First experimental evidence supporting Hamilton's rule regarding kin selection in economic decision-making

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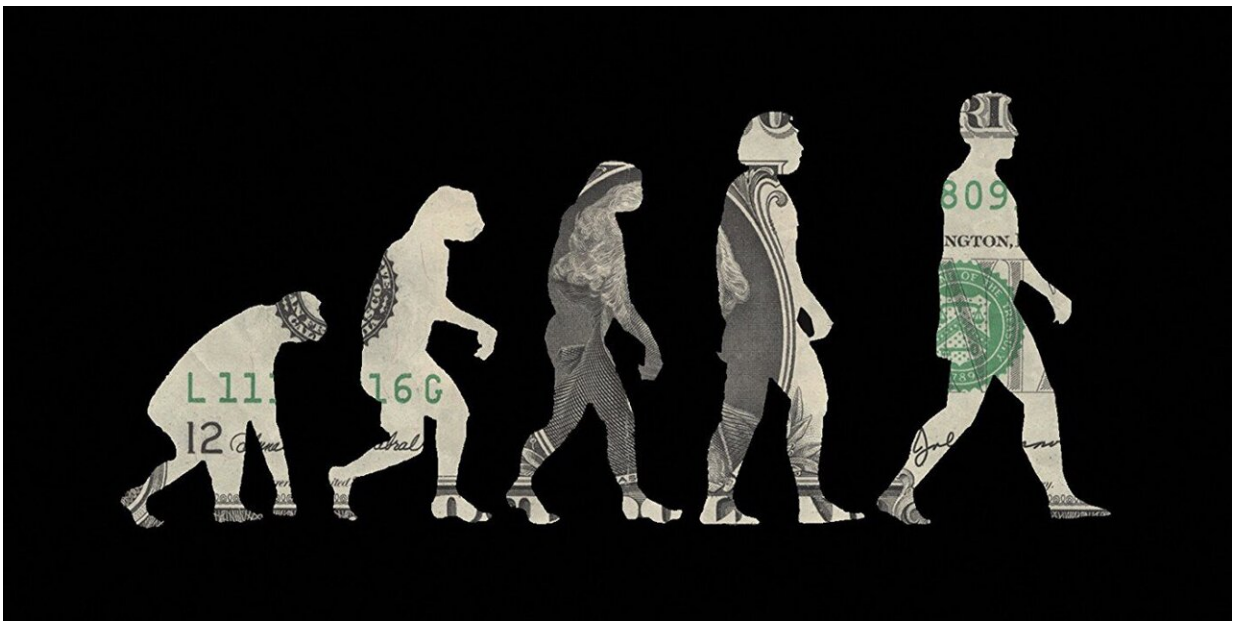

MIT Sloan School of Management Prof. Andrew W. Lo and Hebrew University School of Business Prof. Moshe Levy have found strong support for this rule in an experiment involving monetary transactions among human subjects with varying degrees of genetic relatedness. Credit: Courtesy of Andrew Lo

Hamilton's rule—the mathematical relation quantifying the idea that genetically related subjects are more likely to help each other, even at the expense of their own survival—has been observed in many animal

species, but it had yet to be tested in financial decision-making contexts. Now, in a new study published in the *Proceedings of the National Academy of Sciences*, MIT Sloan School of Management Prof. Andrew W. Lo and Hebrew University School of Business Prof. Moshe Levy have found strong support for this rule in an experiment involving monetary transactions among human subjects with varying degrees of genetic relatedness.

"Our findings are significant not only because they directly test and validate Hamilton's rule in financial settings, but also because they show that the principles of evolutionary biology and financial economics are more closely tied than we thought," says Lo.

Hamilton's rule is summed up in a famous quote by evolutionary biologist J.B.S. Haldane: "I would lay down my life for two brothers or eight cousins." This idea was formalized by William Hamilton in 1964, who captured the key evolutionary ideas of inclusive fitness and kin selection in a simple algebraic relationship. The relationship is based on the premise that an individual's willingness to help another is directly related to the amount of genetic material they have in common.

"Evidence consistent with this rule has been observed in a diverse range of species, including bees, wasps, birds, shrimp, monkeys, and even plants. It is widely accepted as the principal explanation for altruistic behavior in the natural world and is considered as 'one of the greatest theoretical advances in evolution since Darwin's time,'" Lo and Levy wrote in their paper.

While prior observational studies have determined if behavior is consistent or inconsistent with this rule, none have quantified the maximum amount an individual would be "willing to pay" for a given benefit to another person depending on their degree of genetic relatedness. This is known as the cutoff cost in Hamilton's rule.

In their study, Lo and Levy test the cutoff cost predicted by Hamilton's rule in a financial decision-making context involving monetary gifts between people of varying degrees of genetic relatedness. Using money as a proxy for survival, they asked test subjects how much they would be willing to pay for someone else to receive $50. The recipients of the $50 included siblings, half siblings, cousins, identical twins, nonidentical twins, and random individuals chosen by a computer.

Test subjects could earn as much as $50 for their participation, but if a deal occurred, they would also be asked to pay the amount they indicated. When a deal occurred, the researchers paid the recipients the promised $50, ensuring this was a real test rather than a hypothetical question. They found that the cutoff costs aligned based on genetic relatedness in "exactly the degree" proposed by Hamilton's algebraic relationship.

Lo and Levy point out that in addition to validating the rule, their findings also shed light on human motivations in financial decision-making: "One may be surprised by the strong explanatory power of the forces of evolutionary biology on such complex human behavior. It is perhaps possible that these ancient forces are acting indirectly and under the surface on human behavior, by shaping social networks, norms, and morality to exert their influence."

More information: Moshe Levy et al, Hamilton's rule in economic decision-making, *Proceedings of the National Academy of Sciences* (2022). DOI: 10.1073/pnas.2108590119

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