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Power to the people: The benefits and limits of employee self-selection in organizations

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Abstract

Research Summary: One of the key features of boss-less organizations is self-selection, where each employee is allowed to both initiate and join projects freely. While this approach has been gaining in popularity within many big and small organizations, we have a limited understanding of its properties, limitations, and key mechanisms. In this article, we analyze the efficacy and boundary conditions of employee self-selection with respect to project selection and employee allocation. Our results suggest that the relative balance between an organization's human capital and the number of opportunities it faces plays a critical role in determining the advantages of self-selection, which performs better when human capital is scarce relative to opportunities. We also examine common policies that organizations use to further improve the efficacy of self-selection.

Managerial Summary: Self-selection or allowing employees to either launch their own or join existing projects freely, has been recently gaining in popularity. Companies across different industries have found this

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approach advantageous and have been pursuing it either across the entire organization, in selected units, or part time. In this article, we formally analyze the advantages and disadvantages of self-selection and its different variants. We show that self-selection is best pursued in organizations where the magnitude of opportunities outstrips available human resources. However, in environments where opportunities worth pursuing are in short supply relative to available employees, hierarchical arrangements tend to fare much better. We put forth a set of conditions that can help managers decide when self-selection would be appropriate and when it may hurt performance.

KEYWORDS

agent-based modeling, boss-less, organization design, resource allocation, self-selection

1 | INTRODUCTION

A large body of management research focuses on the ways that organization design influences firms' behavior and performance (Chandler, 1962; Ethiraj & Levinthal, 2004; Mintzberg, 1979; Puranam, 2018). This literature has explored the tradeoffs between the strict control of centralized hierarchies and the empowering freedom of autonomous forms of organization. One of the key goals of this literature has been to identify the conditions that make a specific form more suitable than its alternatives (Burns & Stalker, 1961; Miles & Snow, 2003; Mintzberg, 1979). Despite the quantity of scholarly attention directed toward questions of organization design, scholars and practitioners alike have been especially intrigued by forms that eschew hierarchy altogether, delegating authority to the employees themselves (e.g., Mintzberg, 1979; Hamel, 2011; Billinger & Workiewicz, 2019). One such form, which has increasingly become prominent and has captured the attention of the organization design community, is a "boss-less" organization where *identification and evaluation of promising opportunities* and *allocation of employees to those tasks* are left to the employees themselves (Foss & Dobrajska, 2015; Puranam, Alexy, & Reitzig, 2014; Puranam & Håkonsson, 2015). Boss-less organizations are a canonical example of *self-selection*, where employees initiate tasks and allocate responsibility to themselves without the direct interference of a manager (Lee & Edmondson, 2017).

While the interest in self-selection is a relatively recent phenomenon, it has been adopted in organizations of various types for decades. For instance, it has been found in organizations ranging from high-performing academic or research-oriented entities, like the RAND Corporation, or Princeton's Institute for Advanced Study in the immediate post-war period (Augier, March, & Marshall, 2015), to high-tech startups, and even among more traditional manufacturing firms (Hamel, 2011). The literature has suggested many advantages of empowering employees to make selection and allocation decisions, like an increased sense of control, higher job satisfaction and motivation, decreased dysfunctional politics, more expertise, higher quality of decisions, greater organizational commitment and loyalty, and higher individual and team performance (Hamel, 2011; Lee & Edmondson, 2017). Firms like Valve Software or W. L. Gore and Associates use self-selection exclusively (Hamel, 2011; Puranam, 2018; Puranam & Håkonsson, 2015), and many credit self-selection as the key driver of their performance (Hamel, 2011). Furthermore, self-selection is often adopted within traditional hierarchies. Some firms allow their employees to identify and join promising projects freely in some specific areas or part of the time, like Google's 20%-time rule, 3M's 15%-time rule (Levinthal, 2017), or Netflix with its high degree of employee autonomy in specific areas (Gulati, 2018).

Despite the widespread prevalence of self-selection, academic research on it has been scarce, and its key mechanisms and boundary conditions remain poorly understood (Lee & Edmondson, 2017). Furthermore, in many cases, despite initial enthusiasm for the practice, anecdotal accounts suggest limits to its efficacy as firms grow and gain scale (Augier et al., 2015; Burton et al., 2017; Foss, 2003; Puranam & Håkonsson, 2015). As some firms added more employees, they chose either to switch to a hierarchical structure or downscaled their employees (Augier et al., 2015; Burton et al., 2017; Foss, 2003).

This leaves several questions worthy of further exploration. Why and under what conditions does self-selection perform better than hierarchical allocation? What are the mechanisms that give self-selection its edge and what are its boundary conditions? Why do organizations that use and vigorously promote self-selection, like GitHub or Oticon, subsequently abandon it? Why is self-selection seemingly so difficult to scale and how can organization designers address some of the shortcomings of self-selection through directed interventions?

In this article, we focus on the core mechanisms of self-selection to examine possible answers to these questions. While a large body of literature has addressed how adding employees in certain structural positions can impact screening efficacy and thus project selection (e.g., Csaszar, 2013; Knudsen & Levinthal, 2007), there has been little formal research on the role of organizational structure in shaping the process of employee allocation to projects (Sengul, Almeida-Costa, & Gimeno, 2018), a gap recognized specifically by researchers (Csaszar, 2013; Gertner & Scharfstein, 2013). Using a computational model, we examined the efficacy of opportunity evaluation and employee allocation, identifying conditions under which these processes are better carried out by a central planner or delegated to employees. We then explored the mechanisms and boundary conditions of self-selection and compared its efficacy to that of centralized allocation. Finally, we examined different policy interventions firms may undertake to improve the functioning of self-selection and centralized allocation.

Our analysis provides three main insights. First, some scholars claim that companies like Google or Valve provide autonomy to their employees because they possess excess resources (slack) and can thus afford to sacrifice some efficiency to keep their employees happy (Burton et al., 2017). Our analysis, however, suggests that in the presence of imperfect evaluation of new opportunities, companies with abundant human resources may benefit by allocating tasks centrally rather than leaving it to the employees. In the absence of coordination, employees of human-resource-rich companies who self-allocate based on their individual evaluations of project attractiveness compound their estimation errors, even if they can observe others' actions. These produce a "winner's curse," wherein too few attractive tasks attract resources in excess of what is needed, leading to sub-optimal task allocation (Thaler, 1988).

Second, our model indicates that the balance between human resources and available opportunities also determines the efficacy of popular managerial interventions designed to either reduce evaluation errors or eliminate individual erroneous task allocations. The interventions we considered were: (a) stipulating the minimum number of employees required to launch a project, (b) allowing employees to quit projects freely, (c) setting up a minimum profit threshold, (d) requiring approval from a superior to launch an employee-initiated project, and (e) offering strong managerial incentives. Our results demonstrate that some of the interventions lose their efficacy as resources grow relative to available opportunities, while others hurt rather than aid organizational performance. Our analysis thus yields important insights for both theory and practice.

Finally, we found that as organizations scale up, or as the munificence of their environment diminishes, either due to an increase in competition or the evolution of the industry, the balance of the relative advantage between self-selection and centralized allocation changes. As organizations grow, their resource constraints ease up, which makes self-selection less effective. Similarly, as an industry matures and the number of profitable opportunities drops, centralized allocation outperforms self-selection. Our paper thus provides an additional explanation of why certain firms, which initially embrace self-selection with great enthusiasm, may eventually end up abandoning it.

2 | THEORY

Strategy can be conceptualized as a set of decisions that include resource allocations that channel a firm's limited resources, both material and nonmaterial, toward value-creating activities (Bower, 1970; Levinthal, 2017). Management scholars have seen organizational structure as an important lever in managing allocation process and thus helping to shape a firm's strategy (Chandler, 1962; Henderson & Clark, 1990). While earlier studies examined hierarchical forms, such as functional, M-form, or matrix, more recently, the focus has shifted toward novel, nonhierarchical forms of organizing (Lee & Edmondson, 2017; Puranam et al., 2014).

2.1 | The promise and limits of nonhierarchical organizations

Scholars of organization design have frequently indicated that we need more research on novel forms of organizing (Billinger & Workiewicz, 2019; Dunbar & Starbuck, 2006; Greenwood & Miller, 2010; Lee & Edmondson, 2017; Schoonhoven, Meyer, & Walsh, 2005). In their call for new theories of organizations, Daft and Lewin (1993, p. iv) identified a specific organizational form—the “self-organizing organization”—that allows employees to make strategic and tactical decisions at all levels of an organization's hierarchy. This trend has been attributed to increasing uncertainty, new technologies, growth in knowledge-intensive work, and changing societal preferences (Lee & Edmondson, 2017). One of the key properties of this new form is a significant latitude granted to employees to initiate new projects and self-select to them (Daft & Lewin, 1993; Puranam, 2018; Raveendran, Puranam, & Warglien, 2021). The autonomy of employees in such organizations extends beyond that found within earlier frameworks like the “bottom-up” resource allocation process (Bower, 1970; Burgelman, 1983), in which employees suggested initiatives but had to obtain approval from their superiors to gain access to necessary resources. In contrast, companies practicing self-selection allow employees themselves to initiate and join projects without approval from management—a more radical approach.

Some recent studies have offered accounts of organizations where employees, rather than management, possess authority to make key strategic decisions. Puranam and Håkonsson (2015) have provided a detailed a description of the self-selection adopted by Valve Software, a major developer of a computer gaming platform. By design, even though the company's founder and CEO formally had the authority to make decisions in all domains, Valve Software pointedly eschewed formal authority in managing its workforce. There were no project managers, and many important decisions—such as hiring and distributing rewards—which in hierarchies are carried out by top or middle management, were delegated to lower-level employees (Foss & Dobrajska, 2015; Puranam & Håkonsson, 2015). Most importantly, a key strategic function—resource allocation—was also decentralized: each Valve employee had the authority to launch a new project, provided her decision was shared by at least two other colleagues. Alternatively, any employee could choose to join another project. Valve's employees were also allowed to freely leave projects. While Valve was only one of the many existing examples of such firms, it illustrated well the key characteristics of self-selection (for other examples see Lee & Edmondson, 2017).

Some, however, have expressed doubts as to whether self-selection can work at scale as the number of employees increases, or whether it can be implemented in more traditional sectors such as manufacturing (e.g., Burton et al., 2017). Real-world experiences of self-selection suggest that these doubts are well founded. Manufacturing firms such as W. L. Gore or Morningstar have implemented self-selection, but with certain restraints, such as restrictions pertaining to the number of employees allowed to work in a single team (Hamel, 2011). Other firms have adopted self-selection, only to reverse course, returning to a hierarchical approach. For instance, Google tried to remove middle managers from its hierarchy and give greater autonomy to its engineers (Sutton & Rao, 2014). The company subsequently reversed its decision and reinstated middle managers when it realized that they provided an important interface between executives and engineers. Another software firm, GitHub, abandoned self-selection after a period of rapid growth in the number of employees (Burton et al., 2017). The company concluded that "workers can benefit from a little direction" (Mittelman, 2016). Oticon also experimented with self-selection but kept some managerial control. While its employees could initiate projects and self-allocate to projects of their choice, management retained project evaluation and monitoring rights. When the company subsequently experienced significant growth in the 1990s, increasing interference from upper management in the employee allocation process eventually led Oticon to revert to a more conventional matrix form (Foss, 2003). Elsewhere, companies choose to limit the initiatives raised by employees by requiring a certain minimum profit or value threshold (Goold & Campbell, 1987).

Scholars have proposed several mechanisms that could be responsible for problems with scaling up self-selection in organizations. Often cited are the inherent limits of the human mind in maintaining relationships in larger groups and thus coordinating between members of a large team (Hill & Dunbar, 2003; Jaques, 1990). Other researchers found that coercive control in self-managed organizations may induce stress and reduce employee productivity over time (Barker, 1993). Other studies have suggested a possibility that self-selection is an anomaly that only exists due to low selection pressures in the environment that allow almost any form to survive for a while (Burton et al., 2017) or to enduring effects of early success (Levinthal, 1991). Researchers have also pointed out that organizations consisting of autonomous teams would not be able to handle big and complex projects that require coordination between those teams (Lee & Edmondson, 2017; Levinthal & Workiewicz, 2018). Thus, as an organization grows in size and complexity, pressure to switch to a hierarchical form of organization increases.

Another limitation of self-selection is the difficulty in resolving conflicts between teams—one of the defining functions of hierarchies (Burton et al., 2017; Puranam, 2018). Similarly, while Lee and Edmondson (2017) have suggested that managing large nonhierarchical organizations may become complex due to limits to visibility and peer-to-peer coordination, they concluded that "theory and research are needed to identify the limits of self-managing organizations" (p. 17).

Two unresolved issues are worth noting here. First, firms practicing self-selection seem to run into limits as the number of employees increases. Consequently, they either reduce their size, or adopt hierarchical forms. However, the mechanisms responsible for this tendency have not been sufficiently identified and often run counter to findings from prior literature, which linked an increase in a firm's size to greater decentralization of decision rights due to limits to the managerial span of control (Aghion, Bloom, & Van Reenen, 2014). Second, some firms have tried to manage the tradeoffs between hierarchy and self-selection by introducing additional checks to self-selection, such as the rule of three at Valve or requiring managerial approval at Oticon. Since changing organizational structure is costly and risky, many organizations instead adopt these policy levers until it becomes more feasible to transform the organizational structure (as in the case of GitHub). The motivation behind introducing these policies is to limit the inefficiencies of self-selection, but the actual mechanisms underpinning these interventions are not yet well known.

2.2 | Project evaluation and selection

While prior literature has extensively studied the processes and outcomes related to organizations evaluating and selecting available alternatives—a subject more central to the present paper—there have been only a few formal examinations of the role of structure in this process. Marschak and Radner's (1972) economic theory of teams was one of the first attempts to develop a formal model of organizational decision making with a focus on information processing in hierarchies. Building on their work, Sah and Stiglitz (1986, 1988) advanced a formal model of polyarchies and hierarchies composed of individuals who evaluate incoming projects using their own private estimates. They examined how organizational structure determines the number of omission errors (failing to select a value-positive project) and commission errors (selecting a value-negative project) produced by each form, finding that polyarchies (flat, decentralized organizations) produced more errors of commission, whereas vertical hierarchies committed more errors of omission. The intuition for this result is relatively simple: in a polyarchy, an organization in which a positive verdict from any decision maker is sufficient to pursue a given project, too many projects will be launched, including some with negative values. Conversely, in a hierarchy, where approval at each level of the organization is needed to launch a project, the organization makes fewer errors of commission but also misses out on many positive opportunities.

Christensen and Knudsen (2010) and Csaszar (2013) provided a more general version of the Sah and Stiglitz's (1986, 1988) model by considering additional configurations of decision makers. Using different approaches to calculate errors of omission and commission, both studies demonstrated that, for a given number of agents, different configurations of decision makers in an organization can work to control the number of errors of commission and omission that the organization commits. Christensen and Knudsen (2010) offered further mathematical proof that the reliability of project screening can be adjusted by varying the organizational structure and the number of agents, thereby allowing the creation of an arbitrarily reliable organization.

However, in the above-cited literature, employees were viewed strictly as passive information processors who could be arranged in different static configurations to produce desired organizational outcomes related to the precision of evaluation. Their jobs were reduced to screening incoming opportunities and making binary accept/reject decisions regarding whether an opportunity should be pursued or turned down. The literature did not consider the relative ordering between projects, which, as we will show, is critical for allocation purposes. The implicit assumption in this literature is that an organization always has sufficient resources to pursue all projects and the only source of inefficiency is allocating company's resources to value-negative projects. Most firms, however, do not stop at simply identifying the most promising projects among those available; indeed, they must also judiciously assign limited resources to maximize their performance (Bardolet, Fox, & Lovallo, 2011; Klingebiel & Rammer, 2014; Noda & Bower, 1996).

Diminishing returns from resource allocation is a necessary condition for a resource allocation problem to arise, and it is an important feature in a wide variety of settings including R&D projects (Scherer, 1967), software projects (Boehm, Abts, & Chulani, 2000; Brooks, 1995), allocation of talent in manufacturing (Murphy, Shleifer, & Vishny, 1991), and allocation of human capital in general (Chatain & Meyer-Doyle, 2017). More generally, it is a fundamental assumption underpinning neoclassical theories of production (Maksimovic & Phillips, 2002). Consequently, instead of focusing only on appropriately identifying value-positive and value-negative projects, as is customary in models of project screening (Christensen & Knudsen, 2010; Knudsen & Levinthal, 2007; Sah & Stiglitz, 1986, 1988), with diminishing returns, the organization also needs to consider the opportunity costs of resources (Levinthal & Wu, 2010).

2.3 | Employee allocation in organizations

Allocating employees has been at the center of organizational design and broader management research (Levinthal, 2017; Puranam et al., 2014). While this process is important to organizational performance, it also presents significant and unique challenges for organizations (Chatain & Meyer-Doyle, 2017; Coff, 1997). At a more general level, challenges arise because of the non-scale, free nature of human capital: while some resources, like patents or brands, can be applied to new projects without preventing their use in those already under way, most organizational resources, human capital included, possess an opportunity cost, as their use in one area precludes their use in another (Levinthal & Wu, 2010).

The challenge is further exacerbated by several additional factors. First, employees, particularly in human-capital-intensive firms, may differ from their superiors in their evaluation and choice of available alternatives (Aghion & Tirole, 1997). Second, unlike machinery or capital, employees possess agency and often significant bargaining power (Coff, 1997). Third, employees generally have a strong preference for autonomy and tend to distrust centralized hierarchies (Hackman & Oldham, 1976; Herzberg, 1966). An organization designer thus must seek a balance between centralizing the coordination of employees to satisfy the global goals of the organization and allowing employees to act according to their own local interests (Aghion & Tirole, 1997; Levinthal & Workiewicz, 2018).

These characteristics of human capital protect firms against imitation by competitors, but they also make it difficult for firms to adjust the level of their human capital in the short term

(Campbell, Coff, & Kryscynski, 2012; Coff, 1997). On the one hand, many organizations, particularly in the early stages of growth, suffer from insufficient levels of human capital vis-à-vis the available opportunities and struggle to hire and train new employees (Birley & Westhead, 1990; Penrose, 1959). On the other hand, some firms maintain slack in their human capital as a buffer against environmental turbulence (Bentley & Kehoe, 2020; Lecuona & Reitzig, 2014; Thompson, 1967), even when this slack has a negative effect on their performance (Vanacker, Collewaert, & Zahra, 2017). Due to this "stickiness" of human capital, researchers have turned their attention to how firms may optimize the deployment of the human capital they already possess.

While there has recently been a resurgence in research on processes of employee allocation, to the best of our knowledge, there are no formal models exploring the mechanisms and boundary conditions of self-selection. Although a large body of literature uses simulations to explore the effects of organization design on organizational behavior and adaptation (see Baumann, Schmidt, & Stieglitz, 2019, for a recent review), or how adding employees in certain structural positions can impact screening efficacy in particular (e.g., Csaszar, 2013; Knudsen & Levinthal, 2007), there has been little formal research on the role of organizational structure in shaping the process of resource allocation (Sengul et al., 2018). Similarly, Csaszar (2013) has noted that incorporating resource constraints into the screening model would be an important next step.

The few existing formal models of resource allocation in management (Burton & Obel, 1984; Coen & Maritan, 2010; Hutchison-Krupat & Kavadias, 2015), organizational economics (e.g., Athey & Roberts, 2001; Hart & Moore, 2005; Rajan & Zingales, 2001), and finance (e.g., Stein, 2002) focus on financial capital or material resources in general and examine only hierarchical solutions to the problem. Recognizing this gap, Gertner and Scharfstein (2013) have called for more research to address the important topic of "assignment of workers to various jobs within firms" (p. 674).

We aim to fill this lacuna in the research with an aid of a formal model where project selection and employee allocation are presented as two distinctive features of self-selection. Our goal is to identify the key mechanisms responsible for the difference in performance between self-selection and hierarchy and how they shape the processes of project selection and employee allocation.

3 | MODEL

We examine two canonical approaches: (a) self-selection, in which the employees individually evaluate and self-allocate to projects; and (b) centralized allocation, in which a single manager (superior) evaluates opportunities and allocates employees (subordinates) to selected projects.[1] For both types of allocation, all agents (including the manager in a centralized organization) possess inaccurate estimates of the projects' true values, which sets up the problem of identifying value-creating opportunities and assigning sufficient resources to maximize gains.

[1]Although the literature on project screening and the role of organizational structure has explored the role of different hierarchical arrangements in project evaluation (for a detailed analysis, see Christensen & Knudsen, 2010, and Csaszar, 2013), we started with two canonical forms. This simplified approach allowed for greater tractability, because we considered a smaller number of interactions while preserving the key mechanism of interest.

In representing self-selection and centralized allocation of human capital, our model matches the definitions of polyarchy and hierarchy introduced by Sah and Stiglitz (1986), who described the two concepts as follows:

> [Polyarchy is] a system in which there are several (and possibly competing) decision makers who can undertake projects (or ideas) independently of one another. In contrast, decision-making authority is more concentrated in a hierarchy in the sense that only a few individuals (or only one individual) can undertake projects while others provide support in decision making. (p. 716)

In terms of project selection, our conceptualization of self-selection is equivalent to a polyarchy. Similarly, our centralized allocation fits Sah and Stiglitz's definition of a hierarchy, where a single manager selects projects and allocates employees to implement them. The following sections introduce the key elements of the model: (a) an organization, (b) its task environment, (c) the allocation process, and (d) the approach to measuring performance of our stylized organizations.

3.1 | Organization and its task environment

In each round t, each organization faced a fixed number of projects, r. For each of the r projects, we randomly drew a number that determined the true revenue potential of that project, denoted as β_r. This parameter captured whether a given project could be profitably realized; its value was independently distributed according to U(−10,10), with the expected revenue potential of a single project thus set to 0.

3.2 | Allocation process

Each organization had m employees. The goal was to allocate the available m employees across available projects to maximize overall profit. Self-selection proceeded as follows. First, we generated noisy estimates of projects' revenue potential for each of the m workers. Specifically, for each of the r projects, each worker observed the true revenue potential β_r with some noise σ, which we drew from a normal distribution N(0,2). We denoted the worker's noisy estimate as $\beta_{r,m}$. Next, we proceeded through each employee in a random order. Each of them evaluated each project, aiming to join the one with the highest positive marginal profit $P_{r,m}$. Each worker could see the allocation decision made by those before him, but not those who chose later. The perceived marginal profit for each project was in turn a function of the estimated revenue potential of the project ($\beta_{r,m}$), the number of workers already attached to that project (n_r), and the marginal costs of adding one more worker to the project (C). The marginal profit of a project was calculated as:

$$P_{r,m} = \beta_{r,m} \cdot n_r - C_r, \tag{1}$$

where

$$\beta_{r,m} = \beta_r + \sigma \tag{2}$$

$$C_r = \frac{n_r(n_r - 1)}{2}. \tag{3}$$

In the next step, the worker selected the project where he perceives the marginal profit to be the highest (and positive). Following the literature on information processing, we assumed that individual and organizational incentives were aligned.[2] We then proceeded by randomly selecting the next worker from those remaining. The second worker performed the same calculation, and so on, until all workers had an opportunity to self-allocate. Workers who could not find a project with a positive marginal profit remained idle for that round. Thus, we implicitly assumed that in the short term the organization did not hire or fire employees. Because the cost of an idle worker is simply the worker's salary, which is paid regardless of whether the worker is allocated to a project or not, workers' wages were not considered in the profit calculation.[3]

In centralized allocation, a single manager was in charge of screening and allocation decisions. The manager also possessed noisy estimates of the projects' revenue potential. We drew the noise term σ for the manager from the same distribution N(0, 2) as for the workers in self-selection, as we were interested in the effects of structure and not screening ability (Csaszar, 2013; Knudsen & Levinthal, 2007). Given her own estimates of project values, the manager then proceeded to allocate the workers using the same formula the workers used in self-selection. The manager proceeded until either no more workers or profitable allocation opportunities remained.

3.3 | Balancing the available resources with opportunities—The role of resource load

A project's true revenue potential (β_r) in turn determined that project's *carrying capacity*: the number of employees that maximized the project's overall profit. Because *carrying capacity* was a function of a project's true revenue potential, it differed across projects. Since the coordination cost per employee increased with the number of employees allocated to a given project, there existed a maximum number of employees beyond which any additional employee reduced the overall profit. For ease of exposition, we set the parameter values in our model in such a way that a project with value between $0 < \beta_r \leq 1$ had a *carrying capacity* of 1, a project with $1 < \beta_r \leq 2$ had carrying capacity of 2, and so on. Projects with $\beta_r < 0$ had a *carrying capacity* of 0. Consequently, when the number of employees allocated to a project exceeded its *carrying capacity*, then the cost of an additional employee exceeded the revenue generated. By summing all

[2]This is one of the key assumptions in the economic theory of teams (Marschak & Radner, 1972; Van Zandt, 1999) and subsequent research on the role of hierarchies in information processing (Csaszar, 2013). Focusing on information processing considerations, these models are concerned with the challenge of coordination, rather than cooperation (Puranam, Raveendran, & Knudsen, 2012).

[3]Separate analyses indicate that even with workers carrying a fixed cost (and therefore, costs when idle), results from the simulation do not change qualitatively.

carrying capacities of all projects in a given round, we obtained the carrying capacity of the task environment, which we denoted by L_t.

The key variable of interest in our study was *resource load*—a ratio between the overall number of workers m and L_t.[4] This variable determined whether, on average, an organization could address all value-positive opportunities offered by the environment. When *resource load* was less than 100%, it meant that an organization could not pursue all profitable opportunities and would seek to increase its number of employees in the long run. Conversely, when this variable was more than 100%, an organization had a slack in human capital. It might maintain this slack for strategic reasons (see Bentley & Kehoe, 2020), or, in the long run, it might seek to reduce the number of employees. With *resource load* equal to 100%, an organization had on average just the right number of employees to pursue all profitable opportunities.

3.4 | Organizational performance

At the end of each round, when all the employees had had a chance to self-allocate or had been allocated to a project by their manager, we calculated the profit per project by summing the profits or losses that each employee allocated to this project generates. Specifically, to calculate organizational performance, we used the true revenue potential β_r, instead of the noisy estimate of the project's revenue potential $\beta_{r,m}$. An example of the profit calculation is illustrated in Figure 1. There, with β_r being 4.5, the given project has a carrying capacity of 5. With six employees allocated to it, it would be overstaffed and generate the total profit of $4.5 \times 6 - (0 + 1 + 2 + 3 + 4 + 5) = 27–15 = 12$.

To evaluate the relative efficacy of employee allocation for both approaches, we considered the performance of each form as a percentage of maximum possible performance. To do that,

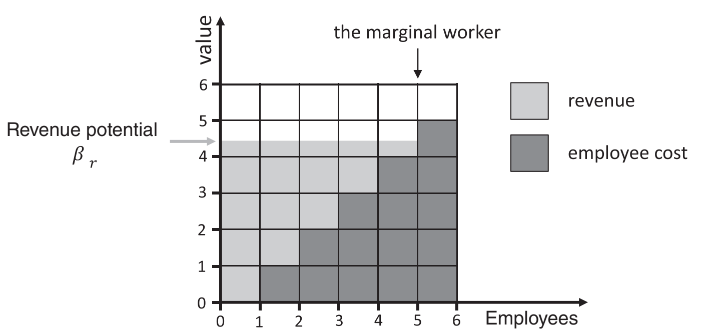

FIGURE 1 Calculating the project's profit. The figure illustrates a project's profit calculation. Each additional worker adds a fixed amount of revenue equal to the *revenue potential* associated with that given project (here, equal to 4.5). The cost of labor, which increases with the number of workers attached to the project, is deducted from the total revenue to arrive at total profit. Increasing the number of workers beyond the point where marginal cost equals marginal revenue (here five workers) leads to negative marginal profit

[4]Our parameter is similar to the *net energy load* from the Garbage Can Model. However, unlike in the Garbage Can Model, we are interested in the efficacy of project selection and human capital allocation rather than in the completion rate of projects.

we simulated *optimal allocation*, which represents the best possible allocation of employees given the number of employees available at the firm and the distribution of projects' values in each round. In optimal allocation, marginal profit of allocating one, two, three, and so on employees is calculated for each project. Then all those marginal profits were sorted from the highest to the lowest, and employees were allocated starting from the highest marginal profit. The process stops when either marginal profit of next allocation is below zero or when there are no more employees remaining. Specifically, we used centralized allocation, where an omniscient manager, with project estimation error $\sigma = 0$, allocated employees. In fact, both self-selection and centralized allocations will produce optimal allocation if there is no uncertainty with respect to the expected profits of the projects.[5]

4 | RESULTS

We started by setting the number of projects available per round to $r = 16$ for both self-selection and hierarchical allocation and varied the number of workers between 20 and 80, specifically $m = \{20,30,40,60,80\}$. By doing so, we were able to observe how well the two organizational forms allocated employees to opportunities in environments with different levels of *resource load*.[6]

We simulated both organizational forms over 20 time periods and ran 10,000 iterations of the simulation, presenting average results to eliminate artifacts of random sampling. For ease of comparison, we normalized the results by comparing the performance of self-selection and centralized allocation to that of the *optimal allocation*, which achieves the best possible performance under given conditions of available projects and resources. We present the results achieved by self-selection and centralized allocation as a percentage of that optimal value.

4.1 | Organizational performance

We began our analysis by examining the performance of both organizational forms. Figure 2 shows the relationship between *resource load* and the normalized firm performance. While the performance of centralized allocation remained largely unchanged when *resource load* ratio increased, the performance of self-selection was superior to that of centralized allocation for low levels of *resource load*, but dropped as *resource load* increases beyond 100%.

To better understand the mechanism behind this result, we examined (a) the number of projects selected, and (b) the resources staffed on these projects (Figure 3), where a project was said to be selected when at least one employee was staffed to it. We found that for all values of *resource load*, self-selection launched more projects than centralized allocation, which in turn launched roughly the same number of projects as optimal allocation. This is consistent with

[5]Sah and Stiglitz (1986) observed that "If screening were perfect, then the architecture of a system has no effect on its output because all projects with $x > 0$ would be accepted and those with $x < 0$ would be rejected" (p. 717).

[6]We selected this range for m specifically to produce conditions where, on average, a firm had either a deficit of workers (50% required for $m = 20$ and 75% required for $m = 30$), just about the right number of workers (for $m = 40$), or slack in its number of workers (150% or 200% required for $m = 60$ and $m = 80$, respectively). This is because in an environment with $r = 16$, the expected number of value-positive projects is 8. Since the values of projects were distributed uniformly, each of these 8 value-positive projects had an average expected revenue potential of $\beta_{r,m} = 5$. Thus, each of the projects could accommodate, on average, 5 workers, which resulted in a total carrying capacity of 40 workers across 16 projects.

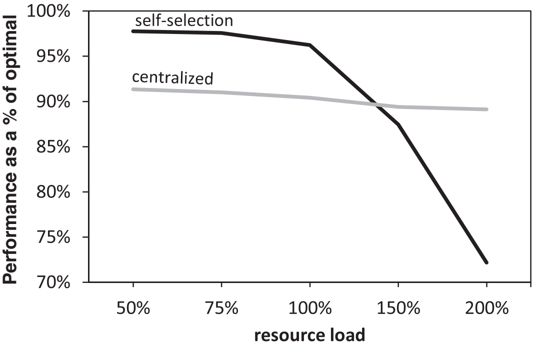

FIGURE 2 Performance comparison between self-selection and centralized allocation

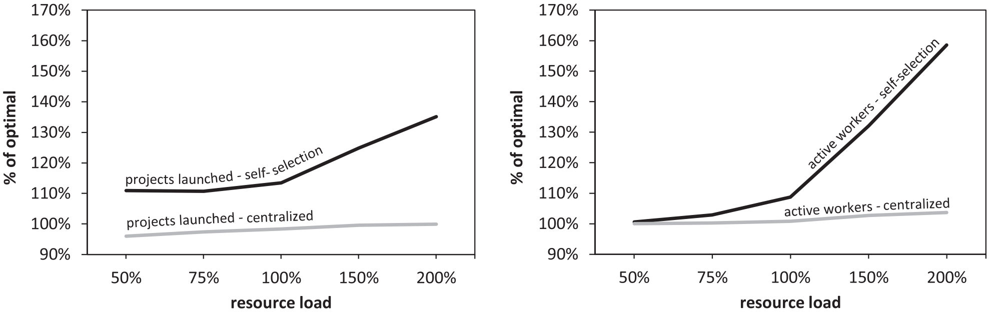

FIGURE 3 Projects launched and active workers for each form. (a) Percentage of projects launched (w.r.t. optimal allocation) and (b) percentage of workers active (w.r.t. optimal allocation)

prior findings that associated polyarchy (which is analogous to self-selection) with accepting relatively more projects compared with vertical hierarchy (Christensen & Knudsen, 2010; Csaszar, 2013; Sah & Stiglitz, 1986, 1988). We further observed that the difference in the number of projects launched increased with *resource load*. For a *resource load* of 50%, centralized allocation launched 96% of the optimal number of projects and self-selection launched 111%. Furthermore, self-selection systematically allocated excess resources to projects, and thus, on average, it overstaffed projects more as *resource load* increased.

However, these facts alone do not explain our main result presented in Figure 2, where for lower values of *resource load*, self-selection outperformed centralized allocation despite making more selection and allocation errors than those made by centralized allocation. Conversely, for centralized allocation, the number of projects launched and workers staffed was close to that of an optimal allocation, yet performance was significantly lower than that of optimal allocation at any *resource load*. The answer to this puzzle lies within the quality of selection and allocation decisions.

4.2 | Errors in project selection and resource allocation

In the presence of resource constraints, identifying value-positive projects is not sufficient, as some value-positive projects may have to be turned down due to a lack of available employees.

In our analysis, we computed allocation errors by comparing allocation decisions made in self-selection and centralized allocation with optimal allocation. Consequently, we have three types of projects: (a) optimal (value-positive and should be undertaken), (b) value-positive but not optimal (should not be undertaken given resource constraints), and (c) value-negative (should never be undertaken). In our analysis, we considered both project selection and employee allocation errors as deviations from optimal allocation, which allowed us to identify seven types of errors (Table 1).

Figure 4 shows how project selection errors vary with changes in the *resource load*. Unsurprisingly, panel (a) shows that self-selection rarely failed to launch an optimal project, while centralized allocation missed on average almost one optimal project when *resource load* is low. For both allocation modes, the number of missed opportunities dropped when the number of available employees grew. Panels (b) and (c) show that self-selection launched more non-optimal projects (both value-positive and value-negative) than centralized allocation. Furthermore, this tendency increased substantially with *resource load* for value-negative projects. Note that in the figure, the number of value-positive, but not optimal projects launched approaches zero as *resource load* increases. The intuition for this is that when resources cease to be a binding constraint, all value-positive projects should be undertaken; that is, all value-positive projects become optimal.[7]

Our model thus replicated the results of the classical screening literature: while centralized allocation was more likely to miss opportunities, self-selection was more likely to launch wrong projects. This does not necessarily imply, however, that when *resource load* is low, the relative advantage of self-selection over centralized allocation stems exclusively from the lower number of omitted optimal projects. Examining how each allocation mode assigns employees to projects yielded further insights into the relative performance of the two forms and the mechanisms at play.

TABLE 1 Seven types of selection and allocation errors

	Omission error	**Commission error**		
Project selection	Failing to launch an optimal project	Launching a value-negative project	Launching a value-positive, but not optimal project	
Employee allocation	Understaffing an optimal project	Allocating employees to a value-negative project	Allocating employees to a value-positive, but not optimal project	Overstaffing an optimal project

Note: Gray cells indicate errors which arise due to resource constraints. When available resources are insufficient to pursue all value-positive projects, errors have to be determined by comparing with best attainable allocation.

[7]Resource constraints push the profit threshold for projects (the value at which they are deemed attractive) above zero, thus making many value-positive projects undesirable. This changes the problem an organization faces from a simple evaluation, which can be modularized and approached on case-by-case basis, to a situation where selection decisions are interdependent, that is, where pursuing one value-positive project means there will be some other project that cannot be initiated. Since this threshold is unknown to the organization designer and varies from period to period, the challenge is to design an allocation scheme where this threshold can be enacted by the actions of the manager or employees.

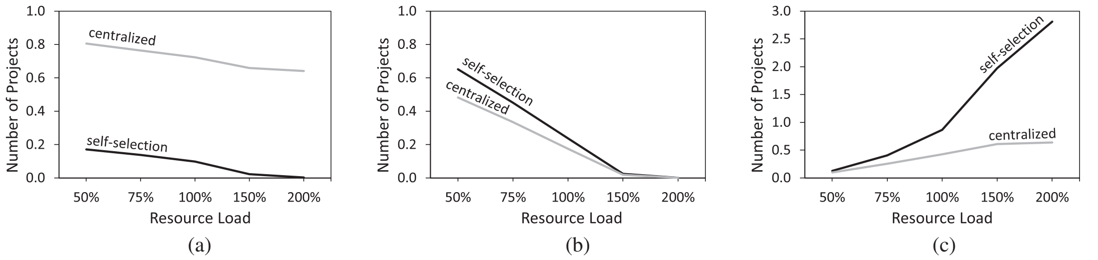

FIGURE 4 Total project selection errors per round. (a) Optimal projects not launched (Omission Errors), (b) value-positive, nonoptimal projects selected (Commission Errors), and (c) value-negative projects selected (Commission Errors)

Figure 5 compares the allocation errors between self-selection and centralized allocation. Panel (a) shows that centralized allocation consistently understaffs more optimal projects than self-selection, which is to be expected. However, panel (b) illustrates that, contrary to the intuition offered by the literature on screening, centralized structures overstaffed optimal projects in resource-constrained regimes (i.e. low *resource load*). Specifically, centralized allocation staffed on average two workers per round (3.28 vs. 1.29) for *resource load* = 50% and continued to overstaff optimal projects until *resource load* passed 100%. Centralized allocation also allocated more employees to projects that were value positive but not optimal; however, the difference was more modest (0.82 vs. 0.72 workers for *resource load* = 50%, panel c). Self-selection in turn systematically overstaffed value negative projects—a tendency that increased with *resource load* (panel d). When employee availability was not an issue (high *resource load*), both allocation modes committed selection and allocation errors in line with what we would expect from the literature on hierarchies and polyarchies. However, with fewer employees available, compared to self-selection, centralized allocation not only selected fewer optimal projects but also *overstaffed* them to a greater extent.

The difference was particularly stark when we considered the number of excess employees per project (Figure 6). The first admittedly obvious observation is that as *resource load* increased, so did overstaffing of projects by both self-selection and centralized allocation. This is in line with findings presented in previous studies. But, more importantly, the trend in understaffing of projects highlights the key mechanism at play. Centralized allocation resulted in more overstaffing of optimal projects (panel a) and value-positive but not optimal and value-negative projects (panels b and c respectively) when *resource load* was at or below 100%. In addition, for value-positive, but not optimal projects, self-selection outperforms centralized allocation for all values of *resource load*. This, in turn, resulted in performance tradeoffs. An explanation of how different allocation errors shaped performance can be found in the Supporting Information Appendix).

The intuition for this result is that when *resource load* is high, there are excess workers with respect to the optimal capacity of the environment to staff workers on a project without losses. On average, both forms should temporarily idle some employees. In the case of self-selection, the excess employees with positively skewed evaluations of project values will tend to gravitate towards the few optimal projects available, thereby leading to their overstaffing. Furthermore, some employees who have positive evaluations of value-negative projects will join them as well, thus further depressing organizational performance. For self-selection, this mechanism produces overstaffing of projects under high *resource load* conditions. Employees are less likely to

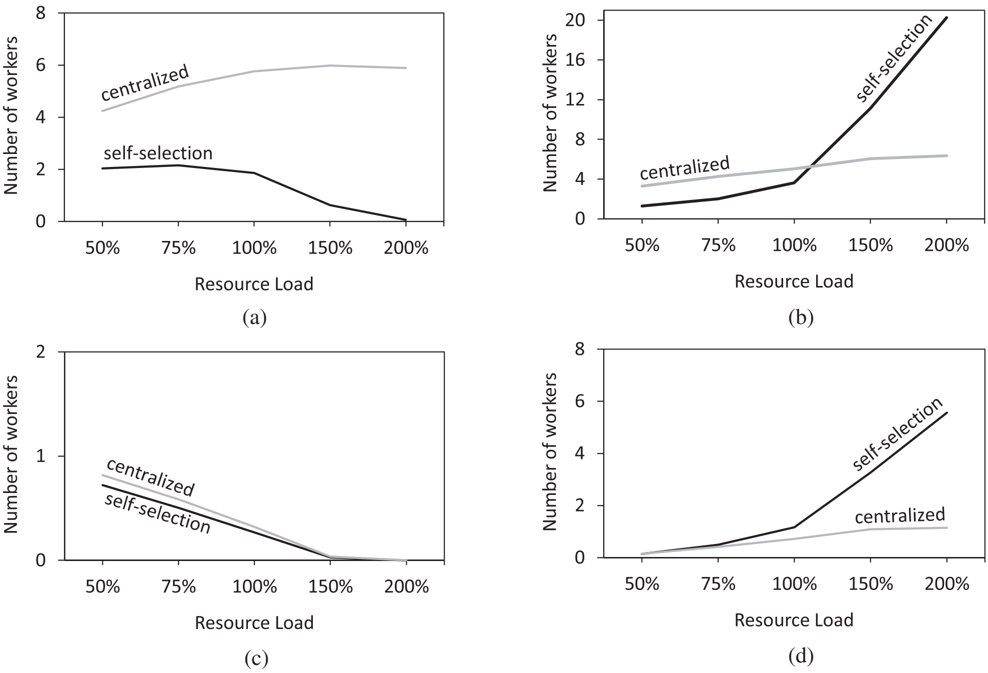

FIGURE 5 Total employee allocation errors per round. (a) Understaffing on optimal projects (Omission Errors), (b) overstaffing on optimal projects (Commission Errors), (c) overstaffing on value-positive, nonoptimal projects (Commission Errors), and (d) overstaffing on value-negative projects (Commission Errors)

sit idle because they can act independently on their often overoptimistic project estimates. The result is analogous to the classic winner's curse problem (Thaler, 1988), where the last employee to join a project is likely to have an extremely positively skewed estimate of the project's true value. With more idle employees available under the high resource load, this becomes more common.

In centralized allocation, on the other hand, only a single manager evaluates each project. The manager still makes mistakes with respect to evaluation of projects' values, since her estimates are as inaccurate as the individual employees' in self-selection. However, unlike in self-selection, the manager has only one set of evaluations and will act only on her own estimate. In centralized allocation, there is no compounding of evaluation errors as in the case of self-selection and more employees are likely to be idle when *resource load* is high.

When *resource load* is low, there are fewer employees compared to available projects. In the case of self-selection, this reduces the effect of overcrowding, since employees can spread themselves across many available projects. As all workers evaluate these projects independently, their preferences are unlikely to coincide exactly. With an abundance of understaffed positive-value projects, the *optimal capacity* of projects will rarely (if ever) be reached. Furthermore, even if one employee makes a mistake, the negative impact of that decision is limited by the amount of human capital that this employee represents.

However, this effect is absent in centralized allocation because only the manager's erroneous estimates are used to formulate a single preference ordering over projects. This preference order is then used to assign employees to projects. If the manager believes that a given project should have three more employees allocated to it than is optimal, she will overstaff the project by three employees. Thus, for low *resource load*, centralized allocation will not only understaff projects to a greater extent (in line with traditional screening models) but also overstaff some of them, leading to the reduced performance levels presented in Figure 2. This is an important point. So far, the literature has focused only on the excessive commission errors performed by polyarchies. However, employee allocation is more than just a screening problem. While self-selection overstaffs more projects, these excesses are small, as each employee only has their own time to allocate and potentially waste. Centralized allocation may err less often, but when it does, the mistakes tend to be bigger.

4.3 | Policy levers

In this section, we show how we built on the preceding analysis to examine the efficacy and limitations of key policy levers that firms employ to address the shortcomings of self-selection by altering either project selection, or employee allocation, or both. The interventions we considered were (a) allowing employees to quit projects freely, (b) stipulating the minimum number of employees required to launch a project, (c) setting up a minimum profit threshold, (d) requiring approval from a superior to launch an employee-initiated project, and (e) introducing strong managerial incentives.

4.3.1 | Allowing employees to quit projects freely

In the base version of our model, each employee in self-selection chose a project by considering her personal estimate of the project's potential and the number of workers on it at the time of her decision. Employees made their decisions one at a time in a random order. This arrangement, however, may lead to an unfavorable situation for an employee who joins a project early. Such an employee chooses what initially looks like an attractive project. However, if too many employees join thereafter, the project becomes unattractive to the initial worker, who may now prefer a different one. Companies like Valve recognize this problem and allow employees to change projects if they find one that is more appealing (Puranam & Håkonsson, 2015).

To examine the effects of this policy, in an extended version of our model, we introduced a new variable, *maxswaps*, which controlled the number of times any worker may reconsider her decision. By setting *maxswaps* to one, we allowed each worker to change his mind one time per round and either join another project or remain idle. The workers were selected in a random order and given the opportunity to revise their initial decision following the procedure outlined in the Model section. Giving the manager in the centralized allocation the opportunity to revise her decisions did not make sense as her evaluations did not change. Figure 7, panel a), presents the results and compares them with those of the original model.

The effect of setting *maxswaps* to allow one change was most evident for high *resource load* and when overcrowding of projects led to a performance drop for self-selection. In a situation where many workers chase few opportunities, self-selection benefits from allowing workers to reevaluate their choices. Without the ability to change their mind, workers who join a given project early may find themselves in a situation where they no longer find the project attractive due to subsequent overstaffing. Such misallocations diminish firm performance in two ways. First, launching an overcrowded project directly reduces organizational performance. Second, it imposes an opportunity cost: if allowed, some employees could have joined more attractive projects and increased those projects' outcomes. By allowing employees to reevaluate their

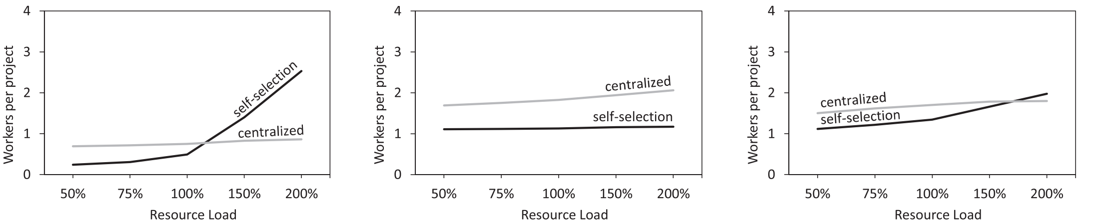

FIGURE 6 Employee allocation commission errors per project per round. (a) Overstaffing on optimal projects (Commission Errors), (b) overstaffing on value positive, nonoptimal projects, and (c) overstaffing on value negative projects (Commission Errors)

decisions, an organization minimizes both inefficiencies and thus this policy lever affects mostly staffing errors.

What is surprising, however, is that allowing employees to change their mind had a negative effect on performance when *resource load* was low. This negative effect did not disappear with an increase in the *maxswaps* variable, revealing an interesting dynamic. In short, allowing employees to change their minds after everyone has had a chance to allocate to a project may lead to a situation where pessimists will erroneously leave good projects. Consider a simple example, where there are two employees and only one project available. The project's *true revenue potential* (β_r) is 1.5, which means that it can profitably accommodate two workers. The first worker, who is pessimistic about the project, evaluates the project at 0.5, while the second worker, who is optimistic, evaluates it at 2.5. Let us further assume that the pessimist decides to join the project first and the optimist second. The project achieves its optimal allocation, and as long as both workers remain involved, it will realize its optimal profit. However, if we allow workers to reconsider, the pessimist will leave, deciding, based on her private (pessimistic) evaluation of 0.5, that the project is overcrowded. Now understaffed, the project is no longer assured of its optimal profit.

This effect occurred with the greatest intensity when *resource load* was low. When *resource load* was high, this negative effect was overtaken by the positive effect of lessening overcrowding of projects; but with low *resource load* an organization was left with only a negative effect of pessimists leaving projects they should have stayed on. Thus, even if employees could be convinced that abandoning a project will not stigmatize them, our results suggest that it may be better for an organization practicing self-selection to *prohibit* employees from leaving projects altogether when *resource load* is low.

4.3.2 | Stipulating the minimum number of employees required to launch a project

Firms that use self-selection often impose a “minimum viability” condition on their employees to start a new project, which requires that a new project should attract a minimum, predetermined number of sponsor employees before it can be started. This ensures that employees do not pursue personal pet projects at a cost to the firm. For example, Valve imposed a “rule of three,” which mandated that any new project attract at least three employees (Puranam & Håkonsson, 2015). Similarly, GitHub imposed a “rule of two” (Burton et al., 2017). Because workers have their personal estimates of projects' values, some workers might eventually join a value-negative project because of their positively skewed evaluations. Setting a minimum number of workers necessary to launch a project makes it more difficult for biased employees to start one, as they must find other employees who share their extreme (and possibly misplaced) optimism about a given project. In other words, this solution is intended to mostly tackle commission errors in project selection.

To simulate this policy intervention, we implemented a variable *rule of*, which specified the minimum number of workers required to launch a project. When deciding whether to join a given project, each worker estimated the project's value to confirm that it could support the minimum number of workers required. After all, workers had made their choice, projects that did not attract the required minimum number of individuals were dropped. Note that the *rule of* was effectively set to one in the base model.

Figure 7b shows that a high *rule of* had a positive effect on firm performance for high *resource load*. When the *rule of* value increased, workers launched fewer projects, and when *resource load* was high, this meant that the rule prevented the launching of value-negative projects—though it did not prevent the overstaffing of optimal projects. However, this result did not hold for low *resource load*, where a higher *rule of* resulted in the rejection of not only value-negative projects, but also some value-positive and optimal projects, thus hurting overall performance. Consider an extreme case in which there are many good projects available but very few resources (low *resource load*). To reach optimum organizational performance, many of these projects should be staffed by only a single or maybe two employees. In this case, the effect of *rule of* turns negative because it prevents resources from being spread effectively over many projects. Thus, a higher *rule of* helps reduce errors of commission when resource constraints are not an issue, but it can lead to errors of omission when resources must be spread thinly over many attractive projects.

4.3.3 | Setting up a minimum profit threshold

Setting a minimum profit threshold per project is a common practice in firms (Goold & Campbell, 1987). Each worker can start a new or join an existing project only if its profit potential is greater than or equal to a specified minimum value. Thus, this intervention is mostly intended to reduce commission errors with respect to project selection. In our model, we represented that value with a *threshold* variable. Figure 7c compares the results for *threshold* = 0 (our base model) and *threshold* = 2. While introducing this condition significantly increased performance for self-selection, it reduced performance in the case of centralized allocation. These effects became more pronounced as *resource load* increased. The boost in performance for self-selection occurred because it took a more erroneous estimate of project value to join the project. The condition limited overcrowding and reduced selection of bad projects. As per our earlier discussion, because there is only one decision maker in centralized allocation, overcrowding is not an issue. However, by setting *threshold* > 0, we reduced the pool of projects the manager could choose from. With many resources to spare, it makes sense to launch even the smallest value-positive projects, which centralized allocation does well on its own. Therefore, adding a profit threshold condition for centralized allocation tended to reduce overall performance irrespective of resource load.

The minimum profit threshold also illustrated the impact of resource constraints on the classical problem of project screening. Having a limited number of employees to allocate means that not all value-positive projects should be selected. Instead, employees should be allocated only to the most promising value-positive projects. This introduces an additional threshold,

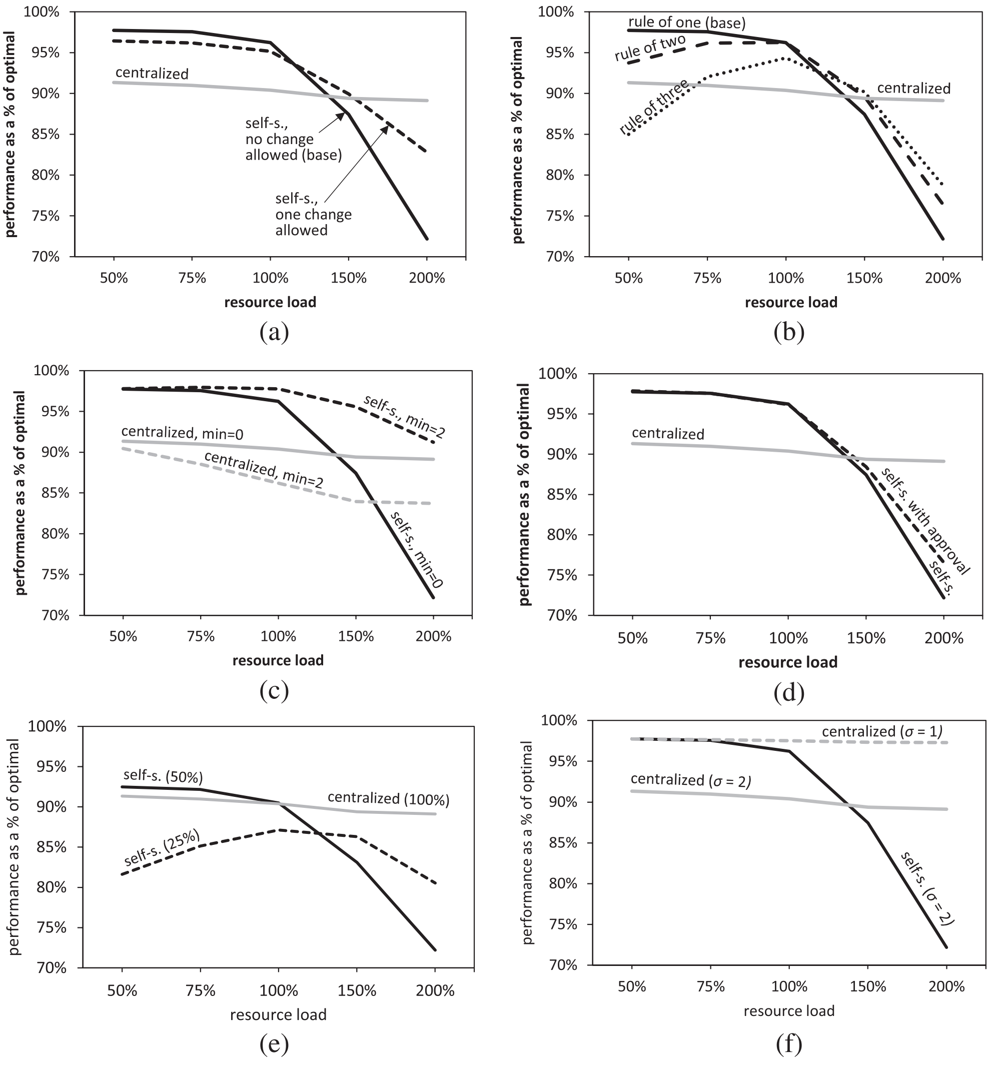

FIGURE 7 Performance effects of policy levers. (a) Allowing employees to quit projects freely, (b) setting a minimum number of workers to launch, (c) setting a minimum threshold for profits, (d) requiring an approval from a manager to launch a project, (e) stronger incentives: Manager evaluates more projects, and (f) stronger incentives: Manager evaluates projects more accurately

which is higher than the breakeven point implicitly assumed in the classical approach (Sah & Stiglitz, 1986).

4.3.4 | Requiring approval from a superior to launch an employee-initiated project

In this manipulation, we allowed employees under self-selection to launch new projects only after they received their superior's approval. At Oticon, employees were given the freedom to launch their own and join existing projects, but senior managers retained their veto rights (Foss, 2003). Such an approach would in principle help firms avoid selecting nonprofitable projects and overstaffing. We operationalized this policy by adding a manager to self-selection who could block a project she considered value-negative. Figure 7d presents the effects of introducing this managerial intervention. While performance of self-selection with managerial intervention was similar to that of unrestricted self-selection when the *resource load* was low, adding managerial intervention did offer a boost in performance as the *resource load* increased. As expected, the manager ensured that wildly optimistic employees who evaluated bad projects as good ones did not launch and assign themselves to such projects, bringing down the overall organizational performance. This was particularly the case when *resource load*, and thus the risk of overstaffing, was the greatest. When *resource load* was low, however, there was no effect, as employees could easily find a new opportunity when their favorite was vetoed.

4.3.5 | Introducing strong incentives for the manager

In our base model, we assumed that with respect to knowledge, all agents (a manager and employees) possessed the same average ability and effort. This allowed us to focus on the effects of organizational structure. Furthermore, whether a given superior possesses a superior or inferior knowledge compared with her subordinate is far from settled. On the one hand, literature stemming from work in transaction cost economics (Williamson, 1975), organizational economics (Garicano, 2000), and resource allocation process (Bower & Gilbert, 2005) has assumed that managers might have been put in their role precisely because of their competence and experience. Elsewhere in organizational economics and in organizational theory, researchers have argued that knowledge rests with subordinates and is one of the key reasons for the delegation of authority (Aghion & Tirole, 1997; Dessein, 2002; Dobrajska, Billinger, & Karim, 2015; Hayek, 1945).

However, regardless of the initial advantages that a manager may or may not have over her subordinates, an organization designer may choose to offer strong incentives to a manager to exert more effort in screening projects and allocating employees to avoid errors in both domains. Incentives are, in fact, one of the most common tools to alter the behavior of agents (Jensen & Meckling, 1976; Obloj & Sengul, 2012). We examined two effects of introducing strong incentives for a manager: (a) examining more projects per round and (b) reducing the evaluation error.

Difference in the number of projects under evaluation

We conducted experiments where we kept the screening competency equal between the manager and workers but allowed the manager to see and evaluate all available projects; at the same time, the workers were able to see only half (8 out of 16) or a quarter (4 out of 16) of all the projects. Results showed that when employees could only see half the projects compared to the manager, self-selection could still outperform a single manager as workers collectively considered nearly all the projects. Only when workers saw four times fewer projects than the manager, did the performance of self-selection drop below that of centralized allocation. Figure 7e illustrates the results for both discussed cases. This further highlights the additional power of self-selection and suggests that a manager would have to be significantly more incentivized and skilled to outweigh the advantage of self-selection when it comes to the breadth of screening. Thus, even if individually the employees are worse at evaluating projects than the manager, as a group they can address more opportunities than even a highly skilled and incentivized individual.

Evaluation accuracy

Another effect of strong incentives is that the manager may spend more time and dedicate more attention to her tasks and thus become more accurate in evaluating the projects. In another variant of the base model, we relaxed our previous assumption that the manager and the employees have the same screening accuracy. More specifically, we varied the standard error of true value estimation (σ) for the manager. The results presented in Figure 7f demonstrate that at least in the context of our model, the manager should be significantly more accurate (two times more) than employees to perform at a comparable level to self-selection for low *resource load*.

Whether strong managerial incentives can produce the desired effects for centralized allocation is uncertain and will depend on the skills necessary to achieve the desired results. While the manager being able to review more projects is plausible and consistent with the observation that superiors have a broader view of the organization, our analysis showed that the pooling of limited attention in self-selection could compensate for this advantage of a diligent manager. Whether stronger incentives can reduce a manager's estimation error is less certain and depends on whether the manager possesses the requisite subject-matter knowledge.

Taken together, our analysis showed that the efficacy of self-selection and additional managerial interventions depends on the relative balance between employees and the number and quality of opportunities that a company faces. When this balance changes, either due to the growth of an organization or a diminishing number of opportunities for the company, self-selection may lose its usefulness with respect to centralized allocation.

4.4 | Robustness checks

To confirm the validity of our measure of *resource load*, we ran our model for different values of number of workers and different arrival rates of projects per round. We also drew the project values from positively and negatively skewed distributions and from long-tailed (normal) distributions. The results remained qualitatively the same. We also examined different values of the estimation error (σ), different approaches to diminishing returns calculation, and different types of distributions of project values (long-tailed) and found that our results were consistent with the base model. We also examined higher values of *maxswaps*, *rule of*, and differences in screening ability. The results were qualitatively similar to those presented in the paper.

5 | DISCUSSION

This article focuses on a specific facet of organizational design: the allocation of decision rights related to project evaluation and employee allocation. We considered two approaches to this dual challenge: self-selection and centralized allocation. The key insight from our analysis is that the balance between resources and opportunities is an important factor when choosing between self-selection and centralized resource allocation regimes. Whereas self-selection performs better in environments rich in opportunities relative to available resources, centralized allocation performs better when opportunities are scarce relative to available resources.

We also found that under resource constraints, looking only at the efficacy of project screening yields an incomplete picture of how the two organizational forms function. The implicit assumption in the classical literature is that an organization possesses enough resources to address all accepted projects; thus, it has focused only on the efficacy of the project evaluation (Christensen & Knudsen, 2010; Csaszar, 2013; Csaszar & Eggers, 2013; Knudsen & Levinthal, 2007; Sah & Stiglitz, 1986) or the speed of decision (Garicano, 2000; Radner, 1993). In our model, however, the number of employees available to allocate to opportunities is an important factor. It may be worthwhile to forgo some positive-value projects if the available employees would be better deployed on other opportunities.

In general, firms implement hierarchical decision making when there are limited resources for implementing projects. By doing so, they intend to exert greater control over these scarce resources so that only the most lucrative projects are chosen, deploying their few available resources in an optimal manner so as to avoid losses. Prior literature on project selection has confirmed this intuition: when it comes to selecting projects, hierarchies tend to be conservative and risk averse, since they commit more omission errors rather than commission errors. However, our results indicate that the opposite is true with respect to employee allocation. Compared to self-selection, centralized allocation tends to staff more employees not only on optimal projects, but also on value-positive, but nonoptimal projects. It might select fewer projects, but it also tends to allocate more resources to those few projects, resulting in reduced performance. This leads to a paradox wherein some opportunities receive more resources than necessary in the face of resource scarcity.

Our study offers several practical implications. First, we highlight a dilemma that firms (and knowledge-intensive firms in particular) often face: the struggle to strike a balance between tightly controlling and directing employees and allowing them to direct their own efforts. Second, we conclude that organizational design choices are dictated not only by size or span of control, but also by the relative availability of human capital and opportunities. Under certain conditions, centralized allocation could be a better-performing, more suitable choice than self-selection. Finally, we argue that under certain conditions, organizations can mitigate the weaknesses of self-selection by implementing additional policies, like mandating a minimum number of workers per project, imposing a profit threshold, requiring managerial approval, or adjusting managerial incentives. Employing such policy levers could reduce the need to restructure, an exercise fraught with risk. However, we also argue that the efficacy of those interventions is itself moderated by the balance between resources and opportunities.

In addition, our analysis suggests that as a firm grows or its available opportunities diminish, it may no longer be feasible to maintain self-selection. In fact, a company's very success as a decentralized organization may eventually compel it to adopt some form of hierarchy. Anecdotal evidence supports this observation. Small technology startups with few employees often use self-selection. Many of these firms, however, face pressures to adopt a more hierarchical structure as the number of employees grows. These pressures are particularly salient in the case of GitHub's transition from a decentralized “boss-less” structure to a hierarchy (Burton et al., 2017). Although it is customary to attribute the pressure to adopt hierarchy to the increasing span of control and communication difficulties (Chandler, 1962; Galbraith, 1977), our model suggests a new mechanism that can contribute to this outcome: the compounding of evaluators' errors.

Our findings can also be applied to changes in organizational forms throughout an industry's trajectory. The literature on industry evolution has generally assumed that industries go through distinct stages (Agarwal & Tripsas, 2008; Klepper & Grady, 1990). After the initial burst of opportunities, when new applications and market segments are being discovered, the market's growth slows, and readily available opportunities for growth diminish. Our model thus suggests that the rationale for choosing self-selection over centralized allocation changes with the industry's growth phase, even if we keep the size of the firm constant. Early in the industry lifecycle, the decentralized form is more efficacious, as the high number of available opportunities limits the risk of commission errors. Later in the industry lifecycle, however, as the number of opportunities shrinks, centralized allocation becomes a better alternative because it helps avoid overcrowding.

At the same time, our results do not necessarily suggest that organizations with abundant human capital should avoid self-selection completely. While maintaining a hierarchical structure, such organizations can use self-selection selectively by either applying it in separate units or allowing employees to dedicate some fraction of their time to pursuing projects of their choosing. However, while prior literature has suggested that organizations should use polyarchy for exploratory activities and keep hierarchy to pursue exploitation (e.g., Csaszar, 2013; Knudsen & Levinthal, 2007), we argue that this may not be universally true. Organization designers should consider the amount of human capital dedicated to exploratory efforts relative to that required. Overstaffed skunk works that embrace employee autonomy and self-selection may in fact be less beneficial for the firm than centralized units pursuing exploration.

From a theoretical perspective, we used a formal model to examine the phenomenon of self-selection of human capital, precisely define the underlying mechanisms, and explore the boundary conditions. The present study extends the literature on project screening in hierarchies and polyarchies (e.g., Christensen & Knudsen, 2010; Csaszar, 2013; Sah & Stiglitz, 1986, 1988) by considering the subsequent process of resource allocation (Bardolet et al., 2011; Bower & Gilbert, 2005; Noda & Bower, 1996). Evaluation of opportunities and allocation of resources go hand-in-hand, as both processes have information processing at their core (Christensen & Knudsen, 2010; Csaszar & Eggers, 2013; Knudsen & Levinthal, 2007). This article addresses this previously identified gap in the literature (Csaszar, 2013). More specifically, we focus on how the choice of allocation mode mediates the evaluation of available opportunities and the subsequent allocation of human capital, a question that is especially important to knowledge-intensive, human-capital-rich firms (Coff, 1997; Lee & Edmondson, 2017).

Having established the mechanisms behind the advantages of self-selection over centralized allocation under certain conditions, we used modifications to our base model to explain the rationale behind four policy levers that can be employed under self-selection: (a) allowing employees to change the project on which they are working, (b) imposing a condition on the minimum number of employees required to initiate a project, (c) instituting a threshold for selecting projects, (d) introducing a mid-level manager who approves or rejects projects selected by workers, and (e) offering strong incentives to the manager. Our analysis revealed that the efficacy of these policy levers also depends on the ratio between resources and opportunities.

Because our model design choices were driven by parsimony, we abstracted away certain real-world features of self-selection and centralized allocation. Following the remark attributed to Box (Box & Draper, 1987) who said that "all models are wrong, but some are useful", our model alone is not sufficient to understand or predict when self-selection or centralized allocation will be more appropriate. In addition to a stream of opportunities, each task environment will also generate differential returns to increased motivation, creativity, and dedication of employees or different incentive conflicts. While this is an inevitable tradeoff between parsimony and external validity that each modeler must make (Knudsen, Levinthal, & Puranam, 2019; Page, 2018), it is important to highlight these assumptions and discuss potential extensions of our model.

First, by focusing on information processing alone, our model assumed that the incentives of individual workers and the organization were aligned. If there was a difference between the priorities of an employee and the organization, it arose because of evaluation error rather than the worker's opportunism or maliciousness. However, we could push this idea further by considering situations in which workers' preferences and the firm's goals are misaligned. While in this article, we were interested in how structure shaped the choice of projects and allocation decisions from an information processing point of view, workers may seek to join only the projects they find attractive for personal reasons, which could be detrimental to the firm's overall performance. More broadly, while in current paper we focused predominately on selection of employees to projects, examining complementarities between different approaches to other factors, like information provision, incentives systems, or managerial ability (e.g., Puranam et al., 2014; Rivkin & Siggelkow, 2003) would be a natural direction for further investigations.

Second, following the literature on screening, we abstracted away from the effect of increased autonomy on employee motivation and creativity. Studies of employee motivation have found that having control over one's job increases effort and motivation, which in turn may lead one to generate more ideas (Coff, 1997; Deci & Ryan, 2000; Hackman & Oldham, 1976; Lee & Edmondson, 2017). Such an effect could reduce the effects of overcrowding in boss-less organizations by generating more opportunities and it could add further nuance to the results presented in this article.

Third, all projects in our model were similar in type and differed only in terms of payoff; we also assumed that all workers had homogenous skills but may have had different evaluation abilities. This assumption is common in prior models from the screening literature and stems from the primary focus on the role of structure (Knudsen & Levinthal, 2007). One could, however, consider extensions to the model, where workers have idiosyncratic skills. One such extension would be to model an organization composed of two different types of employees, where to complete each project, an organization would need to allocate both types of employees to each project. Another possible extension is an organization composed of two types of employees facing an environment generating two types of independent projects. These avenues for future research could provide further insights and identify additional boundary conditions [Raveendran et al. (2021) have recently made considerable progress in that direction].

Finally, we assumed that each opportunity lasted only one period and that a project would be completed, regardless of the number of employees working on it. Future studies could consider projects unfolding over time that require a certain minimum number of employees to be completed and thus examine the effects that self-selection policies may have on project completion rates. Furthermore, allowing opportunities to last for multiple periods would also allow for project-specific learning such that either (a) payoff uncertainty diminishes as an opportunity matures; (b) payoff uncertainty diminishes only for opportunities actively pursued by an organization; or (c) payoff uncertainty for a given agent diminishes only for an opportunity that agent actively is working on. We analyzed and discussed the effects of these three types of learning in Supporting Information Appendix S3.

6 | CONCLUSION

This article picks up the suggestion that we can use existing theories to study novel forms of organizations (Puranam et al., 2014). We extend the literatures on organization design and project screening by highlighting the importance of the balance between the number of opportunities an environment presents and the number of employees available. Examining the results of an agent-based model, we demonstrate that self-selection performs better when a company is understaffed with respect to the projects it can pursue. Centralized allocation, on the other hand, allows organizations to avoid overcrowding when opportunities are few.

With self-selection becoming popular among startups and established firms alike, further theorizing of the various features of such firms is needed to identify their benefits and shortcomings. By illustrating the importance of the ratio of human capital to opportunities, we hope to contribute to the literature on organizational designs and human capital allocation.

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DATA AVAILABILITY STATEMENT

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