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Abstract

This paper develops and studies a tough love model of intergenerational altruism. We model tough love by modifying the Barro-Becker standard altruism model in two ways. First, the child's discount factor is endogenously determined, so that low consumption at young age leads to a higher discount factor later in her life. Second, the parent evaluates the child's lifetime utility with a constant high discount factor. The tough love model predicts that transfers from the parent will fall when the child's discount factor falls. This is in contrast with the predictions of the standard altruism model that transfers from parents are independent of exogenous changes in the child's discount factor.

I Introduction

How different generations are connected is an important economic issue with implications for individual economic behavior like savings, investment in human and physical capital and bequests which in turn affect aggregate savings and growth. It also has nontrivial policy implications as in Barro (1974), who

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has found that there will be no net wealth effect of a change in government debt in the standard altruism model. Infinite horizon dynamic macro models are typically based on the standard altruism model proposed by Barro (1974) and Becker (1974) in which the current generation derives utility from its own consumption and the utility level attainable by its descendant.

A striking implication of the standard altruism model is that when the child becomes impatient, transfers from the parent to the child do not change when the child is borrowing constrained as we will show in Section III. This implication of the model is not consistent with recent empirical evidence on pecuniary and non-pecuniary parental punishments (see Weinberg (2001), Hao, Hotz, and Jin (2008), and Bhatt (2008) for empirical evidence). For example, imagine that a child befriends a group of impatient children and suddenly becomes impatient because of their influence. As a result the child starts to spend more time playing with the new friends and less time studying. In worse cases, the child starts to smoke, drink, or consume illegal drugs (see Ida and Goto (2009) for empirical evidence that shows association of low discount factor and smoking). At least some parents are likely to respond by pecuniary punishments such as lowering allowances or non-pecuniary punishments such as grounding.

This paper modifies the standard model so that it implies that the parent lowers transfers to the child when the child exogenously becomes impatient under a wide range of reasonable parameters. For this purpose, this paper develops and studies a *tough love* model of intergenerational altruism, in which the parent is purely altruistic to the child, but exhibits tough love: he allows the child to suffer in the short run with the intent of helping the child in the long run.

We model parental tough love by combining the two ideas that have been studied in the literature in various contexts. First, the child's discount factor is endogenously determined, so that low consumption at young age leads to a higher discount factor later in her life. This is based on the endogenous discount factor models of Uzawa (1968) except that the change in the discount factor is immediate in Uzawa's formulation whereas a spoiled child with high consumption progressively grows to become impatient in our formulation. Recent theoretical models that adopt the Uzawa-type formulation include Schmitt-Grohé and Uribe (2003) and Choi, Mark, and Sul (2008). Second, the parent evaluates the child's lifetime utility function with a constant discount factor that is higher than that of the child. Since the parent is the social planner in our simple model, this feature is related to recent mod-

els (see Caplin and Leahy (2004); Sleet and Yeltekin (2005), (2007); Phelan (2006), and Farhi and Werning (2007)) in which the discount factor of the social planner is higher than that of the agents.

An argument for plausibility of endogenous discounting can be found in Becker and Mulligan (1997). They model an individual whose discount factor depends on the remoteness or vividness of imagined future pleasures. For the direction of the effect of wealth on the discount factor, this argument can be used to support both the direction of Fisher's (1930) conjecture that poor people are less patient (p.72) and the direction of Uzawa's model that poor people are more patient. Becker and Mulligan's model involves investment in human capital (which they call future-oriented capital) to increase vividness of the imagination. Because richer people tend to invest more, their model typically implies that poorer people are less patient. On the other hand, if a child experiences low consumption, it should be easier for the child to more vividly imagine future misery. This argument implies that a child who experiences low consumption will tend to grow more patient. The child may experience low consumption either because the parent is poor or because the parent is concerned about spoiling the child. In our review of empirical evidence in the next section, we find mixed evidence for both directions which seem to imply that both of these forces are working in reality. For the purpose of our paper, we abstract from the human capital aspect and adopt the formulation that a child who is spoiled by high consumption in childhood grows to be less patient.

Turning to the plausibility of the parent using a higher discount factor than the child, an extreme case is a parent with a newborn baby. When the baby is born, it is very impatient and cries for food all the time but the parent does not give in to this persistent demand of the baby. This is likely because the parent evaluates the baby's utility over its lifetime with a higher discount factor as compared to the baby's very low discount factor. We think that it is likely that many parents continue to evaluate their children's lifetime utility when they are no longer babies. Mischel's (1961) results that we mention in the next section are consistent with our view. Parents may continue to do this until children learn to be as patient as their parents.

In our model, these two features (endogenous discount factor of the child and the parent's evaluation with a high discount factor) lead the parent to exhibit tough love behavior in which the parent takes into account the influence of the amount of income transfer to the child on the child's discount factor.

As a model of parental punishments, our model is related to Weinberg's (2001) model. Weinberg's model is a static incentive model based on asymmetric information, while our model is a dynamic model without any uncertainty. The parent in Weinberg's model does not affect the child's preferences, while the parent in our model takes actions with the explicit intent to affect the child's discount factor.

In many recent theoretical contributions, preferences of children are not exogenous, but are shaped by the attitudes and actions of their parents and/or other role models. In the literature on cultural transmission of preferences, Bisin and Verdier (2001) proposed a general model with endogenous cultural transmission mechanisms wherein parents take actions to affect children's traits, which as a special case can correspond to time preferences. In some other models, parents affect children's preferences, but do not take actions with an intention to affect children's preferences. For example, Fernandez, Fogli and Olivetti (2004) used a dynamic model where mothers who work play an important role in the transmission of attitudes favoring the participation of women in the labor force to their sons. We will further discuss this issue by presenting empirical evidence for parents role in children's endogenous preference formation in the next section.

We focus on the role of the parent in molding the time preference of the child. Our model is closely related to Akabayshi's (2006) and Doepke and Zilibotti's (2008) model in that the parent takes actions in order to affect the child's discount factor in these models. The main difference from our model is that these authors adopt a Becker-Mulligan (1997) type formulation of endogenous discounting so that the child becomes more patient when her human capital is higher. In contrast, we adopt an Uzawa-type formulation for our model. In Akabayashi's model, the child has endogenous discounting and the parent evaluates the child's lifetime utility with a fixed discount factor. Together with asymmetric information about the child's ability, Akabayashi's model can explain abusive repeated punishments by parents under certain parameter configurations. In Doepke and Zilibotti's model, the parent uses the child's discount factor to evaluate the child's lifetime utility. They use their model of occupational choice to account for a number of observations about the British Industrial Revolution. We present a review of the related empirical evidence for endogenous discounting in the next section.

The remainder of the paper is organized as follows. Section II reviews the empirical evidence related to the key assumptions of the tough love model. Section III explains the structure and main findings of the tough love model

with only a consumption good and contrasts the implications of the model with those of the standard altruism model. Section IV proposes two alternative models of altruism in order to show that both features discussed above(endogenous discount factor of the child and the parent's evaluation with a high discount factor) are necessary in order for transfers to decrease when the child exogenously becomes impatient for a wide range of parameters. Section V discusses whether or not there is a sense in which the child is indeed better off with tough love. Section VI introduces leisure in the tough love model and section VII concludes.

II A Review of Empirical Evidence

In this section, we review empirical evidence related to the key assumptions in the tough love model.

Our first question is whether or not there is empirical evidence for parents' behavior influencing their children's discount factors as well as other economic preferences and attitudes. One type of evidence on the effect of parents' actions on a child's economic attitudes and behavior is found in the recent literature on cultural transmission of preferences between parents and children. For example, Dohmen, Falk, Huffman and Sunde (2008) used German Socio-Economic Panel (SOEP) data and tested for intergenerational correlation in risk and trust attitudes. One of their main findings is that children develop similar attitudes toward risk and trust as their parents. Fernandez, Fogli and Olivetti (2004) found evidence for an important role of mothers in the transmission of attitudes favoring the participation of women in the labor force to their sons. Another type of evidence is found in the empirical literature of skill formation. Cunha, Heckman, Lochner and Masterov (2006) present a survey of empirical evidence from both the economics and the psychology literature. They divide skill formation into that for cognitive skills and that for non-cognitive skills. Non-cognitive skills include patience and time preferences. One of their main findings pertinent to the present discussion is that ability gaps in both cognitive and non-cognitive skills across individuals and across socioeconomic groups are strongly correlated with parental education and maternal ability; also, parenting practices have strong effects on the child's emotional development and motivation.

Our second question is whether or not there is direct empirical evidence that some parents take actions with an intention to affect children's pref-

erences. This issue has been addressed more directly in the psychology literature than in the economics literature. Baumrind (1966) identified three modes of parental control. The first mode is *permissive* where the parent acts as a resource to the child and does not actively involve himself in shaping the current as well as the future behavior of the child. The second mode is *authoritarian* where the parent uses a set standard of conduct which is theologically or religiously motivated and tries to shape and control the child's behavior with overt use of power. The third mode is *authoritative* where the parent actively involves himself in shaping the child's behavior and attitudes and uses reasoning and discipline to ensure a well rounded long run development of the child. He affirms the child's current behavior, separating right from wrong, and also sets standards for the child's future behavior. Carlson and Grossbart (1988) used survey data on the mothers of school going children (kindergarten through sixth grade) and divided them into groups based on the parenting style starting from neglecting all the way to rigidly controlling. They found evidence for authoritative parents granting less consumption autonomy to the child, greater communication with the child about consumption related issues, higher consumer socialization goals and greater monitoring of children's consumption vis-a-vis both permissive and authoritarian parents. More recently Webley and Nyhus (2006) used De Nederlandsche Bank household survey (DHS) data and found evidence to support the hypothesis that parental orientations have an effect on the economic behavior of the children as well as their respective economic behavior in adulthood. In Webley and Nyhus' analysis, they observed high degrees of association between children's savings and parental savings, household income and economic socialization of parents.

Our third question is whether or not there is evidence that parents affect children's time preferences. In the psychology literature, there is evidence in favor of the influence of parents in the development of children's willingness to delay rewards. Mischel (1961) studied children in the West Indian islands of Grenada and Trinidad. He found that the children of Grenada showed greater preference for a higher reward later than a smaller immediate reward when compared with the children of Trinidad. He also found that this difference is driven mainly by the critical role fathers played in handing down cultural values of thrift to the children of Grenada and those of immediate gratification to the children of Trinidad.

Because an important assumption of the tough love model is endogenous discounting, we now review empirical evidence for endogeneity of the discount

factor in this section. Becker and Mulligan (1997) cite empirical evidence for endogenous discounting. For the direction of a wealth effect on patience, evidence cited by Becker and Mulligan is in favor of Fisher's hypothesis that wealth causes people to be more patient rather than Uzawa's hypothesis that wealth causes people to be less patient.

It is necessary to be careful in evaluating the empirical evidence for endogenous discounting because of two problems. First, we have the endogeneity problem in that patient people with high discount factors tend to accumulate financial and human wealth. Thus we may find that rich people have higher discount factors than poor people even when the discount factor of an individual is decreasing in wealth as in Uzawa's model. Second, endogenous discounting and wealth-varying intertemporal elasticities of substitution (IES) (see Atkeson and Ogaki (1996)) can have similar implications in growing economies, and may be hard to distinguish from one another.

The endogeneity problem mentioned above is addressed in Ikeda, Ohtake, and Tsutsui (2005). In their paper, they found that without accounting for the possible endogeneity between discount factors and wealth the discount factor appears to be an increasing function of income/wealth. After taking the endogeneity problem in to consideration, they find evidence in favor of the discount factor decreasing in wealth.[1]

Another way to control for the endogeneity problem is to give different levels of consumption to the subjects before an experiment to see which subjects are more patient. Implementing this idea with human subjects is difficult so rats were used instead. The results were in favor of the view that the discount factor is decreasing in wealth as reported in Kagel, Battalio, Green (1995, Chapter 7, Section 3).

Using the Panel Study of Income Dynamics (PSID), Lawrance (1991) employed the Euler equation approach to estimate the endogenous discount factor model. In principle, her instrumental variable method should take care of the endogeneity problem. Lawrance found evidence in favor of the discount factor increasing in wealth. However, Ogaki and Atkeson (1997) point out that Lawrance did not allow the intertemporal elasticity of substitution (IES) to vary with wealth. Ogaki and Atkeson allow both the IES and the discount factor to vary with wealth for a panel data of households in Indian villages. They find evidence in favor of the view that the discount factor is constant

[1]They control the endogeneity problem by analyzing how the discount factor changes with the size of a prize obtained in another experiment.

and that the IES is increasing in wealth. It is possible that the discount factor is decreasing in wealth for richer households, but Lawrance found the opposite result because she did not allow the IES to change. Ogawa (1993) argues that his empirical results from Japanese aggregate data are consistent with a combination of Fisher's and Uzawa's hypotheses.

Overall, we think that the empirical evidence is consistent with the view that reality is best described by a combination of the two hypotheses. In our view, a child who experiences low consumption will grow to be more patient because she can more vividly imagine future misery. At the same time, a wealthier parent is more likely to make investment in human capital to help the child see the future more vividly. In this paper, we abstract from the effects of human capital investment on patience. This is for the purpose of developing a simple model in which transfers decrease when the child exogenously becomes impatient.

III A Consumption Good Economy

The main purpose of this section is to develop and analyze a model of altruism in which the parent's transfers decrease when the child exogenously becomes impatient. For this purpose, we modify the standard altruism model in two ways: the child's discount factor is endogenous in that higher consumption in her childhood causes her discount factor to be lower and the parent evaluates the child's lifetime utility with a high constant discount factor. The modified model is called the tough love altruism model. In order to gain clear understanding of the properties of the model, we consider the simplest setting for our purpose. We will compare the tough love model with the standard altruism model and with two other altruism models each of which modifies the standard altruism model in only one way rather than both ways at the same time.

Imagine a three-period model economy with two agents, the parent and the child. For simplicity we consider the case of a single parent and a single child. The three periods considered are childhood, work and retirement. The model has six features. First, the parent cares about his own consumption but is also altruistic toward the child. He assigns a weight of η to his own utility where $0 < \eta < 1$. The child on the other hand is a non-altruist and derives utility only from her own consumption stream $\{C_t\}_{t=1}^{3}$. Second, the life of the parent and the child overlap only in period 1. Third, transfers, T,

are made only in period 1.[2] Fourth, income of both the parent and the child is given exogenously. Fifth, the child is borrowing constrained in period 1. Lastly, there is no uncertainty in the economy. We will consider and compare four models in this economy.

Standard Altruism Model

We start our analysis with the standard altruism model. In this model, both the parent and the child use the same constant discount factor while evaluating the child's future utility. The parent's problem is,

$$\max_{T} \Bigg[\eta\ v(y_p - T) + (1-\eta)\Big[u(C_1^*) + \beta_2 u(C_2^*) + \beta_2\beta_3 u(R^2(y_1 + T + \frac{y_2}{R} - C_1^* - \frac{C_2^*}{R}))\Big]\Bigg], \tag{1}$$

subject to

$$C_1 = y_1 + T \tag{2}$$

and

$$\{C_1^*, C_2^*\} \equiv \arg\max_{C_1, C_2}\Big[u(C_1) + \beta_2 u(C_2) + \beta_2\beta_3 u(R^2(y_1 + T + \frac{y_2}{R} - C_1 - \frac{C_2}{R}))\Big]. \tag{3}$$

The following notation will be used: $u(C)$ and $v(C)$ are the standard concave utility functions of the parent and the child respectively. $\beta_{t,p}$ is the discount factor used by the parent to evaluate the child's future utility and $\beta_{t,k}$ is the discount factor used by the child in period t.[3] We denote the parent's income in period 1 by y_p. y_1 and y_2 represent the child's period 1 and period 2 income levels.[4] R is the gross nominal interest rate.

[2]We assume that transfers are made from the parent to the child and there are no reverse transfers.

[3]In this model we have $\beta_{t,p} = \beta_{t,k} = \beta_t$.

[4]For simplicity we assume the child gets no income in the last period of her life and simply consumes her savings from past periods.

We are interested in the case where the borrowing constraint is binding for the child and assume that the parameters are such that the constraint is binding. We substitute out the borrowing constraint faced by the child in period 1 and rewrite the parent's optimization problem as

$$\max_{T} \Bigg[\eta\, v(y_p - T) + (1-\eta)\Big[u(y_1 + T) + \beta_2 u(C_2^*) + \beta_2\beta_3 u(R(y_2 - C_2^*))\Big]\Bigg], \tag{4}$$

subject to

$$\{C_2^*\} \equiv \arg\max_{C_2} \Big[u(C_2) + \beta_3 u(R(y_2 - C_2))\Big]. \tag{5}$$

Let us focus on the child's optimization program. From the first order condition for the child's problem described in equation (5), we get:

$$u_{C_2}(C_2) - \beta_3 R u_{C_2}(R(y_2 - C_2)) = 0 \tag{6}$$

where,

$$u_x(x) \equiv \frac{\partial u(x)}{\partial x}.$$

Assuming that the utility function satisfies conditions for the implicit function theorem,[5] we can solve equation (6) for C_2 as a function of the model parameters and the state variables:

$$C_2^* = C_2(y_2, \beta_3, R). \tag{7}$$

The optimal period 2 consumption for the child is independent of the period 1 transfers of the parent and hence can be dropped from the parent's optimization program. Hence we can rewrite the parent's problem described by equations (4) and (5) as:

$$\max_{T} \Big[\eta\, v(y_p - T) + (1-\eta)u(y_1 + T)\Big]. \tag{8}$$

The first order condition for the above problem is given by,

[5] u(.) is continuously differentiable with a non zero *Jacobian*.

$$-\eta v_T(y_P - T) + (1-\eta)u_T(y_1 + T) = 0. \tag{9}$$

Again, using the implicit function theorem, we get,

$$T^* = T(y_P, y_1, \eta). \tag{10}$$

We consider comparative statics for exogenous changes in the discount factor of the child for the standard altruism model. Specifically we decrease the child's discount factor β_3 and observe how this rise in the child's impatience is accommodated by the parent in terms of a change in period 1 transfers. From equation (10) optimum period 1 transfers by the parent in the standard altruism model are in fact independent of the child's discount factor implying that an exogenous change in the child's discount factor will have no effect on the period 1 transfers made by the parent. Hence, parents with the standard altruism motive will not respond to increasingly impatient behavior of the child. As discussed in the introduction, this implication of the model does not seem consistent with data where we find that both pecuniary and non-pecuniary punishments are used by parents to influence their children's behavior and outcomes.

Tough Love Altruism

We propose a tough love altruism model that provides for a channel through which parents can influence the child's economic behavior. We introduce the tough love motive of the parent via asymmetric time preferences between generations and endogenous discounting. This model predicts that the transfer to the child in period 1 will decrease when the child's discount factor exogenously decreases for a wide range of parameters. In this model, the parent uses a constant and high discount factor to evaluate the child's lifetime utility while the child herself uses a discount factor which is endogenously determined as a decreasing function of her period 1 consumption:

$$\beta_{t,k}(C_1) \quad ; \quad \frac{\partial \beta_{t,k}}{\partial C_1} < 0.$$

With the borrowing constraint faced by the child in period 1, her discount factor is given by $\beta_{t,k}(y1 + T)$.

The underlying motivation for this type of endogeneity of the child's discount factor is the belief that the parent can spoil the child by giving her very high consumption during childhood, so that the child will grow to be a relatively impatient person. This in turn is motivated by the empirical evidence discussed in Section II and evidence in the child psychology literature discussed in the introduction.

Now, the parent optimizes by solving the following optimization problem,

$$\max_{T} \Bigg[\eta\ v(y_p - T) + (1-\eta)\Big[u(y_1 + T) + \beta_{2,p} u(C_2^*) + \beta_{2,p}\beta_{3,p} u(R(y_2 - C_2^*))\Big]\Bigg], \tag{11}$$

subject to

$$\{C_2^*\} \equiv \arg\max_{C_2}\ \Big[u(C_2) + \beta_{3,k}(y1 + T)u(R(y_2 - C_2))\Big]. \tag{12}$$

From the first order condition for the child's problem described in equation (12), we get

$$u_{C_2}(C_2) - \beta_{3,k}(y1 + T)Ru_{C_2}(R(y_2 - C_2)) = 0. \tag{13}$$

Using the implicit function theorem, we write the solution of (13) for C_2 as a function of the model parameters and the state variables.

$$C_2^* = C_2(y_2, \beta_{3,k}(y1 + T), R). \tag{14}$$

Unlike the standard altruism model, now the optimal period 2 consumption for the child is not independent of the first period transfers from the parent and hence cannot be dropped from the parent's optimization program. As a result we cannot use the methodology used for solving the parent's problem in the standard altruism model. In our tough love model there is no closed form solution to the parent's problem for any functional form for the utility function. Hence, we solve the problem described in equations (11)

and (12) numerically as a non linear root finding problem. For this purpose we impose the following parametrization:[6]

$$u(C) = v(C) = \frac{C^{1-\sigma}}{1-\sigma}. \tag{15}$$

The discount factor is given by,

$$\beta(y1+T) = \beta_0 + \frac{1}{1+a(y1+T)} \quad where \quad a > 0 \; and \; \beta_0 <= 0. \tag{16}$$

Hence, as the parameter β_0 decreases, at any given level of $y1$ and T, the discount factor falls, implying more impatient behavior on the part of the child.

We consider comparative statics for exogenous changes in the discount factor of the child in the tough love altruism model. For this purpose, we first solve the tough love model for the parametric specification given in (15) and (16) and a given set of model parameter values. This gives us the benchmark optimum transfers and consumption stream, $\{T^*, C_1^*, C_2^*, C_3^*\}$.

Consider an exogenous decrease in the child's discount factor. Formally, this is achieved by decreasing the preference parameter, β_0. The results for a given set of model parameter values are summarized in Table 1. The main finding of the simulation exercise is that there is a monotonic decline in period 1 transfers by parents to the child with a rise in the child's impatience as captured by the falling value of the parameter, β_0. As we observe from Table 1, period 1 transfers fall monotonically from 0.9989 to 0.7075 as we decrease the parameter, β_0, from 0.0 to -0.8. This is in sharp contrast to the comparative statics result for the standard altruism model in which the optimal period 1 transfers are independent of the child's discount factor. In the tough love model, the parent has the motive to make the growth rate of the child's consumption from period 2 to period 3 be more in line with the parent's high discount factor. We call this parental motive the tough love motive. The tough love motive works in the direction of lowering the transfer. When the child exogenously becomes impatient, the tough love motive intensifies, and the transfer decreases.

[6]Our simulation results are robust to alternative parametric specifications of the utility function and also to a wide range of model parameter values.

Table 1. Tough Love Altruism Model

Global Parameters

$\eta = 0.5$; $\sigma = 1.5$; $R = 1.2$;
$\beta_p = 1$; $y_1 = y_2 = 3$; $y_p = 5$; $a = 0.01$

Optimum	$\beta_0 = 0$	$\beta_0 = -0.4$	$\beta_0 = -0.6$	$\beta_0 = -0.8$
T^*	0.9989	0.9736	0.9273	0.7075
C_1^*	3.9989	3.9736	3.9273	3.7075
C_2^*	1.5651	1.8285	2.0295	2.3397
C_3^*	1.7218	1.4058	1.1646	0.7924
$\beta(C_1^*)$	0.9615	0.5618	0.3622	0.1643

Table 2 below presents the simulations with $\sigma < 1$. Again we find that transfers decline monotonically as we lower the child's discount factor by decreasing β_0.

Table 2. Tough Love Altruism Model

Global Parameters

$\eta = 0.5$; $\sigma = 0.7$; $R = 1.2$;
$\beta_p = 1$; $y_1 = y_2 = 3$; $y_p = 5$; $a = 0.01$

Optimum	$\beta_0 = 0$	$\beta_0 = -0.4$	$\beta_0 = -0.6$	$\beta_0 = -0.8$
T^*	0.9976	0.9449	0.8729	0.6829
C_1^*	3.9976	3.9449	3.8729	3.6829
C_2^*	1.4834	2.0342	2.3924	2.7725
C_3^*	1.8199	1.1589	0.7291	0.2730
$\beta(C_1^*)$	0.9616	0.5620	0.3627	0.1645

IV How important is Tough Love?

The main result of our tough love altruism model is that the parent will decrease transfers in response to an exogenous decrease in the child's discount factor. The tough love model modifies the standard altruism model in two ways. Do we need both of these modifications in order to obtain this result?

In order to answer this question, we analyze two alternative models of altruism. First, we modify the standard altruism model by assuming that the parent evaluates the child's lifetime utility by a higher discount factor than the child's. We however, do not introduce endogenous discounting in this model. This model is called the paternalistic altruism model. Second, we modify the standard altruism model by introducing endogenous discounting on the part of the child. However, we assume that the parent will use the child's endogenous discounting to evaluate the child's lifetime utility.

Paternalistic Altruism Model

In this model both the parent and the child use constant discount factors to evaluate future utility. However, unlike the standard altruism model, here the discount factor used by the parent is higher than the child's discount factor, i.e. $\beta_{t,p} > \beta_{t,k}$ where $\beta_{t,p}$ is the discount factor used by the parent to evaluate the child's future utility and $\beta_{t,k}$ is the discount factor used by the child in period t. The parent's problem is:

$$\max_{T} \Bigg[\eta v(y_p - T) + (1-\eta)\Big[u(y_1 + T) + \beta_{2,p} u(C_2^*) + \beta_{2,p}\beta_{3,p} u(R(y_2 - C_2^*))\Big]\Bigg], \tag{17}$$

subject to

$$\{C_2^*\} \equiv \arg\max_{C_2} \Big[u(C_2) + \beta_{3,k} u(R(y_2 - C_2))\Big]. \tag{18}$$

As before, we solve the child's optimization problem first which gives us the optimal period 2 consumption of the child:

$$C_2^* = C_2(y_2, \beta_{3,k}, R). \tag{19}$$

The optimal period 2 consumption for the child is independent of the period 1 transfers of the parent and so can be dropped from the parent's optimization program. We rewrite the parent's problem described by equations (17) and (18) as

$$Max_T \ \Big[\eta\, v(y_p - T) + (1-\eta)u(y_1 + T)\Big]. \tag{20}$$

The first order condition for the above problem is given by:

$$-\eta v_T(y_P - T) + (1-\eta)u_T(y_1 + T) = 0. \tag{21}$$

The above equation in principle can be solved for optimum period 1 transfers,

$$T^* = T(y_P, y_1, \eta). \tag{22}$$

We now consider an exogenous decrease in the child's discount factor, $\beta_{3,k}$. From equation (22) optimum period 1 transfers by the parent are independent of the discount factor of the child. Therefore, like the standard altruism model, in this model as well there is no effect of a decrease in the discount factor on T, the period 1 transfers.

Endogenous Altruism Model

In this model as was assumed in the tough love altruism model, the discount factor used by the child is endogenously determined as a decreasing function of her period 1 consumption.

$$\beta_{t,k}(c_1) \quad ; \quad \frac{\partial \beta_{t,k}}{\partial C_1} < 0.$$

With the borrowing constraint faced by the child in period 1, the discount factor is given by $\beta_{t,k}(y1+T)$. However, unlike the tough love altruism model, now the parent also uses the above discount factor for evaluating the child's future utility. So the key difference is the assumption:

$$\beta_{t,p}(x) = \beta_{t,k}(x).$$

The parent's problem in this model is:

$$\max_{T} \Bigg[\eta v(y_p - T) + (1-\eta)\Big[u(y_1 + T) + \beta_{2,p}(y1 + T)u(C_2^*) + \beta_{2,p}(y1 + T)\beta_{3,p}(y1 + T)u(R(y_2 - C_2^*))\Big]\Bigg], \tag{23}$$

subject to

$$\{C_2^*\} \equiv \arg\max_{C_2} \Big[u(C_2) + \beta_{3,k}(y1 + T)u(R(y_2 - C_2))\Big]. \tag{24}$$

From the first order condition for the child's problem we get:

$$u_{C_2}(C_2) - \beta_{3,k}(y1 + T)Ru_{C_2}(R(y_2 - C_2)) = 0. \tag{25}$$

The above equation yields the optimal period 2 consumption of the child

$$C_2^* = C_2(y_2, \beta_{3,k}(y1 + T), R). \tag{26}$$

The optimal period 2 consumption for the child is not independent of period 1 transfers of the parent and hence cannot be dropped from the parent's optimization program. We solve the problem described in equations (23) and (24) numerically as a non linear root finding problem. The solution method and the parametrization adopted is identical to the one we used for the tough love altruism model.

We now consider an exogenous decrease in the discount factor of the child. For comparative statics, we make the child more impatient by decreasing the preference parameter β_0, and then trace out the effect of this change on the period 1 transfers T. The results for the assumed set of model parameter values are summarized in Table 3. Again, we find that as β_0 is reduced monotonically, parents in the endogenous altruism model will decrease transfers.

Table 3. Endogenous Altruism Model

Global Parameters

$\eta = 0.5$; $\sigma = 1.5$; $R = 1.2$;

$y_1 = y_2 = 3$; $y_p = 5$; $a = 0.01$

Optimum	$\beta_0 = 0$	$\beta_0 = -0.4$	$\beta_0 = -0.6$	$\beta_0 = -0.8$
T^*	1.4343	1.3265	1.2667	1.1988
C_1^*	4.4343	4.3265	4.2667	4.1988
C_2^*	1.5672	1.8313	2.0333	2.3493
C_3^*	1.7193	1.4025	1.1600	0.7809
$\beta(C_1^*)$	0.9575	0.5585	0.3591	0.1597

The results summarized in Table 3 above seem to suggest that endogenous discounting is enough to obtain the result that transfers decrease in response to an exogenous fall in the child's discount factor. However, unlike the results of the tough love model, this result is very sensitive to the assumption made on σ. Table 4 below presents simulation results with $\sigma < 1$. Now we find that as β_0 falls, transfers increase monotonically. Hence, with the endogenous altruism model, depending on the assumption about model parameters we may get a counterintuitive result where parents reward the impatience of the child.

Table 4. Endogenous Altruism Model

Global Parameters

$\eta = 0.5$; $\sigma = 0.7$; $R = 1.2$;

$y_1 = y_2 = 3$; $y_p = 5$; $a = 0.01$

Optimum	$\beta_0 = 0$	$\beta_0 = -0.4$	$\beta_0 = -0.6$	$\beta_0 = -0.8$
T^*	0.2111	0.4393	0.5438	0.6323
C_1^*	3.2111	3.4393	3.5438	3.6323
C_2^*	1.4753	2.0264	2.3866	2.7716
C_3^*	1.8297	1.1683	0.7361	0.2740
$\beta(C_1^*)$	0.9689	0.5668	0.3658	0.1650

Thus, in order to obtain the result that the parent's transfer decreases in response to an exogenous decrease in the child's discount factor over a wide

range of parameters, we need to introduce both endogenous discounting and paternalistic evaluation by the parent of the child's lifetime utility.

V Are parents loving in the Tough Love Altruism Model?

Because the child is optimizes her lifetime utility given her parent's transfer with full knowledge of her endogenous discounting in the tough love model, she during childhood prefers the parent in the endogenous discounting altruism model to the parent in the tough love model. This is because the transfer is higher from the endogenous discounting parent than from the tough love parent. If we are to say that the parent in the tough love model is loving rather than just paternalistic, then there must be a meaning in which the child, on reaching adulthood appreciates what the parent did.

Consider a child who had a tough love parent. Imagine that she evaluates her consumption stream for the three periods of childhood, work and retirement with a counterfactual consumption stream if she had had a parent in the endogenous discounting altruism model. As long as the borrowing constraint is binding, the child has a higher lifetime utility for the last two periods with her consumption stream than the counterfactual consumption stream. Otherwise, she would not be optimizing. However, she had a lower utility level in her childhood. Is there any sense in which this lower utility level is compensated enough by a higher utility level from the last two periods of her life? We conduct a thought experiment in which the child in the work period evaluates her lifetime utility with the discount factor she has attained to evaluate the two consumption streams.

For this experiment, we extend our model in an important dimension. Until now, for notational simplicity, we assumed that the three periods of the child's life are of equal duration. In reality they will vary. We now allow the duration to vary and denote that of the childhood period by τ_1, that of the work period by τ_2, and that of the retirement period by τ_3. For the benchmark case for this section and the next section in which the leisure-work choice is introduced, we abstract from the child's early life in which she does not face the work-leisure choice. We imagine the childhood period of the model to correspond with the period around high school and the early

years of college in which children may engage in part time work (e.g. 16-20 years of age) and set the duration to be 5 years.[7] The benchmark duration of the work period of the model is set to be 40 years, and corresponds to the period of 21-60 years of age. The benchmark duration for the retirement period is set to be 20 years, and corresponds with the period of 61-80 years of age. After allowing for these varying durations of different time periods the parent's problem in the tough love altruism model is summarized by equations (27) and (28).

$$\max_{T} \Bigg[\tau_1 \ \eta \ v(y_p - T) + (1-\eta)\Big[\tau_1 \ u(y_1 + T) + \tau_2 \ \beta_{2,p} \ u(C_2^*) + \tau_3 \ \beta_{2,p} \ \beta_{3,p} \ u(R(y_2 - C_2^*))\Big]\Bigg], \tag{27}$$

subject to

$$\{C_2^*\} \equiv \arg\max_{C_2} \ \Big[\tau_2 \ u(C_2) + \tau_3 \ \beta_{3,k}(y_1 + T) \ u(R(y_2 - C_2))\Big]. \tag{28}$$

Similarly the parent in the endogenous altruism model maximizes:

$$\max_{T} \Bigg[\tau_1 \ \eta \ v(y_p - T) + (1-\eta) \ \Big[\tau_1 \ u(y_1 + T) + \tau_2 \ \beta_2(y_1 + T) \ u(C_2^*) + \tau_3 \ \beta_2(y_1 + T) \ \beta_3(y_1 + T) \ u(R(y_2 - C_2^*))\Big]\Bigg], \tag{29}$$

subject to

$$\{C_2^*\} \equiv \arg\max_{C_2} \ \Big[\tau_2 u(C_2) + \tau_3 \ \beta_3(y_1 + T) \ u(R(y_2 - C_2))\Big]. \tag{30}$$

[7] Cunha, Heckman, Lochner and Masterov (2006)present a survey of empirical evidence that later interventions in the adolescent years can affect non-cognitive skills like patience, self control, temperament, time preferences, etc. while later interventions cannot affect cognitive skills.

For making the child's lifetime utility comparison we solve both the models for a given value of model parameters.[8] However, to make the child's lifetime utility comparison, we evaluate the child's lifetime utility in both the models at the discount factor obtained under the tough love model, $\beta(C^*_{1,TL})$. Let $C^*_{TL} = \{C^*_{1,TL}, C^*_{2,TL}, C^*_{3,TL}\}$ and $C^*_{END} = \{C^*_{1,END}, C^*_{2,END}, C^*_{3,END}\}$ denote the child's optimal lifetime consumption stream in the tough love altruism and endogenous altruism models respectively for a given value of preference parameter β_0. Then, equations (31) and (32) below provide the expressions for the child's lifetime utility in the tough love altruism model and the endogenous altruism model respectively,

$$V(C^*_{TL}) = \tau_1\ u(C^*_{1,TL}) + \beta_2(C^*_{1,TL})\tau_2\ u(C^*_{2,TL}) + \beta_2(C^*_{1,TL})\beta_3(C^*_{1,TL})\tau_3\ u(C^*_{3,TL}), \tag{31}$$

and

$$V(C^*_{END}|\beta_2(C^*_{1,TL}), \beta_3(C^*_{1,TL})) = \tau_1\ u(C^*_{1,END}) + \beta_2(C^*_{1,TL})\tau_2\ u(C^*_{2,END}) + \beta_2(C^*_{1,TL})\beta_2(C^*_{1,TL})\tau_3\ u(C^*_{3,END}). \tag{32}$$

We compute the child's utility level in the two models for a given value of model parameters using the above two expressions. The results of this exercise for a particular set of model parameter values are provided in Table 5. We find that the child's lifetime utility in the endogenous altruism model evaluated at $\beta(C^*_{1,TL})$ is lower than the utility level attained in the tough love altruism model. The results for this thought experiment depend on the parameter values. For example, if we set $\tau_1 = \tau_2 = \tau_3$, then, with the remaining parameter values specified in Table 5, the child's lifetime utility is higher for the consumption stream of the endogenous altruism model evaluated at $\beta(C^*_{1,TL})$. The results in Table 5 show that, with reasonable parameter values, there is a sense in which the child appreciates what the tough love parent has done when she evaluates her life in retrospect.

[8] We compound the gross interest rate and the inter period discount factor to account for varying duration of the time periods.

Table 5. Child's lifetime Utility Comparison

Global Parameters $\eta = 0.5$, $\sigma = 1.5$; $r = 1.02$; $a = 0.01$; $\beta_p = 1$ $y_1 = 1$; $y_2 = 10$; $y_p = 10$; $\tau_1 = 5$; $\tau_2 = 40$; $\tau_3 = 20$						
Model	C_1^*	C_2^*	C_3^*	$\beta(C_1^*)$	$V(C^*)$	$V(C_{END}^*\|\beta(C_{1,TL}^*))$
Tough Love Altrusim	3.5341	7.0943	5.2632	0.9659	-25.2188	-
Endgoneous Altrusim	10.0241	8.9174	1.9610	0.9089	-7.9071	-25.5188

VI Tough Love Altruism Model with Leisure

Until now we have considered an economy where agents derive utility only from consumption. In this section we generalize our setup in an important dimension by allowing for leisure as a choice variable for the child. The purpose is to see how transfers and income are related in the tough love altruism model when leisure is endogenous. This is motivated by empirical evidence against the standard altruism model's redistributive neutrality property (also called the transfer derivative restriction). The standard altruism model implies that an exogenous dollar decrease in the child's income coupled with a dollar increase in the parent's income will lead to a dollar increase in transfers from the parent to the child. There is empirical evidence against this redistributive neutrality. Cox (1987) studied the relationship between transfers received and income of the recipient. Using President's Commission on Pension Policy (PCPP) data he found evidence that transfers is not correlated with the recipient's income as implied by the redistributive neutrality property of a static version of the standard altruism model. Altonji, Hayashi and Kotlikoff 1997) strengthened evidence against the redistributive neutrality implied by a dynamic version of the model. They used PSID data and found that transfers only increase by 13 cents even when the recipient child is borrowing constrained.

The tough love model also implies redistributive neutrality. Because the parent optimizes the child's consumption level in the first period, if an exogenous factor changes the distribution of income for the parent and the child,

the parent neutralizes the change by changing transfers.[9] However, this redistributive neutrality only holds for exogenous income changes. We study below how endogenous changes in income caused by an exogenous change in the child's discount factor is related to transfers.

We continue to assume perfect information. In our set up, this implies that the parent can fully observe the child's effort level. The remaining model assumptions are retained with transfers being made only in period 1 and the child being borrowing constrained in period 1. The following notation is used. L_1 and L_2 denote the amount of leisure consumed by the child in period 1 and period 2 respectively. w_1 and w_2 denote the wage income of the child in the two periods. For simplicity we assume that the child earns no wage income in period 3 and simply consumes her past savings. The parent's problem is:

$$\max_{T} \ \eta \ v(y_p - T) + (1-\eta)\Bigg[\tau_1 \ u(w_1(1-L_1^*) + T, L_1^*) + \beta_{2,p}\tau_2 \ u(C_2^*, L_2^*) \\ +\beta_{2,p}\beta_{3,p}\tau_3 \ u(R(w_2(1-L_2^*) - C_2^*))\Bigg], \tag{33}$$

subject to

$$\{C_2^*, L_1^*, L_2^*\} \equiv \arg\max_{C_2, L_1, L_2}\Bigg[\tau_1 \ u(w_1(1-L_1) + T, L_1) \\ +\beta_{2,k}(w_1(1-L_1)+T)\tau_2 \ u(C_2, L_2) \\ +\beta_{2,k}(w_1(1-L_1)+T)\beta_{3,k}(w_1(1-L_1)+T)\tau_3 u(R(w_2(1-L_2) - C_2))\Bigg]. \tag{34}$$

From the first order conditions for the child's problem we get:

$$\tau_2 \ u_{C_2}(C_2, L_2) - \beta_{3,k}(w_1(1-L_1)+T)R\tau_3 \ u_{C_2}(R(w_2(1-L_2) - C_2)) = 0, \tag{35}$$

[9]The paternalistic and endogenous discount altruism models also imply redistributive neutrality. The proofs for redistributive neutrality of the models in this paper are available by the authors on request.

$$\tau_2 \; u_{L_2}(C_2, L_2) - \beta_{3,k}(w_1(1-L_1)+T)Rw_2\tau_3 \; u_{L_2}(R(w_2(1-L_2)-C_2)) = 0, \tag{36}$$

and

$$\Bigg[\tau_1 u_{L_1}(C_1, L_1) - \tau_1 \; w_1 u_{C_1}(C_1, L_1) - w_1 \frac{\partial \beta_{2,k}(C_1}{\partial L_1}\big[\tau_2 u(C_2, L_2) + \frac{\partial \beta_{2,k}(C_1)}{\partial L_1}\beta_{3,k}(C_1)\tau_3 \; u(R(w_2(1-L_2)-C_2))\big] - w_1 \frac{\partial \beta_{3,k}(C_1}{\partial L_1}\beta_{2,k}(C_1)\tau_3 \; u(R(w_2(1-L_2)-C_2))\Bigg] = 0. \tag{37}$$

As we observe from equations (35), (36) and (37), first period transfers enter as a parameter in all the choice variables of the child. We solve the above problem numerically as a non linear root finding problem since there is no closed form solution to the child's problem for any functional form of the utility function. For this purpose we impose the following parametric specification:

$$u(C, L) = Log(C) + d\frac{L^{1-\gamma}}{1-\gamma} \; : \; (Child's \; Utility \; Function), \tag{38}$$

$$v(C) = Log(C) \; : \; (Parent's \; Utility \; Function). \tag{39}$$

The child's discount function is given by,

$$\beta(w_1(1-L_1)+T) = \beta_0 + \frac{1}{1+a(w_1(1-L_1)+T)} \quad where \quad a > 0 \; and \; \beta_0 < 0. \tag{40}$$

Table 6 summarizes the results of the simulations for two alternative scenarios identified by a decrease in the parameter β_0. We observe that as β_0 falls from 0 to -0.01, the parent with a tough love motive lowers transfers to the child. At the same time there is also a fall in the child's income in the first period corresponding to the fall in β_0. Thus, the parent's transfers and the child's income fall at the same time even though the child is borrowing constrained. Whether or not this feature of the tough love model can explain Altonji, Hayashi and Kotlikoff's finding is an empirical problem

that requires careful study of the PSID data. This depends on how income changes are divided into endogenous and exogenous changes among others. However, the model does imply that the parent's transfers and the recipient's income can move in the same direction even when the recipient is borrowing constrained. This can potentially reconcile the apparent inconsistency between empirical results against the redistributive neutrality property and Laitner and Thomas' (1996) result in favor of parents' altruism for children. They used TIAA-CREFF retirees data and focused on bequests as the channel for parental altruism. They found that for the subsample of respondents characterized by willingness to leave a bequest, the projected amount of the bequest is largest for households with lowest assessments of their children's likely earnings in the future.

Table 6. Tough Love Altruism Model with Leisure

Global Parameters		
$\eta = 0.5$; $d = 0.5$; $\gamma = 0.7$; $r = 1.02$; $a = 0.01$		
$w_1 = 1$; $w_2 = 2$; $y_p = 2$; $\tau_1 = 5$; $\tau_2 = 40$; $\tau_3 = 20$		
Optimum	$\beta_0 = 0$	$\beta_0 = -0.01$
T^*	0.6094	0.5354
Child's First Period Income	0.9256	0.8543

VII Conclusion

In the simple setting of a three period economy with a single parent and a single child with perfect information and borrowing constraints, we develop a model of intergenerational transfers wherein the tough love motive for parents is a driving force behind the parent's behavior. The simulation results for the tough love model for a reasonable range of parameter values show that as the child becomes more impatient, the parent reacts by cutting down transfers in an attempt to inculcate a more patient consumption behavior. This is consistent with our intuition of tough love parenting. This is in contrast with the standard altruism model, in which the parent does not change transfers when the child becomes impatient.

Since exogenous changes in the child's discount factor to make him impatient are likely to cause behavior that calls for the parent's corrective actions,

the tough love model is more consistent with empirical evidence on parental punishments than the standard altruism model.

In the version of the tough love model with leisure, an exogenous change in the discount factor to make the child more impatient can cause both lower income and lower transfers from the parent even when the child is borrowing constrained. This feature of the model may be consistent with empirical findings by Cox and Altonji, Hayashi and Kotlikoff.

In this paper, we abstracted from Becker-Mulligan type human capital investment, which increases the discount factor for the child. It will be interesting to incorporate such an aspect into our tough love model. Another possible extension is to think of a dynasty of tough love altruists where the parent in each generation uses the discount factors he has attained to evaluate the child's life time utility function. In this multigenerational set up another useful generalization is to allow for heterogeneity in altruistic preferences of the parent. We can think of two types of parental altruistic preferences in the model : one with an endogenous altruism motive and the other with a tough love motive. The parent will act as in the endogenous discounting altruism model if he does not appreciate what the grandparent (his own parent) with a tough love motive did in the sense of Section V and the parent who appreciates what the grandparent did will act as in the tough love altruism model. This can lead to a model with parents who have both tough love altruism and endogenous discounting altruism where some families will oscillate between the two types of altruism over generations.

In the future, it will be interesting to analyze the characteristics of parents who exhibit tough love in their children's upbringing. For this purpose, Horioka, Kamesaka, Ogaki, and Ohtake (2008) are analyzing Osaka University Center of Excellence Survey data for the United States and Japan as well as other survey data collected in Japan. Their preliminary empirical results suggest that more U.S. parents show tough love to young children than Japanese parents.

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