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In Favor of Bringing Game Theory into Urban Studies and Planning Curriculum: Reintroducing an Underused Method for the Next Generation of Urban Scholars

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In Favor of Bringing Game Theory into Urban Studies and Planning Curriculum:
Reintroducing an Underused Method for the Next Generation of Urban Scholars

by

Brian McDonald Gardner

A thesis submitted in partial fulfillment of the
requirements for the degree of

Master of Urban Studies
In Urban Studies

Thesis Committee:
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Abstract

By looking at some historical examples of Urban Studies literature and theory (and a detailed dive into Neil Smith's "Toward a theory of gentrification..."¹) this thesis makes the case that Game Theory has valid insights to add to the foundation of Urban Studies and Planning and should be included in Masters and Doctorate level curriculums. As a discipline Game Theory has revolutionized multiple other fields, and can be used both mathematically and/or non-mathematically. It is postulated below that the inclusion of Game Theory would help scholars and practitioners arrive at better outcomes. This case is made by reviewing various areas of Urban Studies, and seeing how Game Theory application might shine new light on current best practices, or how it might have accelerated decision making.

¹ Smith, N. (1979). Toward a theory of gentrification: A back to the city movement by capital, not people. *Journal of the American Planning Association*, 45(4), 538–548.

Dedicated to:

Dr Suzie Gardner (who paved the way),

Emily Gardner (who read the map), and

Suzie Gardner (who rode in the back)

With great appreciation to (in order of appearance):

Dr. Cochran

Dr. Gebhardt

Dr. Golab, and

Sander Dolder

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Introduction

Having obtained an MBA prior to my Master of Urban studies, adapting to the different style of learning was my largest obstacle. One of my first major insights was that Game Theory (the subject that I loved most from my MBA) could and should be applied more frequently to Urban Studies, and done so by scholars of the urban, and not left as a purview of economists. In the realm of Economics, Game Theory is one of the last things taught, and one of the more recent concepts, but the methods of Game Theory and many of the insights can be utilized with minimal mathematics, and the result is recommendations that come from Game Theoretic thinking provide alternatives that may not arise from other methods.

The further I got into my curricula, the more that I believed this to be the case, as many of the insights gleaned in recent years overlap with those that an application of Game Theory might have suggested years ago. In order to avoid future such missteps, I urge all urban enthusiasts to consider at least a non-mathematical familiarity of Game Theory to be a vital subject matter for their studies, in the same way that we include both Qualitative and Quantitative methods today. I suggest that the topics covered in this third method of study would include much of the concepts explained below and itemized in Appendix

G.² By “across Urban Studies.” I mean that the application of Game Theory could benefit nearly every aspect covered in this ever widening field of Urban Studies, Policy, and Planning.

The insights of Game Theory are frequently already seeping into the field with the inclusion of “The Free Rider Problem” and “The Tragedy of the Commons,” and “The Prisoner’s Dilemma.” Unlike other forms of Economics, Game Theory is prescriptive as often as it is descriptive. It is not just about one or multiple people maximizing their own benefits or “payoffs” (which in Game Theory is frequently not purely financial), potential optimal outcomes include a concept known as the Socially Optimal solution, which takes into account the welfare of society as a whole.

Game Theory comes with a number of tools to project outcomes, and ways to ensure that outcomes more strictly match intent. At the end of this thesis, in Section III, I’ll review all of these parts and pieces, as well as my insight after a Seminar and Dissertation on Game Theory as to how Agglomeration overlaps with Hotelling’s Law, how collective bargaining is necessitated by power differentials in wage negotiation, and more.

² This Appendix is not labeled Appendix A because it will be best understood by the reader at the end of this Thesis, and although the list may be referenced now, exactly what each list item means will be discussed throughout.

In his seminal article,³ Neil Smith shares a revolutionary -- and insightful -- finding, that it is capital that is moving back to the city rather than people, but his analysis falls just short of what Loft Living⁴ later confirmed, to be the true revelation -- that it is Government action, and not developer or investor greed that spurs these capital movement decisions. This is an important discovery, because if Government is the problem, then Government may be able to change its actions, better align stakeholder interests to desired actions, and “change the rules,” and by so doing, create more socially optimal outcomes. I realized that these new insights could bring new solutions to Urban Studies, the same way that they have to other disciplines.

Can Game Theory be used non-mathematically to arrive at answers that would lead to better outcomes in Urban Studies, Policy, and Planning?

Would those insights be valid enough to warrant inclusion in the Core Classes of an Urban Studies curriculum?

What I suggest is that the overlap and insights between the Game Theoretic branch of Microeconomics should not stop at established and known insights, but that the process used to derive those insights should be used as a

³ Smith, N. (1979). Toward a theory of gentrification: A back to the city movement by capital, not people. *Journal of the American Planning Association*, 45(4), 538–548.

⁴ Zukin, S. (1982). *Loft living : Culture and capital in urban change* (Johns Hopkins studies in urban affairs). Baltimore: Johns Hopkins University Press.

vital method of Urban Theory, Policy, and Planning including, but not limited to: Energy Policy and Management, Real Estate Development, Urban Design, Transportation, Sustainable Food Systems, Applied Social Demography, Gerontology, and Diversity, Equity, and Inclusion (DEI).

These are the questions that I set out to answer, -- in the pages that follow -- proving that henceforth Game Theory should be a central component of the Urban Studies Curriculum.

Literature Review

Alex Lord, who worked in financial services prior to obtaining a PhD at the University of Manchester's School of Environment and Development, saw the opportunity to close the "theory-practice gap" in planning by introducing Game Theory into the pedagogy. While examining the failings of positivism and postpositivism, along with other methodologies, Lord writes, "The idea that often the outcome of planning games is the result of strategic behaviour (sic)... is not well accounted for by existing theory."⁵ Although he probably meant something slightly different than Game Theory, in "The Dark Side of Planning," Bent Flyvbjerg states that the purpose of planning "is not to dissolve relations of power

⁵ Lord, A. (2012). *The planning game: An information economics approach to understanding urban and environmental management*. London: Routledge.

in a utopia of transparent communication but to play games with a minimum of domination.”⁶

If Game Theory had been applied, then the disposition, predilections, and value alignment of the sheriffs and policy makers who would execute former president Johnson’s well-intentioned “War on Crime”⁷ could have predicted the impact on already disenfranchised racial and ethnic minorities. As detailed thoroughly in Hinton’s *From the War on Poverty to the War on Crime*,⁸ The outcome of putting police in minority neighborhoods would create more crime in much the same way that police wearing riot gear when they arrive at a protest has been shown to create more riots.

Further, while it might have been imagined that these police would be kind supervisors, and indeed the programs at one point focussed on having police be “part of the neighborhood,” a Decision Tree analysis would have highlighted that the “payoffs” and incentives for local law enforcement to target these minorities were too great inside of existing structures, and that more deep-rooted systemic reform was needed before implementing such a grand plan. Or, at the bare minimum, a greater effort to align payoffs to desired outcomes would have been

⁶ Flyvbjerg, Bent, *The Dark Side of Planning: Rationality and 'Realrationalität'* (1996). Seymour J. Mandelbaum, Luigi Mazza, and Robert W. Burchell, eds., *Explorations in Planning Theory*, New Brunswick, NJ: Center for Urban Policy Research Press, 1996, pp. 383-394

⁷ For details see: Lyndon Johnson, “Special Message to the Congress on Law Enforcement and the Administration of Justice,” March 8, 1965, *Public Papers of the Presidents 1965/Part 1* (Washington, GPO: 1966)

⁸ Hinton. (2016). *From the war on poverty to the war on crime : the making of mass incarceration in America*. Harvard University Press.

required as wholesale cultural change was unlikely to happen within a generation.

A similar concept is put in slightly different words by Lord,⁹ who conjectures that the true strength of Game Theory's potential application to Urban Planning is that it combines enough math to handle "the rationalists' dream of finding an empty black box and filling it with pure, objective facts." In addition to a mathematical approach, Game Theory can also satisfy the post-rationalist argument, "that the box might contain an ideal speech situation, mutual collaboration and the possibility of a politically progressive settlement" which has to-date been "frustrated because [facts alone] 'ignore the permanence of conflict, inequality and domination' (Bickerstaff and Walker, 2005: 2139) that, in the neoliberal age, frequently lies within." Lord goes on to say, "Conceived in this manner, the black box contains both the 'local' legal framework through which urban and environmental management takes place, as well as the equally 'local' cultural conventions and customary practices by which players respond to these rules."

Another phenomena that lends itself well to Game Theory evaluation is Police response to protests. The police can come in riot gear, and the protestors can come with shields and hockey sticks to bat away tear gas. It has been

⁹ Lord, A. (2012). The planning game: An information economics approach to understanding urban and environmental management. London: Routledge.

determined that choices made in advance of arrival on the scene can make conflict between the two parties more likely.¹⁰ Indeed, the Prisoner's Dilemma predicts that "Defect" (or in this case wear armor / bring shields and hockey sticks) rather than "Cooperate" (come in plain clothes) is the best one-off strategy. However, in repeated games, and with experimentation, it has been found that "Cooperate" (with a Tit-for-Tat response to Defection) is really the best strategy.¹¹ This has been borne out in policing too, as reported in the Police Executive Research Forum's "The Police Response to Mass Demonstrations Promising Practices": "We also learned from our mistakes... when we took a hard approach: drawing a line and coming out equipped with body armor and heavy equipment.... (Now) we generally take a soft approach. We get a little bit of a pushback from our labor unions in that regard, but they are coming around, because they are realizing that it works."¹²

Game Theory also has some insights into the concept of Agglomeration, which has a lot of overlap with Hotelling's Game.¹³ In Game Theory, it has been posited that the solution of competitors in geographic proximity is not Socially Optimal, as it requires customers as the margins to have to travel further. The

¹⁰ Hafner, K. (2020, June 11). What makes a protest turn violent? Police in riot gear can be a key factor, decades of research shows. - The Virginian-Pilot.
<https://www.pilotonline.com/news/vp-nw-protest-police-response-20200611-jphpxvvdkzc4ppimmj4j2mybsi-story.html> Accessed 5/8/2022

¹¹ Axelrod, & Hamilton, W. D. (1984). The evolution of cooperation. Basic Books.

¹² Police Executive Research Forum (2018). The Police Response to Mass Demonstrations Promising Practices.
<https://www.policeforum.org/assets/PoliceResponseMassDemonstrations.pdf> Accessed 5/8/2022

¹³ https://en.wikipedia.org/wiki/Hotelling%27s_law Accessed 5/8/2022

same argument could be made for Agglomeration in many cases. Further research could be conducted to glean insights on how Agglomeration is similar to and different from Hotelling's Law.

A game that was first proposed by Axelrod, & Hamilton in *Coopetition*,¹⁴ demonstrates the advantage that a capitalist has in setting wage rates for individual workers, and the utility of collective action by said workers as the only real way to counteract the consolidated power of the capitalist. Only through collective action can workers combine their negotiating strength to provide a united front against the holder of capital. The capitalist will likewise respond with "union busting" maneuvers, and so on. Although the experiment is simple, it provides great insight into ways to adapt to different distributions of power. A trial run of this experiment was conducted as part of the early work on this thesis. The results are listed in Appendix B. This experiment shows how unequal distribution of Capital in a society can lead to large disparities in wealth distribution, and more importantly how -- in the process of maximizing self interest -- the Capitalist is incentivized to destroy Potential Production in order to maximize their individual payoff. This experiment not only demonstrates the need for collective bargaining, but also for proactive policies like minimum wage. Reviewing the results of Minimum Wage on society over the past decades, and the current "Fight for \$15, it could be concluded that that Minimum Wage is a policy that has

¹⁴ Abbott. (1996). *Coopetition* - Brandenburger,AM, Nalebuff,BJ [Review of *Coopetition* - Brandenburger,AM, Nalebuff,BJ]. 121(10), 120-& BOWKER MAGAZINE GROUP CAHNERS MAGAZINE DIVISION.

historically proven to be trailing inflation, almost by definition, because rising wages increases demand, which raises prices, which then decrease buying power, which decreases the real wage rate. Appendix C, lays out a proposal developed using Game Theory that is dubbed “a Maximum Wage Gap.” The Maximum Wage Gap ties compensation at the top to compensation at the bottom to better ensure societal wealth equality, and to disincentivize the destruction of Societal Wealth highlighted by the game in Appendix B.

This sort of analysis shows that Game Theory can also be used in a prescriptive manner, how identifying individual incentives or bias might not align with policy objectives. This sort of insight could have very easily prevented at least some of the missteps of the War on Crime, and/or the War on Drugs, which were well intentioned policies left to individuals to enact without thought to how their preconceptions and predilections would taint and corrupt the intentions during implementation. As Lord says, “a much closer consideration of the ‘logic of the game’ (see also Wu, 1997) becomes the fundamental task that planning theory must confront.”¹⁵ Although Lord does not identify his underlying intent in that passage, it is safe to guess that he is referring to Game Theory’s basic nature as the study of different players optimizing outcomes (for themselves, their “group.” and/or society as a whole) while other players are trying to do the same thing. If the purpose of Urban Planning is to create better outcomes for the Urban

¹⁵ Lord, A. (2012). *The planning game: An information economics approach to understanding urban and environmental management*. London: Routledge.

environs, then it should necessarily be the job of this field to account for how these interlacing objectives interplay, and maximize the societal outcome, while minimizing the societal harm. And it is for this reason exactly why Game Theory methodologies should be brought into the Urban Planning curriculum.

Deep Dive 1: Neil Smith's "Toward a theory of gentrification"

One time that the scholars of Urban Studies as a field could have benefitted from a more in-depth application of Game Theory earlier in the process of trying to solve for Gentrification. Indeed, only in the past few years have San Francisco's politicians come up with a policy that Game Theory would have suggested almost in the beginning, as it is starting to require developers to include low income housing in their new developments, or provide a secondary development specifically for housing the residents that the new development will necessarily displace.

An early article on Gentrification and the displacement of poor residents came in Neil Smith's article on the "Rent Gap"¹⁶ between the densely populated urban, and the bountiful sprawling land of the suburban. In his Abstract, Smith wrote:

Consumer sovereignty hypotheses dominate explanations of gentrification but data on the number of suburbanites returning

¹⁶ Smith, N. (1979). Toward a theory of gentrification: A back to the city movement by capital, not people. *Journal of the American Planning Association*, 45(4), 538–548.

to the city casts doubt on this hypothesis. In fact, gentrification is an expected product of the relatively unhampered operation of the land and housing markets. The economic depreciation of capital invested in nineteenth century inner-city neighborhoods and the simultaneous rise in potential ground rent levels produces the possibility of profitable redevelopment. Although **the very apparent social characteristics of deteriorated neighborhoods would discourage redevelopment**, the hidden economic characteristics may well be favorable. Whether gentrification is a fundamental restructuring of urban space depends not on where new inhabitants come from but on how much productive capital returns to the area from the suburbs. (emphasis added)

The line in bold above highlights a path that Neil Smith might have walked. If he were to focus on actions taken by government agents (who frequently focus city improvement and investment projects or incentives in the most blighted neighborhoods) instead of consumer choice, he might have come to a similar conclusion as San Franciscan politicians did above. Thus, instead of thinking that profit motivated developers (acting in a free market) were the cause of redevelopment, he might have recognized that by improving a neighborhood, or providing incentives for redevelopment, the government can change the

economic trade off between potential rent, and real rent. This can happen either by city improvements (like parks, or access to streets and public transit) increasing the potential rent, or by incentives for redevelopment in blighted neighborhoods that can increase Income by lowering costs. However, because he stopped at consumer choice, his findings were based on Consumer and Market Decisions, instead of the interactions and interests of players in the “Rent Game.”

On Page 539, Smith notes:

“The process... viewed as a “back to the city movement...” applies as much to the earlier gentrification projects, such as Philadelphia’s Society Hill (accomplished with substantial state assistance under urban renewal legislation), as it does to the later schemes, such as Baltimore’s Federal Hill or Washington’s Capitol Hill (mainly private market phenomena of the 1970s)¹⁷

Which is an interesting, but unsupported postulate, based on the premise that Federal Hill and Capitol Hill were mainly private market phenomena, instead of a Government priority that was incentivized to make desired development more attractive to the Private Market. How would the private market manage that? Could steps taken by the Government regarding the condition that the residents lived in have signaled a reduction in risk assessment of Lenders?

¹⁷ Smith, N. (1979). Toward a theory of gentrification a back to the city movement by Capital, not people. *Journal of the American Planning Association*, p539

Smith goes on to say:

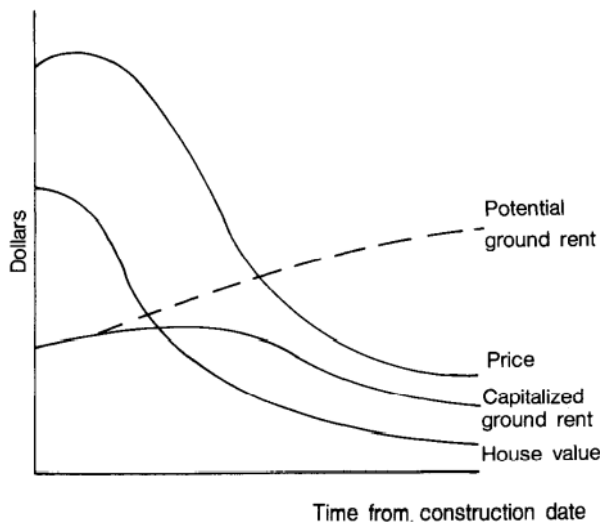
While there is no Napoleon who sits in a position of control over the fate of a neighborhood, there is enough control by, and integration of, the investment and development actors of the real estate industry that their decisions go beyond a response and actually shape the market (Bradford and Rubinowitz 1975, p. 79).¹⁸

And by doing so, Smith starts to develop a series of players, actions, and rules. However, he does not differentiate between the three, nor does he break the Players down into differentiated actors well enough to draw distinctions between them. To be fair, that's not what Smith was trying to do; but in not doing so, he misses some key insights (which are outlined in the Case Study: The Rent Game below, and then experimentally investigated in Experiment 1: Testing the Rent Game, also below). If Smith's goal was to produce a "game," he might have written: "New construction and the first cycle of use," as HomeOwners, Premium Renters, and Developers "Landlordism and homeownership," as Landlords, and Homeowners (both of which, I argue below, could be broken down further into Players with distinguishing characteristics). "Blockbusting and blow out," as Actions that comes from a specific type of racialised structure that is of a time and place, but not explicitly a part of the generic Rent Game, although it certainly had an oversized impact in the Rules at the time of his article, and the

¹⁸ Smith, N. (1979). Toward a theory of gentrification a back to the city movement by Capital, not people. *Journal of the American Planning Association*, p543

phenomena persists, almost unchanged. “Redlining,” as a Rule, with the key difference being that rules are changed in different ways than players are, and affect the game in a very different way as well. “Abandonment,” as an Action that a player might take. Although he didn’t intend to be doing so, in many ways, Neil Smith was laying out a Game, but had intermingled Players, Actions, and States of Nature.

Figure 1 - The Depreciation Cycle of Innercity (sic) Neighborhoods.¹⁹



As seen in Figure 1, as a building ages, its need for upkeep increases, and the “Potential ground rent” for the land on which the property rests starts to increase beyond the Actual (Smith says “Capitalized”) ground rent.

If that was the end of the story, then Gentrification wouldn’t be a big deal though. The problem with Gentrification is that the property value stays the same for the people who are living in it. For them, the value of the property includes the cost of moving, which is more than just the financial cost, but also includes the

¹⁹ Smith, N. (1979). Toward a theory of gentrification a back to the city movement by Capital, not people. *Journal of the American Planning Association*,

time to pack and unpack, getting habituated to a new neighborhood, and also readjusting one's social lives. To illustrate this, let's imagine a family of three people, two parents and an 8 year old child. The child pays no rent at all, nor do they pay for the moving company, but they still have a "cost" to relocate. All of their toys get packed up, their neighborhood friends are now far away. They live in a new location with boundaries and rules of which they are unfamiliar. The exact cost to the child depends upon the distance and cultural disparity between where they were and where they are now. This is why looking at this through the lens of a Game is so important. The property's value changed drastically for the owner, but its value for its residents changed much less, and that is the human cost of gentrification, which, without it, would just be a "market readjustment."

Smith concludes that Developers cause gentrification.

The problem is that if Developers were the cause of gentrification, the next question is what is the tipping point? Is there a price at which the Gap between potential value and market value becomes big enough for a Developer to target the land in that area? If so, what is that price? Do different developers have different prices? How is it determined which developer gets which lot of land? The discipline that answers questions like this is Game Theory, which studies the impact of different players on outcomes for other players. Smith's analysis is economic in its origin, but by stopping at a micro economic perspective, it doesn't

include individual actors like Lenders (what makes a Lender approve one project over another), competition between Developers, and (perhaps most importantly) it doesn't include Government.

A decade later, in *Loft Living*,²⁰ Zukin provides evidence for a different conclusion, that government intervention in the market incentivizes development, which is a primary cause of urban displacement. In order to explain this, Zukin cites various examples around the country including, but not limited to New York City, Boston, and Baltimore. I would like to highlight also that Smith did not determine causality, just correlation. His point was primarily that the gap between potential rent on a space and its actual rent could lead to redevelopment, however, there are vast communities of single family homes that have stood largely undisturbed for decades. What the communities that are targeted for "redevelopment," or demolition for infrastructure or factories have in common is that they house the urban poor and minority populations.

By conducting a Game Theoretic analysis of the interaction between the players in the Case Study below, and by testing that Case Study in an interactive Seminar, I hope to provide evidence that it might have, and in further experiments and case studies, I hope to supply ample evidence that this is not a limited situation, but rather an indication that Game Theory, which is the study of

²⁰ Zukin. (1982). *Loft living : culture and capital in urban change*. Johns Hopkins University Press.

how different Player actions interact with each other to produce collective outcomes (for both good and ill) in the shared urban environment.

Deep Dive 2: Synthesis of Game Theory in The Journal of Planning Education and Research (JPER)

For a complete annotated bibliography of articles in JPER that mention Game Theory, please see Appendix D. Two crucial take-aways from this review are that Game Theory has impacted a number of articles, and is tangentially part of the literature for more than 50 years. The way that it's been brought in is traditionally through the work of Flyvbjerg, but in a 2021 article, Normative Ecologies of Planning,²¹ Leto comes close to recommending something similar to the marriage of Game Theory and Urban Studies that is suggested in this Thesis, which is encouraging because the literature seems to be leading up to my work here-in.

A few years prior to Leto's article, Donaghy and Hopkins²² came to similar conclusions as this thesis regarding The Planning Game by Lord. In their review of it, they highlight Lord's concern with "normative baggage," which is herein embraced as a strength, rather than a weakness by bringing in Game Theory's Socially Optimal goal. The reviewers applaud Lord for bringing in new methods

²¹ Laura Lieto, Normative Ecologies of Planning: Understanding Norms in Action, Journal of Planning Education and Research, First Published 8 Jun 2021.

²² Kieran P. Donaghy, Lewis D. Hopkins, Review: The Planning Game: An Information Economics Approach to Understanding Urban and Environmental Management, Journal of Planning Education and Research, vol. 35, 2: pp. 232-233. , First Published April 6, 2015.

and analytical methods to freshen up the conversation in Urban Planning, which is indeed the minimal hope of this Thesis as well (while it's maximum effort is to introduce a new stream of analysis and discourse into the discipline, not just as a brief diversion, but as a primary method with which to analyze choices and outcomes in the future). Lord, like many of the Game Theory advocates in JPER before him, uses Language Games as the entry point into Game Theory, which the reviewers find ill equipped, and here we agree. These gaps are why I've focused more on "traditional" game theory. Like Lord, what I'm suggesting bringing into Urban scholarship is "well established in economics and political science... but left behind by planning theorists as inherently neoliberal, analytically mathematical, or uninformative for their observations."

The review values his attempt to take this head on, and would hopefully find the same to be true of this thesis. The review concludes that Lord has both succeeded and failed in his efforts, and hopefully this thesis works to correct those errors and compound the successes that the reviewers found. "Lord has brought together ideas not currently salient in the planning theory literature in ways that may jolt some of our currently comfortable scholarly conversations. By our lights, he does not succeed in his ambitious aim to sketch a value-free approach that bridges the gap between theory and practice... He has, however, brought together conversations that have been distinct and provided a useful explication of how elements of game theory can help us to make sense of some aspects of planning behavior that involve strategic exchange of information. The

Planning Game will be of interest to planning theorists, and part II especially will be of interest to planning students looking for a different way to make sense of situations that planners face.”

Published between the review of Lord’s *The Planning Game*, and Leto’s article on *Normative Ecologies of Planning*, is a remembrance of John Dyckman²³ - who is cited in this Thesis, and whose work formed the basis of Lord’s thoughts in *The Planning Game*. Dyckman had advocated in the 60’s to bring Game Theory into Urban Studies and Planning, but was probably ahead of his time for the two disciplines to be ready for each other. Indeed, 60 years ago, Dyckman wrote, “In light of the great currency enjoyed by the decision making studies in the social sciences, it would be surprising if planning practitioners in the field of urban and regional planning were not aware of the growing self-consciousness of the decision process on all sides. Since most planners view planning as a kind of decision-making, usually relatively centralized, the existence of a growing and now substantial literature analyzing decision-making from the viewpoint of the various sciences of human action may be of interest to them.” The remembrance states that Dyckman moved on from Game Theory in later life, but it is argued here that the direction that Game Theoretic thought has taken in the past three decades merits a second look.

This is borne out by the other articles that have been written since 2000 in *JPER*. In October of 2016, Millard-Ball used Game Theory to analyze interactions

²³ Michael B. Teitz, ACSP Distinguished Educator, 1985: John W. Dyckman, *Journal of Planning Education and Research*, vol. 36, 4: pp. 398-399., First Published November 14, 2016

between self-driving cars and pedestrians, and postulated that if they prioritize pedestrians, then pedestrians would be able to act with impunity, and this might affect the adoption of the new technology.²⁴ He brings up a valid point, and does using Game Theory to analyze an Urban Problem, which I find to be the best proof of the concept's viability, even if I don't agree with his exact conceptualization.²⁵

Four years earlier, Millard-Ball was the author of another article about the use of Game Theory in Planning.²⁶ In *The Limits to Planning*, Millard-Ball builds upon the work of Knaap, Hopkins, and Donaghy to suggest that an Urban Plan has use as a Signaling Device, which is a concept in Game Theory that helps “Lift the Fog” and provides communication and a means of coordination between parties that may not otherwise have reliable means of contacting with each other. Millard-Ball suggests that an Urban Plan serves as a signal in a Coordination Game.

Prior to 2012, Game Theory came up in two Notes sections of articles in 2008, but was only lightly referenced.²⁷ The mentions are important though,

²⁴ Adam Millard-Ball, *Pedestrians, Autonomous Vehicles, and Cities*, *Journal of Planning Education and Research*, vol. 38, 1: pp. 6-12. , First Published October 27, 2016.

²⁵ The case that is possitted is close to “The Trolley Problem,” but the full problem isn't explored, Millard-Ball assumes that the pedestrian would be spared over the driver, or another group of pedestrians. If the calculus was simply Hit the Pedestrian (HP) or Don't Hit the Pedestrian (DHP), then DHP is the obvious solution, and Millard-Ball might be right... but if DHP causes some risk to the driver, or other pedestrians, or even just property damage, then the calculation might change. This change would need to be included in the Pedestrian's decision making process, and the risk may well be high enough that acting with impunity may not be a dominant strategy for the pedestrian.

²⁶ Adam Millard-Ball, *The Limits to Planning: Causal Impacts of City Climate Action Plans*, *Journal of Planning Education and Research*, vol. 33, 1: pp. 5-19. , First Published August 2, 2012.

²⁷ Donald Shoup, *Graduated Density Zoning*, *Journal of Planning Education and Research*, vol. 28, 2: pp. 161-179. , First Published December 1, 2008.

because they prove an ongoing usage of Game Theory Concepts in Urban Studies, as the support of ideas, even if not as the primary idea.

In 2007, there were two papers back to back - one in March, and the other in June, that referenced Game Theory more directly.²⁸ Sager is using Game Theory concepts, even when he's not using Game Theory explicitly as he discusses how aspects of Machiavelli's Prince might provide insight around how to align the interests of the City Planner with the residents of the community. Later, he explicitly mentions Game Theory's Free Rider Problem, but even when it's not discussed by name, Game Theoretic principles are forming the substrate of his arguments. Writing earlier in the year, Hoch would have disagreed, sourcing his work from Sanyal when he says that Game Theory can't handle complex systems or ones where the rules change. This is an incomplete understanding of Game Theory, and investigating the lineage of the claim takes us back to a 1979 text, whose influence has stayed stagnant while the realm of Game Theory advanced, and at no time was it passed down by someone versed in Game Theory concepts. While some limitation might apply, the impact of that limitation can be known and worked around rather than dismissing an entire body of knowledge. Relevant to this work and thought process, seven years prior,

and Murtaza H. Baxamusa, Empowering Communities through Deliberation The Model of Community Benefits Agreements, *Journal of Planning Education and Research*, vol. 27, 3: pp. 261-276. , First Published March 1, 2008.

²⁸ Charles J. Hoch, Pragmatic Communicative Action Theory, *Journal of Planning Education and Research*, vol. 26, 3: pp. 272-283. , First Published Mar 1, 2007.
and Tore Sager, Dialogical Values in Public Goods Provision, *Journal of Planning Education and Research*, vol. 26, 4: pp. 497-512. , First Published Jun 1, 2007.

Alexander²⁹ posited that “rationality” is frequently an imperialist construct based on the observers experience, culture, and understanding anyway, and should be eschewed. Irrationality was likewise othering. Alexander quotes Flyvberg (also a favorite of Alex Lord’s to reference) as saying, “Strategic rationality (in its ideal form, expressed in game theory) is more contextual than simple "classic" rationality.”

Ali adds more fuel to the pro-Game Theory side using it as the basis of his 2003 article positing that climate change could be averted if we changed the capitalist approach from a “dilemma of competing interests” to a “dilemma of common aversion.”³⁰ Which is true, the problem then becomes how to do that, and Ali posits that Planners are in the best position to do so... which is another way and case where more knowledge of Game Theory principles would come in handy.

In addition to a number of references to Prisoner’s Dilemma, and the Free Rider Problem, which are two Game Theoretic notions that have gotten the most use in Urban Studies, and serve to highlight that if Game Theory was better understood, that it might have further impacts, two final articles written before the turn of the 21st century are extremely relevant to this discussion:

²⁹ Ernest R. Alexander, Rationality Revisited: Planning Paradigms in a Post-Postmodernist Perspective, *Journal of Planning Education and Research*, vol. 19, 3: pp. 242-256. , First Published Mar 1, 2000.

³⁰ Saleem H. Ali, Environmental Planning and Cooperative Behavior: Catalyzing Sustainable Consensus, *Journal of Planning Education and Research*, vol. 23, 2: pp. 165-176. , First Published Dec 1, 2003.

1. “Do Plans Matter? A Game-Theoretic Model for Examining the Logic and Effects of Land Use Planning”³¹ mirrors this thesis in many ways, postulating that Government is a player, and in conjunction with this thesis might be a good start on how to bring Game Theory into Urbans Studies.
2. Teaching Planning Theory as Order or Fragments?³² Highlights that “The tradition of macroeconomics in Norway is permeated by planning thought.... Problems related to the planning process are analyzed in the language of game theory and social choice theory.”

In conclusion, there are a number of articles in JPER who list Game Theory explicitly, and over 25 more that reference “Prisoner’s Dilemma” or “Free Rider,” but don’t mention Game Theory, and so weren’t included in this search. There have been multiple calls for Game Theory to be more included in Urban Studies, including by people very knowledgeable of it, and the only descent from that philosophy has been by people who don’t like the way it was suggested (language games), or are basing their understanding on outdated information, and/or assumptions about how it handles rationality (the concept of which has been highlighted to be potentially patriarchal and/or othering), and how adaptable it is to complex systems.

³¹ Gerrit J. Knaap, Lewis D. Hopkins, Kieran P. Donaghy, Do Plans Matter? A Game-Theoretic Model for Examining the Logic and Effects of Land Use Planning, Journal of Planning Education and Research, vol. 18, 1: pp. 25-34. , First Published Sep 1, 1998.

³² Tore Sager, Teaching Planning Theory as Order or Fragments?, Journal of Planning Education and Research, vol. 14, 3: pp. 166-173. , First Published Apr 1, 1995.

Research Questions

Can Game Theory be used mathematically and/or non-mathematically to arrive at answers that would lead to better outcomes in Urban Studies, Policy, and Planning?

Would those insights be valid enough to warrant inclusion in the Core Classes of an Urban Studies curriculum?

Methodology and Experiments

Game Theory as a Method

In the near-century since it was introduced as a branch of Economics, Game Theory has revolutionized Biology, Social Sciences, Programming and more. Let's revisit Neil Smith's 1979 article from the APA Journal to show how Game Theory could have both supported his conclusion, and also lead to the next step in Rent Gap Theory that it is the actions of Investors, Developers, and Government that cause gentrification, rather than Individual Actors. Further, Game Theory would have suggested ways to change the rules that are currently being tried as cutting edge. The point of this example is to demonstrate how Game Theory can be used in Urban Studies to presuppose unintended harm, and to change the rules so as to take preventative measures to fix it.

Where much of Microeconomics deals with how individuals or actors can maximize their outcomes in a given situation, Game Theory goes to the next level and asks how individuals (or collective actors) can maximize their outcomes

given that other actors (or in Game Theory terms “players”) are also trying to maximize their own outcomes. The results obtained by looking through this lens are often counter-intuitive. For example, “Judo Economics” shows how new players can enter a market by accessing a niche that is undesirable to larger players in effect using their size against them, and Bundling shows that greater value is realized by combining items that are not complementary goods rather than those that are. By outlining and defining the players, the rules, and the pay-offs, Game Theory allows us to create thought experiments that can accurately predict real-world outcomes. Whereas Urban Studies is the academic pursuit of understanding the complex inner workings of societies, governments, policies, and public goods, it is suggested that a fitting lens to do this through is by utilizing Game Theory, which has been developed for exactly such a purpose. Game Theory traces its formal origins to Theory of Games and Economic Behavior by John von Neumann and Oskar Morgenstern in 1944,³³ and was later expanded upon by John Nash. The most succinct way to implement the practice of Game Theory is: “build a simplified model of... reality, learn from this simplified model, and (then), translate the findings or knowledge back to the reality.”³⁴ Peters later quotes Raser³⁵ as saying, “A model can be said to be valid to the extent that investigation of that model provides the same outcomes as would investigation in the reference system.”

³³ Vanderbei, R. J. (2020). Game theory. *International Series in Operations Research and Management Science*, 285, 171–185. https://doi.org/10.1007/978-3-030-39415-8_11

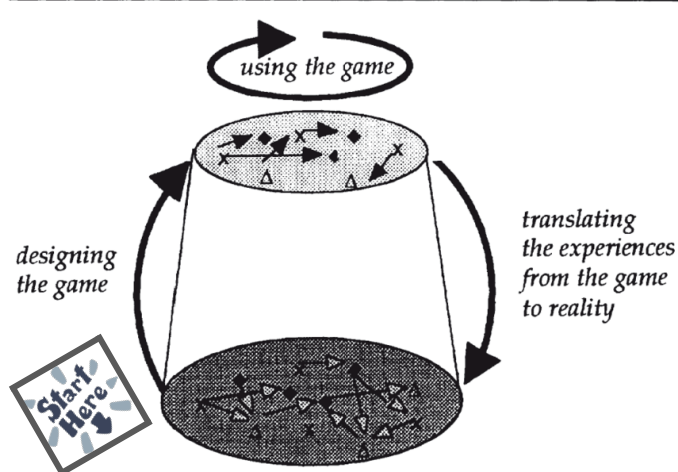
³⁴ Peters, V., Vissers, G., & Heijne, G. (1998). The validity of games. *Simulation and Gaming*, 29(1), 20–30. <https://doi.org/10.1177/1046878198291003>

³⁵ Raser, & Allyn Bacon, publisher. (1969). *Simulation and society : an exploration of scientific gaming*. Allyn and Bacon.

Peters defines 3 types of models:

1. Mathematical – uses variables and functions to approximate reality; such as a particular outcome, and its probability of occurring, these models frequently include quadratic or multidimensional equations;
2. Conceptual – an illustrative approach where arrows are used to indicate connections, and processes are mapped out; or
3. Physical – used more infrequently than the others involves organizing physical objects in a prescribed spatial arrangement.
4. A game, once defined to simulate reality, is “played” either by live participants, or as a thought experiment. The results of the game are analyzed, and either reported, or fed back into a redesign of the game. The latter option would re-start the process in a loop, the former would produce a report that would be able to be presented as “findings,” or a “debrief.”³⁶

Figure 2 - Designing and Applying a Game³⁷



Peters again quotes Raser as determining four criteria for validity:

1. Psychological – the game must feel “real” to participants,

Peters, V., Visser, G., & Heijne, G. (1990). The validity of games. *Simulation and Gaming*, 29(1), 20–30. <https://doi.org/10.1177/1046878198291003>

³⁷ (adapted from Peters et al (1998), *The validity of games*. *Simulation and Gaming* p

2. Structural – there must be a congruence between the relations of the subjects of a game that successfully simulates reality (even if it is an extremely simplified version),
3. Process – the way the game proceeds must also have a correlation to reality, and
4. Predictive – the results of the game should accurately predict the results of reality.

Finally, when designing games, Peters suggests that there are three primary principles to keep in mind, with their own potential validity pitfalls:

1. Reduction – choosing how to make the game a smaller version of reality
 - a. Must make sure to include all deterministic aspects
 - b. Must not include insignificant details (may provide a false sense of focus)
2. Abstraction – choosing how to remove complexity

Observe Reality / Compare Outcomes

- a. Must not overly abstract to the point of participants not realizing the relevance
 - b. Must make abstract enough so that it is a digestible model
3. Symbolization – choice of players, their roles, the rules, and the medium through which players interact

- a. Must not allow symbols (rules, number of players, etc) to be changed in way not translatable to reality
- b. Must allow symbols to be changed when it would be inline with reality

Successfully designing a game that is a reasonable abstraction of reality, with the inclusion of necessary players, and rules (but not unnecessary ones) is a difficult endeavor. In short, “Games” capture a set of strategic decisions that must be made by one or more “players.” If only one active player is involved, then the other Player is frequently determined to be “Nature,” and these are known as “Games Versus Nature.” Players -- unlike in most traditional Microeconomics -- can be Rational, or Irrational, and they can have different levels of knowledge of: the world, the rules, the other players, etc. Each Player’s actions will then have a bearing on their outcomes, and future choices. Additionally, the actions of one player -- whether known or unknown -- often have an impact on the outcomes, and potential actions of other players. Games can also be Consecutive or Concurrent.

Case Study - The Rent Gap Game

Returning to Neil Smith's article on “The Rent Gap,” as a case study, let’s evaluate the players of the game. A first run through might produce Players such as: Home Owners, Renters, Landlords, and Developers; which is akin to the list that Smith developed above. However, deeper insight shows that many of these players have sub-categories that differentiate them from their compatriots and

deserve to be broken down further. For example, Renters might be well off, or near poverty, or anywhere in between. A financially well endowed renter might be willing to move to seek a higher quality of life, with little impact on their day-to-day life. They might be able to comfortably hire movers to pack for them and move their things, they may have time off, or even have an employer pay for their move. Renters of less monetary endowment, would be more resistant to relocation. They would likely have to pack themselves, and do so on their own time, without paid time off, or compensation by their employers. Indeed, moving out of one place would cause them to incur the expense of security deposits on their new habitation, as well as a charge for wear and tear imposed by their former domicile. Thus in the list below, the Player-type of Renter is divided into a Poor Renter and a Rich Renter.

The full list of Players and the Objective that they are trying to maximize proposed (and then reproduced experimentally through the participants in the seminar is detailed below.

Table 1

Players in The Rent Gap Game

Player	Objective
Poor Renter	Maintain affordable housing
Rich Renter	Maximize "Quality of Life"
Home Owner	Maintain inhabitable investment
Landlords	Maximize Income generation
Developers	Maximize profit from sale

Player	Objective
Lenders	Diversify risk, while maximizing return on investments
Government	Public pride, "safety," and revenue

Game Theory provides Decision Trees, and Pay-off Matrices, by which players actions are analyzed for different States of Nature, or decisions made by other Players. For example, in the game of Chess, if Player 1 takes a pawn from Player 2, then they are likewise removing any future actions with that pawn from the list of Player 2's available moves for the rest of the game.

A very simplified Decision Matrix for the Players in Table 1 is produced in Appendix A. This Decision Matrix shows the individual Actions preferred by each player as they attempt to achieve their goals in different States of Nature. These are presented without interaction with each other, as the individuals are responding to a change in the overall Housing Market, not buying or selling from each other individually. The Housing Market is therefore standing in as a State of Nature, and the Players are responding to changes in it. The choices before the Players in The Rent Gap Game are simple, and Beckettian in nature,³⁸

³⁸ In Becket's play *Endgame*, the characters are stuck in an absurdist dilemma. Hamm is blind and unable to move without the assistance of Clov. Meanwhile, Clov spends his life in a miserable servitude to Hamm, able to leave, but unwilling to do so for fear of change. In the climax, Clov seems primed to leave. His bags are packed, and in hand; but will he go? The lights dim. The audience never knows, for tomorrow the play starts again. Whether to stay or go is an existentialist dilemma, as the primary impact that we can have on our surroundings is whether or not we are a part of them. Every other action that we take must be combined with the actions of everyone else, and the impact of it is dulled by the actions of everyone else in existence. The most vital action that we can take to change our surroundings is to leave.

By “gaming out” the roles and their choices in the different states of nature, given their different levels of power, and financial capability, it becomes easy to see that on average, Developers are financially incentivized to buy land cheaply, and then increase its value by building structures upon it - this is the effect of Smith’s Rent Gap in action. After building the residence on the land, they can - for a time - act as monopolists earning the maximum rent for the parcel as is allowed by the restrictions put on development by the Government.

Bankers meanwhile act as mitigating factors and they would be unwilling to finance projects that do not “pencil.” However, Developers can use their financial resources and powers to push for incentives, favorable policies, and “neighborhood revitalization” from the government, who acts in the name of “progress.”

Government, being made up partially of politicians, who need campaign contributions, as well as lobbyist who work for the interests that pay them, is much more susceptible to the the desires of developers with deep pockets, and arguments for “increased safety” that may come from lobbyists, than they are to the pleas of the poor, who are inevitably displaced as the cycle turns on, unless something is done to “change the game.” The moment of government action is pivotal, as it changes the state of nature. Government offers tax incentives to

developers, or provides bankers with assurances that the property will be profitable. In doing this, it adjusts the calculations that these other players make. Tax incentives can move a development from unprofitable, to profitable - and that is indeed their point. Government action can reduce risk by signaling to bankers that crime will be reduced, or “livability/quality of life” will be increased; or, they can build a park, thereby actually increasing the base value of the land.

This very concept was almost directly alluded to by Sager in his article “Responsibilities of Theorists” where he wrote, “What if the planning theorist warns about the advantages that developers with access to money and expertise can have from dialogical, consensus-building processes instead of strict laws, rules and politically binding plans? What if the theorists try to devise ways for counteracting developer power in planning processes? Critics might say that this is all very well but it is not a solution to the problem. It does not change the logic of the game between developers, planners, politicians and local people.”³⁹

Meanwhile, Poor Renters stay in place as long as they can until they are pushed out by either market forces driving their rent up, or redevelopment incentivized by Government. Rich Renters, being willing to seek higher “quality of life” will pursue the next new thing as best as they are able, and readily re-locate at their whim. Meanwhile, homeowners can either transition to Landlords, or use

³⁹ Sager, T. (2009). Responsibilities of theorists: The case of communicative planning theory. *Progress in Planning*, 72(1), 1-51.

their investment to pass on generational wealth.

Smith's conclusion that Developers change the game by building their developments is understandable, but he limited his analysis to observable financial transactions. He has a valid conclusion that Developers change the State of Nature between Markets Falling and Markets Rising for the Game from the Renters (both Poor and Rich) perspective, and potentially from the Homeowner and Landlord's perspective; but, their actions are in turn dependent on the actions of Bankers, who make their decision based on Risk, which is a State of Nature in turn impacted by Government. In the end, although they are the player least directly impacted by the change of the game, Government is the player whose actions set off a series of dominos that sets the Rules (explicitly and implicitly), and thereby the States of Nature to which Lenders and Developers respond.

Thus, by excluding Bankers (who fund the developments), and Government (who permit -- pun intended -- the Development), from his analysis, Smith failed to reach the valuable insight that it is actually Government that is largely to blame for Gentrification. At least, that was the more correct conclusion at the time of Neil Smith's writing, and if he had better identified the culprit, then more optimal solutions to Gentrification might have been realized sooner.

Instead, equity focused Urban Theorists and Planners spent half a century trying to stop Developers from Developing, and champions of the zCreative Class spent a century aggrandizing Government accomplishments like Harbor Place in Baltimore, MD and Quincy Market in Boston, MA.^{40, 41}

Other outcomes to the Rent Gap Game exist, and have been seen in times since Neil Smith's original writing. The true power of Game Theory is not in mapping out the game, which is -- left to itself -- an academic exercise with no practical import. The real power comes in utilizing the game structure to see where different, ideally more desirable outcomes, can be achieved. It is here that Game Theory can be used to bridge the theory-practice gap. Once we have proven that the game significantly approximates reality, we can then utilize the game to test the impacts of different ways of "changing the game." which can be done by altering one or more components of the game. These include (but are not limited to):

- Rules
- Players
- Methods of Interaction
- Knowledge
- Turn order

⁴⁰ Both Quincy Market and Harborplace were criticized as causing displacement of minorities and urban poor in:

Zukin. (1982). *Loft living : culture and capital in urban change*. Johns Hopkins University Press.

⁴¹ Both Quincy Market and Harborplace were celebrated as achievements of Urban Planners "winning" what he dubbed "The Planning Game" in:

Garvin. (2013). *The planning game : lessons from great cities (First edition.)*. W.W. Norton & Company.

- Payoffs

Examples of ways that The Rent Gap Game has been changed recently include San Francisco, who has “changed the rules” and implemented a mandate that new developers have to create low income housing either in the building that they put up on a site, or failing that they must erect a building and set up a non-profit organization to run it adfinitum.⁴² This aligned the Developers goal of making money by building a new structure on dilapidated land, with the desired outcome of providing affordable housing within the cities limits.

Additionally, turning over property to the people who live in it is another solution to The Rent Gap Game. This requires coalition building, and gaining of political capital, like was seen in The South Bronx in the late 1970’s and early 1980’s after the “ghettoization” and fires lead residents of The South Bronx to Tenant Ownership of dilapidated properties. Because these buildings were worthwhile to the people who lived in them, and there was enough impetus to overcome the hurdles of coalition building. The conclusion is that one -- albeit rare -- one solution to The Rent Gap Game is to turn over the property to the people who live in it. This happened by increasing the power of poor renters through something akin to unionization in the workplace, and then using that

⁴² <https://sfplanning.org/project/inclusionary-affordable-housing-program>

power to change the rules in such a way that Tenant Unions could take over ownership of properties left abandoned.^{43, 44}

New York's policy is certainly preferable as far as lifting up the most disenfranchised members of society. Having gamed out the harm that is done to the poorest members of a community, a Socially Optimal Solution to the Rent Gap Game should be found. Something like the “0 Displacement Policy” outlined below. It would include:

1. **Moving Funds** to cover current residents (or residents who were displaced from a property within the last year prior to sale) to relocate, with more money going to those who relocate in close proximity to where they were displaced from - thus incentivizing people to stay in the local community rather than be displaced.
 - As part of licensing, Developers would contribute to a Renters Relocation Fund to help people displaced in a gentrifying neighborhood relocate to new housing.
 - Residents of the neighborhood would have moving costs be paid by the Fund, with more money available the shorter the distance of their move, in order to incentivize staying in the proximity of their social network, and established community.

⁴³ Gold, R. (2014). *When Tenants Claimed the City (Women in American History)*. Baltimore: University of Illinois Press.

⁴⁴ Juravich, N. (2017). “We the Tenants”: Resident Organizing in New York City’s Public Housing, 1964-1978. *Journal of Urban History*, 43(3), 400-420.

2. **Portable Rent Control** would go with a resident as they move throughout a city, especially if they are in an area expected to gentrify. This would be given to low income residents in a targeted Gentrification zone, and would allow them to move anywhere within a city for the same price that they were paying before (with minimal adjustments each year based on inflation). This would also solve poor renters' need to stay in place as living conditions deteriorate in property that is being where the landlord is minimizing upkeep.
 - Paid for by increase in property taxes
 - Potentially mandated that a new housing developer accept a percentage of vouchers based on the number of current residents their project will or has displaced.
3. **Cash Payments** for extremely Low Income renters, who are going to bear all of the burden of gentrification, but none of the reward, a basic income level to help them adjust to increased cost of living and afford to stay in place might be needed if Moving Funds and Portable Rent Control aren't enough. This could be paid for by a portion of increased property taxes . In this way, the benefit to the marginalized residents would come from the increase in property value that is causing the displacement.

Game Theory in Urban Planning: A Six Hour Seminar

What would a class in Game Theoretical Applications to Urban Studies look like? In order to answer this question, I devised a course outline and

conducted a seminar at Portland State University on April 1st and 8th of 2022.

The total six hours was divided into two 3 hour Seminars. In attendance were Dr. Aaron Golub, Director of Urban Planning at PSU, and a PhD candidate in Urban Studies. The outline for the topics covered is included in Appendix D.

During the seminar, we discussed much of what has been reviewed above, including how decisions made by police while managing a civil protest can be seen as similar to a prisoner's dilemma, as both the police and the protesters can make decisions in advance of the protest that cause violent confrontation to be more likely.

Going into the seminar, I had a hypothesis that I wanted to test. My hypothesis was: Given enough information to build a Game with Players, and Objectives, sufficiently knowledgeable Urban Scholars would independently build a similar model to the one that I had created.

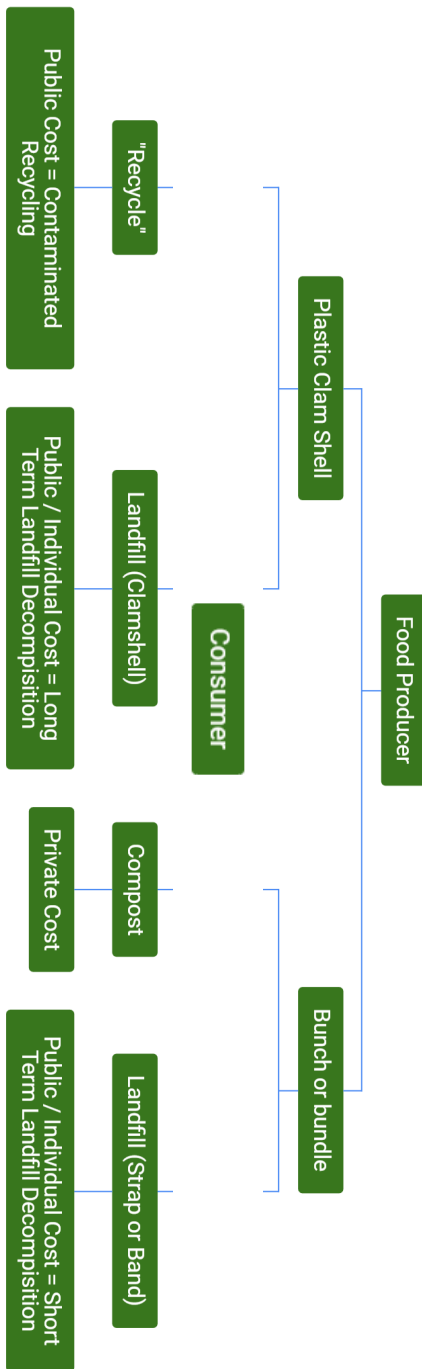
Unfortunately, because of Covid, and other limitations, only two scholars actually attended my Seminar. However, I was able to conduct a rudimentary validation of my Hypothesis, and during the Seminar, after introducing the basic premise of a Game, I asked the scholars in attendance to list the Players in the Housing Market, and to itemize each player's Objectives. The point of this experiment was to see if knowledgeable Urban Theorists would - individually reproduce a Game similar to the one proposed in the Case Study above, which they did. Although two theorists being able to independently reach the same

conclusion as another doesn't act as proof, it is at least some indication that further research might be called for. If this result was able to be reproduced often enough, and manipulations to the market (like those going on now in San Francisco) were able to produce outcomes in line with those suggested by the model, then it could be concluded that the model had - at least some - limited objective validity. This sort of potential for systemic experimentation with minimal real-world interference would further open new doors in the world of Urban Studies.

Other Ways to Use Game Theory

Game Theory has other ways to approach problems other than just Players, Rules, and Payout Matrixes. One way is a Decision Tree. This allows for more complicated systems to be analyzed, where players don't always act at the same time, or where someone else's decision might limit the options of someone else. A good example of this is food packaging, where a consumer's options are limited by what the Producer or Distributor has chosen before them, and it's a good reason for Governments to mandate certain types of packaging, or prohibit others. Or at least put a neoliberal finger on the scale (as it were) to affect the choices. Please refer to Figure 3 on the next page to see an example of the Decision Tree which shows that the options that are available to the consumer, are dependent on the option chosen by the Food Producer.

Figure 3 - Decision Tree for Consumer Goods Packaging



Here we can see that the actions of the Producer impact the options open to the Consumer, so if most groceries are in clam shells, then even the most environmentally conscious consumer doesn't have an option to reduce waste. Likewise, clamshells might be the lowest cost packaging option available to both parties, but acting in their own "best interest", the actions taken by each might create societal harm. This is why mandates might be ideal, but sometimes cost incentives work. Ways to deal with this separation of decision maker and impact include:

1. Full cycle charging - Assessing a charge (tax, levy, penalty, etc) to the Producer (or Consumer) that includes the cost to dispose of the packaging chosen - although assessing the true cost of disposing of clam shells might prove difficult in this instance.
2. Government mandates - Outright telling Producers that they can't use clam shells because of the impact to the environment and our recycling system.
3. Doing an awareness campaign.

Another way of using Game Theory is to look at what other people are doing, and then do something even slightly different. This follows an old joke that my father used to tell about two campers facing a bear attack (which really is unlikely unless they're very hungry) and one camper pausing to put on their shoes. Why they're not running, they reply, I don't have to outrun the bear, just you.

Small governments all around the US are falling prey to Cyber attacks. Many of them have antiquated systems, and haven't budgeted for a Technology Support team, so they're easy targets. One way to avoid being the target of a Cyber attack would, of course, be to hire a Technology Team, but if the attackers don't know that you've done

this, then the impact would be minimal. What if local governments could get similar protection for free?

When choosing a target, malicious hackers are looking for easy targets, because they think that's going to be the way to get a ransom in order to release the malicious code. But they're doing that because they want money. So if you can't stop the code, what if there was a way that a city could make sure hackers know that they won't pay the ransom? If the hacker feels that they are unlikely to get paid for their hacking efforts, then they are potentially even more likely to attack someone else, than they are if cyber defenses have been buttressed.

It doesn't cost anything to say that you won't pay any ransoms, but saying that before you have been attacked does not mean that you're going to follow through with it after you've been attacked. That's what Game Theory considers a lack of credibility. A credible threat (or promise in this case) is one that can be believed. One way to make a promise credible is to create a system that will cause hurt or harm if it's not followed, and do so publicly. A state that passes a law saying that any municipal figure that pays a ransom to hackers will face a personal fine and go to jail, is likely to get some press about doing so, especially if it's the first state. This message might actually make it to the hackers, and may deter future cyber threats well enough that it doesn't matter how well protected the cyber security is.

Of course, if the laws are tested, the State would have to follow through on it, just like saying that you won't negotiate with people who take hostages only works if you actually don't negotiate with them.

Conclusions/Next Steps

As a mathematical and systemological epistemology, Game Theory can provide both new perspectives to old problems, and also highlight opportunities and shortcomings that might otherwise be overlooked. Unlike other fields of Economics, it allows for both individuals optimizing their own personal outcomes, and also solutions for a Socially Optimal outcome. Additionally, by allowing for both experimentation using models, and adjustments to outcomes by changing Rules, or Players, or any other part of the Game, Game Theory can provide Urban Studies with responsive, applicable real-world insights that are usable to create better outcomes based on strategic objectives of the Urban Planner. I believe its potential to branch both positivism and postpositivism, while also providing a method of experimentation, and adaptation makes Game Theory a necessary inclusion as we attempt to gain further advancement in the young school of Urban Planning.

The ideal next steps would be either to produce a larger version of the seminar that was conducted at Portland State University on April 1st and 8th, 2022, and/or to produce an elective course and offer it to the current Urban Studies student body.

References

Abbott. (1996). Coopetition - Brandenburger,AM, Nalebuff,BJ [Review of Coopetition - Brandenburger,AM, Nalebuff,BJ]. 121(10), 120-& BOWKER MAGAZINE GROUP CAHNERS MAGAZINE DIVISION.

Alexander, E. R. (2000). Rationality Revisited: Planning Paradigms in a Post-Postmodernist Perspective. *Journal of Planning Education and Research*, 19(3), 242–256. <https://doi.org/10.1177/0739456X0001900303>

Although Collective Action is generally associated with The Free Rider problem, the problem here comes into play earlier than Free Rider and is well discussed here: <https://www.u4.no/publications/barriers-to-collective-action-against-corruption.pdf>

Axelrod, & Hamilton, W. D. (1984). *The evolution of cooperation*. Basic Books.

Beckett, S., & Beckett, S. (1958). *Endgame: a play in one act ; followed by, Act without words I : a mime for one player*. New York, NY: Grove Press.

Chen, Zhiqi. "How Low Is a Guaranteed-Lowest-Price?" *The Canadian Journal of Economics / Revue Canadienne d'Économie* 28, no. 3 (1995): 683–701. <https://doi.org/10.2307/136057>.

Donaghy, & Hopkins, L. D. (2015). Review: *The Planning Game: An Information Economics Approach to Understanding Urban and Environmental Management*, *Journal of Planning Education and Research*, 35(2), 232–233. SAGE Publications. <https://doi.org/10.1177/0739456X15577158>

Flyvbjerg, Bent, *The Dark Side of Planning: Rationality and 'Realrationalität'* (1996). Seymour J. Mandelbaum, Luigi Mazza, and Robert W. Burchell, eds., *Explorations in Planning Theory*, New Brunswick, NJ: Center for Urban Policy Research Press, 1996, pp. 383-394

Lyndon Johnson, "Special Message to the Congress on Law Enforcement and the Administration of Justice," March 8, 1965, Public Papers of the Presidents 1965/Part 1 (Washington, GPO: 1966)

Garvin. (2013). *The planning game : lessons from great cities* (First edition.). W.W. Norton & Company.

Ghosh, & Ramanayake, S. S. (2021). The macroeconomics of gender equality. *International Journal of Finance and Economics*, 26(2), 1955–1977.
<https://doi.org/10.1002/ijfe.1888>

Gold, R. (2014). *When Tenants Claimed the City* (Women in American History). Baltimore: University of Illinois Press.

Golding, M.P. (1979) 'The Nature of Compromise: A Preliminary Inquiry', in J.R. Pennock and J.W. Chapman (eds) *Compromise in Ethics, Law and Politics*. New York: New York University Press.

Hafner, K. (2020, June 11). What makes a protest turn violent? Police in riot gear can be a key factor, decades of research shows. - *The Virginian-Pilot*.
<https://www.pilotonline.com/news/vp-nw-protest-police-response-20200611-jphpxvdkzc4ppimmj4j2mybsi-story.html> Accessed 5/8/2022

Hinton. (2016). *From the war on poverty to the war on crime : the making of mass incarceration in America*. Harvard University Press.

Inclusionary Affordable Housing Program | SF Planning. (n.d.). San Francisco Planning.
<https://sfplanning.org/project/inclusionary-affordable-housing-program>

Jeong-Yoo Kim & Joon Yeop Kwon (2018) 'Guaranteed lowest prices: do they facilitate collusion?': Revisited, *Economic Research-Ekonomska Istraživanja*, 31:1, 899-907, DOI: 10.1080/1331677X.2018.1456352

John W. Dyckman (1961) *Planning and Decision Theory*, *Journal of the American Institute of Planners*, 27:4, 335-345, DOI: 10.1080/01944366108978368

Juravich, N. (2017). "We the Tenants": Resident Organizing in New York City's Public Housing, 1964-1978. *Journal of Urban History*, 43(3), 400-420.

Lord, A. (2012). *The planning game: An information economics approach to understanding urban and environmental management*. London: Routledge.

Nalebuff, B. J., & Brandenburger, A. M. (1997). Coopetition Competitive and cooperative business strategies for the digital economy. *Strategy & Leadership*, 25(6), 28–33. <https://doi.org/10.1108/eb054655>

O'Connell, O. (2021, October 13). How much does Jeff Bezos make per minute? *The Independent*. <https://www.independent.co.uk/news/world/americas/jeff-bezos-make-per-minute-net-worth-b1887310.html>

Obach, B. (2003). Barriers to Collective Action: A Classroom Simulation. *Teaching Sociology*, 31(3), 312–318. <https://doi.org/10.2307/3211328>

One student, during the review, highlighted this issue by saying that they decided it wasn't worth the effort to haggle, because the potential gain wasn't a large enough amount to be worth the time, effort, and mental cost to fight for their share..

Peters, V., Vissers, G., & Heijne, G. (1998). The validity of games. *Simulation and Gaming*, 29(1), 20–30. <https://doi.org/10.1177/1046878198291003>

Police Executive Research Forum (2018). *The Police Response to Mass Demonstrations Promising Practices*. <https://www.policeforum.org/assets/PoliceResponseMassDemonstrations.pdf> Accessed 5/8/2022

Raser, & Allyn Bacon, publisher. (1969). *Simulation and society : an exploration of scientific gaming*. Allyn and Bacon.

Sager, T. (2009). Responsibilities of theorists: The case of communicative planning theory. *Progress in Planning*, 72(1), 1-51.

Sanyal, B. (2002). GLOBALIZATION, ETHICAL COMPROMISE AND PLANNING THEORY. *Planning Theory* (London, England), 1(2), 116-123.

Smith, N. (1979). Toward a theory of gentrification a back to the city movement by Capital, not people. *Journal of the American Planning Association*,

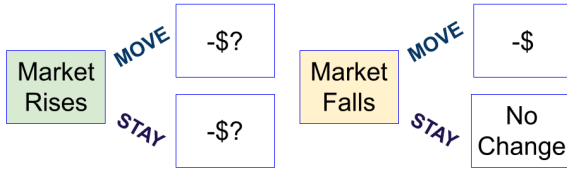
Vanderbei, R. J. (2020). Game theory. *International Series in Operations Research and Management Science*, 285, 171–185. https://doi.org/10.1007/978-3-030-39415-8_11

Wikipedia contributors. (2021, June 14). Hotelling's law. Wikipedia. https://en.wikipedia.org/wiki/Hotelling%27s_law

Zukin, S. (1982). *Loft living : Culture and capital in urban change* (Johns Hopkins studies in urban affairs). Baltimore: Johns Hopkins University Press.

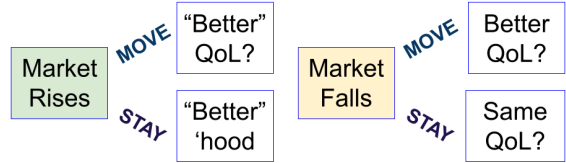
Appendix A: Decision Trees for the Rent Gap Game

Poor Renter (Goal = Save Money)



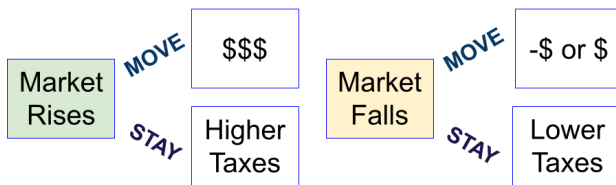
Market Rises = **MOVE** if Rent Hike > Cost to Move
 Market Falls = **STAY**

Rich Renter (Goal = Quality of Life)



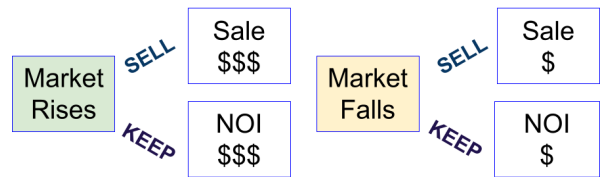
Market Rises = **STAY / MOVE** to "Best 'hood"
 Market Falls = **STAY / MOVE** to Best "QoL"

Home Owner (Goal = Inhabitable Investments)



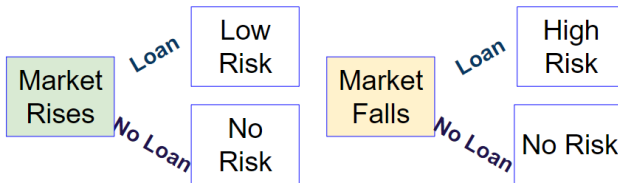
Market Rises = **MOVE** (and become Landlords?)
 Market Falls = **STAY**

Landlords (Goal = Income generation)



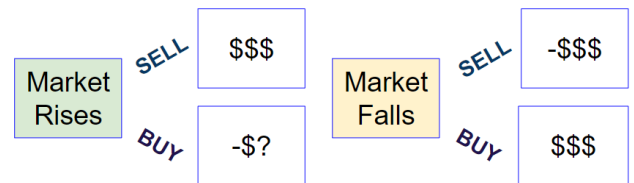
Market Rises = **SELL** if NOI < Sale Price
 Market Falls = **KEEP** (& minimize Op. Expenses)

Investors (Goal = Minimize Risk)



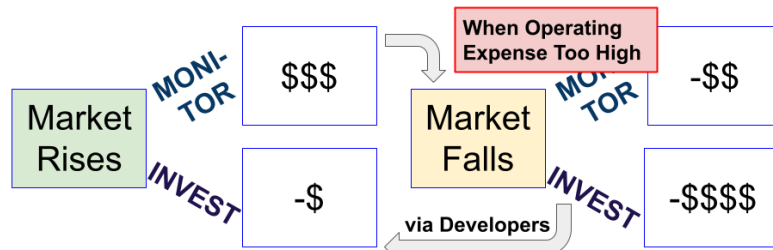
Market Rises = **Loan**
 Market Falls = **No Loan**

Developers (Goal = Profit from Sale)



Market Rises = **SELL**
 Market Falls = **BUY**

Government (Goal = Public Pride & Revenue)



Market Rises = cycle **INVEST / MONITOR**
 Market Falls = **MONITOR** until **INVEST** necessary

Appendix B: Necessity of Coalitions in Instances of Uneven Power Distribution

Introduction

As part of my research, I ran a Negotiation Game with unequal power distribution. On the most basic level, the purpose of this game is to help students understand how to negotiate as an individual member of a collective body against an opponent with an outsized amount of power, and a willingness to use/abuse it. In this case, one player (almost literally) holds most of the cards. For the purposes of this game, and to illustrate that I was playing a character, and not acting as myself, I played “Jeff,” who only had exactly half of the cards distributed, but using his monopoly of Red Cards, Jeff was able to use his consolidated power in order to control a majority of the rewards from the game.

Players - The Game was set up with 23 players:

- 22 Students, who got exactly one Blue Card each, and
- Jeff, who had 22 Red Cards (one per student).

Rules - Stated

1. Each matched set of cards provides \$1 of value.
2. This creates a combined value of \$22 if all cards are matched equally on a 1-1 basis.

Rules - Implied / Reasonably Inferred

The students might see this 50/50 distribution as meaning that their single Blue card is worth \$.50 and each of Jeff’s Red cards are worth \$.50. This assumes a 50/50 split of the \$22 potential value created by combining each pair.

A Deeper Look at Players Motivations, Payoffs, and Incentives

In our micro-economy, there is a total societal value of \$22, and in a well functioning egalitarian system, it might be assumed that each player would get

\$.50, and Jeff would get \$11. However, Jeff is aware that he holds a monopoly on Red Cards, and without him in the game, there is no value at all. The reverse is true of the students, but because their power is distributed, they face the traditional hurdles and barriers that must be overcome to act collectively⁴⁵ -- including enlightened self interest, cost of coordination,⁴⁶ overcoming pressure to defect, and willingness to trust.⁴⁷

While this is put forward as a one-off game for the students, for Jeff this is a repeated game, and he is going to bargain with another group of students next week and the week after that. The real world equivalent of the Blue card held by each student is their labor, and the value that they are negotiating would translate to their “salary,” i.e. their share of the societal good gained by their contribution to production. This one-off game for the students vs a repeated event for Jeff correlates well with the real world where salary negotiations for an employee are a one-off, but corporations negotiate with multiple employees daily.

Monopolist Incentives and “Keeping up with The Gates’, Zuckerbergs, and Benioffs” Jeff also wants to be rich. “Rich” for Jeff doesn’t just mean having a lot of money. For Jeff it means having as much more money as he can in relation or comparison to other members of society. Because this is Jeff’s goal, he is more likely to destroy Societal value than someone who is just looking to maximize their payoff.

So, in our iteration of this game, Jeff started off with an expected income of \$11, but wound up with only \$7.56, which was just over 75% of the total wealth

⁴⁵ Obach, B. (2003). Barriers to Collective Action: A Classroom Simulation. *Teaching Sociology*, 31(3), 312–318. <https://doi.org/10.2307/3211328>

⁴⁶ One student, during the review, highlighted this issue by saying that they decided it wasn’t worth the effort to haggle, because the potential gain wasn’t a large enough amount to be worth the time, effort, and mental cost to fight for their share..

⁴⁷ Although Collective Action is generally associated with The Free Rider problem, the problem here comes into play earlier than Free Rider and is well discussed here:

<https://www.u4.no/publications/barriers-to-collective-action-against-corruption.pdf>

generated. Jeff considers this a success, because he managed to continue to control a lionshare of societal wealth creation.

The Visible Hand - Holding us Down and Oppressing Us

Unlike the “Invisible Hand” proposed by Adam Smith, which postulates that supply and demand (including that of labor) will balance out, in the free market, Jeff’s interest in making more money relative to the other people in society compounds his reputational interest in what is -- for him -- a repeating game. If he gives this group of workers a lot of money, the next group is going to want just as much, but if he can alternatively keep their wages down, it provides a reputation for low wages that can be used as a comparative measure in future negotiations. In game theory this is known as the “Lowest Price Guarantee,”^{48, 49} which sounds like it is offering an equally good value to everyone, but is in fact frequently disadvantageous for the other side of the bargain, as it becomes a disincentive to offer better deals in the future.

This power dynamic, with even distribution of Blue Cards, and consolidated monopolistic control of Red Cards is designed to be a microcosm of the labor market, wherein employers control enough capital to employ workers and set wage rates. Although there is no explicit collusion among employers, the going wage rate is public enough that implicit collusion is highly incentivized.

Destroying Societal Value for Profit (and Maybe Fun?)

44 total cards entered the game, representing \$22 in societal value. In order to maximize his relative wealth, Jeff destroyed potential value by cutting up cards. For each card cut up, \$1 in value was destroyed, and one Blue card no longer had a matching Red card. This action made the person holding the Blue

⁴⁸ Chen, Zhiqi. “How Low Is a Guaranteed-Lowest-Price?” *The Canadian Journal of Economics / Revue Canadienne d’Economie* 28, no. 3 (1995): 683–701. <https://doi.org/10.2307/136057>.

⁴⁹ Jeong-Yoo Kim & Joon Yeop Kwon (2018) ‘Guaranteed lowest prices: do they facilitate collusion?’: Revisited, *Economic Research-Ekonomska Istraživanja*, 31:1, 899-907, DOI: 10.1080/1331677X.2018.1456352

card “expendable” when it comes to maximizing value. Jeff was essentially creating an imbalance in Supply and Demand to maximize the amount of value that he could extract from the game.

Results Analysis

One of the most worrisome results is that 12 people in the class didn’t participate at all. This calls the validity of any other results into question for any relevance to the real world. One student said their actions might have been different if the value was higher and we were talking about dollars, or hundreds of dollars instead of cents. That is true, and in the future iterations, higher monetary value might be considered... along with actual real money rather than just imaginary payouts.

For the 10 people who did play, the total Payout was \$2.44, or approximately \$.24 per person. Jeff’s Capitalistic Rent was \$7.56. In every labor market, there are people who choose not to participate, and a parallel could be drawn for classroom exercises. There is a cost of participation, and it was very obvious that Jeff was not going to be “playing fair,” so there was good reason for people to conscientiously object. All of that aside, Jeff managed to capture 75%, and that included two “mistakes” (both of which I made as the person teaching, rather than as Jeff), without whom, Jeff would have captured over 80% of the total value. The “mistakes” both translated to Jeff not playing as if he was in a repeated game, and treating his Red Cards as if the game was ending, namely:

1. Jeff traded a Red card for two Blue cards. The students involved in this negotiation were the highest earning students in the class, and extreme outliers.
2. The other outlier is from a student who recognized that the game was ending, and Jeff had one more Red Card. He offered Jeff his Blue card in exchange for \$.31, which was the highest direct payout that Jeff made.

In both of these examples, I decided that the lesson was worth the lost revenue, because these were good Negotiation and Game Theory moves and deserved to be rewarded.

Collective Bargaining

Because there are just as many “workers”/Blue cards as there are “jobs”/Red cards, the game opens with both sides being balanced, and there is a theoretical equilibrium. Jeff creates a disequilibrium by destroying cards, and the “workers” have a moment where -- if they decide to -- they could rebalance the game (although not necessarily the equilibrium) by joining together in a union.

If the workers pooled their resources and gave all of their cards to one agent, or otherwise signaled that none of them would work for Jeff if he didn't hire all of them; then they could, theoretically, extract a larger relative share than Jeff. This would happen by them standing firm, and in the real world, they might be able to get funds by releasing some of the workers to work for a different employer. A collective formed this way can generate income even while participating in a work stoppage for one owner of capital. Moves like this would be one example of “Changing the Game.”

Changing the Game

The “Blue Card vs Red Card” game that I ran in class does have solutions other than collective bargaining in Game Theory. It requires “Changing the Game.” Co-opetition⁵⁰ says, “You don't have to accept the game you find yourself in. You have the freedom to change it. And that's where great future success will come from.” The elements of a game are: Players, Rules, Added Values, Tactics, and Scope. The suggestion for the owners of the Blue cards above is an

⁵⁰ Nalebuff, B. J., & Brandenburger, A. M. (1997). Coopetition Competitive and cooperative business strategies for the digital economy. *Strategy & Leadership*, 25(6), 28–33. <https://doi.org/10.1108/eb054655>

example of changing the Scope -- by sending some excess Blue cards off in search of another owner of Red Cards; and changing the Tactics -- by collective bargaining.

In our iteration of the Game, some players did Change the Game. Notably, three players offered 2 Blue cards in exchange for 1 Red card. I accepted that deal because I'm not really Jeff, and I recognized that the students were going in the right direction. This offer was a form of changing the Tactics, Scope, and Added Values, and it means that they got 1 Red Card. Because of time constraints, we didn't investigate what happened to that Red Card, but that would be interesting to follow up on, because once there is 1 Red card, and 1 Blue cards among three people, an interesting experiment would be to see if the money really does get split three ways, or would the new-found owner of capital, and the only person with a blue card left choose to leverage their position of strength and replicate Jeff's actions? Was this situation one person has 1 Red card and one person has 1 Blue card, or does one person out of the three have both cards? In the first scenario, one person doesn't have any cards, in the second scenario, two people don't have cards. Would the money really get split evenly? Plus, \$1 isn't divisible by 3, so what happens to the extra penny?

Other than collective bargaining, there are other things that can be done to change the game. In the real world there are different players, and there's no rule to stop a Government from being formed in this game either. All the students would have to do is band together to form a Government, and then elect a representative.... Or would they go for a Perfect Democracy, a King, or an Egalitarian Communist System. Will the government stay true to the people, or will it be corrupted by access to the wealthy? In the Real World, we have Minimum Wages. Yet, it is currently a topic of debate exactly how much protection these "minimum wage rates" offer. What would they look like in the game? Jeff already couldn't get anyone to trade their card in exchange for less

than \$.18, so to have an actual impact on the game, the Minimum wage would need to be at least \$.20.

Credibility

In the example above of students trading 2 Blue cards for 1 Red card, it's one thing for students to say that they're going to do something when working with each other. It's another to see if they actually do it. The game would have played out very differently if Jeff just walked up to the front of the room and said, "I'm only going to hire 10 of you," because he had 22 cards, no one in their right mind would have reacted the same way to that as they did to him destroying cards. That's because the destruction of the card makes his threat credible.

In the group of three that negotiated 2 Blue cards for 1 Red card, they are students who know each other, and have connections with each other outside of the class. Their relationship forms the "credibility." If, instead of \$1, we were dealing with \$1,000,000; would their relationship be strong enough to withstand the pressure for the people with cards to live up to their promises? Would the person who gave up their card and trusted the other two still be willing to have trusted them? A new reality TV show is born...

One way that the "Blue Card vs Red Card" game can be settled is by changing the Rules -- ala a minimum wage.

Conclusion

While I only had a 20 minute slot, I hope that the students got to witness an extrapolation of a monopolistic / uneven power dynamic, and see (in some instances even discover) a way to tweak that situation to their advantage. The first time something like this is encountered, it can be very jarring, because it's "just not how people operate in a well adjusted society." However, there are actors out there who do act this way, and as planners, it is imperative that we

recognize the need for collective action as soon as possible, before too much value is lost.

Games like this, and the paper clip game at the very beginning of class, can also be used to help people understand the need for resource management, and preservation of societal goods.

One key thing that I like to think about is, what does the game tell us about how we fix this problem in our society? Clearly we have Trillionaires who have earned their wealth by underpaying their work force and keeping a majority of the value gained. Players who were most successful in “Blue card / Red Card” weren’t the ones who maximized the bottom value that Jeff was willing to pay, they’re the ones who formed collectives and exchanged items of unequal value, and leveraged transitional positions (the End of the Game).

The real problem was Jeff’s desire to maximize the wealth disparity, even if it meant destroying societal good. With the problem defined like that, and with the insights from this game, I believe that one solution (and the one I think has the best chance to fix the disparity) is a Maximum Income Gap rather than a Minimum Wage. What this means is that the Government should set a specific percentage gap between pay from one level to the next inside of a company. What that means is that the person at the top can’t make more than 10% more than the person under them, who can’t make more than 10% more than the person under them, and so on, with a defined maximum gap between the top earner and the bottom earner of 10x. So, with today’s minimum wage of \$15/hr in Portland, people at the top should not be able to make more than \$150/hr in total value of compensation. This idea is borne out in Appendix C

Appendix C: Toward a “Maximum Wage Gap” and Equitable Distribution of Societal Production Potential

Income and quality of life disparity is one of the biggest problems that still remain in society. As we enter a second “Gilded Age,” the plight of the 99% grows ever more troubling. Especially as protections for environmental, air, and food quality are getting rolled back.

In what economists dub a near-futile attempt to try to create a living wage, a lot of effort has been spent fighting for a \$15 minimum wage. That helps in the short-term, but because of inflation and the real value of money, increases in the minimum wage have a nominal impact on actual prosperity of the lowest wage earners in the long term. It is a never-ending fight for the next step forward.

The problem with a minimum wage is that it only focuses on one side of the equation. The problem isn't that 50% of Americans make less than \$20k per year. The problem is that the lowest income bracket is making less than \$20k per year and the top 10% is making \$300k/year.

It doesn't help that the 40% in the middle is making less than \$70k per year, or that the top 1% is making roughly \$1,300k/year on average.

That means:

- The ratio between the top 10% and top 1% is about 1:4
- The ratio between the top 50-90% and the top 10% is about 1:5, and
- The ratio between the bottom 50% and the top 50-90% is about 1:3

Meaning that the difference between the bottom 50% of people and the top 1% of people is 1:65! So, instead of trying to raise the “1,” let's try to shrink the “65.” The best way to do that is a Maximum Wage Gap. What this means is

instead of fighting for a \$15 minimum wage, we fight for a 1:20 Maximum Wage Gap.

This would mean top executives couldn't make more than 20 times what their lowest paid employee makes. Then, instead of driving up inflation, it would drive down prices, because everyone could afford things that are now only available to some.

Given this proposal, the top 1% would make closer to \$800k/year, and the lowest 50% would raise up to approximately \$40k/year. The 50-90% of earners would average about \$80k, and the top 10% of earners would make about \$160k. Imagine the increase in consumer spending (our economy's largest driver) if the bottom half of American earners started making twice as much!

All of this happens by connecting the income at the bottom of a corporate hierarchy to the income at the top (and vice-versa). The lowest employee would have to make at least 1/20th of what the highest paid employee makes. BAM! A majority of Americans would be pulled out of poverty, and the economy would get a HUGE injection of consumer spending.

According to reporting, Jeff Bezos makes approximately \$192 per hour,⁵¹ but that assumes that he is working 24 hours a day. The better comparison would be to assume a 10 hour work day, which would have him getting \$460 value of total compensation. So, if workers were paid 10 times less than this, they would be making \$46/hr. The reality of implementation of this kind of policy would probably drop Jeff's income to a poultry \$200/minute, and have workers making something closer to \$20/hr, but that would be a 30% pay raise for the entire bottom level of the Amazon workforce!

⁵¹

<https://www.independent.co.uk/news/world/americas/jeff-bezos-make-per-minute-net-worth-b1887310.html>

Appendix D: Annotated Bibliography - Game Theory Mentions in the Journal of Planning Education and Research

In researching mentions of Game Theory in Urban Studies, I focused specifically on the Journal of Planning Education and Research (JPER) because my focus was on Game Theory as a Method for instruction and synthesizing thought. I read all articles that came up in a JPER search for “Game Theory” and a synopsis of each, or how it mentions Game Theory is included below. Most notably, I found a review of Alex Lord’s *The Planning Game*⁵² - which I felt to be very promising because it pointed out similar gaps to those that I found, so I decided that the review should begin our journey below. After that review, the bibliography is included presented in reverse chronological order, with the newest articles being on top.

[Review: The Planning Game: An Information Economics Approach to Understanding Urban and Environmental Management](#)

[Kieran P. Donaghy](#), [Lewis D. Hopkins](#)

Journal of Planning Education and Research, vol. 35, 2: pp. 232-233. , First Published April 6, 2015.

⁵² Donaghy, & Hopkins, L. D. (2015). Review: The Planning Game: An Information Economics Approach to Understanding Urban and Environmental Management, *Journal of Planning Education and Research*, 35(2), 232–233. SAGE Publications. <https://doi.org/10.1177/0739456X15577158>

The reviewers are not glowing in their report of the book, but do find value in it, and their opinion is inline with my own analysis. I hope that this thesis builds upon the best parts of Lord's work while adding some suggestions that might be deemed more useful. For example, where the review states that, "Lord finds particularly irksome theories that are intended to be explanatory but which carry "normative baggage," Conversely, this thesis embraces these values and political agendas and includes room for them in use of the "Societally Optimal" solutions offered by Game Theory.

The review begins, "When planning theory literature gets bogged down in disagreements based on the same set of philosophers, it becomes unnecessarily repetitive. When different perspectives are unable to engage each other, we cannot reach the kind of productive disagreements from which to advance. In The Planning Game, Alex Lord seeks to" help break that log jam.

The body of the review pokes valid holes in the use of Language Games. These gaps are why I've focused more on "traditional" game theory. Like Lord, what I'm suggesting bringing into Urban scholarship is "well established in economics and political science... but left behind by planning theorists as inherently neoliberal, analytically mathematical, or uninformative for their observations." The review values his attempt to take this head on, and would hopefully find the same to be true of this thesis.

The review concludes that Lord has both succeeded and failed in his efforts, and hopefully this thesis works to correct those errors and compound the successes that the reviewers found. “Lord has brought together ideas not currently salient in the planning theory literature in ways that may jolt some of our currently comfortable scholarly conversations. By our lights, he does not succeed in his ambitious aim to sketch a value-free approach that bridges the gap between theory and practice... He has, however, brought together conversations that have been distinct and provided a useful explication of how elements of game theory can help us to make sense of some aspects of planning behavior that involve strategic exchange of information. The Planning Game will be of interest to planning theorists, and part II especially will be of interest to planning students looking for a different way to make sense of situations that planners face.”

[Normative Ecologies of Planning: Understanding Norms in Action](#)

[Laura Lieto](#)

Journal of Planning Education and Research, First Published 8 Jun 2021.

Being a more recent work, this article dives deep into the “Ecology of Planning Games. Stating in the Introduction, “To develop the normative ecology of planning, the paper first draws on different strands of literature paving the way to understand norms in action. It then presents the ecology of games theory regarding the collaborative/competitive relations between different normative systems. It successively discusses the importance of socio-materiality in

understanding how norms and rules become ascendant or are hindered from their practical effectiveness. Finally, it draws on an empirical case to grasp the richness of relations, both collaborative and competitive, through which norms thrive or are disempowered.”

This article is perhaps the most like what I am suggesting should come about from a marriage of Game Theory and Urban Planning.

[ACSP Distinguished Educator, 1985: John W. Dyckman](#)

[Michael B. Teitz](#)

Journal of Planning Education and Research, vol. 36, 4: pp. 398-399. , First Published November 14, 2016.

Inside a remembrance of the life of John Dyckman, is included the item that he wrote in 1965, called “Planning and Decision Theory,”⁵³ which was (in my mind) too early of an attempt to bring Game Theory into Urban Studies, both because Urban Studies wasn’t ready for it yet, and also because Game Theory itself was still much more focused on microeconomics than it is today It’s been almost 60 years, and I feel it’s time to give the discipline a second look, especially since, as Dyckman put it in the introduction to his article, “In light of the great currency enjoyed by the decision making studies in the social sciences, it would be surprising if planning practitioners in the field of urban and regional planning were not aware of the growing self-consciousness of the decision process on all sides. Since most planners view planning as a kind of

⁵³ John W. Dyckman (1961) Planning and Decision Theory, Journal of the American Institute of Planners, 27:4, 335-345, DOI: 10.1080/01944366108978368

decision-making, usually relatively centralized, the existence of a growing and now substantial literature analyzing decision-making from the viewpoint of the various sciences of human action may be of interest to them.”

Later Dyckman would leave economics behind, and I do not fault him for doing so. The crux of my argument is that Game Theory has changed enough that it has developed at this point useful tools that planners can use, and by eschewing the field because of where both of our bodies of knowledge were in the 1900's precludes us from being in dialog around the improvements we've made in the most recent decades.

[Pedestrians, Autonomous Vehicles, and Cities](#)

[Adam Millard-Ball](#)

Journal of Planning Education and Research, vol. 38, 1: pp. 6-12. , First Published October 27, 2016.

Millard-Ball uses Game Theory to analyze interactions between self-driving vehicles and pedestrians. He supposes that the vehicles must prioritize pedestrians in order to be safe, and assumes that pedestrians and cars will be occupying the same streets. By using pay-off matrices, he concludes that pedestrians will be able to act with “impunity,” as the cars would necessarily avoid hitting them. If this is the case, then he speculates that the slower transit of automobiles through the Urban environment may slow adoption.

[Teaching Planners to Deal: The Pedagogical Value of a \(Simulated\) Economic Development Negotiation](#)

[Laura Wolf-Powers](#)

Journal of Planning Education and Research, vol. 33, 3: pp. 348-362. , First Published June 18, 2013.

This paper makes a singular use of the words “Game Theory” when it says, “Negotiation tends to be pragmatic, tactical, and outcomes driven. Game theory is its intellectual substrate,” and in so doing acknowledges that Game Theory is the foundation on which the exercise is built.

[The Limits to Planning: Causal Impacts of City Climate Action Plans](#)

[Adam Millard-Ball](#)

Journal of Planning Education and Research, vol. 33, 1: pp. 5-19. , First Published August 2, 2012.

Millard-Ball lauds Game Theory as one of the few ways to predict the responses to a plan stating, “there is a paucity of empirical research on planning implementation, there is an even greater dearth of studies that attempt to establish causal attribution. The limited amount of empirical work that does exist has sought to identify changes in land values following plan adoption, which signal changed expectations of future development patterns (Johnston, Schwartz, and Klinkner 1978; Knaap, Ding, and Hopkins 2001); used game theory to predict the responses of local governments and developers to a plan.”

Later he writes:

“First, a plan document may serve as a coordination mechanism in the face of interdependent decisions or high transaction costs (Path A in Figure 1). Here, game theory provides a way of understanding the causal process (Knaap, Hopkins, and Donaghy 1998; Hopkins 2001, 27-28)..... A similar coordination game applies if there are high transaction costs related to development decisions, as when delays in the development approval process are costly to all parties. Once parties have agreed on the coordination point elaborated through the plan, there is no incentive to deviate—adherence to the plan yields the highest payoff over the long run.”

[Graduated Density Zoning](#)

[Donald Shoup](#)

Journal of Planning Education and Research, vol. 28, 2: pp. 161-179. , First Published December 1, 2008.

Mentions Game Theory in Note 17 when talking about land assembly and how small landowners ask a higher price per acre than large landowners do.

[Empowering Communities through Deliberation The Model of Community](#)

[Benefits Agreements](#)

[Murtaza H. Baxamusa](#)

Journal of Planning Education and Research, vol. 27, 3: pp. 261-276. , First Published March 1, 2008.

Mentions Game Theory in Note 9 to discuss thoughts around coalition building and how it impacts resulting policy.

[Dialogical Values in Public Goods Provision](#)

[Tore Sager](#)

Journal of Planning Education and Research, vol. 26, 4: pp. 497-512. , First Published Jun 1, 2007.

Sager cites Alexander (2001, 320) who is again referencing Machiavelli's The Prince in the articles only explicit mention of Game Theory:
"But they are advised to act quite differently if they want to be effective: engage actively in the political "game" with due attention to the realities of power, be like Machiavelli's Prince, applying Realpolitik to develop a plan and commit the relevant actors to its implementation."

That said, prior to that mention, The Free Rider Problem (itself a Game Theoretically derived issue) is dealt with, and the point of the whole paper is how to align incentives to ensure that the actions of the City Planner are inline with the Socially Optimal solution set, a problem that in solving Sager uses a lot of Game Theory concepts without necessarily being able to attribute them back to the source. Again, Game Theory is the substrate --, or hidden support system on which the metaphorical drywall and siding of the article that presents itself for visual inspection -- stands.

[Pragmatic Communicative Action Theory](#)

[Charles J. Hoch](#)

Journal of Planning Education and Research, vol. 26, 3: pp. 272-283. , First Published Mar 1, 2007.

Mentions Game Theory towards the end of the paper, specifically saying, “Sanyal (2002)⁵⁴ mentions an important one: the problem of accounting for institutional conventions and constraints at different scales. So for instance, he notes that game theory cannot cope with situations where the rules change or are complex,” but I take objection to that thought, as I believe that the power of Game Theory really comes from finding ways to change the rules, and below I trace the reason that this current assertion is false is premised - because it is based on another work, who takes its source not from a Game Theory text, but from another text... which itself dates from 1979.

Hoch also includes Game Theory in with other theories, dismissing them all as “the rational model,” which Note 1 says, “I use this idea expansively to include synoptic rationality, satisficing, game theory, and other varieties of rational decision-making theories” Objection is taken here again, because Game Theory, unlike other disciplines mentioned does not require rationality.

Sanyal, who is the source of the concept that Game Theory doesn't cope with situations where the rules change, or are complex originally says, “There is

⁵⁴ Sanyal, B. (2002). GLOBALIZATION, ETHICAL COMPROMISE AND PLANNING THEORY. Planning Theory (London, England), 1(2), 116-123.

a body of literature on theories of negotiation. Also, as some economists would remind us, there is ‘the game theory’ to guide or, at least, predict action.... theories of negotiations have very little to say about moral judgements planners must make. They explain better the process of ‘Deal making.’ Similarly, game theory is appropriate only for games whose rules and outcomes are well defined,” and Sanyal cites as a source for this statement, Golding, M.P. (1979).⁵⁵ This reference is so old, and so little about Game Theory (which is only nominally included), that it should hardly be the basis of a statement in 2007 almost 30 years later.

[Environmental Planning and Cooperative Behavior: Catalyzing Sustainable](#)

[Consensus](#)

[Saleem H. Ali](#)

Journal of Planning Education and Research, vol. 23, 2: pp. 165-176. , First Published Dec 1, 2003.

Ali uses Game Theory concepts and terminology to discuss how climate change can be averted by using Game Theory to subvert capitalists short term financial goals and incentives and elevate instead their long term survival and prosperity instincts. Or, as he puts it in Game Theory terms, convert “‘dilemmas of common competing interests’ to ‘dilemmas of common aversion.’” He believes that if this can be done, it would stimulate “sustainable consensus”—a robust

⁵⁵ Golding, M.P. (1979) ‘The Nature of Compromise: A Preliminary Inquiry’, in J.R. Pennock and J.W. Chapman (eds) *Compromise in Ethics, Law and Politics*. New York: New York University Press.

contract between erstwhile adversaries,” and that “Planners are in a unique position to glean the positive attributes of environmental indicators since they can bridge technical knowledge of environmental impact with an understanding of sociopolitical context at community consultation forums.” To the extent that this has not happened yet, the primary issue of concern is likely that of a Free Rider Problem, in that each altruistic step forward can be seen as an opportunity for a self-interested player to take a step back.

[The Good of the Many Outweighs the Good of the One: Regional Cooperation instead of Individual Competition in the United States and Western Europe?](#)

[Linda McCarthy](#)

Journal of Planning Education and Research, vol. 23, 2: pp. 140-152. , First Published Dec 1, 2003.

In the introduction McCarthy references traditional Prisoner’s Dilemma when discussing offering incentives to businesses to locate in their city. The cities are collectively better off if the companies get no incentives to move there, but no city can guarantee that other cities won’t defect and offer incentives. The thesis question of the paper is, “Can regional cooperation offer a solution to this prisoner’s dilemma?” Further evidence that Game Theory is having a peripheral impact on Urban Studies, but again it is the Prisoner’s Dilemma - the most popularized game - that is being brought to bear.

[Active and Dormant Neighborhoods: A Look at the Geographical Response to School-Based Care](#)

[Ranu Basu](#)

Journal of Planning Education and Research, vol. 21, 3: pp. 274-284. , First Published Mar 1, 2002.

In the body of the work, Game Theory is primarily referenced as one of many schools of thought with something to be said about Collective Action. However, at the end of the article, in one of only two notes, Basu writes, “For a discussion on game theoretic approaches, see Olson (1971), Ostrom (1998), Sandler (1992), and Shubik (1992). See Tarrow (1998) for a historic overview of the development of collective action theories. For a discussion on new social movement theories, see, for example, Larana, Hank, and Gusfield (1994) and Fisher (1994).”

[Rationality Revisited: Planning Paradigms in a Post-Postmodernist Perspective](#)

[Ernest R. Alexander](#)

Journal of Planning Education and Research, vol. 19, 3: pp. 242-256. , First Published Mar 1, 2000.

Throughout this thesis, it has been asserted that Game Theory can deal with irrationality. While this is still asserted, it can also be admitted that it is not the best at dealing with “irrationality.” Several pieces in the review of *Journal of Planning Education and Research* provide different points of view around this, and this article tackles the issue head on. Highlighting that “rationality” is a

judgment that is situated in the observer or the author's experience, culture, and understanding, and similarly "irrationality" is othering.

Beginning with the sentence, "In this apparently postmodern age, planning seems to be entering its post-rational period: Rationality has become a bad word," The point of this paper is to "rescue rationality from its stereotyped image and restore some of its true meaning, especially in relation to planning. This is only possible if we "back off from precise utilitarian definition of rationality and ... think of reason ... as reflecting different ways of knowing or understanding the world" (Dalton 1986, 151)."

When discussing Game Theory, in the article, Alexander - like Lord - references Flyvberg saying:

"Strategic rationality (in its ideal form, expressed in game theory) is more contextual than simple "classic" rationality. Where instrumentally rational homo economicus is playing in a non intentional (sic) environment, the strategic actor is a rationally conscious agent cognizant of the local context and the specific situation with all their social and cultural conventions. In this sense, strategic rationality interacts with communicative forms of rationality (Bridge 1997, 633-637). As coldly calculated actions in the political arena, strategic rationality is not new: It is what Macchiavelli described some 500 years ago. Today, it is advocated under the name of real razionalita for planners who recognize the realities of power, and wish to be more effective than they can be applying traditional technical-instrumental rationality alone (Flyvberg 1998)." (all emphasis in original)

Later in the article, Alexander provides some useful graphs and tables, which are included in Appendix F.

[Private Property in Africa: Creation Stories of Economy, State, and Culture](#)

[Donald A. Krueckeberg](#)

Journal of Planning Education and Research, vol. 19, 2: pp. 176-182. , First Published Dec 1, 1999.

Cites “Rose, Carol M. 1 994a. Property as storytelling: Perspectives from game theory, narrative theory, feminist theory. In Property and Persuasion: Essays on the History, Theory, and Rhetoric of Ownership, Carol M. Rose, 25-45. Boulder, Colo.: Westview Press.” in the References.

[Manipulation in planning: The social choice perspective](#)

[Tore Sager](#)

Journal of Planning Education and Research, vol. 19, 2: pp. 123-134. , First Published Dec 1, 1999.

Written four years later by Sager, who wrote “Teaching Planning Theory as Order or Fragments” below, this article has Game Theory as its underpinnings, and mentions it twice in the Notes section, and once in the body of the work, where it says, “The institutional procedures that intercede between the preferences of individual decision-makers and the social choice are suppressed in much of the formal modelling (sic) literature standard social choice theory,

game theory, and multidimensional voting models (Shepsle and Weingast 1984, 207).”

[Do Plans Matter? A Game-Theoretic Model for Examining the Logic and Effects of Land Use Planning](#)

[Gerrit J. Knaap](#), [Lewis D. Hopkins](#), [Kieran P. Donaghy](#)

Journal of Planning Education and Research, vol. 18, 1: pp. 25-34. , First Published Sep 1, 1998.

This paper does something much like what my Thesis is attempting to do, by seeing “Government” as a player who’s actions impact other players in what I would dub “an Urban Game.” In this instance, the authors “present a game-theoretic model of urban development in which a rational local government plans.” This plan, then informs the actions of other players by providing them with information from which to make their own decisions; with the result being an “increase social welfare.”

They highlight that by “considering local government as a player who plans rather than as an external disturbance that might regulate, we can discover insights and frame hypotheses about the efficacy of planning that are not possible in other urban economic models.” The paper is a good example of how Game Theory might be used as a method to bring insight into Urban Planning.

[Teaching Planning Theory as Order or Fragments?](#)

[Tore Sager](#)

Journal of Planning Education and Research, vol. 14, 3: pp. 166-173. , First Published Apr 1, 1995.

Sager is responding in the Symposium to an earlier work, and he mentions in his “Conclusions and End Note” section, “The tradition of macroeconomics in Norway is permeated by planning thought.... Problems related to the planning process are analyzed in the language of game theory and social choice theory.”

Drawing from his personal experience, he also goes on to relay his journey from Economist to Planner highlighting as a barrier feeling. “Increasingly confined by the economic-man model and the instrumental rationality of my economic upbringing.” He was thus relieved when he came across “Paul Diesing’s analysis of the various types of reason in society!” These works, “both Diesing’s multiple rationalities and Friedmann’s emphasis on dialogue prepared me for Habermas’s distinction between instrumental and communicative rationality.”

Because Game Theory had not fully developed to dealing with “irrationality” yet, Sager found his own path forward by realizing that “The essential insight in this situation may not be that there are several ways of theorizing about planning, but that there are several ways of being rational. Learning about the types of rationality, one will not only be equipped to understand and appreciate the various theoretical approaches to planning.

Equally important, one may be more able to deal with people thinking differently from oneself-without the paternalism and the touch of contempt tending to go along with the suspicion of irrationality.” (emphasis added)

[Tribute Plan Evaluation Method: An Essay in Memory of Morris \(Moshe\) Hill](#)

[Daniel Shefer, Vera Tsubari](#)

Journal of Planning Education and Research, vol. 10, 1: pp. 5-14. , First
Published Oct 1, 1990.

The mention here, is again a memorial article, and only mentions Game Theory in passing as it lists the deceased's efforts to come up with an alternative to Game Theory labeled “The Minimum Requirement approach.”

[The State and the Family: Planning for Equitable Futures in Developing Nations](#)

[Irene Tinker](#)

Journal of Planning Education and Research, vol. 9, 3: pp. 213-216. , First
Published Jul 1, 1990.

Rather than use Game Theory directly, this article highlights historic gaps in Economic Theory. Current Macro Economic Theory is to incentivize and reward women both for getting education and for learning healthy practices.⁵⁶ However, when this article was written in 1990 Tinker was railing against some very sexist economic practitioners, and some male Game Theorists who were

⁵⁶ Ghosh, & Ramanayake, S. S. (2021). The macroeconomics of gender equality. International Journal of Finance and Economics, 26(2), 1955–1977. <https://doi.org/10.1002/ijfe.1888>

building on work done by women to come up with more accurate ideas. In this article too, Game Theory is providing a path forward, although it is doing so on the backs of research led by women.

Appendix E: Game Theory Applications to Urban Studies Seminar Outline

Course Outline:

- Session 1 - What is Game Theory? / Paperclip Forrest

Key Learning Objective: Focuses on using a "game" to model reality by generating a list of players, rules, and objectives, then mapping that Game to see if it has predictive ability to match real or expected outcomes. Once a model has been shown to be predictive, changes in players or rules can be tested using the game, and then potentially applied to real world Scenarios.

- Open discussion
- Lecture: Slides 2-6 from https://docs.google.com/presentation/d/11uwQiWnUDFiFW8fEo_Qv8OyGfah5h0zji9Wh_YRED7U/edit?usp=drivesdk
- Experiment: Paperclip Forest or Access?
 - Rules
 - X paperclips are provided to a group of Y players.
 - Players are allowed to grab as many as they like.
 - If any paperclips are left after Round 1
 - add $X_{\text{Round2}} = X_{\text{Remaining}} * 2$ (Max ≤ 10)
 - Trial 1: Stated Rules = Take as many paperclips as you like
 - Trial 2 & 3: Additional Stated Rules = After each round I will add more paper clips based on the number of paper clips remaining
 - Trial 4 & 5: Additional Stated Rules = The total number of clips will never be more than X_{Round1}
 - What is the desirable outcome?
 - Ideal answers include:
 - Someone gets the most? - Self Serving
 - Everyone gets the same amount? - Egalitarian

- The game doesn't end? - Self Perpetuating
- Possible thought sparks:
 - What if the game is about to end... does that change actions?
 - What if this was about forests?
 - What if it was about social services?
- Session 2 - What Makes a Game? / How does Gentrification happen?

Key Learning Objective: Focusses on the players, rules and objectives. Let class build up a model of Gentrification using the Socratic Method. List the different players and objectives of each player. Build a model using the game and then "run" it to see what the outcome is? Does the model accurately predict what causes Gentrification? Are there any lessons or suggested changes that we can take from the Gentrification Game and apply to reality by changing the rules, players, or objectives?

- Student led discussion - Mapping out Gentrification (Goal is to approximate the outline found in slides 8-17)

https://docs.google.com/presentation/d/11uwQiWnUDFiFW8fEo_Qv8OyGfah5h0zji9Wh_YRED7U/edit?usp=drivesdk


 - Let class fill in Roles/Players, Rules?, etc
 - How does each player's action affect the game?
 - How can you change the game?
 - Change the Rules
 - Change the Players
 - What options would be more desirable?
- Session 3 - Changing the Game, and Competition / Why unions?
 - Blue Card / Red Card game (first time is on easy mode?)

Key Learning Objective: Pt 1- "Rules" and Outcomes (both Assumed and Given) Pt 2- What is the Difference Between Societal Good and Individual Good? What rules are assumed? What rules are given? How do you work within the rules to seek best results for both the individual and the collective? Why is collective action so hard? How do you initiate it? How do you maintain it?

- Number of cards
 - Bc (Blue cards) = 1 per student
 - Rc (Red cards) = SUM(Bc)
-
- Session 4 - Hotelling Revisited - A Game Theory Perspective on How Clinton, Bush, Obama, and Trump won

Key Learning Objective: Utilize the traditional Hotelling's Game (https://www.youtube.com/watch?v=THVrl_2Mu1A), to show how Politicians have changed the game to win Presidential Elections since 2000, and check if it follows Hotelling's prediction.

- What is Hotelling in Game Theory?

 Why do competitors open their stores next to one another? - ...

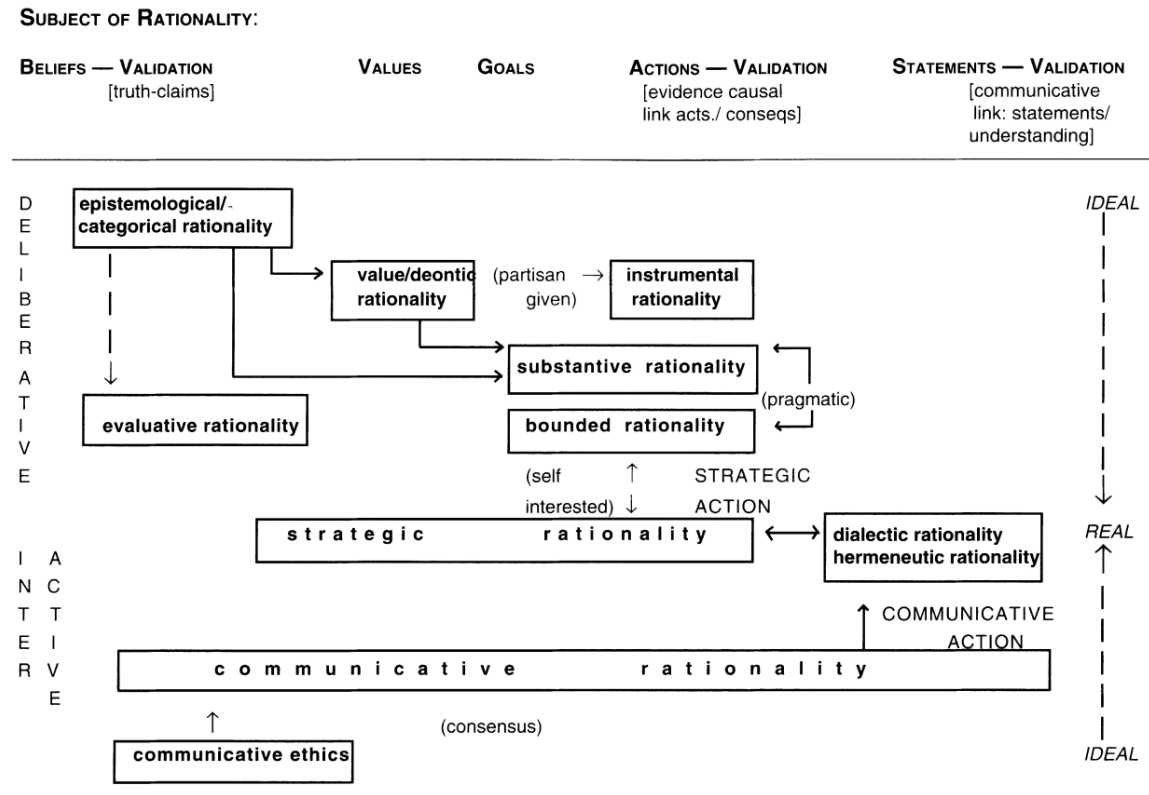
https://www.youtube.com/watch?v=THVrl_2Mu1A

- What would Hotelling predict in a US election?
 - 50/50 division
 - Clinton captured the middle (a game of inches)
- How could you change the game?
 - Bush held centrist ground and “dog whispered” to extremists
 - Obama increased the number of players by registering new voters
 - Trump increased the number of participating players by being extreme enough to wrap around to the other side

Appendix F: Charts and Graphs on types of rationality

These charts and graphs are sourced from Alexander’s article, Rationality Revisited: Planning Paradigms in a Post-Postmodernist Perspective.⁵⁷

Figure 4
Subject of Rationality, Alexander, E. R. (2000)



⁵⁷ Alexander, E. R. (2000). Rationality Revisited: Planning Paradigms in a Post-Postmodernist Perspective. *Journal of Planning Education and Research*, 19(3), 242–256.
<https://doi.org/10.1177/0739456X0001900303>

Figure 5
Planning Paradigms and types of Rationality, Alexander, E. R. (2000)⁵⁸

PLANNING PARADIGM	Actor	Material	Concern/Focus	Aim	Product/Output	RATIONALITY TYPES	Normative theory/ logic	Ideal analytic models	Descriptive/ Explanatory theory
Classic Rational Planning	Individual, quasi-individual	Problem; decision situation; alternative actions & consequences	Problem solving	Optimal/ most effective action/s to achieve goal/s	Decision; commitment to course of action	Instrumental (goal given)	Formal decision theory	Utilitarian self-int. rationality decision maker	
						Substantive (+ goals)	Value analysis		
						Bounded rationality	Satisficing	Satisficing	Decision psychology
Communicative Practice	Individuals in interactive groups/ arenas	Interaction, communication; statements, rhetoric of policies, plans	Social interaction, collective agreement/ decision	Partisan goal-achievement (strategic action) Consensus, mutual understanding (communicative action)	Collective decision; common commitment to agreed on action	Strategic rationality	Games theory	Social choice theory	Foucauldian power analysis
						(Bounded) communicative rationality dialectic/ hermeneutic			
						Communicative rationality	Argumentation theory	Universation principle; "ideal speech situation"	Universation principle; "ideal speech situation"
Coordinative Planning	Organizational units; organizations; interorganizational networks	Strategies; policies programs projects	Collective/ concerted action/implementation	Effective action to achieve mutual goals	Implementation of agreed on strategy; policies, programs projects	Strategic rationality (Bounded) communicative rationality	Games theory	Organization theory; institutional economics	Organizational sociology; organizational behavior
Planning as Frame Setting	Communities; individual roles, firms, organizational interests, networks in polity, territorial community policy/ issue/ planning community	Competing values, perceptions/ images of reality, ideas	Framing process, discourse in relevant community	Partisan goal achievement Setting mutual goals/ objectives Agreement on "frame" for future decisions/ actions	"Frame"; meta-policy, doctrine, planning doctrine, policy, strategic plan	(Bounded) substantive rationality Strategic rationality Value rationality (Bounded) communicative rationality	Ideology, political philosophy/ ethics	Political/ social/ economic theory	Political theory/ sociology

⁵⁸ Alexander, E. R. (2000). Rationality Revisited: Planning Paradigms in a Post-Postmodernist Perspective. *Journal of Planning Education and Research*, 19(3), 242–256.
<https://doi.org/10.1177/0739456X0001900303>

Appendix G: Topics to be included in a Games as a Method of Understanding and Advancing Urban Imaginaries, Theory, and Policy

Game Theory is traditionally taught as a mathematical practice, and the lesson plan of these classes have been well trod in a plethora of Economics text books including first Games against Nature, then introducing the Nash Equilibrium, the culturally outdated and sexist “Battle of the Sexes,” and so on.

Because of Urban Studies curriculum is generally light on mathematics (and for good reason!) if Game Theory was to be included in the curriculum, it would need to be done in a way that brings forward the impact and power of using Games as a model, without the focus on calculations and comparisons of sets. This curriculum could include:

- Using Games as a model to predict and understand reality
- Changing the game to predict ways to shape more Socially desired outcomes in reality by:
 - Changing the Rules
 - Changing the Players
 - Changing the Order
 - Changing the Information
 - Changing Communication
 - Etc
- Using Decision Matrices to model and predict outcomes
- Aligning Player Goals and Incentives with Socially Optimal outcomes