Allocative Efficiency of Markets with Zero-Intelligence Traders: Market as a Partial Substitute for Individual Rationality

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We report market experiments in which human traders are replaced by “zero-intelligence” programs that submit random bids and offers. Imposing a budget constraint (i.e., not permitting traders to sell below their costs or buy above their values) is sufficient to raise the allocative efficiency of these auctions close to 100 percent. Allocative efficiency of a double auction derives largely from its structure, independent of traders’ motivation, intelligence, or learning. Adam Smith’s invisible hand may be more powerful than some may have thought; it can generate aggregate rationality not only from individual rationality but also from individual irrationality.

Becker (1962) proved that several basic features of economics such as downward-sloping demand functions and upward-sloping supply functions can be derived as market-level consequences of agents’ random choice behavior subject to a budget constraint. He pointed out that “households may be irrational and yet markets quite rational” (p.8) and that we should not impute all observed irrationalities of individuals to markets or impute all rationality of markets to their participants.