The Matthew Effect as Skill and Strategy

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Abstract

Literature on Matthew effects and cumulative advantage typically conceives of the Matthew effect as a property of the field in which actors operate. This paper proposes a reinterpretation of the Matthew effect as a property of the individual—as a capability an actor may possess or as a strategy an actor may pursue. This paper discusses the consequences of a strategic interpretation of Matthew effects, including the factors required to incentivize actors to pursue them and the consequences of such pursuit. In addition, the paper highlights how strategic pursuit of cumulative advantage can generate paradoxical results, including the reduction of inequality in response to tournament-based competitive settings.

1 Introduction

Merton (1968) first wrote of the Matthew effect as the tendency for already-lauded scientists to gain ever more fame from their contributions, and to take credit from others for equal discoveries. The term has stuck, describing a variety of processes across a variety of settings in which the rich get richer—in which actors in some social hierarchy or members of some market can channel their past victories into further successes. In this way, the gap between the most and least successful participants of a setting tends to rise over time, making it increasingly difficult for newcomers or the unlucky to rise by their own merit. Such forces operate across a variety of settings, from Merton's own example of accumulation of credit and resources by famed scientists (1968; Azoulay, Stuart, and Wang 2014), to accumulation of network ties (Newman, Barabási, and Watts 2006), to market competition (Podolny 1993).

Research has treated the Matthew effect as a force of nature—a property of the setting actors operate in that applies equally to all. The Matthew effect appears to operate as a phenomenon that happens to actors, not as one which they can control. Yet the specific mechanisms of cumulative advantage—the accrual of status, attention, or resources—all rely on the application of skills and strategies that differ from actor to actor. People differ in charisma and capacity to win attention; they choose how much to network or how many resources to devote to a particular problem.

This paper examines the potential for heterogeneity and control of Matthew effects. Taking inspiration from recent work on the role of chance in market outcomes (Denrell and Liu 2012; Denrell and Liu 2021) and from the resource-based view of the firm (Wernerfelt 1984; Barney 1991), this paper proposes a model in which the actors in a setting can not only differ in their susceptibility to Matthew effects, but can also

choose their degree of susceptibility. That is to say, an actors are not simply subject to the Matthew effect, but differ in their ability to channel it or in their choices to do so. Following a 'Matthew' strategy, an actor will find it easy to capitalize on success but difficult to recover from failure. Conversely, following a 'Mark' strategy protects an actor from the worst outcomes while limiting their potential.

This paper argues that an individuated understanding of Matthew effects substantially changes the interpretation of actor behavior across a variety of contexts. More importantly, it complicates the identification of Matthew effects themselves, identifying situations in which mechanisms commonly understood to increase inequality produce an endogenous reaction that suppresses or even reverses the proposed effect.

This paper proceeds in several stages. First, it integrates the theory of Matthew effects with related concepts from work on organizational strategy. Next, it outlines a simple formal model for developing theory about Matthew effects, skills, and strategies. It discusses the results of this model in two parts, focusing first on individual outcomes and choices, and second on the aggregation of individual behaviors into collective patterns. It concludes on a discussion of the implications of this reframing of Matthew effects.

2 Theory

Matthew effects can be understood narrowly or broadly. In the narrowest conception, the Matthew effect refers specifically to the market for status in science (Merton 1968). There, successful researchers (e.g. Nobel laureates) attract more attention to their work than do lesser scientists. They attract a greater volume of resources, grants, and students, letting them pursue further work (Azoulay, Stuart, and Wang 2014). In

collaborations, they gain greater for credit for smaller contributions.

In the broad conception, the cumulative accretion of status by scientists resembles similar processes across various settings and markets. Podolny (1993) describes how status dynamics among investment banks lock them into different price and cost tiers. Lynn, Podolny, and Tao (2009) model status competition in general social networks. Network theory recognizes the role of preferential attachment processes in generating network size inequality (Barabasi and Albert 1999; Newman, Barabási, and Watts 2006). Similar processes take place among technologies and industries themselves (Arthur 1989; Carroll and Harrison 1994) when early successes enable continuing dominance despite technical inferiority. In general, the Matthew effect stands in for a family of processes of cumulative advantage (Bothner, Podolny, and Smith 2011) that enable actors to transform prior successes into a persistent competitive advantage.

These descriptions fall short in two ways. First, they assume a certain homogeneity of influence of Matthew effects on the actors in a particular setting. Though authors may allow for some heterogeneity in cumulative advantage, there has been no systematic examination of the consequences of such heterogeneity, or of the consequences of individual decisions to pursue such heterogeneity. In one notable exception, Denrell and Liu (2012) assume that heterogeneous susceptibility to cumulative advantage does exist; Denrell and Liu (2021) identify an empirical consequence of this. The second concern is that descriptions of Matthew effects treat them as a problem for the identification of true quality in empirical settings (Denrell and Liu 2012). For instance, scientists may differ in some measure of true skill that is obscured by the cumulative advantage of earlier winners (Merton 1968); true differences in song appeal may be concealed by early view counts that attract further listeners (Salganik and Watts 2008).

This article extends the construct of Matthew effects to the individual level and examines the consequences of this extension. At the most basic level, it considers the notion of a 'Matthew skill' as an individual capacity to manifest cumulative advantage. An individual endowed in a Matthew skill is able to turn earlier successes into subsequent victories more easily than someone who lacks it—conversely, their early failures will lead to greater harm as well. Beyond this, the article examines 'Matthew strategies' as individual actions that attempt to magnify the strength of cumulative advantage processes. Finally, Bothner, Podolny, and Smith (2011) describe a 'Mark effect' as the mirror of the Matthew effect—a mechanism that punishes early successes and rewards early failures in a way that narrows the gap between the most and least successful members of a setting. In the same way, this article considers the Mark skill and the Mark strategy as the talent (or choice) of bouncing back from initial failures—even at the cost of a weaker ability to exploit success.

2.1 Matthew Skills

Matthew skills are more than a theoretical possibility. Findings across settings suggest that individual actors differ in their susceptibility to supposedly common mechanisms. In social networks in particular, individuals appear to have strong internal predispositions to enter certain positions or adopt certain attitudes. Individuals' tendencies to become social brokers persists across domains (Burt 2012). Likewise, people differ in their reactions to networking behavior itself, as some people report repulsion to glad-handing that others find natural (Casciaro, Gino, and Kouchaki 2014). Such individual differences in sociability or charisma affect how people's initial popularity will attract additional social ties.

2.2 Matthew Strategies

Likewise, Matthew strategies appear across contexts in actions that draw attention to or attempt to exploit initial successes. Inasmuch as people differ in their underlying tendency to network, networking is an individual choice. A social climber talking themselves up at a conference helps draw attention to their successes and may enable subsequent relationships or collaborations—such attention may backfire if they publicly fail. Matthew strategies take a variety of forms. At the individual level, people can self-promote to peers or employers (Giacalone and Rosenfeld 1986; Exley and Kessler 2022). Scientists select between pursuing safe research in established fields or risky research in projects that may start new streams if they succeed but are likely to simply flop (Uzzi et al. 2013; Foster, Rzhetsky, and Evans 2015). NASCAR drivers can choose to drive more or less dangerously, balancing the increased risk of an accident against the possibility of a safer future starting position (Bothner, Kang, and Stuart 2007; Bothner, Kim, and Smith 2012).

Matthew strategies extend even to the organizational level. A growing company can choose to expand production slowly or quickly. Slow growth may make it harder to take advantage of unexpected demand, especially in the face of competition. Fast growth—a larger factory, an explosion in storefronts—can lead to a persist cost advantage through economies of scale, or it can doom the company if demand fails to live up to expectation. Matthew strategies represent a decision to overcommit to a particular course of action in the hopes that it will pay off. Technology firms may invest in a technology before its market need is clear (c.f. Christensen and Bower 1996; Barnett 2008). Movie studios must apportion investment between relatively reliable sequels and more risky development of new franchises (Eliashberg, Elberse, and Leenders 2006) or one-shot movies targeted at awards (Rossman and Schilke

2014).

2.3 A resource-based view of cumulative advantage

The decomposition of Matthew effects to individual traits and strategies resembles the resource-based view of organizational strategy. In the resource-based view, persistent competitive advantage stems from an organization's possession of inimitable resources that raise its value in the market (Wernerfelt 1984; Barney 1991). Beyond simply raising an organization's mean performance, high-order resources and dynamic capabilities can increase the autocorrelation of organizational performance (Teece, Pisano, and Shuen 1997; Wibbens 2019). In effect, such high order resources enable a successful organization to persist in initial successes; when such resources harm organizational performance, they can also trap it in a period of low performance.

Matthew skills represent an individual analog to organizational resources. Matthew strategies represent an investment into such resources. While individuals involved in status games can be subject to common mechanisms and forces that manifest as a global process of cumulative advantage, industries subject organizations to common forces. And insofar as organizations are able to invest in differentiating resources in a common game, individuals can take steps to attract or suppress the mechanisms that produce cumulative advantage.

2.4 Consequences of heterogeneity in cumulative advantage

In summary, this article disaggregates the construct of the Matthew effect by examining individual propensities to cumulative advantage ('Matthew skill') and individual choices to shift this propensity ('Matthew strategy'). This article explores the consequences of this disaggregation at three levels:

First, this article examines the consequence of individual heterogeneity in Matthew skill on the heterogeneity of market outcomes.

Second, this article examines the individual decision to pursue a Matthew strategy, and the conditions that push an organization to pursue greater or lesser susceptibility to cumulative advantage.

Third, this article explores whether the individual pursuit of Matthew strategies naturally aggregates into a market-level Matthew effect, and the conditions under which the mechanisms thought to produce cumulative advantage lead to counterintuitive reductions in market inequality.

3 Model

This article builds theory through a simple model of cumulative advantage. Each actor i (an individual or organization) exists across multiple periods, t from $1, \dots T$. In each period, the organization flips a coin with some probability P_{it}, receiving either a favorable outcome ($R_{it} = 1$) or an unfavorable outcome ($R_{it} = 0$). The actor's lifetime outcome is the sum of their outcomes across all periods, R_i, and the actor values greater lifetime outcomes. Two factors contribute to an actor's probability of success in each period: (1) each actor has an underlying 'capability' or 'quality' represented by a baseline probability of success p_i; (2) each actor has an individual susceptibility to cumulative advantage represented by the 'dependence' on past success, w_i. This dependence term is measured against the actor's cumulative successes to date, $x_{it} = \sum_i^t R_{it}$.

Specifically, the probability P_{it} is given by

$$P_{it} = (1 - w_i)p_i + w_i \frac{x_{it}}{t-1}$$

When $w_i = 0$, this collapses into the probability defining the binomial distribution. As w_i approaches 1, the probability of success in any period approaches the actor's prior success rate $x_{it}/(t-1)$, representing cumulative advantage. Conversely, $w_i < 0$ causes future success to become anticorrelated with prior success, representing non-cumulating advantage, or a Mark effect. Drezner and Farnum (1993) analyze the properties of this model and the sum R_i as a generalized binomial distribution.[1]

A notable characteristic of this model is that the expected outcome $E(R_i) = p_i T$ is independent of w_i—that is to say, the expected outcome is independent of the degree of an actor's cumulative advantage. Instead, dependence only serves to increase the variance of lifetime outcomes (see Fig. 1). Two actors that differ only in their degree of dependence—in their degree of susceptibility to cumulative advantage—can expect to have the same average lifetime outcome. The actor with greater dependence, however, will be much less certain whether they will receive a very good or a very bad draw, with the outcome determined by the success or failure of its initial efforts. The actor with low dependence will be able to experience much greater lifetime reliability (c.f. Hannan and Freeman 1984).

[1]Denrell and Liu (2012) analyze a similar model in which the dependence term only reflects the influence of the previous result: $P_{it} = (1 - w_i)p_i + w_i R_{it}$. This model is more difficult to derive analytical results for, which complicates the analysis of this present article.

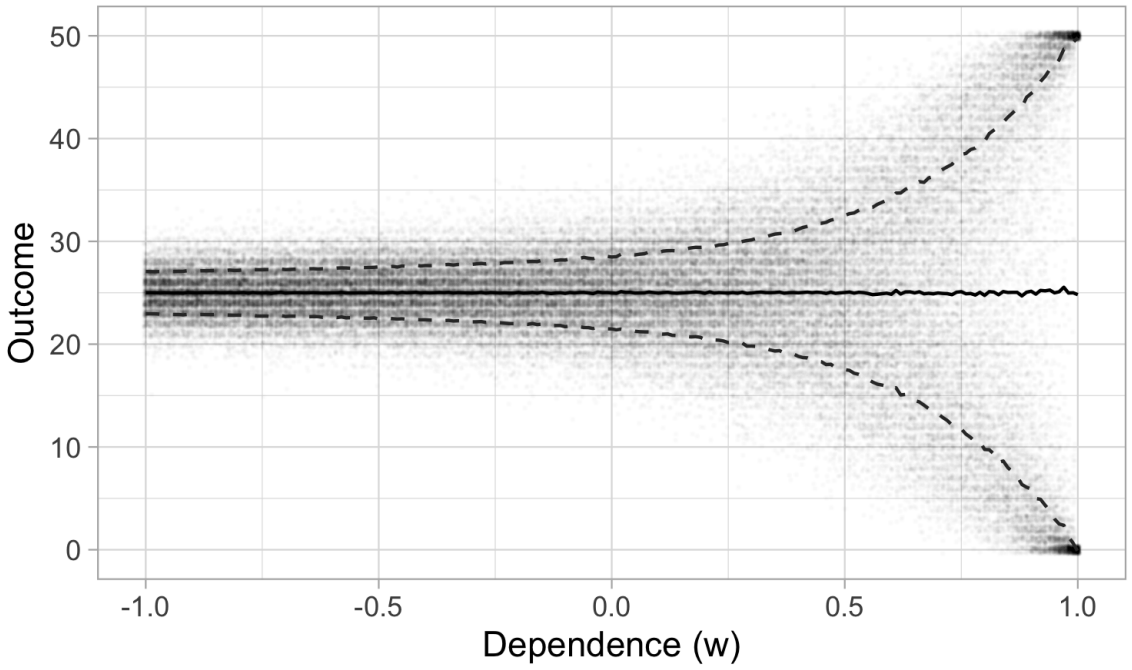


Figure 1: Mean (solid) and standard deviation (dashed) of lifetime outcomes across a range of dependence w_i, with $p_i = 0.5$, and $T = 50$.

4 Analysis: Individual Skills and Strategies

4.1 Matthew Skill

Literature on Matthew effects typically treats Matthew effects as a mechanism that obscures differences in true quality among the participants of a setting (Denrell and Liu 2012; Salganik and Watts 2008; Lynn, Podolny, and Tao 2009). Through the role in affecting the variance of organizational returns, though, cumulative advantage mechanisms can play a key role in organizational strategy, especially in competitive contexts.

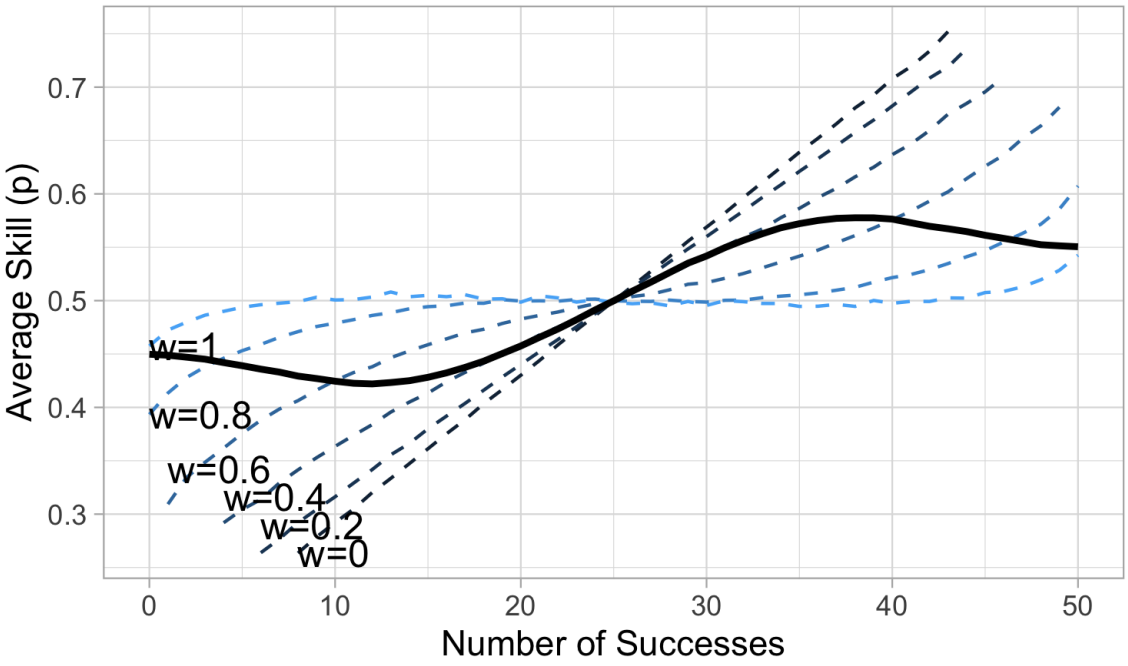
Denrell and Liu (2012) conduct a simple analysis to identify the effect of heterogeneous cumulative advantage on the predictability of organizational. They show that when dependence w_i is distributed uniformly and true skill p_i is distributed according

to a $Beta(10, 10)$ distribution, then the skill-outcome relationship experiences an inversion, with average skill for the most successful actors falling below those slightly less successful. Fig. 2a replicates this relationship while disaggregating it by levels of dependence.

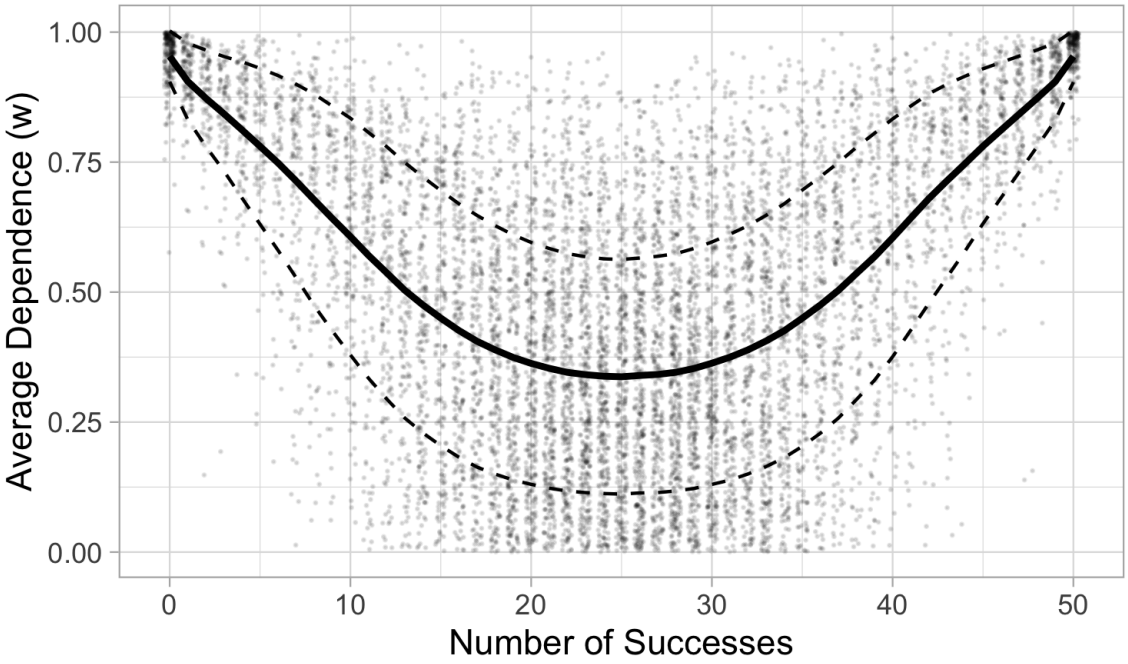
Fig. 2a shows that this quality-outcome inversion does not occur within industries with a homogeneous Matthew effect (i.e. in which w_i for all actors falls within a relatively narrow band). Outcomes predict true skill well at all levels of dependence, with the highest degree of predictability at low levels of dependence (Fig. 2a, dashed line with $w = 0$), and the lowest degree at high dependence (dashed line with $w = 1$). The inversion only occurs within markets that aggregate a broad range of w_i—Denrell and Liu (2021) demonstrate that the effect depends on settings in which the distribution of dependence w_i is heavy-tailed relative to the distribution of skill p_i. The dashed lines also indicate that actors with low levels of dependence struggle to reach extreme outcomes, with their results concentrated in the middle of the outcome distribution.

Fig. 2b presents an alternate view of such markets, showing the predictability of cumulative advantage as a function of outcomes. Here cumulative advantage itself is predictable: market participants with the best and worst outcomes have the highest degree of dependence, while the lowest degree of cumulative advantage occurs at average outcomes.

These results suggest that the analysis of markets would be better informed by examining the mechanisms that allow for heterogeneity in cumulative advantage rather than by examining the mechanisms of cumulative advantage per se. They suggest that Matthew effects do not themselves substantially obscure underlying skill differences, though they do magnify differences among actors of differing skill. Moreover, within



(a) Average skill as a function of success. Solid line indicates average effect, and dashed lines disaggregate by binned w.



(b) Average dependence as a function of success. Solid line indicates average effect and dashed lines indicated one standard deviation interval.

Figure 2: Skill and dependence as a function of success (c.f. Denrell and Liu 2012)

markets that aggregate actors of differing levels of dependence, it is clear that the level of dependence—the degree of susceptibility to cumulative advantage—serves as a major point of differentiation in the competitive outcomes of actors. That is to say, the degree of dependence serves as an individual or organizational resources that can (combined with initial success) serve to produce a durable competitive advantage.

4.2 Matthew Strategies

As described above, cumulative advantage by itself does not affect an actor's expected outcomes. Expected outcomes depend only on quality p_i, with w_i acting only to increase the variance of outcomes. From a strategic perspective, a risk-neutral actor would be indifferent among different levels of cumulative advantage (Pratt 1964). As such, actors require some degree of risk aversion to express choice—moreover, risk averse actors would always avoid the variance imposed by high degrees of dependence, leading to settings dominated by actors pursuing low degrees of cumulative advantage.

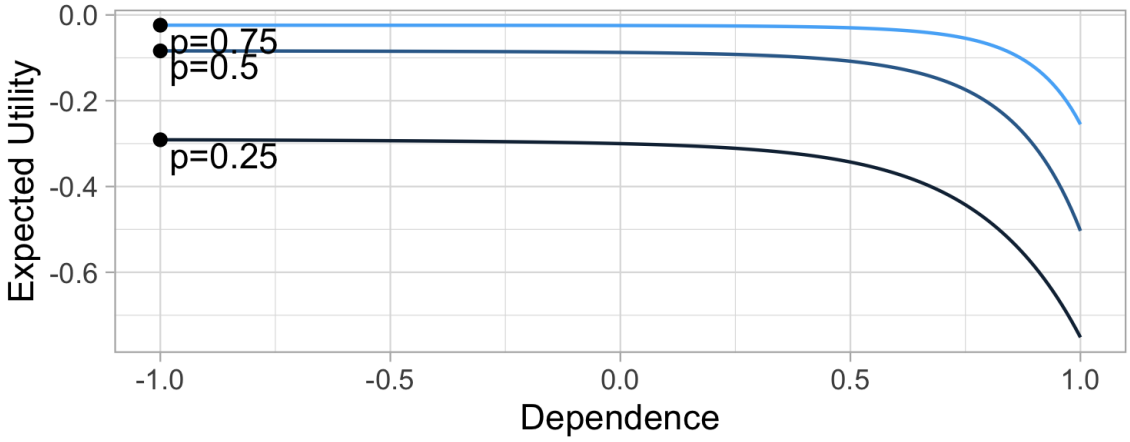
To incentivize a risk averse actor to pursue cumulative advantage, the actor's decision to pursue cumulative advantage must confer some ancillary benefit. There are two ways plausible ways to conceive of such benefits. First, nonlinear returns or threshold-based processes may encourage actors at particular market positions to pursue greater variance through cumulative advantage processes. Such thresholds may arise from performance aspirations (Kahneman and Tversky 1979; March and Shapira 1992; Greve 1998), as actors that fail to meet some internalized aspiration level choose to overcommit to some strategic gamble. Such threshold effects may likewise appear when actors are threatened in their categorical membership (Vashevko 2019). Not coincidentally, threshold-based tournaments are a commonly understood mechanism of cumulative advantage, though research has focused on the consequences of such tournaments,

rather than on their role in promoting the pursuit of cumulative advantage (Bothner, Podolny, and Smith 2011; Bothner, Kim, and Smith 2012; Azoulay, Stuart, and Wang 2014).

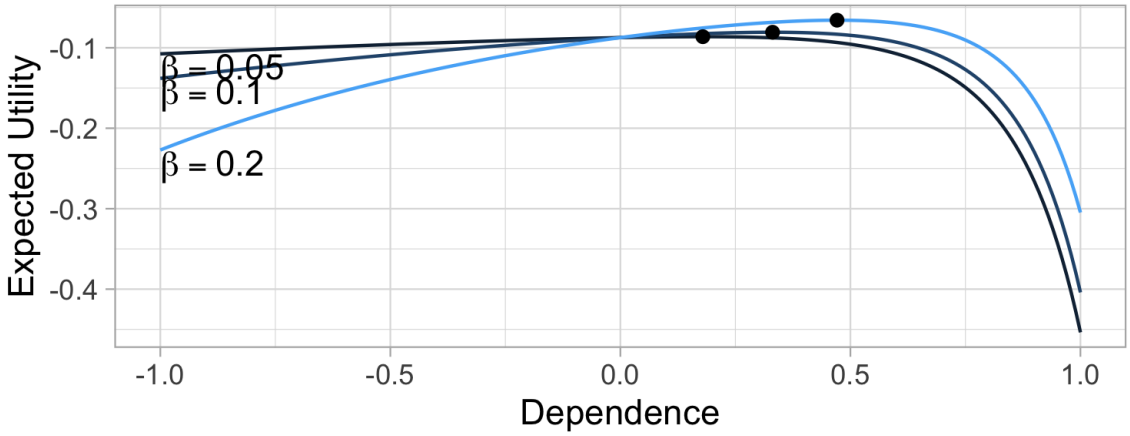
The second way that cumulative advantage can incentivize actors is as a component of a technology that simultaneously increases the actor's underlying quality and their susceptibility to cumulative advantage. In an organizational setting, the construction of a capital-intensive factory imposes this form of decision-making constraint—production at scale simultaneously reduces the organization's production cost and increases fixed costs that may threaten its survival if demand fails to materialize. In effect, Matthew strategies impose a form of strategic brittleness—by becoming more capable, an actor must also face the increased possibility of catastrophic failure.

This paper considers both approaches. Actors make strategic decisions according to a utility function over lifetime outcomes, $u(R_i)$. In particular, the simulations that follow assume the exponential utility function, $u_i(x) = \exp(-a_i x)$, with a_i regulating the degree of risk aversion. The technology of cumulative advantage is modeled as a common linear relationship between quality, p_i, and dependence w_i: $p_i = \frac{1}{2} + \alpha_i + \beta_i w_i$. In effect, actors may differ in their baseline quality, α_i, and they choose some level of dependence w_i that translates into a final quality of product or social appeal.

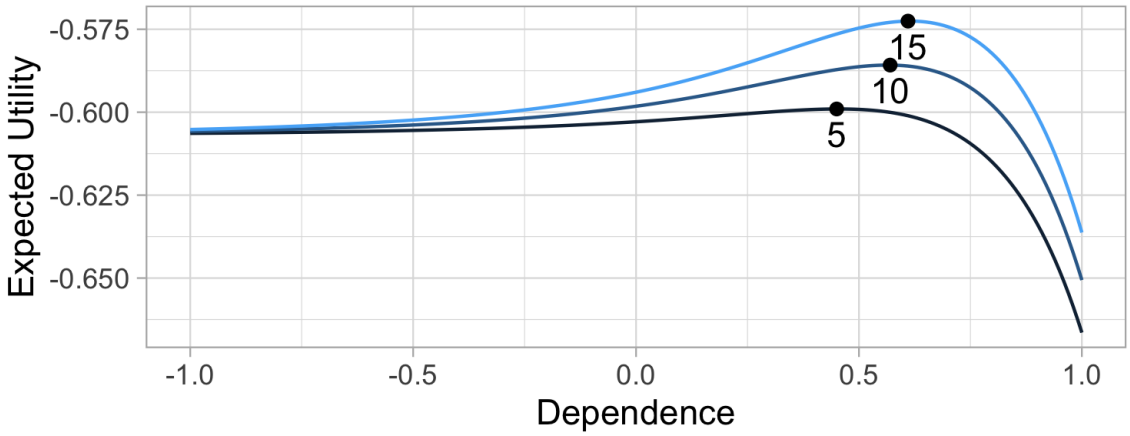
Fig. 3 presents the mechanisms that drive actors to adopt Matthew strategies. Fig. 3a shows that in the absence of incentives, risk-averse actors optimize by minimizing their exposure to cumulative advantage, selecting the minimal degree of dependence available to them. Fig. 3b shows that in the presence of a technological or contextual coupling between Matthew effects and quality, actors select greater degrees of dependence—moreover, this effect is stronger at greater levels of coupling (i.e. as β increases). In



(a) Optimal strategy as a function of baseline skill



(b) Optimal strategy as a function of linear technology, $p_i = \frac{1}{2} + \beta w_i$



(c) Optimal strategy in response to threshold effects, with threshold at $R_i = 30$

Figure 3: Drivers of Matthew strategy. 50 period lifetimes, with dots indicating optimal strategy.

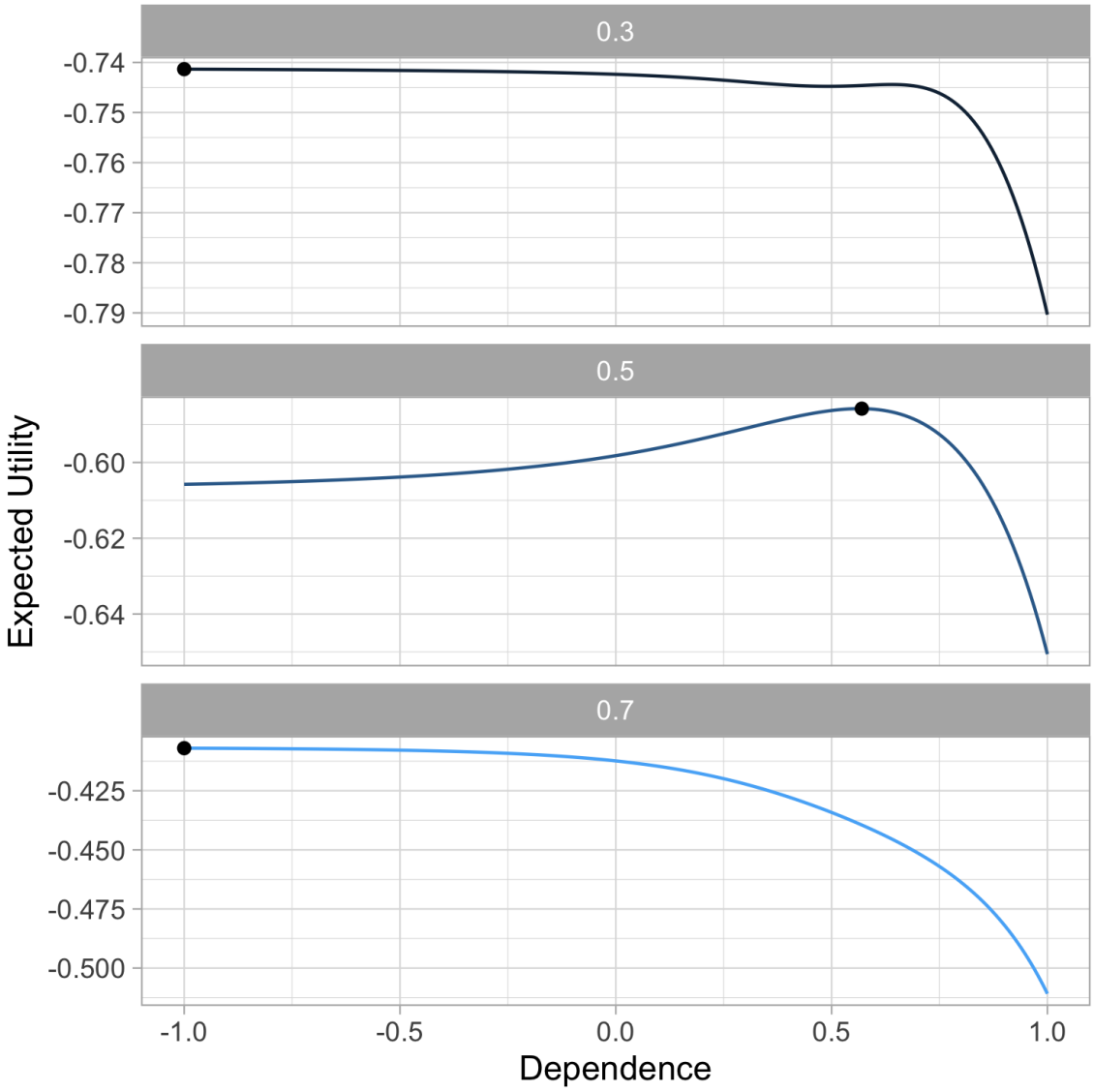


Figure 4: Optimal strategy in response to threshold effects by actors of differing quality, with threshold at $R_i = 30$

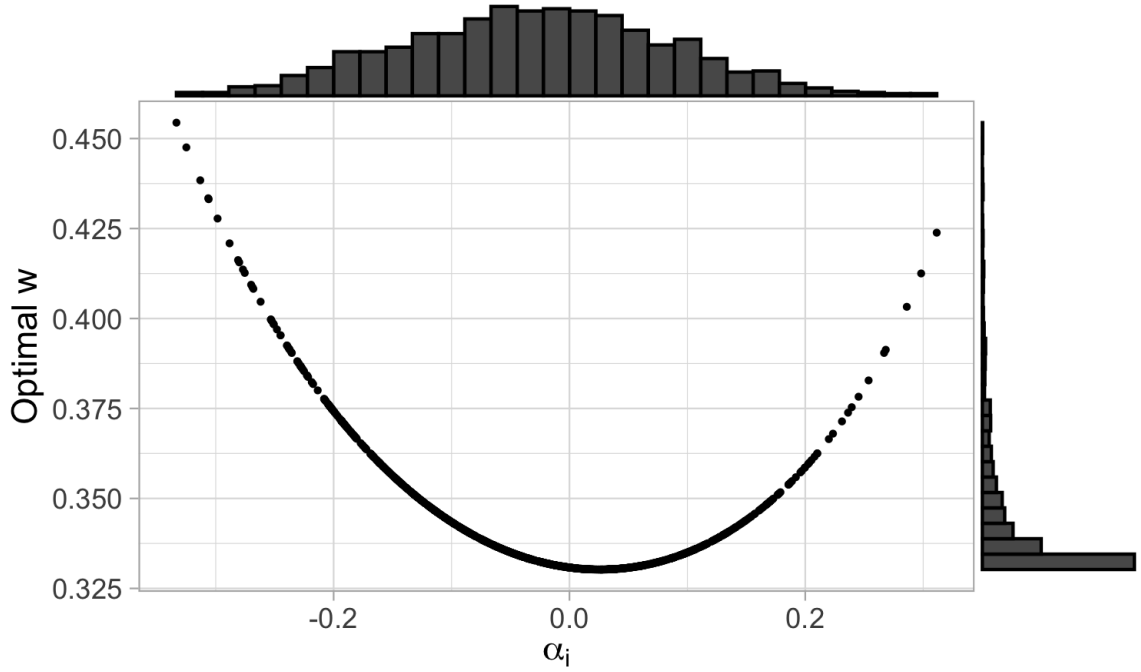
effect, the greater of quality provided enables actors to tolerate a greater degree of risk imposed by cumulative advantage effects. On an organizational level, such situations may occur when production at scale allows for cheaper production at the risk of greater fixed costs. At an individual level, greater attention can channel productive resources to specific actors (Zajonc 1968; Merton 1968) net of their underlying quality, allowing them both to magnify their successes and their failures (Klein et al. 2014).

Fig. 3c shows that tournament rewards present the second mechanism for incentivizing pursuit of cumulative advantage. Here, actors with a true quality of $p_i = 0.5$ participate in a 50-period competition ($E(R_i) = 25$) that awards a variably sized bonus to actors with a lifetime outcome of 30 or greater. As the figure shows, this mechanism encourages actors to pursue Matthew strategies, with the incentive increasing in the size of the bonus. Fig. 4 extends this finding further, showing that within a particular competitive scheme (bonus of 10 with threshold at $R_i = 30$), actors of differing quality will differentially pursue Matthew strategies: actors whose underlying quality makes them extremely likely or unlikely to meet the threshold ($p_i = 0.3, 0.7$) pursue Mark strategies, while only those actors for whom cumulative advantage might make a strategic difference ($p_i = 0.5$) choose to pursue a Matthew strategy. Insofar as the literature on Matthew effects has assumed that tournament-like structures provide a homogeneous effect on inequality of outcomes within a population (c.f. Bothner, Podolny, and Smith 2011), these findings suggest that strategic responses to tournament mechanisms may act to magnify or suppress the direct effects of the tournament mechanism itself.

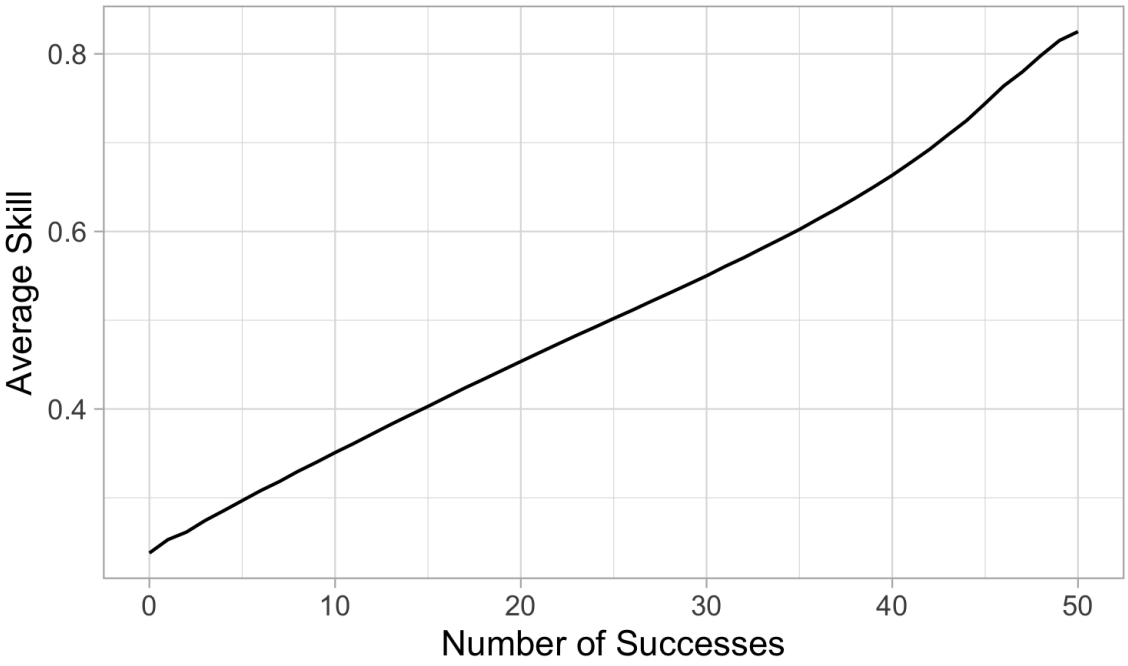
4.3 Outcome-quality inversion under strategic action

Denrell and Liu (2012) and Sec. 4.1 identify the possibility of quality-outcome inversion effects, in which Matthew effects can obscure the relationship between actor skill and outcomes at the extremes of the outcome distribution. This paper examines whether the pursuit of Matthew strategies allows for these quality-outcome inversion effects to emerge. As described above, this inversion depends on the relative heterogeneity of quality and dependence traits within a population—inversions emerge when susceptibility to cumulative advantage is more broadly distributed than true skill. For a particular production technology $p_i = \frac{1}{2} + \alpha_i + \beta w_i$, and a particular level of underlying quality $alpha_i$, actors would choose identical degrees of performance. That is, in a particular setting, two actors of identical quality would pursue identical Matthew strategies. As such, heterogeneity in dependence must be driven by heterogeneity in actors' other traits.

When actors have strategic control over cumulative advantage, such inversions appear to be rare. In a setting featuring a linear production technology with $\beta = 0.1$ and $alpha_i$ distributed according to mean-shifted $Beta(10, 10)$ distribution, actors select their optimal w_i to maximize lifetime outcomes. As Fig. 5a shows that actors select a narrower range of w_i (SD = 0.018) than the range of their underlying quality $alpha_i$ (SD = 0.11). As a consequence, actors never pursue Matthew strategies extreme enough to manifest the sort of inversion that allows the second-tier actors to outperform the best (Fig. 5b). This absence persists across a range of



(a) Optimal w with quality heterogeneity



(b) Outcome-quality relationship

Figure 5: Outcome-quality relationships under strategic selection of cumulative advantage

5 Analysis: Aggregate Matthew Effects

Finally, this paper examines whether the individual pursuit of Matthew strategies naturally generates the appearance of Matthew effects at the level of the setting. Insofar as research on Matthew effects has assumed that they operate homogeneously across the participants of a setting, heterogeneous distribution of Matthew skills, or heterogeneous pursuit of Matthew strategies, may aggregate into a market-level pattern that obscures the existence of a Matthew effect.

This section examines a particular framework. Matthew effects are commonly understood to result from tournament structures that maximize inequality among participants (Merton 1968; Azoulay, Stuart, and Wang 2014; Bothner, Podolny, and Smith 2011). That is to say, market structures that reward the highest outcomes in a particular setting are typically understood as a mechanism that magnifies the gap between high and lower quality actors. As the analyses of the previous section suggest, though, actors that are capable of strategically selecting their exposure to cumulative advantage tend to respond to the variance-maximizing effects of cumulative advantage.

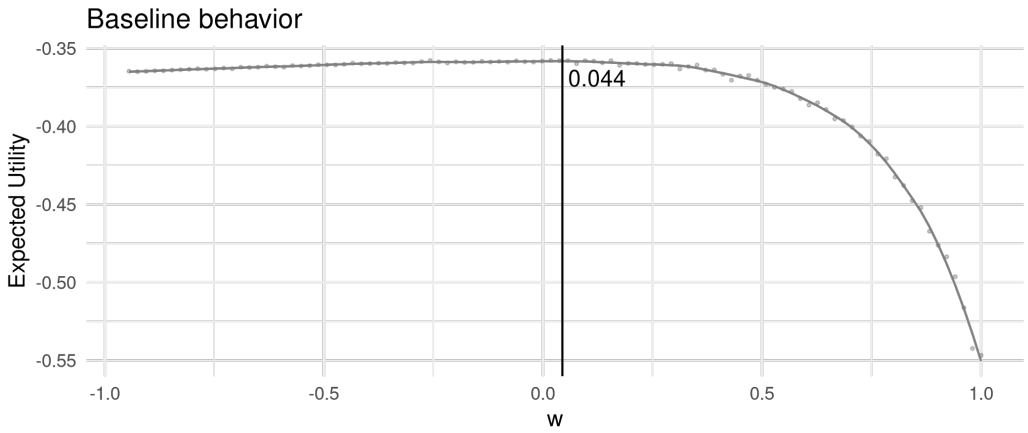
This section examines how actors respond to such a tournament in practice. Markets comprised of 10 actors each participate in one of two forms of multi-period tournament. Under the Matthew effect tournament, a bonus is redistributed each period from the lowest performing actor (split in the case of ties) to the highest performing actor in each market. Under the Mark tournament, the bonus is instead redistributed down from the highest to the lowest performing actor. As such, the Matthew effect tournament emulates the typical structure of tournaments in the world, as well as mimicking the structure typically understood to cause Matthew effects. The Mark tournament instead serves as a structure that protects low-performing actors at the expense of the

highest performers. For comparison, the results of both tournaments are compared to a baseline condition without redistribution—in this situation, actors' behavior is independent of others, and resembles the behavior of isolated actors described above.

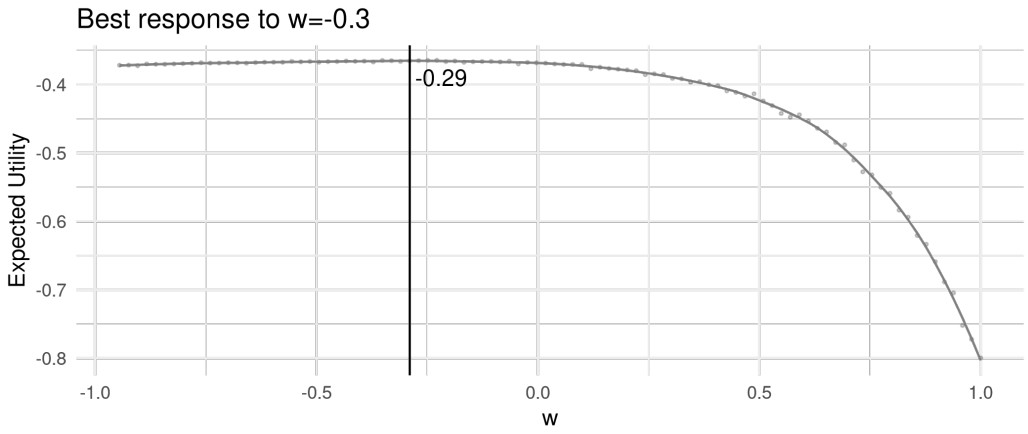
Actors strategically operate in these tournaments by attempting to identify a Nash equilibrium strategy through best responses. This paper identifies this equilibrium by iterating over best responses in a simulation framework. While holding the strategy of the other 9 actors fixed at some common level of $\hat{w}_i$, actors attempt to identify their best response level w_i. The paper simulates possible outcomes across a range of w_i; it then creates a smoothed response function across these possible outcomes using a LOESS model with generalized cross-validation; finally, it identifies the best response by optimizing over this smoothed response function. It identifies a Nash equilibrium in pure strategies by locating a best response that matches the behavior of the other actors.

Finally, the appearance of an aggregate Matthew effect is evaluated by comparing inequality in outcomes in each period after redistribution using the Gini coefficient (c.f. Nielsen and Andersen 2021). Insofar as the Matthew effect is understood as a phenomenon of increasing inequality, such inequality increases should manifest in response to the redistributive tournaments.

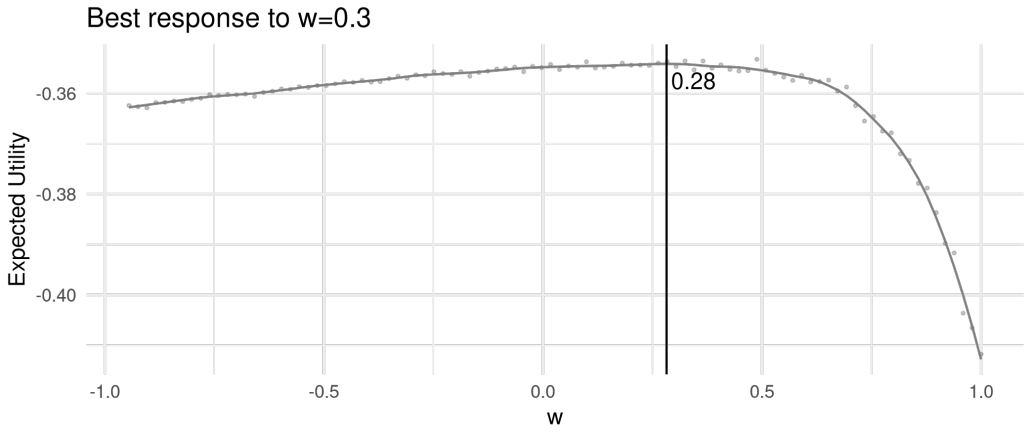
Fig. 6 identifies Nash equilibrium behavior in each of the redistribution conditions. Fig. 6a shows a moderate pursuit of cumulative advantage in the absence of competitive redistributive concerns. Fig. 6b shows that in a tournament that redistributes resources upward (i.e. the classical mechanism for a Matthew effect), actors react by reducing their pursuit of cumulative advantage (optimal w_i lower than baseline). Conversely, in a tournament that redistributes resources down, actors react by increasing their



(a) Optimal behavior without redistribution



(b) Best response to upward redistribution



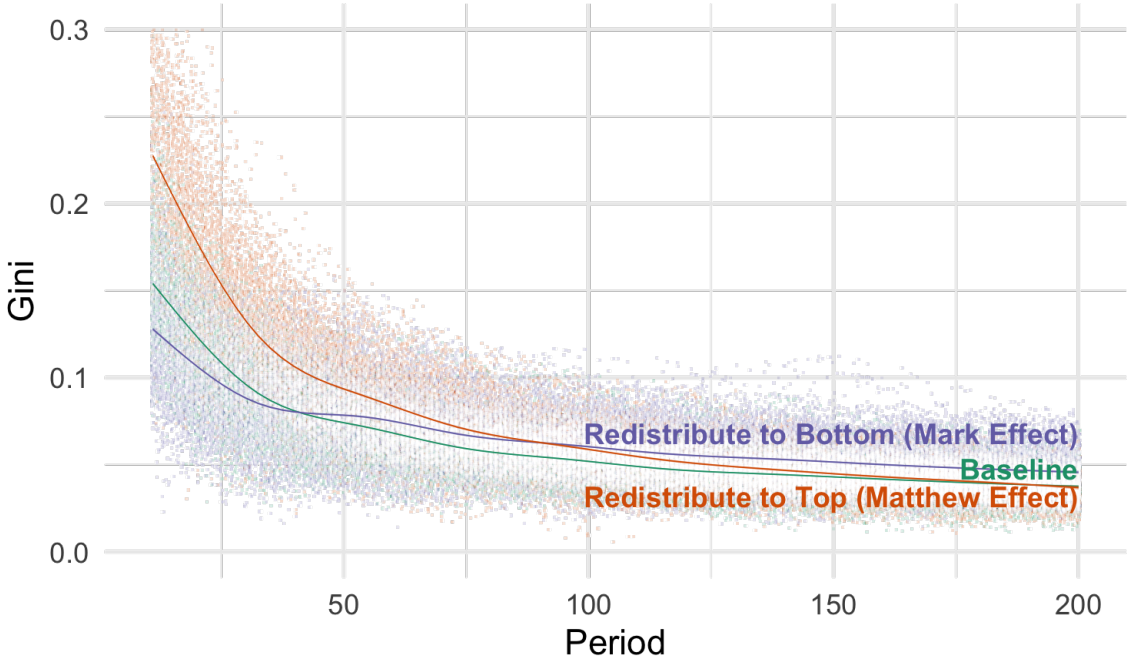
(c) Best response to downward redistribution

Figure 6: Best responses to redistributive tournaments.

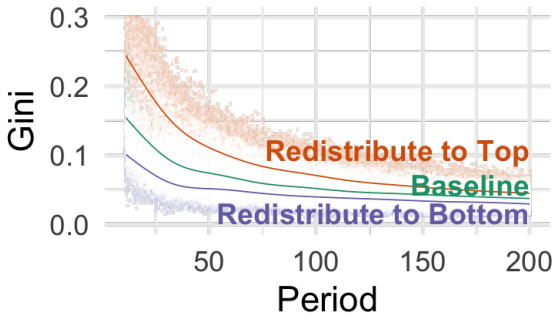
pursuit of cumulative advantage (optimal w_i greater than baseline, Fig. 6c). In effect, redistributive tournaments act to magnify the variance effects of cumulative advantage itself: by increasing rewards to the most successful actors and reducing rewards to the least successful, upward redistribution increases the effective utility gap between lucky and unlucky outcomes for risk averse actors. As such, risk averse actors react by reducing the risk where they are able to—here, they do so by reducing their susceptibility to cumulative advantage. Conversely, tournaments that redistribute resources up reduce the variance of actors' outcomes and enable them to take on greater risk than they otherwise would.

Fig. 7 shows how these combined effects translate into aggregate measures of inequality, and decomposes this effect into the combined contributions of the resource transfer itself, as well as of the strategic response by actors. As expected, in the absence of a strategic response, upward redistribution of resources increases inequality, and downward redistribution reduces it (Fig. 7b). Actors' strategic response, however, causes this effect to reverse, so that (excluding the direct resource transfer itself), inequality increases in response to downward redistributions and falls in response to upward redistributions (Fig. 7c). The composition of these two effects—of resource transfer in the presence of strategic response ultimately swamps the intended effect of redistribution (Fig. 7a): upward redistribution meant to generate a Matthew effect instead leads to the lowest level of inequality, while downward redistribution meant to generate a Mark effect generates the highest level of inequality.

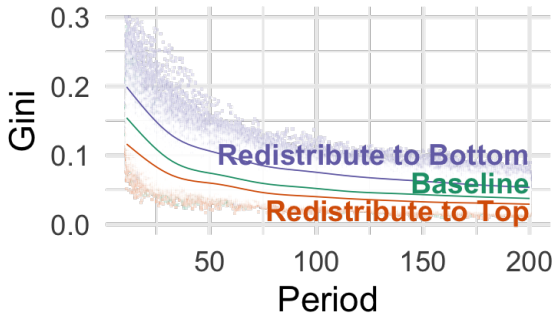
In summary, the mechanisms typically understood to generate Matthew and Mark effects are supposed to do so through their direct effect on the resources available to actors. Yet insofar as actors are able to strategically respond to such mechanisms by manipulating their degree of exposure to cumulative advantage mechanisms, these



(a) Evolution of inequality (Gini) under various redistribution regimes



(b) Effect of redistribution without strategic response



(c) Effect of strategic response without direct redistribution

Figure 7: Evolution and decomposition of inequality effects

strategic responses are able to overwhelm those mechanisms' intended effects. As such, this paper shows that the direct imputation of Matthew or Mark effects from the apparent outcomes or mechanisms at play in a particular competitive setting is highly problematic: individual behaviors do not naturally aggregate to market phenomena.

6 Discussion and Conclusions

This paper contends that the traditional understanding of the Matthew effect as a common property of markets is unduly limited. Cumulative advantage processes fundamentally operate on individual actors and individual actors can choose to maximize or minimize their susceptibility to such effects. Actors can differ in their susceptibility, and they can court cumulative advantage to differing degrees. They can pursue Matthew strategies that maximize outcomes at the cost of brittleness, or they can pursue high reliability through Mark strategies that minimize the downstream costs of temporary setbacks. Most importantly, such strategic pursuits can lead to counterintuitive outcomes: mechanisms intended to reward the highest performers can spur strategic reactions that reduce inequality within a setting.

This paper offers two fundamental contributions to the literature on Matthew effects. First, it centers focus on Matthew effects and cumulative advantage dynamics not as deterministic processes, but as fundamentally chance-based mechanisms that interact with actors' risk preferences (Denrell, Fang, and Liu 2015). Matthew effects do not primarily operate by increasing the gap between the successful and those less so, but by magnifying the outcomes of chance events. In being able to foresee the expected course of such chance processes, actors are able to manipulate the outcomes they are likely to experience.

Second, this paper shifts focus from Matthew effects as a mechanism of opacity in markets to one that is a central locus of strategy and competitive differentiation. Matthew effects do not simply obscure the relationship between true quality and observed outcomes. Instead they control the extent to which actions reverberate through time: actors willing to experience durable consequences prefer situations that maximize cumulative advantage, while those who prefer to buffer against periods of ill luck prefer to minimize it. Fundamentally, though, the degree of susceptibility to cumulative advantage—the degree of Matthew skill—is a key resource differentiating actors from one another and merits further study as an object of strategic control.

Recognition that Matthew effects can exist at the level of individual skills and strategies deepens the understanding of cumulative advantage processes in markets. Markets may create circumstances that channel resources and rewards to the most successful, but it is up to individual actors to exploit these circumstances. The individual pursuit of cumulative advantage, the Matthew strategy, offers a chance for individuals to race ahead of their more reliable peers.

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