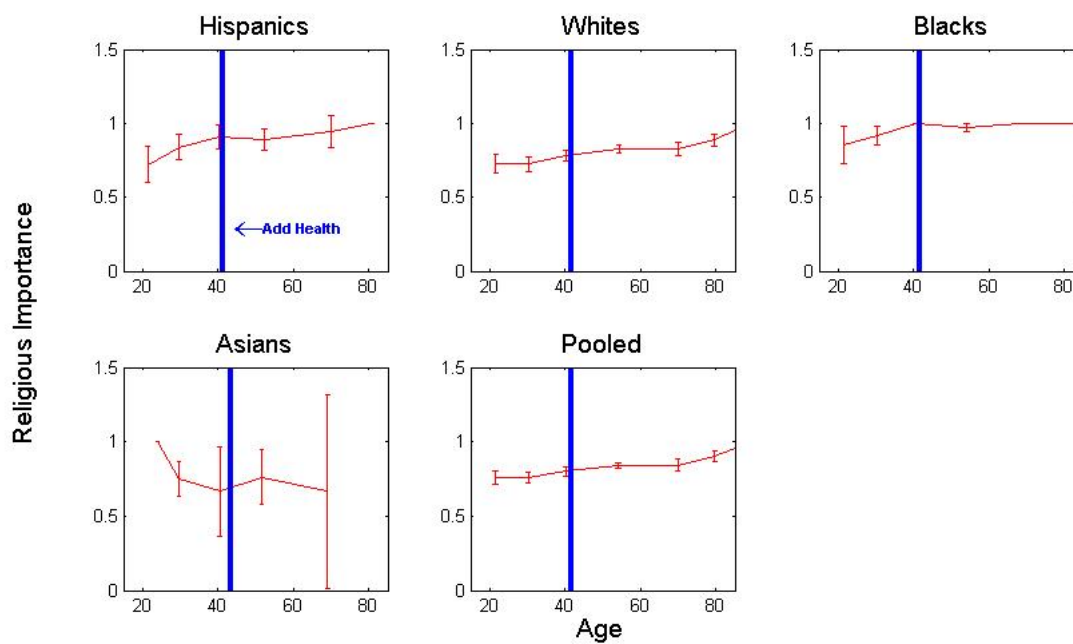


Figure 13: Average religious importance by age groups and ethnic groups for a nationally representative sample of adults using data from Exploring Religious America, 2002. Blue bar corresponds to the average age for parents of each ethnic group in the first wave of information of the Add Health Survey.

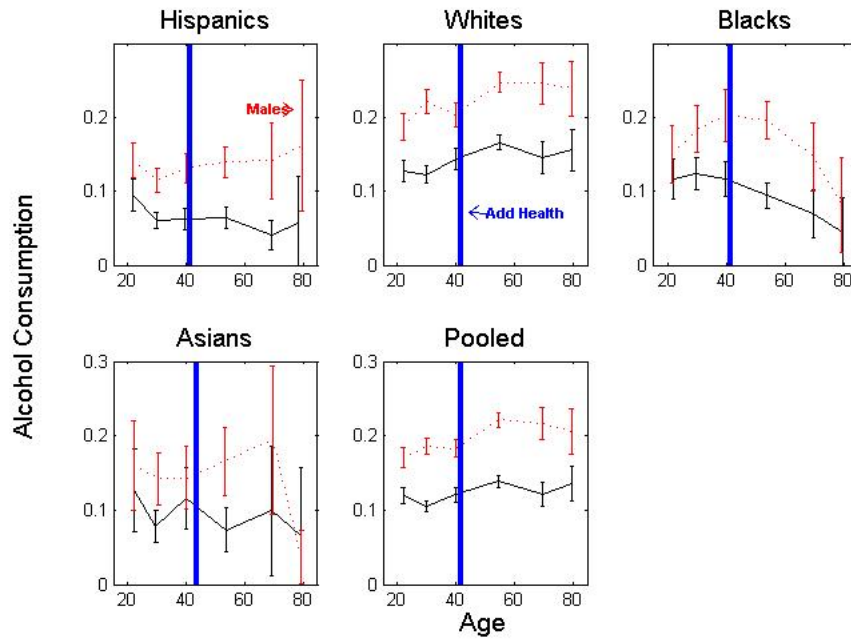


Figure 14: Average frequency of alcohol consumption by age, gender and ethnic groups for a nationally representative sample of adults using data from the National Health Interview Survey, 2010. Blue bar corresponds to the average age for parents of each ethnic group in the first wave of information of the Add Health Survey.

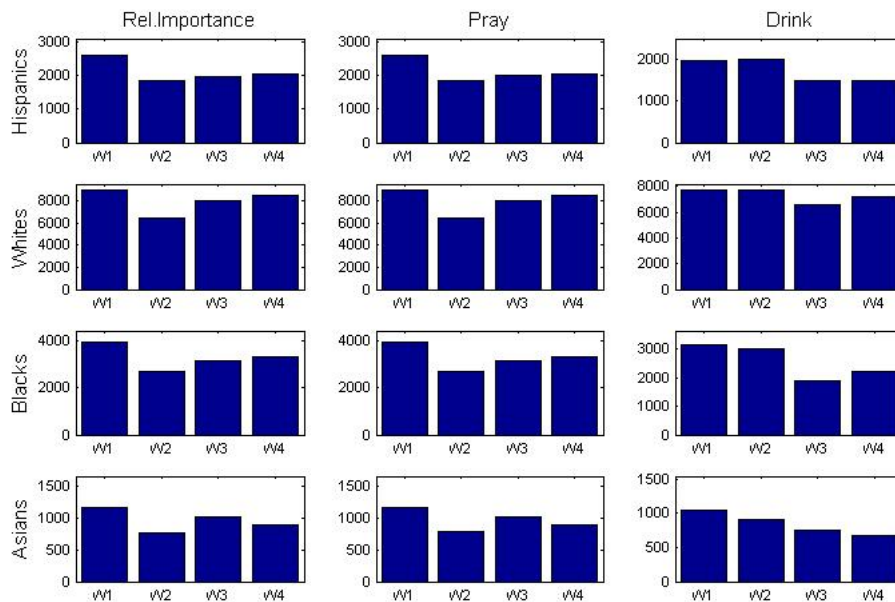


Figure 15: Number of valid responses for each dependent variables across waves of information and ethnic groups.

Table 5: Description of Control Variables

Variables	Description	Min	Max	Mean	Median	Nobs
age	Age	11	20	15.16799	15	20257
female_w1	Female Dummy	0	1	0.503996	1	20270
attract_w1	Interviewer subjective assessment: Attractive	1	4	2.757251	3	20272
persona_w1	Interviewer subjective assessment: Personality	1	5	3.576834	3	20245
physmat_w1	Interviewer subjective assessment: Physically Mature	1	5	3.380879	3	20240
build1	Type of dwelling: detached single-family house	0	1	0.740627	1	20272
build2	Type of dwelling: Mobile home-trailer	0	1	0.057123	0	20272
build3	Type of dwelling: Single-family row-town house	0	1	0.057419	0	20272
street_w1	How well kept is the building where R lives	1	4	1.653619	1	19952
street2_w1	Description of immediate area or street	1	6	2.212068	2	20003
smokehh_w1	Were there signs of smoking at home?	0	1	0.206057	0	20009
drinkhh_w1	Signs of drinking at home	0	1	0.03675	0	20000
protestant	Dummy variable for protestant denomination	0	1	0.479821	0	19872
catholic	Dummy variable for catholic denomination	0	1	0.263688	0	19872
none	Dummy variable for atheist/agnostic denomination	0	1	0.124044	0	19872
phys_limit	Dummy for physical limitations	0	1	0.028163	0	20239
work_hrs	How many hours do you spend working for pay in a typical non-summer week?	0	140	7.706022	1	20059
adopted	Dummy variable for adopted respondent.	0	1	0.059921	0	14903
work_tp_m	What kind of work does she do?	1	16	8.348159	6	18954
work_mom	Does she work for pay?	0	1	0.907441	1	16087
home_mom	How often is she at home when you return from school?	0	5	2.630556	2	18988
warm_mom	Most of the time, your mother is warm and loving toward you	1	5	1.651758	2	19004
warm_dad	Most of the time, your father is warm and loving toward you.	1	5	1.890297	2	14129
indep_mom	Your mother encourages you to be independent	1	5	1.825121	2	18996
talk_mom	When you do something wrong that is important, your mother talks about it	1	5	1.905819	2	19006
number_chi	Which child are you the first, the second, or what?	1	15	2.077968	2	15904
quality_chi	You have a lot of good qualities	1	5	1.745171	2	20190
income_par	About how much total income, before taxes did your family receive in 1994?	0	999	45.80643	38	15002
bills_par	Do you have enough money to pay your bills?	0	1	0.809902	1	16765
welfare_par	Last month, did you or any member of your household receive (SS,SSI,AFDC,Food Stamps,Unemployment Compensations)	0	6	0.459295	0	16767
con1_urban	Contextual- Urban Rural Code for Block Group Residence	0	1	0.569679	1	20085
con1_dens	Contextual- Density (block level)	0	87.52	2.220804	1	20085
con1_wht	Contextual- Proportion White (block level)	0	1	0.724468	0.88	20074
con1_blk	Contextual- Proportion Black (block level)	0	1	0.172108	0.02	20074
con1_hisp	Contextual- Proportion Hispanic (block level)	0	1	0.114762	0.02	20074
con1_age	Contextual- Median Age (block level)	10.79	75.9	32.2822	31.53	20048
con1_pover	Contextual- Poverty Rate 1989 (block level)	0	0.86	0.143376	0.09	20072
con1_churc	Contextual- Church Adherents Per Capita (county level)	0.09	1.08	0.547831	0.55	20158
con1_incom	Contextual- Average Median HH Income (block level)	4999	148752	31560.01	30192	19421
con1_edu_hs	Contextual- Proportion Aged 18 Years and Over with No High School Diploma or Equivalency (block level)	0	0.93	0.285149	0.26	20067
con1_unemp	Contextual- Unemployment Rate (block level)	0	0.59	0.076507	0.06	19709

Table 6: Significance of Controls

	Religious Importance					Pray					Drink				
	H	W	B	A	P	H	W	B	A	P	H	W	B	A	P
age	Y	Y					Y			Y	Y		Y		
female_w1	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
attract_w1						Y						Y		Y	Y
persoa_w1		Y			Y			Y		Y		Y			Y
physmat_w1															
build1		Y					Y	Y							
build2			Y										Y		Y
build3	Y			Y								Y			
street_w1			Y	Y		Y	Y		Y	Y				Y	
street2_w1	Y			Y		Y			Y		Y	Y			Y
smokehh_w1		Y			Y		Y		Y	Y		Y			Y
drikhh_w1	Y			Y		Y		Y		Y				Y	Y
protestat	Y	Y		Y	Y		Y	Y	Y					Y	
catholic	Y	Y	Y	Y		Y		Y		Y				Y	
oe	Y	Y	Y	Y		Y	Y	Y							
phys_limit		Y					Y				Y				
work_hrs			Y								Y	Y		Y	Y
adopted	Y		Y		Y			Y			Y	Y	Y		Y
work_tp_m						Y	Y		Y	Y	Y	Y			Y
work_mom						Y	Y					Y		Y	Y
home_mom	Y					Y			Y		Y	Y	Y		Y
warm_mom									Y		Y				
warm_dad	Y	Y	Y	Y	Y	Y				Y	Y				Y
idep_mom						Y			Y					Y	
talk_mom	Y	Y	Y	Y	Y	Y	Y	Y		Y					
umber_chi		Y			Y	Y						Y			Y
quality_chi	Y	Y	Y		Y		Y	Y		Y	Y				
icome_par			Y	Y				Y	Y						
bills_par		Y							Y	Y					

Continued on next page

Table 6 – continued from previous page

	Religious					Pray					Drink				
	Importance														
	H	W	B	A	P	H	W	B	A	P	H	W	B	A	P
welfare_par		Y		Y	Y	Y								Y	Y
col_urba	Y											Y			
col_des								Y							
col_wht			Y			Y			Y	Y			Y		
col_blk			Y	Y		Y	Y			Y			Y		
col_hisp		Y						Y		Y					
col_age			Y					Y							
col_pover				Y					Y	Y					Y
col_churc	Y			Y					Y						
col_icom		Y					Y	Y							Y
col_edu_hs						Y				Y		Y			Y
col_uemp															Y

Notes: The table shows for each dependent variable in the first wave of information, significant regressors in ethnic group and pooled regressions with the following notation: *H*: Hispanics, *W*: Non-hispanic Whites, *B*: Non-Hispanic Blacks, *A*: Asians, *P*: Pooled sample.

Table 7: OLS Estimates for Pooled Data

Religious Importance				
	Wave 1	Wave 2	Wave 3	Wave 4
Parental	0.32 (0.0232)	0.327 (0.0243)	0.253 (0.0221)	0.245 (0.0254)
Peer	0.73 (0.0293)	0.795 (0.0508)	0.754 (0.0624)	0.951 (0.0755)
Nobs	5177	4341	3763	3833
R^2	0.2277	0.2296	0.2343	0.2509
Pray				
	Wave 1	Wave 2	Wave 3	Wave 4
Parental	0.24 (0.0166)	0.191 (0.0166)	0.268 (0.0218)	0.285 (0.0269)
Peer	0.824 (0.0368)	0.884 (0.0397)	1.03 (0.0853)	0.906 (0.0502)
Nobs	7657	6485	4261	5023
R^2	0.1591	0.1623	0.1942	0.195
Drink				
	Wave 1	Wave 2	Wave 3	Wave 4
Parental	0.014 (0.0091)	0.009 (0.0067)	0.041 (0.0133)	0.057 (0.0131)
Peer	0.986 (0.1186)	0.829 (0.0738)	0.793 (0.0756)	1.017 (0.0939)
Nobs	4521	4795	3644	4092
R^2	0.1059	0.06	0.1174	0.1068

Notes: OLS estimates of parental and peer effects using pooled data.

Table 8: Parental and Peer Effects Estimates - Graham and Hahn

	Wave 1												Wave 2												Wave 3												Wave 4											
	H				W				B				A				P				H				W				B				A				P											
Kellmpo	Parents	0.22	0.36	0.34	0.19	0.33	0.19	0.36	0.29	0.22	0.32	0.26	0.31	0.22	0.15	0.26	0.19	0.27	0.30	0.25	0.24	(0.035)	(0.017)	(0.044)	(0.048)	(0.015)	(0.04)	(0.021)	(0.034)	(0.063)	(0.015)	(0.05)	(0.019)	(0.048)	(0.051)	(0.016)	(0.037)	(0.023)	(0.04)	(0.055)	(0.018)							
	Peers	0.79	0.59	0.62	0.76	0.62	0.74	0.58	0.72	0.75	0.63	0.79	0.65	0.67	0.81	0.66	0.80	0.66	0.74	0.67	0.67	(0.037)	(0.046)	(0.067)	(0.077)	(0.04)	(0.073)	(0.057)	(0.041)	(0.085)	(0.047)	(0.048)	(0.105)	(0.074)	(0.053)	(0.046)	(0.057)	(0.041)	(0.089)	(0.053)	(0.053)							
	N_i	1157	4615	1201	490	6113	1094	3536	1874	367	6806	741	4293	1697	611	6692	1317	3285	1759	537	6028																											
	R^2	0.09	0.14	0.12	0.12	0.11	0.06	0.12	0.07	0.14	0.11	0.11	0.11	0.11	0.07	0.10	0.07	0.10	0.06	0.12	0.10																											
	N_b	93	124	85	64	125	92	123	97	51	132	80	125	92	69	132	95	122	96	65	132																											
R^2	0.82	0.86	0.89	0.82	0.86	0.81	0.83	0.85	0.87	0.82	0.75	0.85	0.81	0.81	0.84	0.81	0.88	0.85	0.85	0.85																												
Pray	Parents	0.22	0.25	0.20	0.17	0.23	0.16	0.20	0.22	0.09	0.19	0.21	0.26	0.22	0.32	0.24	0.29	0.32	0.20	0.15	0.27	(0.031)	(0.013)	(0.031)	(0.047)	(0.011)	(0.034)	(0.014)	(0.037)	(0.057)	(0.011)	(0.051)	(0.022)	(0.067)	(0.07)	(0.017)	(0.056)	(0.026)	(0.063)	(0.076)	(0.019)							
	Peers	0.75	0.64	0.70	0.76	0.72	0.73	0.73	0.72	0.90	0.71	0.75	0.66	0.71	0.58	0.70	0.71	0.69	0.82	0.79	0.67	(0.042)	(0.05)	(0.067)	(0.077)	(0.029)	(0.078)	(0.042)	(0.067)	(0.063)	(0.045)	(0.073)	(0.065)	(0.12)	(0.143)	(0.053)	(0.073)	(0.05)	(0.063)	(0.12)	(0.058)							
	N_i	1564	6105	2105	573	9350	1365	4807	1369	384	9713	1274	4934	1419	580	10922	1282	4033	1599	516	9464																											
	R^2	0.09	0.10	0.05	0.08	0.09	0.08	0.08	0.05	0.11	0.07	0.08	0.08	0.08	0.05	0.06	0.07	0.08	0.07	0.13	0.08																											
	N_b	99	125	96	66	132	94	125	88	53	132	97	127	91	66	132	87	124	94	66	132																											
R^2	0.77	0.78	0.73	0.75	0.77	0.69	0.58	0.60	0.78	0.69	0.77	0.78	0.78	0.78	0.80	0.80	0.84	0.82	0.83	0.84																												
Drink	Parents	0.03	0.01	0.01	0.04	0.02	0.00	0.02	0.01	0.02	0.01	0.05	0.04	0.01	0.08	0.04	0.06	0.07	0.03	0.09	0.07	(0.025)	(0.009)	(0.021)	(0.027)	(0.008)	(0.018)	(0.008)	(0.016)	(0.034)	(0.007)	(0.024)	(0.011)	(0.041)	(0.035)	(0.011)	(0.035)	(0.012)	(0.025)	(0.045)	(0.011)							
	Peers	0.79	0.92	0.91	0.82	0.88	1.00	0.73	0.79	0.62	0.74	0.88	0.81	0.96	0.57	0.77	0.69	0.64	0.92	0.59	0.69	(0.169)	(0.072)	(0.169)	(0.139)	(0.09)	(0.324)	(0.188)	(0.471)	(0.784)	(0.197)	(0.065)	(0.084)	(0.159)	(0.297)	(0.116)	(0.237)	(0.157)	(0.324)	(0.123)	(0.123)							
	N_i	900	4517	836	448	6283	1041	3902	820	418	5511	793	4153	414	430	4651	577	4276	997	310	5672																											
	R^2	0.11	0.07	0.01	0.08	0.06	0.07	0.04	0.02	0.08	0.03	0.06	0.08	0.08	0.07	0.07	0.09	0.06	0.06	0.09	0.06																											
	N_b	86	118	82	54	125	87	124	84	60	132	88	123	71	61	131	80	123	92	55	132																											
R^2	0.46	0.62	0.57	0.45	0.56	0.50	0.54	0.49	0.65	0.56	0.46	0.52	0.65	0.59	0.56	0.43	0.52	0.49	0.65	0.43																												

Notes: School cluster-robust standard errors in parenthesis. Each column displays estimated parental and peer effects (α_p, α_e) for separate ethnic group and pooled regressions with the following notation: Hispanics (H), Whites (W), Blacks (B), Asians (A), Pooled (P) and each wave of information using Graham and Hahn's procedure as explained in the text. Samples sizes for within (N_{it}) and between (N_b) regressions and corresponding R^2 are also included. All results include controls.

Table 9: Sum of Parental and Peer Effects

Religious Importance					
	Hispanics	Whites	Blacks	Asians	Pooled
Wave 1	1.0325 (0.0018)	1.051 (0.0021)	1.0615 (0.0053)	1.0207 (0.0185)	1.0492 (0.003)
Wave 2	1.0393 (0.0116)	1.0708 (0.0031)	1.0643 (0.0012)	1.0394 (0.009)	1.0631 (0.0022)
Wave 3	1.0473 (0.009)	1.08 (0.0023)	1.087 (0.0193)	1.0181 (0.0186)	1.0798 (0.0049)
Wave 4	1.0634 (0.0005)	1.093 (0.0059)	1.1429 (0.006)	1.0644 (0.0156)	1.0973 (0.0055)
Pray					
	Hispanics	Whites	Blacks	Asians	Pooled
Wave 1	0.9777 (0.0033)	0.9791 (0.0051)	0.9681 (0.0126)	0.9639 (0.0264)	0.9754 (0.0023)
Wave 2	0.9791 (0.0182)	0.9741 (0.0049)	0.9656 (0.0078)	0.9905 (0.0032)	0.9732 (0.0065)
Wave 3	1.048 (0.0053)	1.0775 (0.0047)	1.1298 (0.0191)	1.0666 (0.0177)	1.0901 (0.0031)
Wave 4	1.0924 (0.0007)	1.1368 (0.0004)	1.1837 (0.0051)	1.083 (0.0392)	1.1411 (0.0033)
Drink					
	Hispanics	Whites	Blacks	Asians	Pooled
Wave 1	0.7579 (0.1231)	0.8557 (0.0426)	1.0633 (0.1217)	0.7729 (0.1004)	0.8635 (0.0455)
Wave 2	0.805 (0.1973)	0.7833 (0.0868)	0.6506 (0.2686)	0.717 (0.2858)	0.7803 (0.0809)
Wave 3	0.9573 (0.0291)	0.9329 (0.0357)	0.9713 (0.0815)	0.9175 (0.1721)	0.9335 (0.0485)
Wave 4	0.9419 (0.1369)	0.9011 (0.0451)	0.9448 (0.0352)	0.8698 (0.1314)	0.8981 (0.0338)

Notes: Sum of parental and peer effects and cluster-robust (bootstrapped) standard errors (in parenthesis). Controls included.

Table 10: Robustness

	Religious Importance				Pray				Drink			
	Wave 1	Wave 2	Wave 3	Wave 4	Wave 1	Wave 2	Wave 3	Wave 4	Wave 1	Wave 2	Wave 3	Wave 4
	Female											
Parental	0.074 (0.033)	0.01 (0.033)	0.096 (0.037)	0.071 (0.032)	0.044 (0.021)	0.065 (0.022)	0.113 (0.025)	0.099 (0.032)	0.001 (0.013)	-0.013 (0.011)	0.00 (0.019)	-0.001 (0.019)
Peer	-0.087 (0.038)	-0.011 (0.039)	-0.114 (0.043)	-0.097 (0.045)	-0.052 (0.024)	-0.101 (0.034)	-0.143 (0.031)	-0.123 (0.04)	-0.011 (0.11)	0.221 (0.178)	0.00 (0.117)	0.005 (0.087)
	Female × Mother											
Parental	0.081 (0.032)	0.045 (0.035)	0.111 (0.036)	0.083 (0.032)	0.042 (0.021)	0.058 (0.022)	0.115 (0.025)	0.126 (0.03)	0.00 (0.012)	-0.01 (0.01)	0.00 (0.018)	0.009 (0.018)
Peer	-0.095 (0.037)	-0.052 (0.04)	-0.131 (0.043)	-0.114 (0.044)	-0.05 (0.024)	-0.091 (0.035)	-0.144 (0.031)	-0.155 (0.037)	0.00 (0.101)	0.166 (0.175)	-0.002 (0.113)	-0.042 (0.085)
	Neighborhood											
Parental	0.08 (0.034)	0.092 (0.032)	0.104 (0.034)	0.103 (0.033)	0.00 (0.02)	0.009 (0.022)	0.009 (0.028)	0.057 (0.031)	0.046 (0.013)	-0.008 (0.01)	-0.039 (0.017)	-0.022 (0.018)
Peer	-0.094 (0.04)	-0.108 (0.037)	-0.123 (0.041)	-0.141 (0.045)	0.00 (0.024)	-0.014 (0.034)	-0.012 (0.035)	-0.07 (0.038)	-0.377 (0.107)	0.126 (0.165)	0.245 (0.106)	0.102 (0.085)

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Table 10 – continued from previous page

	Religious Importance				Pray				Drink			
	Wave 1	Wave 2	Wave 3	Wave 4	Wave 1	Wave 2	Wave 3	Wave 4	Wave 1	Wave 2	Wave 3	Wave 4
	Move Old											
Parental	0.054 (0.032)	0.053 (0.035)	0.06 (0.036)	-0.023 (0.034)	-0.024 (0.022)	0.003 (0.022)	0.032 (0.028)	0.037 (0.032)	-0.001 (0.015)	-0.004 (0.009)	-0.004 (0.017)	0.066 (0.02)
Peer	-0.063 (0.038)	-0.062 (0.041)	-0.071 (0.043)	0.032 (0.047)	0.028 (0.026)	-0.004 (0.034)	-0.04 (0.035)	-0.046 (0.039)	0.012 (0.12)	0.07 (0.157)	0.025 (0.106)	-0.307 (0.093)
	Move Happy											
Parental	-0.024 (0.039)	0.00 (0.042)	-0.02 (0.048)	-0.003 (0.049)	-0.013 (0.026)	0.004 (0.028)	0.067 (0.039)	0.019 (0.04)	0.028 (0.023)	0.002 (0.014)	0.044 (0.024)	-0.04 (0.026)
Peer	0.028 (0.045)	0.001 (0.048)	0.024 (0.056)	0.004 (0.068)	0.015 (0.031)	-0.006 (0.044)	-0.084 (0.05)	-0.024 (0.049)	-0.231 (0.189)	-0.037 (0.237)	-0.275 (0.149)	0.186 (0.122)
	Small School											
Parental	0.076 (0.056)	0.022 (0.06)	0.018 (0.05)	-0.031 (0.059)	-0.114 (0.021)	-0.038 (0.026)	-0.056 (0.042)	-0.096 (0.045)	0.046 (0.017)	-0.021 (0.014)	0.04 (0.027)	0.013 (0.026)
Peer	-0.089 (0.072)	-0.025 (0.076)	-0.021 (0.066)	0.042 (0.089)	0.135 (0.04)	0.06 (0.056)	0.071 (0.063)	0.119 (0.064)	-0.372 (0.254)	0.358 (0.514)	-0.252 (0.229)	-0.059 (0.00)

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Table 10 – continued from previous page

	Religious Importance				Pray				Drink			
	Wave 1	Wave 2	Wave 3	Wave 4	Wave 1	Wave 2	Wave 3	Wave 4	Wave 1	Wave 2	Wave 3	Wave 4
	Large School											
Parental	-0.05 (0.029)	-0.017 (0.026)	0.002 (0.039)	0.036 (0.025)	0.041 (0.026)	0.032 (0.027)	0.047 (0.021)	0.07 (0.03)	0.00 (0.01)	0.013 (0.007)	0.022 (0.016)	0.042 (0.014)
Peer	0.059 (0.038)	0.02 (0.034)	-0.003 (0.05)	-0.049 (0.04)	-0.049 (0.035)	-0.049 (0.047)	-0.059 (0.032)	-0.087 (0.041)	0.00 (0.139)	-0.218 (0.265)	-0.139 (0.133)	-0.195 (0.00)
	Attractive											
Parental	-0.024 (0.036)	0.002 (0.035)	0.028 (0.037)	0.017 (0.033)	0.019 (0.02)	-0.019 (0.024)	0.008 (0.027)	0.06 (0.033)	0.009 (0.017)	0.004 (0.01)	-0.032 (0.02)	0.012 (0.02)
Peer	0.028 (0.042)	-0.003 (0.041)	-0.034 (0.044)	-0.024 (0.045)	-0.022 (0.024)	0.03 (0.037)	-0.01 (0.034)	-0.074 (0.04)	-0.073 (0.134)	-0.066 (0.17)	0.198 (0.122)	-0.055 (0.091)
	Popular											
Parental	-0.026 (0.042)	-0.068 (0.041)	-0.056 (0.042)	-0.164 (0.042)	-0.004 (0.027)	-0.096 (0.027)	0.081 (0.038)	0.008 (0.04)	-0.005 (0.018)	0.012 (0.013)	-0.016 (0.022)	0.002 (0.028)
Peer	0.03 (0.05)	0.079 (0.048)	0.066 (0.05)	0.226 (0.058)	0.005 (0.032)	0.149 (0.042)	-0.102 (0.048)	-0.01 (0.049)	0.044 (0.146)	-0.196 (0.22)	0.102 (0.138)	-0.01 (0.132)

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Table 10 – continued from previous page

	Religious Importance				Pray				Drink			
	Wave 1	Wave 2	Wave 3	Wave 4	Wave 1	Wave 2	Wave 3	Wave 4	Wave 1	Wave 2	Wave 3	Wave 4
	Independent											
Parental	-0.042 (0.032)	-0.014 (0.032)	-0.119 (0.036)	-0.094 (0.032)	-0.026 (0.021)	-0.016 (0.023)	-0.098 (0.027)	-0.041 (0.028)	0.022 (0.014)	-0.003 (0.01)	0.004 (0.017)	-0.048 (0.019)
Peer	0.049 (0.038)	0.016 (0.037)	0.14 (0.043)	0.129 (0.045)	0.031 (0.025)	0.025 (0.035)	0.123 (0.033)	0.051 (0.035)	-0.176 (0.115)	0.045 (0.168)	-0.024 (0.109)	0.226 (0.09)
	Adopted											
Parental	0.131 (0.136)	0.162 (0.162)	-0.223 (0.129)	-0.179 (0.185)	-0.037 (0.051)	-0.019 (0.093)	-0.103 (0.12)	-0.248 (0.083)	-0.058 (0.042)	-0.01 (0.033)	0.045 (0.049)	-0.077 (0.05)
Peer	-0.154 (0.159)	-0.189 (0.189)	0.264 (0.153)	0.246 (0.254)	0.044 (0.061)	0.03 (0.144)	0.129 (0.15)	0.306 (0.103)	0.473 (0.338)	0.166 (0.548)	-0.279 (0.304)	0.357 (0.231)
	Quarter of Birth											
Parental	0.057 (0.047)	0.112 (0.041)	0.083 (0.049)	-0.003 (0.036)	0.001 (0.024)	-0.02 (0.028)	0.002 (0.03)	-0.013 (0.037)	-0.012 (0.015)	0.021 (0.012)	0.004 (0.02)	0.03 (0.023)
Peer	-0.067 (0.055)	-0.13 (0.048)	-0.098 (0.058)	0.004 (0.049)	-0.001 (0.028)	0.031 (0.043)	-0.002 (0.038)	0.016 (0.045)	0.1 (0.122)	-0.344 (0.207)	-0.025 (0.127)	-0.138 (0.107)

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Table 10 – continued from previous page

	Religious Importance				Pray				Drink			
	Wave 1	Wave 2	Wave 3	Wave 4	Wave 1	Wave 2	Wave 3	Wave 4	Wave 1	Wave 2	Wave 3	Wave 4
					Only Child							
Parental	-0.326 (0.00)	-0.319 (0.00)	-0.27 (0.00)	-0.248 (0.00)	-0.029 (0.027)	-0.194 (0.00)	-0.261 (0.00)	-0.05 (0.037)	-0.014 (0.00)	0.015 (0.016)	0.013 (0.022)	0.035 (0.028)
Peer	0.309 (0.032)	0.3 (0.032)	0.246 (0.033)	0.256 (0.038)	0.034 (0.032)	-0.026 (0.042)	0.063 (0.034)	0.062 (0.046)	-1.786 (0.303)	-0.253 (0.275)	-0.081 (0.137)	-0.164 (0.131)
					Older Child							
Parental	0.024 (0.033)	0.058 (0.034)	0.093 (0.039)	0.065 (0.034)	0.014 (0.021)	0.014 (0.022)	0.093 (0.026)	0.085 (0.031)	-0.01 (0.013)	-0.013 (0.01)	0.013 (0.018)	-0.034 (0.021)
Peer	-0.029 (0.038)	-0.068 (0.04)	-0.11 (0.046)	-0.09 (0.047)	-0.017 (0.024)	-0.021 (0.035)	-0.117 (0.033)	-0.104 (0.038)	0.084 (0.109)	0.222 (0.162)	-0.08 (0.112)	0.156 (0.096)

Notes: Differences in parental and peer effects across robustness scenarios, as described in text, along with bootstrapped standard errors for the difference (in parenthesis). All estimates have been rounded to the fourth decimal place. Specification includes controls.

Comparative Statics: Simulation Results

In this Appendix we solve the model numerically for different parametrizations to show several comparative static results that are difficult to get analytically. Our first result is related to the following partial derivative

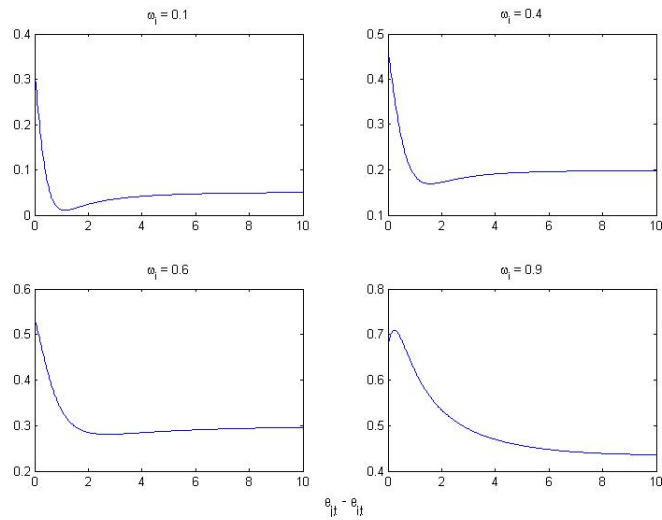
$$\frac{\partial e_{i,t+1} - e_{i,t}}{\partial(\tilde{e}_{-i,t} - e_{i,t})} = (1 - \gamma_{ii,t+1}) - (\tilde{e}_{-i,t} - e_{i,t}) \frac{\partial \gamma_{ii,t+1}}{\partial(\tilde{e}_{-i,t} - e_{i,t})} \quad (30)$$

In Figures (16) and (17) we plot numerical partial derivatives as function of the parental differences $e_{-i,t} - e_{i,t}$ for four different plausible population shares. In order to do so we solve numerically the parental socialization problem

$$\max_{\alpha_{i,t+1} \in [0,1]} -\kappa(e_{i,t} - e_{i,t+1}^*(\alpha_{i,t+1}))^2 - c(\alpha_{i,t+1})$$

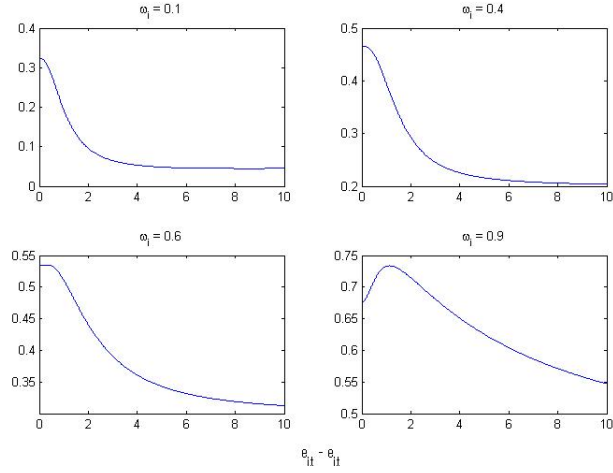
assuming $\kappa = 1$ and assuming $c(\alpha) = 0.5k\alpha^2$, with $k = 1$. Recall that for fixed $A_t = \kappa(\tilde{e}_{-i,t} - e_{i,t})^2$ smaller values of k make the marginal cost of exerting a larger socialization effort relatively smaller, which itself implies that parental best-reply functions will be monotonic increasing. By assuming a larger value of k we are in effect assuming a larger deviation from the pure-selfishness assumption used for parents.

Figure 16: $\frac{\partial(e_{i,t+1} - e_{i,t})}{\partial(e_{i,t} - e_{j,t})}$: case $(e_{i,t} - e_{j,t}) > 0$



Figures (18) and (19) plot estimated second partial derivatives making the same parametric assumptions, but considering a different set of population shares. Our selection is motivated by the fact that these are better approximations of actual population shares in our data, and these

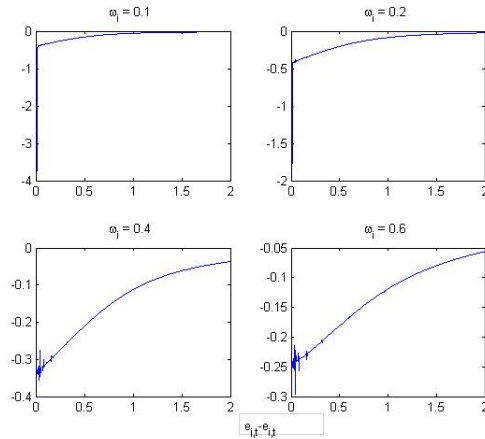
Figure 17: $\frac{\partial(e_{i,t+1}-e_{i,t})}{\partial(e_{i,t}-e_{j,t})}$: case $(e_{i,t} - e_{j,t}) < 0$



have an important effect on the sign of the effect. Importantly, the signs of these and the previous simulations do not depend crucially on the parameter values assumed for the cost function.⁶²

$$\frac{\partial^2(e_{i,t+1} - e_{i,t})}{\partial(\tilde{e}_{-i,t} - e_{i,t})^2} = -2 \frac{\partial \gamma_{ii,t+1}}{\partial(\tilde{e}_{-i,t} - e_{i,t})} - (\tilde{e}_{-i,t} - e_{i,t}) \frac{\partial^2 \gamma_{ii,t+1}}{\partial(\tilde{e}_{-i,t} - e_{i,t})^2}$$

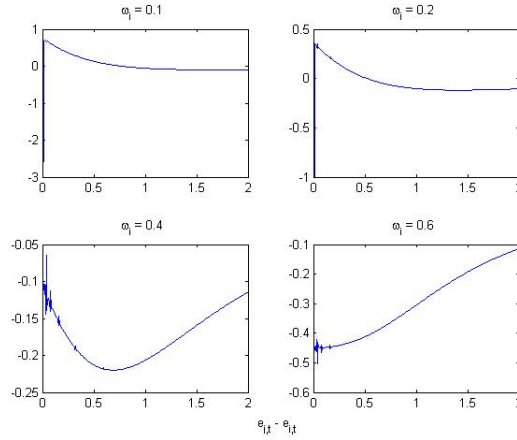
Figure 18: $\frac{\partial^2(e_{i,t+1}-e_{i,t})}{\partial(e_{i,t}-e_{j,t})^2}$: case $(e_{i,t} - e_{j,t}) > 0$



We now turn to the effects that the own ethnic group's population share ω_i has on the parental-child deviations. In Figures (20)-(21) the second partial derivative of parental-child differences with respect to the population shares, for different parameter values of k in the cost

⁶²Matlab programs available upon request.

Figure 19: $\frac{\partial^2(e_{i,t+1}-e_{i,t})}{\partial(e_{i,t}-e_{j,t})^2}$: case $(e_{i,t} - e_{j,t}) < 0$



function, for the the cases where $(e_{j,t} - e_{i,t})$ is positive and negative, respectively. Analytically, this can be found by differentiating the following equation with respect to group i 's population share:

$$\frac{d(e_{i,t+1} - e_{i,t})}{d\omega_i} = -(e_{j,t} - e_{i,t}) \left(\frac{\partial \gamma_{i,t+1}}{\partial \omega_i} + \frac{\partial \gamma_{i,t+1}}{\partial \alpha_i} \frac{\partial \alpha_i}{\partial \omega_i} + \frac{\partial \gamma_{i,t+1}}{\partial \alpha_j} \frac{\partial \alpha_j}{\partial \omega_i} \right)$$

As both figures show, departures from the pure-selfishness assumption (larger k 's) generate a wider variation in the sign of the second partial derivative. In particular, a unique sign is consistent only with a small k , and the larger the deviation the wider the range over the population shares where there is a change in sign. Also important is the fact that for a large subset of possible population shares, the second partial derivative is close to zero.

Figure 20: $\frac{\partial^2(e_{i,t+1}-e_{i,t})}{\partial \omega_i^2}$: case $(e_{j,t} - e_{i,t}) > 0$

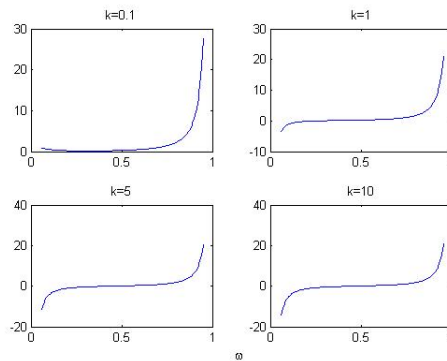


Figure 21: $\frac{\partial^2(e_{i,t+1}-e_{i,t})}{\partial\omega_i^2}$: case $(e_{j,t} - e_{i,t}) < 0$

