Settlement Selection and Inequality in Video Games through an Anthropological Lens

Exploring the *Catan Universe*

Amy E. Thompson

For thousands of years, humans have been entertained by board games. The earliest documented game boards date to at least 6000 BC in the Near East (Sebbane 2001), and we know the name, *Senet*, and rules of a board game from Egypt dating to 3500–3100 BC. Aspects of inequality are omnipresent in the dynamics of the competition and cooperation inherent in games. In this review, I assess the digital version of the board game *Catan*, which is also called *Catan Universe*, discussing how anthropological theories such as human behavioral ecology are recognizable in the digital game. Playing this game provides a unique way to test models of inequality.

CATAN WITHIN ANTHROPOLOGICAL FRAMEWORKS

Settlers of Catan, now simply called *CATAN*, was developed by board game designer Klaus Teuber and released in 1995. The main goal of game play is to expand one's territory and gain points by building roads and new settlements and by upgrading settlements to cities. The "settlers" term in the original title evoked colonialization and expansionism. Although the name changed, the themes of settler colonialism are still evident in game play, which involves expansion onto new lands and the construction of hierarchical and networked settlements (Veracini 2013). However, explicit colonization of previously occupied lands is not part of the game, because new groups are not taking land occupied by Indigenous communities.

In this review, I use the anthropological framework of human behavioral ecology (HBE) to discuss how settlement decision-making is deeply affected by differential access to key resources. This results in inequalities developing among the players of *Catan*, such as differential access to key resources through the establishment of settlements and cities. In an ideal free distribution (IFD; Kennett 2005; Sutherland 1996) model, settlers seek to occupy the highest-quality patches of land first and then settle secondary and then tertiary patches of the land. In an ideal despotic distribution (IDD; Bell and Winterhalder 2014) model, individuals located on and possessing key resources accumulate wealth and ultimately harness the ability to control the settlement decision-making processes of others. Additionally, I consider the impact of fiscal financing and trade networks on inequality, predicting that more successful trades will result in greater access to a variety of resources and thus a higher score in the game.

The basic tabletop game now has a variety of expansion packs, many of which are inspired by archaeological themes, including *Dawn of Humankind*, *Rise of the Inkas*, *Histories: Settlers of the Stone Age*, and *Histories: Struggle for Rome*. Furthermore, you can play digital versions of *Catan* online, on the computer desktop game *Catan Universe*, and in virtual reality (Liang 2021). Since its debut nearly 30 years ago, the game has been translated into 40 languages and more than 40 million games have been sold (www.catan.com).

Catan: The Board Game

The goal of *Catan* is to expand one's territory, building a network of settlements and roads that are connected to key resources and gaining points along the way. The traditional game board consists of interchangeable hexagonal resource tiles, including ore, brick, lumber, wool, and grain. Resource tiles are assigned random numbers that correspond to the values rolled on the dice, which is how players gain resources. Resources with more commonly rolled values, such as 6 and 8, are highly valued and often settled first, whereas resource tiles with values less likely to be rolled, such as 2 and 12, are often last to be settled, if at all. The number 7 is not assigned to any resource tiles, and if a 7 is rolled, any player with more than eight cards must discard half their resources. Settlements and cities are constructed at the intersections of three resource tiles, providing the player access to those resource cards. The four construction options—building a road, settlement, city, or purchasing a Development Card—vary in their building costs, making it important for each player to have access to a variety of resources (Figure 1). New settlements must be connected to established settlements or cities via roads along the seams between the resource tiles, which are built using resource cards. For game play, players take turns rolling dice, and all players collect the corresponding resources. When it is their turn, players may spend their resources or initiate a trade with another player. Ultimately, players gain resource cards through game play, trade for resource cards they need or do not have access to, and expand their territories with settlements, cities, and roads until they earn 10 points (see Table 1).

Catan Universe: The Digital Game

Catan Universe has the same basic setup as the tabletop version. Resource tiles (ore, brick, lumber, wool, and grain) are randomly numbered; when a player rolls the dice, anyone with a settlement or city on the corresponding numbered tiles receives those resource cards. As seen in Figure 2, if a 5 is next rolled, Lin (purple)

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FIGURE 1. Initial setup of the *Catan* board game (photo by Amy E. Thompson).

would receive 1 brick card and 1 wheat card, and athomp04 (green) would receive 1 wheat card; Nassir (red) and Jean (yellow) would not receive any resource cards in that turn. Throughout the game, players build settlements and roads, upgrade to cities, trade with others, and buy Development Cards until victory is achieved.

The game play is simple and takes about 30 minutes, yet each game is different. The resource tiles and values are generated for each game, and players can choose from several different AI characters (Cobb 2023). The AI characters can be set to one of three levels of experience: rookie (beginner), veteran (intermediate), and master (advanced). To some degree, the AI characters' level of experience plays out in the game: advanced AI characters seem to make better decisions and gain points more easily, and beginner AI characters make rookie mistakes, such as holding more than eight cards for several rounds at a time, ultimately discarding half of them when a 7 is inevitably rolled.

TABLE 1. Action Items and Points in *Catan*.

Items That Gain Points	Action Item	Points
Settlement	Receive one resource if the corresponding number is rolled	1 point per settlement
City	Receive two resources if the corresponding number is rolled	2 points per city
Development Card	Cards with a variety of advantages including victory point, knight, build two free roads, etc.	Varies: 1 point per Victory Point card; 2 points for the largest army after three knight cards have been collected
Roads	Connect settlements and cities; roads built by different players cannot cross	2 points for the longest road starting at five road segments

Although concepts of settlement expansion evoke early urbanism with the rise of large and populated cities and expansive trade routes (Marcus and Sabloff 2008; Veracini 2013), other aspects of anthropological archaeology are present in *Catan* as well. Through the lens of HBE (Smith and Winterhalder 2006) and concepts such as IDF and IDD, differential access to resources, niche constructions, and inequality become apparent. Furthermore, we can apply concepts from archaeogaming (Reinhard 2018) to test the theoretical models of HBE with inequality in *Catan Universe*.

ANTHROPOLOGICAL ARCHAEOLOGY THEMES IN *CATAN*

Inequality and Resource Patchiness: Ideal Free Distribution and Ideal Despotic Distribution

In *Catan*, resources are distributed across the landscape and are accessible only through rolling the corresponding number on the

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FIGURE 2. Game setup of the online *Catan Universe*. Resources are represented by different tiles; for example, the dark-green forest tile represents lumber. If the number on the tile with a settlement is rolled, the player receives the corresponding resource card (Catan Universe 2023).

tiles. As players begin game play, they select where to place their settlements based on resource accessibility, adhering to the IFD (Kennett 2005; Sutherland 1996). The IFD model predicts that the best patches of land will be occupied first before settlers select secondary patches of land of lesser value. Then, when the secondary patches of land are filled in, new settlers will occupy the tertiary patches, and so on. In *Catan*, highly valued "patches" or tiles with more frequently rolled numbers such as 6 and 8 are more likely to be settled before "patches" or tiles with a lower probability of being rolled such as 2 and 12. When selecting where to place settlements, the player evaluates the totality of tiles at each intersection, considering the likelihood that the combination of numbers will be rolled. Just as in the real world, there are a finite number of locations on the board that are highly coveted, which are settled first. Eventually, these spots are taken, and players must select less preferable patches of land. Other factors may also come into play, such as access to a variety of resources (wool, ore, and lumber) versus only to a single resource (all lumber) and the proximity and arrangement of settlements, following the IFD. Because the game is only a simplified simulation of life, decisions are not affected by other common human variables like politics, ideology, or even topography.

Another anthropological lens is offered through the dimensions of the IDD (Bell and Winterhalder 2014) and related inequality, which are also present in *Catan*. IDD is characterized by some individuals occupying higher-quality patches of land and accumulating more resources through time. Likewise, IDD results in patches of land disproportionately being controlled by despots. In *Catan*, when settlements grow into cities, they gain double the resource cards when the corresponding number on a tile is rolled. In this way, having access to resources to build a city leads to the increased accumulation of resources, similar to how the "rich get richer" through the intergenerational transmission of wealth. Often, the settlements that advance to cities are those located on the best patches of land, adhering to IDD. Even more so, IDD is present in *Catan* via the network of roads constructed by each player, because others cannot cross the roads of another player when settling new tiles. The network of roads created by one player may restrict access to high-quality patches of land unoccupied by other players.

Roads, Trade Networks, and Fiscal Financing

A second aspect of the game that connects to archaeology is the prominence of trade and fiscal financing as players build their settlements and interconnected roads, construct cities, and buy Development Cards to secure additional gameplay perks. In the ancient world, vast networks of roads connected distant cities across, for example, the Roman Empire (Figures 3a and 3b), Inka Empire, and Classic (AD 250–800) Maya landscapes. Long-distance trade routes such as the Silk Road and Incense Road brought opportunities to those living in harsh environments, such as at Petra (Zohar and Erickson-Gini 2020). The importance of these routes was carved into the sandstone walls of the Siq (Anderson 2020), which displayed caravans of camels and merchants (Figure 3c). Among the Classic Maya, a combination of least cost path analysis and social network analysis (SNA) found that more interconnected settlements had higher degrees of wealth inequality based on differences in house size than settlements with lower SNA centrality scores (Thompson et al. 2021). Similarly, an SNA of ceramic types in the US Southwest suggests the ability of individualist brokers to harness financial and, albeit limited, social capital (Peeples and Haas 2013). In the realm of *Catan*, I hypothesize that, in addition to having access to a variety of resources on highly valued tiles, players who traded more

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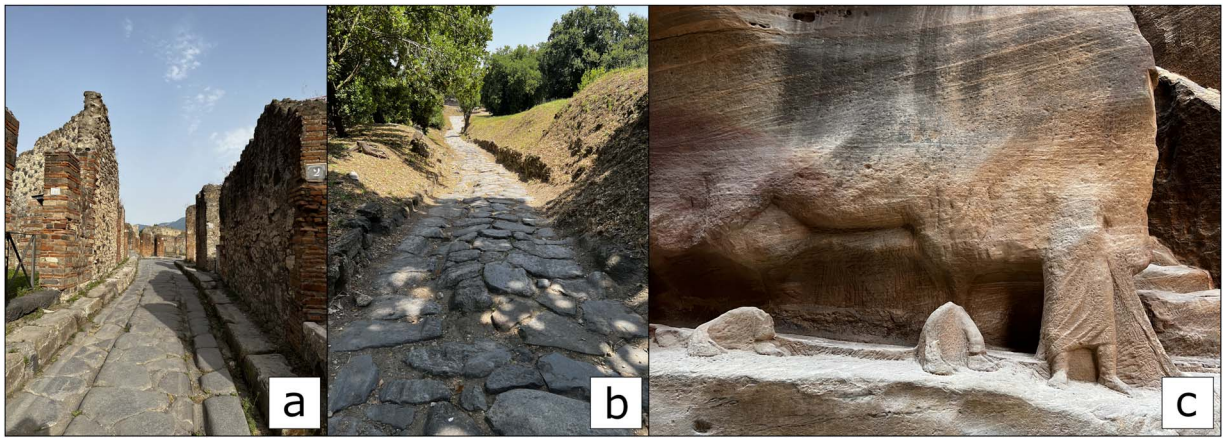

FIGURE 3. Ancient Roman roads at (a) Pompeii and (b) Cuma in modern Italy; (c) an eroded carving in the Siq of Petra (in modern Jordan) that shows the feet and bodies of a merchant and a camel caravan of the Incense Road (all photos by Amy E. Thompson).

frequently—earning higher successful trade scores—would have higher success rates or overall scores than players who declined trade offers. In the archaeological record, fiscal financing is one of the key mechanisms that leads to inequality (Blanton et al. 2020). In this case, inequality means winning the game or racking up more points than others.

INEQUALITY AND DIFFERENTIAL ACCESS TO RESOURCES IN *CATAN UNIVERSE*

Testing the Models

To test the impact of trade networks and fiscal financing in the world of *Catan*, I played the basic version of *Catan: The First Island* 40 times. To simulate a variety of environments and places around the globe, I selected the option of having random maps generated, meaning that the location of resource tiles and the values associated with each resource tile varied. However, I used the same three AI characters as opponents for every game—Lin, Jean, and Nassir, all of whom were set to "veteran" status. I also set it so that a random player would start each game, there would be no timer, and victory occurred at 10 points. When playing, I made logical moves that would benefit myself. At the end of each game, I recorded each player's statistics for five variables—successful trades, cities built, settlements built, roads built, and number of times robbed by other players—and the final scores.

Next, I ran linear regressions on the final game scores and each variable to test the relationship between each variable and the final score. This simple yet powerful statistic provides insights into the correlation between an independent and a dependent variable. I expected that the frequency of trading would correlate with the final score, meaning that frequent traders would often be the winners or top scorers.

Results

There is a slight positive correlation between the number of successful trades and final score, but contrary to my hypothesis, this relationship is weak ($R^2 = 0.08$; Figure 4). In other words, only 8% of the final score can be explained by successful trades, and this variable does not substantially influence the final score. (Removing the outlier score of 13 increases the R^2 value slightly to 0.09.) Perhaps unsurprisingly, the number of settlements and cities both had stronger positive relationships with the final score, with R^2 values of 0.39 and 0.45, respectively (Figure 5). This means that 39% of the final score can be explained by the number of settlements, and 45% of the final score can be explained by the number of cities. Of course, more cities often resulted in higher scores not only because each new city automatically adds one victory point but also because cities produce double the resources, playing into the idea that the "rich get richer" of wealth inequality.

CONCLUDING REMARKS: *CATAN* AND ANTHROPOLOGICAL ARCHAEOLOGY

Playing board games and video games provides entertainment but can also subconsciously engage in anthropological theory such as human behavioral ecology and the IFD and IDD models, which assess settlement strategies in areas of limited resources (Ploetz 2023; Snyder 2022). Similarly, the gradual growth of settlements into cities and the accumulation of resources echo themes of urbanism and inequality. In *Catan*, themes of IFD are evoked from the initial game setup and the gradual expansion of settlements, with players seeking to settle on highly valued resources. However, there are times while playing the game that one must construct roads through or settle on lower-quality land to gain access to other key resources located farther from the initial settlements. These processes are echoed in the archaeological record when we document settlements in unexpected and less-than-ideal locations.

In my assessment of *Catan*, the accumulation of wealth and inequality was not affected by fiscal financing or trade. As seen in the archaeological record and even today, vast trade networks provide goods and services to growing populations, often

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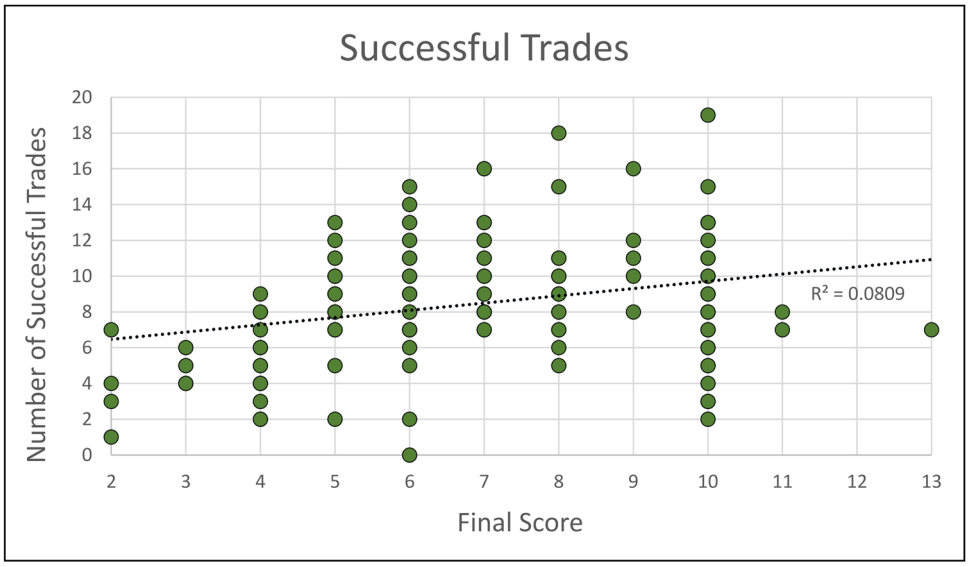

FIGURE 4. Scatterplot and linear regression of the number of trades compared to final scores in *Catan: The First Island*.

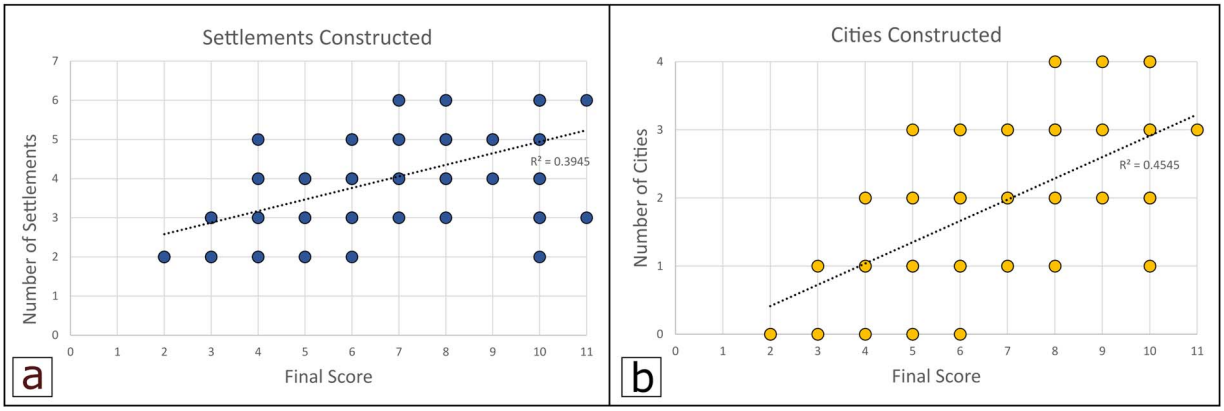

FIGURE 5. Scatterplot and linear regression of (a) the number of settlements and (b) the number of cities compared to final scores in *Catan: The First Island*.

resulting in the accumulation of wealth among merchants and brokers. However, in *Catan*, the number of trades did not result in greater wealth: the accumulation of wealth in the form of cities and settlements was more influential for the final score than trade alone. The examples from *Catan* highlight the complex and dynamic relationships among landscapes, resources, inequality, and settlement archaeology.

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Competing Interests

The author declares none.

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