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Anja Prummer
Francesco Squintani

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Anja Prummer† Francesco Squintani‡

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Abstract

Motivated by the recent surge in union drives, we present a theoretical model of the factors that influence unionization. An employee seeking to unionize their workplace assembles organizers to persuade coworkers to vote in favor. If unionization benefits workers, it is more likely to succeed when the organizers are credible. Credibility depends on the organizers not being overly biased and/or bearing significant organizational costs. Our theory explains why grassroots movements, rather than established unions, often succeed in organizing workplaces. Interestingly, the likelihood of successful unionization, when it benefits workers, is non-monotonic with respect to organizational costs. When such costs are low, a firm that opposes unionization and targets organizers may paradoxically increase the chances of success. However, the unionization drive is ineffective if the firm's opposition is sufficiently strong, as this makes organizational costs prohibitive.

Keywords : Unions, Labor Organization, Campaigns
JEL Codes: D71, D83, D23

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†Fachbereich Wirtschaftswissenschaft, Freie Universtät Berlin and Berlin School of Economics, anja.prummer@fu-berlin.de

‡University of Warwick, f.squintani@warwick.ac.uk

> If they lose,[. . .], it's because workers don't feel unions make a difference in their lives. "The UAW and other unions have to do a better job of selling themselves and letting workers see the benefits, [. . .] They haven't been very good at that."[1]

1 Introduction

Efforts to unionize workplaces have gained increased attention in the United States, particularly with the unionization attempts at Amazon warehouses in Bessemer, Alabama, and Staten Island. While the efforts in Bessemer were unsuccessful, the Staten Island warehouse unionized.[2] On average, about 50% of union representation petitions lead to unionization, prompting the question: what factors contribute to these outcomes?

We provide the first formal model of the strategic interactions that take place in unionization campaigns. Our main result is to provide a novel, informational rationale for the widespread consensus that a grassroots initiative originating within the workplace outperforms top-down unionization campaigns led by an established union, when unionization is indeed beneficial for workers.

Further, we identify a non-monotonic relationship between the probability of unionization, when advantageous to workers, and organizational costs. When these costs are low, a firm opposing unionization might unintentionally increase its chances. But if the firm's opposition is strong enough, the unionization campaign fails, as the organizational costs become prohibitive.

We then relate our findings to institutional determinants of unionization. We confirm intuitive results such as temporary and blue collar workers having a lower probability of unionization. Additionally, our model generates novel insights, e.g., that higher uncertainty both about the value of unionization as well as the economic environment improves the odds of unionization.

The model we study represents succinctly the main features of unionization drives. Unionization is a heavily regulated process within the US, designed with an awareness of the obstacles faced by decentralized collective action problems in absence of adequate regulation. We provide an overview of the legal framework that governs the unionization process in Section 3, and tailor our model to this framework.

Unionization starts with one worker, the leader, who assembles an organizational team. Together with the team, she collects signatures for a representation petition proposing

[1] https://www.cnbc.com/2014/02/05/volkswagen-union-vote-chattanooga-tenn-could-be-labor-rally-point.html

[2] For more on the unionization efforts at Amazon and other examples, see Section 5 and Appendix B.

that the workplace is unionized. The leader and her team face significant organizational costs, which include time and monetary expenses, as well as potential repercussions from the firm directed at the organizers. If sufficiently many signatures are collected, the whole workforce is called to vote in favor or against unionization. The leader's aim is to convince workers that unionization is beneficial for them. Workers typically do not actively invest in directly acquiring information about the advantages and disadvantages of unionization. Rather, they make an inference about the value of unionization by observing the characteristics of union organizers, and their campaign.[3] Union organizers can be professionals deployed by an existing union, in which case unionization follows a top down approach. Alternatively, the leader reaches out to co-workers and follows a bottom up approach.

While the leader and organizers campaign in favor of unionization, management counters by hiring consultants who hold public meetings with workers. Additionally, management may attempt to sway workers against unionization, for example, by making promises if they choose not to unionize or by implying negative consequences if they do. Further, management can partially influence the organizational costs of the leader and their team by targeting union organizers. In addition to the unionizers' and the management's campaigns, the outcome of the workers' vote may also be affected by external factors, such as the broader political climate in their location, or the legislation in place.

The model we formulate captures succinctly these strategic interactions. We presume that the leader is sufficiently pro-union to make unionization worthwhile for her. To represent the formation of the organizational team, we stipulate that a leader (she) draws a contact (he), either from a set of co-workers, or a professional organizer. The contact need not be as pro-unionization as the leader. His pro- or anti-union biases are private and unknown to all other workers, including the leader. The contact draws a signal informative about the value of unionization, which can be high or low, meaning that unionization is more likely beneficial or not. Based on the signal, his own personal preferences for unionization, the environment he is facing as well as organizational costs, the contact then decides whether to become an organizer or not.

The decision of the contact to become an organizer or not provides information to workers. Workers do not draw signals themselves, but rely on the decision of the contact to provide them with information on whether unionization benefits them. While a worker knows the organizational cost, they do not see the signal nor the personal biases of the contact. Therefore, the worker needs to disentangle whether the contact made his decision to become an organizer or not based on his signal or his biases. Observing an organizer can

[3] Workers may not have the time to independently assess whether unionization is beneficial for them, but they can easily observe organizational activities and will note their absence.

mean that the contact is strongly pro-union, and even a low signal did not dissuade him from becoming an organizer. Alternatively, the contact may have become an organizer solely due to his high signal.

While the workers do not know the precise views of the contact, they know the range of biases of the pool from which he is drawn. We parameterize the contact's preference with an anti-union bias. So, a higher bias means a lower preference for unionization. We assume that the pool of possible contacts' anti-union biases range from a minimal value equal to the leader's to a *maximal bias* that may represent, for example, how diverse the leader's contacts are in the workplace. If the maximal bias of the contacts is low, then all contacts are pro-union. A higher maximal bias means that the contact can also be skeptical towards unionization. Before deciding how to vote, the workers make an inference about the contact's signal upon observing whether he becomes an organizer or not. The outcome of the vote can also be influenced by the firm's anti-unionization activity, and by random aggregate shocks.

The analysis of our model is undertaken in Section 4. We characterize the different equilibria as a function of the organizational cost and of the maximal bias in the pool of contacts. First, we observe that there always exists an equilibrium in which the contact never becomes an organizer, regardless of the signal he observes. In such an equilibrium the contact's choice to not join the leader is uninformative, and hence does not affect the probability of unionization. The contact never becomes an organizer to avoid bearing organizational costs.

We are interested in informative equilibria. These have the feature that the contact's choice depends on the signal he observes and therefore, conveys information about his signal to the workers. We distinguish between high, intermediate and low organizational costs.

If organizational costs are high, then there are no informative equilibria. The contact never becomes an organizer, regardless of his signal. If a contact is required to incur large cost, then unionization efforts are not worthwhile, even if he learns that unionization is likely beneficial for the workers.

For intermediate organizational costs, a contact with a low signal never becomes an organizer, regardless of his bias. If the maximal bias in the pool of the leader's contacts is below a certain threshold, an informative equilibrium exists where the contact with a high signal becomes organizer regardless of his bias. Such an equilibrium is fully informative. Although workers do not directly observe the contact's signal, they make a precise inference based on the contact's behavior. If he becomes an organizer, they know he received a high signal, and vice versa.

With intermediate costs, a partially informative equilibrium also exists, in which the contact who observes a high signal becomes an organizer if and only if his bias is not too large. If he is more pro-union, he becomes an organizer; if he is more anti-union, he refrains from participating in organizational activities.[4]

Decreasing organizational costs further, consider the case of low costs. Now, not only a contact with a high signal but also one with a low signal may opt in and become an organizer in an informative equilibrium. The precise form taken by the equilibrium depends once again on the maximal bias. If it is sufficiently low, then each possible contact is so pro-union that they become organizers with a high signal. For higher maximal bias, some contacts are sufficiently anti-union to opt out even if observing a high signal.

Interestingly, for sufficiently low organizational costs together with a strongly pro-union pool of contacts, an informative equilibrium ceases to exist. If the contact opts in and becomes an organizer, the workers are unable to make any inference about his signal, and hence about the value of unionization. This is because all contacts are so pro-union that they would prefer to become organizers regardless of their signal. Only uninformative equilibria exist, and whether the contact opts in or out depends only on the workers' beliefs off the equilibrium path. If workers beliefs are independent of the contact's choice, on and off path, then the contact never becomes an organizer, as this entails a cost and does not influence the workers' vote. There may also exist uninformative equilibria in which the contact opts in regardless of his signal. Such an equilibrium is supported by off-path workers beliefs that the signal must be negative if the contact opts out.

After characterizing the equilibria, we determine which maximal bias in the pool of contacts leads to the most informative equilibrium, for the different organizational cost ranges.[5] Higher equilibrium informativeness means the worker is more likely to learn the true value of unionization. If unionization is beneficial, greater informativeness increases its likelihood of success. Conversely, if the value of unionization is negative, higher informativeness lowers the probability of unionization. The model we solve has the characteristic that the equilibrium probability of the two types of error (not unionizing if the value is positive, and unionizing if it is negative) is independent of the maximal bias and organizational costs ex-ante,[6] and therefore informativeness of any equilibrium can be measured with either.

Naturally, the most informative equilibrium occurs when the contact's decision fully

[4] The existence region of such an equilibrium depends on the organizational costs. If costs are higher, then the partially informative equilibrium coexists with the fully informative equilibrium. For lower moderate costs, the partially informative equilibrium exists if and only if the maximal bias is above the existence threshold of the fully informative equilibrium.

[5] We focus on the fully informative equilibrium in the parameter region where it coexists with a partially informative equilibrium.

[6] This is because in our model, the probability of unionization is linear in the expected value of unionization. Hence, by the law of iterated expectation, the ex-ante probability of unionization is the same across all equilibria.

reveals the signal he has observed. With intermediate costs, any maximal bias that leads to this fully informative equilibrium maximizes informativeness. For low costs there is a specific maximal bias that optimizes equilibrium informativeness. This bias ensures that a maximally biased contact remains indifferent about becoming an organizer when observing a high signal.

Consequently, if unionization is beneficial, it is more likely to occur if organizers are sufficiently credible, meaning their decision to campaign conveys information about the value of unionization. Organizers are only credible if they are not too biased towards unionization and/or face sufficiently high organizational costs. However, if unionization does not provide value to workers, lower credibility leads to a higher probability of unionization, as it produces less informative outcomes.

Let us now turn to consider management responses to unionization efforts, specifically their equilibrium effects through the influence on organizers' costs. Our results show that equilibrium informativeness is highest when organizational costs are intermediate. This implies that the relationship between organizational costs and the probability of unionization is non-monotonic. Suppose unionization is valuable to workers: as costs rise from a low level, the likelihood of unionization increases, peaking at intermediate costs, before dropping as costs become too high.

Consequently, the management's attitude towards unionization matters. A firm opposed to unionization can target organizers, raising their costs. If organizational costs are low, then management's opposition improves an organizer's credibility and in turn, the chances of successful organization. This implies that targeting organizers can actually backfire. However, if management obstructs organizational activities aggressively, then beneficial unionization can only succeed under sufficient political and legal protection.

Our result challenges the established narrative that unionization campaigns fail solely due to management's obstruction. Some level of opposition may actually support unionization, as organizers need to face non-negligible costs to be credible and convince workers, if unionization is beneficial. At the same time, organizers need to have sufficiently balanced views on unionization to be credible, emphasizing the importance of their characteristics in determining the outcomes of unionization drives.

Section 5 applies our results to explain why a bottom-up approach is generally more successful than a top-down approach, when unionization benefits workers. As a matter of fact, unions on average deliver a wage premium, and are thus often beneficial to workers (Farber, Herbst, Kuziemko, and Naidu 2021).

Ostensibly, professional union organizers favor unionization more strongly than regular workers. Moreover, a professional's organizational costs are limited compared to a regular worker.[7] Therefore, professional organizers face lower organizational costs and display a stronger pro-union bias, reducing their credibility. It follows that if unionization is beneficial, it is more likely to occur with an organizational team consisting of co-workers due to their higher credibility—-conditional on political, economic, and other environmental factors.

Established unions recognize the value of adopting a bottom-up approach and the credibility it brings, which is reflected in their practice of 'salting.' Salting involves sending professional organizers to work at firms they aim to unionize, without disclosing their pro-union stance, while quietly promoting unionization within the workplace. This practice suggests that unions are aware of the importance of not appearing overly pro-union, aiming for a perceived bias that is not too strong.

Further, we relate our findings to unionization campaigns in the U.S. that have been widely covered in the media, evaluating their outcomes through the lens of our model. Specifically, we examine unionization efforts at two Amazon warehouses—one in Staten Island and the other in Alabama. Despite facing strong resistance from Amazon in both cases, the grassroots approach in Staten Island succeeded, while the top-down strategy in Alabama did not.

These cases underscore that management's opposition is not the only factor influencing the outcome of a union drive. We support this claim by citing instances where unionization did not take place, even in companies supportive of unionization. In these cases, workers were not convinced of the benefits, emphasizing the importance of credible organizers, as predicted by our model.

The final part of the analysis (Section 6) investigates how the equilibrium probability of unionization (in the case it benefits workers) changes as a function of the model parameters. We assess how factors such as management practices, economic conditions, the legal framework, and workforce characteristics influence unionization.

As is intuitive, higher unionization rates are observed in workplaces with more pro-union workers. This result is in line with the evidence that white-collar workers, who are usually more pro-union, are also more likely to unionize than blue-collar workers. The firm's response in the event of unionization also impacts outcomes. Stronger pushback against workers significantly reduces the likelihood of unionization. Further, an increase in the adversity to unionization in the economic and legal environment lowers the likelihood of unionization in moderate-cost cases.

It is less obvious to assess the effect of higher uncertainty in the economic and legal environment, holding the expected value fixed. In moderate-cost scenarios, it turns out

[7] A regular worker may face repercussions at the workplace due to his campaign efforts, which is not the case for a professional organizer.

to increase the unionization rate, when the baseline rate of unionization is low. If it is high, it decreases it.

Further, unionization is more likely to succeed when there is higher uncertainty about its value, holding the expected value fixed. This result is driven by the greater potential upside of unionization, which is likely correctly assessed in the fully informative equilibrium of moderate cost settings. Unions that are less proactive in their campaigns may be perceived as offering lower upside potential, thereby reducing their chances of fostering unionization.[8]

2 Related Literature

We present a formal model of the strategic interactions that occur during unionization campaigns. To our knowledge, there is no existing theoretical work specifically addressing union formation.

Our study contributes to the literature on the determinants of the success of social movements. Olson (1965) postulates that collective action suffers from free-rider problems, and unions form when they successfully overcome these issues. One solution to this coordination failure involves early participants in the social movement, whose presence encourages others to join. This dynamic has been explored in various contexts, including protests and revolutions (see Shadmehr 2015; Shadmehr and Bernhardt 2019; Tarrow 2022). One reason early participants, or leaders, play a critical role in social movements is their access to superior information (Hermalin 1998; Ginkel and Smith 1999; Loeper, Steiner, and Stewart 2014). Additionally, these models often suggest that early participants tend to be more extreme in their views (Kuran 1991; Lohmann 1994a,b; Kricheli, Livne, and Magaloni 2011).

In contrast, we focus on unionization, a highly regulated process in the U.S. designed to address the challenges posed by decentralized collective action in the absence of sufficient regulation. This regulatory framework shapes incentives and defines the unionization process, effectively mitigating the collective action problem. Similar to findings in the protest literature, we assume that organizers—often early participants—possess better information. However, unlike protest movements, our results indicate that moderate organizers, rather than extreme ones, play a pivotal role in effectively transmitting information.[9]

[8] In the low cost case, the effect of uncertainty in the value of unionization or the economic and legal environment are ambiguous.

[9] Our findings also differ from those of cheap talk models, which suggest that it is beneficial to first persuade agents with more aligned interests, who in turn influence those further from the original sender. In such models, it is optimal to initially target the most extreme agents, unlike our costly signaling model, where moderate agents play the central role (Caillaud and Tirole (2007); Awad (2020); Schnakenberg (2017)).

Earlier theoretical work on unions presume that they exist without examining how they are actually formed. For instance, Galbraith (1954) views unions as a countervailing force to management power. This notion has been reflected in theoretical work on wage bargaining and strikes as in Ashenfelter and Johnson (1969). The role of unions on wage setting, but also giving workers a voice has been widely explored since the seminal work by Freeman and Medoff (1984), most recently by Harju, Jäger, and Schoefer (2021). Our study, which explores the selection process for worker representation, complements research focused on the selection into union membership as explored in Naylor and Cripps (1993). Even though they also take the union as given, they discuss the conditions for which unions unravel. Instead, our model shows how a union can be (re-)established.

Understanding this is particularly relevant for the US where private-sector bargaining coverage has been eroded (Farber et al. 2021). This is despite US workers being often favorable to union representation (Kochan, Yang, Kimball, and Kelly 2019, Hertel-Fernandez, Kimball, and Kochan 2022). Even though unionization is sought, successful unionization is tied to lower profits and establishment closures, especially when management opposed unionization (Lee and Mas 2012, Frandsen 2021, Wang and Young 2022).[10]

The idea of different types of workers touches on the characteristics of union members, organizers and leaders. Boudreau, Macchiavello, Minni, and Tanaka (2021) investigate empirically the role of union organizers in Myanmar's garment sector. Union organization in these workshops is pursued by employees and corresponds to our bottom up approach. They show that convincing workers is instrumental for mobilization– in line with our theory.

Further, our work aims to improve our understanding of organizations in political economy. While there is a vast literature on the organizational structure of firms starting with Coase (1937), and of parties (e.g. Levy 2007, Morelli 2004), the study of the other many organizations that populate strategic interactions in political economy is only in its infancy (see, for instance, the discussion in Patty 2024). In this context, our work introduces a novel concept of leadership. Prior research has explored leading by example (Hermalin, 1998), leaders' judgment and communication (Dewan and Myatt, 2007, 2008), and the competence-loyalty trade-off (Egorov and Sonin, 2011). We emphasize that leadership success often depends on the leader's connections, echoing Machiavelli (1532) Chapter 22. In our study, the leader needs to rely on organizers that lend her credibility, and hence the attributes of the organizational team play a pivotal role in unionization success.

[10]One reason for lower profits is provided by the theory of Levine, Mattozzi, and Modica (2023). They distinguish between workers and shirkers and provide conditions under which labor associations protect shirkers.

3 An Organizational Theory of Unionization

The Unionization Process The unionization process is governed by regulations that leaders, union organizers, and management must follow. [11] These rules are enforced by the National Labor Relations Board (NLRB). Unionization typically begins with a 'disgruntled' employee, the leader, who is dissatisfied with working conditions and initiates a campaign to unionize her workplace. She contacts an established union and, with their help, files a petition with the NLRB. From there, the leader may choose to hand over the management of the campaign to the established union, employing a top-down approach. Alternatively, she might opt to collaborate with colleagues and friends to form an organizational team, taking a bottom-up approach to the unionization effort.

Independently of whether the union campaign is run as a top down or bottom up approach, the following steps will be taken:

1. The leader as well as organizers try to convince as many workers as possible that unionization is beneficial for them, through a unionization campaign. The campaign consists of calling workers, producing leaflets, but also entails social events.[12]
2. In many instances, management hires consultants to discourage unionization efforts. They might also suggest the possibility of closing the bargaining unit or take action against the organizing team. Management's response is usually known before the organizational decision takes place.
3. Organizers require at least 30% of workers within the bargaining unit to sign cards.[13] Once they collected the necessary signatures, the organizers return to the NLRB, which holds a vote on unionization.
4. If a majority of employees in the bargaining unit vote in favor of unionization, then the workplace is unionized.

In a unionized bargaining unit, the union negotiates with management on wages. Additionally, the union influences working conditions by addressing issues such as scheduling and raising workplace concerns with management on behalf of the workers.

The Model: Actions and Timing Our model focuses on the unionization campaign. A leader campaigns for unionization, potentially together with an organizer. We model bringing an organizer on board simply by stipulating that the leader draws a contact from

[11] Unionization includes broader possibilities, such as solidarity and minority unions, which provide employee representation without wage bargaining and are not registered with the NLRB. This discussion focuses on the most common processes.

[12] The unionization campaign resembles a political campaign in that it generates talking points, but it cannot inform workers exactly what will happen after unionization, as this is subject to considerable uncertainty.

[13] Workers need to show first that they are interested in unionization and they do so by signing union authorization cards.

a pool of potential co-organizers. The contact can either be a co-worker or a professional union organizer. If the contact decides to become an organizer, he bears a cost c.[14] We denote the contact's decision by $x \in \{0, 1\}$, where $x = 1$ means that the contact opts to be an organizer.

Before deciding whether to become an organizer, the contact tries to figure out whether unionization is beneficial for workers. We say he observes a signal $s \in \{0, 1\}$, which is informative of the value of unionization $v \in \{v_0, v_1\}$. The unionization value can be positive or negative, with $v_1 > 0 > v_0$. For simplicity, we assume that the values v_0 and v_1 are equally likely. The precision of signal s is $p > \frac{1}{2}$.[15]

While the leader, and possibly her contact, campaign for unionization, management may attempt to obstruct these efforts through pressure or promises aimed at influencing the entire workplace.[16] We denote the degree of obstruction, or pushback, as d. To simplify the analysis, we do not model how the firm selects d, treating it instead as a fixed parameter. Additionally, we assume that the firm's policies which determine d are decided before the contact's choice x and are not contingent on x. We also allow for the possibility that management could support unionization, in which case $d < 0$, though in the typical case of management being opposed, $d > 0$.

At some pre-specified date, the whole workforce (which we model as a continuum of workers) is called to vote on whether to unionize the worksite or not. Workers base their beliefs about the value of unionization v on the contact's choice x, which may or may not be informative of the signal s, in equilibrium. The outcome of the vote is uncertain at the time at which the unionization campaign takes place, i.e., we model voting as "probabilistic."[17] Specifically, we say that there is a common shock δ, uniformly distributed between $\underline{\delta} < 0 < \overline{\delta}$, that influences every worker's voting preferences about unionization. The shock δ can be a political, economic or environmental shock (or a combination of all three), and takes place after the contact chooses x.

To sum up, a worker's vote depends on their beliefs about the unionization value v and the common shock δ. Additionally, each worker w has a personal preference for unionization, represented by a bias b_w, which is private information. While v can be interpreted as the objective value of unionization, the subjective value for an individual worker is given by b_w. A more negative (i.e., more left-leaning) bias b_w indicates a stronger preference for unionization. The workers' biases b_w are uniformly distributed between $\underline{b}$ and $\overline{b}$, $b_w \sim U[\underline{b}, \overline{b}]$, where $\underline{b} < 0 < \overline{b}$.

[14] If the organizer is sent by the union, then it may be the union making the organization decision on behalf of the contact, which still comes at a cost.

[15] Formally: $P(s = l | v_l) = p$, for $l = 0, 1$.

[16] For example, management might warn of potential workplace closure if it unionizes or offer rewards to discourage unionization.

[17] See Wittman (1983) and Persson and Tabellini (2002).

The leader is strongly pro-union and hence we set her bias at $\underline{b}$. The contact's bias b is uniformly distributed between $\underline{b}$ and ω, $b \sim U[\underline{b}, \omega]$, where $\omega \leq \bar{b}$ to capture that contacts may be more pro unionization than workers. Implicit in the construction is the assumption that the leader has access to potential co-organizers that are strongly pro-union, and whose bias b is close to $\underline{b}$. The "maximal (anti-union) bias" ω describes the breadth and diversity of views on unions, in the pool of potential contacts accessible to the leader.

We summarize the timing of our model of unionization as follows:

1. Management decides on the level of obstruction d in case unionization occurs.
2. The leader starts a unionization campaign and draws a contact from the pool of potential co-organizers.
3. The contact observes a signal s about the value of unionization v, and then makes his choice x to become an organizer.
4. The common shock δ is realized, and workers vote in favor or against unionization.

The Model: Payoffs and Equilibrium Concept If the contact becomes an organizer, his payoff is as follows:

$$\mathbb{E}[v|s] - d - c \qquad \text{if unionization succeeds,} \tag{1}$$
$$b + \mathbb{E}[\delta] - c \qquad \text{if unionization fails.} \tag{2}$$

An organizer's payoff if unionization succeeds depends on the expected value $E[v|s]$ of unionization conditional on the signal s, and on the level of obstruction imposed by management d in case of unionization. Further, there is a cost of becoming an organizer, denoted by $c > 0$. If unionization fails, then the payoff to the organizer is his bias b. This is positive if the contact is anti-union, as he prefers the current status quo, and negative if the contact is pro-union. Moreover, the payoff if unionization fails depends on the overall economic and political environment. If the environment in expectation is favorable towards unionization then $E[\delta]$ is negative, while an adverse environment means $E[\delta] > 0$.

If the contact does not become an organizer, then his payoffs are given by

$$\mathbb{E}[v|s] - d \qquad \text{if unionization succeeds,} \tag{3}$$
$$b + \mathbb{E}[\delta] \qquad \text{if unionization fails.} \tag{4}$$

They key difference between the payoff after becoming an organizer versus opting out is the organizational cost which only accrues if the contact opts in.

We now turn to the workers' payoffs. Worker w obtains a payoff $E_w[v|x] - d$ if unionization occurs and $b_w + \delta$ if unionization does not occur. The key difference from the contact's payoff is that workers do not observe a signal about the value of unionization; they only observe whether the contact decides to become an organizer. Their expectation of the value of unionization, denoted by w, is thus based on the contact's decision x.

We solve for weak perfect Bayesian equilibria as is commonly done. Before solving our model, we briefly discuss the difference between a top-down and a bottom-up approach.

Top Down vs. Bottom Up We capture the difference between a top-down and a bottom-up approach through the maximal bias ω and the organizational cost c. Organizational costs are lower, if not negligible, for professional union organizers. These include the time, effort, and financial resources required for unionization, as well as potential management retaliation. Unlike professionals, worker-recruited organizers often dedicate personal time and resources to these efforts without compensation.

Additionally, worker-recruited organizers face heightened risks, as management frequently targets them with actions like termination—a threat external professionals do not encounter. For employees, organizing carries significant personal stakes, including the potential loss of livelihood. This illustrates the stark contrast in costs and risks between professional organizers and those drawn from within the workforce.

The second major difference lies in attitudes toward unionization. Professional organizers, employed by unions, typically exhibit a more pronounced pro-union stance. Their work often entails modest compensation, extensive travel, and occasional hostility from anti-union workers during campaigns. In our model, this translates to a lower maximal bias ω for professional organizers. However, this does not imply that co-worker contacts lack pro-union sentiment; rather, it reflects the possibility of encountering a contact who is more anti-union than any professional organizer.

Our approach abstracts from other potential differences between a professional organizer and a co-worker. For example, a professional organizer may remain unaffected by management's pushback on the workplace (d) or the broader environment ($\mathbb{E}[\delta]$). This simplification would not alter the worker's process of updating their beliefs about the value of unionization. Furthermore, if we simply assumed that the professional organizer always joined the leader in the unionization campaign, regardless of his personal beliefs on the value of unionization, then the strategic interactions would become more straightforward, and our conclusions would hold a fortiori. We explore alternative assumptions about professional organizers and their comparative outcomes in Supplementary Appendix A.

4 Equilibrium Analysis and Informativeness Ranking

We solve our model by proceeding backwards, and first consider the workers' vote regarding unionization.

The Workers' Vote A worker w is in favor of unionization if and only if

$$\mathbb{E}_w[v|x] - d > b_w + \delta \qquad \Leftrightarrow \qquad \mathbb{E}_w[v|x] - d - b_w - \delta > 0.$$

For a worker w to vote for unionization, it must be that the expected value of unionization $\mathbb{E}_w[v|x]$, based on the the organization decision x of the contact, compensates for the firm's level of obstruction d, the realized environment δ, and the worker's personal bias b_w. Let $\hat{b}_w = \mathbb{E}_w[v|x] - d - \delta$ be the bias for a worker to be indifferent between voting in favor or against unionization.

Denote by $\pi_u(x)$ the share of workers in favor of unionization, conditional on the choice x of the contact:

$$\pi_u(x) = \begin{cases} 0 & \text{if } \hat{b}_w < \underline{b} \\ \frac{\mathbb{E}_w[v|x] - d - \delta - \underline{b}}{\overline{b} - \underline{b}} & \text{if } \hat{b}_w \in (\underline{b}, \overline{b}) \\ 1 & \text{if } \hat{b}_w > \overline{b}. \end{cases}$$

Unionization is successful if a majority of workers decides in favor of it. This yields the probability of unionization:

$$P(u|x) = P\left(\pi_u(x) > \frac{1}{2}\right) = \frac{\mathbb{E}_w[v|x] - d - \mathbb{E}[b] - \underline{\delta}}{\overline{\delta} - \underline{\delta}}. \tag{5}$$

As we require this to be a probability, we ensure that $P(u|x)$ lies between zero and one by imposing appropriate restrictions on $\underline{\delta}$, $\overline{\delta}$ and $\mathbb{E}[b]$, which we detail in Appendix A.

The Contact's Choice At the heart of our problem is the decision of the contact, whether to become an organizer or not. The contact opts in if and only if

$$\begin{aligned} &P(u|x=1)\left(\mathbb{E}[v|s] - d - c\right) + \left(1 - P(u|x=1)\right)\left(b + \mathbb{E}[\delta] - c\right) \\ &\qquad > P(u|x=0)\left(\mathbb{E}[v|s] - d\right) + \left(1 - P(u|x=0)\right)\left(b + \mathbb{E}[\delta]\right). \end{aligned} \tag{6}$$

This is equivalent to

$$\mathbb{E}[v|s] - d - b - \mathbb{E}[\delta] \geq \frac{c}{P(u|x=1) - P(u|x=0)}. \tag{7}$$

The right-hand side of inequality (7) is constant in b, while the left-hand side is decreasing. Hence, in equilibrium, there must be a cut off b_s such that a contact with signal s and bias $b < b_s$ becomes an organizer, while he does not when $b > b_s$. We will write $b_s = \underline{b}$ to mean a contact with signal s never chooses to become an organizer, regardless of his bias b. In the same spirit, $b_s = \omega$ means that the drawn contact always becomes an organizer with signal s. Because $\mathbb{E}[v|s = 1] > \mathbb{E}[v|s = 0]$, it cannot be the case that $b_0 > b_1$ in equilibrium. Whether $b_0 < b_1$ or $b_0 = b_1$ depends on whether the equilibrium is informative or not, as we detail later in the analysis.

For expositional reasons, it is useful to define the following two expressions,

$$k_0 \equiv \mathbb{E}[v|s = 0] - d - \mathbb{E}[\delta] \qquad \text{and} \qquad k_1 \equiv \mathbb{E}[v|s = 1] - d - \mathbb{E}[\delta].$$

The term k_0 represents the total expected payoff of unionization following a low signal. It accounts for the management's response to unionization (d) and the expected common shock ($\mathbb{E}[\delta]$). Similarly, k_1 denotes the expected payoff of unionization following a high signal.

The difference between k_1 and k_0 is given by

$$\tilde{v} \equiv k_1 - k_0 = (2p - 1)(v_1 - v_0).$$

The term $\tilde{v}$ represents the difference in the expected value of unionization after receiving signals $s = 1$ and $s = 0$. This difference increases with the precision of the signal and the magnitude of the gap $v_1 - v_0$ between the positive and negative values of unionization. Thus, $\tilde{v}$ can be interpreted as a measure of the signal value. Obtaining a signal is more advantageous when it is more informative and when the difference $v_1 - v_0$ is greater.

To avoid considering too many cases in the analysis, we operate under the following assumption:[18]

Assumption 1. *Let* $\frac{v_0+v_1}{2} - d - \underline{b} - E[\delta] > 0$.

This assumption ensures that the most pro-union contact, whose bias is $\underline{b}$, would still support unionization even without any information about its value, based on the expectation $\mathbb{E}[v] = \frac{v_0+v_1}{2}$. Substantively, it identifies an upper bound, $\overline{d} \equiv \frac{v_0+v_1}{2} - \underline{b} - E[\delta]$, on how much a firm can push back against unionization efforts, given the legal protections in place.[19]

[18] If this assumption does not hold, then certain types of the informative equilibria we identify in the analysis cease to exist.

[19] One immediate consequence is that if a firm could adopt a degree of obstruction $d > \overline{d}$, only a contact with signal $s = 1$ would become an organizer.

Equilibrium Characterization The main focus of our analysis are the informative equilibria, where workers are able to draw conclusions about the organizer's signal.

Definition 1 (Informative Equilibrium)**.** *An equilibrium* (b_0, b_1) *is informative if and only if* $b_0 < b_1$*, so that a worker can make an inference about the value of unionization* v *based on the decision* x *of the contact.*

Before calculating the informative equilibria, we briefly describe uninformative ones. The next result shows that, for any parameter values, there always exists an equilibrium in our model in which the contact never chooses to become an organizer, regardless of his signal s and bias b. An uninformative equilibrium in which the contact always becomes an organizer exists only when the organizational costs c are sufficiently low, and the expected payoff after a low signal exceeds the maximal bias, i.e.,$k_0 - \omega$ is positive.

Proposition 1 (Uninformative Equilibria)**.** *For any parameter values, there always exists an equilibrium with* $b_0 = b_1 = \underline{b}$*: the contact chooses* $x = 0$ *and never becomes an organizer regardless of his signal* s *and bias* b*. An equilibrium with* $b_0 = b_1 = \omega$*, exists if and only if* $c \leq \frac{1}{2}\tilde{v}\frac{k_0 - \omega}{\bar{\delta} - \underline{\delta}}$*: the contact chooses* $x = 1$ *and always becomes an organizer regardless of* s *and* b*.*

The existence of an equilibrium in which the contact always chooses $x = 0$ regardless of his signal s and bias b is intuitive. In such an equilibrium, the workers cannot update beliefs about the signal s and hence on the unionization value v upon observing $x = 0$. Such an equilibrium is supported by off path workers' beliefs that do not update about s also upon observing $x = 1$. With such off path beliefs, the contact's choice x has no effect on the unionization probability, and hence he chooses to not become an organizer to avoid paying the organizational cost c.

The existence of an equilibrium where the contact always chooses $x = 1$ requires that the off path workers' beliefs on signal s upon observing $x = 0$ are sufficiently pessimistic to make the contact chooses $x = 1$ regardless of his bias b and signal s. As a result, the workers do not update their beliefs on s, on the basis of the contact's choice. In this equilibrium, the contact chooses $x = 1$ even when his signal $s = 0$ and he is maximally biased against unions, $b = \omega$, meaning that such an equilibrium only exists when c is very small, and $k_0 > \omega$.

We now turn to the main focus of the equilibrium analysis, the characterization of informative equilibria. We demonstrate the importance of organizational costs in our first result. No informative equilibrium exists for high organizational costs c, because even a contact with the strongest pro-union bias, $b = \underline{b}$, and high signal $s = 1$, is not willing to pay the cost c to become an organizer and increase the unionization probability.

Proposition 2 (High Organizational Costs)**.** *If $c > \tilde{v}\frac{k_1-\underline{b}}{\bar{\delta}-\underline{\delta}}$, then there exists no informative equilibrium. In equilibrium, the contact chooses $x = 0$ and never becomes an organizer regardless of his signal s and bias b.*

If the cost of becoming an organizer is too high, then not even the most pro-union contact with signal $s = 1$ opts in. High costs imply that organizers are required to spend significant time on organizational efforts, which could be burdensome, or that the firm may penalize organizers, potentially leading to a less favorable work environment or, in extreme cases, job loss. Our result suggests that if management has enough means to discourage union organizers, it will be able to hinder unionization efforts.

We turn to the case where organizational costs are not too high, $c < \tilde{v}\frac{k_1-\underline{b}}{\bar{\delta}-\underline{\delta}}$. We ask whether there always exist informative equilibria and with what characteristics. Based on the arguments presented after inequality (7), an informative equilibrium must take one of four possible forms, depending on whether or not the thresholds b_0 and b_1 are on the interior of bias set $[\underline{b}, \omega]$.

We refer to an equilibrium (b_0, b_1) as "fully-informative" when $b_0 = \underline{b}$ and $b_1 = \omega$. In this equilibrium, the contact's choice x fully reveals the signal s he observed, because $x = s$ regardless of the contact's bias b.

The equilibrium (b_0, b_1) is defined as "interior" if $\underline{b} < b_0 < b_1 < \omega$. In this equilibrium, neither of the contact's choices x is fully informative of his signal s. A pro-union contact with bias $b < b_0$ becomes an organizer even if his signal is $s = 0$, and an anti-union contact with bias $b > b_1$ opts out even if his signal is $s = 1$.

We denote by "corner equilibria," the two cases where only one of the cutoffs b_0, b_1 is in the interior of $[\underline{b}, \omega]$ and the other one is not. Specifically, a "b_0-corner equilibrium" (b_0, b_1) is such that $\underline{b} = b_0 < b_1 < \omega$. In this equilibrium, a contact with signal $s = 0$ never becomes an organizers regardless of his bias b. A contact with signal $s = 1$ and low bias opts in, while he does not if his bias is high.

Similarly, a "b_1-corner equilibrium" (b_0, b_1) has the property that $\underline{b} < b_0 < b_1 = \omega$. In this equilibrium, a contact with signal $s = 1$ chooses to opt in independently of his bias, whereas a contact with signal $s = 0$ becomes an organizer if and only if his bias b is not too high.

To limit the number of cases considered in the analysis, we make the following assumption, which ensures that $\frac{1}{2}\tilde{v}(k_1 - \underline{b}) > \tilde{v}(k_0 - \underline{b})$.[20]

Assumption 2. *Let $\tilde{v} > k_0 - \underline{b}$.*

This assumption requires that the signal's value $\tilde{v}$ is sufficiently high compared to the payoff of the most pro-union contact who observes signal $s = 0$. It holds as long as the

[20]Without this assumption, the second case outlined in Proposition 3 no longer applies.

most pro-union contact does not have an excessively strong bias in favor of unions, i.e., as long as $\underline{b}$ is not too negative.

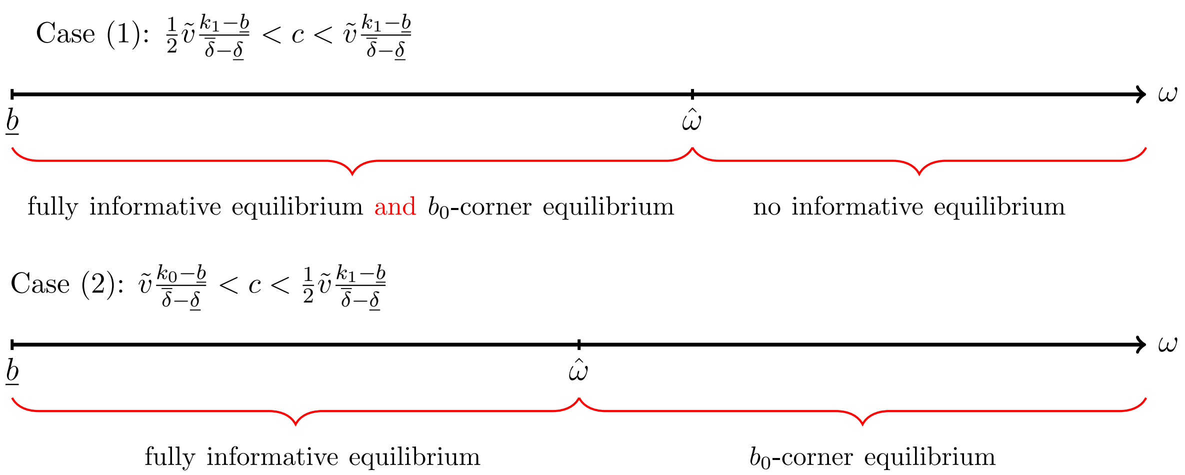
Adopting this assumption, we now proceed to describe the informative equilibria for the "intermediate" cost case in which $\tilde{v}\frac{k_0-\underline{b}}{\overline{\delta}-\underline{\delta}} < c < \tilde{v}\frac{k_1-\underline{b}}{\overline{\delta}-\underline{\delta}}$. We use the following threshold in the maximal bias space: $\hat{\omega} \equiv k_1 - \frac{c}{\tilde{v}}(\overline{\delta}-\underline{\delta})$. A contact with signal $s=1$ and bias $\hat{\omega}$ is indifferent between becoming an organizer or not, given that a contact with signal $s=0$ never becomes an organizer.

Proposition 3 (Intermediate Costs)**.** *Let Assumptions* (1) *and* (2) *hold,*

1. *for* $\frac{1}{2}\tilde{v}\frac{k_1-\underline{b}}{\overline{\delta}-\underline{\delta}} < c < \tilde{v}\frac{k_1-\underline{b}}{\overline{\delta}-\underline{\delta}}$, *there exists a fully informative equilibrium and a* b_0*-corner equilibrium if* $\omega \leq \hat{\omega}$, *and no informative equilibria if* $\omega > \hat{\omega}$;
2. *for* $\tilde{v}\frac{k_0-\underline{b}}{\overline{\delta}-\underline{\delta}} < c < \frac{1}{2}\tilde{v}\frac{k_1-\underline{b}}{\overline{\delta}-\underline{\delta}}$, *there always exists a unique informative equilibrium; it is fully informative if* $\omega < \hat{\omega}$ *and a* b_0*-corner equilibrium if* $\omega > \hat{\omega}$.

We provide an overview of the result in Figure 1. With intermediate organizational costs, $\tilde{v}\frac{k_0-\underline{b}}{\overline{\delta}-\underline{\delta}} < c < \tilde{v}\frac{k_1-\underline{b}}{\overline{\delta}-\underline{\delta}}$, and low maximal bias, $\omega < \hat{\omega}$, there exists a fully informative equilibrium. The contact becomes an organizer, $x=1$, if and only if he observes a signal $s=1$. Hence, his choice x is fully informative about s for the voters. The impact of his choice $x=1$ on the relative unionization probability, $P(u|x=1)-P(u|x=0)$ is maximal. It is interesting that such an equilibrium exists for organization costs c that are not too low. In fact, too low costs would not match the high benefit for becoming an organizer, i.e., the high impact of the contact's choice $x=1$ on the unionization probability. Additionally, existence of a fully informative equilibrium also requires that the maximal bias is not too high, $\omega < \hat{\omega}$. The reason is that contacts with $b > \hat{\omega}$ are so anti-union that they would choose to opt out even when observing signal $s=1$.

Figure 1: Intermediate Costs



Together with the fully informative equilibrium, a b_0-corner equilibrium exists. Specifically, when costs are such that $\tilde{v}\frac{k_0-\underline{b}}{\overline{\delta}-\underline{\delta}} < c < \frac{1}{2}\tilde{v}\frac{k_1-\underline{b}}{\overline{\delta}-\underline{\delta}}$, the b_0-corner equilibrium exists for large maximal biases, $\omega > \hat{\omega}$, complementary to the existence range of the fully informative equilibrium. As a consequence, an informative equilibrium always exists. In this b_0-corner equilibrium, a contact with signal $s = 0$ never becomes an organizer, independently of his bias b, while a contact with signal $s = 1$ opts in if and only if his anti-union bias b is not too high. Interestingly, when costs are higher, $\frac{1}{2}\tilde{v}\frac{k_1 - \underline{b}}{\bar{\delta} - \underline{\delta}} < c < \tilde{v}\frac{k_1 - \underline{b}}{\bar{\delta} - \underline{\delta}}$, the b_0-corner equilibrium exists for the same existence range as the fully informative equilibrium, for $\omega < \hat{\omega}$. So, there exist two informative equilibria for $\omega < \hat{\omega}$, and none for $\omega > \hat{\omega}$.[21]

Proposition 3 highlights that intermediate organizational costs can lead to a fully informative equilibrium. Although workers cannot directly observe the contact's signal s, his choice x perfectly reveals it to them.

Next, we consider the low-cost scenario, where $c < \tilde{v}\frac{k_0 - \underline{b}}{\bar{\delta} - \underline{\delta}}$.[22] The type of equilibrium is determined by specific thresholds for ω: $\tilde{\omega}$, $\tilde{\omega}_0$, and $\tilde{\omega}_1$. The threshold $\tilde{\omega}$ represents the smallest value of ω such that the equilibrium value of b_0 is below ω, given that $b_1 = \omega$. Simply put, an informative equilibrium cannot exist if $\omega < \tilde{\omega}$. The threshold $\tilde{\omega}_0$ represents the largest ω where b_0 is interior, meaning $\underline{b} < b_0 < \omega$, assuming b_1 is also interior. Similarly, $\tilde{\omega}_1$ is the smallest ω where b_1 is interior, provided that b_0 is interior as well.[23]

Proposition 4 (Low Costs)**.** *Let Assumptions (1) and (2) hold,*

1. *For $\frac{1}{2}\tilde{v}\frac{k_0 - \underline{b}}{\bar{\delta} - \underline{\delta}} \leq c \leq \tilde{v}\frac{k_0 - \underline{b}}{\bar{\delta} - \underline{\delta}}$, there is a b_1-corner equilibrium if $\omega \leq \tilde{\omega}_1$, an interior equilibrium if $\tilde{\omega}_1 < \omega < \tilde{\omega}_0$, and a b_0-corner equilibrium if $\tilde{\omega}_0 \leq \omega$;*
2. *For $c < \frac{1}{2}\tilde{v}\frac{k_0 - \underline{b}}{\bar{\delta} - \underline{\delta}}$, no informative equilibrium exists for $\omega < \tilde{\omega}$; there is a b_1-corner equilibrium if $\tilde{\omega} < \omega \leq \tilde{\omega}_1$, and an interior equilibrium if $\tilde{\omega}_1 < \omega$.*

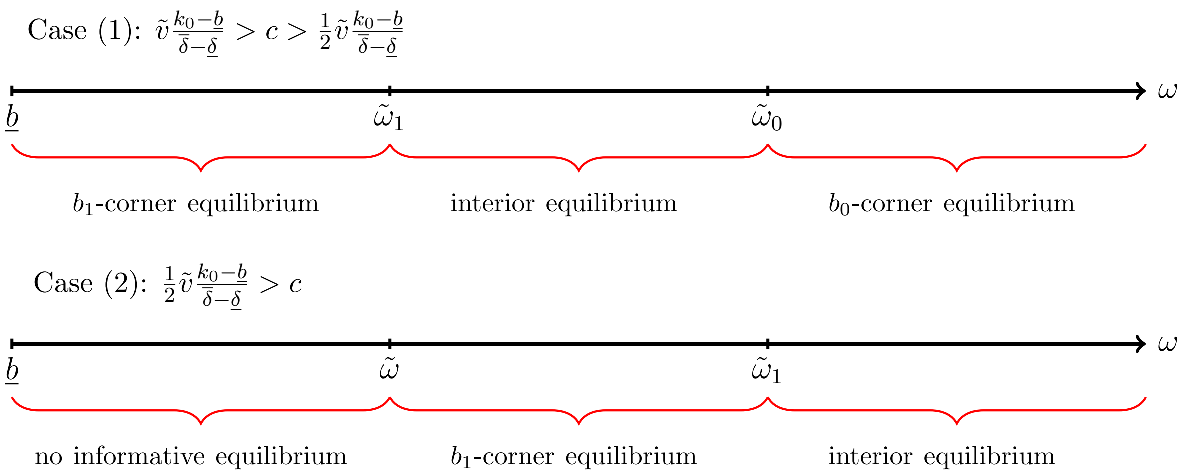
The result is summarized in Figure 2. If costs are below $\frac{1}{2}\tilde{v}\frac{k_0 - \underline{b}}{\bar{\delta} - \underline{\delta}}$, whether an informative equilibrium exists or not depends on whether the maximal bias ω is above or below $\tilde{\omega}$. However, this does not imply that if $\omega < \tilde{\omega}$, then the contact will never become an organizer in equilibrium. As outlined in Proposition 1, for $c \leq \frac{1}{2}\tilde{v}\frac{k_0 - \omega}{\bar{\delta} - \underline{\delta}}$, there exists an uninformative equilibrium in which the contact always chooses to be an organizer.

[21] That there may exists multiple informative equilibria follows from the characteristics of the right-hand side of inequality (7). We show in Appendix B that it is decreasing in b_1 (and, when $b_0 = \underline{b}$, linear in b_1). As a result, it may be that there is an interior $b_1 < \omega$ that satisfies inequality (7) as an equality, and at the same time that inequality (7) is satisfied as a strict inequality for $b_1 = \omega$. When this is the case, a b_0-corner equilibrium with $\underline{b} = b_0 < b_1 < \omega$ and a fully informative equilibrium with $\underline{b} = b_0 < b_1 = \omega$ coexist.

[22] Without Assumption 2, which ensures $\frac{1}{2}\tilde{v}(k_1 - \underline{b}) > \tilde{v}(k_0 - \underline{b})$, the condition for the low-cost case would be $c < \min\left\{\tilde{v}\frac{k_0 - \underline{b}}{\bar{\delta} - \underline{\delta}}, \frac{1}{2}\tilde{v}\frac{k_1 - \underline{b}}{\bar{\delta} - \underline{\delta}}\right\}$.

[23] The explicit formulas of of these thresholds is not overly informative, and hence it is relegated to Appendix B.

Figure 2: Low Cost Thresholds



In every informative equilibrium for $c < \frac{1}{2}\tilde{v}\frac{k_0-\underline{b}}{\bar{\delta}-\underline{\delta}}$, the threshold b_0 lies in the interior of the set $[\underline{b}, \omega]$. Hence, the choice x of a contact with signal $s = 0$ depends on his bias b. He becomes an organizer if and only if he is sufficiently pro-union $b < b_0$. The equilibrium choice of a contact with $s = 1$ depends on the maximal bias ω. If the maximal bias is low, $\omega \leq \tilde{\omega}_1$, then $b_1 = \omega$ and the contact contact always opts in, regardless of his bias b. If the maximal bias ω is larger than $\tilde{\omega}_1$, then the cutoff b_1 is interior, and the contact becomes an organizer if and only if he is sufficiently pro-union, $b < b_1$.

Now, suppose that costs are higher, $c > \frac{1}{2}\tilde{v}\frac{k_0-\underline{b}}{\bar{\delta}-\underline{\delta}}$. In this case, an informative equilibrium always exists, and the two informative equilibria described earlier remain. However, for large maximal biases ω, a new equilibrium arises, where a contact with a signal $s = 0$ never becomes an organizer, while only a sufficiently pro-union contact with $s = 1$ chooses to opt in.

Ranking Equilibria Informativeness We conclude the equilibrium analysis by determining, for each organizational cost c, the maximal anti-union bias ω that results in the most informative equilibrium. This equilibrium is defined as the one in which workers are least likely to make a mistake when voting on unionization. It identifies the characteristics of the pool from which a 'benevolent' leader, who supports unionization only when it genuinely benefits the workers, should select his contact.

There are two types of errors. Namely, unionization is unsuccessful when of high value $v = v_1$, and conversely the workers unionize when this is of low value $v = v_0$. In our setting, the most informative equilibrium minimizes the both types of errors, see Appendix A.[24] Hence, we simply measure equilibrium informativeness as the probability of unionization $P(u|v_1)$ given that unionization is of high value $v = v_1$.

[24]This results follows as the ex-ante probability of unionization is independent of ω and c across all equilibria.

The probability of unionization given $v = v_1$, $P(u|v_1)$, increases in the workers' equilibrium expected value of v when, unbeknownst to them, $v = v_1$, i.e., $\mathbb{E}[\mathbb{E}_w[v|x]|v_1]$. Therefore, to find the maximal bias ω that yields the equilibrium maximizing $P(u|v_1)$, we only need to maximize $\mathbb{E}[\mathbb{E}_w[v|x]|v_1]$. This optimal ω depends on the organizational costs c, and specifically on whether we are in the moderate or low-cost case. We disregard the high-cost case, as no informative equilibrium exists, making the maximal bias ω irrelevant for equilibrium informativeness.

Proposition 5 (Optimal ω for Equilibrium Informativeness)**.** *The optimal bias ω for the most informative equilibrium depends on the organizational cost c:*

1. *For intermediate costs, $\tilde{v}\frac{k_0-b}{\bar{\delta}-\underline{\delta}} < c < \tilde{v}\frac{k_1-b}{\bar{\delta}-\underline{\delta}}$, any $\omega \leq \hat{\omega}$ induces the fully informative equilibrium, yielding the same unionization probability $P(u|v_1)$.*
2. *For low costs, $c \leq \tilde{v}\frac{k_0-b}{\bar{\delta}-\underline{\delta}}$, the optimal bias is $\omega = \tilde{\omega}_1$, inducing the b_1-corner equilibrium, which maximizes $P(u|v_1)$ and equilibrium informativeness.*

If costs are intermediate, any maximal bias $\omega \leq \hat{\omega}$ leads to a fully informative equilibrium. In this case, a contact with signal $s = 1$ always becomes an organizer, and a contact with $s = 0$ never does, allowing workers to perfectly infer the contact's signal from his choice. For all such equilibria, the probability of unionization when its value is positive is the same, making any $\omega \leq \hat{\omega}$ optimal for equilibrium informativeness.

If costs are low, the unique optimal maximal bias is $\tilde{\omega}_1$. This leads to a b_1-corner equilibrium. The choice of a contact with signal $s = 0$ depends on his bias, but a contact who observes $s = 1$ always opts in, regardless of his bias. Hence, workers can conclude that the contact saw $s = 0$ if he does not become an organizer. Reducing ω below $\tilde{\omega}_1$ introduces noise, as it increases the probability that a contact opts in even when observing $s = 0$. Raising ω above $\tilde{\omega}_1$ has a two-fold effect: it adds noise because a highly biased contact might opt out even when observing $s = 1$, but it also reduces the chance that a strongly pro-union contact becomes an organizer when observing $s = 0$. The former effect dominates the latter, making $\omega = \tilde{\omega}_1$ the bias that maximizes equilibrium informativeness.

In sum, our results show that equilibrium informativeness is higher with intermediate costs than in low-cost equilibria. Remarkably, our results identify a non-monotonic relationship between the probability of unionization, provided it is beneficial to workers, and the organizational costs of unionization drives. As costs increase from a low level, the likelihood of unionization initially rises, peaking at intermediate costs. Beyond this point, further increases in costs make organizing prohibitively expensive, preventing any unionization drive from occurring. In such cases, the probability of unionization reverts to the baseline level, as if the unionization process had never been initiated by the leader.

Top Down vs Bottom Up Our findings highlight the unique strengths of grassroots movements compared to campaigns led by professional union organizers. Regular employees face greater burdens when organizing, such as dedicating personal time and risking repercussions, challenges that professional organizers—who are not reliant on the firm for their livelihood—largely avoid. This makes unionization initiatives by regular employees inherently more credible than those led by professional organizers. The low organizational costs and strong ideological commitment of professional organizers often undermine their credibility with workers. Consequently, informative equilibria are more likely to emerge in bottom-up efforts driven by employees, while no such equilibrium is likely in campaigns run by professional organizers.

The tendency of the bottom-up approach to produce more informative outcomes suggests that it is more likely to result in unionization when it benefits workers. Conversely, a grassroots movement makes unionization less likely when it does not serve workers' interests.

Management, typically opposed to unionization regardless of its benefits to workers, faces the highest likelihood of unionization when (i) it benefits workers, (ii) organizers encounter moderate costs, and (iii) the leader's pool of potential contacts is not overly biased against unions. Our results support the common assumption that highly adversarial management can reduce the likelihood of unionization by significantly increasing organizational costs, making successful union drives infeasible.

However, we find that the likelihood of unionization benefiting workers may also be low when organizational costs are minimal, and the leader's potential contacts are excessively pro-union. Notably, in such cases, management's efforts to prevent unionization by targeting organizers may backfire. If these efforts fail to prevent all unionization initiatives, they can make the decision of regular employees to become organizers more informative to other workers, thereby increasing the likelihood that they vote for unionization.

5 Grassroots Movements in the US

In many unionization campaigns, professional organizers are sent to workplaces to persuade employees to support unionization (Farber, 2015; Shepherd, Roskill, Naidu, and Reich, 2023). However, unions understand that workers tend to trust their peers more than external organizers. This awareness is exemplified in the practice of 'salting,' where a union organizer takes a job at the workplace they aim to unionize, blending in as a regular employee. Known as 'salts,' these individuals are instructed by organizations like the Industrial Workers of the World to avoid revealing their union affiliation. For example, salts are advised not to wear union-related items and are given guidance such as: "Don't tell your coworkers that you're a Union member or a salt. You want to be seen as an ordinary worker."[25] This strategy highlights unions' recognition of credibility challenges and their effort to present a grassroots image.

The recent success of a bottom-up union movement at Amazon's Staten Island warehouse has led unions to reconsider their strategies. This has been succinctly phrased as:

> organized labor has begun to ask itself an increasingly pressing question: Does the labor movement need to get more disorganized?[26]

Our paper argues that a grassroots approach may be more effective than a top-down campaign in increasing the chances of unionization, provided it benefits workers. For example, a top-down campaign at another Amazon warehouse in Bessemer, Alabama, was unsuccessful. At the same time, Amazon appears to be a case where workers might benefit from unionization, as reports of worker mistreatment have been widely covered in the media and have led to numerous lawsuits.[27]

Of course, other factors distinguish the New York and Alabama warehouses beyond their organizational approach. However, there seems to be a growing consensus that grassroots movements are more effective than top-down campaigns. We offer a novel informational rationale for why this might be the case.

Before discussing the unionization campaign, we briefly consider Amazon's position on unionization.[28] Amazon is strongly opposed to unionization and follows a typical response when faced with union efforts. The company runs anti-union campaigns, encouraging employees to vote against unionization. It also holds mandatory meetings to explain how unions operate. Additionally, Amazon monitors organizers closely and has, in some instances, even terminated their employment. These strategies were used during the unionization attempts in both Alabama and New York.

Amazon Warehouse BHM1 in Bessemer, Alabama One of the most widely covered unionization attempts took place at the Amazon warehouse in Bessemer, Alabama, known as BHM1, which employed about 5,800 workers when the effort began. In May 2020, Jennifer Bates, along with a few coworkers, reached out to the Retail, Wholesale and

[25] The quote is sourced from https://web.archive.org/web/20110605071434/http://www.iww.org/en/organize/strategy/salt.shtml.

[26] https://www.nytimes.com/2022/04/07/business/economy/amazon-union-labor.html

[27] Amazon was sued by the Attorney General of New York for COVID violations, https://ag.ny.gov/press-release/2021/attorney-general-james-files-lawsuit-against-amazon-failing-protect-workers. There are also law firms specializing in cases against Amazon, particularly for warehouse employees, https://mccunewright.com/amazon-warehouse-discrimination/.

[28] For an overview of common employer tactics, see https://files.epi.org/page/-/pdf/bp235.pdf.

Department Store Union (RWDSU) to explore unionizing the workplace. By November 2020, RWDSU had announced its intention to lead the unionization campaign.[29]

By involving RWDSU, the union took the lead in running the campaign. Bates described the process in an interview:

> One of the things I can say is that we sought out the union organization, [the Retail, Wholesale and Department Store Union], [...]. A lot of us had already been in places that were unionized. We had a group of people and a union that was strong and didn't just come to help, but stayed. [...] They gave us the materials and information that we needed.[30]

Due in part to the COVID-19 pandemic, much of the unionization effort was carried out by phone. According to the union, both employees and volunteers made hundreds of calls each day.[31]

Despite these efforts, the majority of workers voted against unionization in the election that concluded on March 29, 2021. RWDSU appealed the result to the NLRB, which found that Amazon had interfered with the election. A key issue was the installation of a mailbox on the premises, raising concerns that the vote would not be anonymous. Amazon did not contest the NLRB's findings. A second vote was held, with results counted on March 28, 2022, but once again, the unionization effort was unsuccessful.[32]

Amazon Warehouse JFK8 in Staten Island, New York In contrast to the unsuccessful union drive in Alabama, JFK8, an Amazon warehouse in Staten Island, successfully unionized. JFK8 is one of the largest warehouses, employing around 8,000 workers. Unionization efforts at JFK8 began in March 2020, during the COVID-19 pandemic, even before the Bessemer, Alabama drive. Workers were required to come in, even when showing symptoms of COVID, and in some cases, after testing positive. This led to concerns about health and safety as many workers fell ill.[33]

In response to what they saw as inadequate health measures, Chris Smalls and Derrick Palmer, two employees, organized a protest.[34] Amazon dismissed Chris Smalls, claiming

[29] For a report on Jennifer Bates and her efforts, see https://www.rollingstone.com/politics/politics-features/jennifer-bates-amazon-union-organizer-interview-jeff-bezos-1147426/.

[30] https://www.rollingstone.com/politics/politics-features/jennifer-bates-amazon-union-organizer-interview-jeff-bezos-1147426/.

[31] https://www.newyorker.com/news/us-journal/the-alabama-workers-trying-to-unionize-an-amazon-fulfillment-center.

[32] For both campaigns, votes were collected over a two-month window. See also https://thehill.com/policy/technology/592767-labor-legislation-failure-looms-over-amazon-union-vote/.

[33] For more details, see https://www.nytimes.com/interactive/2021/06/15/us/amazon-workers.html.

[34] New York also sued Amazon over inadequate worker protections during COVID-19. See https://www.nytimes.com/2021/02/16/technology/amazon-new-york-lawsuit-covid.html.

that he violated a quarantine order after being in contact with a sick employee.[35] After his termination, Smalls began organizing a union drive full-time, supported by Derrick Palmer, who continued working at the warehouse. Smalls was seen as the face of the union effort, partly due to his outspoken personality.[36] In contrast, Palmer was more deliberate and managed to keep his job while supporting Smalls.

Initially, the unionization process was slow, in part due to various legal requirements. Seeking more insight, Smalls and Palmer visited Bessemer, Alabama, in early 2021 to observe the union drive there, which had already attracted significant media attention.

Unlike the grassroots efforts at JFK8, the Bessemer campaign was led by professional union organizers. Smalls and Palmer found the union organizers there less than welcoming and viewed them as "outsiders who had descended on the community."[37] Disappointed, they decided to pursue their own campaign at JFK8. They connected with workers at the bus stop, shared TikTok videos, made s'mores, and sang songs to engage their coworkers. In an interview, Palmer mentioned that between his regular shifts and organizing efforts, he hadn't spent a day away from the warehouse in months.

The workers they approached were initially skeptical of unions, had concerns about unions in general, were appreciative of Amazon's pay and health care, or simply did not have the time to engage.

Ultimately, the workers were persuaded, and they voted to unionize JFK8 on April 1, 2022.

Comparing Unionization Campaigns We compare the two unionization campaigns through the lens of our model, which helps explain why unionization was unsuccessful in Alabama but succeeded in New York.

At both warehouses, a leader emerged. In Alabama, Jennifer Bates became the public face of the campaign, while in New York, Chris Smalls dedicated himself to the unionization drive full-time. Both leaders had contacts and friends within the warehouse who supported the effort. In Alabama, Daryl Richardson helped by reaching out to RWDSU. Many of the contacts in Alabama were already quite pro-union, having had experience in unionized workplaces. Additionally, professional union organizers played a central role in the Alabama campaign.

In contrast, in New York, Derrick Palmer, was the key contact with whom Chris Smalls discussed unionization. Although they also contacted RWDSU, they chose not to

[35]Internal emails later revealed that some HR officials questioned this reasoning. See https://www.nytimes.com/2022/04/02/business/amazon-union-christian-smalls.html.

[36]Descriptions of Smalls and Palmer are from https://www.nytimes.com/interactive/2021/06/15/us/amazon-workers.html.

[37]The quote is from https://www.nytimes.com/2022/04/02/business/amazon-union-christian-smalls.html.

involve the union in their campaign. Neither Smalls nor Palmer had any prior involvement with unions. Palmer was particularly concerned with health and safety but was also disappointed by the lack of advancement opportunities at the warehouse. As a result, the organizers at BHM1 included both pro-union employees and professional organizers, whereas the main organizer at JFK8, Derrick Palmer, had no previous union experience but was described as 'deliberate.'[38]

Furthermore, the organizational teams led fundamentally different campaigns. In Alabama, the campaign relied heavily on materials provided by the union and was conducted mostly by phone. In New York, all campaign materials were produced locally by the organizers, who also hosted numerous events to engage workers directly.

These differences in the composition of the organizational teams and campaign approaches can be interpreted in terms of our model as follows: (1) organizers at JFK8 faced higher organizational costs, and (2) they were perceived as more moderate compared to those at BHM1.

In sum, our model suggests that in Alabama union organizers lacked credibility due to a lower cost of organization as well as a more pro-union bias among the organizer, while this credibility was a given in New York. This made a more informative equilibrium more likely at JFK8, increasing the probability of unionization. Of course, other external factors may also have contributed to the success of the campaign at JFK8 compared to Bessemer, Alabama. However, the credibility of the organizers played a significant role, as evidenced by Chris Smalls and Derrick Palmer's decision to distance themselves from the established union.[39]

Alternative Explanation: Firm's Opposition We have provided an informational rationale for why a bottom-up, grassroots movement tends to outperform the top-down approach of established unions. Our model challenges the standard narrative that a firm's opposition is the sole reason for unsuccessful unionization efforts. To support this, we discuss a case where a firm was in favor of unionization, and yet unionization was voted against.

This occurred at the Volkswagen plant in Chattanooga, Tennessee.[40] Volkswagen (VW) wanted to establish a workers' council at its factory, following the German model of worker representation. In the U.S., such a council can only be formed in a unionized workplace. Therefore, when the United Automobile Workers (UAW) began a union drive

[38] https://www.npr.org/2022/04/02/1090353185/amazon-union-chris-smalls-organizer-staten-island

[39] We provide additional examples of unionization campaigns consistent with our model in Supplementary Appendix B.

[40] https://www.nytimes.com/2014/02/15/business/volkswagen-workers-reject-forming-a-union.html

in 2014, Volkswagen was supportive. For example, VW urged third parties, including politicians and business groups opposed to unionization, to stay out of the process. They also issued joint statements with UAW, expressing eagerness to work together.[41]

Despite Volkswagen's support, the factory was not unionized. Among the reasons cited were concerns that UAW had harmed Detroit's automakers, leading many workers to vote against it.

There was also skepticism about what the union could offer. A VW worker who led the anti-union campaign said that many workers felt they were already paid and treated well without a union and didn't see the need for one.

After the union drive failed, one of its opponents helped create an alternative worker's council, the American Council of Employees, which can be seen as an attempt to organize workers outside the traditional union structure.[42] He expressed distrust of UAW, stating:

> "I think [workers] became educated about their history," he says. "I saw mismanagement, I saw malfeasance, I saw cronyism, I saw nepotism. Just looking at their membership numbers, the way they've declined since 2002. Job security? Well, you can't give me that. And when I look at our wages compared with the Big Three, we're doing better, so you can't give me a raise."

Workers did not see the value of unionizing, even though Volkswagen supported it. This case underscores how traditional unions can struggle to establish credibility, and that this may happen when there is no strong opposition from management.[43]

6 Comparative Statics: The Determinants of Unionization

We consider the effects of different environments on $P(u|v_1)$, the equilibrium probability that unionization occurs, provided it benefits workers. We then tie our results to the determinants of unionization.

6.1 Comparative Statics

As before, we focus on the most informative equilibrium given the cost range. Thus, in the intermediate cost range, we consider the fully informative equilibrium. In the low-cost

[41] Despite this, some third parties remained opposed, with the Governor of Tennessee promising a new production line if the union vote was defeated. Volkswagen responded by stating that there was no connection between the new production line and the union vote.

[42] https://www.washingtonpost.com/news/storyline/wp/2014/11/19/the-strange-case-of-the-anti-union-union-at-volkswagens-plant-in-tennessee/

[43] The role of corruption scandals in unions has been explored by Venturini (2023), who shows that labor racketeering has the greatest impact in regions where individuals have limited exposure to unions.

range, we focus on the b_1-corner equilibrium with $\omega = \tilde{\omega}_1$, where every contact with signal $s = 1$ becomes an organizer, while the share of contacts with $s = 0$ who opt in is minimal.

Recall that the probability of unionization, given that $v = v_1$, is given by

$$P(u|v_1) = \frac{\mathbb{E}[\mathbb{E}_w[v|c,\omega]|v_1] - d - \mathbb{E}[b] - \underline{\delta}}{\overline{\delta} - \underline{\delta}}, \tag{8}$$

where $\mathbb{E}[\mathbb{E}_w[v|c,\omega]|v_1]$ is the expected value of the workers' equilibrium expectation $\mathbb{E}_w[v|c,\omega]$ about the unionization value v, conditional on the actual value being v_1. The workers' expectation $\mathbb{E}_w[v|c,\omega]$ depends on the type of equilibrium that arises, which in turn is determined by the organizational costs c and the maximal bias ω.

Inspection of expression (8) shows that the parameters d, $\mathbb{E}[b]$, $\overline{\delta}$, and $\underline{\delta}$ have a direct impact on the probability of beneficial unionization $P(u|v_1)$. Additionally, some parameters can affect the expected value $\mathbb{E}[\mathbb{E}_w[v|x,c,\omega]|v_1]$ and thus have an indirect effect on the probability of unionization $P(u|v_1)$. To assess the overall effect of the parameters, we therefore must take these two effects into account.

Intermediate Costs In the fully informative equilibrium, which emerges in the intermediate cost case, the workers' expectation $\mathbb{E}[\mathbb{E}_w[v|x]|v_1]$ is given by[44]

$$\mathbb{E}[\mathbb{E}_w[v|x]|v_1] = (v_1 - v_0)(p^2 + (1-p)^2) + v_0. \tag{9}$$

This expectation depends on v_1, v_0, and p. Additionally, the parameters d, $\mathbb{E}[b]$, $\overline{\delta}$, and $\underline{\delta}$ directly affect the unionization probability. The overall effect of these parameters on the unionization probability $P(u|v_1)$ is summarized in Proposition 6.

Proposition 6 (Comparative Statics: Fully Informative Equilibrium)**.** *The unionization probability $P(u|v_1)$ in the fully informative equilibrium increases with p, v_1, v_0 (and hence $\mathbb{E}[v]$ holding $v_1 - v_0$ fixed). It decreases with d, $\mathbb{E}[b]$, $\overline{\delta}$, and $\underline{\delta}$ (and hence $\mathbb{E}[\delta]$ fixing $\overline{\delta} - \underline{\delta}$). Further, $P(u|v_1)$ increases in $v_1 - v_0$ holding $\mathbb{E}[v]$ fixed, and in $\overline{\delta} - \underline{\delta}$ fixing $\mathbb{E}[\delta]$ if and only if $P(u|v_1) < 1/2$.*

It is intuitive that the probability $P(u|v_1)$ in the fully informative equilibrium is higher when unionization is more valuable on average (higher v_1 and v_0) and when the contact's signal is more informative (higher p). Conversely, a stronger firm pushback, captured by higher d, a more anti-union workforce (higher $\mathbb{E}[b]$), or a more anti-union environment (higher $\underline{\delta}$ and $\overline{\delta}$) reduce $P(u|v_1)$. The result that $P(u|v_1)$ increases in $v_1 - v_0$ holding $\mathbb{E}[v]$ fixed is less obvious. This follows as unionization actually benefits workers (i.e., $v = v_1$).

[44] This expectation is derived from $\phi(\omega; b_0, b_1)$ as defined in the Proof of Proposition 5. Plugging in $\phi(\omega; b_0 = \underline{b}, b_1 = \omega)$ yields the expectation provided in (9).

Learning about the value now increases the probability that the unionization campaign succeeds, as a successful unionization campaign delivers a greater value.

An increase in $\overline{\delta} - \underline{\delta}$, the uncertainty about the economic and political environment, keeping the expected value constant, dampens the relevance of the information signaled to the workers. Hence, increasing $\overline{\delta} - \underline{\delta}$ reduces the probability of unionization $P(u|v_1)$ when it is above one half to start with. Conversely, $P(u|v_1)$ increases in $\overline{\delta} - \underline{\delta}$, if it is below one half initially.

Low Costs In the low-cost case, the most informative equilibrium is the b_1-corner equilibrium, obtained when the maximal bias is $\omega = \tilde{\omega}_1$. As before, we analyze how the model parameters influence the expected value $\mathbb{E}[\mathbb{E}_w[v|x]|v_1]$ in order to assess their overall effect on unionization if it benefits workers, $P(u|v_1)$. Unlike in the intermediate cost case, however, most effects are ambiguous. This is because now the model parameters influence the expected value $\mathbb{E}[\mathbb{E}_w[v|x]|v_1]$ both directly and indirectly through their effect on $\tilde{\omega}_1$, and these effects often have opposite signs.

Proposition 7 (Comparative Statics for Low Cost)**.** *The probability of unionization $P(u|v_1)$ increases with v_1 and p, and decreases with d and $\overline{b}$. The effect of the other parameters is ambiguous.*

In contrast to Proposition 6, in the low-cost case, we must account for both the direct effect of parameter changes on workers' expectations $\mathbb{E}[\mathbb{E}_w[v|x]|v_1]$ and their indirect effect on the informationally optimal bias $\tilde{\omega}_1$.. There are only a few parameters for which these effects go in the same direction. As is intuitive, we find that the probability of unionization $P(u|v_1)$ decreases when the firm's pushback is stronger (higher d). Similarly, an increase in $\overline{b}$ decrease the probability of beneficial unionization $P(u|v_1)$.[45] At the same time, $P(u|v_1)$ increases in the high value v_1, and if the precision p of the contact's signal increases.

6.2 The Determinants of Unionization

We turn to describe the various factors commonly believed to affect unionization as identified in the literature, and tie them to our comparative statics predictions.

Value of Unionization, Workforce Composition and Signal Precision In general, workers face uncertainty about the value of unionization. The key benefits often include higher wages (Blanchflower and Bryson, 2004) and having a voice in the workplace, meaning the ability to communicate concerns and problems to management (Freeman

[45] In contrast, the effect of $\underline{b}$ is ambiguous as it also affects the decision of the contact.

and Medoff, 1984). The significance of these benefits depends on the workplace policies implemented by management and the quality of union representation.

Unions charge membership fees, which vary, so the wage gains achieved through unionization ideally need to outweigh these costs. Moreover, unions are expected to negotiate the best possible outcomes for their members, but this has not always been the case. For example, one factor contributing to the decline of unions in the 1980s was corruption among union leaders: some were paid off by companies to block meaningful wage increases, ultimately harming the workers they were supposed to represent.[46]

Given these factors, workers often remain skeptical about whether unionization would benefit them in their specific workplace. Consequently, the goal of a unionization campaign is to present a compelling case for why unionization would be advantageous.

In our framework, unionization can either benefit ($v = v_1$) or harm ($v = v_0$) workers, reflecting the fundamental uncertainty they face about its value. In the fully informative equilibrium (Proposition 6), both v_0 and v_1 contribute to increasing the equilibrium probability $P(u|v_1)$. This probability also rises with greater uncertainty about union value, as measured by a larger $v_1 - v_0$, while holding the expected value $\mathbb{E}[v]$ constant. In low-cost scenarios (Proposition 7), only the effect of v_1 can be unambiguously determined.

Uncertainty about v may stem from differences between an established union and a newly formed, worker-led union. Established unions may have more predictable outcomes compared to nascent efforts, which could partly explain the higher success rate of worker-led union drives. However, professional unions bring negotiation experience that can benefit workers, particularly during strikes, where salaries are often supported by larger union networks. This capacity to provide strike support could result in a higher v_1, making unionization more attractive.

Signal precision p, or the ability of organizers to accurately assess union value, is another important factor. Professional organizers may possess more precise information, which could increase $P(u|v_1)$, the probability of unionization when it benefits workers. However, if union value is specific to the bargaining unit and depends on local knowledge, a worker-led drive may offer better signal precision, giving it an advantage.

The value of unionization may vary by worker type. Temporary workers, for instance, might assign a lower v_1 to unionization compared to full-time workers, as they may leave before bargaining concludes or risk losing opportunities to return to a unionized workplace. A lower v_1 reduces the probability of unionization across all cost ranges, helping to explain why units with predominantly temporary workers are less likely to unionize.

Higher unionization rates are more likely in workplaces with pro-union workers, reflected in a lower $\mathbb{E}[b]$ in our model. A lower $\mathbb{E}[b]$ increases the probability of unionization,

[46]For a discussion of labor racketeering, see Venturini (2023).

$P(u|v_1)$. This may help explain why unionization rates are typically higher in white-collar jobs, where workers tend to be less anti-union, compared to blue-collar roles.

Legal and Economic Environment The success of unionization efforts is heavily influenced by the legal environment, particularly the aggressiveness of the National Labor Relations Board (NLRB) in supporting workers. If a worker believes they were fired for participating in union activities, they can file a complaint with the NLRB. However, the NLRB's support often depends on the state where the firm operates. States differ in the strength and priorities of their NLRB offices, and the board exercises discretion in choosing which cases to pursue. In states where courts have a history of ruling against workers, the NLRB may decide not to bring cases, deeming them futile.

A key legal factor is whether a state is a Right-to-Work state.[47] In Right-to-Work states, union membership is not mandatory, even in unionized workplaces; employees can benefit from collective bargaining agreements without joining the union or paying dues. This promotes free-riding and has been linked to union decline (Fortin, Lemieux, and Lloyd, 2023). Conversely, in states without Right-to-Work laws, employees in unionized bargaining units must join the union and pay dues. Despite these distinctions, unionization rates between Right-to-Work and non-Right-to-Work states are similar (Farber et al., 2021).

Economic conditions also play a role in unionization success, though their effects are ambiguous. In a strong job market, workers may opt to leave poorly paying or poorly managed companies rather than pursue unionization, which is costly and time-consuming. However, organizing becomes less risky in such conditions since finding a new job is easier if the firm retaliates. Conversely, in weak economic conditions, workers may be reluctant to leave their jobs but find unionization riskier due to potential retaliation. As a result, it is unclear whether favorable or unfavorable economic conditions promote unionization.[48]

We model the economic, political, and legal environment using $\underline{\delta}$, $\overline{\delta}$, and $\mathbb{E}[\delta]$. The expected value $\mathbb{E}[\delta]$ captures the general pro- or anti-union sentiment faced by organizers, such as in Right-to-Work states, where $\mathbb{E}[\delta]$ tends to be higher. Public attention can also influence $\mathbb{E}[\delta]$, especially if business groups actively oppose unionization.

While federal politicians have limited influence on unionization due to state-level legal decisions, the NLRB plays a critical role. For example, during the Bessemer, Alabama unionization drive, the NLRB voided the first election due to irregularities but did not fully address similar concerns in the second election, reflecting higher $\mathbb{E}[\delta]$. Greater NLRB support could have reduced $\mathbb{E}[\delta]$.

[47] Farber (1984) argues that these differences reflect attitudes toward unionization.

[48] Pezold, Jäger, and Nüss (2023) explore the impact of labor market tightness on union activity and find no significant effect.

The expected environmental stance, $\mathbb{E}[\delta]$, influences unionization through two channels: the expected unionization value (informational effect) and the unionization probability (via $\underline{\delta}$ and $\overline{\delta}$). Under intermediate costs, adversity does not affect informativeness but directly reduces the unionization probability $P(u|v_1)$. Under low costs, higher $\mathbb{E}[\delta]$ can raise workers' expectations about union value, sometimes enhancing informativeness. However, the direct effect of greater adversity remains negative, lowering the equilibrium probability of unionization. In partially informative equilibria, the overall effect of $\mathbb{E}[\delta]$ on $P(u|v_1)$ is ambiguous, balancing indirect and direct effects.

Uncertainty, represented by $\overline{\delta} - \underline{\delta}$, reduces $P(u|v_1)$ directly when $\mathbb{E}[\delta]$ is fixed, though the overall effect also depends on its impact on workers' beliefs about unionization value. In intermediate-cost cases, greater uncertainty lowers $P(u|v_1)$ if it initially exceeds one-half and raises it otherwise. Under low costs, the overall effect remains ambiguous.

Our analysis highlights the complex role of the environment in unionization outcomes. A hostile environment may increase unionization likelihood if low costs allow adversity to enhance informativeness more than it reduces unionization probability directly. Similarly, greater uncertainty can either improve or diminish unionization chances depending on the context.

Firm's Response The likelihood of unionization also depends on the response from the bargaining unit, which could be a firm or a specific division within the firm responsible for setting wages. For example, each Amazon warehouse or Starbucks store functions as its own bargaining unit. Management typically opposes unionization, even if it benefits workers, because unionization introduces additional complications. Even if unions fail to deliver worker benefits, management must still engage with them.[49]

Firms influence unionization efforts primarily through two strategies: (i) raising organizational costs by targeting union organizers and (ii) offering rewards for not unionizing or imposing penalties in the event of unionization. Management often hires consultants, known as 'union busters,' to highlight the perceived drawbacks of unionizing during mandatory meetings. They may also provide incentives to discourage workers from unionizing or threaten to shut down the bargaining unit entirely. In some instances, management may discipline employees involved in union efforts. Although firing or penalizing workers for union activity is illegal, enforcing these protections can be challenging for those affected.

We model the firm's response to unionization using the parameter d. Regardless of organizational costs, an increase in d decreases the unionization probability $P(u|v_1)$.

[49] For example, if a union is corrupt and agrees to a poor contract for workers, the firm still incurs costs to negotiate or make side payments. Without the union, the firm could implement the same contract without those extra expenses.

This explains why firms seeking to prevent unionization often aim to maximize d, thereby reducing organizers' chances of success. The frequent involvement of firms with the NLRB in unionization disputes indicates that they often employ all available means to oppose unionization.

7 Conclusion

Motivated by the recent increase in union drives, this paper presents a formal model of unionization, to our knowledge, the first in this area. We have demonstrated that a bottom-up approach to unionization generally leads to more informative campaigns compared to the top-down strategies often employed by established unions. When unionization is beneficial to workers, the bottom-up approach results in higher chances of success. This offers a new explanation for why grassroots movements may succeed where traditional unions have not: credibility.

Local organizers, central to a bottom-up approach, invest significant personal time and effort in unionization campaigns and may face repercussions from management. Unlike professional organizers, they are part of the workforce and typically adopt a more moderate stance on unionization. Pragmatically, they are more likely to engage only if they genuinely believe unionization will benefit workers. This belief is communicated to their peers through their efforts, increasing the credibility of the unionization drive. In contrast, professional organizers may be perceived as ideological or motivated by external motives, making it harder for them to build the same level of trust and engagement.

Our model challenges the common view that firm's opposition is the primary factor preventing unionization. We show that a firm's opposition to unionization does not always succeed in blocking union efforts and can even backfire. In fact, as long as the opposition is not too strong it may give higher chances to unionization. In light of our model, the frequently cited narrative by established unions that firm's opposition is the sole reason for unsuccessful union drives does not capture the whole picture.

We connect our model to examples of unionization, providing support for the determinants of unionization we identify. Further we analyze the impact of other features, such as unionization value, the economic, political and legal environment, signal precision, worker characteristics, and the firm's stance on unionization on the outcomes of unionization campaigns.

While our analysis highlights the importance of grassroots, bottom-up initiatives in unionization drives, this insight extends to other types of voting campaign scenarios. For example, many of the features outlined in our model are also characteristic local election campaigns. In local elections, a candidate—like a unionization leader—gathers a small team of organizers who may either be volunteers or paid staff. These organizers, whether grassroots or professional, work to persuade the local electorate that their candidate is the best choice. Similar to unionization campaigns, grassroots organizers in elections tend to outperform professionals, as shown by studies on electoral mobilization (Nickerson, 2007; Sinclair, McConnell, and Michelson, 2013).[50]

[50]In larger-scale elections or referendums, where a larger electorate must be mobilized, grassroots campaigns often involve many organizers. Hence, a collective action problem among volunteer organizers can arise, as analyzed in Herrera and Martinelli (2006). Unlike these larger campaigns, the small number of local organizers involved in unionization drives allows us to abstract from this issue in our model.

A Additional Steps

Parametric Conditions We first require that the most pro-union worker in the pool votes for unionization even in the worse-case scenario that $v = v_0$ and $\delta = \overline{\delta}$:

$$\overline{\delta} < v_0 - d - \underline{b}.$$

Second, to ensure that the probability of unionization, given in expression (5) lies between zero and one, we impose:

$$\underline{\delta} < \mathbb{E}_w[v|x] - d - \mathbb{E}[b] < \overline{\delta}. \tag{10}$$

Combining these two restrictions on $\overline{\delta}$ implies that

$$\begin{aligned} & \mathbb{E}_w[v|x] - d - \mathbb{E}[b] < v_0 - d - \underline{b} \\ \Leftrightarrow \qquad & \mathbb{E}_w[v|x] - v_0 < \mathbb{E}[b] - \underline{b} = \frac{1}{2}(\overline{b} - \underline{b}) \end{aligned}$$

A sufficient condition for this inequality hold is that $v_1 - v_0 < \frac{1}{2}(\overline{b} - \underline{b})$, as $v_1 > \mathbb{E}_w[v|x]$.

Characterization of $\mathbb{E}[v|s]$ Letting $\Delta v = v - v_0$, we obtain:

$$\mathbb{E}[v|s] = v_0 + \mathbb{E}[\Delta v|s].$$

Then, we can write

$$\begin{aligned} \mathbb{E}[\Delta v|s=0] &= P(v=v_0|s=0)(v_0-v_0) + P(v=v_1|s=0)(v_1-v_0) \\ &= (v_1-v_0)\frac{(1-p)}{(1-p)+p} = (v_1-v_0)(1-p) \qquad (11) \\ \mathbb{E}[\Delta v|s=1] &= P(v=v_0|s=1)(v_0-v_0) + P(v=v_1|s=1)(v_1-v_0) \\ &= (v_1-v_0)\frac{p}{p+(1-p)} = (v_1-v_0)p. \qquad (12) \end{aligned}$$

The expected value of unionization is lower after a low signal than after a high signal.

Characterization $\mathbb{E}_w[v|x]$ in an Informative Equilibrium The difference in unionization probabilities, $P(u|x=1) - P(u|x=0)$ in equation (7) can be rewritten as

$$P(u|x=1) - P(u|x=0) = \frac{\mathbb{E}_w[v|x=1] - \mathbb{E}_w[v|x=0]}{\overline{\delta} - \underline{\delta}}. \tag{13}$$

As $\mathbb{E}_w[v|x=1] - \mathbb{E}_w[v|x=0] = \mathbb{E}_w[\Delta v|x=1] - \mathbb{E}_w[\Delta v|x=0]$, the expectation of Δv conditional on the contact's decision x is:

$$\mathbb{E}_w[\Delta v|x=0] = P(v=v_1|x=0)(v_1-v_0),$$
$$\mathbb{E}_w[\Delta v|x=1] = P(v=v_1|x=1)(v_1-v_0).$$

The probabilities are given by

$$P(v=v_1|x=0) = \frac{P(x=0|v=v_1)P(v_1)}{P(x=0)} = \frac{(\omega-b_1)p+(\omega-b_0)(1-p)}{(\omega-b_1)+(\omega-b_0)},$$
$$P(v=v_1|x=1) = \frac{P(x=1|v=v_1)P(v_1)}{P(x=1)} = \frac{(b_1-\underline{b})p+(b_0-\underline{b})(1-p)}{(b_1-\underline{b})+(b_0-\underline{b})}.$$

Collecting terms and simplifying yields

$$\mathbb{E}_w[\Delta v|x=0] = \frac{\omega-b_1p-b_0(1-p)}{2\omega-b_1-b_0}(v_1-v_0), \tag{14}$$
$$\mathbb{E}_w[\Delta v|x=1] = \frac{b_1p+b_0(1-p)-\underline{b}}{b_1+b_0-2\underline{b}}(v_1-v_0). \tag{15}$$

Hence, the differences in expectations is:

$$\mathbb{E}_w[\Delta v|x=1] - \mathbb{E}_w[\Delta v|x=0] = \tilde{v}\frac{(b_1-b_0)(\omega-\underline{b})}{(b_1+b_0-2\underline{b})(2\omega-b_1-b_0)}. \tag{16}$$

Contact's Simplified Payoffs In the remainder of the analysis, let $\bar{c} \equiv c(\overline{\delta}-\underline{\delta})$ to simplify the exposition.

A contact with signal s chooses to become an organizer if and only if

$$k_s - b \geq \frac{\bar{c}}{\tilde{v}}\frac{(b_1+b_0-2\underline{b})(2\omega-b_1-b_0)}{(b_1-b_0)(\omega-\underline{b})}. \tag{17}$$

To simplify notation, we define

$$g(b_0,b_1) \equiv \frac{\bar{c}}{\tilde{v}}\frac{(b_1+b_0-2\underline{b})(2\omega-b_1-b_0)}{(b_1-b_0)(\omega-\underline{b})}. \tag{18}$$

We observe that:

$$\frac{\partial g(b_0,b_1)}{\partial b_0} \propto \frac{4(\omega-b_1)(b_1-\underline{b})}{(b_1-b_0)^2(\omega-\underline{b})} + \frac{1}{\omega-\underline{b}} > 0,$$
$$\frac{\partial g(b_0,b_1)}{\partial b_1} \propto -\frac{4(\omega-b_0)(b_0-\underline{b})}{(b_1-b_0)^2(\omega-\underline{b})} - \frac{1}{\omega-\underline{b}} < 0.$$

Equilibrium Candidates b_0 and b_1 The equilibrium candidates are as follows:

1. Fully Informative Equilibrium: $\underline{b} = b_0 < b_1 = \omega$.
   This is an equilibrium if and only if:

$$k_0 - \underline{b} < g(\underline{b}, \omega) = \frac{\bar{c}}{\tilde{v}} \frac{(\omega + \underline{b} - 2\underline{b})(2\omega - \omega - \underline{b})}{(\omega - \underline{b})(\omega - \underline{b})} = \frac{\bar{c}}{\tilde{v}} < k_1 - \omega.$$

   For this to hold, it must be that $k_1 - \omega > k_0 - \underline{b}$. Hence, a necessary condition for existence of the fully informative equilibrium is $\tilde{v} = k_1 - k_0 > \omega - \underline{b}$.

2. Interior Equilibrium: $\underline{b} < b_0 < b_1 < \omega$
   When $s = 0$, the contact is indifferent between $x = 0$ and $x = 1$ if and only if

$$k_0 - b_0 = g(b_0, b_1). \tag{19}$$

   When $s = 1$, the contact is indifferent between $x = 0$ and $x = 1$ if and only if

$$k_1 - b_1 = g(b_0, b_1). \tag{20}$$

   As the right-hand sides of (19) and (20) are the same, it follows that the left-hand side must be identical as well:

$$\begin{aligned} & k_0 - b_0 = k_1 - b_1 \\ \Leftrightarrow \qquad & b_1(b_0) = \tilde{v} + b_0. \end{aligned}$$

   Plugging $b_1(b_0)$ into expression (19) indirectly defines b_0. For this equilibrium to be feasible, it must hold that $\omega > b_0 + \tilde{v} > b_0 > \underline{b}$. A necessary condition is $\omega - \underline{b} > \tilde{v}$.

3. b_0-Corner Equilibrium: $\underline{b} = b_0 < b_1 < \omega$
   For $b_0 = \underline{b}$, the cutoff b_1 is implicitly defined by

$$k_1 - b_1 = g(\underline{b}, b_1) = \frac{\bar{c}}{\tilde{v}} \frac{2\omega - b_1 - \underline{b}}{\omega - \underline{b}}.$$

   Solving for b_1 yields

$$b_1 = \frac{k_1 \tilde{v}(\omega - \underline{b}) - \bar{c}(2\omega - \underline{b})}{\tilde{v}(\omega - \underline{b}) - \bar{c}}.$$

   When signal $s = 0$, the contact plays $x = 0$ if and only if

$$\begin{aligned} & k_0 - \underline{b} < g(\underline{b}, b_1) = \frac{\bar{c}}{\tilde{v}(\omega - \underline{b})} \left(2\omega - \frac{k_1 \tilde{v}(\omega - \underline{b}) - \bar{c}(2\omega - \underline{b})}{\tilde{v}(\omega - \underline{b}) - \bar{c}} - \underline{b} \right) \\ \Leftrightarrow \qquad & k_0 - \underline{b} < \frac{\bar{c}(2\omega - k_1 - \underline{b})}{\tilde{v}(\omega - \underline{b}) - \bar{c}}. \end{aligned} \tag{21}$$

4. b_1-Corner Equilibrium: $\underline{b} < b_0 < b_1 = \omega$

If $b_1 = \omega$, then b_0 is implicitly defined by

$$k_0 - b_0 = g(b_0, \omega) = \frac{\bar{c}}{\tilde{v}} \frac{\omega + b_0 - 2\underline{b}}{\omega - \underline{b}}.$$

Solving for b_0 yields

$$b_0 = \frac{k_0 \tilde{v}(\omega - \underline{b}) - \bar{c}(\omega - 2\underline{b})}{\tilde{v}(\omega - \underline{b}) + \bar{c}}.$$

When signal $s = 1$, the contact plays $x = 1$ if and only if

$$\begin{aligned} & k_1 - \omega > g(b_0, \omega) = \frac{\bar{c}}{\tilde{v}(\omega - \underline{b})}\left(\omega + \frac{k_0 \tilde{v}(\omega - \underline{b}) - \bar{c}(\omega - 2\underline{b})}{\tilde{v}(\omega - \underline{b}) + \bar{c}} - 2\underline{b}\right) \\ \Leftrightarrow \quad & k_1 - \omega > \frac{\bar{c}(\omega + k_0 - 2\underline{b})}{\bar{c} + \tilde{v}(\omega - \underline{b})}. \end{aligned} \tag{22}$$

5. Uninformative Equilibrium with $x = 0$: $\underline{b} = b_0 = b_1$.

6. Uninformative Equilibrium with $x = 1$: $b_0 = b_1 = \omega$.

Note that inequality (17) together with $k_1 > k_0$ imply that it cannot be that $\underline{b} < b_0 = b_1 < \omega$ in equilibrium.

Probability of Unionization and Equilibrium Informativeness We first prove that the ex-ante probability of unionization is independent of the equilibrium thresholds (b_0, b_1) and of ω and c. We then use this to show that the same equilibrium that minimizes of the probability of the type I error $1 - P(u|v_0)$ also minimizes the probability of type II error $P(u|v_1)$.
The ex-ante probability of unionization $P(u)$ for any equilibrium thresholds, is given by

$$\begin{aligned} P(u) &= \sum_{x=0,1} P(u|x)P(x) = \frac{\sum_{x=0,1} \mathbb{E}[v|x]P(x) - d - \mathbb{E}[b] - \underline{\delta}}{\bar{\delta} - \underline{\delta}} \\ &= \frac{\mathbb{E}[v] - d - \mathbb{E}[b] - \underline{\delta}}{\bar{\delta} - \underline{\delta}}. \end{aligned}$$

The last equality follows from the law of iterated expectations, $\sum_{x=0,1} \mathbb{E}[v|x]P(x) = \mathbb{E}[v]$. Further, the ex-ante probability of unionization $P(u)$ can be decomposed as follows:

$$P(u) = P(u|v_0)P(v_0) + P(u|v_1)P(v_1).$$

The simplifying assumption that $P(v_0) = P(v_1) = 1/2$ yields that

$$1 - P(u|v_1) = P(u|v_0) + 1 - 2P(u),$$

where $1 - 2P(u)$ is independent of the equilibrium (b_0, b_1) and of ω and c. It follows that maximizing $P(u|v_1)$ corresponds to both a minimization of the Type I and Type II error.

B Mathematical Proofs

Proof of Proposition 1 We first establish in the following Lemma under which conditions the contact always becomes an organizer, regardless of the signal s he receives.

Lemma 1. *The uninformative equilibrium in which the contact always becomes an organizer independently of s and b, $b_0 = b_1 = \omega$, exists if and only if $\bar{c} \leq \frac{1}{2}\tilde{v}\,(k_0 - \omega)$.*

Proof. Consider an uninformative equilibrium in which $b_0 = b_1 = \omega$, that is the contact always becomes an organizer. It follows that $\mathbb{E}[v|x = 1] = \mathbb{E}[v]$, as $x = 1$ is always chosen by the contact regardless of the signal s observed. If workers do not see a contact, $x = 0$, their beliefs would be entirely free, so that $\mathbb{E}[v|x = 0]$ can take any value weakly larger than $\mathbb{E}[v|s = 0]$ and smaller than $\mathbb{E}[v|s = 1]$. Hence, using inequality (7) and noting that the difference in probabilities is given by expression (13), an uninformative equilibrium with $b_0 = b_1 = \omega$ exists if and only if, for both $s = 0, 1$,

$$\begin{aligned}\mathbb{E}[v|s] - d - b - \mathbb{E}[\delta] \geq k_0 - \omega \geq & \frac{c(\overline{\delta} - \underline{\delta})}{\mathbb{E}[v] - \mathbb{E}[v|s = 0]} = \frac{\bar{c}}{\mathbb{E}[\Delta v] - E[\Delta v|s = 0]} \\ = & \frac{\bar{c}}{(v_1 - v_0)/2 - (v_1 - v_0)(1 - p)} = \frac{\bar{c}}{(v_1 - v_0)(p - 1/2)}.\end{aligned} \tag{23}$$

Rearranging, we obtain the condition:

$$\bar{c} \leq (k_0 - \omega)\,(v_1 - v_0)(p - 1/2), \tag{24}$$

or, using $\tilde{v}/2 = (p - 1/2)(v_1 - v_0)$,

$$\bar{c} \leq \frac{1}{2}\tilde{v}\,(k_0 - \omega)\,. \tag{25}$$

□

We turn to the uninformative equilibrium with no opting in.

Lemma 2. *There always exists an uninformative equilibrium in which the contact never becomes an organizer independently of s and b, $b_0 = b_1 = \underline{b}$.*

Proof. In such an equilibrium, $b_0 = b_1 = \underline{b}$, the contact never becomes an organizer, i.e., $x = 0$ for all s and b. Hence, the workers' beliefs upon observing $x = 0$ remain the same as under the prior $\mathbb{E}[v|x = 0] = \mathbb{E}[v]$.

Off-the equilibrium path, if the contact were to become an organizer, i.e., $x = 1$, the workers' beliefs are entirely free in a Perfect Bayesian Equilibrium. An equilibrium with no opting in is supported by beliefs that ignore the contact's choice also if he becomes an organizer, $\mathbb{E}[v|x = 1] = \mathbb{E}[v]$. With such beliefs, the probability of unionization is independent of the contact's choice x: equation (13) becomes $P(u|x = 1) - P(u|x = 0) = \frac{\mathbb{E}[v|x=1]-\mathbb{E}[v|x=0]}{\bar{\delta}-\underline{\delta}} = 0$. The contact never chooses to become an organizer, as he does not want to pay the cost c to no effect on the probability of unionization. Formally, inequality (6) simplifies to $-c > 0$, which obviously can never be satisfied.

Hence, an equilibrium in which the contact plays $x = 0$ independently of of s and b always exists. □

Proof of Proposition 2: High Costs We show that there is no informative equilibrium for high costs, i.e., $\bar{c} > \tilde{v}(k_1 - \underline{b})$.

We earlier concluded that, a contact of bias b is willing to participate in an informative equilibrium if and only if $k_s - b \geq g(b_0, b_1)$. The left-hand side is maximized by $k_1 - \underline{b}$. Because $g(b_0, b_1)$ increases in $b_0 \geq \underline{b}$ and decreases in $b_1 \leq \omega$, the right-hand side is minimized by setting $b_0 = \underline{b}$ and $b_1 = \omega$

$$g(\underline{b}, \omega) = \frac{\bar{c}}{\tilde{v}} \frac{(\omega + \underline{b} - 2\underline{b})(2\omega - \omega - \underline{b})}{(\omega - \underline{b})(\omega - \underline{b})} = \frac{\bar{c}}{\tilde{v}}.$$

Hence, we conclude that an informative equilibrium cannot exist for $\bar{c} > \tilde{v}(k_1 - \underline{b})$.

Evidently, the condition $\bar{c} > \tilde{v}(k_1 - \underline{b})$ contradicts $\bar{c} \leq \frac{1}{2}\tilde{v}(k_0 - \omega)$, the condition for an uninformative equilibrium with participation. Hence the only equilibrium for high costs, $\bar{c} > \tilde{v}(k_1 - \underline{b})$, is the uninformative equilibrium in which the contact never becomes an organizer. □

Proof of Proposition 3: Intermediate Costs We hypothesize that $\tilde{v}(k_0 - \underline{b}) < \bar{c} < \tilde{v}(k_1 - \underline{b})$.

We first show that for any $b_1 \leq \omega$, the best response b_0 must be such that $b_0 = \underline{b}$. As found in Appendix A, this is equivalent to $k_0 - b_0 < g(b_0, b_1)$ for all $b_0 \geq \underline{b}$ and $b_1 \leq \omega$. Because the left-hand side decreases in b_0, whereas g increases in b_0 and decreases in b_1, it is sufficient to show that $k_0 - \underline{b} < g(\underline{b}, \omega)$, i.e., that

$$k_0 - \underline{b} < \frac{\bar{c}}{\tilde{v}} \frac{\omega + \underline{b} - 2\underline{b}}{\omega - \underline{b}} = \frac{\bar{c}}{\tilde{v}},$$

which is implied by the hypothesis $\tilde{v}(k_0 - \underline{b}) < \bar{c}$.

As a consequence, the informative equilibrium cannot be an interior nor a b_1-corner equilibrium. We are then left with the following equilibrium candidates, which we will consider in turn:

1. the fully informative equilibrium ($\underline{b} = b_0 < b_1 = \omega$)
2. the b_0-corner equilibrium ($\underline{b} = b_0 < b_1 < \omega$)

The Fully Informative Equilibrium We already established that the best response to $b_1 = \omega$ is $b_0 = \underline{b}$. For a fully informative equilibrium, it must also be that the best response to $b_0 = \underline{b}$ is $b_1 = \omega$. As found in Appendix A, this is equivalent to $k_1 - \omega > g(\underline{b}, \omega)$, i.e.,

$$k_1 - \omega > \frac{\bar{c}}{\tilde{v}} \qquad \Leftrightarrow \qquad \omega < k_1 - \frac{\bar{c}}{\tilde{v}} \equiv \hat{\omega},$$

Further, as we we found in Appendix A, the fully informative equilibrium requires that $\tilde{v} > \omega - \underline{b}$. This condition is satisfied for $\omega < \hat{\omega}$, if $\tilde{v} > \hat{\omega} - \underline{b}$, or $\hat{\omega} < \tilde{v} + \underline{b}$. Note that

$$\hat{\omega} = k_1 - \frac{\bar{c}}{\tilde{v}} = k_0 + \tilde{v} - \frac{\bar{c}}{\tilde{v}} < \tilde{v} + \underline{b} \qquad \Leftrightarrow \qquad (k_0 - \underline{b})\, \tilde{v} < \bar{c},$$

and the final inequality is part of our cost hypothesis. This establishes the existence of the fully informative equilibrium with $b_0 = \underline{b}$ and $b_1 = \omega$ for $\omega < \hat{\omega}$.

The b_0-Corner Equilibrium We already established that the best response to $b_1 = \omega$ is $b_0 = \underline{b}$. For a b_0-corner equilibrium, it must also be that the best response to $b_0 = \underline{b}$ is $b_1 < \omega$. As found in Appendix A, this is equivalent to $k_1 - b_1 = g(\underline{b}, b_1)$ for some $b_1 \leq \omega$, and hence,

$$b_1 = \frac{k_1 \tilde{v}(\omega - \underline{b}) - \bar{c}(2\omega - \underline{b})}{\tilde{v}(\omega - \underline{b}) - \bar{c}}. \tag{26}$$

We now show that a b_0-corner equilibrium exists for $\omega > \hat{\omega}$ and $\bar{c} < \frac{1}{2}\tilde{v}(k_1 - \underline{b})$. Note that if $\omega > \hat{\omega}$ and $\bar{c} < \frac{1}{2}\tilde{v}(k_1 - \underline{b})$, then $\tilde{v}(\omega - \underline{b}) - \bar{c} > 0$. To see this, assume by contradiction that $\bar{c} > \tilde{v}(\omega - \underline{b})$. Then,

$$\bar{c} > \tilde{v}(\omega - \underline{b}) > \tilde{v}(k_1 - \frac{\bar{c}}{\tilde{v}} - \underline{b}) = \tilde{v}(k_1 - \underline{b}) - \bar{c},$$

and hence

$$\bar{c} > \tilde{v}(k_1 - \underline{b}) - \bar{c} \qquad \Leftrightarrow \qquad \bar{c} > \frac{1}{2}\tilde{v}(k_1 - \underline{b}).$$

With this result, we now verify that b_1 pinned down by (26) is admissible, i.e., $\underline{b} < b_1 < \omega$. For $b_1 < \omega$, we need:

$$\frac{k_1 \tilde{v}(\omega - \underline{b}) - \bar{c}(2\omega - \underline{b})}{\tilde{v}(\omega - \underline{b}) - \bar{c}} < \omega \qquad \Leftrightarrow \qquad (k_1 - \omega)\tilde{v} < \bar{c} \qquad \Leftrightarrow \qquad \omega > \hat{\omega} = k_1 - \frac{\bar{c}}{\tilde{v}}.$$

Next, we consider $b_1 > \underline{b}$,

$$\frac{k_1 \tilde{v}(\omega - \underline{b}) - \bar{c}(2\omega - \underline{b})}{\tilde{v}(\omega - \underline{b}) - \bar{c}} > \underline{b} \qquad \Leftrightarrow \qquad \frac{1}{2}\tilde{v}(k_1 - \underline{b}) > \bar{c}.$$

We have therefore established that if $\bar{c} < \frac{1}{2}\tilde{v}(k_1 - \underline{b})$, a b_0-corner equilibrium exists if and only if $\omega > \hat{\omega}$.

Suppose now that $\frac{1}{2}\tilde{v}(k_1 - \underline{b}) < \bar{c} < \tilde{v}(k_1 - \underline{b})$. The condition $b_1 > \underline{b}$ can only be satisfied for $\tilde{v}(\omega - \underline{b}) - \bar{c} < 0$, i.e., $\omega < \frac{\bar{c}}{\tilde{v}} + \underline{b}$. As a result, for $b_1 < \omega$ we require $\omega < \hat{\omega}$. Because

$$\frac{1}{2}\tilde{v}(k_1 - \underline{b}) < \bar{c} \qquad \Leftrightarrow \qquad \frac{\bar{c}}{\tilde{v}} + \underline{b} > k_1 - \frac{\bar{c}}{\tilde{v}} = \hat{\omega},$$

we obtain that $\tilde{v}(\omega - \underline{b}) - \bar{c} < 0$ for all $\omega < \hat{\omega}$. We have therefore established that for $\frac{1}{2}\tilde{v}(k_1 - \underline{b}) < \bar{c} < \tilde{v}(k_1 - \underline{b})$, a b_0-corner equilibrium exists if and only if $\omega < \hat{\omega}$.

In sum for low intermediate costs, $\tilde{v}(k_0 - \underline{b}) < \bar{c} < \frac{1}{2}\tilde{v}(k_1 - \underline{b})$, we obtain

1. the interior equilibrium ($\underline{b} < b_0 < b_1 < \omega$), for $\omega < \hat{\omega}$,
2. the b_0-corner equilibrium ($\underline{b} = b_0 < \omega < b_1$), for $\omega > \hat{\omega}$.

Instead, for $\frac{1}{2}\tilde{v}(k_1 - \underline{b}) < \bar{c} < \tilde{v}(k_1 - \underline{b})$, the interior and the b_0- corner equilibrium coexist as we obtain

1. the interior equilibrium ($\underline{b} < b_0 < b_1 < \omega$), for $\omega < \hat{\omega}$,
2. the b_0-corner equilibrium ($\underline{b} = b_0 < \omega < b_1$), for $\omega < \hat{\omega}$.

In this higher intermediate cost range, for $\omega > \hat{\omega}$, there is no informative equilibrium. □

Proof of Proposition 4: Low Costs With low costs, we cannot have a fully informative equilibrium. To see this, recall that for a fully informative equilibrium, the following condition must hold:

$$k_0 - \underline{b} < \frac{\bar{c}}{\tilde{v}}, \tag{27}$$

as outlined in Appendix A, but this is ruled out by the hypothesis on costs.

We therefore are left with the following candidates for an informative equilibrium:

1. the interior equilibrium ($\underline{b} < b_0 < b_1 < \omega$)
2. the b_0-corner equilibrium ($\underline{b} < b_0 < \underline{b} < b_1 < \omega$)
3. the b_1-corner equilibrium ($\underline{b} < b_0 < \omega = b_1$)

The b_1-Corner Equilibrium When $b_1 = \omega$, we found in Appendix A that:

$$b_0 = \frac{k_0\tilde{v}(\omega - \underline{b}) - \bar{c}(\omega - 2\underline{b})}{\tilde{v}(\omega - \underline{b}) + \bar{c}}. \tag{28}$$

The equilibrium admissibility condition is $b_0 \in (\underline{b}, \omega)$. Condition $b_0 > \underline{b}$ is equivalent to

$$\frac{k_0\tilde{v}(\omega - \underline{b}) - \bar{c}(\omega - 2\underline{b})}{\tilde{v}(\omega - \underline{b}) + \bar{c}} > \underline{b} \tag{29}$$

$$\Leftrightarrow \qquad \tilde{v}(k_0 - \underline{b}) > \bar{c}, \tag{30}$$

which holds by hypothesis. Condition $b_0 < \omega$ holds if and only if:

$$\frac{k_0\tilde{v}(\omega - \underline{b}) - \bar{c}(\omega - 2\underline{b})}{\tilde{v}(\omega - \underline{b}) + \bar{c}} < \omega \tag{31}$$

$$\Leftrightarrow \qquad k_0 - \frac{2\bar{c}}{\tilde{v}} < \omega. \tag{32}$$

Define $\tilde{\omega} \equiv k_0 - \frac{2\bar{c}}{\tilde{v}}$. Then, for $b_1 = \omega$, we have an admissible $b_0 \in (\underline{b}, \omega)$ if and only if $\tilde{\omega} < \omega$. This always holds if $\tilde{\omega} < \underline{b}$, which is equivalent to

$$k_0 - \frac{2\bar{c}}{\tilde{v}} < \underline{b} \qquad \Leftrightarrow \qquad \frac{1}{2}\tilde{v}(k_0 - \underline{b}) < \bar{c}. \tag{33}$$

Now, fix b_0. Then, $b_1 = \omega$, i.e., a contact with signal $s = 1$ always wants to be an organizer, if and only if

$$k_1 - \omega > g(b_0, \omega) = \frac{\bar{c}}{\tilde{v}} \frac{\omega + b_0 - 2\underline{b}}{\omega - \underline{b}} \tag{34}$$

Plugging in b_0 as specified in (28) yields

$$g(b_0, \omega) = \frac{\bar{c}(\omega + k_0 - 2\underline{b})}{\tilde{v}(\omega - \underline{b}) + \bar{c}} \tag{35}$$

Hence, the marginal ω such that a contact with signal $s = 1$ always wants to be an organizer is the value $\tilde{\omega}_1$ for which

$$k_1 - \tilde{\omega}_1 = \frac{\bar{c}(\tilde{\omega}_1 + k_0 - 2\underline{b})}{\tilde{v}(\tilde{\omega}_1 - \underline{b}) + \bar{c}} \tag{36}$$

This is a quadratic equation in $\tilde{\omega}_1$, which yields two solutions, namely

$$\tilde{\omega}_1^{+/-} = -\frac{\bar{c}}{\tilde{v}} + \frac{1}{2}(k_1 + \underline{b}) \pm \frac{1}{2\tilde{v}}\sqrt{4\bar{c}^2 - 4\bar{c}(k_0 - \underline{b})\tilde{v} + (k_1 - \underline{b})^2\tilde{v}^2}. \tag{37}$$

As $\tilde{\omega}_1^- < \underline{b}$ (see the Mathematica file in the Supplementary Appendix C), the relevant threshold $\tilde{\omega}_1$ is given by

$$\tilde{\omega}_1 = -\frac{\bar{c}}{\tilde{v}} + \frac{1}{2}(k_1 + \underline{b}) + \frac{1}{2\tilde{v}}\sqrt{4\bar{c}^2 - 4\bar{c}(k_0 - \underline{b})\tilde{v} + (k_1 - \underline{b})^2\tilde{v}^2}. \tag{38}$$

We now verify that inequality (34), $k_1 - \omega > g(b_0, \omega)$, holds for $\omega < \tilde{\omega}_1$. Put differently, if $\omega < \tilde{\omega}_1$ then $b_1 = \omega$: a contact with signal $s = 1$ always wants to be an organizer.

Note first that for $\omega \to \underline{b}$, $g(b_0, \omega)$ simplifies to $k_0 - \underline{b}$. Therefore, inequality (34) boils down to

$$k_1 - \underline{b} > k_0 - \underline{b} \qquad \Leftrightarrow \qquad k_1 > k_0, \tag{39}$$

which always holds.

Note further that $k_1 - \omega$ is linearly decreasing in ω, while the right-hand side of (34) is a convex decreasing function in ω as

$$\frac{\partial\left(\frac{\bar{c}(\omega+k_0-2\underline{b})}{\tilde{v}(\omega-\underline{b})+\bar{c}}\right)}{\partial\omega} = -\frac{\bar{c}(\tilde{v}(k_0-\underline{b})-\bar{c})}{(\tilde{v}(\omega-\underline{b})+\bar{c})^2} < 0 \tag{40}$$

$$\frac{\partial^2\left(\frac{\bar{c}(\omega+k_0-2\underline{b})}{\tilde{v}(\omega-\underline{b})+\bar{c}}\right)}{\partial\omega^2} = \frac{2\bar{c}\tilde{v}(\tilde{v}(k_0-\underline{b})-\bar{c})}{(\tilde{v}(\omega-\underline{b})+\bar{c})^3} > 0 \tag{41}$$

This means that for $\omega < \tilde{\omega}_1$, the left-hand side is larger than the right-hand side, and the reverse holds for $\omega > \tilde{\omega}_1$. Therefore, if and only if $\omega < \tilde{\omega}_1$ does the contact always become an organizer when receiving signal $s = 1$, i.e., $b_1 = \omega$. Hence, there are two possibilities for b_1-corner equilibrium existence.

First, if $\bar{c} > \frac{1}{2}\tilde{v}(k_0 - \underline{b})$, then for $\underline{b} < \omega < \tilde{\omega}_1$, the informative equilibrium is a b_1-corner equilibrium: b_0 is pinned down by (28), and $b_1 = \omega$.

Second, if $\bar{c} < \frac{1}{2}\tilde{v}(k_0 - \underline{b})$, we need to compare $\tilde{\omega}_1$ and $\tilde{\omega}$. We show that $\tilde{\omega}_1 > \tilde{\omega}$ (see the Mathematica file in the Supplementary Appendix C). Hence, we conclude that for $\tilde{\omega} < \omega < \tilde{\omega}_1$, the informative equilibrium is a b_1-corner equilibrium.

The b_0-Corner Equilibrium As in the proof of Proposition 3, we need to ensure that:

$$\underline{b} < b_1 = \frac{k_1\tilde{v}(\omega-\underline{b}) - \bar{c}(2\omega-\underline{b})}{\tilde{v}(\omega-\underline{b})-\bar{c}} < \omega. \tag{42}$$

For the condition

$$b_1 = \frac{k_1\tilde{v}(\omega-\underline{b}) - \bar{c}(2\omega-\underline{b})}{\tilde{v}(\omega-\underline{b})-\bar{c}} > \underline{b} \tag{43}$$

to hold, we must have $\tilde{v}(\omega-\underline{b})-\bar{c} > 0$. If this is the case, in fact, inequality (43) simplifies to $\frac{1}{2}\tilde{v}(k_1 - \underline{b}) > \bar{c}$, which is implied by the hypothesis $\tilde{v}(k_0 - \bar{b}) > \bar{c}$ under Assumption 2. As in the proof of Proposition 3, the condition $\tilde{v}(\omega - \underline{b}) - \bar{c} > 0$ then implies that $b_1 < \omega$ is satisfied if and only if $\omega > \hat{\omega}$. Hence, we require

$$\omega > \hat{\omega} = k_1 - \frac{\bar{c}}{\tilde{v}} \qquad \Leftrightarrow \qquad \bar{c} > \tilde{v}(k_1 - \omega). \tag{44}$$

Given that $\bar{c} < \tilde{v}(k_0 - \underline{b})$, such an equilibrium is only feasible for

$$\tilde{v}(k_0 - \underline{b}) > \tilde{v}(k_1 - \omega) \qquad \Leftrightarrow \qquad \omega > \tilde{v} + \underline{b}. \tag{45}$$

The latter is always satisfied under the assumption that costs are low, $\tilde{v}(k_0 - \underline{b}) > \bar{c}$, because $\omega > \hat{\omega}$ and

$$\hat{\omega} = k_1 - \frac{\bar{c}}{\tilde{v}} > \tilde{v} + \underline{b} \qquad \Leftrightarrow \qquad \tilde{v}(k_0 - \underline{b}) > \bar{c}, \tag{46}$$

where we take into account that $k_1 = k_0 + \tilde{v}$.

Given the b_1 specified by (42), we now determine under which conditions $b_0 = \underline{b}$. As found in Appendix A, this is the case if and only if

$$k_0 - \underline{b} \leq g(\underline{b}, b_1) = \frac{\bar{c}(2\omega - k_1 - \underline{b})}{\tilde{v}(\omega - \underline{b}) - \bar{c}}. \tag{47}$$

Whether or not this holds depends on ω. Note that $g(\underline{b}, b_1)$ is increasing in ω as

$$\frac{\partial \frac{\bar{c}(2\omega - k_1 - \underline{b})}{\tilde{v}(\omega - \underline{b}) - \bar{c}}}{\partial \omega} = \frac{\bar{c}((k_1 - \underline{b})\tilde{v} - 2\bar{c})}{(\tilde{v}(\omega - \underline{b}) - \bar{c})^2} > 0, \tag{48}$$

as $(k_1 - \underline{b})\tilde{v}/2 > \tilde{v}(k_0 - \underline{b}) > \bar{c}$ by hypothesis. This means that if inequality (47) holds for some $\tilde{\omega}_0$ as an equality, then it holds for any $\omega > \tilde{\omega}_0$ strictly. This threshold $\tilde{\omega}_0$ is pinned down by:

$$k_0 - \underline{b} = \frac{\bar{c}(2\tilde{\omega}_0 - k_1 - \underline{b})}{\tilde{v}(\tilde{\omega}_0 - \underline{b}) - \bar{c}} \qquad \Leftrightarrow \qquad \tilde{\omega}_0 = \frac{\underline{b}\left(\tilde{v}(k_0 - \underline{b}) - 2\bar{c}\right) - \bar{c}\tilde{v}}{\tilde{v}(k_0 - \underline{b}) - 2\bar{c}}. \tag{49}$$

If $\tilde{\omega}_0 > \underline{b}$, then for any $\omega > \tilde{\omega}_0$, we have a b_0-corner equilibrium. However, $\bar{c} < \frac{1}{2}\tilde{v}(k_0 - \underline{b})$ implies that $\tilde{\omega}_0 < \underline{b}$, because

$$\tilde{\omega}_0 - \underline{b} = \frac{\underline{b}\left(\tilde{v}(k_0 - \underline{b}) - 2\bar{c}\right) - \bar{c}\tilde{v}}{\tilde{v}(k_0 - \underline{b}) - 2\bar{c}} - \underline{b} = \frac{\bar{c}\tilde{v}}{2\bar{c} - \tilde{v}(k_0 - \underline{b})} < 0. \tag{50}$$

We therefore must check for $\bar{c} < \frac{1}{2}\tilde{v}(k_0 - \underline{b})$ whether there exists an ω, such that (47) holds. We have already shown that $g(\underline{b}, b_1)$ is increasing in ω. Therefore, if we can show for the highest possible ω that a contact with signal $s = 0$ and bias ω prefers to become an organizer,

$$k_0 - \underline{b} > \frac{\bar{c}(2\omega - \underline{b} - k_1)}{\tilde{v}(\omega - \underline{b}) - \bar{c}}, \tag{51}$$

then this must hold for any other ω. Letting $\omega \to \infty$, yields

$$\lim_{\omega \to \infty} \frac{\bar{c}(2\omega - \underline{b} - k_1)}{\tilde{v}(\omega - \underline{b}) - \bar{c}} = \frac{2\bar{c}}{\tilde{v}}. \tag{52}$$

For $k_0 - \underline{b} > \frac{2\bar{c}}{\tilde{v}} > \frac{\bar{c}(2\omega - \underline{b} - k_1)}{\tilde{v}(\omega - \underline{b}) - \bar{c}}$, we then have that the most pro-union contact with signal $s = 0$ chooses to become an organizer. This rules out $b_0 = \underline{b}$, and hence the b_0-corner equilibrium, whenever $\bar{c} < \frac{1}{2}\tilde{v}(k_0 - \underline{b})$.

We then conclude that we have an equilibrium with $b_0 = \underline{b}$ and the specified interior b_1 for $\omega > \tilde{\omega}_0$ and $\tilde{v}(k_0 - \underline{b}) > \bar{c} > \frac{1}{2}\tilde{v}(k_0 - \underline{b})$.

The Interior Equilibrium As shown in Appendix A, we can express b_1 as a function of b_0, namely

$$b_1(b_0) = \tilde{v} + b_0 \tag{53}$$

We then obtain from Appendix A that b_0 solves:

$$k_0 - b_0 = g(b_0) \equiv \frac{\bar{c}(2b_0 - 2\underline{b} + \tilde{v})(2\omega - \tilde{v} - 2b_0)}{\tilde{v}^2(\omega - \underline{b})} \tag{54}$$

This is a quadratic expression in b_0 of the form

$$A_1 b_0^2 - A_2 b_0 + A_3 = 0, \tag{55}$$

where

$$A_1 = \frac{4\bar{c}}{\tilde{v}^2(\omega - \underline{b})} \tag{56}$$

$$A_2 = 1 + \frac{4\bar{c}(\omega + \underline{b} - \tilde{v})}{\tilde{v}^2(\omega - \underline{b})} \tag{57}$$

$$A_3 = k_0 - \frac{\bar{c}(\tilde{v} - 2\underline{b})(2\omega - \tilde{v})}{\tilde{v}^2(\omega - \underline{b})}. \tag{58}$$

Real Solutions Existence Equation (55) has real solutions if and only if

$$A_2^2 - 4A_1A_3 \geq 0. \tag{59}$$

Suppose that expression (59) is satisfied as an equality:

$$\left(1 + \frac{4\bar{c}(\omega + \underline{b} - \tilde{v})}{\tilde{v}^2(\omega - \underline{b})}\right)^2 = \frac{16\bar{c}}{\tilde{v}^2(\omega - \underline{b})}\left(k_0 - \frac{\bar{c}(\tilde{v} - 2\underline{b})(2\hat{\omega}_1 - \tilde{v})}{\tilde{v}^2(\omega - \underline{b})}\right). \tag{60}$$

Rearranging and simplifying shows that this equality has a unique solution $\breve{\omega}$, which, letting $D = d + \mathbb{E}[\delta]$, takes the form:

$$\breve{\omega} = \frac{16\left(\frac{1}{2}(v_0 + v_1) - D\right)\bar{c}\tilde{v}^2 + \underline{b}\left(\tilde{v}^2 - 4\bar{c}\right)^2}{\left(\tilde{v}^2 + 4\bar{c}\right)^2}. \tag{61}$$

The Mathematica file in the Supplementary Appendix C shows that inequality (59) is satisfied if and only if $\omega \geq \breve{\omega}$.

Admissible Solution When they exist, the two real solutions of (55) are:

$$\begin{aligned} b_0^{+/-} &= \frac{A_2 \pm \sqrt{A_2^2 - 4A_1A_3}}{2A_1} \\ &= \frac{\omega + \underline{b} - \tilde{v}}{2} + \frac{\tilde{v}^2(\omega - \underline{b})}{8\bar{c}} \pm \frac{1}{8\bar{c}}\sqrt{(\omega - \underline{b})\left(16\bar{c}^2\omega + \tilde{v}^4\omega + 8\bar{c}\tilde{v}^2(\omega - k_0 - k_1) - \underline{b}(\tilde{v}^2 - 4\bar{c})^2\right)} \end{aligned} \tag{62}$$

We must determine whether the admissible solution b_0 is b_0^- or b_0^+.

Consider the threshold $b_1(b_0^+) = b_0^+ + \tilde{v}$ associated with the solution b_0^+. We show in the Supplementary Appendix C that $b_1(b_0^+) > \omega$ (see Mathematica file). This is not admissible in an interior equilibrium. Therefore, we can rule out b_0^+ as an admissible solution. Let us consider b_0^-, which we henceforth write succinctly as b_0.

The following Lemma determines that b_0 decreases in ω.

Lemma 3 ($b_0 \downarrow$ in ω)**.** *The threshold b_0 is decreasing in ω.*

Proof. Defining $K \equiv 16\bar{c}^2\omega + \tilde{v}^4\omega + 8\bar{c}\tilde{v}^2(\omega - k_1 - k_0) - \underline{b}(\tilde{v}^2 - 4\bar{c})^2$ and taking the derivative with respect to ω yields

$$\frac{\partial b_0}{\partial \omega} = \frac{1}{8\bar{c}}\left[4c + \tilde{v}^2 - \frac{1}{2}\sqrt{\frac{\omega - \underline{b}}{K}}(4\bar{c} + \tilde{v}^2)^2 - \frac{1}{2}\sqrt{\frac{K}{\omega - \underline{b}}}\right] \tag{63}$$

The derivative is negative if

$$-(4\bar{c} + \tilde{v}^2) + \frac{1}{2}\sqrt{\frac{\omega - \underline{b}}{K}}(4\bar{c} + \tilde{v}^2)^2 + \frac{1}{2}\sqrt{\frac{K}{\omega - \underline{b}}} > 0 \tag{64}$$

$$\Leftrightarrow \quad -2(4\bar{c} + \tilde{v}^2) + \sqrt{\frac{\omega - \underline{b}}{K}}(4\bar{c} + \tilde{v}^2)^2 + \sqrt{\frac{K}{\omega - \underline{b}}} > 0 \tag{65}$$

$$\Leftrightarrow \quad (4\bar{c} + \tilde{v}^2)^2 - 2\sqrt{\frac{K}{\omega - \underline{b}}}(4\bar{c} + \tilde{v}^2) + \frac{K}{\omega - \underline{b}} > 0 \tag{66}$$

$$\Leftrightarrow \quad \left((4\bar{c} + \tilde{v}^2) - \sqrt{\frac{K}{\omega - \underline{b}}}\right)^2 > 0, \tag{67}$$

where the latter always holds. (Once again, see the Mathematica file in the Supplementary Appendix C.) □

Having found b_0, we then need to make sure that $b_0 > \underline{b}$ and $b_1 = b_0 + \tilde{v} < \omega$.

Lemma 4 ($b_0 > \underline{b}$)**.** *The threshold b_0 is greater than $\underline{b}$, if and only if either $\tilde{\omega}_0 > \omega > \underline{b}$, or $\tilde{\omega}_0 < \underline{b}$.*

Proof. Consider first the case where $\tilde{\omega}_0 > \underline{b}$, which is ensured by $c > \frac{1}{2}\tilde{v}(k_0 - \underline{b})$. The cutoff $b_0 = \underline{b}$ if and only if $\omega = \tilde{\omega}_0$. To see his note that the threshold then becomes

$$b_0(\tilde{\omega}_0) = \frac{\tilde{v}^2(\tilde{\omega}_0 - \underline{b})}{8\bar{c}} + \frac{1}{2}(\tilde{\omega}_0 + \underline{b} - \tilde{v}) - \frac{\tilde{v}^2(\tilde{\omega}_0 - \underline{b})}{8\bar{c}} \frac{\tilde{v}^2 + 4\tilde{v}(k_0 - \underline{b}) - 4\bar{c}}{\tilde{v}^2} \tag{68}$$

$$= \frac{1}{2}(\tilde{\omega}_0 + \underline{b} - \tilde{v}) - \frac{\tilde{v}^2(\omega - \underline{b})}{8\bar{c}} \frac{4\tilde{v}(k_0 - \underline{b}) - 4\bar{c}}{\tilde{v}^2} \tag{69}$$

$$= \tilde{\omega}_0 - \frac{1}{2}\tilde{v} - \frac{(\tilde{\omega}_0 - \underline{b})\,\tilde{v}\,(k_0 - \underline{b})}{2\bar{c}} \tag{70}$$

$$= -\tilde{\omega}_0 \left[\frac{\tilde{v}(k_0 - \underline{b}) - 2\bar{c}}{2\bar{c}}\right] + \frac{\underline{b}\tilde{v}\,(k_0 - \underline{b})}{2\bar{c}} \tag{71}$$

$$= \underline{b} + \frac{1}{2}\tilde{v} - \frac{1}{2}\tilde{v} = \underline{b} \tag{72}$$

Noting that b_0 decreasing in ω yields the result.

Suppose now that $\tilde{\omega}_0 < \underline{b}$. This holds for $\bar{c} < \frac{1}{2}\tilde{v}(k_0 - \underline{b})$. Then, $b_0(\omega) > \underline{b}$ for any $\omega > \underline{b}$. (See the Mathematica file in the Supplementary Appendix C.) □

Lemma 5 ($b_1 < \omega$)**.** *The threshold b_1 is smaller than ω, if and only if $\omega > \tilde{\omega}_1$.*

Proof. We set $b_1 = b_0 + \tilde{v} = \omega$. Then it must hold that

$$k_1 - \omega = \frac{\bar{c}}{\tilde{v}^2(\omega - \underline{b})}(2\omega - 2\underline{b} - \tilde{v})(2\omega + \tilde{v} - 2\omega) \tag{73}$$

$$\Leftrightarrow \qquad k_1 - \omega = \frac{\bar{c}}{\tilde{v}(\omega - \underline{b})}(2\omega - 2\underline{b} - \tilde{v}) \tag{74}$$

$$\Leftrightarrow \qquad (k_1 - \omega)(\omega - \underline{b}) = \frac{2\bar{c}}{\tilde{v}}(\omega - \underline{b}) - \bar{c} \tag{75}$$

Recall that $\tilde{\omega}_1$ as calculated in (38) is the marginal ω such that the informative equilibrium is a corner equilibrium with $b_1 = \omega$. Rewriting it as

$$\tilde{\omega}_1 = \frac{1}{2}\left[k_1 + \underline{b} - \frac{2\bar{c}}{\tilde{v}} + \hat{K}\right], \text{ where } \hat{K} = \frac{1}{\tilde{v}}\sqrt{4\bar{c}^2 - 4\bar{c}(k_0 - \underline{b})\tilde{v} + (k_1 - \underline{b})^2\tilde{v}^2}, \tag{76}$$

and plugging it into (75) yields

$$-\bar{c} + \frac{\bar{c}}{\tilde{v}}\left[k_1 - \underline{b} - \frac{2\bar{c}}{\tilde{v}} + \hat{K}\right] = -\bar{c} + \frac{\bar{c}}{\tilde{v}}\left[k_1 - \underline{b} - \frac{2\bar{c}}{\tilde{v}} + \hat{K}\right], \tag{77}$$

which establishes that if $\omega = \tilde{\omega}_1$, then $b_1 = \omega$ also if the informative equilibrium is interior.

Because $b_1 = b_0 + \tilde{v}$ and b_0 is decreasing in ω, we obtain that for any $\omega > \tilde{\omega}_1$, b_1 lies below ω in the interior equilibrium. □

As we have established that an interior equilibrium is only feasible for $\omega > \underline{b} + \tilde{v}$, it is worth noting that $\tilde{\omega}_1 > \underline{b} + \tilde{v}$.

We show in Supplementary Appendix C that $\breve{\omega} < \tilde{\omega}_1$ (see Mathematica File). The condition $\omega > \breve{\omega}$ for existence of real solutions of equation (55) is weaker than the condition $\omega > \tilde{\omega}_1$ for $b_1 < \omega$, and hence can be omitted.

Our results establish that we need to distinguish between (1) $\bar{c} < \frac{1}{2}\tilde{v}(k_0 - \underline{b})$ and (2) $\bar{c} > \frac{1}{2}\tilde{v}(k_0 - \underline{b})$.

For $\bar{c} < \frac{1}{2}\tilde{v}(k_0 - \underline{b})$, the informative equilibrium can only take two forms:

1. the b_1-corner equilibrium ($\underline{b} < b_0 < \omega = b_1$), for $\tilde{\omega} < \omega < \tilde{\omega}_1$,
2. the interior equilibrium ($\underline{b} < b_0 < b_1 < \omega$), for $\omega > \tilde{\omega}_1$.

When $\omega < \tilde{\omega}$, no informative equilibrium exists as none of the conditions required for the informative equilibria apply.

For $\bar{c} > \frac{1}{2}\tilde{v}(k_0 - \underline{b})$, we also need to consider the threshold $\tilde{\omega}_0$. Note that for $\tilde{\omega}_0 > \underline{b}$, it must be that $\tilde{\omega}_1 < \tilde{\omega}_0$. In turn, $\tilde{\omega}_1 < \tilde{\omega}_0$ implies $\tilde{\omega}_0 > \hat{\omega} = k_1 - \frac{\bar{c}}{\tilde{v}}$ (see the Mathematica file in the Supplementary Appendix C). Based on this, we can summarize as follows the different forms taken by the informative equilibrium when $\bar{c} > \frac{1}{2}\tilde{v}(k_0 - \underline{b})$.

1. the b_1-corner equilibrium ($\underline{b} < b_0 < \omega = b_1$), for $(\underline{b} <)\omega < \tilde{\omega}_1$
2. the interior equilibrium ($\underline{b} < b_0 < b_1 < \omega$), for $\tilde{\omega}_1 < \omega < \tilde{\omega}_0$.
3. the b_0-corner equilibrium ($b_0 = \underline{b} < b_1 < \omega$), for $\tilde{\omega}_0 < \omega$.

As $\tilde{\omega} < \underline{b}$ for $\bar{c} > \frac{1}{2}\tilde{v}(k_0 - \underline{b})$, an informative equilibrium always exists in this cost range. □

Proof of Proposition 5: Probability of unionization given that $v = v_1$ We compare the probability of unionization conditional on $v = v_1$ across the informative equilibrium as the value of the maximal bias ω changes. Of course, the workers do not know the value of v. From their perspective, the expected value of unionization is $E_w[v|x]$. Taking into account the workers' beliefs, the probability of unionization conditional on $v = v_1$ is then

$$P(u|v_1) = \frac{\mathbb{E}[\mathbb{E}_w[v|x]|v_1] - d - \mathbb{E}[b] - \underline{\delta}}{\overline{\delta} - \underline{\delta}}. \tag{78}$$

This probability is increasing in $E[E_w[v|x]|v_1]$ and therefore the maximization of $P(u|v_1)$, the unionization probability given $v = v_1$, is equivalent to finding the value of ω and associated informative equilibrium that yields the highest workers' expected value of unionization, $E[E_w[v|x]|v_1]$. This expectation can be expressed as follows:

$$\begin{aligned} \mathbb{E}[\mathbb{E}_w[v|x]|v_1] &= \mathbb{E}[\mathbb{E}_w[\Delta v|x]|v_1] + v_0 && (79) \\ &= \mathbb{E}_w[\Delta v|x=0]P(x=0|v_1) + \mathbb{E}_w[\Delta v|x=1]P(x=1|v_1) + v_0, && (80) \end{aligned}$$

where

$$\mathbb{E}_w[\Delta v|x] = P\left(v = v_1|x\right)\left(v_1 - v_0\right) \tag{81}$$

$$= \frac{P\left(x|v_1\right)}{P\left(x|v_0\right) + P\left(x|v_1\right)}\left(v_1 - v_0\right). \tag{82}$$

The workers' expected value of unionization simplifies to

$$\mathbb{E}[\mathbb{E}_w[v|x]|v_1] = (v_1 - v_0)\left[\frac{P\left(x=0|v_1\right)^2}{P\left(x=0|v_0\right) + P\left(x=0|v_1\right)} + \frac{P\left(x=1|v_1\right)^2}{P\left(x=1|v_0\right) + P\left(x=1|v_1\right)}\right] + v_0. \tag{83}$$

We define

$$\begin{aligned}\phi\left(\omega; b_0, b_1\right) \equiv & \frac{P\left(x=0|v_1\right)^2}{P\left(x=0|v_0\right) + P\left(x=0|v_1\right)} + \frac{P\left(x=1|v_1\right)^2}{P\left(x=1|v_0\right) + P\left(x=1|v_1\right)} \\ = & \frac{P\left(x=0|v_1\right)}{\frac{P(x=0|v_0)}{P(x=0|v_1)} + 1} + \frac{P\left(x=1|v_1\right)}{\frac{P(x=1|v_0)}{P(x=1|v_1)} + 1} \\ = & \frac{1 - P\left(x=1|v_1\right)}{\frac{P(x=0|v_0)}{1-P(x=1|v_1)} + 1} + \frac{P\left(x=1|v_1\right)}{\frac{1-P(x=0|v_0)}{P(x=1|v_1)} + 1} \\ = & \frac{\left(\omega - (1-p)b_0 - pb_1\right)^2}{\left(\omega - \underline{b}\right)\left(2\omega - b_0 - b_1\right)} + \frac{\left(b_1 p + b_0(1-p) - \underline{b}\right)^2}{\left(\omega - \underline{b}\right)\left(b_0 + b_1 - 2\underline{b}\right)}.\end{aligned} \tag{84}$$

The last equality follows as

$$\begin{aligned}P\left(x=1|v_1\right) = & P_w\left(x=1|s=1\right)P(s=1|v_1) + P_w\left(x=1|s=0\right)P(s=0|v_1) \\ = & \frac{b_1 - \underline{b}}{\omega - \underline{b}}p + \frac{b_0 - \underline{b}}{\omega - \underline{b}}(1-p), \\ P\left(x=0|v_1\right) = & P\left(x=0|s=1\right)P(s=1|v_1) + P\left(x=0|s=0\right)P(s=0|v_1) \\ = & \frac{b_1 - \underline{b}}{\omega - \underline{b}}p + \frac{b_0 - \underline{b}}{\omega - \underline{b}}(1-p).\end{aligned}$$

The function $\phi\left(\omega; b_0, b_1\right)$ is increasing in b_1 and decreasing in b_0:

$$\frac{\partial\phi\left(\omega; b_0, b_1\right)}{\partial b_0} = \frac{(2p-1)^2(b_1 - b_0)\left(b_0(2b_1 - \underline{b} - \omega) + 2b_1^2 - 3b_1(\underline{b} + \omega) + 4\underline{b}\omega\right)}{(b_0 + b_1 - 2\underline{b})^2(b_0 + b_1 - 2\omega)^2} < 0, \tag{85}$$

$$\frac{\partial\phi\left(\omega; b_0, b_1\right)}{\partial b_1} = \frac{-(2p-1)^2(b_1 - b_0)\left(2b_0^2 + b_1(2b_0 - \omega - \underline{b}) - 3b_0(\underline{b} + \omega) + 4\underline{b}\omega\right)}{(b_0 + b_1 - 2\underline{b})^2(b_0 + b_1 - 2\omega)^2} > 0, \tag{86}$$

see also the Mathematica File in the Supplementary Appendix C.

This immediately establishes that in the intermediate cost case, the fully informative equilibrium leads to the highest probability of unionization given that $v = v_1$. In the intermediate cost case, we either have a b_0-corner equilibrium or the fully informative equilibrium. In both equilibria, a contact with signal $s = 0$ refrains from becoming an organizer, meaning $b_0 = \underline{b}$. At the same time, $b_1 = \omega$ in the fully informative equilibrium, but $b_1 < \omega$ in the b_0-corner equilibrium. As $\phi(\omega; \underline{b}, \omega) \geq \phi(\omega; \underline{b}, b_1)$ the fully informative equilibrium maximizes the unionization probability for given ω. Let now ω increase in the b_0-corner equilibrium. We obtain

$$\frac{\partial \phi(\omega; b_0, b_1)}{\partial \omega} = \underbrace{-\frac{(1-2p)^2(b_1-b_0)^2}{(b_0+b_1-2\underline{b})(b_0+b_1-2\omega)^2}}_{<0} + \underbrace{\frac{\partial \phi(\omega; b_0, b_1)}{\partial b_0}}_{=0}\frac{\partial b_0}{\partial \omega} + \underbrace{\frac{\partial \phi(\omega; b_0, b_1)}{\partial b_1}}_{>0}\underbrace{\frac{\partial b_1}{\partial \omega}}_{<0} < 0$$

To see that the derivative of b_1 with respect to ω is negative, recall that in the b_0-corner equilibrium, b_1 is given by (43). The derivative is then

$$\frac{\partial b_1}{\partial \omega} = \frac{\bar{c}(2\bar{c} - \tilde{v}(k_1 - \underline{b}))}{(\tilde{v}(\underline{b} - \omega) + \bar{c})^2}.$$

Noting that $2\bar{c} - \tilde{v}(k_1 - \underline{b}) < 0$ as $\bar{c} < \frac{1}{2}\tilde{v}(k_1 - \underline{b})$ yields the result.

We turn to the low cost case, where a b_1- corner, an interior or a b_0-corner equilibrium may exist. For a b_1-corner equilibrium the unionization probability is maximized at $\tilde{\omega}_1$. In any b_1-corner equilibrium, $b_1 = \omega$. In this type of equilibrium, b_0 is given by (28). Note that b_0 is increasing in ω as

$$\frac{\partial b_0}{\partial \omega} = \frac{\bar{c}(\tilde{v}(k_0 - \underline{b}) - \bar{c})}{(\tilde{v}(\omega - \underline{b}) + \bar{c})^2} > 0,$$

due to the assumption on cost. Plugging (28) in $\phi(\omega; b_0, \omega)$ and taking the derivative with respect to ω yields

$$\frac{\partial \phi(\omega; b_0(\omega), \omega)}{\partial \omega} = \frac{(2p-1)^2(\tilde{v}(k_0 - \underline{b}) - \bar{c})}{\tilde{v}(\omega + k_0 - 2\underline{b})^2} > 0. \tag{87}$$

At $\tilde{\omega}_1$, the b_1-corner equilibrium delivers the same unionization probability as the interior equilibrium as for $b_1 = \tilde{\omega}_1$, see Lemma 5. This then also implies the same b_0, as

$$b_1\text{-corner eq.} \qquad b_0 = \frac{k_0\tilde{v}(\omega - \underline{b}) - \bar{c}(\omega - 2\underline{b})}{\tilde{v}(\omega - \underline{b}) + \bar{c}}, \tag{88}$$

$$\text{interior eq.} \qquad b_0 = \omega - \tilde{v}. \tag{89}$$

It then holds that

$$\tilde{\omega}_1 - \tilde{v} = \frac{k_0\tilde{v}(\tilde{\omega}_1 - \underline{b}) - \bar{c}(\tilde{\omega}_1 - 2\underline{b})}{\tilde{v}(\tilde{\omega}_1 - \underline{b}) + \bar{c}} \quad \Leftrightarrow \quad (\tilde{\omega}_1 - \tilde{v})(\tilde{v}(\tilde{\omega}_1 - \underline{b}) + \bar{c}) = k_0\tilde{v}(\tilde{\omega}_1 - \underline{b}) - \bar{c}(\tilde{\omega}_1 - 2\underline{b}),$$

see the Mathematica file in the Supplementary Appendix C.

We turn to the interior equilibrium. In this equilibrium, both b_0 and b_1 are decreasing in ω. We therefore plug in our solution to b_0 in the interior equilibrium into (84), also taking into account that $b_1 = b_0 + \tilde{v}$. We show in the Supplementary Appendix that the total derivative of $\phi(\omega; b_0, b_1)$ with respect to ω is negative, meaning in the class of interior equilibria, the unionization probabilities are maximized for $\omega = \tilde{\omega}_1$.

The maximal bias $\tilde{\omega}_1$ also maximizes the probability of unionization given that $v = v_1$ if $\bar{c} < \frac{1}{2}\tilde{v}(k_0 - \underline{b})$. For costs above this threshold, we must verify that there is no b_0-corner equilibrium that leads to a higher unionization probability than the interior equilibrium at $\omega = \tilde{\omega}_1$. First, note that at $\tilde{\omega}_0$, the interior and the b_0-corner equilibrium generate the same cut-offs. By Lemma 4, $b_0 = \underline{b}$. Moreover,

$$\text{interior eq.} \qquad b_1 = \underline{b} + \tilde{v}, \tag{90}$$

$$b_0\text{-corner eq.} \qquad b_1 = \frac{k_1 \tilde{v}(\omega - \underline{b}) - \bar{c}(2\omega - \underline{b})}{\tilde{v}(\omega - \underline{b}) - \bar{c}}. \tag{91}$$

Taking into account that $\omega = \tilde{\omega}_0$ establishes equality, see the Supplementary Appendix. As we have already demonstrated with intermediate costs that in the b_0-corner equilibrium the unionization probability given that $v = v_1$ is decreasing in ω, it follows that indeed $\tilde{\omega}_1$ maximizes the probability of unionization given that $v = v_1$, in the low cost case. $\square$

Proof of Proposition 6: Comparative Statics Intermediate Costs To assess the impact of a change in the different parameters on the probability of unionization if beneficial, $P(u|v_1)$, we first consider the effect on the expected value $\mathbb{E}[\mathbb{E}_w[v|x]|v_1]$, before discussing the overall impact on $P(u|v_1)$. The expected value of unionization for workers, conditional on $v = v_1$ is

$$\mathbb{E}[\mathbb{E}_w[v|x]|v_1] = (v_1 - v_0)(p^2 + (1-p)^2) + v_0. \tag{92}$$

Taking the derivative with respect to the three parameters it depends on yields

$$\frac{\partial \mathbb{E}[\mathbb{E}_w[v|x]|v_1]}{\partial v_1} = p^2 + (1-p)^2 > 0, \tag{93}$$

$$\frac{\partial \mathbb{E}[\mathbb{E}_w[v|x]|v_1]}{\partial v_0} = 2p(1-p) > 0, \tag{94}$$

$$\frac{\partial \mathbb{E}[\mathbb{E}_w[v|x]|v_1]}{\partial p} = 2\tilde{v} > 0. \tag{95}$$

Inspection of expressions (8) and (9) immediately shows that increasing $\mathbb{E}[v]$ holding $v_1 - v_0$ fixed increases $\mathbb{E}[\mathbb{E}_w[v|x]|v_1]$. We also consider an increase $v_1 - v_0$ holding $\mathbb{E}[v] =$

$(v_0+v_1)/2$ fixed. Then, $d(v_1-v_0)>0$ together with $d\frac{v_1+v_0}{2}=0$ implies $dv_1=-dv_0=d\hat{v}>0$, and

$$\frac{\partial}{\partial\hat{v}}\mathbb{E}[\mathbb{E}_w[v|x]|v_1]=\frac{\partial}{\partial v_1}\mathbb{E}[\mathbb{E}_w[v|x]|v_1]-\frac{\partial}{\partial v_0}\mathbb{E}[\mathbb{E}_w[v|x]|v_0]=(2p-1)^2>0.$$

We consider the overall effect of the parameters on the probability of unionization if beneficial, $P(u|v_1)$. The effect of the high value v_1, the low value v_0, and signal precision p only operate through the effect on the expected value $\mathbb{E}[\mathbb{E}_w[v|x]|v_1]$. As all three parameters, $\mathbb{E}[v]$ holding v_1-v_0 fixed, and $\mathbb{E}[v]$ with v_1-v_0 constant increase this expectation, it follows that they also increase $P(u|v_1)$.

We turn to the remaining parameters that only directly affect $P(u|v_1)$: d, $\underline{b}$, $\overline{b}$, $\underline{\delta}$, $\overline{\delta}$. It is straightforward to show that an increase in d, an increase in $\underline{b}$ and $\overline{b}$, as well as in $\overline{\delta}$ decrease $P(u|v_1)$. We turn to a change in $\underline{\delta}$:

$$\frac{\partial}{\partial\hat{v}}P(u|v_1)=\frac{\mathbb{E}[\mathbb{E}_w[v|x]|v_1]-d-\mathbb{E}[b]-\overline{\delta}}{(\overline{\delta}-\underline{\delta})^2}<0, \tag{96}$$

where the inequality follows from condition (10). It is immediate that increasing $\mathbb{E}[\delta]$ holding $\overline{\delta}-\underline{\delta}$ fixed decreases $P(u|v_1)$. Instead, increasing $\overline{\delta}-\underline{\delta}$ holding $\mathbb{E}[\delta]=\left(\overline{\delta}+\underline{\delta}\right)/2$ fixed has an ambiguous effect. Again, this implies that $d\overline{\delta}=-d\underline{\delta}=d\hat{\delta}>0$, hence

$$\begin{aligned}\frac{\partial}{\partial\hat{\delta}}P(u|v_1) &= \frac{\partial}{\partial\overline{\delta}}\frac{\mathbb{E}[\mathbb{E}_w[v|c,\omega]|v_1]-d-\mathbb{E}[b]-\underline{\delta}}{\overline{\delta}-\underline{\delta}}-\frac{\partial}{\partial\underline{\delta}}\frac{\mathbb{E}[\mathbb{E}_w[v|c,\omega]|v_1]-d-\mathbb{E}[b]-\underline{\delta}}{\overline{\delta}-\underline{\delta}}\\ &= -\frac{\tilde{k}-\underline{\delta}}{\left(\overline{\delta}-\underline{\delta}\right)^2}-\frac{\tilde{k}-\overline{\delta}}{\left(\overline{\delta}-\underline{\delta}\right)^2}=-2\frac{\tilde{k}-(\overline{\delta}+\underline{\delta})/2}{(\overline{\delta}-\underline{\delta})^2},\end{aligned}$$

with $\tilde{k}\equiv\mathbb{E}[\mathbb{E}_w[v|c,\omega]|v_1]-d-\mathbb{E}[b]$. Note that the condition

$$0<\frac{\tilde{k}-\underline{\delta}}{\overline{\delta}-\underline{\delta}}<1,$$

implies that $\underline{\delta}<\tilde{k}<\overline{\delta}$. Hence, $\frac{\partial}{\partial\hat{\delta}}P(u|v_1)$ may be either positive or negative, and it is negative if $\overline{\delta}<2\tilde{k}-\underline{\delta}$. Subtracting $\underline{\delta}$ from both sides and dividing by $2\overline{\delta}-\underline{\delta}$ yields

$$\frac{1}{2}<\frac{\tilde{k}-\underline{\delta}}{\overline{\delta}-\underline{\delta}}\equiv P(u|v_1).$$

If the probability of unionization $P(u|v_1)$ exceeds 1/2, then an increase in uncertainty $\overline{\delta}-\underline{\delta}$ holding $\mathbb{E}[\delta]$ fixed decreases $P(u|v_1)$. If the probability $P(u|v_1)$ lies below 1/2, then an increase in uncertainty increases the probability of unionization. □

Proof of Proposition 7: Comparative Statics Low Costs We focus here on the effect of a change in parameters on the maximal probability of unionization if beneficial, $P(u|v_1)$ for $\omega = \tilde{\omega}_1$. Parameters affect the probability of unionization through their effect on $\tilde{\omega}_1$, and $\mathbb{E}[\mathbb{E}_w[v|x]|v_1]$, as well as their direct effect on $P(u|v_1)$.

We first consider how $\tilde{\omega}_1$ changes as the different parameters increase,

$$\frac{\partial \tilde{\omega}_1}{\partial v_1} > 0, \quad \frac{\partial \tilde{\omega}_1}{\partial v_0} \gtrless 0, \quad \frac{\partial \tilde{\omega}_1}{\partial v_1} - \frac{\partial \tilde{\omega}_1}{\partial v_0} > 0, \quad \frac{\partial \tilde{\omega}_1}{\partial p} > 0, \quad \frac{\partial \tilde{\omega}_1}{\partial \underline{b}} > 0, \quad \frac{\partial \tilde{\omega}_1}{\partial d} = \frac{\partial \tilde{\omega}_1}{\partial \mathbb{E}[\delta]} < 0, \tag{97}$$

see the Mathematica file in the Supplementary Appendix C.
We turn to the effect of the different parameters on $\mathbb{E}[\mathbb{E}_w[v|x]|v_1]$. At $\omega = \tilde{\omega}_1$, the expected value of unionization for the workers, conditional on $v = v_1$ is

$$\mathbb{E}[\mathbb{E}_w[v|x]|v_1] = (v_1 - v_0)\left(\frac{(p\tilde{\omega}_1 + (1-p)(\tilde{\omega}_1 - \tilde{v}) - \underline{b})^2}{(\tilde{\omega}_1 - \underline{b})(\tilde{\omega}_1 + (\tilde{\omega}_1 - \tilde{v}) - 2\underline{b})} + (1-p)^2 \frac{\tilde{\omega}_1 - (\tilde{\omega}_1 - \tilde{v})}{\tilde{\omega}_1 - \underline{b}}\right) + v_0 \tag{98}$$

$$= (v_1 - v_0)\left(\frac{(\tilde{\omega}_1 - (1-p)\tilde{v} - \underline{b})^2}{(\tilde{\omega}_1 - \underline{b})(2\tilde{\omega}_1 - \tilde{v} - 2\underline{b})} + (1-p)^2 \frac{\tilde{v}}{\tilde{\omega}_1 - \underline{b}}\right) + v_0. \tag{99}$$

We first note that the change of the expected value in $\tilde{\omega}_1$ is negative:

$$sign\left(\frac{\partial \mathbb{E}[\mathbb{E}_w[v|x]|v_1]}{\partial \tilde{\omega}_1}\right) = sign\left(-\frac{(2p-1)^2\tilde{v}}{(2\tilde{\omega}_1 - 2\underline{b} - \tilde{v})^2}\right) < 0. \tag{100}$$

The parameters d and $\mathbb{E}[\delta]$ affect $\mathbb{E}[\mathbb{E}_w[v|x]|v_1]$ only through their effect on $\tilde{\omega}_1$. Therefore, the effect of an increase in d and $\mathbb{E}[\delta]$ increases the expected value of unionization for workers.

To capture the overall effect of the remaining parameters v_0, v_1, p, $\underline{b}$, on $\mathbb{E}[\mathbb{E}_w[v|x]|v_1]$ we need to also take their direct effect on the expected value of unionization into account. The overall effect of v_0 and of $v_1 - v_0$ holding $\mathbb{E}[v]$ fixed is ambiguous, and we can construct examples for the expected value increasing or decreasing as v_0 increases. Moreover, we show in a Mathematica File in the Supplementary Appendix C that the expectation is increasing in v_1, p and $\underline{b}$.

In addition, d, $\underline{b}$, $\overline{b}$, $\underline{\delta}$, and $\overline{\delta}$ have a direct effect on the unionization probability, identical to the effect we identified in the proof of Proposition 6, namely an increase in any of these parameters decreases the unionization probability. However, d, $\mathbb{E}[\delta]$, and $\underline{b}$ increase the expected value $\mathbb{E}[\mathbb{E}_w[v|x]|v_1]$, which in turn increases the unionization probability. We show in a Mathematica File in the Supplementary Appendix C that an increase in d decreases $P(u|x_1)$. The overall effect of $\underline{b}$, $\underline{\delta}$, and $\overline{\delta}$ is ambiguous. Further, an increase in $\overline{b}$ decreases the unionization probability as only the direct effect matters. □

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A Supplementary Appendix: Alternative Payoffs for Professional Organizers

We consider different potential payoffs that professional organizers could possess, highlighting that the equilibria we derive encompass all these settings.

Information and Biases Suppose the professional organizer has the following payoff if he engages in the unionization activities:

$$\mathbb{E}[v|s] - c \qquad \text{if unionization succeeds,} \tag{101}$$

$$b - c \qquad \text{if unionization fails.} \tag{102}$$

If he does not participate in unionization activities, he does not expend organizational costs, but otherwise his payoff remains the same. In this case, the union organizer does not care about the pushback against the bargaining unit or the broader atitudes towards unionzation. The professional organizer chooses to participate in the union drive if any only if

$$\mathbb{E}[v|s] - b \geq \frac{c}{P(u|x=1) - P(u|x=0)}. \tag{103}$$

This leads to the exact same strategic considerations, as $P(u|x=1) - P(u|x=0)$ solely depends on the informational content of the contact's decision.

No Information If professional organizers pursue a union drive independently of whether it benefits the workplace, then by definition, we cannot have an informative equilibrium. We capture this in our setting with costs being sufficiently low and the professional having a high pro-union bias. Such a setting would corresponds to union organizers being sent in by the union, which has not obtained further information as to whether unionization would benefit the workplace at hand.

No Bias In the unrealistic case where a professional organizer does not have any ideological bias, but only cares about transmitting information, he would choose to partake in organizational activities if

$$\mathbb{E}[v|s] \geq \frac{c}{P(u|x=1) - P(u|x=0)}. \tag{104}$$

We would then either obtain an informative equilibrium or a fully informative one. The latter only exists if and only if

$$\mathbb{E}[v|s=1] > \frac{c(\overline{\delta}-\underline{\delta})}{\tilde{v}} > \mathbb{E}[v|s=0] \tag{105}$$

Our setting also generates such a fully revealing equilibrium, allowing for biases.

Therefore, we consider the assumption that professional organizers have the same payoff as a contact who is a colleague without loss.

B Supplementary Appendix: Case Studies of Unionization Attempts

We provide additional examples highlighting that the differences in outcomes at the two Amazon warehouses, BHM1 and JFK8 are not merely an artefact, but are consistent with the unionization successes and failures across the US. Note however, that our examples omit by necessity cases where no union organizer was present. Therefore, if a contact chooses to not become an organizer, then this is an unionization attempt we do not observe. This can also not be remedied with more systematic unionization data, as workers file with the NLRB only once the organization phase started.

It is noteworthy, that Chris Smalls after his success at JFK8, attempted to unionize a second Amazon warehouse in Staten Island, LDJ5. Unionization efforts failed there.[51] In this case, the organizers, who were locals at JFK8, were outsiders at LDJ5 and workers were not convinced that unionization was beneficial for them. They were sceptical about promises made, and did not believe unionization would deliver value for them. This highlights that the unionization success at JFK8 was not a product of especially skilled organizers, but that it was indeed about credibility, about believing that unionization would deliver value.

Another failed unionization attempt occurred at an Apple Store in St. Louis.[52] There, employees blamed the International Association of Machinists and Aerospace Workers (IAM), the union in charge of the organization efforts.

> we determined if we took on a union as a partner, the IAM would not be a good fit for our team. In their haste to represent us, the IAM disregarded the wishes of our organizing employees.

[51] https://www.nytimes.com/2022/05/02/technology/amazon-union-staten-island.html

[52] https://www.imore.com/apple/st-louis-apple-store-employees-blame-union-for-organizing-withdrawal

The reasons given for not wishing to unionize were summarized as follows:

> Points of bargaining were debated, but it was challenging for the team to agree on any that could be impacted positively by collective bargaining.[...] Some no longer felt the union would provide anything complimentary to Apple's culture and existing benefits, while others felt they had been misled [...]

These quotes highlight that the union failed to convince employees that unionization would be beneficial for them. Similarly, the first unionization petition to ever be filed at an Apple Store, the one in Atlanta, Georgia was withdrawn. This was again a union-led unionization campaign that failed.[53] Further, unionization campaigns at Starbucks stores have been remarkably successful, with numerous stores unionized. These campaigns have been in organized in a decentralized fashion:

> at Starbucks [...] the campaign has largely expanded through worker-to-worker interactions over e-mail, text and Zoom, even as it is being overseen by Workers United,[54]

emphasizing once again the value of a bottom approach.[55]

C Supplementary Appendix: Mathematica Results

We collect here the links to three Mathematica Files, which contain the additional results.

Equilibrium Characterization We begin with the equilibrium characterization. Additional results are provided in AccFile-EquilibriumCharacterization, https://www.anjaprummer.com/s/AccFile-EquilibriumCharacterization-yhgl.nb.

Ranking Equilibria The additional results needed in order to rank equilibria are provided in AccFile-ProbabilityBeneficialUnionization.nb, https://www.anjaprummer.com/s/AccFile-ProbabilityBeneficialUnionization.nb

Comparative Statics For our comparative statics results, we provide additional results in AccFile-ComparativeStatics.nb, https://www.anjaprummer.com/s/AccFile-ComparativeStatics.nb

[53] The union in charge there cited Apple's illegal union busting techniques as a reason to withdraw, https://www.cnbc.com/2022/05/27/apple-union-push-faces-setback-as-atlanta-organizers-withdraw-bid-.html

[54] https://www.nytimes.com/2022/04/07/business/economy/amazon-union-labor.html

[55] There have been additional successful bottom up unionization campaigns for instance at Verizon in Washington state,https://apnews.com/article/2022-midterm-elections-business-everett-austin-a65b2a310ebba2f1662b92fb7be3f1bf, overall too numerous to count.

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