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SAVED IN SPACE: A COMPUTATIONAL MODEL OF THE EFFECTS OF RELIGIOUS ALTRUISM  
ON THE SURVIVAL OF HUMAN SPACE SETTLEMENTS

**Abstract**

When selecting settlers for future space colonization, STEM-based qualifications are typically prioritized over social skills. Religion, especially, receives zero-priority considering its assumed potential to promote conflict and incompatibility with scientific thinking. We challenge this preconception noting that religion may act as a means of social coordination via norm enforcement. Numerous social science disciplines suggest that religion is among the most powerful enablers of altruistic behavior and ethical consumption of collective resources. By considering religion as a historically-important institution for generating behavioral norms that promote social coordination, we prompt policymakers to look beyond the narrow range of technical characteristics ideal for space travelers. We present experimental results of a computational analysis of religious altruism within the context of a simulated human community. Our model examines the effect of religiously-motivated altruistic behavior on the use of scarce resources and resiliency of settler cooperation. To test our hypothesis that a religious sub-population within a larger settlement will enhance social cooperation and effective use of resources, we designed and implemented an agent-based model. The simulation starts with a settlement containing two agent-sets of equal size: atheist scientists maintaining the settlement's production capacity and religious workers producing food. Each turn, food output is computed accounting for the level of individual satisfaction and a future prediction of the needs of the settlement as a whole. Once food is produced, units are redistributed to the members of the colony in equal shares. Each member decides whether to consume their quota or set aside some of it for future use. Religious individuals also have the option to donate part of their stored food to the colony to mitigate scarcity and envy among greedier members of the settlement. The fundamental assumption is that altruistic individuals are more sensitive to future needs. However, an excess of altruistic behavior might incentivize non-altruistic agents to reduce their production and become free-riders. In order to measure the settlement's level of performance under different proportions of religious and non-religious agents, we employ metrics of fluctuations over time for colony growth/decay rate, food production, and overall agent satisfaction. Experimental results show that religious individuals contribute to optimal performance through altruistic behavior if they are large enough to support a cycle of virtuous consumption, but do not represent a majority. Interestingly, the presence of too many altruistic oriented religious agents, or the complete absence thereof, always results in sub-optimal production and allocation, thereby decreasing settlement resiliency.