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Bequests as signals: Implications for fiscal policy

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Abstract

This paper explores how bequests affect redistributive fiscal policies. The main premise underlying our approach is that bequests act as a signal of parental affection. It is shown that private transfers in the form of bequests may not offset public transfers to a significant extent, even though such private transfers are altruistically motivated and are strictly positive for all but a negligible set of households. This is notable since these conditions are normally believed to yield a fully offsetting response (Ricardian equivalence). We explicitly identify circumstances under which the departure from Ricardian equivalence is large. Notably, the departure may be quite large even when our model is observationally very close to one in which Ricardian equivalence is known to hold (in the sense that children care very little about parental affection).
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1. Introduction

Understanding the motives for (and patterns of) intergenerational transfers is important for economists because such transfers feature prominently in theoretical and empirical discussions of capital accumulation, fiscal policy, income distribution, and other issues.[1]

This paper investigates policies that redistribute resources between parents and children (such as social security, deficit financing, and the taxation of accrued capital gains) in light of the signalling theory of intergenerational transfers developed by Bernheim and Severinov (2003).

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[1] For example, Kaplow (2001) and Cremer and Pestieau (2003) emphasize that the effect of taxation depends in a significant way on the nature and motives behind intergenerational transfers.

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This theory is based on two premises: first, a child's perception of parental affection directly affects his or her subjective well-being, and second, a child may draw inferences about parental affection from the parent's actions, particularly bequests. These premises are well-grounded in psychological evidence (see e.g. Coopersmith (1967), Bednar and Peterson (1996), and Baik and Kahn (1997)) and are consistent with the conclusions emerging from a number of sociological studies and surveys.[2] When these assumptions hold, bequests can serve as signals of parental affection.[3]

One of the central issues addressed in this paper is whether this theory's predictions regarding the effects of policies of intergenerational redistribution bear any resemblance to those of more familiar theories. One important school of thought holds that these policies have no real effects. This view, known as "Ricardian equivalence," is commonly associated with the work of Robert Barro (1974). Barro supplemented the traditional overlapping generations model with intergenerational altruism and argued, in essence, that voluntary transfers between parents and children cause the representative family to behave as though it is a single, infinite-lived individual — a "dynastic" unit. From the point of view of the family, neither debt nor social security alters available alternatives; both are therefore neutral. Thus, Barro's analysis identifies the nature of intergenerational altruism as a key factor in determining the effects of government bond issues and public pension programs.

The central Ricardian proposition can be summarized as follows: with positive, altruistically motivated private transfers, endogenous adjustments to private transfers completely neutralize public transfers.

In this paper, we show that, when bequests signal parental affection in a model that is otherwise very similar to Barro's, this central proposition is undermined in a surprisingly powerful way. In particular, private transfers may not offset public transfers to any significant extent, even though private transfers are altruistically motivated in Barro's sense, and even though these transfers are strictly positive for all but a negligible (measure zero) set of households. In our model, the existence of positive, altruistically motivated private transfers does not necessarily imply that private transfers offset public transfers to any significant extent, *even when children place arbitrarily small weight on parental affection* (in which case our model is observationally almost equivalent to Barro's model in the sense that parents are farsighted and altruistically motivated).

Since many other authors have exhibited theoretical failures of Ricardian equivalence, it is important to emphasize that the implications of our theory are unique. There is a number of theories in which Ricardian equivalence does not hold for a given household either because the parent is corner constrained, or because the parent is not an altruist in Barro's sense (examples include Andreoni (1989), Kotlikoff et al. (1990), and Yotsuzuka (1987)). To our knowledge, this is the first demonstration that Ricardian equivalence may fail even when both of these

[2] Based on a series of family interviews, Stum (1999) maintains that bequest decisions "symbolize whom parents love, respect and trust the most, and have the power to disrupt sibling and parent–child relationships for years to come". As a specialist in the field of late-life planning, Lustbader (1996) expresses a similar view. A survey conducted by Charles Schwab & Co. (2003) provides evidence indicating that a significant proportion of children are uncertain about the size of the bequest that they would ultimately receive from parents and that actual bequests cause an emotional and psychological response. According to this survey based on a sample of 1102 respondents randomly selected from the appropriate population, 48% of the respondents have not discussed their estate plans with their prospective heirs. Significantly, 39% of those explained their inaction as follows: "I want my heirs to be pleasantly surprised."

[3] Bernheim and Severinov (2003) argued that this theory merits close attention because it provides a potential explanation, and possibly the only available explanation, for the fact that a significant majority of testate decedents with multichild families divide their estates exactly equally among their children (the "equal division puzzle"). Studies that confirm that a large majority of parents split their bequests equally between their offspring include Wilhelm (1996), Menchik (1980, 1988), and McGarry (1999). McGarry (2001) finds that wealthy parents maintain equal bequest allocation despite tax incentives to alter such behavior.

assumptions hold. In addition, instead of merely exhibiting a theoretical possibility, we explicitly identify circumstances under which the departure from Ricardian equivalence is large. Notably, the departure may be quite large even when children care very little about parental affection.

The paper also extends another line of inquiry concerning Ricardian equivalence. Bernheim and Bagwell (1988) provided a critique of Barro's theory, in which they argued that the central assumptions behind the Ricardian view guarantee the irrelevance of all redistributional policies, distortionary taxes, and prices. Their results rely on the existence of interfamily linkages, which arise whenever two unrelated individuals produce a common child. Bernheim and Bagwell concluded that, since these other neutrality propositions do not hold even approximately, one cannot assert that the world is approximately dynastic. Accordingly, all conclusions following from the dynastic framework (including Ricardian equivalence) are suspect.

Abel and Bernheim (1991) reexamined Bernheim and Bagwell's analysis under the additional assumption that an exogenous social norm constrains parents to divide their estates equally among their children. They demonstrated that Ricardian equivalence holds in this setting for policies affecting the intergenerational distribution of resources, but that policies affecting intragenerational distribution have significant allocative effects. Thus, in the presence of an equal division constraint, the theory of Ricardian equivalence does not encounter the logical problems outlined by Bernheim and Bagwell.

Unfortunately, the *ad hoc* nature of an exogenous egalitarian constraint undermines the force of the preceding argument. It therefore is important to determine whether Ricardian equivalence also survives in a model of intergenerational resource allocation that explains the existence of the constraint. The model of Bernheim and Severinov (2003) offers one such explanation. However, that model abstracts from the parent's consumption decision, and is therefore not well-suited for analyzing the effects of policies that redistribute resources across generations. Here, we abstract from the issue of division between children, and focus instead on the implications of bequest signaling for the division of resources between generations. The results of this paper imply that, when one introduces a consideration (bequest signaling) that is capable of accounting for the equal division constraint, Ricardian equivalence does not survive. Abel and Bernheim's result therefore follows from their equal division assumption which they impose exogenously.

This paper is also related to the study of the signalling role of charity by Glazer and Konrad (1996). In their model, individuals make charitable donations in order to signal their wealth to the society and thereby acquire higher social status. Glazer and Konrad examine the effects of income redistribution among private donors and government funding of charities on the level of private donations. Clearly, both the motivation for signalling and the focus on the intergenerational redistribution policies distinguish this paper from theirs.

The remainder of this paper is organized as follows. We describe the model in Section 2. Section 3 considers the simple case where there are only two types of parents. Section 4 extends the analysis to cases with a continuum of types. Section 5 presents some parametric examples. Section 6 concludes.

2. The model

Consider a family consisting of a parent, P ("she"), and a child, K ("he"). The parent is endowed with wealth $w_P>0$, which she divides between her own consumption, c_P, and a non-negative bequest to the child, $b\in[0, w_P]$. The child is endowed with wealth w_K, and consumes $c_K=w_K+b$. For simplicity, we assume that endowments are perfectly observable. It will be convenient to think of the parent as dividing the family's total resources $W=w_P+w_K$ between c_P and c_K, subject to the constraint that $c_K\geq w_K$.

We use U_P and U_K to denote the utilities of the parent and child, respectively. We assume that the parent is an altruist, in the standard sense that she receives utility from her own consumption as well as from the utility of the child, and that parents differ in the population according to the relative weight that they attach to the child's utility. Specifically,

$$U_P = (1-t)u_P(c_P) + tU_K,$$

where $t \in [0, 1]$. We assume that parent's type t is known to the parent but not to the child. The parameter t has some known population distribution; let F denote the associated cumulative probability distribution function.

We assume that the child cares about his own consumption, c_K, as well as about t. That is, the child's sense of well-being is affected by the extent to which he feels "loved". Though the child cannot observe t directly, he may attempt to infer it from aspects of the parent's behavior, particularly the choice of a bequest, b.

When the child believes that $t=\widehat{t}$, his utility is given by

$$U_K = u_K(c_K) + \beta v(\widehat{t}\,).$$

Unless otherwise specified, we will invoke the following assumption throughout.

Assumption. u_i, $i=P, K$, is strictly increasing, strictly concave, and continuously differentiable on $(0, W]$, with $\lim_{c\to 0} u_i'(c)=\infty$. v is strictly increasing and continuously differentiable with bounded derivative on [0, 1].

Note that the marginal utility of consumption goes to infinity as consumption goes to zero. In contrast, the marginal utility of affection remains finite as $\widehat{t}$ goes to zero. We have made these assumptions to simplify uninteresting technical aspects of the problem. However, we also think they are reasonable: one can live without parental affection, but not without consumption.

The structure of the model is simple. After observing t, the parent chooses b. The child then observes b and draws inferences about the parent's preference parameter, t. The preceding expressions for U_P and U_K describe the resulting payoffs.

Naturally, the child does not receive the bequest and draw inferences about the parent's preferences until after the parent dies. In effect, we are assuming that the parent correctly anticipates the inferences that the child will make after the parent's death, and that the child attempts to make the best inference possible. We do not explore the interesting possibility that either party might have an incentive to engage in self-deception, intentionally forming incorrect expectations or inferences.

In this setting, the parent's choice of b can signal the parent's type, t. Indeed, the model can be recognized formally as a "signaling game", in the sense of Banks and Sobel (1987) or Cho and Kreps (1987). Specifically, the parent acts as the "sender", the child acts as the "receiver", b serves as the sender's "message", and $\widehat{t}$ serves as both the receiver's inference and the receiver's "response". Thus, we identify the receiver's inference with the receiver's response, which is easily reconciled with the standard game-theoretic approach.[4]

[4] Instead of assuming that the parent cares directly about the child's inference, assume that the parent cares about the child's reaction to his inference. One can then renormalize the set of possible reactions to conform with the set of possible inferences. In other words, one case use $\hat{t}$ to denote the child's reaction to the inference that the value of the parent's altruism parameter is $\hat{t}$.

When we impose the constraint $c_P = W - c_K$, the slope of a type-t indifference curve is given by

$$\left.\frac{d\hat{t}}{dc_K}\right|_{\overline{U}_P} = \frac{(1-t)u'_P(W-c_K) - tu'_K(c_K)}{t\beta v'(\hat{t})}$$

Note that the value of this expression decreases with t. Thus, our model satisfies the standard Spence–Mirrlees single-crossing property.

Ignoring for the moment the possibility that children may infer $\hat{t}$ from the bequest b, we can optimize U_P over c_K to find the parent's bliss point $c^*(t)$. Specifically, we define $c^*(t)$ as follows:

$$c^*(t) = \arg \max_{c \in [0,W]} (1-t)u_P(W-c) + tu_K(c). \tag{1}$$

Under our assumptions, $c^*(t)$ is increasing in t (strictly so when $c^*(t) \in (0, W)$). Thus, if children only cared about consumption, then the optimal decision of type-t parent would be to choose $c_K = \max\{w_K, c^*(t)\}$. However, when children also care how much they are loved by the parent, then parents would attempt to signal their love through increased bequests. As we will see below, this causes the child's consumption to rise above $c^*(t)$ for each $t \in (0, 1)$, and ultimately leads to a failure of Ricardian equivalence in our model.

3. A simple case: two types

We begin by considering a simple case in which there are only two types, $\underline{t}$ and $\overline{t}$, with $\overline{t} > \underline{t}$. We assume that $c^*(\underline{t}) < w_K$, so that type $\underline{t}$ would ideally like to extract resources from her child. This condition is essential for the failure of Ricardian equivalence in the two-type case. However, it holds naturally in the model with a continuum of types analyzed in the next section, because there we have $\underline{t} = 0$ and $c^*(0) = 0$.

We will also assume that type $\underline{t}$ strictly prefers $(\max\{c^*(\overline{t}), w_K\}, \overline{t})$ to $(w_K, \underline{t})$ (where the first number in each pair denotes the child's consumption, and the second number denotes the child's inference). This assumption is satisfied as long as $\underline{t}$ is strictly positive and sufficiently close to $\overline{t}$. The role of this assumption will be apparent below.

As mentioned above, parent–child interaction in our model constitutes a signalling game where the bequest b provides a signal on the basis of which the child forms a belief $\hat{t}$ regarding the parent's type. This belief affects both the child's and the parent's utilities via the term $\beta v(\hat{t})$. We will focus on separating equilibria in which, by definition, different parent types leave different bequests and so the child infers the parent's type precisely after observing the bequest.

Let $\underline{b}$ ($\overline{b}$) denote the bequest of type-$\underline{t}$ (type-$\overline{t}$) parent in a separating equilibrium. Then the child of type-$\underline{t}$ (type-$\overline{t}$) parent attains consumption level $\underline{c}_K = \underline{b} + w_K$ ($\overline{c}_K = \overline{b} + w_K$). Since the difference between the child's consumption and the bequest is always equal to w_k, for simplicity of notation we will consider the child's consumption level, rather than bequest, as the parent's decision variable (this is just a simple normalization). Then the child's beliefs (as a function of consumption) are given by: $\hat{t}(\underline{c}_K) = \underline{t}$ and $\hat{t}(\overline{c}_K) = \overline{t}$. To define the child's off-equilibrium beliefs, we simply set $\hat{t}(c_K) = \underline{t}$ if $c_K \notin \{\underline{c}_K, \overline{c}_K\}$.[5]

Since type $\underline{t}$ strictly prefers $(\max\{c^*(\overline{t}), w_K\}, \overline{t})$ to (w_K, t), there is no separating equilibrium in which the two types simply leave their best feasible bequests, i.e. $\overline{c}_K = \max\{c^*(\overline{t}), w_K\}$ and

[5] It is standard in the signalling literature to assign the most pessimistic beliefs, which are equal to $\underline{t}$ here, after an off-equilibrium action choice.

$\underline{c}_K = w_K$. Indeed, if that were the case, then type $\underline{t}$ would prefer to imitate type $\overline{t}$. Hence, we have a non-trivial signalling problem.

Further, in a separating equilibrium type $\underline{t}$ will choose zero bequest, i.e. $\underline{c}_K = w_K$. For, if otherwise (i.e. $\underline{c}_K > w_K$), then type-$\underline{t}$ parent would strictly benefit by deviating to zero bequest. Indeed, such deviation strictly increases her utility from her own and her child's consumption (since $w_K > c^*(\underline{t})$) and does not decrease the utility that this parent-type obtains from the child's belief, as the latter cannot fall below $\underline{t}\beta v(\underline{t})$.

Finally, $\overline{c}_K$ is defined by the following non-imitation condition for type $\underline{t}$:

$$(1-\underline{t})u_P(W-w_k) + \underline{t}u_K(w_K) + \underline{t}\beta v(\underline{t}) = (1-\underline{t})u_P(W-\overline{c}k) + \underline{t}u_K(\overline{c}K) + \underline{t}\beta v(\overline{t}) \tag{2}$$

In words, $\overline{c}_K$ is the lowest consumption of the child of type-$\overline{t}$ parent which does not cause type $\underline{t}$ to imitate type $\overline{t}$.[6]

Notice that for any $\beta > 0$, we have $\overline{c}_K > w_K$ even if $c^*(\overline{t}) < w_K$. In other words, even when type $\overline{t}$ prefers to consume its entire endowment and β is tiny, $\overline{t}$ still leaves a positive bequest $\overline{b} > 0$ (though for small β the bequest is small).

Now consider the impact of a fiscal policy that redistributes resources τ from the child to the parent (e.g. social security), holding W constant. That is, let $w_P = w_P^0 + \tau$, and $w_K = w_K^0 - \tau$, where w_i^0 is the pre-transfer endowment for $i = K$, P. Implicit differentiation of the non-imitation condition (2) reveals that

$$\frac{\mathrm{d}\overline{c}_K}{\mathrm{d}\tau} = -\frac{\underline{t}u'_K(w_K) - (1-\underline{t})u'_P(W-w_K)}{\underline{t}u'_K(\overline{c}_K) - (1-\underline{t})u'_P\,(W-\overline{c}_K)}$$

Both the numerator and the denominator on the right-hand side are strictly negative, because $\underline{t}\,u_K(c_K) + (1-\underline{t})u_P(W-c_K)$ is concave in c_K and both $\overline{c}_K > c^*(\underline{t})$, as argued above, and $w_K > c^*(\underline{t})$ (the latter holds by assumption). Thus, the derivative $\frac{\mathrm{d}\overline{c}_K}{\mathrm{d}\tau}$ is strictly negative. This implies that the consumption of the child of type $\overline{t}$ declines in response to a redistribution from children to parents. This occurs despite the fact that type $\overline{t}$ is an altruist in the sense of Barro (1974), and despite the fact that type $\overline{t}$'s corner constraint, $\overline{b} \geq 0$, is not binding. Thus, under conditions normally thought to produce Ricardian equivalence, we obtain results consistent with the Neoclassical view that consumption of the current generation should rise in response to fiscal policy transferring the resources from the next generation to the current one.[7]

Ricardian equivalence fails here because $\underline{t}$'s corner constraint *is* binding, and because the outcome for $\underline{t}$ affects $\overline{t}$ through the non-imitation constraint.

How large is the effect of the hypothesized fiscal policy on the child's consumption? By Assumption 1, the absolute value of $\underline{t}u'_K(c) - (1-\underline{t})u'_P(W-c)$ rises with c over the interval $[w_K, \overline{c}_K]$. Thus, $\frac{\mathrm{d}\overline{c}_K}{\mathrm{d}w_K} \in (0, 1)$. This means that the model gives rise to partial offset of public policy for type $\overline{t}$. The degree of offset rises as the curvature of the utility function increases. Conversely, as

[6] Although there are other separating equilibria in which type $\overline{t}$ leaves a larger bequest resulting in larger $\overline{c}_K$, all such equilibria are supported by unintuitive beliefs and, consequently, can be ruled out by standard refinements, such as equilibrium dominance and 'intuitive criterion' of Cho and Kreps (1987).

[7] I thank the referee for pointing out that the results of this paper are most naturally interpreted as Neoclassical. It is also useful to note that Neoclassical predictions regarding the effects of fiscal policy are compatible with Keynesian view. The differences and similarities between Ricardian, Neoclassical and Keynesian views on fiscal policies are thoroughly discussed in Bernheim (1989).

the utility function approaches linearity, offsetting private transfers vanish and the effect of the fiscal policy gets larger.

We illustrate this analysis in Fig. 1. The curve $\underline{I}$ represents the indifference contour of type $\underline{t}$ through the point $(w_K, \underline{t})$. The point $\overline{c}_K$ is chosen so that $\underline{t}$ is indifferent between $(w_K, \underline{t})$ and $(\overline{c}_K, \overline{t})$. The curve $\overline{I}$ represents the indifference contour of type $\overline{t}$ through the point $(\overline{c}_K, \overline{t})$. The single crossing property guarantees that it is flatter than $\underline{I}$. Notice that the mutual non-imitation constraints are satisfied. Now imagine that some government fiscal policy redistributes resources from child to parent, so that the child's resources fall to w'_K. Then, to assure continued non-imitation, the equilibrium level of consumption for type $\overline{t}$ falls to $\overline{c}'_K$. For this reason, private transfers will not perfectly offset the public transfer. From the point of view of type $\underline{t}$, increments to the child's consumption are less costly from a base of w'_K than from a base of w_K (this follows from the concavity of the utility function). Thus, it takes a larger consumption increment to discourage imitation of $\overline{t}$-type parent by type $\underline{t}$ when the child's resources are w'_K, than when the child's resources are w_K. For this reason, private transfers generally offset the public transfer to some extent.

It is important to clarify the factors that produce non-neutralities in this model. One natural (but incorrect) conjecture is that transfers are non-neutral because the child cares not only about consumption, but also about the magnitude of the parent's transfer. It is well-known that fiscal policy is non-neutral when the parent's preferences are defined directly over transfers (Andreoni (1989, 1990)), and it is clear that a similar proposition would hold for children's preferences. However, this is not what is going on in the current model. Preferences are defined over consumption and over the child's inference, not over transfers. It is true that equilibrium inferences can be written as a function of transfers (just as they can be written as a function of the child's consumption), but this, by itself, does not generate non-neutrality. To see this clearly, consider the case in which $c^*(\underline{t}) > w_K$, which implies that type $\underline{t}$ is no longer corner constrained. Then in a separating equilibrium we will have $\underline{c}_K = c^*(\underline{t})$. Notice that this choice will not change as the government varies the distribution of resources between the parent and the child on the margin. Consequently, the non-imitation constraint (2) is unaffected, and type $\overline{t}$'s choice remains fixed as well. Thus, non-neutralities arise in this model because the lowest type parent is corner constrained, and not because transfers are somehow implicitly in the utility function.

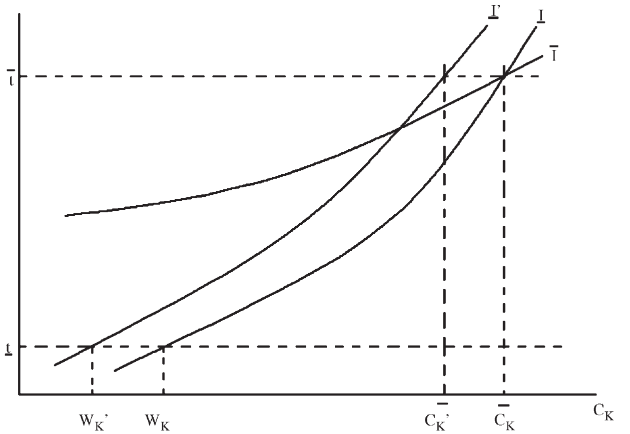

Fig. 1. Separating equilibria with two types.

4. The general case: a continuum of types

In the previous section, we restricted attention to the case with only two types of parents. Although the “higher” parent-type $\bar{t}$ was not corner constrained, she increased her own consumption in response to an external redistribution from children to parents. She did so because by making a not-fully-offsetting increase in her bequest she could nevertheless assure continued non-imitation by “lower” type parents, who were corner constrained and who were therefore directly affected by the redistribution. Thus, full crowding out did not occur. It is natural to inquire whether this result extends to cases with more than two types.

With two types, the argument for non-neutrality depends on the existence of binding corner constraints for the lowest type. With multiple types, the consumption decision of each type is determined by a non-imitation constraint involving the next lowest type. Consequently, one might conjecture that transfers are neutral for a given type unless the next lowest type is corner constrained. However, it turns out that transfers are non-neutral for every type. The consumption decisions of successive types are linked by a chain of mutual non-imitation constraints. If one perturbs the constraint for the lowest type, the decision of every higher type is affected. Referring back to Fig. 1, if we added a third type $\hat{t}$ (with $\hat{t}>\bar{t}$) to the model, the consumption choice for this new type would have to deter imitation by type $\bar{t}$. The set of consumption choices satisfying this constraint changes as the fiscal policy shifts $\bar{t}$’s choice from $\bar{c}_K$ to $\bar{c}'_K$.

To illuminate these issues, we now assume that there is a continuum of types and some non-atomistic population distribution over this continuum. We assume that the support of the cumulative distribution function F is [0, 1], so that all potential types are represented.

As in the two-type case of the previous section, a separating equilibrium is characterized by the function $\mu(t)$ that maps each parent type t to a level of consumption for the child. Note that $\mu(t)=w_K+b(t)$ where $b(t)$ is the bequest left by a type-t parent in equilibrium. Thus, when type-t parent leaves a bequest allowing her child to consume $\mu(t')$, the parent attains the utility equal to $(1-t)u_P(W-\mu(t'))+tu_K(\mu(t'))+t\beta v(t')$. Differentiating this utility function with respect to t' to obtain the first-order condition of type-t parent and making use of the fact that equilibrium beliefs are rational i.e. $t'=t$, yields the following differential equation for μ:

$$\mu'(t)=\frac{\beta t v'(t)}{(1-t)u'_P(W-\mu(t))-tu'_K(\mu(t))}. \tag{3}$$

Since type $t=0$ does not care about the child, $\mu(0)=w_K$. Any other choice of $\mu(0)$ does not maximize this type’s utility. Given this initial condition, Eq. (3) uniquely determines the separating action function μ.

We begin with some important observations concerning the separating equilibrium:

Proposition 1. *$\mu(t)$ is strictly increasing with $\mu(t)>c^*(t)$ for all $t\in[0, 1)$, and $\mu(1)=W$.*

Proof. Note first that $\mu(0)=w_K>c^*(0)=0$. Then, by continuity of $\mu(\cdot)$, $\mu(t)>c^*(t)$ when t is sufficiently small. Further, the denominator on the right-hand side of Eq. (3) converges to zero as $\mu(t)-c^*(t)$ approaches zero from above, while its numerator remains bounded from below at any $t\in(0, 1]$. So, if $\mu(t)-c^*(t)$ is sufficiently small at some $t<1$, then $\mu'(t)$ exceeds $c^{*\prime}(t)$. Thus, $\mu(t)$ remains strictly above $c^*(t)$ for all $t\in[0, 1)$. To show that $\mu(t)<W$ for $t\in[0, 1)$, we argue by contradiction. So, let $\tilde{t}=\min\{t|\mu(t)=W\}$ and suppose that $\tilde{t}<1$. But then type $\tilde{t}$ would get a larger payoff by imitating type t' close to $\tilde{t}$ s.t. $\mu(t')-W$ is positive and sufficiently small, because:

$$(1-\tilde{t})(u_P(W-\mu(t'))-u_P(0)) > \tilde{t}(u_K(W)-u_K(\mu(t')) + \beta(v(\tilde{t})-v(t')))$$

This inequality holds because $\lim_{c\to 0} u'_P(c)=\infty$, while $v'(t)$ is bounded for all $t \in [0, 1]$ and $u'_K(c)$ is bounded for c close to W. So, we cannot have $\mu(t)=W$ for $t \in [0, 1)$ in a separating equilibrium.

Thus, $c^*(t)<\mu(t)<W$ for all $t \in [0, 1)$. So, both the numerator and the denominator of (3) are positive for $t \in (0, 1)$. It follows that $\mu(t)$ is strictly increasing for $t \in [0, 1]$. Since $c^*(1)=W$, we must have $\mu(1)=W$. □

In words, all types (except $t=1$) bequeath more than they would ideally like to bequeath. In addition, the child's consumption is strictly increasing in the strength of the parent's altruism.

Note the following trivial but important corollary of Proposition 1: all types other than $t=0$ make strictly positive transfers to their children. Thus, virtually all families (formally, a set of full measure) are internally linked by operative, altruistically motivated intergenerational transfers. Notice that this result holds even if β is very tiny, and even if the population distribution of t is concentrated near 0. Also notice that this result does not hold when there are only two types of parents (as in Section 3). Indeed, as long as the number of types is finite, a strictly positive fraction of the population (all of the lowest types) bequeaths nothing in equilibrium.

Next, we consider the impact of a fiscal policy that transfers resources on the margin from the child to the parent. Observe that this does not alter the differential equation that defines μ, but it does change the initial condition (the value of $\mu(0)$), thereby altering the entire trajectory of μ. In particular, after a decrease in w_K (holding W fixed), the function μ shifts downward: the parent consumes more and the child consumes less for every value of t. More specifically, consider two distinct values of w_K, w_K^l and w_K^h with $w_K^l<w_K^h$. Since W is fixed, a change from w_K^h to w_K^l represents a redistribution from the child to the parent (e.g. social security). Let μ_l and μ_h denote, respectively, the separating functions associated with these endowments. Define $\Delta w \equiv w_K^l - w_K^h$ (the change in the child's endowment), and define $\Delta\mu(t) \equiv \mu_l(t)-\mu_h(t)$ (the change in the child's consumption for parent type t). The following result summarizes the impact of this redistribution:

Proposition 2. *For all* $t\in(0, 1)$, $\Delta w<\Delta\mu(t)<0$. *Moreover,* $\Delta\mu(t)$ *is strictly increasing in* t, $\lim_{t\to 0} \Delta\mu(t)=\Delta\mu(0)=\Delta w$, *and* $\lim_{t\to 1} \Delta\mu(t)=\Delta\mu(1)=0$.

Proof. Note that (i) $\mu_l(0)=w_K^l<w_K^h=\mu_h(0)$, and so by continuity $\mu_l(t)<\mu_h(t)$ for small t, (ii) for $t\in(0, 1)$, $\mu'_l(t)>\mu'_h(t)$ if and only if $\mu_l(t)<\mu_h(t)$, and (iii) $\mu'_l(t)=\mu'_h(t)$ if $\mu_l(t)=\mu_h(t)$. Thus, $\Delta\mu(0)=\Delta w$, $\Delta\mu(t)$ is continuous and increasing on (0, 1), and is non-positive for $t\in[0, 1]$. By Proposition 1, $\mu_l(t) > c^*(t)$ for all t, and moreover, $\lim_{t\to 1} c^*(t)=W$. Since $\mu_h(t)<W$ for all $t<1$, we obtain that $\lim_{t\to 1} \Delta\mu(t)=\Delta\mu(1)=0$. □

To interpret this result, note that $\Delta\mu(t)=0$ corresponds to full private offset of public policy (the pure Ricardian equivalence case), and that $\Delta\mu(t)=\Delta w$ corresponds to no private offset of public policy. Thus, we obtain very little offset for low values of t, and substantial offset for high values of t. Recall that the separating function μ does not depend on the population distribution of t. Consequently, if the type distribution is concentrated near zero, then the fiscal policy has a large effect (as predicted by the Neoclassical paradigm), even though all families are internally linked by operative, altruistically motivated intergenerational transfers and even though the set of constrained parents is negligible (it has measure zero). Conversely, if the population distribution of t is concentrated near unity, then the outcome is nearly Ricardian.[8]

Notably, since the Proof of Proposition 2 does not invoke any assumption concerning the magnitude of β, our conclusions are valid even when concern over parental affection is very weak. It is natural to conjecture that our results might nevertheless converge to the Ricardian case as β approaches zero, but this is false in one very important sense. The following result illuminates this issue.

Proposition 3. *For* $t<(c^*)^{-1}(w_K^l)$, $\lim_{\beta\to 0} \Delta\mu(t)=\Delta w$. *For* $t>(c^*)^{-1}(w_K^h)$, $\lim_{\beta\to 0} \Delta\mu(t)=0$.

Proof. To prove the Proposition, we need to show that $\mu(t)$ converges to $\max\{w_K, c^*(t)\}$ as β goes to zero. Eq. (3) implies that for any given value of $\mu(t)-c^*(t)$, $\mu'(t)$ converges to zero as β converges to zero. So, for small t (where $w_K>c^*(t)$) $\mu(t)$ converges to w_K, and for t such that $w_K\leq c^*(t)$, $\mu(t)$ converges to $c^*(t)$. The proposition follows. □

To interpret this result, note that $(c^*)^{-1}(w)$ represents the type of parent for whom the distribution of endowments, w and $W-w$, is also the best possible distribution of consumption. Proposition 3 states that, as β goes to zero, private transfers do not offset public transfers at all for those who would have made no transfers in the absence of signaling ($t<(c^*)^{-1}(w_K^l)$), and that private transfers fully offset public transfers for those types who would have made transfers in the absence of signaling ($t>(c^*)^{-1}(w_K^h)$). This is exactly what one gets in the limiting case where $\beta=0$: the policy is fully neutralized for those types who make private transfers, and not neutralized at all for those types who do not make private transfers. This is the standard Ricardian result.

However, the Proposition has a very different interpretation when $\beta>0$, because in this case virtually all types (a set of full measure), including those with $t<(c^*)^{-1}(w_K^l)$, do make operative, altruistically motivated transfers. But when the government redistributes endowments on the margin, those who would not have made transfers in the absence of signaling ($t<(c^*)^{-1}(w_K^l)$) respond as if they are corner constrained (even though they are not). Thus, if β is tiny and the population distribution of t is concentrated below $(c^*)^{-1}(w_K^l)$, then we obtain Neoclassical non-neutrality of the fiscal policy, even though the set of constrained parents is negligible (it has measure zero), and even though all other families are internally linked by operative, altruistically motivated intergenerational transfers.

The implications of the analysis in the preceding paragraph deserve emphasis. The central Ricardian proposition is that the existence of positive, altruistically motivated private transfers implies that endogenous private transfers will neutralize public transfers. We have shown that, on the contrary, once one assumes that children care about parental affection, the existence of positive, altruistically motivated private transfers does not imply that private transfers will offset public transfers to any significant extent, even when the dependence of the child's utility on parental affection (summarized by the parameter β) is extremely weak. We provide further illustrations of this principle in the next section.

It is important to reiterate that the failure of Ricardian equivalence in this model is inherently tied to binding non-negativity constraints on transfers, as in more standard settings with altruistic preferences. However, in contrast to standard models, non-neutralities may be pervasive even

[8] Proposition 2 also implies that the welfare effect of fiscal policy transferring resources from children to parents is ambiguous. Such policy causes $\mu(t)$ to shift closer to the parent's bliss point $c^*(t)$ for each $t\in[0, 1)$, so all parent types in [0, 1) become *strictly better off*. In contrast, the child of each parent type gets worse off because her consumption decreases.

when these constraints bind for a negligible fraction of the population. This occurs because each type of parent must differentiate itself from the "next lowest" type. Provided that non-negativity constraints bind for the lowest type, any redistribution of resources between the parent and the child affects the lowest type, and therefore affects every other type through the chain of non-imitation constraints.

This explains why our findings that Ricardian equivalence would fail even under a small degree of altruism differs from the prediction of the theory of 'warm glow' (see Andreoni (1989, 1990)). According to that theory, the outcome becomes approximately Ricardian as the degree of 'impure altruism', i.e. the 'warm glow' that people experience from giving to others, becomes very small.[9] Simply put, in our model there is a divergence of interests not just between parents and children, but also between different types of parents. The latter factor explains why non-Ricardian effect persists even under a diminishing degree of altruism.

5. Parametric examples

Naturally, the extent to which private transfers offset public policy depend on the various parameters of the model. In this section, we explore the nature of this dependence. Our objective here is, in part, to evaluate the likely effects of public policy under reasonable assumptions.

From the discussion in Section 2, it is obvious that the curvature of the utility function is an important determinant of the degree to which private transfers offset public policy. When this curvature is relatively small over the relevant domain, the degree of offset tends to be greater. To emphasize this point, we consider the boundary case for which utility is linear. To avoid generating outcomes in which the parent transfers all of her resources to her child and consumes nothing, we impose the restriction that $t < \frac{1}{2}$.[10] For this case, we demonstrate that, with even the tiniest degree of concern about parental affection, an exogenous transfer between parents and children is not offset by private transfers at all, even though essentially all families are internally linked by altruistic intergenerational transfers. Thus, the failure of Ricardian equivalence identified in this paper can be quantitatively significant, irrespective of β.

Example. Suppose that preferences are linear: $u_P(c_P)=c_P$, $u_K(c_K)=c_K$, and $v(t)=t$. Assume also that the support of F is $[0, \overline{t}\,]$, with $\overline{t} < \frac{1}{2}$, so that no parent would choose to make a positive transfer in the absence of signaling. Then it is easy to verify that the consumption of the child of type-t parent in the separating equilibrium is given by $\mu(t) = w_K - \beta\left[\frac{t}{1-t} + \log\left(1 - \frac{t}{1-t}\right)\right]$. Note that, for each parent type, the child's consumption increases dollar-for-dollar (and hence the parent's consumption decreases dollar-for-dollar) with this child's resources. This occurs even though $t=0$ (a set of measure zero) is the only parent type for which the transfer constraint binds, and irrespective of the size of β.

Naturally, we are also interested in evaluating the magnitude of the effects identified in this paper for less extreme cases. Accordingly, we parameterize the model as follows: $u_P(c_P)=c_P^\gamma/\gamma$, $u_K(c_K)=c_K^\gamma/\gamma$, and $v(t)=t^\lambda/\lambda$.[11] We discretize the type space by assuming that there are 50

[9] This directly follows from the formula characterizing the effect of fiscal policy redistribution in (Andreoni, 1989), p.1454.

[10] Technically, this case does not satisfy the assumptions of Section 2. Nevertheless, it is easy to solve this case by direct computation.

[11] Technically, $v(t)$ does not satisfy our assumption that $v'(t)$ is bounded for all $t\in[0, 1]$. This is inconsequential, however, because $v'(t)$ is bounded for all $t\in[0.01, 0.99]$, and since this interval contains the entire type space used in our simulations.

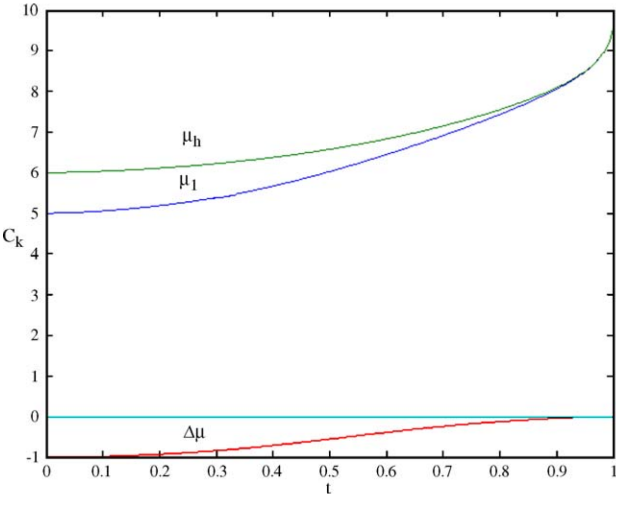

Fig. 2. Separating equilibria for base case parameters.

distinct types of parents, corresponding to $t=0.01+0.02n$ for $n=0, \ldots, 49$. We then solve numerically for the separating equilibrium, using the fact that $\mu(0.01)=w_P$, through iterative application of the 49 non-imitation constraints for adjacent types (the n-th constraint requires that type $t=0.01+0.02(n-1)$ does not want to imitate type $t=0.01+0.02n$). Our base-case parameters are as follows: $w_K=6$ and $W=10$ (so that the child is endowed with 60% of the family's resources), $\gamma=-1$, $\lambda=\frac{1}{2}$, and $\beta=0.1$.

Fig. 2 illustrates the separating equilibrium for the base case (labelled μ_h). It also illustrates a separating equilibrium for a variant of the base case in which w_K is decreased to 5, holding W constant at 10 (labelled μ_l), as well as the difference between these functions (labelled $\Delta\mu$). Note that each of these functions has the features indicated in Propositions 1 and 2.

Table 1 provides the results of numerical simulations quantifying the effect of a unit reduction in w_K on μ (i.e. $\Delta\mu$ for various types t) under different values of the underlying parameters. In these simulations the total family resources W are always held fixed at 10. The fourth column contains the values of w_K before the unit reduction.

The first row (case 1) corresponds to our base case. Note that private transfers offset the public transfers at the rate of 45 cents on the dollar for $t=0.5$. The offset is much smaller for $t=0.3$ (16 cents on the dollar). Though it is much larger for $t=0.7$, the child's consumption still declines by 23 cents for each dollar transferred. For case 2, we reduce the value of β from 0.1 to

Table 1
Numerical examples

Case	γ	β	w_K	$\Delta\mu(0.1)$	$\Delta\mu(0.3)$	$\Delta\mu(0.5)$	$\Delta\mu(0.7)$	$\Delta\mu(0.9)$
1	−1	0.1	6	−0.98	−0.84	−0.55	−0.23	−0.04
2	−1	0.01	6	−1.00	−0.98	−0.86	−0.12	−0.00
3	−1	1.0	6	−0.82	−0.34	−0.12	−0.04	−0.01
4	−1	0.1	3	−0.49	−0.01	−0.00	−0.00	−0.00
5	−1	0.1	9	−0.99	−0.96	−0.90	−0.80	−0.58
6	0.5	0.1	6	−1.00	−0.99	−0.88	−0.00	−0.00
7	−2	0.1	6	−0.88	−0.47	−0.22	−0.16	−0.00

0.01. Notice that the values of $\Delta\mu$ increase sharply for values of t up to and including 0.5. However, $\Delta\mu$ falls for higher values of t. This is a reflection of Proposition 3. Notably, the use of a smaller value of β produces a result that appears to be less Ricardian overall. For case 3, we increase the value of β from 0.1 to 1.0. Surprisingly, the results are more Ricardian for all values of t (though there are still significant effects on consumption for smaller values of t). Thus, the considerations raised in this paper appear to be most important for small to medium values of β. For case 4, we reduce the child's endowment, w_K, to 3 (30% of the family's resources before the transfer, 20% after). The outcome is much closer to the Ricardian benchmark, even for small values of t. For case 5, we increase the child's endowment to 9 (90% of the family's resources before the transfer, 80% after). The outcome is much closer to the Neoclassical benchmark of effective fiscal policy, even for high values of t. For case 6, we reduce the curvature of the utility function by setting $\gamma=0.5$.[12] As expected, the equilibrium involves much smaller offsets for $t \leq 0.5$. However, since μ converges to the fixed upper bound, W, the degree of offset is greater for higher values of t. Case 7 shows that an increase in curvature ($\beta=-2$) moves the results closer to the Ricardian benchmark.

Obviously, these calculations can neither prove nor disprove the empirical validity of the Ricardian result. However, they do demonstrate that one can obtain a wide range of outcomes, including outcomes that are consistent with Neoclassical predictions, for reasonable parameter values, even though virtually all parents make positive, altruistically motivated transfers.

6. Conclusions

In this paper, we explored the implications of the bequest signaling hypothesis for redistributive fiscal policies. We showed that private transfers may not offset public transfers to any significant extent, even though private transfers are altruistically motivated and strictly positive for all but a negligible set of households. This is notable since these conditions are normally thought to yield fully offsetting responses (Ricardian equivalence). We explicitly identified circumstances under which the departure from Ricardian equivalence is large. Notably, the departure may be quite large even when our model is very close to one in which Ricardian equivalence is known to hold (in the sense that children care very little about parental affection).

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[12] This particular case does not satisfy Assumption 1. Consequently, $\mu(t)$ reaches W before t reaches 1. As a result, the equilibrium involves a small pool at the top end of the type space. However, the equilibrium possesses all the other properties characterized in Propositions 1–3.

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