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Shaping intergenerational relationships: the demonstration effect

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Abstract

According to the demonstration effect theory, parents make intergenerational transfers to their elders in order to elicit a symmetric future behavior from their children. In this paper we show that upstream transfers are expected to increase with low returns from alternative financial assets and with the donor's life expectancy. The latter effect creates a greater incentive for daughters to care for parents.

Keywords: Intergenerational transfer; Demonstration effect; Imitation

JEL classification: D10; J10

1. Introduction

Motives for intergenerational transfers within the family are usually explained either by altruism or by exchange (Laferrère, 1999). According to the altruistic hypothesis, parents take into account the well-being of their children and they increase the recipients' level of consumption using cash or in-kind gifts (Becker, 1991). In the exchange model, financial transfers from parents correspond to the purchase of services and attention provided by children (Cox, 1987). There may also be a repayment by children to their aging parents for the support the former received earlier in the life course (Cox, 1990; Cigno, 1993). Accounting for the motivation underlying inter vivos transfers has fundamental implications for the redistributive outcomes of public transfers programs, since private gifts fully offset the effect of public income redistribution under altruism.

As far as support in old age is concerned, Cox and Stark (1996, 1998a) suggest an innovative explanation based on an indirect process of exchange that involves three generations. According to the

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demonstration effect theory, adults take care of their elders in order to elicit a future support from their children. The motive for upstream transfers would no longer be a repayment, but setting an example to the young generation so that in future years the latter will replicate the behavior of their parents. The model generates testable predictions described in greater detail by Cox and Stark (1996), such that parents are expected to help their own parents more through contact and visits when their young children are around.[1] The policy implications of this preference shaping hypothesis are important, since the impact of public allowances on current transfers may affect the expectations and incidence of future private assistance.

In this paper, we extend the demonstration theory by adding to it some formalization. Our purpose is twofold. Firstly, we account for the possibility of the capital market as a substitute for old-age support (Bergstrom, 1996). Secondly, we focus on the difference by sex in the incentives to invest in the demonstration effect. The paper proceeds as follows. Section 2 briefly describes the model of imitative intergenerational transfers proposed by Bergstrom and Stark (1993) and Cox and Stark (1996). Section 3 compares the risky returns from engagement in demonstration with the sure return to savings. Section 4 shows, using a dynamic setting, that daughters should invest more in the familial network than sons because of the difference in life expectancies. Section 5 concludes.

2. The demonstration effect model

The model of upstream transfers developed by Bergstrom and Stark (1993) and Cox and Stark (1996) includes imitative behavior in the expected utility maximization and involves three generations: grandparents G, parents P, and children K. According to the demonstration theory, P give to G in anticipation that when they, the P, become G, and the K become P, the K will treat P in the same way that P treat G.

While children may imitate the parental action, they may also choose a behavior maximizing their own self-interest. In the latter case, the choosers are aware that their behavior may in turn be copied by their progeny. With a probability π $(0 \leq \pi \leq 1)$ that K will treat P in the future as they see P care for G in the present, the parents P choose to maximize the expected value of their utility function $U(X, Y)$:

$$\max_{X} EU(X, Y, \pi) = \pi U(X, X) + (1 - \pi)U(X, Y) \tag{1}$$

where the first argument in U is the transfer from P to G, the second is the transfer from K to P, and U is a twice-differentiable utility function with $U_1 < 0$ and $U_2 > 0$. The desire that children adopt imitative action creates sufficient incentives to care for elders. Let $U^I \equiv U(X, X)$ be the utility of the donor parents if their children are imitators, and $U^S \equiv U(X, Y)$ be the utility of the donor parents if their children are selfish maximizers; the children respond to X with Y, not with X, where $Y \neq X$. From the first-order condition found by calculating $\partial EU(X, Y, \pi)/\partial X = 0$,

$$-[\pi U_1^I + (1 - \pi)U_1^S] = \pi U_2^I \tag{2}$$

[1] In the altruism and exchange models, upstream transfers are expected to decrease when the donor parents have children since then they provide more resources to their own progeny.

the marginal cost of assistance to elders $-[\pi U_1^I + (1-\pi)U_1^S]$ and its marginal expected benefit πU_2^I are equalized at the optimum. Therefore, the parents' equilibrium choice of assistance depends on the probability of imitation, π, and on the expected transfer, Y, received from children, so that the unique solution $\bar{X}$ may be written as $\bar{X} = \bar{X}(Y, \pi)$. Cox and Stark (1996) prove that the equilibrium choice $\bar{X}$ is increasing in the probability of imitation π since $\partial\bar{X}/\partial\pi = U_1^s/\pi EU_{11} > 0$.

3. Demonstration as a risky investment

In the demonstration effect model, individuals attempt to secure support in old age by the example they set in helping their own elders. As pointed out by Bergstrom (1996), parents may choose instead to buy financial assets in the capital market since investing in the well-being of elders is a risky investment.[2]

To compare the sure returns of savings with the risky returns of demonstration, we consider the following two-period model. We suppose that parents earn an income Y_1 in the working period 1, but nothing at all in the retirement period 2. In order to get resources in old age, parents must either engage in demonstration-effect type of activities by making an upstream transfer X, or save in the financial market. While the returns of savings given by the interest rate are sure, child-provided care is a more valuable but risky asset. Let $\tilde{r}$ be a random variable indicating the rate of return on the demonstration transfer, which is defined on the state space Ω and characterized by the normal distribution function $F(\tilde{r})$. The case $\tilde{r} = -1$ corresponds to a selfish maximizer attitude from children, while the case $\tilde{r} = 0$ may be associated with an imitative behavior by children.

Let $V(C_t)$ be the parental utility function in period $t = 1$, 2 which depends on the level of consumption C_t (C_2 is a random consumption). The function V is assumed to be continuous and twice-differentiable. The optimality problem so defined can be formulated:

$$\begin{aligned} &\max V(C_1) + \frac{1}{1+\rho}\int_{\Omega} V(C_2)\mathrm{d}F(\tilde{r}) \\ &\text{s.t. } C_2 = (1+i)(Y_1 - C_1 - X) + n(1+\tilde{r})X \end{aligned} \tag{3}$$

where ρ is the subjective rate of time discount, i is the market rate of interest, and n is the number of children whose behaviors are assumed to be perfectly correlated ($n \geq 1$). First-order conditions are:

$$V'(C_1) - \frac{1+i}{1+\rho}E[V'(C_2)] = 0 \tag{4}$$

$$-(1+i)E[V'(C_2)] + E[n(1+\tilde{r})V'(C_2)] = 0. \tag{5}$$

From (5) which defines the equilibrium choice of X, $[n-(1+i)]E[V'(C_2)] + nE[\tilde{r}V'(C_2)] = 0$ and using $E[\tilde{r}V'(C_2)] = \mathrm{cov}[\tilde{r}, V'(C_2)] + E(\tilde{r})E[V'(C_2)]$, we finally deduce:

[2] Following Bergstrom (1996, p. 1917), 'an adult chooser must decide whether to support her elderly parents or to ignore the parents and invest her money in financial assets which she can trade for support in her old age. Investing in the well-being of her parents in the hope that this investment will be copied by her children is risky'.

$$E(\tilde{r}) = \left(\frac{1+i}{n} - 1\right) - \frac{\mathrm{cov}[\tilde{r}, V'(C_2)]}{E[V'(C_2)]}. \tag{6}$$

Thus, the expected rate of return on the risky demonstration activity $E(\tilde{r})$ is equal to the sum of the weighted riskless interest rate $(1+i)/n - 1$ and a positive risk premium $-\mathrm{cov}[\tilde{r}, V'(C_2)]/E[V'(C_2)]$. Let us calculate the optimal value of the demonstration transfer X^*. Noting that $\tilde{r}$ and C_2 are bivariate normally distributed, we apply the Stein's lemma so that $\mathrm{cov}[\tilde{r}, V'(C_2)] = E[V''(C_2)]\mathrm{cov}(\tilde{r}, C_2)$ provided that V is twice-differentiable (Huang and Litzenberger, 1988). From the definition of C_2, we get $\mathrm{cov}(\tilde{r}, C_2) = n\sigma_{\tilde{r}}^2 X^*$ where $\sigma_{\tilde{r}}^2 = \mathrm{var}(\tilde{r})$. Defining the absolute risk aversion $a = -E[V''(C_2)]/E[V'(C_2)] > 0$, the optimal value of the risk premium can be written as $a\sigma_{\tilde{r}}^2 nX^*$ which implies that:

$$X^* = \frac{n[1 + E(\tilde{r})] - (1+i)}{an^2\sigma_{\tilde{r}}^2}. \tag{7}$$

From (7), parents invest in the demonstration effect by setting an example to their children only if the random rate of return of private transfers $n[1 + E(\tilde{r})]$ exceeds the sure rate of savings $(1+i)$. This model provides a formal proof of Bergstrom's (1996, p. 1916) statement which claims that 'a chooser will do more to support her elderly parents, the higher the probability that her children are copiers and the lower the expected returns from alternative financial assets'. On the one hand, the effect of an increase in i diminishes the equilibrium choice of X^* since $\partial X^*/\partial i < 0$. On the other hand, the level of transfer increases in the rate of return of the demonstration effect $E(\tilde{r})$ which is positively correlated with the probability of imitation π $(\partial X^*/\partial E(\tilde{r}) > 0)$. Moreover, parents who have a strong risk aversion prefer to undertake less risky investments by saving in the financial market rather than using the familial network $(\partial X^*/\partial a < 0)$.[3].

4. Gender differences in the demonstration effect

Since wives are typically younger than their husbands, and since women live longer than men, wives will gain more from the demonstration effect as they are more likely to benefit from child-to-parent transfers during a longer period of time (Cox and Stark, 1996). We examine these gender differences in the provision of care to elders using a time-continuous model of demonstration transfers with mortality risk.

We consider a dynamic setting where the parents P may reap the benefit from their investment in the demonstration effect during several time periods. In the first period, the expected value of the demonstration is $V_1 = \pi U(X, X) + (1-\pi)U(X, Y)$ following Cox and Stark (1996). In the second period, the expected value depends on the utility $\pi U(X, X)$ of being imitated by K in that period and on the first period utility expectation $(1-\pi)V_1$, so that $V_2 = \pi U(X, X) + (1-\pi)V_1 = \pi U(X, X)[1 +$

[3]Engagement in the demonstration effect also decreases with the variance of the rate of return on upstream transfers $(\partial X^*/\partial \sigma_{\tilde{r}}^2 < 0)$. The effect of an increase in n on the equilibrium choice is given by the sign of $\partial X^*/\partial n = [-n(E(\tilde{r}) + 1) + 2(1+i)]/an^3\sigma_{\tilde{r}}^2 <> 0$. Thus, there exists a value of the number of children n^*, where $n^* = 2(1+i)/(1+E(\tilde{r}))$, which maximizes the investment in the demonstration effect. Following Cox and Stark (1998b), G should make intergenerational tied transfers to P in order to encourage the production of n^* children.

$(1-\pi)]+(1-\pi)^2U(X,\ Y)$. Using the same argument, we determine the expected utility after t periods $V_t=\pi U(X,\ X)+(1-\pi)V_{t-1}$ which may be written as $V_t=\pi U(X,\ X)\Sigma_{i=0}^{t-1}(1-\pi)^i+(1-\pi)^tU(X,\ Y)$. Since $0\leq\pi\leq1$, we have $\Sigma_{i=0}^{t-1}(1-\pi)^i=[1-(1-\pi)^t]/\pi$ and the expected value V_t of the demonstration effect after having waited for t periods is:

$$V_t(X)=U(X,X)-(1-\pi)^t[U(X,X)-U(X,Y)]. \tag{8}$$

Let $q(t)=(1-\pi)^t$ be the probability of non-imitation during t periods. Using $\log q(t)=t\log(1-\pi)$ and $\log(1-\pi)\approx-\pi$, we have $\log q(t)\approx-\pi t$ so that $q(t)$ is approximately equal to $e^{-\pi t}$. Thus, the expected utility of the demonstration effect after having waited for t periods in a time-continuous setting may be written as:

$$V_t(X)=U(X,X)-e^{-\pi t}[U(X,X)-U(X,Y)]. \tag{9}$$

In this model, parents choose the optimal level of upstream transfer X^* by maximizing the expected utility V_t given the subjective time rate of discount ρ and an uncertain lifetime. Let T be the maximum age to which parents can live where the random variable T has the exponential density function $f(T)=\lambda e^{-\lambda T}$ and the cumulative distribution function $F(T)=1-e^{-\lambda T}$ $(T\geq0)$, so that life expectancy is $E(T)=1/\lambda$.[4] Parents maximize the expected utility $V_\infty=E(\int_0^TV_te^{-\rho t})\mathrm{d}F(T)$ which is equivalent to:

$$\max_X V_\infty=\int_0^{+\infty}V_t(X)e^{-(\rho+\lambda)t}\mathrm{d}t. \tag{10}$$

The solution to the maximization program given by (10) is:

$$\max\nolimits_X\ V_\infty=\frac{\pi U(X,X)+(\rho+\lambda)U(X,Y)}{(\rho+\lambda)(\pi+\rho+\lambda)}. \tag{11}$$

Let us calculate the equilibrium choice X^* resulting from the demonstration effect in this setting. From the first-order condition, the marginal benefit expected from demonstration is equalized with its marginal cost which depends on the mortality risk:

$$-[\pi U_1^I(X^*,X^*)+(\rho+\lambda)U_1^S(X^*,Y)]=\pi U_2^I(X^*,X^*). \tag{12}$$

From Eq. (12), the equilibrium choice of transfer depends on the values of ρ and λ, so that the unique solution X^* can be expressed as $X^*=X^*(Y,\ \pi,\ \rho,\ \lambda)$. In this model, we can prove that X^* is decreasing in the parameter λ, the inverse of the life expectancy. By differentiating the first-order condition $V_X(X^*,\ \pi,\ \rho,\ \lambda)=\pi(U_1^I+U_2^I)+(\rho+\lambda)U_1^S$, we obtain $V_{XX}\mathrm{d}X^*/\mathrm{d}\lambda+V_{X\lambda}=0$ and hence $\operatorname{sgn}\mathrm{d}X^*/\mathrm{d}\lambda=\operatorname{sgn}V_{X\lambda}$, using the concavity of V_{XX}. The effect of an increase in λ on X^* is then given by $\operatorname{sgn}\mathrm{d}X^*/\mathrm{d}\lambda=\operatorname{sgn}U_1^S$ and the sign of this last derivative is negative. As we consider an adult characterized by a short life expectancy, the incentives to invest in the demonstration effect are weakened since the horizon over which benefits accrue from intergenerational transfers by children in

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[4]Because of sex differences in life expectancy, husbands face a higher mortality risk and they are therefore characterized by a higher value of λ.

old age is shortened. Therefore, women who live longer than men prefer to make a greater investment in demonstration by providing more help to their elders.

5. Conclusion

Looking at the motives underlying private transfers, this paper moves away from standard models based on altruism and exchange and focuses instead on the demonstration effect theory proposed by Cox and Stark (1996, 1998a,b), where individuals take care of their elders in order to elicit a symmetric future support from their children. In this paper, we have provided formal proof that upstream transfers are expected to increase with low returns from alternative financial assets and with the donor's life expectancy. The latter effect creates a greater incentive for daughters to care for their elders. Many predictions of the demonstration effect are borne out by the data.

Both in the United States and in France, Cox and Stark (1996) and Wolff (2000), respectively, find that having at least one child widely increases adult respondent-parents contact and visits.[5] The number of children is positively related to the probability of giving money to elders and parents are more likely to expect financial transfers from children when they themselves make financial transfers to their elders (Cox and Stark, 1998a). The empirical studies exhibit gender differences in the propensity of assistance to elders, where women are more likely to provide time-related transfers. The intra-household distribution of income also affects the probability to make an upstream transfer in a way which suggests that women prefer to invest more in the demonstration effect. These results strongly support the demonstration theory which should be taken as the benchmark case in studying motives for inter vivos transfers within the extended family.

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[5] Nevertheless, as shown by Wolff (2000), incentives for respondents who have at least one child to have a greater amount of contact with parents may also be based on the need for child care.

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