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WELFARE-ENHANCING PARENTAL ALTRUISM AND CHILDREN'S HABIT FORMATION

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Welfare-Enhancing Parental Altruism and Children's Habit Formation[†]

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Abstract

We propose a model of parental altruism in relation to children's habit formation, as children are unaware of their developing habits while young and only become cognizant with age. We show that an altruistic mother (1) maintains the amount of income transferred to her child lower than the child would desire and (2) reduces further income transfer upon an exogenous increase in case of a particular negative habit of the child. The child, when grown, may end up being grateful for the small income transfer if the mother is sufficiently altruistic and has a relatively high income: When evaluated by the realized habitual preferences, a small income transfer leads to greater welfare. This implies that parents from richer families tend to appreciate the authoritative parenting practice.

Keywords: Habit Formation, Parental Altruism, Welfare-Enhancing, Time Preference.

JEL Classification: D10; D60; D91; J13.

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1. Introduction

Parents discipline their young children by keeping income transfer (e.g., allowances) lower than what the children themselves desire. This causes conflicts between the parents, who act on altruistic motives, and the children, who believe that they will benefit from more money. The scope of this paper is to theoretically address parents' regulating behavior and the intergenerational conflict from the viewpoint of children's welfare.

Even though empirical research on parents' restrictive attitude toward children is still sparse in economics, some psychological studies provide evidence of parents' restrictive practice of money transfer and feeding. A typical example is research on pocket money, a proxy of parents' money transfer: A series of studies show that the difference in the amount of children's pocket money is much smaller than their family's socioeconomic status (e.g., West et al. 2006; Barnet-Verzat and Wolff 2002; Furnham and Thomas 1984). In other words, the amount of money transfer for children from high-income families is smaller than what they expect from their family's socioeconomic status. Moreover, Furnham (1999) reports that most of the children (over 80%) in his questionnaire claim that their parents will not give them more money if they spent all of their allowance. It is also shown that parents do not give children allowances or pocket money unconditionally, and they intentionally reduce the amount to cultivate better self-regulation (e.g., Otto 2013; Furnham 2001; Miller and Yung 1990). As for feeding practices, parents' restrictions on unhealthy food consumption are often observed (e.g., van der Horst et al. 2007; Patrick et al. 2005; Gable and Lutz 2000). Overall, all these restrictive actions correspond to an authoritative parenting style (Baumrind 1967, 1971, and 1978), which represents a parenting behavior with high level of control and maturity demands through active communication and induction. Doepke and Zilibotti (2014) show that "thrift," as a typical feature of the authoritative parenting style is frequently observed across countries. Meanwhile, several studies find that poverty has a considerable effect on children because children are able to understand and anticipate their family economic status through social comparison (e.g., Rosenberg and Pearlin 1978; Duncan et al. 1998). Furthermore, consistent with casual observation, there is empirical evidence showing that the authoritative parenting is likely to cause negative feelings from children (Fisher and Birch 2000). By conducting parent-child pair experiments, Akabayashi et al. (2014) show that, unlike the standard intergenerational altruism model, conflict of interest exists between parents and children when they are making joint decision about payments to the children.

Given these empirical facts, the questions that this study is trying to answer are why do altruistic parents not transfer as much income to their young children as the latter would like, and whether grown

children appreciate their parents' altruism. Consequently, in order to understand how parent-child interactions affect the consumption/saving behavior and related preference formation of the family members, this paper aims to theoretically address the following problems:

1. Why do altruistic parents keep income transfers to young children lower than the children desire?

2. Whether, and under which conditions, does the parents' behavior of restricting income transfers enhance children's welfare?

Therefore, we consider an altruistic parent's behavior toward his/her habit-forming child by modifying the framework of Becker (1974) and Barro (1974), in which the parent obtains utility from his or her own consumption, as well as the child's utility. In line with Weinberg (2001) and Bhatt and Ogaki (2012), the altruistic parent (e.g., a mother) can determine the consumption level of her young child (a son, in this case) by controlling the amount of income transferred to him. A unique feature of our model is that the child is habit forming. By controlling income transfers to her young son, the mother in our model can influence his consumption habits, and hence, his future consumption behavior.

We posit two key assumptions when specifying the model in section 2. First, as is the case of actual children, the young child is assumed to be unaware that consumption is habit forming, whereas his mother is assumed to be aware. The assumption of the child's misperception about habit formation is reasonable and reinforced by psychological literature, which provides empirical evidence for the necessity of parental intervention in children's habits, in contexts as diverse as food consumption (e.g., Baumrind 1991) and passive leisure such as TV viewing (Walsh et al. 1998).[1] These studies show that parents directly or indirectly regulate children's habitual good consumption in case of unawareness regarding habituation that may cause children to consume excessively. Moreover, the framework of misperceived habit formation is also motivated by an interpretation of the Easterlin paradox from the aspect of habituation (Clark et al. 2008).[2] Clark et al. (2008) explain the failure of happiness increase (despite rise in GNP per capita) by incorporating the internal backward-looking reference point (i.e., habituation). However, people did not expect this failure of rising in happiness. It indicates that the habituation is misperceived.

We also assume that, after reaching adulthood, the child becomes aware of the true mechanisms of habit formation. We are interested in how the grown child re-evaluates his mother's strict upbringing retrospectively, by using his realized habitual preferences. In particular, we regard the mother's income transfer to her young son as welfare enhancing from the (grown) son's perspective if, when evaluated

[1] However, there has been some controversy regarding the empirical validity of habit formation models (e.g., Dynan 2000).

[2] Easterlin (1974) found that happiness has remained constant over time despite rises in GNP per capital in Western countries over the last 50 years.

according to his true preferences, greater welfare was attained under the transfer than would have been under greater income transfer.

Relative to problems (1) and (2), Propositions 1 and 2 are elaborated in section 4. For problem (1), we show analytically in Proposition 1 that an altruistic parent keeps income transfers to his or her child lower than the child wants. Thus, our model describes a conflict between altruistic parents who raise their children strictly, and the children who complain about it. It is crucial to note that children's habitual preference formation is known to their parents, but not to the children themselves.

Our solution to problem (2), summarized in Proposition 2, explains the welfare implications of authoritative parenting. It is shown that a parent's income transfer to her child will induce child gratitude if and only if the parent is sufficiently altruistic and rich compared with the child. This is because a marginal unit of income transfer reduction to a child has two countervailing effects. First, it directly reduces the child's felicity throughout the period. Second, it weakens the child's consumption habit in the following period and mitigates excess consumption that comes from the child being unaware of his or her habit formation. The parental behavior of keeping income transfers low enhances the child's welfare only when the second positive effect dominates the first negative one. Consequently, if parental income, as well as the degree of parental altruism, is not large, and hence, if the income transfer level is not large, the marginal utility of income transfer is sufficiently high so that the first negative effect dominates the second positive effect, and hence that the strict parenting is not appreciated by the child.

The result of Proposition 2 is related to theoretical and empirical literature showing that authoritative parenting is more likely to be appreciated by high-income samples. Based on a static principal-agent model of the child-parent interaction, Weinberg (2001) empirically supports the hypothesis that the frequency of using pecuniary punishment, rather than corporal punishment, is positively associated with parental income. Unlike his model with parent-child information asymmetry, our dynamic model assumes cross-generational asymmetry in cognitive power to identify future habit effects. We emphasize parental cognitive power that corrects children's habitual over-consumption.[3] By parents directly choosing the time preference parameter for children's endogenous patience to affect their choices of occupation and educational investment, Doepke and Zilibotti (2014) theoretically show that authoritative parenting depends on economic status. Using data from World Value Survey, they empirically report that the rise of authoritative parenting occurs with economic development (Doepke and Zilibotti 2014).

As for our main results, we provide two further discussion points in section 5. First, it is shown that

[3] Despite the differences, our results—suggesting that income transfers of richer parents are likely to be welfare enhancing to children—seems consistent with the positive relationship that Weinberg (2001) reports between parental income and children's outcome. Both results relate child-rearing practices to parental income.

when the child's habit parameter exogenously shifts upward, the altruistic parent reduces the unexpectedly low income transfer further, so as to mitigate the child's over-consumption. The result is comparable with parental "tough love" behavior that Bhatt and Ogaki (2012) derive, by specifying an endogenous time-discounting function. They show that an altruistic parent reduces income transfer in order to affect the child's rate of patience. Since an increase in the habit parameter is shown to raise the child's time preference induced by the consumption habit, our comparative static result could be considered a version of tough love. However, there are two key differences. First, in the present model, time preference is endogenously generated by habit formation, rather than by an exogenously given time preference formation. Second, our tough love is welfare-enhancing to the child if his parent is sufficiently altruistic and relatively rich. This contrasts with the Bhatt and Ogaki model, wherein a mother's tough love reduces her son's welfare, because the mother evaluates her son's future utility by using a different time preference than the child (Bhatt and Ogaki 2012).[4]

Second, we discuss how the main results change in the case of "good" habits, in which parents' transfer involves children's good-habit formation that raises their future gratification (e.g., transfers in the form of books and piano lessons). In this case, parents are shown to give unexpectedly large transfers to children, reflecting that the children are unaware of the future welfare-improving effect of the current consumption that would occur due to good-habit formation (Proposition 4). Thus, in contrast to the negative habit case, grown-up children appreciate the parental income transfer they received during childhood.

Our results show strong importance of parents' control of children's impulsive and habitual consumption, because it is beneficial to children's academic, economic, and health outcomes in the long run. A series of empirical studies support this conclusion (see, e.g., Shoda et al. 1990; Heckman et al. 2006; Chabris et al. 2008; and Moffit et al. 2011).

The remainder of this paper is organized as follows: section 2 introduces the model; section 3 describes the expected transfer by the child; section 4 compares the parental income transfers and the child's welfare; section 5 discusses implications for two related issues (first, the effect of an exogenous increase in the habit parameter is analyzed, and second, we consider the case in which the parent's income transfer involves children's good habits, rather than a negative habit); and section 6 concludes the paper.

[4] Bhatt and Ogaki (2012) also examine an "endogenous altruism model" in which the parent evaluates the child's future utility by using the same time discounting function that the child uses. In this case, the income transfer that the altruistic parent chooses necessarily equals what the child expects to receive. Therefore, even when the parent reduces income transfer due to a shock, it is not "tough" but always reasonable, even to the young child. This contrasts with our case, in which a reduction in the parent's income transfer after a shock always seems harmful, and hence tough, to the child at that time, because he is then unaware of the habit effect. It is, therefore, only reasonable and welfare-enhancing to the child after reaching adulthood. Bhatt and Ogaki (2008) show that parental tough love could be appreciated by the child in adulthood if welfare were retrospectively evaluated using time preference that was formed under the tough love. Note, however, that the attained welfare level under endogenous altruism is necessarily higher than under tough love: children definitely prefer endogenous altruism to tough love.

2. The Model

Consider a family consisting of a parent and a child, both of whom live for three periods. The parent (a mother) gives birth to a child (a son) in her second period, which therefore overlaps with the child's first period.

The Child's Problem

In the child's first period, he receives transfer T from the parent. In the second period, the child receives an exogenous income y_2.[5] Variables c_i $(i = 1,2,3)$ denote the child's consumption in period i. The child is assumed to face borrowing constraints in period 1: $c_1 \leq T$. In order to focus on authoritative parenting to reshape children's intertemporal preferences, we follow Bhatt and Ogaki (2012) in assuming that his disposable income T is small enough that the borrowing constraint is binding:[6]

$$c_1 = T, \tag{1}$$

His intertemporal budget in periods 2 and 3 is given by

$$c_3 = R(y_2 - c_2). \tag{2}$$

where R is the gross interest rate.

The child forms consumption habits. His preference is given by

$$U = u(c_1) + \beta u(c_2 - \theta_1 h_2) + \beta^2 u(c_3 - \theta_2 h_3), \tag{3}$$

$$\text{where} \quad h_2 = c_1 \ \text{ and } \ h_3 = c_2,$$

which captures the habit effects of consumption in the previous period. Parameters $\theta_1, \theta_2 > 0$ represent the strength of habit formation, and $\beta > 0$ denotes the discount factor.

Equation (3) implies that while the existence of habit formation raises the marginal utility of consumption, it also reduces the levels of period utilities. However, the child does not realize until his third period that his consumption in his first and second periods was habit forming.

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[5] We assume away the first-period income y_1 to the child. This, however, does not affect our main results below.

[6] We can show that our main results below do not change if consumption in each period is a normal good even when transfer T is large enough that the borrowing constraint is not binding: $c_1 < T$. For the case where borrowing constraint is not binding ($c_1 < T$), see Appendix A6. However, in that case, the parent's control over income transfer becomes less direct and less effective in authoritatively regulating the intertemporal consumption allocation of the habit-forming child, because the transfer directly influences the child's lifetime wealth and affects c_1, c_2, and c_3 equally.

For the similar reason, we assume that the child receive no transfer in his second period. An income transfer in the child's second period will also increase his lifetime wealth and affect consumption of each period equally. The effect of the parent's restrictive action on the child's habit will thus be diluted.

Assumption 1. The child is unaware of his habit in his first and second periods. In his third period, he becomes aware of the habit.

Under Assumption 1, the child's consumption behavior is assumed to proceed as follows.

In the first period, since the child is unaware of his habit, he just naively maximizes his lifetime utility

$$u(c_1) + \beta u(c_2) + \beta^2 u(c_3). \tag{4}$$

In this period, the child decides nothing, but receives the income transfer from his parent. However, he finds that this actually received transfer deviates from his expectation, which will be discussed in the later sections.

In the second period, the child notices that the utility is also actually different from what was expected in the previous period. However, instead of recognizing the true mechanism of habit formation, he incorrectly regards it as being caused by a permanent preference shock[7] and hence maximizes the utility

$$u(c_2 - \theta_1 c_1^*) + \beta u(c_3 - \theta_1 c_1^*), \tag{5}$$

where c_1^* denotes the child's actual consumption level in the first period.[8]

In his third (the last) period, the child becomes aware of his true preference with habit formation as in (3). Therefore, he can re-evaluate his lifetime utility with the true preference (3).

The Parent's Problem

Since the parent can affect the child's consumption—and, thereby, welfare—through income transfer T, we focus on her decision in her second period. In the second period, she receives endowment income y_p, and maximizes the sum of the second and third period utilities by choosing consumption basket $(c_{2,p}, c_{3,p})$ and transfer T to the child. Her budget constraint is given by

$$c_{3,p} = R(y_p - c_{2,p} - T). \tag{6}$$

Assumption 2. The parent knows that her child is unaware of his own habit formation until his last period.

The parent is altruistic toward her child. We specify her utility function as a convex sum of the felicity

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[7] For the case where the misperception disappears in period 2, see Appendix A5.

[8] In a more reasonable setting, by comparing equation (5) and actual transfer T^*, the child could learn that his belief of equation (5) is actually incorrect. Although we simplify our main analysis by putting the permanent preference shock assumption (5), it can be shown that our main result holds valid even when the child gets aware of the true preference in period 2. For the details, see Appendix A5.

from her own consumption ($u(c_{2,p}) + \beta u(c_{3,p})$) and her child's true utility (U): [9]

$$V = (1-\gamma)\left[u(c_{2,p}) + \beta u(c_{3,p})\right] + \gamma U, \tag{7}$$

where $\gamma \in [0,1]$ denotes the degree of parental altruism.

She is aware that her child, who is ignorant of the effect of habit formation, will consume too much in his first and second periods. The altruistic parent therefore has an incentive to keep her child's consumption level lower by restricting the amount of income transfer.

In order to obtain closed-form solutions, we specify the period utility function as follows:

Assumption 3. $u(x) = \frac{x^{1-\alpha}}{1-\alpha}$ $(\alpha > 0)$.

We guarantee that the arguments of the utility functions are positive by assuming the following:

Assumption 4. When $\theta_2 < 1, (\beta R)^{-1/\alpha} < 1,\ y_p < \frac{Ry_2}{\theta_1(1+R)}$;

$$\text{when } \theta_2 \geq 1, (\beta R)^{-1/\alpha} < \frac{1}{\theta_2},\ y_p < \frac{[1-\theta_2(\beta R)^{-1/\alpha}]Ry_2}{\theta_1(\theta_2+R)[1-(\beta R)^{-1/\alpha}]}.$$ [10]

Intuitively, the above assumption ensures that the child's consumption in the second and third periods is sufficiently low compared to the level in the previous period. This is achieved by restricting parameters, such that (i) the sum of the parent's income and the child's first-period income is sufficiently lower than the child's second-period income and (ii) the child's discount factor is sufficiently high.

To show the welfare implications of the altruistic transfer, we distinguish and compare two types of the income transfers to the child: (i) the actual transfer that the parent determines by maximizing her altruistic utility (i.e., (7)), and (ii) the income transfer that is expected by the child. Because the parent knows the child's habit formation, while the child does not, the two transfers will differ.

The parent understands her child's habit-formation, and considers it when she determines the transfer to her child. In this context, the parent indirectly steers her child away from falling into unintended excessive consumption due to this habit effect. The child, however, does not know the parent's altruistic intervention.

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[9] Without loss of generality, we assume that the parent's period utility function is the same as the child's.

[10] When the child gets the first-period income y_1, the corresponding assumption to Assumption 4 should be as follows: when $\theta_2 < 1$, $(\beta R)^{-1/\alpha} < 1$, $y_p + y_1 < \frac{Ry_2}{\theta_1(1+R)}$; when $\theta_2 \geq 1$, $(\beta R)^{-1/\alpha} < \frac{1}{\theta_2}$, $y_p + y_1 < \frac{[1-\theta_2(\beta R)^{-1/\alpha}]Ry_2}{\theta_1(\theta_2+R)[1-(\beta R)^{-1/\alpha}]}$.

3. The Income Transfer Expected by the Child

We consider how much income transfer the child expects to receive from his parent in his first period. The expected level of income transfer could be a reference point for us to evaluate the parent's intervention through income transfer: it enables us to (i) show that, consistent with daily observations, the parent's income transfer is unexpectedly small for her young child, and (ii) examine whether the unexpectedly small transfer is welfare-enhancing to the grown-up child.

Consider the child's consumption choice prior to receiving an income transfer from the parent in his first period. Because he does not foresee the transfer level perfectly, it is a sort of expected consumption choice based on his expectations regarding parental income transfer. The obtained solutions for expected consumption, c_i^e $(i = 1,2,3)$, will not be realized—first because the parent's income transfer differs from he expects, and second, because his preferences would shift due to the habit effect of the transfer in the first period.

Let T^e denote the income transfer that the child expects to receive in his first period. With the expected transfer T^e being given, the c_i^e are obtained by maximizing the child's lifetime utility (4) subjecting to budget constraints (1) and (2). The optimality conditions are given by

$$c_1^e = T^e, \tag{8}$$

$$u'(c_2^e) = \beta R u'(c_3^e). \tag{9}$$

Equation (8) determines c_1^e. Budget constraints (1) and (2) and first-order condition (9) jointly determine c_2^e and c_3^e. Note that c_2^e and c_3^e are independent of the expected parent's transfer T^e ($\frac{\partial c_2^e}{\partial T} = 0$, $\frac{\partial c_3^e}{\partial T} = 0$), because the child does not incorporate the habit effect from Assumption 1.

Given that the expected consumption behavior c_i^e is conditional on parental income transfer, the child, in turn, computes expected income transfer T^e by anticipating his parent's utility-maximizing behavior. When anticipating the parent's behavior, however, he does not incorporate his own habit due to Assumption 1. From the anticipated utility-maximizing behavior of the parent, the expected transfer T^e is determined jointly with expected parent's consumption ($c_{2,p}^e$, $c_{3,p}^e$) by the budget constraint

$$c_{3,p}^e = R(y_p - c_{2,p}^e - T^e)$$

and the first-order conditions

$$(1-\gamma)[u'(c_{2,p}^e) - \beta R u'(c_{3,p}^e)] = 0, \tag{10}$$

$$\beta R(1-\gamma)u'(c_{3,p}^e) = \gamma u'(T^e), \tag{11}$$

where we set $\frac{\partial c_2^e}{\partial T} = 0$ and $\frac{\partial c_3^e}{\partial T} = 0$ in (11) from Assumption 1.

4. The Altruistic Intervention of the Parent

4.1. The Actual Transfer Decided by the Parent

The parent behaves differently from the child's expectation because she knows that her child's preferences will shift due to the effect of habit formation, even though the child himself does not recognize it in his early periods. Hence, when deciding an income transfer level for her young son, the mother takes into account the habit effect that the transfer will have on his consumption in his second and third periods. Formally, the parent chooses the transfer level to her child by maximizing her altruistic utility (7), which incorporates the child's true utility function (3). We denote the actual income transfer level that the parent decides optimally by T^*.

In the child's second period, the child takes the habit as a permanent preference shock. Maximizing (5) leads to the first-order condition of the child in the second period:

$$u'[c_2 - \theta_1 c_1^*] = \beta R u'[c_3 - \theta_1 c_1^*], \tag{12}$$

where the first-period consumption is given by the borrowing constraint

$$c_1^* = T^*. \tag{13}$$

Under budget constraints (13) and

$$c_3^* = R(y_2 - c_2^*),$$

the actual consumption levels c_2^* and c_3^* are determined by (12). Because the first-period consumption c_1^* depends on the income transfer level from (13), the actual consumption levels c_2^* and c_3^* are functions of the income transfer T from (12).

With the function c_2^* and c_3^* being given, the parent chooses $(c_{2,p}, c_{3,p}, T^*)$ so as to maximize (7). The first-order conditions are

$$(1-\gamma)\left[u'\left(c_{2,p}^*\right) - \beta R u'\left(c_{3,p}^*\right)\right] = 0, \tag{14}$$

$$\beta R(1-\gamma)u'\left(c_{3,p}^*\right) = \gamma[u'(T^*) + \beta u'(c_2^* - \theta_1 c_1^*)\left(\frac{\partial c_2^*}{\partial T^*} - \theta_1 \frac{\partial c_1^*}{\partial T^*}\right)$$

$$+\beta^2 u'(c_3^* - \theta_2 c_2^*)\left(\frac{\partial c_3^*}{\partial T^*} - \theta_2 \frac{\partial c_2^*}{\partial T^*}\right). \tag{15}$$

First-order conditions (14) and (15) and budget constraint (6) jointly determine the parental income transfer level. We denote it by $T^*(\alpha, \gamma, \beta, R, y_p, \theta_1, \theta_2, y_2)$.

In the following subsections, we characterize the income transfer T^* of the altruistic parent by comparing it with the young child's expectation on income transfer T^e. By substituting functions $c_i^*(T)$ into (3), we obtain the child's indirect utility as a function of income transfer T, $U(T)$. Notice that there exists a maximum of $U(T)$. We denote the transfer level that maximizes the child's utility by $\overline{T}$. By definition, it satisfies $U'(\overline{T}) = 0$. Using Assumption 3, we express $\overline{T}$ as $\overline{T}(\alpha, \beta, R, \theta_1, \theta_2, y_2)$.

Since the child's utility is maximized at the point of $\overline{T}$, too much income transfer (more than $\overline{T}$) harms him. Note that the parent necessarily chooses income transfer level T^* no larger than $\overline{T}$: $T^* \leq \overline{T}$. This is because if T^* were higher than $\overline{T}$, it would not enhance the child's welfare but would rather cost the parent's consumption.

However, the expected transfer T^e can be either smaller or larger than $\overline{T}$, depending on the parent's income level y_p. To compare the actual and expected transfers (T^* and T^e) and the corresponding welfare levels, it would, therefore, be helpful to separate two cases: (i) $y_p > \overline{T}$ and (ii) $y_p \leq \overline{T}$, which represent the rich-parent and poor-parent cases, respectively. [11]

4.2. Comparison of Actual and Expected Transfers

The parent is aware of her child's habit formation and incorporates it in her decision making, while the child does not. Thus, the actual transfer T^* deviates from the expected one T^e. Proposition 1 states the relationship between T^* and T^e.

Proposition 1. For any degree of parental altruism $\gamma \in (0,1)$, the parental income transfer is unexpectedly small to the young child, that is, $T^* < T^e$.

Proof. See Appendix A1.

Proposition 1 implies that, insofar as the parent is not purely selfish or purely altruistic, she keeps the transfer level to her child lower than he expects. The parent knows that more transfer leads the child to form deeper habits, and hence consume more excessively in the next period. Hence, she intervenes in the child's behavior by keeping the transfer low.

Note that when the parent is purely selfish ($\gamma = 0$) or purely altruistic ($\gamma = 1$), T^* can be equal to T^e. In particular, when $\gamma = 0$, we have trivially $T^* = T^e = 0$ (i.e., purely selfish parents do not give, and

[11] Since both the critical value y_p and $\overline{T}$ are linear in y_2, $y_p > \overline{T}$ implies that y_p is relatively high compared with y_2. Therefore, when referring to "the rich parent", we stress that the parent's income is high enough relative to the child's income, and ceteris paribus for "the poor parent".

are not expected to give, transfers to their children).

When $\gamma = 1$, we have $T^* = y_p$ if the parent is poor, $y_p \leq \bar{T}$. Since the poor parent cannot afford to transfer $\bar{T}$, she just gives her whole income to her child, as he expects. In the poor parent case, therefore, we have $T^* = T^e = y_p$. When the parent is rich, $y_p > \bar{T}$; however, the parental transfer T^* is smaller than what the child expects and again, $T^* < T^e$. This is because T^* maximizes the child's utility, $T^* = \bar{T}$, whereas the naive child expects the purely altruistic parent to transfer her whole income to him, $T^e = y_p (> \bar{T}$ by construction).

4.3. The Welfare of the Child

As shown in the previous section, the parental income transfer is unexpectedly small in the eyes of the young child. Our interest here is to evaluate it from the viewpoint of the child's welfare; we shall show that the unexpectedly small transfer could make the child better off.

We compare utility values of actual transfer T^* $(U(T^*))$ and expected transfer T^e $(U(T^e))$ by employing the true utility function (3). Because the child is incognizant of the true utility function $U(\cdot)$ until his third period, the utility function $U(\cdot)$ can be regarded as a retrospective welfare measure of income transfer T.[12]

Of particular interest is whether the parental income transfer generates higher welfare of the child than the child's expected transfer does, when evaluated by the retrospective measure. If it does, the grown-up child is thankful to his parent for receiving the unexpectedly small transfer. Hence, we include the following definition.

Definition 1. When $U(T^*) > U(T^e)$, parental income transfer T^* is referred to as *welfare-enhancing* to the child.

We first consider the case of a parent with relatively low income, where $y_p \leq \bar{T}$ (Fig. 1 and Fig. 2). In this case, the parent cannot provide the child with a transfer exceeding $\bar{T}$. As an example of this case, Fig. 1 shows that both T^* and T^e are less than y_p, and hence are less than $\bar{T}$. Recall from Proposition 1 that $T^* < T^e$ for $\gamma \in (0,1)$. Since the child's welfare increases with transfers in the region of $T < \bar{T}$, we have $U(T^*) < U(T^e)$ for $\gamma \in (0,1)$ (i.e., the parental income transfer is not welfare-enhancing to the child).[13]

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[12] Pollak (1978) recommends "unconditional welfare ordering", which incorporates the effects of endogenous preference formation. We used the same welfare criterion here.

[13] When the parent is purely selfish ($\gamma = 0$) or purely altruistic ($\gamma = 1$), we have $U(T^*) = U(T^e)$ (See Fig. 2).

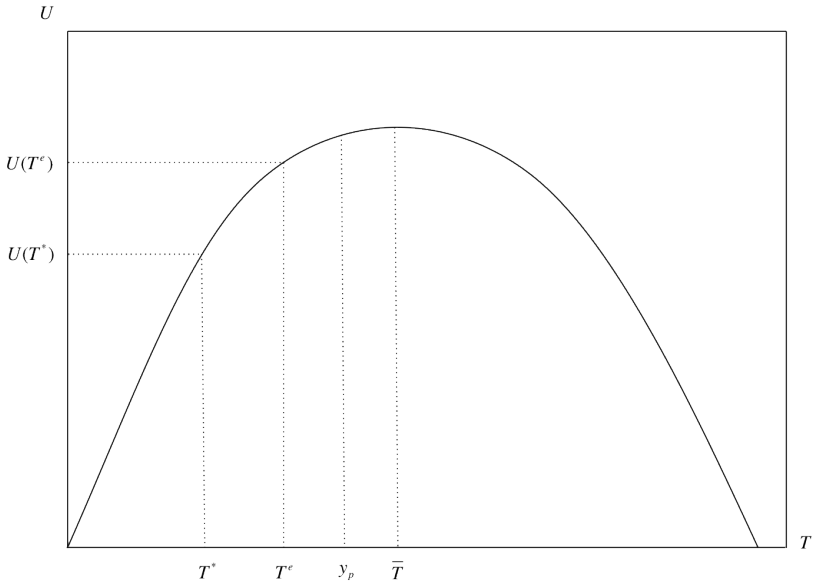

Fig. 1 The utility of the child as a function of T when $y_p \leq \overline{T}$

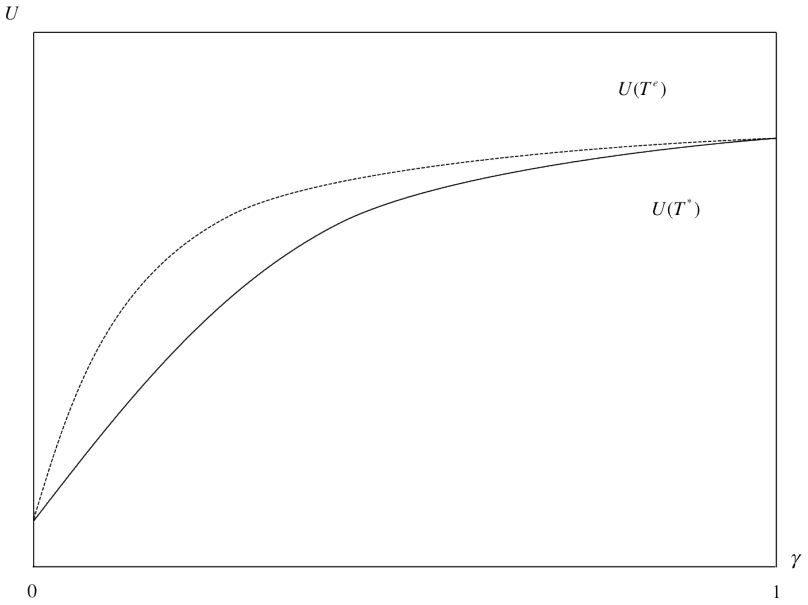

Fig. 2 The utility of the child as a function of γ when $y_p \leq \overline{T}$

When the parent's income is relatively high, $y_p > \overline{T}$, the child's welfare first increases and then decreases with the income transfer level. As an example of this case, Fig. 3 shows that the rich parent can provide the child with more transfer than $\overline{T}$, but she maintains transfer level T^* lower than this. However, the expected transfer T^e can be more than $\overline{T}$. Too much transfer (more than $\overline{T}$) causes the

child's welfare U to decrease. Therefore, the retrospective utility of the expected transfer $U(T^e)$ can be lower than that of actual transfer $U(T^*)$.

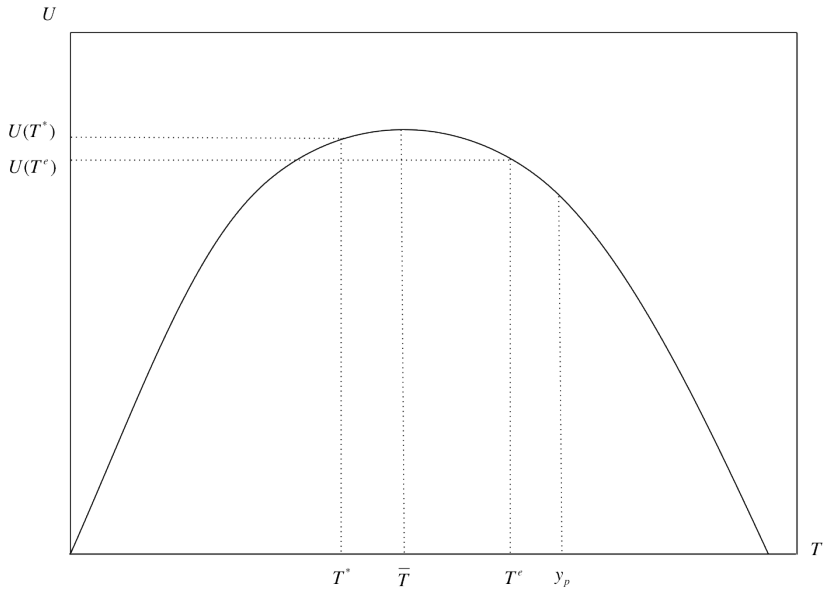

Fig. 3 The utility of the child as a function of T when $y_p > \bar{T}$

Recall that when $\gamma = 0$, $T^* = T^e = 0$, and that when $\gamma = 1$, $T^* = \bar{T}$, which is an interior solution, and $T^e = y_p$, which is a corner solution (See Fig. 4). As γ increases from 0 to 1, the actual transfer T^* increases from 0 to $\bar{T}$, and the expected transfer T^e increases from 0 to y_p. The parent has to balance between her own utility and the child's utility. Under the condition of the rich parent, the child's welfare increases with the actual transfer T^*, and hence also increases with the degree of parental altruism γ. However, the child's retrospective utility level of T^e decreases with T^e when it exceeds $\bar{T}$. Therefore, there exists a certain degree of parental altruism, which equalizes $U(T^*)$ and $U(T^e)$.

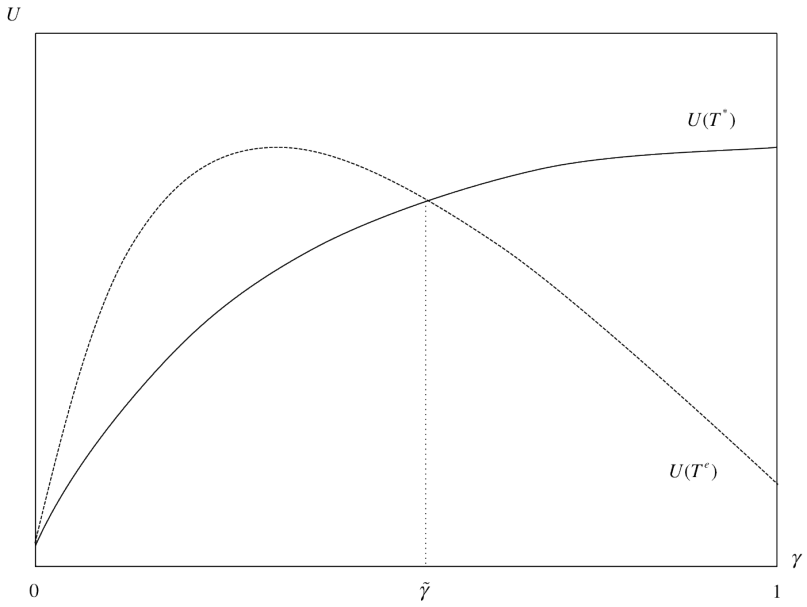

Fig. 4 The utility of the child as a function of γ when $y_p > \overline{T}$

Lemma 1. When the parent's income is high enough relative to the child's income, there exists a degree of parental altruism $\tilde{\gamma} \in (0,1)$ such that $U(T^*) = U(T^e)$.

Proof. See Appendix A2.

For all degrees of parental altruism higher than $\tilde{\gamma}$, the actual transfer leads to higher welfare of the child, and hence, the actual transfer is welfare-enhancing for the child.

Proposition 2. When the parent's income is relatively high ($y_p > \overline{T}$), the parental income transfer T^* is welfare-enhancing for the child, that is, $U(T^*) > U(T^e)$, if the parent is so altruistic that $\gamma > \tilde{\gamma}$.

Proof. See Appendix A2.

Reducing parental income transfer (i) directly lowers the child's utility in each period and (ii) weakens the child's consumption habit. When the parent's income and the degree of parental altruism are large enough, and hence the income transfer is large enough, the second positive effect dominates the first negative one. Therefore, the unexpectedly low transfer makes the child better off. In this context, in his third period, the child becomes aware of the habit and thanks the parent for having given him less transfer than he expected.

5. Discussions

5.1 An Increase in the Habit Parameter

As shown in Proposition 1, the altruistic parent keeps income transfer lower than the child expects to receive. When the child's consumption habit and his consumption propensity are exogenously enhanced, the parent would further reduce the income transfer so as to mitigate the resulting increase in the child's over-consumption.

We can show the validity of this conjecture by examining the effect of an exogenous increase in the child's habit parameter in his second period θ_1.

Proposition 3. A higher degree θ_1 of the child's habit in the second period implies a lower level of parental income transfer T^*, that is, $\frac{dT^*}{d\theta_1} < 0$.

Proof. See Appendix A3.

Proposition 3 shows that the parent penalizes the child for an increase in habitual consumption by reducing income transfer. This strict behavior, however, comes from the parent's altruistic motive.

Note that the apparently strict yet altruistic behavior of the parent is similar to the parents' "tough love" behavior that Bhatt and Ogaki (2012) derived. By assuming an endogenous time-discounting function, they show that, in response to an exogenous rise in a child's future time preference, his altruistic parent reduces income transfer so as to mitigate the increase in his degree of impatience. Our result in Proposition 3 is comparable to this tough love result, because an increase in the habit parameter would raise the child's time preference.

Formally, following the literature on time preference (e.g., Obstfeld 1990), we define the child's pure subjective rate of time preference in his second period as follows:

$$\begin{aligned}\chi_{2,3}(c) &= \log MRS(c_2, c_3)\,|_{c_2=c_3=c} \\ &= \rho + \log\left[\frac{u'(c-\theta_1 h_2)}{u'(c-\theta_2 h_3)} - \frac{\theta_2}{1+\rho}\right],\end{aligned} \tag{16}$$

where $\rho = {}^{1}\!/_{\beta} - 1$ is the subjective discount rate of the child. It is then easy to see that when degree of the habit formation in the child's second period θ_1 exogenously increases, the child's time preference function $\chi_{2,3}(c)$ shifts upward. Because the parent reduces income transfer T^* (see Proposition 3) upon the increase in θ_1, the parent's behavior above seems to duplicate the tough love behavior discussed by Bhatt and Ogaki (2012).

Our discussion is distinct in two aspects. First, in the present model, time preference is endogenously generated by habit formation rather than by an exogenously given time preference formation. Second and more importantly, our tough love is welfare-enhancing to the child if his parent is altruistic and rich enough. This contrasts with the case explored in the Bhatt and Ogaki model, wherein a mother's tough love reduces her son's welfare, because the mother evaluates her son's future utility by using different time preference than that of the child.

5.2 The Case of "Good" Habits

In the previous sections, we consider the case of "negative" habits by assuming habit parameters to be positive ($\theta_1, \theta_2 > 0$), where children's current consumption harms their future utility. Alternatively, we can think about parents' income transfer that involves children's "good" habits: Parents would give books to children, or take children to piano lessons, which would increase the children's future gratification. The implications for the "good-habit" case could be obtained by assuming negative habit parameters, $\theta_1, \theta_2 < 0$.

Proposition 4. When the parent's income transfer involves the child's "good" habits, where $\theta_1, \theta_2 < 0$, the following results are obtained.

(i) The parental income transfer is unexpectedly large to the young child, that is, $T^* > T^e$.

(ii) The parental income transfer T^* is welfare-enhancing for the child, that is, $U(T^*) > U(T^e)$.

Proof. See Appendix A4.

Proposition 4 shows that when habit parameters are negative and hence when the parental income transfer contributes to the formation of the child's good habit, parental income transfers are larger than what the children expect for any degree of parental altruism. Because parents know that current consumption enhances future utility, they tend to transfer more income to invest in children's habit.[14]

When the habits of the child are "good", increasing income transfer causes two positive effects on children's utility. It (i) directly increases the child's felicity throughout the period (ii) and enhances his "good" habit in the subsequent period. In this context, the parent tends to give more income transfer and the grown-up child is always grateful toward the unexpectedly large income transfer.

6. Concluding Remarks

[14] More natural modeling would be that children consume two goods, a negative-habit good and a good-habit good. In the setting, the results would be easily conjectured from our results insofar as the two types of goods are additively separable: Parents will give unexpectedly small amount of the negative-habit goods and unexpectedly large amount of the good-habit goods.

By employing a parental altruism model where the child is ignorant of his own habit until he reaches adulthood, we show that the parental income transfer seems unexpectedly low to the young child. However, the unexpectedly low parental income transfer can generate higher welfare for the child than the expected transfer, when evaluated retrospectively. In other words, when the parent's income is high enough relative to that of the child and sufficiently altruistic, the parent's income transfer is welfare-enhancing to the grown child.

This research may have important implications for understanding how parent-child interactions affect the consumption behavior and related preference formation of family members. In the framework of this model, the authoritative parenting practice is referring to the lower level of actual transfer T^* than the expected transfer T^e ($T^* < T^e$). Although the result $T^* < T^e$ holds both for rich and for poor parents, the lower actual transfer T^* than T^e is welfare-enhancing to the child only when the parent is sufficiently rich. Parents from rich families thus tend to appreciate this authoritative parenting practice they were subject to when they were young, which might contribute to the transmission of these practices in these families.

To give evidence to the theoretical predictions, we are conducting empirical analysis by using questionnaire survey data (Zhang and Ikeda 2014). We find that there are significantly positive relations between respondents' strict upbringing attitude and their living standards when 15 years old in the case that they are aware of habit. Besides, our theoretical prediction is also supported by Doepke and Zilibotti (2014): They show the rise of authoritative parenting in recent decades with the process of economic development.

More work remains for the future research. By putting the simplifying assumption that the child misperceives the effect of habit as a permanent preference shock, we assume away the possibility that the child may learn about his true preference by observing how much transfer the parent gave. It is of interest to investigate parent-child interaction in the presence of such learning process, possibly under some asymmetric information. For example, if children do not know how altruistic their parents are, they may mistakenly attribute small income transfers to the parents' selfishness, rather than to their tough love to control children's consumption habits. Due to this misperception, it would take longer time for the children to learn their true preferences from the parents' behavior. The interesting topic is beyond the scope of the current work, however. We shall tackle this issue in the future.

Appendix

A1. Proof of Proposition 1

When $\forall\gamma \in (0,1)$, we compare the actual transfer T^* with the expected transfer T^e by dividing the first order condition (11) with the first order condition (15). By substituting first-order conditions (9) and (14) as well as Assumption 1 we have

$$\left(\frac{y_p - T^*}{y_p - T^e}\right)^{-\alpha} = \left(\frac{T^*}{T^e}\right)^{-\alpha}$$

$$-\frac{\beta\theta_1(R+1)(\beta R)^{-\frac{1}{\alpha}}[Ry_2(\beta R)^{-\frac{1}{\alpha}} - \theta_1(R+1)(\beta R)^{-\frac{1}{\alpha}}(T^*)]^{-\alpha}}{[1+R(\beta R)^{-\frac{1}{\alpha}}]^{1-\alpha}(T^e)^{-\alpha}}$$

$$-\frac{\beta^2\theta_1(\theta_2+R)\left[1-(\beta R)^{-\frac{1}{\alpha}}\right]\left[Ry_2(1-\theta_2(\beta R)^{-\frac{1}{\alpha}}) - \theta_1(\theta_2+R)(1-(\beta R)^{-\frac{1}{\alpha}})(T^*)\right]^{-\alpha}}{[1+R(\beta R)^{-\frac{1}{\alpha}}]^{1-\alpha}(T^e)^{-\alpha}}. \quad \text{(A1)}$$

The second and third items on the RHS are both negative, so we have $\left(\frac{y_p - T^*}{y_p - T^e}\right)^{-\alpha} < \left(\frac{T^*}{T^e}\right)^{-\alpha}$. Hence equation (A1) implies that $\frac{T^*}{T^e} < 1$. Therefore, we have $\forall\gamma \in (0,1),\ T^* < T^e$.

A2. Proof of Lemma 1 and Proposition 2

The child's utility U is continuous in the degree of parental altruism γ. When $T < \overline{T}$, U is increasing in T; and when $T > \overline{T}$, U is decreasing in T. The income transfers T^* and T^e are both continuous and increasing in γ.

When $y_p > \overline{T}$, we obtain $\lim_{\gamma\to 1} T^* = \overline{T}$, which is an interior solution and that $\lim_{\gamma\to 1} T^e = y_p$, which is a corner solution. We also have $\lim_{\gamma\to 1} U'(T^*) = 0$ and $\lim_{\gamma\to 1} U'(T^e) < 0$. Hence, in the neighborhood of $\gamma = 1$, $U(T^*) > U(T^e)$.

When γ decreases from 1, both T^* and T^e decrease, as does $U(T^*)$. However, $U(T^e)$ increases until T^e equals to $\overline{T}$. Hence, there exists a certain $\tilde{\gamma}$ such that $U(T^*) = U(T^e)$. When $\gamma > \tilde{\gamma}$, we have $U(T^*) > U(T^e)$.

A3. Proof of Proposition 3

First-conditions (10) and (11) and budget constraint (4) jointly determine the optimal transfer of the parent $T^*(\alpha, \gamma, \beta, R, y_p, \theta_1, \theta_2, y_2)$.

Substituting first-order condition (10) into (11) and taking the total derivative of the optimal transfer by the parent T^* with respect to the habit parameter θ_1 leads to

$$\begin{aligned}
&\{\frac{(1-\gamma)\alpha\beta R^{1-\alpha}\left(y_p - T^*\right)^{-\alpha-1}}{\gamma\left[1+R(\beta R)^{-\frac{1}{\alpha}}\right]^{-\alpha}} + \alpha(T^*)^{-\alpha-1} \\
&+\frac{\alpha\beta[(\beta R)^{-\frac{1}{\alpha}}\theta_1(1+R)]^2[Ry_2(\beta R)^{-\frac{1}{\alpha}} - \theta_1(1+R)(\beta R)^{-\frac{1}{\alpha}}(T^*)]^{-\alpha-1}}{[1+R(\beta R)^{-\frac{1}{\alpha}}]^{1-\alpha}} \\
&+\frac{\alpha\beta^2\theta_1^2(\theta_2+R)^2[1-(\beta R)^{-\frac{1}{\alpha}}]^2[Ry_2\left(1-\theta_2(\beta R)^{-\frac{1}{\alpha}}\right) - \theta_1(\theta_2+R)(1-(\beta R)^{-\frac{1}{\alpha}})(T^*)]^{-\alpha-1}}{[1+R(\beta R)^{-\frac{1}{\alpha}}]^{1-\alpha}}\}\frac{dT^*}{d\theta_1} \\
&= -\frac{\beta(\beta R)^{-\frac{1}{\alpha}}(1+R)[Ry_2(\beta R)^{-\frac{1}{\alpha}} - \theta_1(1+R)(\beta R)^{-\frac{1}{\alpha}}(T^*)]^{-\alpha-1}}{[1+R(\beta R)^{-\frac{1}{\alpha}}]^{1-\alpha}} \\
&\cdot\{\left[Ry_2(\beta R)^{-\frac{1}{\alpha}} - \theta_1(1+R)(\beta R)^{-\frac{1}{\alpha}}(T^*)\right] + \alpha(1+R)(\beta R)^{-\frac{1}{\alpha}}(T^*)\} \\
&-\frac{\beta^2(\theta_2+R)[1-(\beta R)^{-\frac{1}{\alpha}}][Ry_2\left(1-\theta_2(\beta R)^{-\frac{1}{\alpha}}\right) - \theta_1(\theta_2+R)(1-(\beta R)^{-\frac{1}{\alpha}})(T^*)]^{-\alpha-1}}{[1+R(\beta R)^{-\frac{1}{\alpha}}]^{1-\alpha}} \\
&\cdot[Ry_2\left(1-\theta_2(\beta R)^{-\frac{1}{\alpha}}\right) - (1-\alpha)\theta_1(\theta_2+R)(1-(\beta R)^{-\frac{1}{\alpha}})(T^*)],
\end{aligned} \tag{A2}$$

where, from Assumption 4, the coefficient of $\frac{dT^*}{d\theta_1}$ is positive; and the right hand side is negative. Therefore, we have $\forall\gamma(0,1),\ \frac{dT^*}{d\theta_1} < 0$.

A4. Proof of Proposition 4

From equation (A1), we have that with negative θ_1, θ_2 it implies that $\frac{T^*}{T^e} < 1$. Therefore, we have $\forall\gamma \in (0,1),\ T^* > T^e$.

When $\theta_1, \theta_2 > 0$, the child's retrospective utility is always increasing in parental income transfer T. Hence, we always have $U(T^*) > U(T^e)$.

A5. When Misperception Disappears in the Child's Second Period

Here, we show that our main results are robust even when the child is assumed to become aware of his own habit formation in the second period, rather than in the third period.

In order to guarantee that the arguments of the utility functions are positive, we assume, the following, instead of Assumption 4:

Assumption A1. $y_p < \frac{Ry_2}{\theta_1(R+\theta_2)}$.

We denote optimal solutions in the present case by using an apostrophe, instead of an asterisk in the text.

In the second period, the misperception of the child disappears and the child maximizes the utility $u(c_2 - \theta_1 c_1') + \beta u(c_3 - \theta_2 c_2)$. The first-order condition is given by

$$u'[c_2 - \theta_1 c_1'] = \beta(R + \theta_2)u'[c_3 - \theta_2 c_2]. \tag{A3}$$

With c_1' being given by the parent's income transfer T', (A3) and budget constraint (2) jointly determine the consumption levels c_2' and c_3'.

The parent's first-order conditions of the parent are

$$(1-\gamma)\left[u'\left(c_{2,p}'\right) - \beta R u'\left(c_{3,p}'\right)\right] = 0, \tag{A4}$$

$$\beta R(1-\gamma)u'\left(c_{3,p}'\right) = \gamma[u'(T') + \beta u'(c_2' - \theta_1 c_1')\left(\frac{\partial c_2'}{\partial T'} - \theta_1 \frac{\partial c_1'}{\partial T'}\right)$$

$$+\beta^2 u'(c_3' - \theta_2 c_2')\left(\frac{\partial c_3'}{\partial T'} - \theta_2 \frac{\partial c_2'}{\partial T'}\right).$$

(A5)

First-order conditions (A4) and (A5) and budget constraint (6) jointly determine the parental income transfer T'. By noting that the expected transfer T^e is the same as in the text, we obtain the following result:

Proposition A1. For any degree of parental altruism $\gamma \in (0,1)$, the parental income transfer is unexpectedly small to the young child, that is, $T' < T^e$.

Proof.

By substituting (9) into (11), (A4) into (.5), and dividing (A5) with (10), we have

$$\left(\frac{y_p - T'}{y_p - T^e}\right)^{-\alpha} = \left(\frac{T'}{T^e}\right)^{-\alpha}$$

$$-\frac{\beta^2\theta_1(R+\theta_2)[Ry_2 - \theta_1(R+\theta_2)(T')]^{-\alpha}}{\left\{1+(R+\theta_2)[\beta(R+\theta_2)]^{-\frac{1}{\alpha}}\right\}^{-\alpha}(T^e)^{-\alpha}}.$$

(A6)

Equation (A6) implies that $\frac{T'}{T^e} < 1$. Therefore, we have $\forall\gamma \in (0,1),\ T' < T^e$.

We can also show that there is a critical degree of parental altruism $\hat{\gamma} \in (0,1)$, such that $U(T') = U(T^e)$. As in Proposition 2, we have:

Proposition A2. When the parent's income is high relative to the child's income ($y_p > \bar{T}$), the parental

income transfer T' is welfare-enhancing for the child, that is, $U(T') > U(T^e)$, if the parent is so altruistic that $\gamma > \hat{\gamma}$.

Proof.

The child's utility U is continuous in the degree of parental altruism γ. When $T < \overline{T}$, U is increasing in T; and when $T > \overline{T}$, U is decreasing in T. The income transfers T' and T^e are both continuous and increasing in γ.

When $y_p > \overline{T}$, we obtain $\lim_{\gamma \to 1} T' = \overline{T}$, which is an interior solution and that $\lim_{\gamma \to 1} T^e = y_p$, which is a corner solution. We also have $\lim_{\gamma \to 1} U'(T') = 0$ and $\lim_{\gamma \to 1} U'(T^e) < 0$. Hence, in the neighborhood of $\gamma = 1$, $U(T') > U(T^e)$.

When γ decreases from 1, both T' and T^e decrease, and $U(T')$ also decreases. However, $U(T^e)$ increases until T^e equals to $\overline{T}$. Hence there exists a certain $\tilde{\gamma}$ such that $U(T') = U(T^e)$. When $\gamma > \tilde{\gamma}$, we have $U(T') > U(T^e)$.

A6. When the Child's Borrowing Constraint Is Not Binding ($c_1 < T$)

When the child's borrowing constraint is not binding, his life-time intertemporal budget is given by

$$R^2 c_1 + R c_2 + c_3 = R^2 \mathrm{T} + \mathrm{R} y_2, \tag{A7}$$

so parental transfer T constitutes a part of the child's wealth.

The transfer T^e expected by the child is determined by budget constraint (A7) and the following first-order conditions

$$(1-\gamma)[u'(c_{2,p}^e) - \beta R u'(c_{3,p}^e)] = 0, \tag{A8}$$

$$\beta R(1-\gamma) u'(c_{3,p}^e) = \gamma \frac{\partial c_1^e}{\partial T^e} u'(c_1^e). \tag{A9}$$

By maximizing life-time utility (4) subjecting to budget constraint (A7), we could obtain the expected consumption $c_1^e(T^e)$. Providing that c_1^e is a normal good, c_1^e is an increasing function of wealth and hence of T^e.

Under the permanent preference shock assumption

Under the permanent preference shock assumption, the parent's consumption $c_{2,p}^*$, $c_{3,p}^*$ and the actual transfer T^* are determined by budget constraint (A7) and the following first-order conditions

$$(1-\gamma)[u'(c_{2,p}^*) - \beta R u'(c_{3,p}^*)] = 0, \tag{A10}$$

$$\beta R(1-\gamma)u'\left(c_{3,p}^{*}\right)=\gamma\frac{\partial c_1^{*}}{\partial T^{*}}\{u'(c_1^{*})$$

$$-\frac{\beta(\theta_1+\theta_1R+R^2)(\beta R)^{-\frac{1}{\alpha}}[Ry_2(\beta R)^{-\frac{1}{\alpha}}-\theta_1(R+1)(\beta R)^{-\frac{1}{\alpha}}(c_1^{*})]^{-\alpha}}{[1+R(\beta R)^{-\frac{1}{\alpha}}]}$$

$$-\frac{\beta^2\left[\theta_1(\theta_2+R)\left(1-(\beta R)^{-\frac{1}{\alpha}}\right)+R^2(1-\theta_2(\beta R)^{-\frac{1}{\alpha}})\right]\left[Ry_2\left(1-\theta_2(\beta R)^{-\frac{1}{\alpha}}\right)-\theta_1(\theta_2+R)\left(1-(\beta R)^{-\frac{1}{\alpha}}\right)(c_1^{*})\right]^{-\alpha}}{\left[1+R(\beta R)^{-\frac{1}{\alpha}}\right]}\}. \tag{A11}$$

By maximizing life-time utility (4) subjecting to budget constraint (A7), we could obtain the actual consumption $c_1^{*}(T^{*})$. Insofar as c_1^{*} is a normal good, c_1^{*} is an increasing function of wealth and hence of T^{*}.

By comparing equations (A8) and (A9) with (A10) and (A11) respectively, we could find that all items are the same except the RHS of equation (A9) and (A11). Because the second and third items of equation (A11) are both negative, when the parent decides the transfer, the marginal utility of the child in equation (A11) is lower than that in equation (A9). In other words, the actual transfer is smaller than the expected one. Therefore, the result of Proposition 1 that $T^{*}<T^{e}$ is still valid.

When the misperception of habit disappears

In the case where the misperception of habit disappears in child's second period (see Appendix A5), the parent's consumption $c_{2,p}'$,$c_{3,p}'$ and the actual transfer T' are determined by budget constraint (A7) and the following first-order conditions

$$(1-\gamma)[u'\left(c_{2,p}'\right)-\beta Ru'(c_{3,p}')]=0, \tag{A12}$$

$$\beta R(1-\gamma)u'\left(c_{3,p}'\right)=\gamma\frac{\partial c_1'}{\partial T'}\{u'(c_1')$$

$$-\frac{\beta^2\left[R^2+\theta_1(\theta_2+R)+(R+\theta_2)\left(R^2+R\theta_1+\theta_1\theta_2\right)(\beta(R+\theta_2))^{-\frac{1}{\alpha}}\right]\left[Ry_2\left(1-\theta_2(\beta R)^{-\frac{1}{\alpha}}\right)-\theta_1(\theta_2+R)\left(1-(\beta R)^{-\frac{1}{\alpha}}\right)(c_1')\right]^{-\alpha}}{\left[1+(R+\theta_2)(\beta(R+\theta_2))^{-\frac{1}{\alpha}}\right]}\}. \tag{A13}$$

By maximizing life-time utility (4) subjecting to budget constraint (A7), we could obtain the actual consumption $c_1'(T')$. As a normal good, c_1' is an increasing function of wealth and hence T'.

Except the second item of the RHS in equation (A13), other items in equations (A12) and (A13) are the same with equations (A8) and (A9). It implies that when the parent decides the transfer the marginal

utility of child in equation (A13) is lower than that in equation (A9). Hence, the result that actual transfer is smaller than the expected on is still valid.

Furthermore, similar to the proof in Appendix A2, we could find that when $y_p > \bar{T}$, we obtain $\lim_{\gamma \to 1} T^* = \bar{T}$, which is an interior solution and that $\lim_{\gamma \to 1} T^e = y_p$, which is a corner solution. We also have $\lim_{\gamma \to 1} U'(T^*) = 0$ and $\lim_{\gamma \to 1} U'(T^e) < 0$. Hence, in the neighborhood of $\gamma = 1$, $U(T^*) > U(T^e)$.

When γ decreases from 1, both actual transfer and expected transfer decrease, as does $U(T^*)$. However, $U(T^e)$ increases until T^e equals to $\bar{T}$. Hence, there exists a certain $\tilde{\gamma}$ such that $U(T^*) = U(T^e)$. When $\gamma > \tilde{\gamma}$, $U(T^*) > U(T^e)$. Therefore, the conclusion of Proposition 2 still holds.

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