THI QAR ARTS JOURNAL
TQARTJ | VOL 1 NO. 49 MAR. 2025

Games of Strategy on the Renaissance Stage: A Game Theory Analysis of Ben Jonson's *Volpone*

Asst. Prof. Samir Talib Dawood (PhD)
University of Basrah/College of Arts

Abstract

This study presents an analysis of Ben Jonson's *Volpone* (16606) using game theory. It argues that this kind of analysis would yield new readings of the play. While the traditional criticism of the play focused on issues of morality and greed, an analysis inspired by game theory will shed light on issues of rationality (or the lack thereof) of characters' actions. Instead of looking at characters in terms of tricksters and dupes, it will treat characters as players of strategic games who are trying to maximise their payoffs and minimise their costs. Besides, game theory can also help explain the process of theatrical communication in a new light. Moreover, by highlighting zero-sum games and the absence of equilibria in the interactions among characters, the analysis can account for the dark, almost tragic nature of the play.

Keywords: Game Theory, Volpone, Ben Jonson, Theatrical Communication

1: Introduction

> Not only are the theatrical skills of Volpone and Mosca expertly deployed to the maximum profit in the play; we also see the delight in self-transformation and performance which cannot be separated from the energy of capitalist accumulation, and which runs through this play like an electric charge. (McEvoy 2008, 55)
>
> VOLPONE: Thus do all gamesters, at all games, dissemble.
> No man will seem to win. (5.6.25-6)

By highlighting 'maximum profit', 'capitalist accumulation' and 'theatrical skills,' Sean McEvoy's quote above underscores the interconnection between the economic and theatrical aspects of Ben Jonson's *Volpone* (1606). However, as it spots that interconnection, McEvoy's account falls short of articulating it in a coherent model that conceptualises these two aspects of the play. Yet, one model that can encapsulate all these aspects of the play is game theory. Deeply rooted in economic thought and largely interested in the dynamics of human behaviour and decision-making, game theory can shed light on the intricate dynamics of characters' interactions in the play, the rationality (or the lack thereof) of their decisions as well as on the nature of the theatrical communication itself. Jonson's other plays (such as *Bartholomew Fair* (1614) and *The Alchemist* (1610)) abounds with examples of games (in their traditional sense). Although *Volpone* does not share that interest in traditional games, yet it is very interested in the perspective of games of strategy and economic behaviour, areas where game theory takes as its prime field of interest.

The present study argues that game theory can yield a better understanding of Ben Jonson's *Volpone* (1606). Traditional criticism emphasized the themes of deception, manipulation and greed in the play (See McEvoy 2008, 64; Kay 1995, 90)[1]. Yet, an analysis informed by game theory can add nuanced understanding of new issues in the play and can also shed a fresh light on those traditional themes. By highlighting issues of rationality and irrationality, this analysis sheds light on the actions of Volpone with Celia and Mosca's recruitment of Bonario and their strategic failures, in which rationality is overruled by desire. Characters were intimately engaged in strategic games but what distinguishes Volpone and Mosca

is that they masterfully deploy the knowledge gap to their advantage. And by foregrounding the competitive nature of the games being played, this analysis will find Mosca's behaviour quite understandable as players tend to cooperate less as the games last longer, just as players in a prisoners dilemma case would do.[2] Besides, it also highlights missed opportunities of cooperation in terms of the absence of Nash equilibrium and the prevalence of zero-sum games. Game theory can also explain out generic differences between comedy and tragedy. Thus, such prevalence of zero-sum games also explains the tragic and gloomy aspect of the play. Moreover, the study also argues that game theory can account not only for events within the play's world, but also on the meta-discourse of the play. In other words, it can put forward an account of the theatrical communication as a kind of a game between the playwright and the audience. Finally, the study puts to test the concept of homo economicus (economical man) and sets out to prove that 'homo economicus' is an ideal that cannot be easily realized in Renaissance drama.

The study is a contribution to the ever-widening field of game theory in literature in general and Renaissance drama in particular. More broadly, since game theory flourished in the field of economy and economic behaviour, the study falls within the prospects of economic criticism. Going beyond the old Marxist-based economic criticism, several studies have attempted to investigate themes and issue related to economy in the drama of Shakespeare and his contemporaries (See Woodbridge 2003; Sebek and Deng 2008). David Hawkes echoes these advances in economic criticism pointing out that "Readers now tend to notice economic themes and imagery in places where they had previously gone unremarked" (2015, 68). The economic nature of this study is premised on game theory and the contribution it can make to the understanding and appreciation of Renaissance drama.

However, the game theoretic analysis is not meant to use the purely axiomatic, numerical notation. There are difficulties with applying the axiomatic aspect of game theory in human affairs. Anatol Rapoport refers to such disappointment when attempting to apply game theory to literary texts (1960, 240). One way out, as Peter Swirski suggests, is to use ordinal rather than cardinal valuation: "One can thus hardly expect to work with cardinal utilities or expected value calculations. One way out is to assume strictly ordinal rankings in which

players' choices are ordered according to the preference (utility) of outcomes, with no numerical values attached to payoffs" (Swirski 2007, 132). Game theory is seen as more technical and that it does not make psychological assumptions (Binmore 2007, 6; Chew 2013, 14). Moreover, the identification of conflicts as well as the pinpointing of reasons and rationality is more controversial than what might be assumed (Swirski 2007, 128; Wainwright 2016, xi). The present study takes up these challenges and attempts to deploy game-theoretic analysis in a close reading of the text of the play to show how Renaissance drama marshalled issues of strategic thinking and game-oriented behavior in an early state of the capitalist ethos. In what follows, a survey of game theory and its applications in literature and Renaissance drama will be given. Then the many games in the play will be discussed, followed by the study of the game-theoretic account of theatrical communication and the social contract. Finally, an assessment of the homo economicus concept and the generic account of the play will be discussed.

2: Game theory in Literature

Games theory is defined as "a distinct and interdisciplinary approach to the study of human behaviour, an approach that studies rational choices of strategies and treats the interactions among people as if it were a game, with known rules and payoffs and in which everyone is trying to win" (McCain 2023, 19). Game theory was first formulated in 1928 by John von Neumann. Later, von Neumann and Oskar Morgenstern set the formal foundations of game theory in their foundational text, *Theory of Games and Economic Behaviour* ([1944] 1953). They point out that the need for game theory is rooted in the attempts to define what constitutes a maximum of utility or profit for the individual in any social or economic interaction (1953, 1). In its formal sense, a game is an interaction between two participants (players), both of whom are trying to gain maximum payoff. In order to achieve that, each player will make some moves. A move is "the occasion of a choice between various alternatives, to be made either by one of the players" (ibid., 49). These moves, however, are not done arbitrarily. Each move is based on and informed by the player's strategy. A strategy, according to John D. Williams, is "*a plan so complete that it cannot be upset by enemy action or Nature*; for everything that the enemy or Nature may choose to do, together with a set of possible actions for yourself, is just part of the description of the strategy" (1954, 16, original

emphasis). A dominant strategy of a player is one which yields them the highest payoff (McCain 2023, 34). A payoff is the satisfaction of each outcome or the benefit that the player aspires to when playing the game (Nordstrom 2023, 11). A utility or payoff can be anything that the player considers to be of value. [3]

A cornerstone of game theory is rationality. Game theory analysis assumes that players act rationally. Rationality is defined as acting in such a way as to maximise one's payoffs (Davis 1970, 14; McCain 2023, 13). As Brams points out, "a key aspect of our humanity is our ability to think rationally about alternative choices, selecting the one that best satisfies our goals" (2011, ix). Rationality is associated with what came to be called 'homo enonomicus,' the ruthlessly self-interested individual whose sole aim is to maximise his/her own profit (Ryner 2014, 5; Hawkes 2015, 10;). Yet, although players are assumed to be perfectly rational, perfect rationality does not exist. As Wainwright observes, perfect rationality is a fiction (2016, 16). Likewise, many writers doubt if homo economicus a real being or an invented construction (Comyn 2018, 1). Although rationality is associated with dull, instrumental, calculative mentality, yet it perfectly fits with imaginative literature. As will be demonstrated later, characters might not all the time behave rationally. Sometimes, behaving rationally is not immune to tragic endings. Tragic characters who commit mistakes are still sometimes acting in a rational way (Brams 2011, 13). Besides, game theory also assumes reflexive thinking. In contemplating each move that a player will make, he must also imagine what move the other play would be thinking to make. It is rooted in the recognition that other minds are different from one's own and that a player must take the perspective of other players when they are putting forward their own strategy. Scholars agree that any game theoretic analysis requires a theory of mind, whereby a player can read the mind of the other player, anticipating, not only what move they will make, but also what they think that he thinks that they think (Chwe 2013, 15-7; Wainwright 2016, 25).

Although game theory grew in purely scientific settings, it attracted the attention of scholars in the social sciences and the humanities. In the field of social sciences, it migrated from economy to political sciences. Neumann and Morgenstern's monograph appeared during the time of the second world war, yet it was after the war that game theory took its stronghold. More specifically, it found

its most fruitful applications in shaping cold war strategies of arms race and mutual deterrence. As Michael Wainwright rightly observes, it was when Neumann was appointed in the RAND Corporation, a national defence think tank, that he did his most relevant work in game theory (2016, 33). In the humanities, scholars have become increasingly aware of the explanatory and descriptive power that game theory can lend to these fields. One strong proponent of this tendency is Steven J. Brams. In his *Game Theory and the Humanities* (2011), Brams applies game theory to fields as varied as history, Biblical studies, theology, philosophy, law, and literature.

Literature, in particular, has been a fertile ground for the application of game theory. Literary critics refer to the benefits that a game-theoretic model can offer to the analysis of literary works. Peter Swirski, for example, points out areas in literary studies to which game theory can make contributions, such as giving an account of the reading process itself and the analysis of plot and character motivations. He strongly affirms that Game Theory's "potential in literary studies is enormous, and its as-yet scarce applications can only grow" (2007, 128). Although game theorists are satisfied with attributing a descriptive and predictive power to game theory and are cautious of granting it an explanatory power (Binmore 2007, 7, 16), literary scholars were firm to harness any explanatory and interpretive power that game theory might have in understanding literary texts. Brams, for example, holds that game theory "offers insight into certain interpretive questions, such as whether the ordinary calculations of literary characters can explain their extraordinary actions in some of literature's great tragedies (2011, 2). In game-theoretic readings of literary works, both plot and character are of central importance. Michael Wainwright avers that literary scholars need game theory for the understanding it provides of the cognitive portrayals of characters (2016, xi). Brmas avers that in game theory, plot is "front and centre" of every analysis (2011, 25). As Rapoport affirms, "game theory stimulates us to think about conflict in a novel way" (1960, 242). The benefits of applying game theory to literature might also extend to the former. Swirski argues that game theorists can learn much from literature and they might need to overhaul their theories of conflict and payoffs accordingly (2007, 126). I do agree with Bradley D. Ryner who, following Michel Serres, argues that literature can yield knowledge similar to science (Ryner 2014,

2). Employing the scientific game theory, the study attempts to unpack the strategic nature of character interactions in renaissance plays.

Interestingly, John von Neumann and Oskar Morgenstern themselves have applied game theory to the story "The Final Problem" from Arthur Canon Doyle's Sherlock Holmes Stories, namely to the interaction between Holmes and Morierty (1953, 176-8). Another favourable application of game theorists is Edgar Allen Poe's short story "The Purloined Letter." In his book, *Jane Austen: Game Theorist* (2013), Michael Suk-Young Chwe makes the bold claim that Jane Austen intended to theorise strategic thinking in her novels (2013, 7-8). Another stanch proponent of applying game theory to literature is Michael Wainwright who dedicated his work to this area of enquiry. Wainwright applied game theory to Sherlock Holmes (2012), to American literature (2016a and 2016) and to Shakespeare (2018). In his *The Rational Shakespeare: Peter Ramus, Edward de Vere, and the Question of Authorship* (2018), Wainwright intervenes in the Shakespeare authorship controversy, lending firm support for the Edward de Vere's candidacy. However, he follows a fresh approach to the issue. He traces the influence of Peter Ramus, the French thinker, in Shakespeare's work and, building on the intimate relationship between Ramus and de Vere, he concludes that it must have been de Vere who wrote the plays. Interestingly, he uses game theory and its manifestations in the plays and links that to Ramus's rationality.

As far as Renaissance drama is concerned, almost all applications of game theory, perhaps unsurprisingly, were devoted to Shakespeare's plays. Brams (2011, 6) lists many Shakespeare's plays to which game theory has been applied, such as *Hamlet*, *The Merchant of Venice*, *Richard III*, *Measure for Measure*, etc. Wainwright (2018) extends his analysis to a range of plays including *Antony and Cleopatra*, *Love's Labour's Lost*, *King John* and *Henry V*. It is not difficult to see why Shakespeare proves a fertile territory for the application of game theory, as it is always the case with other critical approaches. The sheer breadth of Shakespeare's plots and the wide range of his characters make his plays pliable to game-theoretic analysis. Yet, it is a matter of much regret that these analyses did not extend to other Renaissance playwrights. I think that applying game theory to other Renaissance playwrights can better illuminate the wide range of the mechanisms of plot structure and character portrayal in Renaissance drama. Besides, as with

other applications, it might as well shed light on and further complicates our understanding of game theory itself.

This study attempts to prove this point by applying game theory to Ben Jonson's *Volpone* (1606). Jonson provides a promising ground for the application of game theory for many reasons. Firstly, Jonson's characters are less rounded and more one-dimensional than Shakespeare's characters. This opinion of Jonson was voiced most vocally in the eighteenth century by William Hazlitt who writes that Jonson's "imagination fastens instinctively on some one mark or sign by which he designates the individual, and never lets it go" (1841, 49). This opinion persists in the twentieth century, with Edmund Wilson who writes that "Though he [Jonson] attempts a variety of characters they all boil down to a few motivations" (1952, 205). T. S. Eliot draws an intriguing comparison between Shakespeare and Jonson, concluding that Jonson's characters cannot exist outside of the worlds of their plays, while Shakespeare's characters can be made to live amongst us. To Eliot, Jonson's characters are flat and their flatness stems from the flatness of their world (1957, 112). One reason behind this overuse of flat characters is his adoption of the comedy of humours, in which characters were defined by the dominance of one trait according to which of the four humours dominates their personality. Amongst his Renaissance colleagues, Jonson was the best known writer of the comedy of humours, which can be seen in his plays like *Every Man in His Humour* (1598), *Every Man out of his Humour* (1599), *Epicœne, or The Silent Woman* (1609), etc. *Volpone* is also considered as a humours play (Jørgensen 2015). In Volpone, for example, the only character who was able to change of his perception about himself is Sir Politic Would-Be. Jonson mentioned what he means by humour in the Prologue to his play, *Every Man Out of His Humour*. There he writes that humour shapes a quality that "Doth so possess a man, that it doth draw/ All his affects, his spirits, and his powers" (Prologue 106-7). This one-dimensionality is crucial for the success of the analysis of the play using game theory since, for the analyst to measure the payoffs more accurately, he needs to have a clear picture of the goals of the players (Swirski 2007, 132; Brams 2011, 7).[4]

The second reason why *Volpone* lends itself to game-theoretic analysis is premised on the economic nature of the play and the story that it dramatizes. First of all, that the story is taking place in Venice is far from coincidental. To the English

audience of the early seventeenth century, Venice represented the ideal of cosmopolitan city. As Lea Knudsen Allen points out, Venice occupied a special place due to its location that facilitated the trade across the Mediterranean and helped to flourish its shipping industry and its place as a financial centre (2008,102). It was "the archetypal mercantile city" that specialises in luxury good and rare items (Loxley 2005, 70).[5] This is clear in the play of the oriental gifts that Volpone acquires. The Venetians were also seen as typically economic people, what McEvoy calls their "ruthlessness in business and their political cunning. … of luxurious living and sexual morality" (2008, 56). Moreover, the play reflects the capitalist ethos that was starting to emerge in England by the end of the sixteenth century and the beginning of the seventeenth century (Grav, 2008, 14; McEvoy 2008, 54; Holderness 2020, 5).[6] Furthermore, among all the literary genres prevalent during the Renaissance, it was with the theatre that this economic vibrancy found its clearest expression. On the one hand, theatre itself was a commercial activity *per excellence* and depended for its flourishment on that capitalist ethos mentioned above. On the other hand, Renaissance theatre staged economy as a mode of discourse (Ryner 2014, 1). Shakespeare, in particular, had a first-hand experience with this new system of the capitalist institution of the theatre, in which he was a shareholder (Chedgzoy, Sanders, and Wiseman 1998, 9). Ben Jonson also was intimately aware of these changes in the economic life. As Martin Butler points out, "Jonson's comedies are obsessed with situations in which business and theatre intersect" (28). *Voplone* is a play concerned mostly with economic behaviour. Money and credit are central to the play. The play mentions 'credit' (Prologue 5) and 'profit' (Prologue 8) from its very beginning, while Volpone calls the legacy hunters 'my clients" (1.2.87). Moreover, 'gold' is elevated by Volpone to a god-like status: he calls it his 'saint' or the 'world's soul' (1.1.2-3) and the best of things (1.1.16). all these reasons make Volpone an ideal play for the application of game theory.

3: Game Theory in Volpone

This section explores the many games in Jonson's Volpone which make it pliable to a game theory analysis. These include the games between Volpone (and Mosca) and the legacy hunters, the game between Corvino and Celia and Volpone and Celia

as well as the last game between Volpone and Mosca. It will also transpire that there are many minor games throughout the play, as the one played by Volpone (disguised as Scoto). In light of Game Theory, *Volpone* can be seen as a series of games. These games flow uninterrupted throughout the play from its first scene to the last.

3-1: Volpone and the Legacy hunters

The first game starts with the beginning of the play, when Voplone and Mosca are planning to dupe the legacy hunters to take their money. Voplone mentions that since he has no wife and no child to inherit him, this has cultivated the hope in many inheritance hunters to try to be his heirs:

> but whom I make
> Must be my heir, and this makes men observe me.
> This draws new clients, daily, to my house,
> Women and men of every sex and age,
> That bring me presents, send me plate, coin, jewels.
> With hope that when I die (which they expect
> Each greedy minute) it shall then return
> Tenfold upon them; (1.1.74-81)

Thus, Volpone frames the inheritance race as a game with two players. The first player is Volpone and the second is these hunters. The interaction between Volpone (and Mosca), on the one hand, and the legacy hunters, on the other hand, can be divided into two simultaneous games: the first game is between Volpone and the legacy hunters, and the second is among the legacy hunters themselves.

As far as the first game is concerned, it can be seen as a signalling game. A signalling game is one in which a player takes an action to convey information of a certain kind. The game consists of two players: the sender and the receiver. Signalling is used by persons to establish a reputation that they might not really have (Watson 2013, 392). In this game, Volpone (through Mosca) was sending signals that he is dying and that he is favouring each one of the hunters as an heir.

The signalling aspect of the game is related to information control. Volpone and Mosca control the game by manipulating information. They import to Voltore the signal that he is on the right track winning the game. They get across to him the idea that Volpone is really dying. Volpone asserts him: “I cannot now last long … I

feel me going - uh! uh! uh! uh!" (1.3.27-8). And Mosca exclaims: "Well, we must all go … Age will conquer" (31, 33). Mosca goes even further asserting that the will names Voltore the only heir: "Without a partner, sir, confirmed this morning;/ The wax is warm yet, and the ink scarce dry/ Upon the parchment" (1.3.45-7). This sentence has the double effect of assuring and de-assuring Voltore: on the one hand, writing is the incarnation of permanence and stability, which is why fate is always associated with and expressed as indelible writing. On the other hand, it shows the volatility of that writing: it is not dry yet and the ink is not fixed, which means it is still contingent and can be changed at any time. Interestingly, Mosca is using common wisdom (that all humans must die) in order to make Voltore's decision (namely, waiting for Volpone's death) seem more rational and in order to further bolster his false conviction of winning,

The other legacy hunters are also lagging behind with an ever-widening information gap in relation to Volpone and Mosca. Mosca even uses the same technique with Corbaccio, assuring him that he is the one chosen to be heir and that Mosca is doing everything to ensure that (1.4.122-3). But shortly in an aside Mosca mocks Corbaccio: "Your knowledge is no better than your ears, sir" (1.4.126), referring to Corbaccio's almost deaf ears. He does the same thing with Corvino (1.5.3-6). Misled by these signals, Corvino honestly thinks that Volpone is really sick and assures Celia that he cannot do her any harm (3.7.50-1). Volpone signals that even more when he sees Celia, exclaiming: "my state is hopeless!" (3.7.87). That signalling and manipulation continues throughout the play. In all cases above, Mosca declares that, guided by Volpone's instructions, he is using the false information as signals to hook them even further: "You know this hope/ Is such a bait it covers any hook" (1.4.134-5).

Mosca plays another strategy, namely exposing his own vulnerability and utter dependency on the good will legacy hunters to survive. He is assuring Voltore that he is inscribed heir, and as a result begging Voltore to be in his family: "I am lost" (1.3.37), he says to Voltore. He makes the same plea to Corvino, assuming to be his creature: "Am not I here, whom you have made your creature?/ That owe my being to you?" (1.5.78-9). He expresses the same sense of dependence on Corvino, on whom he has his 'whole dependence' (2.6.41). Deception is native to the world of Venice. "Volpone's deceptions are normative in the fictional world of

Venice, a world that not only tolerates but richly rewards secrecy" (Slights 1994, 59). Signalling is the prototypical game of deception.

In any signalling game, communication plays a crucial role. Game theorists observe that communication enhances cooperation among players and that it has a profound impact on games (Davis 1970, 77). One thing that could have changed the outcome of this game is if the hunters decided to communicate. If they did so, they would have readily discovered the deception that they have been subjected to. However, Davis also mentions that communication is not the first choice of players. "Players who had the opportunity to communicate chose not to do so, however" (Davis 1970, 132). This is made crystal clear since the legacy hunters refrain from communicating with each other.

In this game, all players are motivated by calculations of cost and benefit. Each player wants to minimise his cost and maximise his payoff. For Volpone, the payoff is anything he can get out of these legacy hunters. In fact, Volpone is not very much into material gains. As he makes clear at the start of the play, he is playing these game for sheer fun: "Yet, I glory/ More in the cunning purchase of my wealth/ Than in the glad possession" (1.1.30-2). As for the cost he is likely to pay, it is nothing just the pretence effort he is exerting in duping them.

As for the second game, it is an auction bidding game among the three legacy hunters. The three legacy hunters engage in a competition where each is trying to prove to Volpone that they love him more than the other two by offering him increasingly bigger gifts that the other two did. That is why they start with small gifts but then escalate until they arrive to a situation where Corbaccio disinherits his own son and Corvino offering his own wife to Volpone.

In this auction game, each player will tend to outbid the other players, because he thinks that making the higher bid might cause the other player to quit (Osborne 2000, 173). On the other hand, the bids are made relative to the players' valuation of the object. Each player will make a bid that is not under the value of the object, because if the other bids are equal to the value of the object, they will win (Schecter and Gintis 2016, 48-9). This reveals how the legacy hunters are making lower bids relative to the expected wealth of Volpone.

This time it is no longer a game between Volpone and these legacy hunters, but rather a game of strategy among the three clients. As Volpone puts it, some of them "seek to engross me, whole,/ And counter-work the one unto the other" (1.1.82-3). As they try to engross him 'whole,' the resultant game is a zero-sum game, where the gain of one player is the loss of the other player, so much so that the total sum of the game and loss is zero (McCain 2023, 38; Nordstrom 2023, 15). It has no option where more than one play can achieve partial gains. Hence the legacy hunters try hard to 'counter-work' each other. In this game each of the hunters presents some gifts and is waiting to be named heir to Volpone. The lawyer Voltore presents a valuable plate; the Corbaccio, an old man, offers to disinherit his son on behalf of Volpone, while the merchant Corvino offers his beautiful young wife, Celia, to Volpone.

While the payoff for all hunters is the same (inheriting Volpone's wealth), the cost they incur varies significantly. Voltore seems to be the luckiest amongst them, since all the cost he had to pay is a large gold plate from St. Mark.[7] Corbaccio, however, is convinced by Mosca that the best prize he can pay is to name Volpone his sole heir, which means that he has to disinherit his own son, Bonario (1.4.93-7).

Game theorists have observed that, in gambling situations, "as time passes, the bets grow larger: apparently the amount that one considers an acceptable risk increases as the game proceeds" (Davis 1970, 59). In this regard, the hunters get increasingly prone to incur even higher costs. Game theorists measure the degree somebody wants something by the size of the risk he/she is ready to take to achieve that thing (Binmore 2007, 8). As for Corvino, the cost is offering his own wife. He laments that he is caught in such an unenviable situation: "If any man/ But I had had this luck" (2.6.68-9). Mosca sugar-coats this cost by saying that others were ready to pay a similar cost, as physician Lupo who offered his own daughter to Volpone. Mentioning that Lupo's daughter is a virgin adds to that cost. Even though the case of a wife is obviously worse than that of a daughter, yet Corvino tries to convince himself that they are the same: "In the point of honour/ The cases are all one of wife and daughter" (2.6.72-3). It is also observed in game theory that the context affects how decisions are made (Davis 1970, 60). Here it is interesting how Mosca frames these gifts in such a way that it looks reasonable to make.

The payoffs highlight the economic aspect of this game. Voltore, for one, is looking for "large return … of all his ventures" (1.2.103), a belief that even Volpone himself confirms: "Your love … shall not be unanswered" (1.3.22). As for Corvino, Mosca promises him that the payoff will be proportionate to the cost he incurred: "you have cut all their throats./ Why, 'tis directly taking a possession!" (2.6.84-5). However, the play makes the point that all these imagined payoffs are illusory. Corbaccio, for one, is too old and too weak to enjoy the acquired wealth (1.4.39-41). For one thing, he is near deaf. He hears 'longer' as 'stronger' (1.4.39-41). Mosca highlights the piquant irony that Corbaccio is even weaker than the pretending Volpone: "A wretch who is indeed more impotent/ Than this can feign to be, yet hopes to hop/ Over his grave" (1.4.3-5). According to Volpone, Corbaccio is flattering his age "as if fate/ Would be as easily cheated on as he,/ And all turns air!" (1.4.157-9). The 'air' here refers to the illusory nature of his looked after payoffs. However, in Game Theory, the payoff is what the player thinks it to be, regardless of whether it is objectively valid or not.

Mosca fuels the competition among the legacy hunters in quite smart ways. Even as he tells anyone that he is named heir, he still keeps him in doubt and inflames his feeling that he is constantly at risk. For example, he tells Voltore: "You still are what you were, sir. Only you./ Of all the rest, are he commands his love" (1.3.1-2). Even though assured that he is chosen, Voltore is still haunted by 'the rest'. He plays the same trick with Corvino: "But here has been Corbaccio,/ Here has been Voltore, here were others too -/ I cannot number 'em, they were so many "(1.5.25-7). So many are they that he stopped counting. This has psychological impact on the legacy hunters. The more they are, the more threatened each of them will be, and the more ready they will be to incur more cost.

An essential part of any game is that each player, in addition to advancing their own cause, attempts to anticipate the other player's moves in order to prevent the them from advancing theirs. In game-theoretic terms, this is called blocking. Blocking is a common strategy used by almost all players in this play. For example, Corbaccio learns that Voltore preceded him to Volpone's house and that he presented a precious gift, a large plate. So, he tries to block Voltore's move by one of his own:

I shall prevent him yet. See, Mosca, look,

Here I have brought a bag of bright chequins,
Will quite weigh down his plate. (1.4.68-70)

It is to be noticed here that blocking is also related to the control of information mentioned above. For, after all, it is Mosca who is guiding the flow of information of who is presenting what to Volpone. Most of these information is, of course, false. Mosca fabricates to Corvino the story of the doctor who offered his daughter to Volpone. As a result, Corvino decides to force Celia to go to Volpone, as a move to block that doctor: "I will prevent him" (2.6.78). later in Act III, when Corvino comes with Celia to Volpone's house, earlier than planned, thus threatening to destroy Mosca's scheme, he justifies that he feared that others might come earlier than him and "they might prevent us" (3.7.3), and that he is ready to do anything that might prevent him from achieving his goal: "Because I would avoid all shifts and tricks,/ That might deny me" (3.7.22-3).

3-2: Corvino and Celia

Prior to the Corvino-Celia game, there is a bargaining game that Volpone plays in Act II, scene i. Motivated to see Celia, Volpone disguises as Scoto who is a mountebank selling drugs and erects his table beneath her window. Scoto engages in a long signaling game laying out his credentials and the qualities of the elixir he is selling. He emphasizes the exotic nature of the drug. He also signals to the buyers that he is selling it with a lower price (2.2.41-2). He then lowers the price even further and professes that he is "content to be deprived of it for six" pence (2.2.200). Scoto's strategy is consistent with the observation of game theorists that "the ability to conceal one's utility can better the payoff" (Swirski 2007, 126). This kind of concealing needs a theatrical role-playing on the part of the seller. Game theorists discuss bargaining as a game. Some writers consider it as a variant of the prisoners dilemma game (Rasmusen 2007, 21). In a bargaining game, the seller is in an awkward position: he needs to raise the value of the object he is selling, but not too much lest the buyer will stop buying it (Davis 1970, 104). It is an interactive game in which the actions of the seller are shaped in reaction to the actions of the buyer. However, Volpone's (Scoto's) theatricality was so influential that even Celia,

the most straightforward and the least theatrical of characters, was so affected that she threw her handkerchief to him.

The game between Corvino and Celia is consequent on the previous games. This game is called Chicken. Its name is derived from the 1955 movie *Rebel without a Cause* (dir. Nicholas Ray), in which two teenagers settle a dispute by driving their cars ahead towards each other. "If one of them turns away at the last minute, then the one who turns away is the loser — he is the chicken. However, if neither of them turns away, they both stand to lose a great deal more, since they will be injured or killed in a collision. For the third possibility, if both of them turn away, neither gains or loses anything" (McCain 2023, 102). In this game, either Corvino or Celia backs off. If both refuse to do so (as they really do), they will both lose.[8]

At the beginning, Corvino was very jealous at Celia and he gets furious as she responds to the mountebank.[9] Yet, ironically enough, once instigated by Mosca, Corvino is keen on offering his own wife, Celia, to Volpone, in order to increase his chances of being named heir. Since this cost is too high to pay, Corvino suggests to get out of this impasse by bringing a courtesan to Volpone to satisfy his lust.

Corvino: Best to hire
Some common courtesan?
Mosca: Ay, I thought on that, sir.
But they are all so subtle, full of art,
And age again doting and flexible.
So as - I cannot tell - we may perchance
Light on a quean may cheat us all. (2.6.50-5)

Mosca counterargument is that this is quite risky because the courtesan might play them by seducing Volpone and getting his favour. So, his argument goes, they need to employ a decent woman who is not skilled at seducing men. They need someone who is a 'simple thing' that 'has no tricks' (56-7). Interestingly, they imagine a virtual game in which that courtesan defects (make a relationship with Volpone) rather than cooperates (just does her work in return for a pay). In such a case, Volpone's health will be recovered and they will be sidelined. It is this virtual game that makes it more urgent for Corvino to accept offering Celia, a woman whose decency he trusts and abandons the idea of bringing a courtesan who might have a strategy of her own.[10]

So, Corvino has no other option but to offer his wife, Celia to Volpone. Yet in order for that game to be operational/ to work, it needs the agreement and complicity of Celia. Yet Celia does not. She would rather die than succumb to her husband's wishes: "Sir, kill me rather. I will take down poison./ Eat burning coals, do anything –" (3.6.94-5). She even invests her honourable death with religious overtones, calling herself a 'martyr' (107). In order to encourage Celia to accept, Corvino frames the choices she has as a game. He threatens her of defamation if she declines: "I will drag thee hence home by the hair./ Cry thee a strumpet through the streets" (3.7.96-7). So, she has two options: either to cooperate (accept his offer) and win or to defect and be defamed as a whore. If she accepts, she will get 'jewels, gown, attires' and what she wants. If she declines, she will lose her reputation.

Yet, a basic principle of game theory is that games are interactive: for any activity to be called a game, it needs at least two players who agree on playing that game. Celia is not of the kind that plays games. Her husband even describes her position as 'stubborn' and 'obstinate'. Together with Bonario, Celia does not consider what happens as a game being played. They rather take a semi-religious stance, regarding even their innocence at the end as the work of Heaven (5.12.5, 107). However, Corvino is not even convinced that she is doing that out of sheer innocence and honour. He considers her behavior to be another game played by her: "Whore,/ Crocodile, that hast thy tears prepared./ Expecting how thou'lt bid 'em flow" (3.7.117-9). To him, she is playing a game of chicken where she is trying to get as large a payoff as possible. He considers her, in other words, to be acting refusal rather than refusing in earnest. In the play, theatricality is associated with playing games. This association will be explored in more details below.

In addition to being a Chicken game, the game between Corvino and Celia also has elements of a bullying and threat game. According to Davis (1970, 87), "The purpose of a threat is to change someone's behavior: to make him do something he would not do otherwise". There are two things related to threats: first, they limit the options of the person making the threat. Second, if carried out, they would be both to the threatened and the one issuing the threat. Third, in order to be effective, they need to be believable (Schecter and Gintis 2016, 10). Moreover, it can also be seen as a hawk-dove game. It is a variant of the Chicken game. In this

game, the best strategy is if the two players play dove. If one plays hawk, and the other player plays dove, the first player will lose. So, the best strategy if the first player plays hawk is for the second player to play hawk as well (McCain 2013, 148). In this example, since Corvino played hawk, the best option for Celia is to play hawk also. In all accounts, this game ends with neither side swearving and so both clash and get harmed.

3-3: Volpone and Celia

Volpone presents Celia with another game. According to Volpone, she has two options: to live with a man who sold her for money (Corvino) or live with a man who paid money to buy her (Volpone):

> Volpone: Why droops my Celia?
> Thou hast in place of a base husband found
> A worthy lover; use thy fortune well,
> With secrecy and pleasure. See, behold,
> What thou art queen of; not in expectation.
> As I feed others, but possessed and crowned. (3.7.185-190)

Volpone's framing of her situation is quite rationalistic. He is advising her to think strategically: 'use they fortunes well.' He is also, perhaps less strategically, alluding to the game of imperfect information in which he engaged the legacy hunters, her husband included. He boasts that he made them live 'in expectation' of gaining a wealth. According to him, Celia's situation is much better because, should she accept his offer, she is 'possessed and crowned'. Her other choice, as Volpone frames it, is completely untenable: she will stay married to a husband "that would sell thee,/ Only for hope of gain" (3.7.141-2). Again, Volpone's accuracy is to be commended, since Corvino has sold her not for certain gain, but 'for hope of gain'. Volpone promises her of many things and countless riches. In game-theoretic terms, promise is like threat in terms of the commitment it places on the person making the promise so that they become as credible as possible (Schecter and Gintis 2016, 11). Celia might not have doubts of the ability of Volpone to fulfil his promises. However, "When Volpone turns out to be very much alive and ready for action, she is not inclined to join in his game (Bevington 2000, 76). Yet, she eventually defects by declining his offer.

Even his carpe diem- themed song (Come my Celia let's prove/ While we can the sports of love) is more like a game between the human being and time. Humans try to achieve as much as possible before they age out. So, each human has two options: either to slow down or to haste up. Time, on the other hand, has one option in either case: to haste up: "But if once we lose this light,/ 'Tis with us perpetual night./ Why should we defer our joys?" (3.7.172-4). Thus, the best strategy is for the human to haste while time itself is hasting. Deference of joy is a losing strategy because time does not cooperate. It always defects.

The problem with this resultant game is that the players have diverging value systems. "Value-based theories hold that an agent's reasons for action are a function of the values that can be realized by his actions" (Wainwright 2016, 9). What counts as payoff for one may be considered a loss for the other. In her conversation with Corvino, Celia resorts to honour as a guiding principle, while Corvino dismisses honour as an intangible object (3.7.37-40). In her exchange with Volpone, who promises her all kinds of riches, Celia considers her innocence to be far more valuable than any wealth. In fact, she considers her innocence to be her wealth:

> Celia: Good sir, these things might move a mind affected
> With such delights; but I, whose innocence
> Is all I can think wealthy, or worth th' enjoying,
> And which, once lost, I have nought to lose beyond it.
> Cannot be taken with these sensual baits.
> If you have conscience - (3.7.206-11)

As she values her innocence far more than money '*Is all I can think wealthy, or worth th' enjoying*', Celia thinks that losing her innocence cannot be compensated with money. She also frames her choice in terms of a game. She considers the loss of her innocence as her ultimate loss, because it cannot be recovered: '*And which, once lost, I have nought to lose beyond it*.' After that, she considers her best prize, her beauty, to be a crime: "And punish that unhappy crime of nature,/ Which you miscall my beauty" (3.7.251-2). So, the game between Celia and Corvino or her and Volpone is difficult to initiate since the players cannot agree on what constitute a payoff or a loss.

3-4: Volpone and Mosca

The abrupt transition from the end of Act IV to the beginning of Act V has long bedeviled critics since by the end of Act IV Volpone has already won in the court and his happiness was so exuberant that he preferred it to money and even to a virtually successful seduction of Celia. So, how would he rush into the actions at the outset of Act V, namely the feigning of his death and inheriting Mosca all his money? Thompson (2011, 13) holds that there are two actions in the play, since the final act does not follow from what comes before. One major justification for the final Act was that if the play ends in Act IV, it will have lacked a moral message, since by the end the evil character have triumphed and the good punished. Katharine Eisaman Maus (2003, 35) observes that Volpone is an example of the antagonism between plot and moral. However, Leggatt (1969, 19-20) offers an ingenious explanation for this issue. He asserts that the impulse that has driven Volpone to get into the troubles of Act V has already been there from the beginning of the play, namely his actor/artist personality. Volpone assumes the role of the actor/playwright who manipulates scenarios to his liking. As an artist, he cannot leave things as loosely as they were at the end of Act IV. In other words, Volpone is driven by "The artist's instinct to bring his work to an end, to close it off and set it in its final form" (ibid., 25) an impulse that overrules his material self-interest. Hinchliffe (1985, 34) holds that Voplone cares "for the game more than the profit, refuses at the end to be blackmailed by a common dependent." Yet we see that he lost the game and the profit.

The last major game in Act V is the one between Volpone and Mosca. Having duped the legacy hunters, Volpone goes too far as to tease them even further. He agrees with Mosca to announce himself dead and make it seem as if Mosca has inherited everything. He is keen on seeing how the hunters will react to this news.

First, he gets his death announced. Then, he places Mosca as if he were his heir: "I will ha' thee put on a gown,/ And take upon thee as thou wert mine heir" (5.2.69-70). He even laments that Mosca was not born a clarissimo:

> Volpone: Pity thou wert not born one.
> Mosca [*aside*]: If I hold
> My made one, 'twill be well. (5.5.4-6)

Mosca's defection is starting at this point. It is the first time he speaks an aside in response to Volpone's speech. This aside indicates that he has a plan of his own. But firstly, the plan goes on as Volpone envisioned. The hunters come to Mosca, who now assumes the role of the owner of all that wealth. They ask about Volpone's will, each wishing to have been named heir. To their dismay, Mosca reveals the will, which says that Mosca is the sole heir. Meanwhile, Volpone busks in watching them suffer. In the meantime, however, Mosca was implementing his own plan. Alone, he now declares that he is the real owner of all Volpone's wealth: "So, now I have the keys and am possessed./ Since he will needs be dead afore his time,/ I'll bury him, or gain by him. I'm his heir" (5.5.12-4). Now the table is turned on Volpone when he discovers that Mosca has really seized on his wealth: "Outstripped thus, by a parasite! A slave,/ Would run on errands, and make legs for crumbs?/ Well, what I'll do –" (5.7.1-3). After seeing how things are proceeding, he realizes his mistake, namely that he is caught up in his own games: "To make a snare for mine own neck!" (5.11.1). After being denied the whole fortune, Volpone started to play the minimax theorem which "tells you to work out the worst payoff you could get on average from each of your mixed strategies, and then to choose whichever strategy would maximize your payoff if this worst-case scenario were always realized" (Binmore 2007, 30). So, Volpone now tries to get the maximum payoff of his worst case scenario. He then tries to convince Mosca out of this game: "he must now/ Help to sear up this vein, or we bleed dead" (5.11.6-7). Mosca gives options to Volpone, namely that in order to declare that Volpone is still alive, Mosca will get half of the fortune. Volpone refuses at first. Then he relents to give the half to Mosca, but this time Mosca declines and says that he cannot accept of that now: "I cannot now/ Afford it you so cheap" (5.7.68-9).

The game that Volpone and Mosca are playing now starts as an ultimatum game and then turns into a Chicken game. In an ultimatum game, an amount of money is divided between two players. Player 1 (the proposer) has to make a suggestion of how that amount is to be divided. Player 2 (responder) has the options of accepting the proposal (if he thinks it is acceptable) or reject it (in which case neither of them can get anything (Julmi 2012, 62; Watson 2013, 66). Here the amount of money consists of Volpone's fortune. Mosca is the proposal and he makes the proposal of half of the fortune and Volpone rejects. Volpone accepts later only to be shocked that Mosca does not accept it now. There is one variant of

the ultimatum game, called the Dictator game. The dictator game is very much like the ultimatum game, except that the second player does not have the option to reject the proposal made by the first player (Osborne 2000, 180-1). This time, Mosca's version of the game is apparently the dictator game. Yet he is not in a position to play that game. There is no way Volpone can accept that proposal in which he will get nothing. The ultimatum game has an element of threat, because Player 2's refusal is a threat to Player 1 prompting him to raise his proposal. "As in the game of Big Monkey and Little Monkey, a threat to make an "irrational" move, if it is believed, can result in a higher payoff than a strategy of always making the "rational" move" (Schecter and Gintis 2016, 12-13).

Then, after Mosca's refusal to share the money, the game changes into a Chickens game. It is a game in which each player pushes as hard as he can, wishing that the other player will swerve. The best strategy for each player is continue pushing on and the other stops. The worst strategy for both players is when they both stay because it consists in mutual destruction (Binmore 2007, 11).[11] In this case, both Volpone and Mosca stick to their position. So, they end up both losing. Neither of them accepts to relent and compromise. Mosca refuses to have the half of the fortune and Volpone refuses to lose all for Mosca. Instead of this mutual destruction, they could have opted for what game theorists call 'Pareto optimality. "An outcome is Pareto optimal if there is no other possible agreement that enables both players to do better simultaneously" (Davis 1970, 118). The 50/50 choice was a Pareto optionality from which could satisfy both, because none of them can do better at the same time otherwise. even worse, the game between Mosca and Volpone turns into what game theorists call a negative-sum game', one in which the sum of the payoffs of all participants is under zero. It is a purely lose-lose situation (Schreiber and Romero 2021, 299).

In fact, the absence of equilibria and optimality might account for the tragic and gloomy nature of the play. Critics see that Ben Jonson's Volpone is bordering on tragedy (See Leggatt 1969). This aspect of the play can also be accounted for using game theory. The prevalence of zero-sum games and the paucity of any equilibria point to the tragic nature of the play. Tragedy is characterized by hosting characters that are less flexible and more stubborn than comic characters. Tragic characters are more exclusive, while comic characters are inclusive. Most of the

games characters fail to arrive to a compromise or to an equilibrium. Thus, game theory can even contribute to the study of literary genres.

When Volpone realizes that he is losing everything, he is now ready to lose all, rather than have Mosca have it all:

> Volpone [aside]: Soft, soft. Whipped?
> And lose all that I have? If I confess,
> It cannot be much more. (5.12.83-5)

However, Volpone's choice is far from rational. In this game, Volpone has two choices: cooperate (keep silent) or defect (exposes Mosca). First of all, he should have agreed to grant Mosca half the fortune, since this was his best strategy. When Mosca refused even the half and insisted on taking it all, none of Volpone's choices (cooperation with Mosca or defection from him) would have yielded him anything. However, his cooperation would have left him free of prosecution, since to the authorities he is now a dead man. His defection (confessing on Mosca and, consequently, on himself) would yield him not only the loss of his money, but also public prosecution. What he gets from defection is only the mutual destruction of Mosca: "My ruins shall not come alone" (5.7.86). But how could this have benefited him?! This indicates that he is acting out of sheer anger and retribution, rather than making rational decisions. This far from the homo economicus that Volpone might be taken to stand for. Maybe if he cooperated and kept silent for now and then approached Mosca after the trial he could have gained part of his fortune. Volpone's rationality is overruled by desire.

Yet, from a game theory perspective, Volpone's retaliation against Mosca is quite understandable. In experiments conducted using the ultimatum and dictator games, it turned out that sometimes people act altruistically. They might settle for options that do not match their maximum interest. In these experiments, it was found that "people will sacrifice to punish a perceived unfair, non – cooperative defection … that cross-culturally people are likely to accept some cost or sacrifice willingly to punish a player (whether familiar to the player or not) who makes little attempt to be cooperative with others" (Wagner 2013, 334). The aggressive behavior of Mosca, as perceived by Volpone, has prompted that irrational reaction from the latter. In game theory, this is called reciprocity. It means that people might accept a cost either to reward a sacrifice by the other player (positive reciprocity)

or “to revenge for some aggressive behavior (negative reciprocity) (McCain 2013, 486). Thus, Volpone’s move is a negative reciprocity towards Mosca.

During this mess that Volpone and Mosca have created, the first Avocatore exclaims: “This is confusion” (5.10.47). He is referring to the multiplicity of games that mushroomed in this part of the play. When all issues are resolved and both Volpone and his accomplices are indicted, the same Avocatore says: “The knot is now undone by miracle” (5.12.93). This is when all games are over by now. However, he is attributing the end to a miracle, while in fact it was just games being played and are now resolved. In fact, the play presents a non-game view, which holds that everything is happening by divine Providence. Celia exclaims thus when the court is convinced of her innocence: “How ready is heav’n to those that pray!” (5.12.5). Bonario makes a similar comment later when he was found innocent: “Heaven could not long let such gross crimes be hid” (5.12.97). The play gives credit to the former view of the prevalence of games over a religious explanation.

4: Theatrical communication as a game

The other level of the play where games form a great deal of the experience is the nature of the theatrical representation and its status as a game between writer and spectators. The nature of the fictional status of the stage has been explained by some aestheticisms as a children game of make-believe (Walton 1991). This game is based on the idea of pretense, when the two sides agree to pretend that what is being represented is real.

Theatrical communication is, in a sense, analogous to economic activity. This analogy is rooted in the awareness of a “correspondence between the mode of economic exchange and the mode of signifying exchange” (Hawkes 2015, 70). The semiotic medium and the economic medium are both based on the idea of exchange. But while in economics the exchange is that of goods and services, in language the exchange is of signs, linguistic and otherwise. Theatrical communication is a kind of semiotic exchange of signs between writer and spectator (through actors).[12]

Consequently, theatrical representation can be accounted for in terms of game theory. According to this account, writer and spectator are involved in a game. For that game to succeed and for each part to go out with the optimal payoff,

they have to cooperate. If one side defects, the fictional game is over. In this game, each side has to do their part of the game. The writer has to present the spectator with the play that guarantees the utmost gain. In the Prologue he writes: “to mix profit with your pleasure” (Prologue 7) or in the Epistle “to inform men in the best reason of living” (Epistle 44). The spectator, on the other hand, has to cooperate and work out their imaginings in such a way as to make up for the lack and limitations of theatrical representation. In short, they have to participate in the pretense. If either side defects, the fictional game is over. Jonson makes this idea clear, employing other terms, in his Epistle to the play. He tells his readers that he tried to observe the classical unities because they have come down to us from the ancients and they would preserve the perfection of the play and guarantee the ability of the audience to comprehend the play and believe in its credibility. He commits himself to limiting the action of the play to one action, and to one place and to one time, twenty-four hours. In return, Jonson is asking audience and readers of his plays to do their best to appreciate the plays.[13]

Besides, Ben Jonson was intimately engaged with the idea of theatre as a game. Douglas Duncan holds that Jonson, by the time of writing *Volpone*, was influenced by the Dutch humanist Desiderius Erasmus. Erasmus was looking to his fiction as a game. In this view of writing as a game, the representation of reality is not is as important as the participatory nature of the activity. What characterises this vision “is a basic distrust of fiction per se. For him [Erasmus], the imitation of life was still less an end in itself than the play of the mind” (1979, 50). McEvoy goes further to liken this vision to the plays of Aristophanes’ Old Comedy where the audiences are acknowledged as participants (20·8, 12). This make-believe nature of the theatre would guarantee that both sides (writer and spectators) abide by the same rules of the game. This is supported by the interchangeability of the words ‘game’ and play,’ both of which indicate a kind of make-believe. The world inside that make-believe activity is to be kept distinct from the world of the world outside it (ibid.; Butler 2000, 12). As Peter Womack points out, in the Induction, the audience is invited to enter into an agreement to play a game with the writer: it “invites the audience to play at being parties to such a contract . . . . The act of coming to see the play is retextualized as participation in a game” (1986, 158).

This stark self-awareness of the play as a game and of watching the play as participating in a game is premised on the self-conscious theatricality of the play. Ben Jonson's Volpone is an overtly metatheatrical. It is fraught with examples where it self-reflectively refers to itself as a play, such as referring to the "English stage" (2.1.57-8) as well as using theatrical terminology, such as 'scene' (2.3.2), 'actor' and 'spectators' (2.5.9, 40). Volpone appeals to Celia bout "our scene/ At recitation of our comedy" (3.7.159-160). In Act V, Volpone asks Mosca to "play the artificer now" (5.2.111) and then he himself disguises as a *Commendatore* (5.5.1). The theatricality of the play is mainly encapsulated in the main two characters Volpone and Mosca. As far as Volpone is concerned, and as indicated by the above quotations, he spent the play metamorphosing from one character to another: "So we watch as he changes from magnifico to sick man to mountebank doctor to virile lover to dying man to commendatore - and, at last, to the fox himself" (Hinchliffe 1985, 22). Mosca is no less a good actor himself. Hinchliffe observes that Mosca was inflected by the theatricality of his master (ibid., 36), yet others consider him a superb actor whose performance and ability for improvisation far outperform Volpone himself and in comparison to whom Volpone appears as merely an amateur (Cave 1991, 54). In game theoretic terms, improvisation works on contingency thinking. According to McCain, "A "contingent" strategy is a strategy that is only adopted if a particular contingency arises" (2023, 27). Mosca is an improviser, not a planner, and most of his plans are contingency strategies. Most character, except Celia and Bonario, are acting (Loxley 2005, 70).

Not only is this metatheatricality apparent inside the play, but it is also insistently emphasized in the metadiscourse that encapsulates the play: the Epistle, the Prologue and the Epilogue. The Epistle to the two sister universities, mentioned above, sets Jonson's agenda about the play and the audience. In the Epilogue, he also addresses the audience directly. Interestingly, after Volpone's terms of punishment were announced, he appeals to the audience to get their sympathy:

> The seasoning of a play is the applause.
> Now, though the Fox be punished by the laws.
> He yet doth hope there is no suff'ring due
> For any fact which he hath done 'gainst you.
> If there be, censure him; here he doubtful stands.
> If not, fare jovially, and clap your hands. (Epilogue 1-6)

The Epilogue frames the play as a game: if the actors do their part successfully (seasoning of a play), the audience must pay them off by applauding their performance (the applause). The different options of that game are indicated by the conditional 'if'. The audience is directly addressed by using the second person pronouns in 'against you' and 'your hands'. Not only does game theory analysis address the actions in the world of the play, but also extends to the meta-discursive level of the play, to account for the game being played between the writer and the audience.

5: The Social Contract and the Judicial System as a Game

The play depicts Venetian society and its strife to keep law and order through the judicial system. The durability of the judicial system in Venice was emblematic during the Renaissance and was consequently dramatized in many works, not the least of which is Shakespeare's *The Merchant of Venice* (1596). Although the play highlights the weaknesses in that system, that system proves to be still functional and capable of achieving a kind of justice, especially at the end. Social behavior and the interaction that keeps the fabric of the society intact has also been seen in terms of game theory. Many writers viewed the social contract as a kind of game that individuals play and in which they sacrifice part of their personal freedom (cost) in return for a common security and mutual assurance (payoff). Especially significant in this line of thinking is the English philosopher Thomas Hobbes. In his *Leviathan* (1651), Hobbes envisioned the social contract as a cooperative game. It is more like a Prisoner Dilemma game which, in order to work, it needs cooperation from all members (Hobbes [1651] 1996, 189). It makes no sense for an individual to give up part of his freedom to the group if the other members do not. General cooperation, not defection, is required. Thus, self-interest turns from a destructive force ripping society apart to a cohesive force that ties society together. This is different from the former accounts of self-interest, especially that of Nicolo Machiavelli. "Machiavelli commended the assumption of self interest to the prince; Hobbes applied it to everyone" (Wainwright 2016, 4). Consequently, the judicial system and the social contract that sustains it can be a fertile ground for a game theory analysis.

6: Rationality and the homo economicus

The play also speculates on rational behavior and its relation to economic decisions. At the beginning of the play, and in line with Volpone's praise for gold as 'the best of things', Mosca intervenes and confirms that it is also "A greater good than wisdom is in nature" (1.1.29). This comment is quite premature since, as the play will demonstrate, money depends on wisdom. It is rational economic behavior that generates fortune, not the other way around. Later in the play it is Volpone who corrects that statement. In Act V, in his teasing of Voltore, Volpone says: "You are so wise, so prudent, and 'tis fit/ That wealth and wisdom still should go together" (5.9.19-20). The correct understanding of things dictates that strategic thinking (wisdom) are necessary requirements for wealth. This confirms the metaphor of life as a game, which in order to win you need to think rationally and outsmart your opponents. In the middle of the play, Volpone uses that word as a plea to Celia to start thinking strategically and in terms of utilities: "'Tis the beggar's virtue./If thou hast wisdom, hear me, Celia./Thy baths shall be the juice of July-flowers" (3.7.221-3). So, to Volpone the rational 'wise' choice for Celia is to accept his offer and play that game (mentioned above) in which she has to make a decision between her husband and Volpone. They also use common wisdom in order to make their decisions look rational. For example, in his persuasion of Voltore that Volpone is going to die soon, he mentions the sorts of diseases that beset his master. He mentions these phrases of common wisdom such as "Well, we must all go" and "Age will conquer" (1.3.31, 3).

Yet, even Volpone who is epitome of rational thinking commits mistakes and does actions that are far from rational. He is far from being the homo economicus. His behavior is far removed from the image of the homo economicus. His infatuation with Celia was not a rational act. After Volpone, disguised as Scoto, is beaten by Corvino for selling under the window of his house, Volpone tells Mosca his love for her after he had seen her from the window:

Volpone: O, I am wounded!
Mosca: Where, sir?
Volpone: Not without;
Those blows were nothing, I could bear them ever.
But angry Cupid, bolting from her eyes,
Hath shot himself into me like a flame; (2.4.1-4)

Later, after he tried to assault Celia and was attacked by Bonario, he realizes the gravity of his mistake and his irrational behavior: "I am unmasked, unspirited, undone./ Betrayed to beggary, to infamy" (3.7.278-9). In retrospect, Volpone's plans of duping the legacy hunters out of their money was going smoothly. His whims about Celia were a distraction of that plan and, at the end, it led to the dismantling of all his empire. Otherwise, he would not have had problems with the authorities. Related to this incident, the other irrational action they committed is engaging other players whose behavior they cannot predict. This happened when Mosca invited Bonario to overhear Volpone's speech with Corbaccio. After they were beaten, they try to understand what happened:

> Volpone: Woe on thy fortune!
> Mosca: And my follies, sir.
> Volpone: Th' hast made me miserable.
> Mosca: And myself, sir.
> Who would have thought he would have hearkened so? (3.8.8-10)

Mosca's admission of his 'follies' indicates how irrational that decision was. Yet the final line 'Who would have thought' is quite indicative of that mistake. In game theory, the player in any game must anticipate the behavior of all other player and act accordingly (Wainwright 2016, 2). His failure to account for Bonario's prospective behavior is an irrational act and a strategic failure. Another failure is the brining of Bonario to overhear the conversation with his father. How would that contribute to their scheme? If Volpone and Mosca were after the money, why would they create a problem between father and son?! That, certainly, would be of no benefit to them.

Another irrational behavior that he engages in is his inheriting of Mosca of all his fortune. As mentioned above, he did that out of sheer love for fun. Mosca decides to turn on him and claim the money for himself: "Let his sport pay for't. This is called the fox-trap" (5.5.18). His frivolity has cost him his entire fortune. This irrational behavior is not warranted by any system of wisdom. Thus, the play indicates that rational behavior and the homo economicus are not common stock.

7: Conclusion

The analysis of Jonson's Volpone using game theory has shown that the play dramatizes issues of strategic thinking and (ir)rational decision-making, as based on calculations of cost and payoff. It also frames competition in terms of characters anticipating other characters' moves and blocking them. The play is far from simply dealing with themes of greed, morality and manipulation. It rather puts forward very nuanced views of human behaviour. The play is fraught with games that follow after one another uninterrupted: the games between Volpone (and Mosca) and the legacy hunters, between Celia and Corvino and Celia and Volpone and then between Volpone and Mosca. Instead of the *theatrum mundi* (or 'All the world is a stage') trope, the play seems to provide another trope, that of all the world is a game (ludus mundi). While traditional reading of the play sets apart legacy hunters as idiotic dupes, this analysis has proved that they also follow strategic moves. What distinguishes them from Volpone and Mosca is that the knowledge gap that the latter two marshal for their advantage. What was traditionally read as betrayal (as Mosca's move against Volpone) can now be conceptualised as an expected move in situations where cooperation is unstable.

The analysis also underscores moments of missed opportunities when cooperation was possible. There are many situations where characters, had they been more cooperative, would have reached a Nash Equilibrium or a Pareto optimality in which all sides could have come out winning. This way they could have avoided the unfortunate ends. This line of interpretation lends the door wide open for employing game theory in accounting for dramatic genres as comedy and tragedy. According to this account, tragedy prospers where the dramatic world is dominated by zero-sum games, or where no equilibria or an optimality is achieved. The availability of these conditions in Volpone makes it border on tragedy, which many critics have complained about but were unable to explain in accurate terms.

It also transpired that games are not exclusive to the dramatic world only, but they are also operative in the meta-theatrical world, namely in the relationship between the writer and the spectator. The study offered a theoretical perspective for building a model of theatrical communication inspired by game theory. Moreover, it has shown how the judicial system and the social contract that sustains it can be explained out in terms of a game among members of a certain

community, whose success is premised on the mutual cooperation of all members. The law can thus be seen as a tool to punish defection of that game.

Furthermore, the above analysis must have proved the utility of employing game theory in reading Renaissance non-Shakespearean texts. Such readings might also prove crucial for a period that has witnessed the emergence of market capitalism which the stage was one of its crucial models. The affinity between the stage and games of strategy extends far beyond the simple linguistic polysemy of the word 'play'.

Notes

[1] McEvoy observes that the play promotes a kind of 'moral conservativism' (2008, 64). Kay also refers to the satirical tone of the play and traces influences of and parallels with the satires of Lucian and Horace targeting legacy hunters (2008, 90).

[2] A Prisoners Dilemma is a prototypical scenario in game theory, in which mutual cooperation benefits both players but non-cooperation (defection) is the expected behaviour due to selfishness or greed (Davis 1970, 93). Interestingly, some critics considered that both Volpone and Celia are prisoners in some way or another, not the least of which is the absence of their privacy (See Steggle 2011, 5)

[3] However, classical economic theory has always attempted to define utility in quantitatively measurable terms (von Neumann and Morgenstern [1944] 1953, 16). In its informal level, Game theory deals with human behaviour: "if the theory is not related to human behavior in some way, it will be sterile and meaningless except as pure mathematics" (Nordstrom 2023, 43). Nineteenth century utilitarian philosophers like Jeremy Bentham and John Stuart Mill had tried to define utility in terms of how much pleasure or pain one can bring in or avoid, respectively. Yet modern economic thinkers do not follow in their steps (Binmore 2007, 6).

[4] It is interesting that many games have names of animals (such as Hawk-Dove, Chickens, Big Monkey –Little Monkey, etc.) just like Jonson's *Volpone* where most of the characters are named after animals (Fox, Vulture, Mosca, etc.).

[5] That is why Shakespeare's *The Merchant of Venice* (1596) also addressed money and lending and loans.

[6] Grav makes a similar point about Shakespeare's The Merchant of Venice, which shares too much with Jonson's Volpone. He identifies the commercial language that is shared by all characters of the play like their lingua franca (2008, 84).

[7] Lea Knudsen Allen (2008, 102) points out that both Volpone and Marlowe's The Jew of Malta "mercantilism and the consumption of luxury goods are lexically equated with travel, with the movement of things across place." Allen makes the same point about the exoticism that Scoto attributes to his drug.

[8] There are elements of a Stag hunt game in the interaction between Corvino and Celia. A Stag hunt game is one in which the two players have to agree on cooperation in which case each player's payoff will be greater than if they both defected. As such, if Celia cooperates with Corvino and submits to Volpone's wishes, they will gain by Corvino being named heir. If she defects, and Volpone does not get the reward he was seeking of her attention, they will both lose. Celia's defection, her refusal to give herself to Volpone, is what Corvino considers as causing his loss.

[9] McEvoy (2008, 57) observes that this was a common practice of Venetian men to lock their wives in their homes.

[10] Katherine Eisaman Maus thinks that Corvino's cuckoldry is voluntary and that he is thrilled by the idea of being cuckolded: "The thrill of cuckoldry interests Jonson: witness Corvino in Volpone, a violently jealous husband who craves seeing his wife in another man's arms" (2003, 258). However, I do not think that this observation is supported by the play.

[11] The game of Chicken ensures mutual deterrence because the end result of the game if neither player swerves is mutual destruction. In fact, it is the game whereby the nuclear crises between great powers were envisioned (Alberti and Nagar, 30-5).

[12] Quoting Heather C. Easterling, Hui observes that in Jonson's *Bartholomew Fair* language is no more than a game that people play with themselves and each other (2018, 140).

[13] However, critics have complained that Jonson did not deliver on his side of the agreement. For example, Thompson, referencing John Dennis, refers to the assumption that the plot was not reasonable, that the unity of action is not preserved and that there is no consistency of character (the abrupt transformation from trickery to recklessness that besets Volpone from Act IV and Act V (2011, 14). Samuel Taylor Coleridge, for one, also complained about the lack of goodness in the play. To Coleridge, the play is too bleak and gloomy to enjoy. He mentions that the play "After the third act, this play becomes not a dead, but a painful, weight on the feelings" ([1874] 2019, 257). Moreover, McEvoy (2008, 52) holds that the play seduces its audience into respecting fraudulent behavior and makes them complicit. This is far from moral.

References

Alberti, Riccardo and Atulya K. Nagar. "Can Deterrence Lead to Fairness?" In *Game Theory Relaunched*, edited by Hardy Hanappi, 27-54. Rijeka: InTech.

Allen, Lea Knudsen. 2008. "Not every man has the luck to go to Corinth": Accruing Exotic Capital in The Jew of Malta and Volpone" in *Global Traffic Discourses and Practices of Trade in English Literature and Culture from 1550 to 1700*, Edited by Barbara Sebek and Stephen Deng pp. 95-116. New York: Palgrave.

Bevington, David. 2000. "The Major Comedies." In *The Cambridge Companion to Ben Jonson*, edited by Richard Harp And Stanley Stewart, 72-89. Cambridge.

Binmore, Ken. 2007. *Game Theory: A Very Short Introduction*. Oxford.

Brams, Steven J. 2011. Game Theory and the Humanities: Bridging Two Worlds. Cambridge, Mass.: The MIT Press

Butler, Martin. ٢٠٠٠. "Jonson's London and its Theatres." In *The Cambridge Companion to Ben Jonson*, edited by Richard Harp and Stanley Stewart, 15-29. Cambridge.

Cave, Richard Allen. 1991. *Ben Jonson*. New York: Macmillan Education.

Chedgzoy, Kate, Julie Sanders and Susan Wiseman. 1998. "Introduction: Refashioning Ben Jonson." In *Refashioning Ben Jonson Gender, Politics and the Jonsonian Canon*. Edited by Kate Chedgzoy, Julie Sanders and Susan Wiseman, pp. 1-27. London: Macmillan Press Ltd.

Chwe, Michael Suk-Young. 2013. *Jane Austen, Game Theorist*. Princeton University Press.

Coleridge, S. T. [1874] 2019. *Lectures and Notes on Shakespeare and other Dramatists*. London: Routledge.

Comyn, Sarah. 2018. P*olitical Economy and the Novel: A Literary History of "Homo Economicus"*. New York: Palgrave.

Davis, Morton D. 1970. *Game Theory: A Nontechnical Introduction*. New York: Basic Books, Inc.

Duncan, Douglas. 1979. *Ben Jonson and the Lucianic Tradition*. Cambridge: Cambridge University Press.

Eliot, T. S. 1957. *'The Sacred Wood:' Essays on Poetry and Criticism*. London: Methuen and Co. Ltd.

Grav, Peter F. 2008. *Shakespeare and the Economic Imperative: "What's aught but as 'tis valued?"*. London: Routledge.

Hawkes, David. 2015. *Shakespeare and Economic Theory*. London. Bloomsbury.

Hazlitt, William. 1841. *Lectures on the English Comic Writers*. London: Oxford University Press.

Hinchliffe, Arnold P. 1985. *Volpone: Text and Performance*. New York: Macmillan.

Hobbes, Thomas. ([1651] 1996). "From Leviathan." In *Modern Political Thought: Readings from Machiavelli to Nietzsche,* edited by David Wootton, 122-296. Indianapolis: Hackett Publishing Company Ltd.

Holderness, Graham. 2020. "Introduction: Shakespeare, Minted." In Shakespeare *and Money*. Edited by Graham Holderness, pp. 1-14. New York: Berghahn Books.

Hui, Isaac. 2018. *Volpone's Bastards: Theorising Jonson's City Comedy*. Edinburgh University Press.

Jonson, Ben. ([1598] 1966). Every Man in His Humour. Edited by Martin Seymour-Smith. New York: Ernest Benn Limited.

Jonson, Ben. *Volpone*. In *Ben Jonson: Three Comedies*. Edited by Michael Jamieson, 37-174. London: Penguin.

Jørgensen, Nils-Johan. 2015. *An Image of the Times: An Irreverent Companion to Ben Jonson's Four Humours and the Art of Diplomacy*. Kent: Renaissance Books.

Julmi, Christian. 2012. *Introduction to Game Theory*. (E-book).

Kay, W. David. 1995. *Ben Jonson: A Literary Life*. New York: Palgrave Macmillan.

Leggatt, Alexander. 1969. "The Suicide of Volpone." *University of Toronto Quarterly*, 39 (1): 19-32. https://doi.org/10.3138/utq.39.1.19

Loxley, James. 2005. *The Complete Critical Guide to Ben Jonson*. London: Routledge.

Maus, Katherine Eisaman. 2003. "Fetish and Poem: Ben Jonson's Dilemma." In *Money and The Age of Shakespeare: Essays in New Economic Criticism*, edited by Linda Woodbridge, pp. 251-64 New York: Palgrave.

McCain, Roger A. 2023. *Game Theory: A Nontechnical Introduction to the Analysis of Strategy*. London: World Scientific.

McEvoy, Sean. 2008. *Ben Jonson: Renaissance Dramatist*. Edinburgh University Press.

Nordstrom, Jennifer A. Firkins. 2023. *Introduction to Game Theory: A Discovery Approach*. California: LibreTexts.

Osborne, Martin J. 2000. *An Introduction to Game Theory*. Oxford: Oxford University Press.

Pollard, Tanya. 2005. *Drugs and Theater in Early Modern England*. Oxford University Press.

Rapoport, Anatol. 1960. *Fights, Games, and Debates*. Michigan: The University of Michigan Press.

Rasmusen, Eric. 2007. *Games and Information: An Introduction to Game Theory*. Oxford: Basil Blackwell.

Ryner, Bradley D. 2014. *Performing Economic Thought: English Drama and Mercantile Writing, 1600–1642*. Edinburgh: Edinburgh University Press.

Schecter, Stephen and Herbert Gintis. 2016. *Game Theory in Action: An Introduction to Classical and Evolutionary Models*. Princeton: Princeton University Press.

Schreiber, Ian, Brenda Romero. 2021. *Game Balance*. Oxon: CRC Press.

Slights, William W.E. 1994. *Ben Jonson and the Art of Secrecy*. Toronto: University of Toronto Press.

Steggle, Matthew. 2011. "Introduction." In *Volpone: A Critical Guide*, edited by Matthew Steggle, 1-7. London: Continuum.

Stout, Michael. 1988. *Volpone*. London: MacMillan Education.

Swirski, Peter. 2007. *Of Literature and Knowledge: Explorations in Narrative Thought Experiments, Evolution, and Game Theory*. London: Routledge.

Thompson, Sam. 2011. "The Critical Backstory." In *Volpone: A Critical Guide*, edited by Matthew Steggle, 8-30. London: Continuum.

von Neumann, John and Oskar Morgenstern. ([1944] 1953). *Theory of Games and Economic Behaviour*. Princeton: Princeton University Press.

Wagner, Paul A. 2013. "Game Theory as Psychological Investigation." In *Game Theory Relaunched*, edited by Hardy Hanappi, 325-344. Rijeka: InTech.

Wainwright, Michael. 2012. "Sherlock Holmes and Game Theory." *An Interdisciplinary Critical Journal* , 45 (3): 81-98. https://www.jstor.org/stable/44030696

----------. 2016. *Game Theory and Postwar American Literature*. New York: Palgrave Macmillan.

----------. 2018. *The Rational Shakespeare Peter Ramus, Edward de Vere, and the Question of Authorship*. New York: Palgrave Macmillan.

Walton, Kendall. 1990. *Mimesis as Make-Believe: On the Foundations of Representational Art*. Cambridge, MA: Harvard University Press.

Watson, Joel. 2013. *Strategy*. New York: W. W. Norton & Company.

Williams, John D. 1954. *The Compleat Strategyst: Being a Primer on the Theory of Games of Strategy*. New York: Dover Publications, Inc.

Wilson, Edmund. 1952. "Morose Ben Jonson". In *The Triple Thinkers: Twelve Essays on Literary Subjects*, 203-220. London: John Lehmann.

Woodbridge, Linda (ed). 2003. *Money and the Age of Shakespeare: Essays in New Economic Criticism.* New York: Palgrave.

Womack, Peter. 1986. *Ben Jonson*. Oxford: Basil Blackwell Ltd.