PARENTAL ALTRUISM IN FRESHWATER MANAGEMENT

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Population growth, industrial development and attendant pollution put increasing stress on freshwater. Freshwater is a scarce non-renewable resource; only around 0.9% of the total water on earth is ground water and 0.009% is surface water. These water sources are highly vulnerable to excessive consumption and pollution by the current generation. The effort by the current generation to protect or save this resource will directly affect its availability for the future generation. .

Existing literature on freshwater management mainly concerns water consumption and regulations for one generation or particular regions. There are a limited number of studies that consider overlapping intergenerational relationship of water consumption and pollution.

We develop an OLG model of parental (current generation's) altruism in fresh water management and attempt to combine both quantity and quality of freshwater consumption. This model consists of an infinite-horizon economy with altruistic individuals living for two periods, a firm and two goods, one of which is public good, water, and the other of which is private good produced by the firm using not only neoclassic production inputs (labor and capital), but water resources. Individuals only work and earn wages in the first period during which they only consume water and save income. Then they retire in the second period during which they consume both water and the private good, leave some amount of water valued by the market water price, and voluntarily contribute some money to improve water quality. Households obtain utility from consuming both goods and are disutilized by pollution in the second period, but since individuals are retired in the second period, so the pollution can be only from the first period.

A representative parent tries to maximize the sum of utility from water consumption over his or her life time and an altruistic value derived from water bequeathed to his/her offspring, net of disutility from pollution from income-earning activity. This maximization is subject to income constraint, physical water amount constraint and pollution constraint. We will then characterize the effects of population growth, net recharge rate, degree of altruism, and the marginal utility from consumption or disutility from pollution on inter-generational water allocation. Next, individual parent's inter-generational decision will be integrated into a social planner's problem in order to characterize an inter-generational social equilibrium path for water allocation. We also empirically model climate uncertainty by parameterizing water recharge rate.

Solving the optimizing problem combining income/budget, physical water amount, and pollution control yield the following results: the last unit of pollution brings less disutility to households when the natural pollutant absorption rate is high. The more altruistic the parents are, the higher the marginal disutility they suffer from pollution. The higher the discount rate, the more satisfaction parents will have from the last unit of water consumption. The more altruistic the parents are or the faster the population grows, the less water they will consume in the first period. If the net water recharge rate is high, the marginal utility from consuming water in the first period could go down. Similar results are found for marginal utility of water consumption in the second period. Additional findings are that when the water market price increases in the second period,

parents get more satisfaction consuming the last unit of water in the same period, and net recharge rate has ambiguous effect on the marginal utility for the second period. The results of the social planner's problem closely mirror the results derived for the individual's problem above. Based on the theoretical and empirical results, paper makes policy recommendations for improving altruistic behavior especially against climate-driven uncertainty in recharge rates and market-driven private water consumption behavior.