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**Construct an argument for the claim that the most useful tools for understanding the real economy are those provided by game theory.**

Economics has historically developed as the science of “human behaviour as a relationship between ends and scarce means which have alternative uses”—however, considering its long history it is unfortunate that this definition is yet to be appreciated fully. Real-life (*r.l.*) economic behaviour deviates considerably from the predictions of the first welfare theorem (*f.w.t.*), its exceptions, and various tweaks to force its blunt instruments into modelling *r.l.* situations that it was not built to handle; it is a good first attempt, yet has little scientific knowledge to offer. Game theory (*g.t.*), on the other hand, is a powerful new tool for establishing a new foothold in the analysis of such human behaviour, where strategic interaction takes centerstage, and a wider variety of social phenomena can come into view.

Most market structures are not *p.c.*, with their infinitesimally divisial quantities and no barriers to entry—but rather oligopolistic, with firms having market power and strategically interacting; customers suffer from imperfect information, and society from externalities. Traditional economic models do a poor job of resolving these discrepancies other than the government; *g.t.*, on the other hand, *founds* itself on strategic interaction.

*G.t.*'s strategic interaction models are useful for almost all *r.l.* economic scenarios where agents have market power. Major commodity, infrastructure, and financial markets are oligopolies of varying degrees—processed food, oil, internet, insurance. These rent-seeking behaviours are inherent in all economic agents and built on *market power*. Thus agents will aim to garner market power through controlling entry barriers, mergers, or colluding—and traditional economics has an analysis without a solution in such behaviours, other than government interaction. *G.t.*, on the other hand, is useful in understanding and providing solutions to such situations; its basic models provide ample tools for predicting the behaviour of OPEC, internet service providers<sup>1</sup>, insurance companies,<sup>2</sup> or M&A contractors<sup>3</sup>. Considering the increasing rate

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<sup>1</sup> Fu, Hong, et al. “A Multi-Internet Service Provider Game: Equilibrium, Stability, and Characteristics.” *Concurrency and Computation: Practice and Experience*, vol. 32, no. 14, 2020, <https://doi.org/10.1002/cpe.5700>.

<sup>2</sup> Wu, Renchao. *Game Theoretical Approaches for Pricing of Non-life Insurance Policies Into a Competitive Market Environment*. University of Liverpool, 2017.

<sup>3</sup> Deman, Suresh. *Game Theory and Its Applications to Takeovers*. Cambridge Scholars Publishing, 2021.

of consolidation of firms<sup>4</sup>, there is ample reason to believe such behaviour will soon dominate the market, and *g.t.* will emerge as an essential tool in such analyses.

Another core ingredient in any realistic economic analysis must include non-private goods, which modernity especially benefits from. Such *public goods* (*p.g.*), do not, due to their non-rivalrous, non-excludable nature, lend themselves neatly to traditional analysis, and the positive externalities it produces more so. However, armed with *g.t.*, we may analyze how an economic agent may be incentivized or coerced into its production. Such modes of arranged or forced collaboration are increasingly essential as *p.g.s* are increasingly valuable in the globalized and collaborative nature of the *r.l.* economy.

The analysis of such disequilibria has hereto hinged on government intervention; however, we should not preclude the existence of a perfect-knowledge benevolent state as an essential producer of *p.g.s*—its existence itself requires justification and its operations demystification. *Government* is a simple concept for a complex problem on its own, and one that traditional economics frequently defer solutions to. Assuming the existence of *an omniscient state adjusting market conditions* is a statement itself in need of analysis—the government must form, its laws established, and its actions informed.

*G.t.* does just that, as it views the actions of a state not as a black box but as the producer of *p.g.s*. It is possible, with *g.t.*, to consider how rational egoists may collaborate to produce *p.g.s*, or if a government is necessary for its production, depending on characteristics of the good or society. It is a deeper model for the problem of externalities, explaining in more detail how individual interaction could produce certain positive or normative results—a fully decentralized model, from which may arise a need (or lack thereof) for an economic planner, not bestowed upon markets, but as its product. With this model *g.t.* can model when government interaction is necessary, or if civil societies are well-enough maintained; whether individuals may collaborate to produce *p.g.* for themselves, or lawful tweaking of payoffs is required. For such institution design problems *g.t.*'s tools are best suited, with its precision in individual interaction, and scalability of its models.

Ultimately the foundations of economics are laid *solely* upon the pillar of individual interaction of rational egoists, from which arises a collective human behaviour. It is when we depart from

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<sup>4</sup> Autor, David, et al. “The Fall of the Labor Share and the Rise of Superstar Firms\*.” *The Quarterly Journal of Economics*, vol. 135, no. 2, Oxford UP (OUP), Feb. 2020, pp. 645–709. Crossref, <https://doi.org/10.1093/qje/qjaa004>.

the less necessary assumptions of *f.w.t.*, that we can divorce economics from a mathematical fantasy, and reconstruct it as a social science. Game theory, with its foundation on strategic interaction, and proven analyses of collaboration, is the new pillar capable of supporting this effort.

*(745 words)*

**Why is the allocative efficiency of financial markets the most important requirement for an economy? Why are financial markets the easiest to prevent being allocatively efficient?**

Financial markets (*f.m.*) play a crucial role in any economy as a *market for money*; an allocatively efficient one, therefore, would greatly benefit the economy's growth potential. Unfortunately, it is also a market littered with rent-seeking opportunities, making them remarkably inefficient in real life.

Money serves as, among other things, a claim on future consumption; one can trade their perishable goods with those who need their consumption *now*, for an amount of *postponed consumption* (*p.c.*). *F.m.s* arise as the result of a person's need to postpone or borrow consumption. Persons with extra postponable consumption—"savers"—can lend their *p.c.* to, *e.g.*, entrepreneurs, who may need to pay for their current capital purchase, and can pay back after the investment generates cash flow, with additional interest, *i.e.* the price of *p.c.* Such capital investment, incidentally, is crucial for economic growth—barring technological innovation, growth happens only with the creation of capital, which must be funded by current consumption, lent to them by these savers.

While individuals may be able to trade current and future consumption in a decentralized way, due to the variety of desired amounts and risk tolerances it is more effective for an intermediary to coordinate this exchange, packaging up amounts of consumption into sellable chunks. Financial institutions such as banks play this crucial role—without it the high transaction costs of the problem of savers and entrepreneurs finding each other would discourage any financial transaction. Financial institutions can then profit off the differential in interest rates savers want from them and entrepreneurs are willing to pay; this is their rent. In an allocatively efficient *f.m.*—derived from perfect competition—interest correctly reflects the current price of money; *i.e.* the interest rates savers demand are similar to what entrepreneurs are willing to pay. If this dichotomy is exaggerated and *f.m.s* are allocatively inefficient they may cause over- or under-investment in capital, exaggerating risk tolerance to cause instability, or reducing capital purchase to stagnate economic growth.

Unfortunately, the *f.m.* easily devolves into inefficiency. The structure of the problem of trading *p.c.* demands large firms be set up that can tolerate defaults and package savings into larger capital investments. Such banks will have a near-monopsony on the market of savers, and can artificially lower interest rates, while they have a near-monopoly on the market for selling *p.c.*

(although in this market, the purchasers of money likely also wield market power). Financial firms then may inflate or deflate rates without savers or entrepreneurs noticing, gaining monopsony and monopoly rent off these differences. A prominent example is the *Libor scandal* where banks falsely reported the interest rates they were paying for rent-seeking from this differential.

The complex nature of packaging up investments and analyzing its risk profile makes firms opaque and further prone to rent-seeking. With such asymmetric information and oligopolistic market structures, financial firms can employ predatory lending practices to borrowers and deflate risk to savers for their outsized profits. With these funds firms can lobby legislators and regulatory commissions to maintain both their market power and opacity in operations, with regulatory barriers to entry and reduced information disclosure requirements put in place. The recent subprime mortgage crisis resulted precisely due to such behaviour—firms misreported the risk profile to investors, and credit rating agencies approved such false credit ratings, which led to investments without full risk information, where banks made huge profits at the cost of high default risk.

Such a cycle of profits being diverted to bribery and lobbying that allow further rent-seeking is an egregious positive feedback loop with little oversight. After the Great Depression, Glass-Steagall legislation afforded protection for savers and put leverage limits on banks; however, the efficient market hypothesis argued that the stock market need to be regulated, observing that mutual funds do not outperform the individual investor, and led to gradual deregulation, leading to its repeal. After the subprime mortgage crises, Dodd-Frank regulations again put restrictions in place, but it was also established that governments will inject cash to prevent the bankruptcy of large financial firms that are “Too Big to Fail,” thus creating a *moral hazard* for firms to take on more risk.

Ultimately the nature of the financial sector leads to a monopsonistic and monopolistic market, and thus regulation must prevent such allocative inefficiencies. Unfortunately, the current reality of the *f.m.* is that it has unconstrained rent-seeking and cronyism as the norm. An alternative, incentive-compatible institution design to mitigate inefficiencies and keep the market for *p.c.* healthy, is essential for long-term growth.

(748 words)

**Three children come to you with a problem of distributive justice. One has made a wooden flute, the second is the only one who can play it, and the third child has no toy whatsoever. They demand that you decide who should get the flute. Explain how each of at least three different moral theories would provide a rationale for one's decision about who should get it. Then endorse one choice and explain your justification.**

Mills, Rawls, and Nozick's moral standards warrant different analyses in the prescribed hypothetical situation—*A* who made the flute, *B* who can play, and *C* without any toy—each of which I will outline, and then one of which I will endorse based on categorical principles as well as moral intuition.

Mills's utilitarian principles warrant the grand sum of utility to be maximized, and thus a utilitarian would demand *A* to give their flute to *C*. They would argue that utility surpasses all moral judgements, *including any past descriptions about ownership*, thus the loss of utility to *A* is likely to be offset by *B*'s gain in utility, as *A* cannot use the flute, but possibly *B* *can*, and thus will gain more utility than *A* loses. Alternatively, another utilitarian may argue that since *C* has no toy, transferring the flute from *A* to *C* might enhance total utility, as humans experience diminishing marginal benefit (MB) of goods: MB gained by *C* can be larger than MB lost by *A*. *A* (and *B*) who have other toys to play with, will not care too much about whether or not they have an additional flute to play with, but *C* might be very happy in having the one flute.

A Rawlsian may have good arguments for two answers: *A*'s transference of the flute to *C*, or *A* keeping the flute; the former, as Rawls's the maximin solution—one that benefits the least-advantaged, in this case, *C* with no toys. Child *A* (or even *B*) having toys that *C* does not—economic inequality—is not a permissible inequality as the worst-off person—*C*'s well-being is not maximized. However, if a Rawlsian argues that *A* has the "basic right" to have things they make, transference is unacceptable as the first principle precedes the second; basic rights are untrumpable due to matters of economic equality. Whether one considers the possession of private property to be a basic right or socioeconomic inequality would yield different arguments, the former *A*'s continued possession, and the latter transference to *C*.

A Nozickian has the clearest answer, in which justice in holdings and the historical transference of such holdings determine the rightful holder. *A*'s making of the flute is from unowned natural resources, and is their initial acquisition. Any transfer, according to Nozick, must be a just one to create a just distribution, regardless of the current state of affairs. Thus any forced transfer upon *A*, *B*, and *C* by the observer, is a clear violation of such a rule.

I argue that A's transference of the flute to C is the most just, and base my arguments on Rawlsian principles of basic rights, the *maximin* principle, and how it may in fact align with our moral intuition. It is unlikely that those in the original position under the veil of ignorance will argue for full protection of private property, as such systems are likely to lead to perpetuating inequalities, and thus an alternative system employing the *maximin* principle is the most rational option. For A, B and C we can lead them to consider this by suggesting that (i) the opaqueness of their future endowments, fortunes and failures as adults cast them under the veil of ignorance, (ii) in such scenarios an established and agreed-upon set of basic rules are necessary, and (iii) the natural conclusion is that one must maximize the minimum amount of well-being one can have; thus under such rules, A should hand the flute to C. This would facilitate how a forced transfer of holdings—commonly held to be unjust—could be understood, in fact, to align actually with our deeper moral intuitions of fairness.

It is important to highlight the weakness of property rights from the view of the *maximin* principle. The psychological discount of future property is high, and especially as children, or as individuals under the veil of ignorance, future holdings are highly discounted. Instead to create a weaker system of ownership society may establish a focal point of *respect* for other people's goods, and another of *sharing*, enforced with emotional, rather than monetary or punishment-based payoffs. In cases such as these the transfer or "sharing" of the flute does indeed agree with our moral intuition and does not violate any natural rights, thus while still offending the Nozickian, may agree with the utilitarian, and pertains to Rawls' lexicographical ordering of the principles of *justice as fairness*.

(737 words)