# DISCUSSION PAPER SERIES

DP13770

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## INDUSTRIAL ORGANIZATION AND LABOUR ECONOMICS

ISSN 0265-8003

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Discussion Paper DP13770
Published 30 May 2019
Submitted 29 May 2019

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## Abstract

Employee referral programs (ERPs) are randomly introduced in a grocery chain. Larger bonuses increase referrals and decrease referral quality, though the increase in referrals is modest. Still, ERPs are highly profitable, partly, because referrals stay longer than non-referrals, but, mainly, because non-referrals stay longer in treated stores than in control stores. In a post-RCT firmwide ERP rollout, referral rates remain low for grocery jobs, but are high for non-grocery jobs, which are perceived as more attractive. Our results (1) are consistent with referral-making being driven by money and altruism toward friends; (2) show that ERPs can have substantial benefits beyond generating referrals. The most-supported mechanism for (2) is that workers value being involved in hiring.



JEL Classification: J24, M51, J30, J63, D90

Keywords: referrals, employee referral programs, Hiring, respect, Turnover, altruism



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# What Do Employee Referral Programs Do?*

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Employee referral programs (ERPs) are randomly introduced in a grocery chain. Larger bonuses increase referrals and decrease referral quality, though the increase in referrals is modest. Still, ERPs are highly profitable, partly, because referrals stay longer than non-referrals, but, mainly, because non-referrals stay longer in treated stores than in control stores. In a post-RCT firmwide ERP rollout, referral rates remain low for grocery jobs, but are high for non-grocery jobs, which are perceived as more attractive. Our results (1) are consistent with referral-making being driven by money and altruism toward friends; (2) show that ERPs can have substantial benefits beyond generating referrals. The most-supported mechanism for (2) is that workers value being involved in hiring.

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*We thank Iwan Barankay, Lori Beaman, Nick Bloom, Tore Ellingsen, Matt Gentzkow, Edward Lazear, Rosario Macera, Jeremy Magruder, Hideo Owan, Kathryn Shaw, Lowell Taylor, Russell Weinstein, our departmental colleagues, and seminar/conference participants at Aarhus, U. Alberta, U. de los Andes, the Berkeley-Paris Org Econ Conference, Boston College, Central European University, UChicago Field Experiments Conference, Columbia, COPE, Copenhagen, EEA, Empirical Management Conference at the World Bank, German Economic Association, Hitotsubashi, INSEAD Singapore, Konstanz, KU Leuven, MPI Bonn, NBER (Labor Studies / Personnel Economics and Organizational Economics), NUS, Queen's Org Econ Conference, SIEPR, SIOE, Stanford Conference on Hiring and Organizations, Stanford GSB, SUNY Buffalo, Tokyo, Toronto, Toronto Rotman, UCSD, Waseda, Würzburg, and Zurich for helpful comments. We would like to praise the team spirit of the partners in the study. We thank Muhammad Azim, Julija Mozurevičiute, Monika Mozurevičiute, and Sonja Settele for excellent research assistance. We are grateful to the World Management Survey (WMS) and especially Daniela Scur for sharing their data with us, which we use to report on the prevalence of employee referral programs. Financial support from the Institutional Strategy of the University of Cologne within the German Excellence Initiative (Hans Kelsen Prize 2018), Michael Lee-Chin Family Institute, and SSHRC is gratefully acknowledged. We also thank the Stanford Institute for Economic Policy Research for its hospitality. The experiment was pre-registered on 11/25/2015 with the AEA RCT registry under ID AEARCTR-0000964.

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# 1 Introduction

Firms must find workers to fill jobs, and workers must find firms to employ them. One of the most common ways by which workers get hired is via employee referrals.[1] A growing literature shows that referral hires tend to be of higher quality than non-referrals, with lower turnover, lower recruiting costs, and sometimes higher productivity (e.g., Brown et al., 2016; Burks et al., 2015; Castilla, 2005; Fernandez et al., 2000; Heath, 2018; Pallais and Sands, 2016). Thus, it may not come as a surprise that many firms have employee referral programs (ERPs), a management practice where workers are explicitly encouraged to refer their social contacts for jobs, often using bonuses.[2]

Whether an ERP would boost referrals or benefit a firm is theoretically and empirically an open question. On one hand, referral bonuses could be ineffective if the decision to refer is primarily driven by non-pecuniary motives. Bonuses could even be counterproductive if they crowd out intrinsic motivations to refer (Deci et al., 1999; Benabou and Tirole, 2003) or lead to lower-quality hires. Further, bonuses are costly and may lead to less diverse hires if workers refer people like themselves. On the other hand, beyond generating referrals, ERPs could have broader organizational benefits, as do other HR policies that serve more than one purpose and affect whether workers feel respected (Ritter and Taylor, 1994; Ellingsen and Johannesson, 2008; Rebitzer and Taylor, 2011). By involving workers in the hiring process, ERPs may convey the feeling of respect from the employer, which workers appreciate.

We examine what ERPs do using a 13-month randomized control trial (RCT) on over 10,000 workers in a large European grocery chain. All 238 stores were randomly assigned to

[1] 25-40% of European jobs are found via referral (Pellizzari, 2010), as are about half of US jobs (Granovetter, 1974; Topa, 2011). Referrals may matter for many labor issues such as wage inequality (Montgomery, 1991; Calvo-Armengol and Jackson, 2004) and racial gaps in unemployment (Holzer, 1987; Zenou, 2015).

[2] The Society for Human Resource Management defines an ERP as "a recruiting strategy in which employers encourage current employees, through rewards, to refer qualified candidates for jobs in their organizations" (SHRM, 2016). CareerBuilder.com estimated that 69% of firms on its platform had a formal ERP (CareerBuilder, 2012). In the retail module of the World Management Survey (Bloom et al., 2014b) covering Canada, US, and UK, 23% of establishments have an ERP (see Appendix A.1). While we have no precise data about the use of bonuses in ERPs, observational studies of referrals in firms suggest that bonuses are very common (Brown et al., 2016; Burks et al., 2015; Fernandez and Weinberg, 1997; Fernandez et al., 2000).

Control (no ERP) or one of four ERP treatment arms inviting referrals. One treatment arm only provided information to encourage referrals, whereas the other three arms additionally paid different referral bonuses of up to 40% of monthly salary after taxes if the referrer and the person hired through a referral stayed at least 5 months. Following the literature, we will use the term "referral" both for the process through which a person is recommended to the firm, and for the person who is hired into the firm as a consequence of this process.

Beyond the large sample size it offers, the firm we study (described more in Section 2) is well-suited for an RCT on the impacts of ERPs. First, because of high worker turnover, grocery stores are constantly looking for new workers. Second, grocery cashier jobs have minimal qualifications, so everyone's friends could reasonably be hired. Finally, the retail setting of the firm is broadly representative of millions of jobs worldwide.

To generate testable predictions, Section 3 presents a stylized model in which a worker decides whether to make a referral and whether to quit. Beyond bonuses or effort costs from making a referral, the worker is altruistic and, following Ellingsen and Johannesson (2008), she cares about the firm's belief about her altruism. An ERP makes the worker feel "respected" in the sense that it credibly signals the firm believes her to be altruistic. The model yields predictions regarding the impact of having an ERP or referral bonus on (P1) referral quantity, (P2) referral quality, (P3) attrition of all workers in the stores, and (P4) firm profits. It also predicts how perceived job quality affects referral quantity and the efficacy of referral bonuses (P5).

Sections 4-8 provide evidence for each of the five predictions. The higher the bonuses, the more referrals are made (P1). However, while statistically significant, the magnitude of the impacts is economically small. Even under the largest referral bonus, referrals comprise only 5% of hires. Encouraging referrals without paying a bonus leads to no referrals. In line with our model, we believe the low referral rate to be due to grocery jobs being perceived as unattractive.[3] While the number of referrals is modest, consistent with P2, referral quality

[3] We support this using surveys and the firmwide rollout of ERPs to jobs of different attractiveness.

is high: referrals have 40% lower attrition than observably similar non-referrals and are 19% less likely to be absent, though the absence difference is not statistically significant. However, also consistent with P2, as bonuses increase, the relative retention benefit of referrals falls.

The paper's quantitatively most important, and potentially most surprising, result stems from P3: having an ERP in a store leads to a roughly 15% reduction in worker turnover. Effects are similar in percentage terms among new workers and workers hired prior to the RCT. These effects cannot be mainly attributed to the incidence of referrals or to peer effects because turnover falls in treatment stores where no RCT referrals are made. Nor are the effects related to managers behaving differently in treatment stores. Instead, our surveys suggest that effects are due to workers feeling respected because the ERP invited them to be involved in hiring, and because they value having a say in who they work with.

Consistent with P4, having an ERP is highly profitable, reducing labor costs by up to 2.8%. About 5% of the savings reflects that referrals have higher retention than non-referrals ("direct benefits"), while 95% of profit gains come from an ERP boosting the retention of non-referred workers ("indirect benefits"). Hence, only comparing referrals vs. non-referrals would dramatically underestimate the benefits of an ERP, which we believe to be a major take-away from our RCT. Direct benefits are non-monotonic in the bonus level, consistent with the model-predicted quantity-quality tradeoff.

Because the firm appreciated the effects of the RCT, it rolled out the ERP to all employees, including non-grocery jobs in logistics and food production. For non-grocery jobs, the ratio of referrals to total hires was three times larger than in the grocery jobs. In surveys among workers, managers, and the general public, a consistent picture emerges: grocery jobs are perceived as unattractive, implying that workers who care for their friends would not want to refer them for these jobs. However, production and logistics jobs are perceived as much more attractive.[4] These results are consistent with P5.

Our paper contributes to three main literatures. First, it substantially expands what is

[4]The surveys also indicate (1) that job attractiveness explains why there are more referrals for non-grocery than grocery jobs and (2) that it is grocery jobs that are unattractive, not the firm itself.

known empirically about referrals and ERPs, offering the first RCT on an ERP in a for-profit firm. Beyond assessing how ERPs affect referral-making, our RCT enables us to assess how having an ERP and the level of referral bonus affect worker outcomes and firm profits. While larger referral bonuses increase referrals, we also show for the first time that they decrease the quality of referral hires, thereby illustrating a quantity-quality tradeoff. Prior work summarized by Hoffman (2017) compares average worker outcomes and/or average profit differences between referrals and non-referrals,[5] but lacks exogenous variation in ERPs, and thus cannot assess the consequences of ERPs. The exceptions are Beaman and Magruder (2012) and Beaman et al. (2018) (discussed at the end of the Introduction).

In Beaman and Magruder (2012), subjects in India were recruited to participate in games in an experimental lab. They were then asked to refer someone to join, for which they earned a bonus that was fixed or linked to the referral's performance, depending on the treatment.[6] Beaman and Magruder (2012) differ from us in that they focus on whether people have the ability to screen. In contrast, we focus on how ERPs affect a firm's quantity and quality of referrals, and, most importantly, we analyze whether ERPs have broader organizational consequences beyond the referrer and referral. Another difference between our settings is that we are studying referrals for existing jobs with a definite reputation, whereas lab experiment jobs may have less definite reputations.[7] Despite these differences, our results strongly support a key modeling decision of Beaman and Magruder (2012), namely, that referral-making is driven by both money and altruism toward friends.

Second, and beyond referrals, our results contribute to a small but influential literature on dual-purpose HR practices. As emphasized in Rebitzer and Taylor (2011), HR practices can have multiple effects on workers, e.g., performance pay may both increase effort and

[5]Using RCTs in an online labor market, Pallais and Sands (2016) show that referrals outperform non-referrals due to selection and teamwork differences.

[6]The only statistically significant impact on referrals came from performance-based referral bonuses.

[7]For Beaman and Magruder (2012), this likely has the virtue of abstracting away job reputational considerations, allowing tighter focus on their research question regarding people's ability to screen. Another difference between our setting and theirs is that their performance measure is a cognitive ability test, whereas ours are employee attrition, employee absence, firm profits, and other firm-level outcomes. Also, our data cover 18,000 workers (10,000 in the RCT), compared to under 1,000 total participants in theirs.

attract better workers (Lazear, 2000). However, evidence on dual-purpose HR practices is relatively scarce.[8] We show that having an ERP generates referrals (who yield benefits to the firm relative to non-referrals) and separately causes workers to stay longer, arguably because they value being involved in hiring. Our results are consistent with the theoretical insight of Ellingsen and Johannesson (2008) that workers care about being well-regarded by their employer. As far as we know, ours is the first academic paper in any field to show that ERPs can have broader organizational consequences beyond the referrer and referral.

Third, our paper helps advance theoretical understanding of why people make referrals. While quite simple and "partial equilibrium", our model of referral-making (based on superior information, altruism, and desire for respect) delivers five predictions, all of which are supported by the data. We believe this to be valuable because most theories of referrals do not model the decisions of referrers, assuming that referrals occur exogenously.[9]

Beyond our main results, we also examine how ERPs relate to diversity. Practitioners often worry that ERPs may reduce diversity (Frank, 2018; Sharma, 2016). In our firm where women and youth are already over-represented, referrals are 2.8 years younger and 10 percentage points (hereafter, pp) more likely to be female. Having an ERP increases the share of female hires by 4pp, providing the first experimental evidence on how having an ERP affects diversity. These findings echo Beaman et al. (2018), who show that referrals disadvantage female survey enumerators in a Malawi NGO.[10] Our settings differ in that Malawi enumerators are predominantly male, whereas our grocery store workers are mostly female. Still, our results are broadly consistent with Beaman et al. (2018) in suggesting that ERPs may indeed lead to a less demographically representative workforce.[11]

[8] Ritter and Taylor (1994) and Landers et al. (1996) are noteworthy examples; Rebitzer and Taylor (2011) discuss the literature, including further examples.

[9] This is true across the main classes of models, including those based on learning (Simon and Warner, 1992; Dustmann et al., 2015), homophily (Montgomery, 1991), and moral hazard (Kugler, 2003; Castilla, 2005; Heath, 2018). Key exceptions are Saloner (1985), who studies competing referrers, and Ekinci (2016), who presents a career concerns model where referral quality provides information about referrer ability.

[10] Beaman et al. (2018) cross-vary bonus structure (two fixed bonus levels or performance pay) with whether peopled were asked to refer a woman, man, or someone of either gender. In contrast, beyond randomizing the level of the bonus, we randomly vary whether or not an ERP exists.

[11] Smith (2005) argues that within-firm reputational concerns about making "bad referrals" make disad-

## 2 Study Background

**The study firm.** The firm is one of three main grocery chains in an Eastern European Union (EU) country.[12] Prior to the RCT, the firm's management had changed. The new management decided to pursue a strategy of increasing quality, partly triggered by the threat of entry from Lidl, a discount German chain. Reducing worker turnover was proclaimed a high-priority goal to assure quality service and bring down excessive worker training costs.

As is common for low-skill workers, attrition is high, at an annual rate around 80%.[13] Turnover costs are non-negligible, with direct (administrative and training) costs around €250 per exit, plus additional costs owing to lost productivity (details in Appendix A.9). Indeed, in meetings with the authors, firm executives expressed strong interest in reducing attrition, and this helped motivate our study in the first place.

The average store employs 24 workers, 19 of whom are cashiers, one is the store manager, and the rest are department managers or specialists (e.g., butchers, bakers). Stores have average monthly sales of roughly €200,000. In its retail activity, the firm has roughly 5,000 cashiers, plus about 500 specialists. The firm also has 1,200 workers in non-grocery-store jobs: logistics (primarily truckers), production (workers at a central food production facility), and a small number of white-collar jobs. Because we observe the company over more than four years, the total number of employees observed is around 18,000.

Cashiers perform stocking and check-out functions. Most (95%) work full-time, and receive a monthly wage of roughly €350 (with minor variation depending on location, city or countryside), plus a bonus tied to store performance (4% of wages, on average).[14] The cashier job has no formal requirements, so anyone's friend would presumably be qualified. Applicants are pre-screened via a centralized HR process. Those who pass the initial screen

vantaged Blacks hesitant to refer friends. Our paper is complementary by showing that referral-making may also be affected by reputational or altruistic concerns with respect to one's friends instead of the firm. Holzer (1987) and Fernandez and Fernandez-Mateo (2006) also study how referrals interact with race.

[12] We avoid naming the country to protect confidentiality, as the firm is one of the largest in the country.

[13] As discussed below, turnover is particularly high for new hires: over half exit in the first 5 months. For comparison, for the call-center workers in Burks et al. (2015), about half exit in the first 90 days.

[14] Specialists are paid about €500 per month on average, plus a bonus similar to cashiers.

are sent to a store manager, who does interviews and makes hiring decisions. About 20% of non-referred applicants are hired. New cashiers receive two days of formal training (where they are paid but do not work), followed by two weeks of on-the-job training. Cashiers were 88% of grocery worker hires during the RCT.

**Why the firm did the RCT.** In October 2015, we met with the firm's top management and suggested implementing an ERP via an RCT.[15] Having an ERP was quite natural for the firm to consider for several reasons. First, the firm had an ERP during the 2000s, though it was discontinued in 2008 when the firm's growth came to a halt. Second, some of the firm's competitors pay referral bonuses. Third, we argued that an ERP could help reduce turnover. The firm was willing to do an RCT in order to investigate whether to have an ERP and in what form.[16] While we designed the RCT and monitored its implementation through our contacts in the central HR office, the RCT was carried out by the firm.

**Referral process.** According to the firm's definition, an employee referral occurs when someone is hired via the firm's formalized referral process. The process was designed to make it very easy for employees to suggest a new hire and to make the time costs for employees as low as possible. To make a referral, an existing employee called a dedicated contact in HR and answered a few brief questions (name of referral, relation to employee, how long they have known them, how often they meet). The phone number and referral process details were listed in the poster put up in the staff common room in each treatment store (Figure 1), with variations depending on the treatment arm. The referrer received a text message if the referral was hired, and could always call HR again for updates.

**RCT details.** We refer to the five RCT arms as Control; information only or "R0"; or information plus bonus, with the arms called R50, R90, or R120. In the Control arm,

[15]Before running this paper's RCT, we worked with the firm on an RCT where the CEO communicated to store managers about the importance of bringing down attrition rates (Friebel et al., 2018). Controlling for a store's treatment status in Friebel et al. (2018) does not affect any of our results.

[16]The firm's executives are generally interested in running experiments (or "pilots"), particularly in regard to operations. Several pilots occurred during the ERP RCT (e.g., changing the order of items on the shelves).

nothing changed relative to before the RCT, and employees were not informed about the possibility to refer. However, HR was told to accept referrals from Control stores if any were called in.

In the four treatment arms (R0, R50, R90, R120), store managers conducted information meetings with employees. During the meetings, all employees received a letter explaining the ERP. Store managers read aloud the same letter during the meeting. The centralized HR office ensured that the meetings took place. Furthermore, HR communicated with the regional managers (the hierarchy level above store managers) who also monitored that store managers were in compliance with the new ERP. Neither workers nor store managers were informed that an RCT was occurring.[17] Beyond the information provided, workers in R50, R90, and R120 received €15 after the referral was hired to provide an immediate reward. The remainder of €50, €90, or €120 (i.e., an additional €35, €75, €105) was paid if the referrer and referral stayed 5 months. This was clearly explained in the letter and posters, and workers hired after the RCT began were given letters explaining the ERP.

**Rationale for bonus structure.** We suggested a 5-month tenure threshold because we learned from top management that over half of cashiers leave in the first 5 months while attrition is significantly lower after that. Tenure thresholds are very common in ERP bonuses (Brown et al., 2016; Burks et al., 2015; Fernandez et al., 2000). To choose bonus amounts, we surveyed non-grocery workers, who were not part of the RCT. We asked those workers how much money would make them willing to make a referral for a hypothetical vacancy in their unit. We chose the bonus amounts for our treatment arms corresponding to the 25th (€50 per referral), 50th (€90), and 75th (€120) percentiles of the distribution of survey responses.[18] All bonuses were paid in after-tax amounts (i.e., the firm already paid

[17] Regional managers were informed at a training event with one of the authors about the nature of the RCT. We felt it was important to inform regional managers about the RCT to ensure that stores were fully compliant. Regional managers were not involved in any operational or implementation aspects of the RCT, but rather solely monitored whether store managers were complying.

[18] The non-grocery workers were told truthfully that we were surveying them as part of academic research; to avoid any announcement effects, no explicit reference to any pilot project in the firm or to our specific RCT was given.

the worker's taxable share), and relative to wages were substantial. The combined post-tax bonus of €120 represents 40% of a cashier's monthly post-tax salary, which is comparable to or higher than referral bonuses used in other studies (see Appendix A.2 for details).

**RCT timing.** RCT materials (posters, letters, and instructions for the store managers) were sent to the treatment stores around November 20th, 2015, with instructions to implement the ERP immediately. The central HR office and regional managers (to whom store managers report) ensured compliance of the treatment store managers with the RCT procedures. We registered our RCT with the AEA RCT Registry on November 25, 2015 under ID AEARCTR-0000964. In the fall of 2016, about a year after the start of the RCT, we met with the firm's management to present the RCT results. After this meeting, it was decided to roll out an ERP to all jobs within the firm.

**Safeguards to assure RCT validity**. There are two immediate concerns for an RCT like ours. First, it is critical that employees in treated stores are aware of the ERPs. We address this using posters and letters to employees, and by having regional managers ensure that stores are in compliance. Also, we can test for awareness: in surveys carried out in fall 2016, 87% of employees in treatment stores reported being aware of the ERPs, indicating substantial awareness of the program, despite high employee turnover.

Second, workers need to trust that bonuses will be paid. While trust is low in many post-Communist countries (Aghion et al., 2010), we do not think this was a concern at all for us, given the group meetings, and the paper trail from the company letters and posters. Workers were told that they could call HR about any questions on the ERPs. Further, given that the country is in the EU and has high formal legal standards, the firm is legally bound to pay bonuses it tells workers it will pay, and workers are aware of this. We find no evidence of problems with procedural compliance in the surveys we carried out (explained more later).

**Data.** We use the firm's personnel and accounting data for Feb 2014-May 2017. The personnel data are for grocery store workers, cover over 18,000 workers (7k active only in the pre-RCT period, and 11k active during the RCT or beyond), and contain standard personnel variables (e.g., hire dates, termination dates, exit codes), as well as absences, earnings, bonuses, hours, and demographics. Importantly, our personnel data also include information from the firm's ERP, including who the referrer and the referral are, the date of referral, and the relationship between referrer to referral. The main accounting variables are sales and shrinkage at the monthly and daily level by store. We assemble these datasets to create worker-month and store-month panels.[19]

In addition to the firm's administrative data, we also use surveys carried out before, during, and after the RCT. In line with Bloom and Van Reenen (2010), the surveys covered different types of respondents: store workers, store managers, and the country's general population. We asked about topics including reactions to the ERPs; beliefs about mechanisms; and social perceptions regarding grocery jobs and our firm. Information on the surveys is discussed along the way, with details in Appendix A.3. Figure 2 summarizes our datasets.

**Randomization.** The 238 stores were randomized into the five RCT arms.[20] Table 1 shows that the five store groups are well-balanced over observables. In Panel A, we regress a characteristic on a constant and dummies for the four treatment arms. Thus, the constant corresponds to the control group mean, and the coefficients correspond to differences between the different treatment groups and the control group. We also show p-values for the F-statistic of joint significance of the four treatment dummies for each observable, and none are statistically significant. Panel B compares ERP stores (i.e., any of the treatments) vs. control stores, and finds no significant differences.

[19]We observe referred applicants (hired and not hired), though 85 of 88 referred applicants are hired in the RCT, so referred hires and referred applicants are almost the same. Among non-referrals, we only observe hires, not applicants. We highlight two data limitations. First, our worker-month panel does not cover non-grocery workers, so our analyses of non-grocery workers are more limited, and use auxiliary data. Second, starting in Jan. 2017, our data do not have information on who was referred, only on who made referrals.

[20]Randomization took place by computer. Allocations were re-drawn numerous times until store averages were reasonably similar across the treatment groups in store employees ("head count"), attrition, sales, and store square footage. We control for these variables linearly in our regressions, as suggested by Scott et al. (2002) and Bruhn and McKenzie (2009) for RCTs with multiply drawn randomization allocations.

# 3 Model

We present a simple model to fix ideas on how ERPs affect employee outcomes, both directly in terms of affecting referrals and indirectly via creating respect. The goal is to make theoretical predictions about our RCT, not to provide an equilibrium analysis of ERPs.

The model takes up three ideas. First, an ERP provides the firm with more precise signals about a candidate's match quality (Simon and Warner, 1992; Brown et al., 2016; Dustmann et al., 2015). In contrast to these models, we assume that the information resides with an employee instead of the overall firm. Second, building on Beaman and Magruder (2012), the model includes social preferences of employees toward friends they may refer. Third, and potentially most important, our model incorporates workers caring about being respected (Ellingsen and Johannesson, 2008). More precisely, employees value the firm thinking that they are pro-social.[21]

**Set-up.** The firm employs an incumbent worker, $I$, and wants to hire an additional worker. Following Ellingsen and Johannesson (2008), $I$ can be of two different types $\Sigma \in \{0, \sigma\}$, where $0 < \sigma < 1$. Type $\Sigma$ represents the social preferences of $I$ toward an individual, $N$, of their social network, who could be referred for the job opening. In our model, $\Sigma$ reflects altruism, but it could also represent reputational considerations. For simplicity, we assume that $\Sigma = \sigma$ for sure, but assume that $I$ initially believes the firm to believe that $\Sigma = 0$. This simplifying assumption is discussed in Appendix B.2.

Incumbent $I$ observes $N$'s match quality $m$, and chooses whether to refer them, $R = \{0, 1\}$. The firm observes $m$ only after the worker is hired. The match reflects that a particular job suits some people better than others (e.g., some people are better than others at interacting with customers), and we assume $m \sim F(m)$, with the pdf denoted by $f(m)$. Making a referral requires a cost of effort $k > 0$. Furthermore, $I$ has an outside option,

[21] We assume the worker cares about being regarded as pro-social because (1) it is realistic for our setting; (2) referral models naturally contain altruism so it is simple to include the worker caring about this; and (3) doing so follows Ellingsen and Johannesson (2008). The model's logic would still hold if the worker cared about the firm thinking it had another trait about which the firm credibly signals a positive belief by having an ERP (e.g., the firm would not want to have an ERP for a worker with bad judgment).

$\varepsilon \sim G(\varepsilon)$, and decides whether to stay in the firm or leave it. The timing is:

1. $I$ believes that there is some chance that nature informs the firm via a private signal that workers have $\Sigma = \sigma$.
2. $I$ believes the firm decides whether to have an ERP. $I$ does not know it is an RCT.
3. If there is an ERP, $I$ has one network contact, $N$, and decides whether to refer them.
4. $I$ decides whether to leave the firm.

*Incumbent's Payoffs.* $I$ gets utility from three sources: (1) the ERP bonus, $b \equiv \widetilde{b} - k$, (2) $N$'s utility, $U^N(\cdot)$, and (3) her belief, $\hat{\Sigma}$, about the firm's esteem for her. Letting $U^I(R=1)$ and $U^I(R=0)$ be utility from making or not making a referral, respectively, we have:

$$U^I(R \;=\; 1) = (1-\Sigma)b + \Sigma U^N(R=1) + B(\hat{\Sigma}) \tag{1}$$

$$U^I(R \;=\; 0) = \Sigma U^N(R=0) + B(\hat{\Sigma}) = B(\hat{\Sigma}), \tag{2}$$

Here, $N$'s utility depends on the job match, $m$, and job overall attractiveness, $q$, with $U^N(R=1) = m + q$. Match $m$ represents all person-specific rewards from the job. Job attractiveness, $q$, is the same for all workers, and may depend not only on the wage but also on its non-pecuniary aspects, such as working conditions and reputation in society. In (2), we normalize $N$'s utility if he is not referred to 0.

The third term, $B(\cdot)$, represents $I$'s benefit from feeling esteemed or respected (Ellingsen and Johannesson, 2008), with $B(\hat{\Sigma}=0) = 0$ and $B(\hat{\Sigma}=\sigma) > 0$. The term, $\hat{\Sigma}$, is $I$'s belief of the firm's belief about $\Sigma$. We assume that $I$'s prior is $\hat{\Sigma} = 0$, i.e., $I$ initially believes that the firm considers her to be selfish.

*Firm Profits.* The firm's payoff from a referral is $\pi = m - \widetilde{b}$. Bad matches are expensive for the firm, because the firm has to spend resources on training costs. With the share of referrals in the total number of employees denoted by $r$, the expected profit of the firm with an ERP is:

$$\pi = r\big(E[m|m > m^*] - \widetilde{b}\big) + (1-r)E[m] - cPr(Q),$$

where $E[m|m > m^*]$, and $E[m]$ are the expected quality matches of the referred and non-referred workers, respectively; $c$ is the cost of attrition for an incumbent worker; and $Pr(Q)$ is the probability that the incumbent worker exits and is equal to $1 - G(\sigma)$.[22] In contrast, firm profits without an ERP are $E(m) - c(1 - G(0))$.

Our model yields five predictions. We provide intuition here and proofs in Appendix B.1. The model's simplifying assumptions are discussed more in Appendix B.2.[23]

**Prediction 1.** *Higher referral bonuses will increase referrals.*

**Prediction 2.** *Referrals will be of higher quality than non-referrals. However, as referral bonuses increase, the quality of referrals decreases.*

Referrals are higher quality because $I$ can observe $N$'s match quality, and $I$ prefers to make a referral when $m$ is higher. There is no information on non-referrals so they are hired at random. As the bonus increases, $I$ is willing to refer someone who is less suitable for the job, and average referral quality decreases.

**Prediction 3.** *Having an ERP increases retention. This should occur even in store where no referrals are made.*

Having an ERP makes $I$ feel respected, as she believes that the firm would only choose to have an ERP if it believed that $I$ had positive social preferences ($\Sigma = \sigma$). This makes $I$ less likely to quit, and because it does not work through referrals, occurs even in stores where no referrals are made. Note that if $\Sigma = 0$, $I$ would make referrals irrespective of $m$.

**Prediction 4.** *As long as the referral bonus is not too large, having an ERP increases firm profits. The relationship between referral bonuses and firm profits from hiring referrals (vs. hiring non-referrals) is ambiguous.*

Firm profits increase through two channels. First, having an ERP enables referrals, allowing the firm to exploit $I$'s private information, and this improves profits as long as $b$

[22] The term, $Pr(Q)$, is a reduced form of having an incumbent with larger $m$ than a potential new hire.

[23] The short-cuts discussed are: (i) because of the static game, the bonus is paid upon hire and not after five months; (ii) social preferences only relate to a potential referral (and not intrinsically to the firm); (iii) the worker can only have two types; (iv) the worker's belief updating is non-Bayesian.

is not too large. Second, profits benefit from $I$ staying longer. Turning to the relationship between bonus level and profits from referrals, on one hand, larger bonuses increase referrals, who are valuable relative to non-referrals. On the other hand, larger bonuses lower average referral quality, and also cost money.

**Prediction 5.** *More referrals will be made for attractive jobs than for less attractive jobs. Suppose that $f'(m^*) < 0$, which occurs if referrals are few. Then, the more attractive the job, the more responsive are referrals to bonuses.*

The first sentence reflects that $I$ has social preferences toward potential referrals. For the third sentence, note that if a job has very low $q$ and referrals are rarely made, then $I$ is unlikely to be marginal, and increased bonuses may do little to push $I$ to make a referral. However, for a higher quality job, $I$ is more likely to be marginal.

P1-P4 are tested using the RCT. P5 is tested using surveys and the firmwide ERP rollout.

# 4 Referral Bonuses and Referrals (Prediction 1 of Model)

Table 2 summarizes referral patterns across the five arms. There are 88 referred applicants and 85 referred hires. In 79 of 85 cases, referrals are hired in the same store as their referrers. Of the 6 exceptions, 3 are hired in the Control stores, where no information about an ERP was provided and no referrals are made. There are also no referrals made in information only ("R0") stores. The number of referrals made monotonically increases with the bonus. Still, in the highest bonus arm ("R120"), only 5% of hires are referred.

Figure 3 plots the share of referrals in the total hires by quarter, showing a modest ratio throughout the RCT. After the RCT, when a single ERP is rolled out to the entire firm and the bonus increased, referrals increase, but the ratios are similar across the former treatment arms.

Table 3 shows RCT impacts of ERPs on whether a hire is referred, but using regressions with a number of store and individual controls listed in the table notes. Throughout the regressions, standard errors are clustered at the store level, as randomization occurs at the store level. Column 1 of Panel A regresses whether a hire is referred on dummies for the four treatment arms (an observation is a hire), where Control is the excluded category.[24] The results are similar with controls in Column 2. Instead of using dummies for the four treatments, Column 3 uses a dummy for having any of the four ERPs (excluded category is Control store). Having an ERP increases the chance an employee is referred by 2.5pp. This is highly statistically significant, but seems economically modest.

The 88 referrals occur in 34 stores. Referred workers are younger and are (weakly) more likely to be female, but we postpone age and gender analysis until Section 9. Appendix A.4 provides basic facts on referrers.

# 5 The Quality of Referred Workers (P2)

As described in the RCT pre-registration, our main outcome variable is attrition, and our secondary outcome is absence. We focus on attrition for three reasons. First, like many firms, the firm regards high attrition as a critical business issue, causing it to spend large sums recruiting and training new hires, and high-turnover stores also have lower sales.[25] Second, worker retention is a standard measure of match quality (Jovanovic, 1979). Third, past work finds that some of the largest differences between referrals and non-referrals occur in attrition (Hoffman, 2017), so it seems natural to investigate attrition when analyzing ERPs. Absenteeism is also an important outcome in grocery jobs (Glover et al., 2017) and other low-skill jobs. As with attrition, absenteeism is high and expensive for our firm, but we emphasize it less, first, because the firm regards attrition as the HR outcome of greatest interest, and second, because the distribution of days absent in a month is highly skewed,

[24] The coefficient on R0 is slightly negative, reflecting that there are 3 referrals hired at Control stores and 0 referrals hired at R0 stores. The 3 referrals hired at Control stores were referred by workers at different stores paying bonuses.

[25] High attrition also imposes serious costs and performance consequences on US firms, particularly in retail (Ton, 2014). As a policy issue, when attrition is high, firms may invest less in workers skill development.

allowing for less precision in estimation.[26]

**Attrition.** Panel (a) of Figure 4 shows that referred hires have higher survival than non-referred hires without any controls. Next, we add the controls that we will generally use for analyzing panel data, namely month-year of hire dummies, current month-year dummies, a 5th order polynomial in tenure, a dummy for being a cashier, demographic controls, and pre-RCT means of store-level characteristics (with the full list in the table notes). Table 4 estimates linear probability models of the attrition of workers hired during the RCT. In line with past work, Column 1 of Table 4 shows that, compared to non-referred workers, referred workers are 7.0 pp or 44% less likely to leave each month.

Column 2 analyzes referral differences in turnover separately during a worker's first five months of tenure and also afterwards. In months 1-5, referral attrition is lower by 9pp (or 50% relative to the attrition rate of non-referrals in the first 5 months), whereas it is lower by 3pp or 1/3 thereafter. Thus, while referral differences in attrition are strongest during the first five months, consistent with the structure of the referral bonus, referrals are still less likely to attrite after the 5-month milestone.[27]

Consistent with Prediction 2 of the model, Column 3 of Table 4 shows that referral/non-referral attrition differences are smaller at higher levels of the referral bonus. For the R50 treatment group, the referral attrition difference is -11pp or about 70%. In contrast, for the R90 and R120 groups, the referral differences are about -6pp or a bit under 40%. These differences are statistically significant (p=0.04 for R50 vs. R90; p=0.06 for R50 vs. R120). The survival curves in Panel (b) of Figure 4 show similar results.

Table 4 classifies referrals according to the store where they work. However, results are

[26]Another common outcome in supermarkets is items scanned per minute (Mas and Moretti, 2009; Glover et al., 2017), but the firm's IT system does not allow us to measure worker-level items per minute. The firm's main HR key performance indicator is attrition and its secondary one is absence.

[27]If referrals were staying longer than non-referrals solely to get a bonus, then referred attrition would be higher than non-referred attrition after 5 months, but this is not the case. Also, that referral differences are larger in the first 5 months than after does not mean that referrals are not useful for the firm. Even if referrals stayed longer solely to get a bonus, which is not the case for us, this could still be valuable to the firm. Figure D1 shows that referrals are less likely to depart than non-referrals at most tenure levels.

robust to excluding the 6 referrals who get hired in different stores than their referrers.

**Absences.** Because the distribution of monthly absences is highly skewed, we perform negative binomial regressions.[28] Column 4 shows that referrals have 19% percent fewer absences per month, but this is not statistically significant. Column 5 shows that, during the first 5 months, referrals have significantly fewer (41%) absences than non-referrals, but after that, there is no difference. This could be due to referrals not wanting to be fired before 5 months to ensure that their friend gets the bonus. Referral absence differences do not significantly vary by bonus size.

**Adding store dummies.** For analyzing referral/non-referral differences, we can add store fixed effects, which is useful given it is a non-randomized comparison.[29] Appendix Table D1 shows that referral attrition differences are similar (and slightly larger) when store fixed effects are added. Absence differences are statistically insignificant and noisy. Broadly consistent with Burks et al. (2015), there are stark referral differences in attrition, but we do not observe significant differences in our non-attrition performance variable of absence.

# 6 The Impact of ERPs on Worker Outcomes (P3)

## 6.1 Results

**Attrition.** Table 5 shows that ERPs reduce attrition of all workers, with similar percentage effects on new hires and incumbents. Column 1 of Table 5 analyzes the impact of the randomly assigned ERP treatments on attrition during the RCT (as opposed to comparing referrals vs. non-referrals). Relative to workers in Control stores, workers in R0, R50, R90, and R120 stores have monthly attrition that is lower by 1.00pp, 0.47pp, 1.59pp, and 0.81pp, respectively, corresponding to attrition reductions of 15%, 7%, 23%, and 12%. These

[28] In Column 4, the estimated overdispersion parameter is $\alpha = 23.2 (s.e. = 0.95)$. This indicates sizable overdispersion and that negative binomial is more appropriate than Poisson (Cameron and Trivedi, 2005).

[29] In our main results on the impact of ERP, we cannot control for store fixed effects because our treatment is randomized at the store level, though we can control for store fixed effects if we exploit pre-RCT data.

differences are statistically significant for R0, R90, and R120. Column 2 shows that having an ERP reduces attrition by 0.97pp or 14%. Given that referrals were only 2.5% of hires in ERP stores, it seems unlikely that these differences are entirely or primarily due to referred workers staying longer than non-referrals or people becoming more likely to stay as a result of making a referral. Comparing R0 vs. Control, recall that there are 0 referrals made and 0 referral hires in R0 stores. Thus, any reduction in attrition in R0 stores relative to Control stores cannot be due to workers being referred or making referrals.

Though our treatments are randomized, we may obtain additional power or control by exploiting the personnel data before the start of the RCT. Columns 3-4 report the results from a difference-in-difference regression of attrition on the RCT and treatment period dummies and their cross-product. Store dummies are included to control for persistent differences across stores in employee attrition and other characteristics, and current month-year dummies account for differences in attrition over time. Relative to Column 1, results are slightly stronger in Column 3, with statistical significance for all 4 ERPs. The Column 4 coefficient of -1.19pp corresponds to a reduction of roughly 20%.[30]

To better understand the dynamics of the ERP effects, Figure 5 presents an event study where having an ERP is interacted with the quarter after the ERP RCT began. ERP impacts occur in the first quarter ("quarter 0" or Dec. 2015-Feb. 2015) of the RCT, though effects take a few months to fully realize. There is no pre-trend. After the RCT ends, and the ERP is rolled out to the Control stores, the attrition difference between treatment and Control stores vanishes. Panel (a) presents overall results. Panel (b) shows similar results restricting to stores where no referrals are made during the RCT.

Columns 5-6 of Table 5 show impacts of the ERPs on attrition of workers hired during the RCT, whereas Columns 7-8 show impacts on incumbent workers, i.e., people already working at the firm at the start of the RCT. Panels (a) and (b) of Appendix Figure D2 show ERP impacts interacted with quarter of the RCT for new hires and incumbents.

[30]The results are further robust to (and slightly stronger when) including store-specific time trends.

Panels (c)-(d) of Figure D2 show that the overall impact on attrition is driven by a decrease in voluntary attrition. ERPs had no significant impact on involuntary attrition.

**Attrition magnitudes.** Having an ERP reduces attrition by an economically sizable 15%. As a benchmark, Bloom et al. (2014a) show that randomly assigning employees to work from home reduces attrition by half in Chinese call centers. Thus, compared to variables like TFP and output per hour, attrition may be easier to change. As another benchmark, in an earlier RCT, we found that a letter from the CEO to store managers asking them "to do what they can" to bring down turnover led to a 25% drop in turnover (Friebel et al., 2018). Our setting may be one where turnover is relatively malleable.

**Absences and store-level outcomes.** Table D2 shows that ERPs have no impact on absence. Column 2 (baseline) estimates a coefficient close to 0, whereas column 4 ("diff-in-diff") indicates that having an ERP reduces absence by 8%, but it is statistically insignificant.

Table D3 shows that having an ERP does not significantly affect store-level outcomes, including store-level hours, shrinkage (i.e., share of inventory lost to theft, spoilage, and other reasons), sales per worker, or operational profit per worker (i.e., net sales minus cost of goods minus wages minus overheads). The coefficients on shrinkage, sales, and operational profit have a sign indicating benefit to the firm, but are not statistically significant.[31]

## 6.2 Mechanisms for ERP Impacts

The most natural reason an ERP would reduce turnover is by promoting referrals, as referrals are less likely to quit and referrers may be more likely to stay to get a bonus. However, Section 6.2.1 provides evidence that promoting referrals explains only a modest share of the impact of an ERP. Section 6.2.2 next discusses additional mechanisms that, while plausible *ex ante*, are *ex post* inconsistent with the RCT results. Section 6.2.3 discusses mechanisms that are

[31] Operational profit is not a full measure of profit, so the statistically insignificant results here are not in any way inconsistent with our results on profits in Section 7. While the estimates Appendix Table D3 are reasonably precise, we appear to lack the statistical power to detect small changes in these variables.

consistent with the RCT evidence, including our preferred mechanism of workers valuing being involved in hiring, and uses surveys to tease these apart.

### 6.2.1 Assessing Referrals as the Mechanism

How much of the effect of ERPs on attrition (a 15% reduction) comes via effects related to referrals, i.e., getting more referrals or making referrers more likely to stay? The simplest evidence against referrals as the main mechanism comes by comparing R0 and Control stores. R0 stores have roughly 15% lower attrition than Controls stores, even though the R0 treatment induced no referrals.

A second way to address this question is mediation analysis. We repeat the analyses in columns 1-2 of Table 5, but additionally control for whether someone is referred and/or the number of referrals a person has made to date. The estimates imply that only 5% of the impact of having an ERP on attrition is mediated via having more referral hires and having workers made more referrals to date, whereas 95% of the impact remains unexplained. Also, relative to someone who has not made a referral, someone who has made a referral is no more likely to stay on average, though they are more likely to stay in the first 5 months after a referral. For brevity, we present the mediation results in Appendix A.5.

Last, Appendix Table D4 shows that our main attrition results are similar when restricting attention to stores where no referrals are made during the RCT. If no referrals are made in a store, then there are no referrers, and only referrals that are made from other stores, making it very hard for referrals to drive the impact of the ERP.[32]

### 6.2.2 Unlikely Mechanisms for Non-referral Channel

*Peer effects in attrition from referrals.* It is unlikely that peer effects from referrals or referrers drive our results. First, there were relatively few referrals made. Second, and more importantly, the overall impact of having an ERP on attrition is similar to our baseline

[32] Results are similar if we restrict to stores with no referral hires (instead of no referrals made). Panels (c) and (d) of Figure 4 show that non-referrals have better survival in ERP than Control stores.

estimate even while restricting to stores where no referrals are ever made during the RCT.

*ERPs help the firm make better hiring decisions.* Having an ERP could help a firm improve its hiring process, perhaps by helping a store manager learn about what type of candidates to target or by freeing up additional time that would be spent on interviews. However, this also seems unlikely to explain our results. Beyond the fact that ERPs have large effects in stores where no referrals are made, ERPs also have similar percentage impacts on incumbents relative to their impacts on new hires. This mechanism cannot explain why ERPs reduced incumbent attrition.

*Other concurrent policies or managerial reactions in treatment stores.* Throughout the RCT period, the firm did not differentiate any management practice by treatment status. Recall that store managers were not aware there was an RCT. Further, having an ERP did not affect firing or self-reported store manager time use (time use details in Appendix A.6).

*Control store frustration.* Instead of workers in treatment stores being less likely to quit, perhaps workers in control stores became more likely to quit, if they happened to hear about the ERPs in other stores, a particular form of a treatment spillover. There is evidence against this interpretation. First, HR was told to accept referrals from control stores if employees called to make them, but they did not get any referrals from control stores. Second, we instructed HR to record any complaints that it received from control stores about there not being an ERP, but there were no complaints made. Third, in all the surveys we conducted, both during and after the RCT, we never heard a worker mention anything about control store frustration.

### 6.2.3 Possible Mechanisms for Non-referral Channel

The impact of an ERP is strong in stores where no referrals are made; is relatively flat over time; affects hires and incumbents in similar percentage terms; is driven by quits, not fires; affects turnover, not absence; and treatment/control differences vanish once the ERP is rolled out to control stores. What can explain this? We believe it should be a mechanism or mechanisms that increase the non-wage value of working at the firm, making employees less likely to quit but no more likely to exert effort to increase sales, reduce shrinkage, or not be absent. Such mechanisms may include:

1. *Employees feel respected after being asked to be involved in hiring or liked having some say about who they might work with.* Workers may value being involved in hiring, perhaps because it makes them feel respected (Ellingsen and Johannesson, 2007), or because it gives workers some voice (Hirschman, 1970; Turco, 2016) or decision authority (Fehr et al., 2013; Bartling et al., 2014) in hiring.
2. *The introduction of an ERP is a positive signal about the firm being a better place to work.* Instead of being simply about hiring or whom a worker gets to work with, an ERP may increase a worker's perception of the overall quality of the firm, e.g., having a costly ERP may raise a worker's expectation of the firm's future profitability.
3. *Workers think they may make referrals in the future.* Even if few workers took advantage of the ERP during the RCT, workers could imagine that there would be some chance that they would use the benefit in the future.
4. *ERPs increase informal referrals.* The ERPs could have increased "informal referrals," i.e., people who may have informally heard about the job from a friend, but where the friend was not willing to call HR to register the referral.

To shed further light on these explanations, we conducted phone surveys with 222 store managers and an in-store electronic kiosk survey with 113 store workers from the study firm. We explained that ERPs had reduced attrition at the firm separate from generating referrals, and asked them their opinion on which of the above four mechanisms (or a 5th option of a mechanism of their own choosing) was most likely to explain the result. We randomized the order in which the four mechanisms were presented.

Panel A of Table 6 shows that (1) was by far the most common explanation, chosen by 66% of managers and 50% of workers. There are modest differences between workers and managers, e.g., a larger share of workers supports (3), but the overall message from both groups is the same.[33]

Is it possible to parse further into whether (a) employees felt respected about being involved in hiring or (b) whether they liked having some say about who they might work with? We asked workers choosing (1) to specify whether (a) or (b) was the main reason or whether both were equally likely. As seen in Panel B of Table 6, 15% said (a), 17% said (b), and 67% said both were equally likely. While (a) and (b) may be conceptually distinct, workers view them as closely related.[34] We refer to (a) and (b) together as workers valuing being involved in hiring.

While researchers have not previously considered that workers valuing being involved in hiring is a mechanism for the impact of ERPs, it is highly consistent with evidence from practitioners, as we discuss further in Appendix A.7.

Beyond surveying managers and workers at the firm about reasons for the indirect effects, a complementary approach to identifying mechanisms is to use a vignette (e.g., Kaur, 2019). In late 2018, we surveyed a representative sample of 548 US workers. This is useful both because it helps indicate that the results are not somehow an artifact of the within-firm survey design and because it helps suggest that the mechanism we identify may hold in other contexts. We provided the following vignette (with bolding as in the original):

> *An employee is working at a firm where an **employee referral program** is introduced. Under the program, employees are asked to refer their friends for jobs, and they are paid a **bonus** if their friend is hired. In addition, under the referral program, the firm will provide **special consideration** in the hiring process to referred candidates. Do you think the firm having the employee referral program would make the employee feel more respected?*

In the survey, 68% of workers said having an ERP would make the employee feel more

[33]For ERPs to credibly signal respect, workers must believe that candidates they refer will be hired. Indeed, 97% of referred candidates were hired compared to roughly 20% of non-referred candidates. Also, most survey respondents indicated that referred candidates would likely be hired.

[34]This is unsurprising. Part of why someone may feel respected is that the firm is allowing them to help influence who they might work with.

respected, whereas only 11% said it would make the employee feel less respected, and 21% who said they were uncertain. Appendix A.8 provides details on the vignette survey.

Overall, our evidence indicates that most of the impact of ERPs does not come generating referrals. Rather, the explanation most supported by the survey evidence (intra-firm and US vignette) and intra-firm data patterns is that workers feel respected after being asked to be involved in hiring or value having some say about who they might work with.

# 7 Referral Bonuses and Profits (P4)

We use the P2 and P3 results to calculate the profitability of the ERPs. Past work has calculated the profits of hiring a referral relative to a non-referral (Fernandez et al., 2000; Burks et al., 2015), but has yet to be able to calculate profit gains from an ERP. Since the ERPs reduced turnover, but did not affect absence, sales, or shrinkage, we focus exclusively on attrition impacts. ERPs may also reduce recruiting costs (e.g., due to less time interviewing candidates), but we set that aside, given we lack applicant data on non-referrals.

The attrition benefit of an ERP per worker-month is $tc$, where $t$ is the impact of an ERP on turnover and $c$ is the turnover cost. We also calculate the benefit of an ERP in terms of specification populations, namely, referrals and all new hires. For population $p$, the benefit of lower turnover is $\theta_p t_p c$, where $\theta_p$ is the share of worker-weeks from group $p$ in the treatment group and $t_p$ is the attrition difference within population $p$. For all hires, we estimate $t$ using Column 2 of Table 5. We present results where $c$ is based on direct, administrative costs ($c =$€250) or where $c$ is based on the "full costs" of higher turnover ($c =$€1,150). Appendix A.9 gives further detail on $c$.

The cost of an ERP is the bonus paid to the referrer. The cost per referral is $b_0 + Pr(both) * b_1$, where $b_0$ is the bonus paid upon hire; $Pr(both)$ is the probability that referrer and referral stay 5 months after the referral; and $b_1$ is the bonus paid after 5 months. Appendix A.10 gives further details on the profit calculation.

**Results.** Panel A of Table 7 reports the overall benefits from having an ERP versus not. Focusing first on $c =$€250, the benefit/savings from ERP is €2.44 per worker-month, far exceeding the cost per worker-month of €0.10. The overall net profit per worker-month is €2.34, or 0.6% of the labor costs. Only 5% of the turnover benefits accrue from ERPs yielding referrals, who have lower attrition. Rather, the vast majority of the benefit accrues from non-referral hires having lower attrition and from incumbents having lower attrition in ERP stores. Under $c =$€1,150, having an ERP becomes even more profitable, increasing profits by roughly €11 per month, or 2.8% of labor costs, a substantial benefit for a competitive industry like grocery retail.

If having an ERP is evaluated based on lower turnover from referrals, the benefits still outweigh the costs, though both are relatively comparable under $c =$€250. The comparison is radically different once we account for the non-referral turnover benefits of an ERP.

Panel B repeats Panel A separately for the different ERPs. We use the more conservative $c =$€250. Focusing first on the turnover benefits from referrals hired during the RCT, the benefits are non-monotonic, reflecting differences in the quality and prevalence of referrals between treatment arms. This broadly supports P4, i.e., that the relationship between $b$ and profit benefits is ambiguous. Overall turnover savings are also non-monotonic in $b$, reflecting the non-monotonic relation in Column 1 of Table 5. As for Panel A, focusing only on the referral benefits of ERPs yields vastly different conclusions regarding the profitability of an ERP (e.g., based solely on referral benefits, there is little profit benefit from R120). R0 yields large profit gains despite producing 0 referrals.

Panel C looks at profits under the post-RCT firmwide ERP rollout (discussed in further detail below in testing P5). The share of turnover benefits from referral hires is 14%, which is higher than during the RCT, but most benefits are still not from referral hires.

# 8 Job Quality Perceptions and Referrals (P5)

For our last prediction (P5), we lack randomized variation in job quality perceptions. Instead, we exploit surveys from firm managers, firm employees, and our firm's host country's general population. We also analyze the post-RCT firmwide ERP rollout.

**General public survey on occupational attractiveness.** P5 says first that referrals are less likely for less attractive jobs. Panel (a) of Figure 6 shows ratings of the attractiveness of different occupations using surveys of the general population in the host country. Cashier jobs, comprising 90% of hires during our RCT, receive the lowest score among the occupations. Our estimate of the mean is precise. In contrast, non-grocery jobs at the firm, namely, those in logistics and food production, rate substantially higher.[35]

**Employee and manager surveys.** Table 8 shows that managers and workers strongly believe that the reason why the RCT only modestly increased referrals is because grocery jobs are regarded as undesirable. In the fall 2016 manager survey, we asked an open question about why ERPs had little impact on getting referrals. Undergraduates in a lab later classified the reasons into several categories. As seen in Column 1 of Panel A, the most common explanation, given by half of managers and four times more common than the next most common explanation, is that grocery store jobs are undesirable. In Column 2, the share rises to 68% if we exclude (1) the mechanical explanation of no open jobs, (2) the response that the referral bonuses worked well, and (3) instances where managers gave no reason. Panel B of Table 8 shows that similar findings apply to workers. We gave cashiers the six most frequently mentioned reasons from the manager survey and asked them to rank them.[36] 51% listed "Many people perceive working conditions in supermarkets as not very attractive (e.g. low salary, high workload)" as the #1 reason why employees were not making referrals.

[35] While Panel (a) of Figure 6 accords with many aspects of occupational prestige in the US, there are some differences, e.g., doctors or teachers are not ranked very highly. This reflects historic reasons (the country is a post-communist society) as well as lower earnings in these professions relative to required qualifications.

[36] These were the five most frequently mentioned reasons; to these, we added a sixth reason that wasn't mentioned, namely, that the size of the bonus could have been too small.

Beyond job quality, other reasons never featured prominently in the two surveys. First, reputational concerns vis-a-vis the firm, as opposed to vis-a-vis their friend, were not mentioned often. Only 12% of managers gave a response involving concern about people not wanting to make a referral to avoid embarrassment; likewise, only 16% of workers thought "Employees don't want to be responsible if their friend doesn't do a good job" was the main reason for the limited impacts observed. Second, if workers lack friends to refer or these friends already have good jobs, then an ERP cannot generate many hires. But the idea of workers not having friends looking for jobs was rarely mentioned.

**Firmwide ERP rollout and referral bonus increase.** Because of the benefits from the RCT, the firm decided to roll out an ERP to the entire company. Under the new regime, employees received €30 when a referral was hired, plus an additional €100 if both parties stayed 3 months. This constitutes three changes, all of which make the bonus larger in expected value. First, twice as much money is being paid upon hire. Second, it reduces the months that the referrer and referral must stay for the referrer to get paid (3 instead of 5). Third, the total payment (€130) is higher than in all the RCT arms.[37]

The rollout serves several functions for us. First, it allows us to examine the impact of an ERP in grocery and non-grocery jobs. Second, it helps rule out concern that the RCT bonuses were too low in perceived expected value.[38] Third, we can test whether differences between treatment and control stores disappear once all stores are given the same treatment.

Among grocery store workers, Table 9 shows that in the post-RCT period (January-May 2017), the ratio of referrals made to hires was 12%, which is an increase above the 5% ratio in R120 during the RCT. However, among non-grocery workers in production and logistics, the post-RCT ratio was 37%. While there are differences between grocery and

[37]There are three limitations that must be kept in mind in considering the new ERP. First, the firm was not willing to randomize this change. Second, we only were able to obtain data on who made referrals, not who was referred. Third, because our personnel data only cover grocery store workers (and not non-grocery store workers), we can only match the data on who made referrals to individual personnel records for grocery workers. Despite these limitations, the data on referrals made can still be very fruitfully used.

[38]Though the surveys indicated otherwise, perhaps workers were very present biased or had some other concern on not getting the bonus fast enough. Five months is not a trivial length of time to wait, particularly when almost half of referrals leave in the first 5 months.

non-grocery jobs other than attractiveness, these differences seem to reinforce our story.[39]

In sum, while front-loading and increasing the bonus further increased referrals for grocery jobs, the ratio of referrals made to hires only increased to 12%; this suggests that frontloading plays a role, but is unlikely to be the primary cause of our RCT finding that bonuses modestly boosted referrals for grocery jobs. Second, the referral rate was substantially higher for non-grocery jobs, which is consistent with our earlier evidence that the bad reputation of grocery jobs limits the ability of ERPs to generate referrals.

**Asking the general public why there were more referrals for non-grocery than grocery jobs.** We did a second survey of randomly selected citizens from the country where the firm operates.[40] We asked them why they thought that few referrals were made for grocery jobs, whereas significant referrals were made for non-grocery jobs. As seen in Column 3 of Panel A of Table 8, nearly 3/4 of respondents ascribed the difference in referral rates between grocery and non-grocery jobs to grocery jobs being undesirable.

**Alternative explanations beyond job quality perceptions for our evidence supporting P5.** We discuss two explanations here, leaving most to Appendix A.11.

*Job or the Firm?* We argued that our results are driven by grocery jobs being unattractive, but could they be driven instead (or in addition) by our study firm being unattractive? Panel (b) of Figure 6 shows that our firm is well-regarded relative to other retail firms in the host country, suggesting that results are not driven by the firm being unattractive.

*Reputational Cost toward the Firm?* An alternative explanation for few referrals is that workers were concerned about their standing in the firm and did not wish to refer someone who could embarrass them (Smith, 2005). However, only 12% of managers surveyed gave a

[39] For production and logistics jobs, pay is higher than for cashier jobs, making the fixed €30 + €100 referral bonus a smaller share of pay. Another difference is that, unlike grocery jobs, not everyone's friends could work in logistics or food production. Most logistics jobs are truckdriver positions requiring a license. Food production jobs require working at a central facility (unlike the grocery store jobs which are located around the country). Such restrictions should work against generating more referrals.

[40] By this point of time, the study firm CEO had left, and we (the authors) lost our ability to collect new surveys within the firm. Still, surveying the general public instead of firm employees provides a useful outside perspective.

response about workers avoiding referrals to prevent embarrassment. Likewise, only 16% of workers surveyed thought "Employees don't want to be responsible if their friend doesn't do a good job" was the main reason for the limited impacts on generating referrals. Moreover, reputational cost toward the firm would not generate P4 or P5.

**Vignette evidence for P5.** As discussed in Appendix A.8 for brevity, we also find in our vignette survey (mentioned in Section 6.2.3) that US workers describing their current job as more attractive are more willing to refer a qualified friend for a hypothetical opening.

**Job quality and responsiveness to bonus level.** For non-grocery jobs, there was no ERP before the firmwide rollout. Thus, it is somewhat challenging to use the non-grocery evidence to properly test the second part of P5, i.e., that referrals are more responsive to referral bonuses in good jobs than in bad jobs.[41] However, Table 9 shows that we can provide evidence by separating grocery jobs into cashier jobs and non-cashier grocery jobs (e.g., butcher, baker, assistant manager), which are regarded as more attractive than cashier jobs. During the RCT, the ratio of referrals made by the group to hires was 5% for non-cashier grocery jobs compared to 3% for cashier jobs. Post-RCT, the ratio was 17% for non-cashier grocery jobs compared to 11% for cashier jobs. That is, ERPs have more of an impact on boosting referrals for better jobs, consistent with P5.

# 9 ERPs, Age, and Gender

While we focus on our pre-registered outcomes of attrition and absence, we here explore the common concern that ERPs may affect worker demography and make the workplace less diverse. Table 10 explores how referrals and ERPs relate to age (Panel A) and gender (Panel B). Column 1 shows that referrals are 3 years younger than non-referrals,[42] and are 9pp more

[41] As far as we are aware, formal referrals were not being made for non-grocery jobs before the firm's rollout in January 2017. Thus, one can think of our evidence as tracing out a referral responsiveness curve, where initially there were 0% referrals at a bonus level of 0, and 37% referrals made per hire at the bonus of €130.

[42] We are aware of limited work that finds this result. In an analysis of neighborhood effects, Bayer et al. (2008) observe that referral differences are greater for young workers. Other HR management practices interact with age, e.g., Friebel et al. (2017) find that young workers drive the impact of group bonuses.

likely to be female, though this last difference misses statistical significance. Having an ERP increases the share of female hires by 4pp, but does not affect age. Given that grocery workers at the firm are 85% female, making the workforce more female is making it less representative of the general population, and thus decreases diversity.[43]

Despite this, referrals yield high-value hires from disadvantaged workers. A common policy concern in many EU countries is youth unemployment. In the country we study, youth unemployment far exceeds the rate for older workers. In informal interviews with five store managers at our firm, all expressed concern that young workers are more likely to quit than older workers. Column 4 of Panel A shows that this is true: among non-referrals, young workers (i.e., under 25 at time of hire, following the OECD definition) are almost 50% (6.7 pp per month) more likely to quit than older workers. However, referred young workers are no more likely to quit than non-referred older workers. If a firm worries that young workers will quit shortly after hire, our results suggest that referrals may neutralize this concern.[44]

Another common policy concern is that women have higher rates of absenteeism than men (Ichino and Moretti, 2009). Indeed, among non-referrals, women have 46% more absences than men (Column 5 of Panel B). However, referred female workers are no less likely to be absent than non-referred men. In fact, referral vs. non-referral differences in absenteeism are entirely concentrated among female referrals.

# 10 Conclusion and External Validity

ERPs may affect firms in two ways: (1) Directly, i.e., by affecting referrals, or (2) Indirectly, i.e., via costs or benefits separate from generating referrals. We use the first RCT on ERPs in a for-profit firm and the post-RCT firmwide rollout to better understand these two pathways.

On (1), we find that larger bonuses increase referrals and that referrals are higher

[43] Likewise, although having an ERP does not affect the age of hires, referred hires are younger than non-referred hires. Given that a high share of the firm's workforce is young, making the firm younger makes the firm less demographically representative of the general population.

[44] One concern is that young workers might be working summers off from school, and would naturally quit at the end of summer. However, the results in column 4 are very similar when dropping summer months.

quality than non-referrals, though the share of referrals is modest. Larger bonuses decrease referral quality, and the direct profit benefits of ERPs are non-monotonic in the bonus. Further, the level of referrals and the responsiveness of referrals to bonuses is higher for more attractive jobs. All these results are predicted by a model where referrers receive utility both from money and the utility of their social contacts. These findings are consistent with, but substantially expand, the earlier findings of Beaman and Magruder (2012).

On (2), we show that ERPs can have substantial indirect benefits. Having an ERP reduces turnover by 15% and these effects are present even in stores where no referrals are made. The ERPs we randomized were highly profitable and 95% of the benefit came from indirect benefits. Surveys suggest that the indirect benefits arise from employees valuing being involved in the hiring process and having some say over who they would work with. These results may explain why ERPs are a common management practice. More generally, and beyond ERPs, our results help rationalize why firms seek employee participation in hiring (beyond the importance of using worker information for selection), and support the Ellingsen and Johannesson (2008) model of respect in the workplace. Beyond hiring, the notion that HR practices that involve workers may cause them to feel more respected may be relevant for many workforce practices, such as idea suggestion systems and 360° evaluation.

As of May 2019, about 2.5 years after the RCT ended, the firm continues to use the rolled-out ERP. This longer-run persistence of a change in management practice echoes Bloom et al. (2019). In informal interviews in late 2018, both executives and store managers report high satisfaction with having an ERP. According to auxiliary records from the firm, referral rates remain sizable at roughly 30% for non-grocery jobs, and remain fairly low (but non-trivial) at roughly 10% for grocery cashier jobs.

In all one-firm RCTs, it is important to consider whether conclusions are likely to be different in other contexts, even when the sample size is very large. On (1), our results certainly do not imply in general that ERPs will only modestly increase referrals—in fact, the post-RCT ERP was very effective in motivating referrals for non-grocery jobs at our firm. In a high-skilled context, it could be that people are more responsive to bonuses, or potentially less responsive, e.g., if referral-making is instead driven by strong career motivations.

On (2), would ERPs generate indirect effects in other contexts? As seen in Table 9, we observe substantial indirect effects for different jobs and ERPs, suggesting that indirect effects could be substantial for other low-skill jobs. While our analysis does not cover high-skill jobs, we speculate that ERPs may still generate indirect benefits from workers valuing being involved in hiring. Our experience is that professors sometimes skip various faculty meetings, but nearly everyone comes to faculty hiring meetings, suggesting that faculty like being involved in hiring. Of course, workers in high-skill jobs may feel more respected than workers in low-skill jobs, so it is possible that indirect benefits of ERPs would be lower in high-skill jobs.[45] On the other hand, if people are more willing to make referrals for better jobs, then there may be more opportunities to be involved in hiring for high-skill jobs than for low-skill jobs, possibly making respect benefits larger for high-skill jobs.

To go beyond casual observation and speculation on the external validly of (2), we note that our US vignette survey (see Section 6.2.3) strongly supported that ERPs may also make US workers feel more respected. Moreover, US workers with a bachelor's degree or higher are 10pp (s.e.=4.0pp) more likely than less-than-bachelor's US workers to say that having an ERP would make an employee feel more respected. This is consistent with the possibility that indirect benefits of ERPs may be present in contexts with higher-skill workers.

We look forward to future RCTs that can examine the ideas from our paper in other settings, both other low-skill settings and high-skilled settings. Further, there are other motivations to make or not make referrals beyond those discussed in our paper. For example, people may make referrals because it signals being a good corporate citizen, or may avoid making referrals if they think that the person referred will outshine them (Ekinci, 2016). We believe that it would be useful for future RCTs to explore such ideas as well.

[45] Higher skill jobs also often have much lower hiring rates, even for referred workers.

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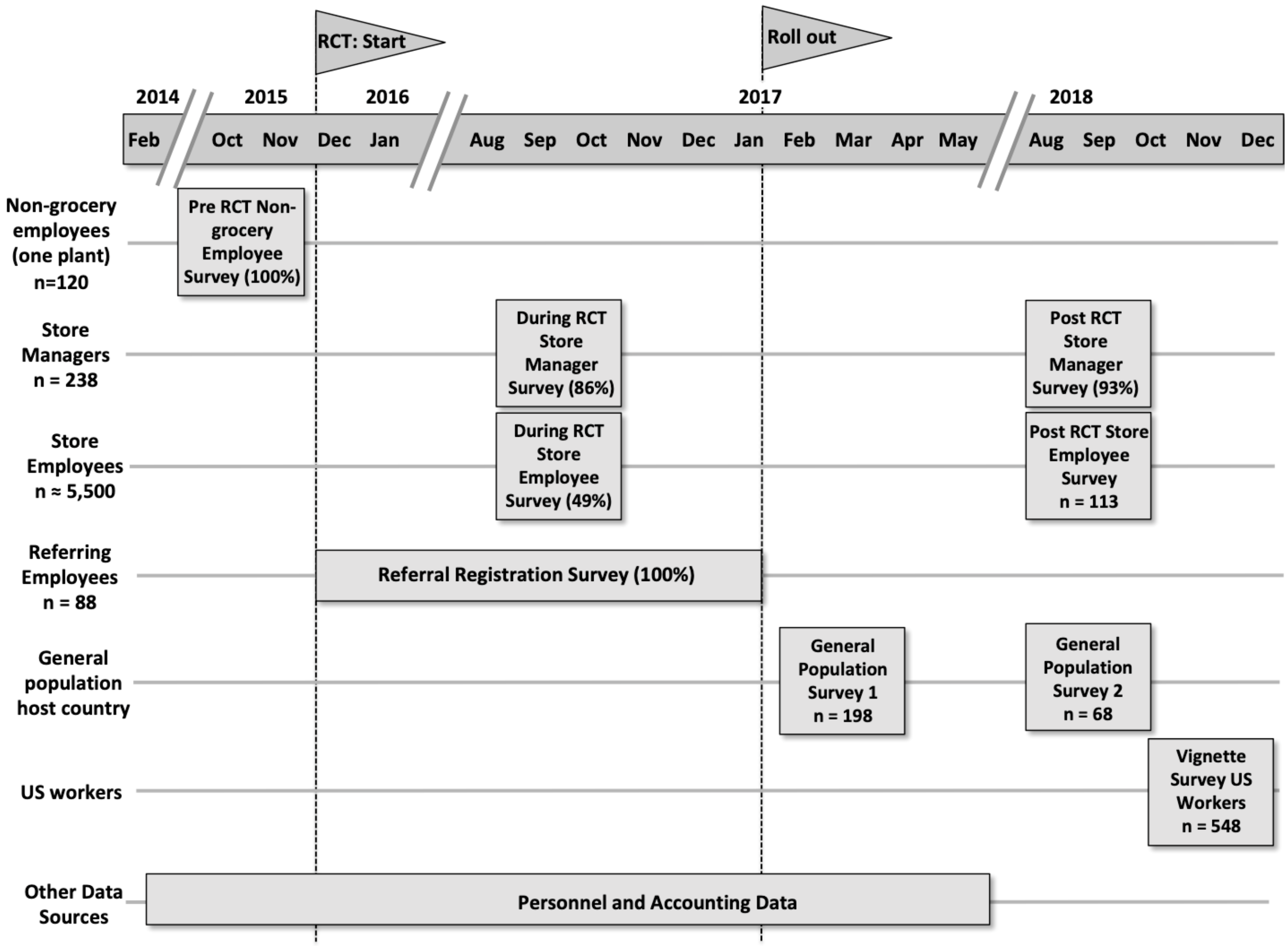
**Figure 1:** Referral Program Poster Used During RCT

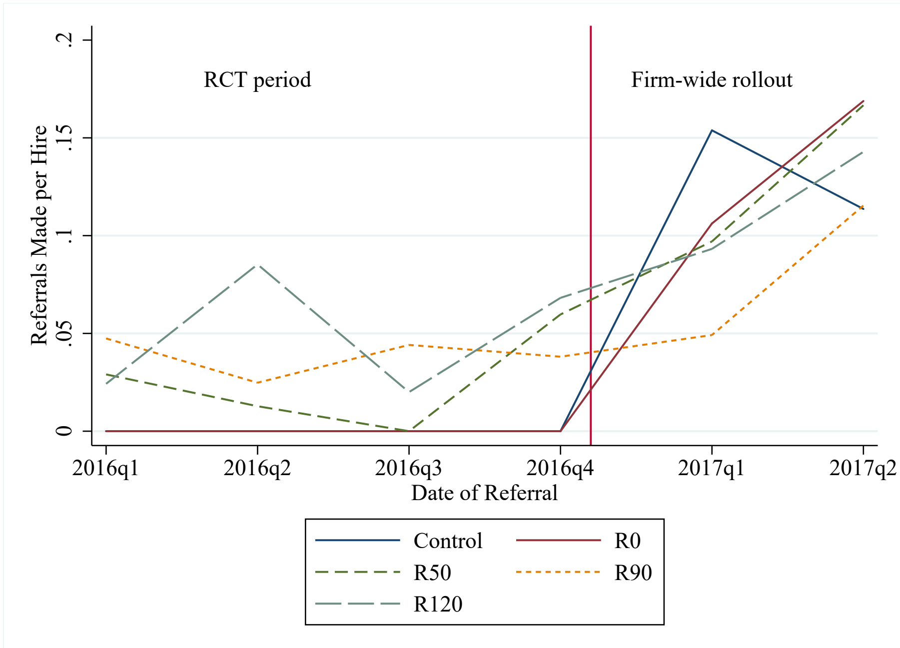

Notes: This is a translated version of a poster used during the RCT, with the firm name redacted.

**Figure 2:** Datasets Used in the Paper

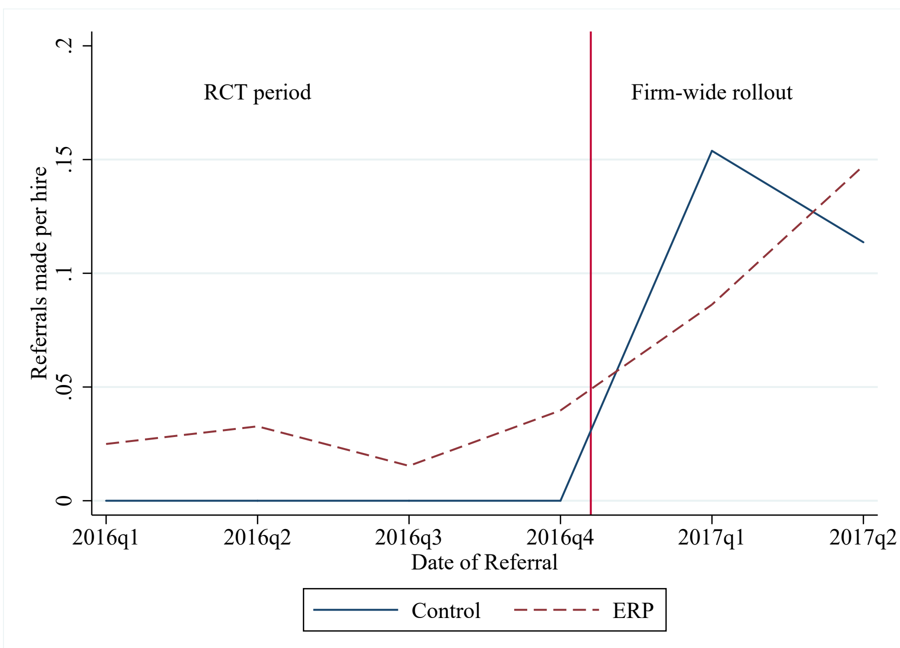



Notes: The *Pre-RCT survey of non-grocery employees* is discussed in Section 2 in describing how we selected the level of the referral bonuses for the RCT. The *During RCT surveys of managers and employees* are analyzed in Section 8, with results in Table 8 (Panel A covers managers, whereas Panel B covers employees). These help gain insight on why the RCT ERPs generated only a modest number of referrals. The *Post-RCT surveys of managers and employees* are analyzed in Section 6.2.3, with results in Table 6. These help gain insight on the mechanism for the indirect effects of ERPs on employee attrition. The *Post-RCT survey of employees* was conducted by the firm using store kiosks, so we do not know how many workers saw the survey on the kiosks (or know the share of workers who agreed to participate conditional on seeing the surveys). The *Referral Registration Survey* provides information on who referred whom and is used throughout the paper. The very brief survey is conducted by the firm as part of the referral process. Starting in January 2017, we only have information on who made referrals, not on who is referred. *General Population Survey 1* is analyzed in Section 8, with results in Figure 6. *General Population Survey 2* is analyzed in Section 8, with results in Panel A of Table 8. The *US worker vignette survey* is discussed in Sections 6.2.3, 8, and 10. It provides further evidence regarding the mechanism for ERP impacts on attrition, and also allows us to examine results across both lower-skill and higher-skill workers. In addition, it provides further evidence supporting the first part of Prediction 5, i.e., that workers should be more willing to make referrals for more attractive jobs. Appendix A.8 provides details on the vignette survey.

**Figure 3:** Referrals Made over Time in the RCT and Firmwide Rollout



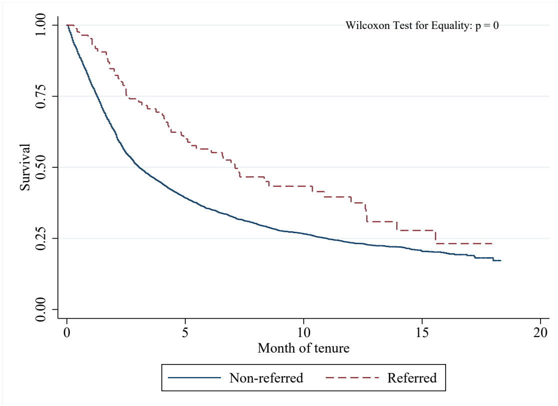

(a) Five Arms



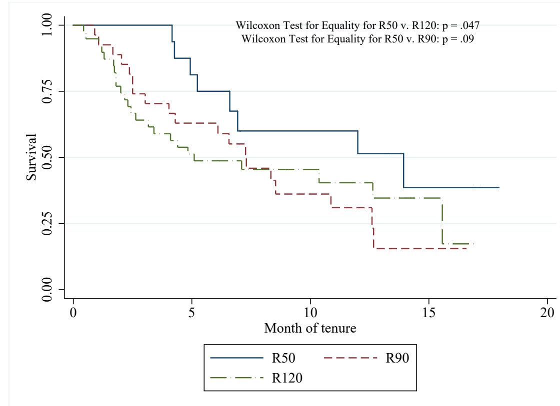

(b) ERP vs. Control

Notes: This figure shows referrals made divided by hires over time during the experiment across the 5 experimental arms. The vertical line is located in between 2016q4 and 2017q1, and separates the RCT period from the firmwide rollout. Panel (a) shows the 5 arms and panel (b) shows control vs. ERP stores.

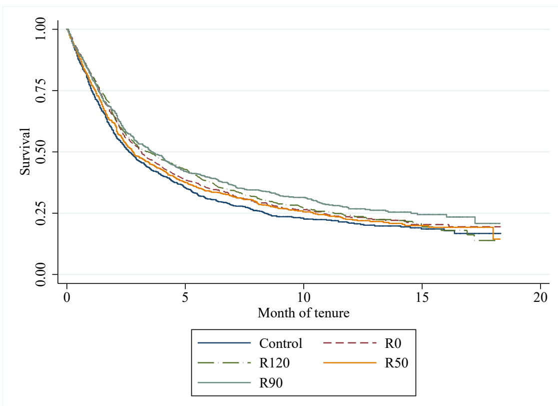
**Figure 4:** Survival Curve Comparisons



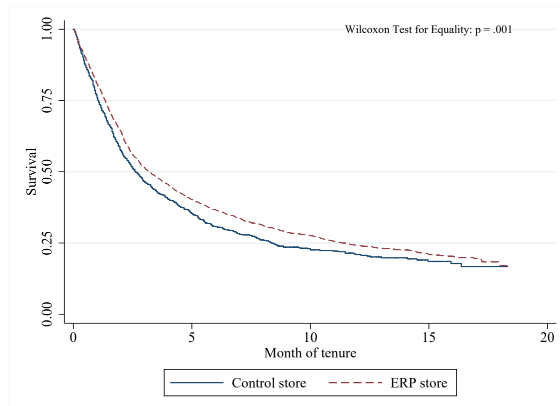

(a) Referrals vs. Non-referrals




(b) Referral Survival by Bonus Level



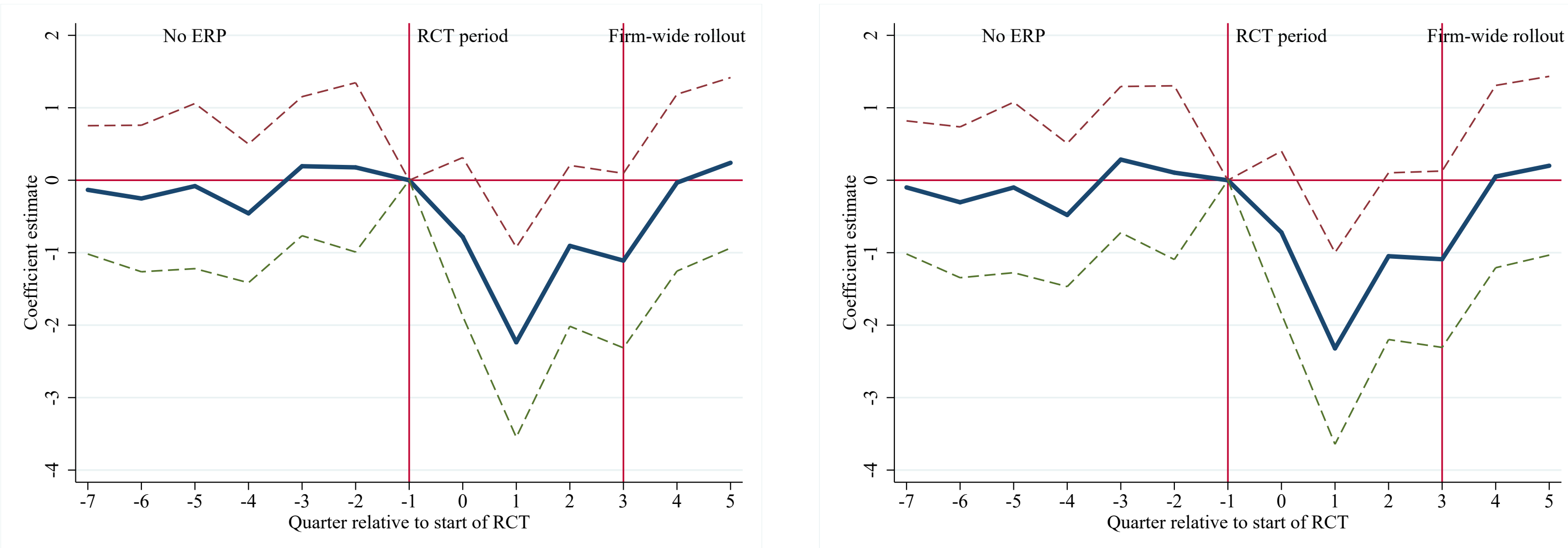

(c) Survival of Non-Referrals by Bonus Group




(d) Survival of Non-Referrals, by ERP Stores vs. Control

Notes: This figure presents different survival comparisons. Panel (a) compares referrals and non-referrals in terms of survival. Panel (b) analyzes the survival of referrals across the three positive bonus groups. Panel (c) analyzes the survival of non-referrals according to the five randomized treatments (Control, R0, R50, R90, R120). Panel (d) repeats panel (c) but splits according to whether there was a referral program, thereby grouping R0, R50, R90, and R120 together vs. Control. We restrict attention to workers hired during the RCT (December 2015-December 2016), but we follow them here through May 2017.

**Figure 5:** Event Studies: ERP Lowers Attrition during the RCT, and the Effect is Reversed Once ERP is Rolled out to Control Stores. ERP Effects are Similar in Stores with No Referrals During RCT.

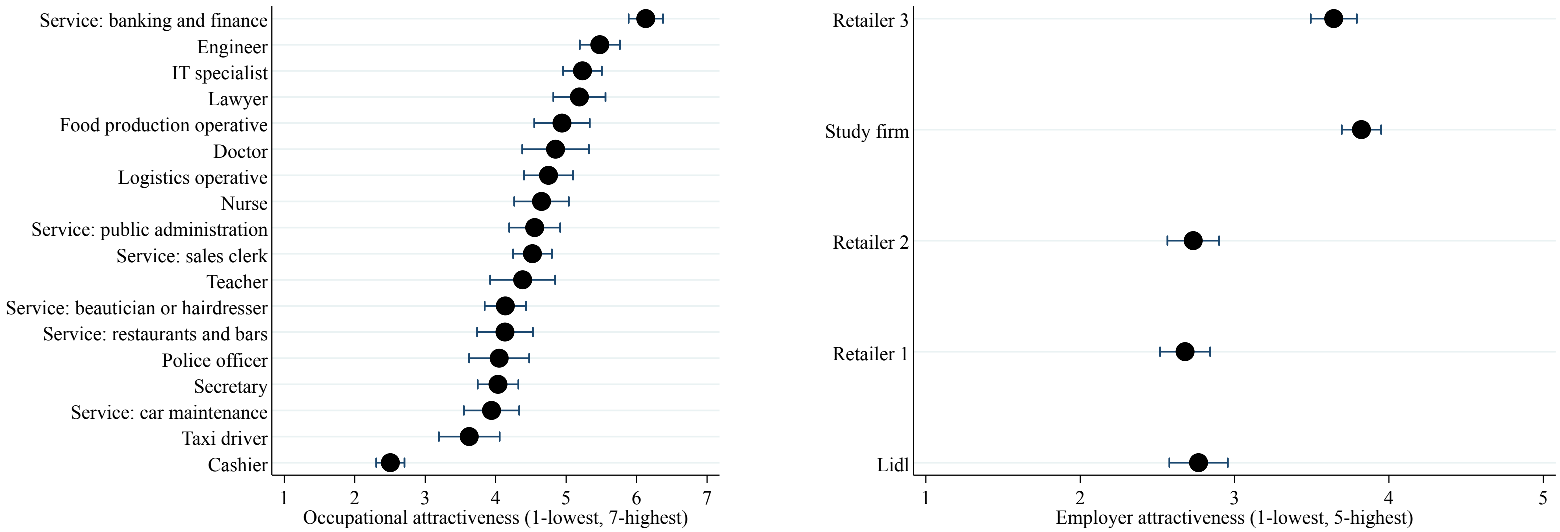



(a) Overall Results

(b) Stores with No Referrals during RCT

Notes: The solid line denotes the coefficient estimate, with the dotted lines denoting the 90% confidence interval. Panel (a) analyzes the impact of the randomly assigned ERP treatments on attrition. The omitted category is the Control stores. The regression used in plotting the event study is similar to column 4 of Table 5. The difference is that we interact the ERP dummy with event time dummies indicating the current quarter relative to the start of the RCT. Quarter 0 refers to December 2015-February 2016. Quarter 3 covers 4 months, going from September 2016-December 2016, which we do since the RCT goes through December 2016. In addition, quarter 4 is January-March 2017 and quarter 5 is April-May 2017. The omitted category are the stores that were formerly treatment stores during the ERP. Panel (b) repeats Panel (a) while restricting attention to workers in stores where no referrals are ever made during the RCT.

**Figure 6:** Attractiveness of Occupations and Grocery Chains in our Firm's Host Country




(a) Occupations

(b) Grocery Chains

Notes: Dots are mean attractiveness ratings, and whiskers are 95% confidence intervals for the means. The data are from our *General Population Survey 1*. The sample is people from the general public of the country where our retailer is based. In panel (a), in measuring occupational attractiveness, we use an approach similar to that in the General Social Survey (Smith and Son, 2014). Specifically, to reduce survey time and ensure maximize time, respondents are asked about 6 occupations from our overall list of 18 occupations. Each respodent saw the cashier occupation plus 5 other occupations. In the survey in panel (b), each respondent is asked about all 5 grocery retailers (our study firm, 3 other local retailers, and the German chain Lidl).

**Table 1:** Comparing Pre-Treatment Store Means across the Treatment Groups ($N = 238$ stores): Randomization Check

**Panel A: Across All 5 Arms**

| | Head count | Net sales | Shrink-age rate | In big city | Lidl store nearby | Attri-tion rate | Quit rate | Fire rate | Share female | Age | Unemp rate |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| Constant | 25.110*** | 209.776*** | 0.029*** | 0.370*** | 0.239*** | 5.005*** | 5.402*** | 0.776*** | 0.889*** | 32.315*** | 7.852*** |
| | (2.696) | (23.341) | (0.001) | (0.072) | (0.064) | (0.421) | (0.509) | (0.178) | (0.012) | (0.631) | (0.329) |
| R0 | 0.584 | 1.080 | 0.001 | 0.110 | 0.053 | 0.291 | 0.350 | 0.150 | -0.011 | 0.121 | -0.263 |
| | (3.549) | (30.012) | (0.002) | (0.102) | (0.092) | (0.542) | (0.755) | (0.252) | (0.017) | (0.813) | (0.449) |
| R50 | -0.975 | -16.132 | -0.000 | 0.068 | 0.032 | 0.322 | -0.167 | 0.048 | 0.006 | 0.356 | -0.444 |
| | (3.764) | (31.075) | (0.002) | (0.102) | (0.091) | (0.573) | (0.693) | (0.228) | (0.017) | (0.854) | (0.479) |
| R90 | 0.745 | -2.218 | 0.000 | 0.089 | -0.052 | 0.296 | 0.549 | 0.033 | -0.005 | -0.572 | 0.058 |
| | (3.927) | (32.161) | (0.001) | (0.102) | (0.085) | (0.584) | (0.718) | (0.230) | (0.018) | (0.885) | (0.487) |
| R120 | 0.080 | 0.713 | -0.001 | -0.057 | -0.052 | 0.268 | -0.092 | 0.188 | 0.005 | 0.682 | 0.056 |
| | (3.895) | (33.816) | (0.001) | (0.099) | (0.085) | (0.585) | (0.689) | (0.244) | (0.017) | (0.808) | (0.484) |
| Observations | 238 | 238 | 238 | 238 | 238 | 238 | 238 | 238 | 238 | 238 | 238 |
| F-test | 0.0660 | 0.123 | 0.411 | 0.970 | 0.599 | 0.104 | 0.379 | 0.232 | 0.355 | 0.662 | 0.428 |
| p-val | 0.992 | 0.974 | 0.800 | 0.425 | 0.664 | 0.981 | 0.823 | 0.920 | 0.840 | 0.619 | 0.788 |
| **Panel B: ERP (All 4 Treatment Arms) vs. Control Arm** | | | | | | | | | | | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| ERP | 0.108 | -4.139 | 0.000 | 0.052 | -0.005 | 0.294 | 0.160 | 0.105 | -0.001 | 0.147 | -0.148 |
| | (2.987) | (25.558) | (0.001) | (0.080) | (0.070) | (0.460) | (0.564) | (0.194) | (0.013) | (0.686) | (0.369) |
| Observations | 238 | 238 | 238 | 238 | 238 | 238 | 238 | 238 | 238 | 238 | 238 |
| F-test | 0.00132 | 0.0262 | 0.00926 | 0.428 | 0.00459 | 0.408 | 0.0805 | 0.292 | 0.00952 | 0.0457 | 0.161 |
| p-val | 0.971 | 0.871 | 0.923 | 0.513 | 0.946 | 0.523 | 0.777 | 0.589 | 0.922 | 0.831 | 0.689 |

Notes: Panel A compares stores across the different conditions in terms of store-level characteristics. Each column is an OLS regression on dummies for the four treatment arms. The estimated constant corresponds to the mean in the control group. There are 46 stores in the control group, and 48 stores in each of the 4 treatment groups. The F-test and p-value correspond to the test for joint significance of the treatment dummies. A similar regression-based balance test can be found in DellaVigna et al. (2016). Panel B lumps all treatment stores together and compares versus Control stores. "Head count" is the number of employees in a store. Note that the breaking of attrition into quits and fires is only available starting in 2015m4. * significant at 10%; ** significant at 5%; *** significant at 1%

**Table 2:** Summary of the Treatments and Referrals Made during RCT

| | Control ($N = 46$) | R0 ($N = 48$) | R50 ($N = 48$) | R90 ($N = 48$) | R120 ($N = 48$) |
|---|---|---|---|---|---|
| **Panel A: Summary of the Five RCT Arms** | | | | | |
| Information to encourage referrals (posters, letter, meeting) | No | Yes | Yes | Yes | Yes |
| Bonus paid to referrer after referral is hired | 0 | 0 | €15 | €15 | €15 |
| Bonus paid to referrer if both referrer & referral stay 5 months | 0 | 0 | €35 | €75 | €105 |
| **Panel B: Total Hires, Referrals Made, and Referrals Hired** | | | | | |
| Number of Hires | 763 | 748 | 750 | 709 | 841 |
| Number of Referrals Made | 0 | 0 | 18 | 28 | 42 |
| Number of Referral Hires | 3 | 0 | 16 | 27 | 39 |
| Referrals as Share of Hires | .004 | 0 | .021 | .038 | .046 |

Notes: This table compares means across treatment arms in the number of referrals made, as well as in the characteristics of referrals (as reported by the referrer). The first two columns of Panel B are blank because there were no referrals made in the Control or R0 conditions. During 2016, €1 was worth between about $1.04-$1.16 USD.

**Table 3:** Impact of ERPs on whether New Hires are Referred

| *DV = Hire is a Referral* | (1) | (2) | (3) |
|---|---|---|---|
| R0 | -0.004* | -0.000 | |
| | (0.002) | (0.005) | |
| R50 | 0.017** | 0.022** | |
| | (0.008) | (0.009) | |
| R90 | 0.034** | 0.037*** | |
| | (0.014) | (0.013) | |
| R120 | 0.042*** | 0.041*** | |
| | (0.014) | (0.011) | |
| ERP | | | 0.025*** |
| | | | (0.006) |
| Observations | 3,811 | 3,811 | 3,811 |
| Controls | No | Yes | Yes |

Notes: Standard errors clustered at the store level. An observation is a grocery worker hired during the RCT. Controls are store-level controls (pre-RCT average monthly turnover rate, pre-RCT average monthly head count, pre-RCT average monthly sales, square footage, region dummies, whether the store is in a big town, and whether there is a Lidl store nearby), year-month of hire dummies, age controls (with age in 6 bins, plus a dummy for age being missing), gender (including a dummy for gender being missing), and a dummy for being a cashier. * significant at 10%; ** significant at 5%; *** significant at 1%

**Table 4:** Comparing Referrals vs. Non-referrals

| Dep. var.: | Attrition (0-1) x 100 | | | Monthly absences | | |
|---|---|---|---|---|---|---|
| Method: | Linear Probability Model | | | Negative Binomial | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Hire was referred | -6.96*** | | | -0.19 | | |
| | (1.17) | | | (0.20) | | |
| Referred X first 5m | | -8.76*** | | | -0.41* | |
| | | (1.62) | | | (0.24) | |
| Referred X after 5m | | -2.86* | | | 0.22 | |
| | | (1.67) | | | (0.45) | |
| Referred X R50 | | | -11.00*** | | | 0.07 |
| | | | (1.66) | | | (0.37) |
| Referred X R90 | | | -6.15*** | | | -0.08 |
| | | | (1.61) | | | (0.39) |
| Referred X R120 | | | -6.09*** | | | -0.41* |
| | | | (2.00) | | | (0.24) |
| Observations | 14,879 | 14,879 | 14,879 | 14,879 | 14,879 | 14,879 |
| MDV if referred=0 | 15.91 | | 15.91 | 1.362 | | 1.362 |
| Workers | 3796 | | 3796 | 3796 | | 3796 |
| MDV in first 5m if ref=0 | | 17.75 | | | 1.152 | |
| MDV after first 5m if ref=0 | | 9.100 | | | 2.143 | |
| F(R50 vs. R90) | | | 0.04 | | | 0.77 |
| F(R50 vs. R120) | | | 0.06 | | | 0.28 |

Notes: Standard errors clustered at the store level. Columns 1-3 are linear probability models, where the dependent variable is whether an employee attrites in a month, with coefficients multiplied by 100 for readability. Columns 4-6 are negative binomial models, where the dependent variable is a worker's number of sick days in a month. An observation is a worker-month. The sample is grocery workers hired during the RCT. Controls are the same as in Table 3, plus current month-year dummies and a 5th order polynomial in tenure. Columns 2 and 5 also have a dummy for "after 5m of tenure." In column 3, the excluded category is non-referred, but we do not include a "Referred X R0" dummy because there were no referral hires in R0 stores. We also do not include "Referred X Control" because there are only 3 hires in Control stores—however, the other coefficients are similar if "Referred X Control" is included. * significant at 10%; ** significant at 5%; *** significant at 1%

**Table 5:** The Impact of the ERPs on Attrition (Linear Probability Models)

| Type of workers: | All | All | All | All | Hires | Hires | Inc | Inc |
|---|---|---|---|---|---|---|---|---|
| Sample period: | RCT | RCT | Pre &RCT | Pre &RCT | RCT | RCT | RCT | RCT |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| R0 | -1.00** | | | | -0.91 | | -1.05*** | |
| | (0.40) | | | | (1.15) | | (0.34) | |
| R50 | -0.47 | | | | -1.29 | | -0.38 | |
| | (0.45) | | | | (1.32) | | (0.39) | |
| R90 | -1.59*** | | | | -2.90** | | -1.25*** | |
| | (0.38) | | | | (1.22) | | (0.34) | |
| R120 | -0.81* | | | | -1.95 | | -0.52 | |
| | (0.42) | | | | (1.23) | | (0.36) | |
| ERP | | -0.97*** | | | | -1.76* | | -0.81*** |
| | | (0.34) | | | | (1.04) | | (0.28) |
| R0 X RCT | | | -0.92* | | | | | |
| | | | (0.47) | | | | | |
| R50 X RCT | | | -0.98* | | | | | |
| | | | (0.50) | | | | | |
| R90 X RCT | | | -1.75*** | | | | | |
| | | | (0.41) | | | | | |
| R120 X RCT | | | -1.11** | | | | | |
| | | | (0.45) | | | | | |
| ERP X RCT | | | | -1.19*** | | | | |
| | | | | (0.39) | | | | |
| Store FE | No | No | Yes | Yes | No | No | No | No |
| MDV if ERP=0 | 6.677 | 6.677 | 5.434 | 5.434 | 17.24 | 17.24 | 4.362 | 4.362 |
| Observations | 74,188 | 74,188 | 203,798 | 203,798 | 14,879 | 14,879 | 55,953 | 55,953 |
| Workers | 10,003 | 10,003 | 16,942 | 16,942 | 3,796 | 3,796 | 5,870 | 5,870 |

Notes: Standard errors clustered at the store level. All columns are linear probability models, where the dependent variable is whether an employee attrites in a month, with coefficients multiplied by 100 for readability. An observation is a worker-month. Controls are the same as in column 1 of Table 3 except we do not use age controls because age is missing for workers who are hired before the start of the data and who do not attrite, and this missingness is highly correlated with attrition. Columns 3 and 4 add store fixed effects and exclude pre-RCT store-level controls. In terms of type of workers, "All" refers to all grocery workers working at the firm from Feb 2014-Dec 2016, "Hires" refers to people hired during the RCT, and "Inc" refers to incumbents, i.e., individuals who were working with the firm at the time the RCT began. The RCT period is December 2015-December 2016. Data from the firmwide ERP rollout (2017m1-2017m5) are not used here, and this is why the number of workers in columns 3 and 4 is roughly 17,000 instead of 18,000. * significant at 10%; ** significant at 5%; *** significant at 1%

**Table 6:** Why did ERPs Reduce Turnover Separate from Generating More Referrals?

| Reason | Managers N=222 | Workers N=113 |
|---|---|---|
| **Panel A: Why did ERPs Reduce Turnover Separate from Generating More Referrals?** | | |
| "Employees felt more respected after being asked to be involved in the hiring process or liked having some say about who they might work with" | 66% | 50% |
| "Because FIRM NAME started the referral program, it made employees think that FIRM NAME was a better place to work." | 23% | 14% |
| "Employees didn't have a person to recommend, but they hoped to recommend a friend in the future." | 13% | 28% |
| "Employees referred their friends, but they did not tell FIRM NAME about it (and they did not get a bonus). The employees or their friends were more likely to stay at FIRM NAME." | 3% | 5% |
| "None of these reasons are important or likely. What is your explanation?" | 10% | 4% |
| **Panel B: Parsing Further for Workers Selecting the First Reason Listed Above** | | |
| "Employees felt more respected after being asked to be involved in the hiring process" | | 15% |
| "Employees liked having some say about who they might work with" | | 17% |
| "Both were equally likely" | | 67% |

Notes: This is from the post-RCT surveys of grocery workers and managers. Managers did the survey by phone and could select more than one option (hence, the options don't add up to 100%). Workers did the survey via an electronic kiosk at work and could only select one option. The manager response rate was 93%, with 222 of 238 managers responding. For Panel A, we randomized the order in which the four reasons were presented to respondents, with "None of these reasons are important or likely" always presented last. For Panel B, as noted in the main text, for workers selecting "Employees felt more respected after being asked to be involved in the hiring process or liked having some say about who they might work with", we asked them to parse further about whether "Employees felt more respected after being asked to be involved in the hiring process" or Employees liked having some say about who they might work with" was the main reason or whether both were equally likely.

**Table 7:** Profits from the ERPs

**Panel A: Overall Profits from an ERP vs. Control**

| Turnover cost number: | €250 | €1,150 |
|---|---|---|
| Justification: | Admin cost | "Full cost" |
| Total savings in turnover costs | 2.44 | 11.21 |
| *Contribution to savings from:* | | |
| Referrals hired during RCT | 0.13 | 0.58 |
| Non-referral hires during RCT | 0.75 | 3.47 |
| Pre-RCT incumbents | 1.56 | 7.16 |
| % of savings from referrals hired during the RCT | 5% | 5% |
| Costs of the ERP | 0.10 | 0.10 |
| Profit per worker-month | 2.34 | 11.12 |
| Profit as share labor costs | 0.6% | 2.8% |

**Panel B: Profit by Particular ERP (turnover cost = €250)**

| | R0 | R50 | R90 | R120 |
|---|---|---|---|---|
| Total savings in turnover costs | 2.50 | 1.18 | 3.97 | 2.02 |
| *Contribution to savings from:* | | | | |
| Referrals hired during RCT | 0 | 0.20 | 0.15 | 0.18 |
| Non-referral hires during RCT | 0.44 | 0.42 | 1.25 | 0.92 |
| Pre-RCT incumbents | 2.05 | 0.56 | 2.57 | 0.92 |
| Costs of the ERP | 0 | 0.05 | 0.11 | 0.22 |
| Profit per worker-month | 2.50 | 1.13 | 3.86 | 1.80 |

**Panel C: Profits from Rollout ERP vs. Control**

| Turnover cost number: | €250 | €1,150 |
|---|---|---|
| Total savings in turnover costs | 2.68 | 12.31 |
| Contribution to savings from referrals hired during rollout | 0.37 | 1.68 |
| % of savings from referrals hired during the rollout | 14% | 14% |
| Costs of the rollout ERP | 0.54 | 0.54 |
| Profit per worker-month | 2.13 | 11.76 |

Notes: This table reports profit calculations using the method outlined in Section 7. Panel A reports the profit gains from having an ERP vs. Control, pooling all the RCT ERP treatments together. Panel B reports the profit gains from having one of the particular ERPs compared to Control. Panel C reports the profit gains from having the ERP used in the firmwide rollout (with €30 on hire and €100 after 3 months) vs. Control. All numbers are in euros per worker-month. Labor costs are assumed to be €400 per worker-month. The difference between the "administrative costs" and "full costs" of turnover is that the administrative costs are only the direct costs to hire and train a replacement and do not account for lost productivity, as explained in Appendix A.9. See Appendix A.10 for further details on the profit calculation.

**Table 8:** Manager and employee surveys: why did the ERPs generate only a few referrals? General popular survey: why fewer referrals from cashiers than from logistics and food production workers?

**Panel A: Managers & General Population**

| Reason | All managers (N=156) | All managers except those giving reasons 8, 9, 11 (N=118) | General population (N=68) |
|---|---|---|---|
| Undesirable job | 48% | 68% | 74% |
| No friends to refer | 10% | 13% | |
| Didn't want to refer someone who could embarrass | 12% | 13% | |
| People were unaware of referral system | 9% | 10% | |
| No trust that firm will pay the money | 6% | 7% | |
| Referral process was burdensome | 5% | 5% | |
| Bonus too low; referral might not stay | 4% | 4% | |
| No open jobs in the store | 6% | | |
| Referral system worked in her store | 11% | | |
| Other reasons | 11% | 10% | 3% |
| No reasons mentioned | 8% | | 22% |

| **Panel B: Employee Survey (N=342)** | Rank 1 | Rank 2 | Rank 3 | Rank 4 | Rank 5 |
|---|---|---|---|---|---|
| "Many people perceive working conditions in supermarkets as not very attractive (e.g. low salary, high workload)" | 51% | 29% | 13% | 5% | 3% |
| "Employees' friends already have jobs" | 23% | 32% | 30% | 6% | 10% |
| "Employees don't want to want to be responsible if their friend doesn't do a good job" | 16% | 23% | 36% | 17% | 8% |
| "Employees were not informed by the company about the opportunity to refer a friend/did not know how the referral program worked" | 4% | 12% | 14% | 50% | 19% |
| "The amount of money that employees could get for a bonus was too low" | 7% | 6% | 6% | 21% | 59% |

Notes: This table is based on the During RCT surveys of store managers and employees, as well as a post-RCT survey of the general population of the country where the study firm operates (*General Population Survey 2*). *Store managers* in treatment stores were presented with the findings of the RCT and asked for their opinion why the ERPs had produced only a few referrals. Their answers, in free text, were classified into Reasons 1 to 11 by undergraduate coders. The randomly selected members of *general population* were contacted after the rollout and asked "why were there fewer referrals from cashiers than from the logistics and food production workers?". Their answers were coded similarly to managers. Randomly selected *cashiers* were asked the same question as store managers, except that they had to choose from a fixed set of possible reasons.

**Table 9:** Heterogeneity by Job and by Period: Referrals Made and Share of Turnover of Savings from Referral Hires

| | RCT | Post-RCT Rollout |
|---|---|---|
| **Panel A: Refs Made as a Share of Total Hires** | | |
| All Grocery Jobs | 3% | 12% |
| Cashier | 3% | 11% |
| Grocery Non-cashier | 5% | 17% |
| Non-Grocery Jobs | | 37% |
| **Panel B: Share of Turnover Benefits from Referral Hires** | | |
| All Grocery Jobs | 5% | 14% |
| Cashier | 4% | 3% |
| Grocery Non-cashier | 12% | 20% |
| Non-Grocery Jobs | | 35% |

Notes: Panel A shows the number of referrals made as a share of total hires by job and period. For example, if there were a job-period where employees made 3 referrals and for which 10 new workers were hired, the number shown would be 30%. The post-RCT period is Jan-May 2017, and is the period during which the firm rolled out a new ERP to all the firm at once (paying €30 at hire and €100 after 3 months). During the post-RCT period, there are 1,079 hires in grocery jobs and about 500 hires in non-grocery jobs. Panel B shows the share of turnover benefits from referral hires. The percentage shown is the direct benefit, whereas the indirect benefit is given by 100% minus the percentage shown. For example, for grocery non-cashier jobs in the post-RCT ERP rollout, 20% of the turnover benefits are direct and 80% are indirect.

**Table 10:** Referrals, ERPs, and Demographics (Age and Gender)

| **Panel A: Age** | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Dep. Var.: | Age | Age | Age | Attrition (0-1) x 100 | Monthly absences |
| Hire was referred | -2.68* | | | -6.80*** | -0.20 |
| | (1.48) | | | (1.33) | (0.32) |
| Young X referred | | | | 0.09 | -0.05 |
| | | | | (1.96) | (0.50) |
| Young (age<25) | | | | 6.67*** | -0.13 |
| | | | | (0.65) | (0.09) |
| R0 | | 0.68 | | | |
| | | (0.84) | | | |
| R50 | | -0.49 | | | |
| | | (0.77) | | | |
| R90 | | 0.30 | | | |
| | | (0.73) | | | |
| R120 | | 0.76 | | | |
| | | (0.81) | | | |
| ERP | | | 0.32 | | |
| | | | (0.60) | | |
| Observations | 3,787 | 3,787 | 3,787 | 14,879 | 14,879 |
| Mean dep. var. | 31.36 | 0.480 | 0.480 | 15.69 | 1.363 |
| **Panel B: Gender** | | | | | |
| Dep. Var.: | Female | Female | Female | Attrition (0-1) x 100 | Monthly absences |
| Hire was referred | 0.093 | | | -12.36*** | 0.73** |
| | (0.077) | | | (1.90) | (0.31) |
| Female X referred | | | | 6.81*** | -1.31*** |
| | | | | (2.39) | (0.41) |
| Female | | | | -5.59*** | 0.46*** |
| | | | | (0.82) | (0.11) |
| R0 | | 0.037 | | | |
| | | (0.029) | | | |
| R50 | | 0.036 | | | |
| | | (0.026) | | | |
| R90 | | 0.049 | | | |
| | | (0.030) | | | |
| R120 | | 0.041 | | | |
| | | (0.032) | | | |
| ERP | | | 0.040* | | |
| | | | (0.022) | | |
| Observations | 3,810 | 3,810 | 3,810 | 14,879 | 14,879 |
| Mean dep. var. | 0.718 | 0.718 | 0.718 | 15.69 | 1.363 |

Notes: An observation is a grocery worker in columns 1-3, and a grocery worker-month in columns 4-5. Columns 1-4 present OLS regressions, whereas column 5 presents negative binomial regressions. Standard errors clustered at the store level. In Panel A here, the controls in columns 1-3 are the same as the controls in Table 3 except we do not use age controls. In columns 4-5 of Panel A here, the additional controls are the same as in Table 4. In Panel B here, the controls in columns 1-3 are the same as the controls in Table 3 except we do not control for gender. In columns 4-5 of Panel B here, the additional controls are the same as in Table 4, plus age controls. * significant at 10%; ** significant at 5%; *** significant at 1%

# Online Appendix for "What Do Employee Referral Programs Do?"

Guido Friebel, Matthias Heinz, Mitchell Hoffman, Nick Zubanov

This Online Appendix consists of several parts. Appendix A provides additional discussion and results. For each subsection, we give the relevant section of the main paper that it accompanies. Appendix B accompanies the model from Section 3. Appendix C is the Data Appendix. Appendix D contains additional figures and tables. Appendix E provides additional materials used by the firm in the ERPs.

## Appendix A Additional Discussion and Results

### A.1 World Management Survey (Accompanying Section 1)

The World Management Survey (WMS) of Bloom et al. (2014b) has traditionally focused on manufacturing firms. However, in 2009, the WMS surveyed 661 retail establishments, and information on ERP status is available for 537 of these establishments. As in other WMS surveys, interviews were conducted by phone using open-ended questions using safeguards to preserve firm confidentiality (see Bloom et al. (2014b) for further details). Of the 537 establishments, 352 are in Canada, 126 are in US, and 59 are in UK. Unlike the other WMS surveys, which do not ask about referral programs, the survey enumerators explicitly asked managers about whether the establishment had a referral program. In the data, the share of establishments having an ERP is 25% in Canada, 15% in the US, and 32% in UK. In many cases, respondents explicitly mentioned a bonus, but we currently do not have any data on whether the referral program reflected bonuses.

One reason why the WMS rate of referrals is lower than that in CareerBuilder is that the question is asked at the establishment level. A retail firm may decide that it has an employee referral program in general, but some local managers may choose not to apply it.

### A.2 Additional Discussion on Referral Bonus Levels (Section 2)

We compare the referral bonuses in the RCT to those paid in other studies. The main other existing paper on experimental referral bonuses, Beaman and Magruder (2012), used bonuses of 60-100 rupees, with some component based off of the performance of the referral. Beaman and Magruder (2012) report that 135 rupees is about \$3, and that the average daily wage is about 110 rupees. Thus, they used referral bonuses of half to one day's worth of wage. In our setting, workers could earn up to 40% of monthly salary for making a referral, and we also paid more in expected value terms taking into account the requirement that referrer and referral had to stay 5 months post-referral.[1] In a very different context, Brown et al. (2016) report a modal referral bonus of \$1,000 (median of \$2,000), which is

[1] The referral bonus was paid for 45% of referral hires. Thus, the expected value of value of the bonuses was €37.5, €55.5 and €69 in R50, R90, and R120, respectively. These are equivalent to 13-23% of monthly salary, i.e., up to a week of monthly salary.

about 1% of annual salary at the firm (or 12% of the monthly salary), which is similar to our bonuses in expected value, and lower than the maximum value of our bonuses.[2] Our nominal bonuses are similar in percentage terms to the bonuses at the trucking firm in Burks et al. (2015), where drivers got $1,000 (or about 1/3 of monthly salary) for referring an experienced driver, though there was also a 6-month tenure requirement.

## A.3 Details of the Surveys Used in the Paper (Section 2)

We analyze the following surveys, which we conducted at the study firm:

1. *Pre-RCT Survey of Non-grocery Employees*: In October-November 2015, we surveyed 120 food production workers at the firm regarding how much money would make them willing to make an employee referral for a hypothetical vacancy. These responses were used to choose the bonus levels for the RCT, as noted in Section 2. The response rate was 100%.
2. *During RCT Survey of Grocery Store Managers and Employees*: In September-October 2016, we conducted phone surveys of store managers recording their time use and their opinions regarding why the RCT ERPs were generating only a modest number of referrals. The response rate was 92%. In October-December 2016, we conducted phone surveys of cashiers. For each store, we randomly called two cashiers, one with an above- and the other below-median tenure. All participated. We asked the same broad questions as in the manager survey about why referrals were few. In addition, we asked some (but not all) of the questions from the October-November 2015 employee survey. These surveys are analyzed in the main text in Section 8, with results in Table 8.[3]
3. *Post-RCT Survey of Grocery Store Managers and Employees*: In summer and fall 2018, we conducted phone surveys of store and regional managers regarding the mechanism for the observed indirect impact of ERPs on attrition. In fall 2018, we conducted similar surveys for employees, but via in-store electronic kiosk.[4] These surveys are analyzed in the main text in Section 6.2.3, with results in Table 6.

In all surveys, subjects were told truthfully that we were conducting an international retail survey in partnership with a local university in the country. In addition, subjects were told truthfully that their employer would not see individual-level responses to the survey. All phone surveys were conducted by native speakers recruited from a local university.[5]

[2] The bonuses in Brown et al. (2016) also require people to stay 6 months.

[3] Note that this survey also needed to cover questions on unrelated topics. Thus, we had to be parsimonious in the choice of questions relevant for this study.

[4] The reason why these surveys were not conducted until summer and fall of 2018 is because our study firm CEO had earlier left the firm, as noted in footnote 40 of the main text. However, in summer 2018, we were able to re-engage with top executives at the firm in order to carry out these post-RCT surveys.

[5] Beyond these surveys, we also conducted pre-RCT pen-and-paper surveys of grocery store managers and employees. The response rate was 61% for the grocery store employees and 97% for managers, yielding about 3,000 employee responses and about 230 manager responses. It included questions on social connections within and outside the workplace, as well as attitudes regarding one's managers/supervisors, the firm, and their job. These surveys were useful to us in designing the RCT, but are not used in any analysis.

In addition to these within-firm surveys, we also did phone surveys of randomly picked members of the general public of the country where the study firm operates:

- *General Population Survey 1*: Conducted in early 2017, this survey collected opinions regarding the attractiveness of different occupations and retail firms. This survey is analyzed in the main text in Section 8, with results in Figure 6.
- *General Population Survey 2*: Conducted in August-September of 2018, this survey explained to subjects that a grocery store firm had instituted an ERP, and that few referrals had been made for grocery jobs, whereas many referrals were made for non-grocery jobs. Subjects were then asked why they thought this was. This survey is analyzed in the main text in Section 8, with results in Panel A of Table 8.

Finally, we also ran a vignette survey on US workers that we describe below in Section A.8.

## A.4 Referrers (Section 4)

**Who makes referrals?** For the 88 referrals made during the RCT, there are 75 referrers. That is, most referrers made one referral during the RCT. In the ERP rollout, there are 314 referrals made by 268 referrers, of whom 193 are grocery workers. Broadly consistent with Burks et al. (2015), referrals are more common from workers with lower absence rates. In terms of links between referrer and referrals, the most common one is family member (about 1/3 of referrals in the RCT), followed by friend and acquaintance (about 20% each).

**What stores do referrals come from?** Comparing summary statistics of the stores that make referrals in the RCT versus those that do not, the stores with referrals have more employees, more sales, and more square footage. However, these stores are also the ones which hire more workers. At the individual level, these store characteristics do not much predict whether a particular hire is a referral.

## A.5 Mediation Analysis (Section 6.2.1)

Following Imai et al. (2010a,b), consider the following system:

$$M_{it} = \alpha_0 + \alpha_1 ERP_i + X_{it}\delta_2 + u_{it} \tag{3}$$
$$y_{it} = \beta_0 + \beta_1 ERP_i + \gamma M_{it} + X_{it}\delta_2 + v_{it} \tag{4}$$

Here, $y_{it}$ is an outcome of person $i$ in month $t$ (namely, whether $i$ exits the firm during $t$); $M_{it}$ are the mediator variables, namely whether someone is referred or someone's referrals made to date; $ERP_i$ is a dummy for having an ERP in one's store; $X_{it}$ are controls; and $u_{it}$ and $v_{it}$ are errors. A key goal in the mediation analysis is to estimate $\beta_1$ and $\gamma$. The mediator effect is $\alpha_1 * \gamma$, whereas the non-referral effect of the ERP is $\beta_1$. Imai et al. (2010b) show that OLS produces consistent estimates under Assumption 1 below.

**Assumption 1**

$$y_{it}(e', m), M_{it}(e) \perp\!\!\!\perp ERP_i |\ X_{it} \tag{5}$$
$$y_{it}(e', m) \perp\!\!\!\perp M_{it}(e) |\ X_{it} \tag{6}$$

for any treatment $e, e' \in \{0, 1\}$, for any mediator $m$, and for any controls $X$

where $y_{it}(e', m)$ is the potential outcome for worker $i$ in month $t$ under treatment $e'$; and mediator $m$ and $M_{it}(e)$ is the potential mediator under treatment $e$. Equation (5) of Assumption 1 will hold because of random assignment. Equation (6), i.e., that potential referral status is independent of potential duration conditional on observables, is much less obvious.[6] For example, a person who is likely to be referred under an ERP may have other positive unobservables relative to someone unlikely to be referred. Given past research suggesting that referrals are positively selected (Brown et al., 2016; Burks et al., 2015; Pallais and Sands, 2016), we hypothesize that any bias would be toward biasing upward the estimate of $\gamma$. That is, any bias would seem to work against our conclusion that referrals are not a main driver of the ERP effect, making our qualitative conclusion even stronger.

Table D5 shows results. Columns 1-2 show the impact of having an ERP on being referred and referrals made to date using the full panel data. Columns 3-5 shows the impact of having an ERP as the mediators are gradually controlled for. The coefficient only falls from 0.97 to 0.82. The estimates imply that only 5% of the impact of having an ERP on attrition is mediated via getting more referrals and having more referrals to date, whereas 95% remains unexplained. Column 5 shows that having made referrals so far to date does not significantly predict whether a person will attrite. Column 6 separate referrals made to date into those made in the last 5 months vs. those not made in the last 5 months. For each referral made in the last 5 months, a person is 1.7pp less likely to attrite, consistent with referrers staying a bit longer to get a bonus.

## A.6 Manager Time Use (Section 6.2.2)

During the RCT in fall 2016, store managers were asked about the share of time during the preceding few months that they spent on five time use categories: goods/products, customers, administration, human resources, and employee turnover. We have time use data for store managers in 199 of the 238 stores. To assess whether manager time use was affected by having an ERP, we regressed normalized time use for each category on a dummy for having an ERP. As seen in Table A1, there is no impact of an ERP on time use.

**Table A1:** No Impact of Having an ERP on Normalized Manager Time Use (N=199)

| Time spent on: | Goods | | Customers | | Administration | | HR | | Turnover | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| ERP | -0.10 | -0.10 | -0.18 | -0.13 | 0.19 | 0.20 | 0.08 | 0.08 | -0.08 | -0.12 |
| | (0.17) | (0.16) | (0.19) | (0.20) | (0.16) | (0.17) | (0.16) | (0.17) | (0.19) | (0.18) |
| Store controls | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes |

Notes: Robust standard errors in parentheses. An observation is a store manager. The dependent variable is normalized time use on each of the 5 categories. Store controls are pre-RCT head count, attrition, sales, store square footage, region dummies, in big city dummy, and dummy for having a Lidl store nearby. * significant at 10%; ** significant at 5%; *** significant at 1%

[6] Equation (6) would hold if the mediator were directly randomized (Imai et al., 2010b), but one cannot force someone to be a referral hire or to make referrals. We experimented with estimating Equation (4) while instrumenting the mediator (either whether someone is referred or makes referrals) using the level of the referral bonus. Doing so had little impact on $\beta_1$ compared to OLS, but produced a large standard error for $\gamma$ (despite having a strong first stage). Because of this imprecision with IV, we stick with OLS.

## A.7 Discussion from Practitioners and Sociology (Section 6.2.2)

Our mechanism results, i.e., that having an ERP attrition appears to be due to workers valuing being involved in hiring, is highly consistent with two main points raised by business practitioners. First, practitioners point out specifically that ERPs make workers feel more involved in the hiring process. One recruiting website argues that ERPs "help increase attachment to the organization and make employees feel as though they have a stake in the future of the business. Employees want to grow, so having a hand in the company's forward motion is exactly what they're looking for." Another recruiting website argues that ERPs make "current employees feel trusted and valued since they are participating in the company's future and growth."[7]

Second, separate from ERPs, practitioners point out that involving workers in hiring can be beneficial to firms by increasing feelings of involvement. For example, DeLong and Vijayaraghavan (2002) describe an investment bank that seems to benefit by strongly involving the firm's bankers, from entry-level to senior-level, in hiring.

Turning to sociology, Fernandez and Weinberg (1997) is a study showing that referrals receive special consideration at different stages of the hiring process. In their Discussion section, the authors briefly consider that the desire to involve lower-level employees could be one reason why referrals receive special consideration in hiring (page 899).

## A.8 Vignette Survey of US Workers (Sections 6.2.3, 8, and 10)

The vignette survey of US workers was carried out by the online survey company Pureprofile on our behalf. Participants came from a pool of regular survey takers who have an account with Pureprofile. On average, active members of their pool take around five surveys per month. Most of the surveys are run by commercial companies, but researchers also use online surveys increasingly. The invitation form for the survey was generic and did not mention ERPs. We used respondents between age 18-65.

Table A2 below compares characteristics of survey participants to the 2018 March CPS. Compared to the CPS, participants in the survey are older, whiter, and more educated, but our survey still contains a broad mix of workers of different skills.

**Table A2:** Comparing Survey Participants to the CPS

| | US ERP Survey | CPS |
|---|---|---|
| Female | .51 | .52 |
| Age | 47.08 | 41.28 |
| Black | .08 | .12 |
| Hispanic | .08 | .2 |
| Asian | .05 | .07 |
| Bachelor's or more | .54 | .32 |

Notes: For the CPS, we restrict attention to individuals with age between 18 and 65.

[7] The first quote is from: https://recruiterbox.com/blog/4-reasons-why-an-employee-referral-program-may-be-your-best-recruiting-tool and the second is from https://www.formstack.com/blog/2016/employee-referral-system-benefits.

**ERPs and respect.** As noted with the vignette's full text in Section 6.2.3, the main question in our vignette survey was "Do you think the firm having the employee referral program would make the employee feel more respected?" The survey responses were:

- It is very unlikely to make the worker feel more respected (2.6%).
- It is unlikely to make the worker feel more respected (4.0%).
- It is somewhat unlikely to make the worker feel more respected (4.7%).
- It is uncertain whether it will make the worker feel more respected (20.6%).
- It is somewhat likely to make the worker feel more respected (21.2%).
- It is unlikely to make the worker feel more respected (26.1%).
- It is very likely to make the worker feel more respected (20.8%).

Section 10 reports a comparison of workers with a bachelor's degree or higher versus workers with less than a bachelor's in terms of whether they believe that having an ERP would make an employee feel more respected, defined as a dummy for one of categories 5-7 above. We regress whether an employee would feel more respected on a dummy for having a bachelor's or higher with robust standard errors. Of course, the purpose of this regression is not to establish a causal relation between education and one's answer to the survey.[8] Rather, our point is simply that among higher-skilled workers, the belief that having an ERP affects respect is even a bit stronger than among lower-skilled workers.

**Job quality and referrals.** In addition to the above, we asked the below vignette:

> *Think of your **current main job**. Assume your employer has an **open job** in your department. One of your friends or relatives would probably match the requirements of the job. On a scale from (1) very unlikely to (7) very likely, would you try to **refer your relative/friend** to your employer?*

We combined answers to this question with questions where we asked *How attractive is your current job?* and *How attractive is your current employer?* on a scale from 1-7. As seen in Table A3 below, a $1\sigma$ increase in job attractiveness increases the chance that someone would be willing to make a referral (defined as response 5-7 to the above vignette) by about 20pp. A $1\sigma$ increase in firm attractiveness increases referral willingness by 7-8pp. These results support P5, i.e., that people are willing to make referrals for better jobs.

## A.9 Calculation of the Costs of Turnover (Section 7)

We base our calculations on the following numbers: an average cashier salary of €350 per month, an average store manager salary of €900 per month, and overall average grocery store worker salary of €400 per month.

**Direct costs (administration and training).** Based on conversations with several store managers, we assume it takes about 18 hours of worker time and 20 hours of store manager time to hire a new worker. For store managers, this is based on time spent on interviewing candidates, processing the paperwork of each leaver, re-writing work

[8] Indeed, if one controls for gender, race, and 6 age categories, the coefficient on bachelor's degree or higher falls to 5pp (s.e.=4pp).

**Table A3:** People who Rate their Job or Employer as More Attractive Report Being More Willing to Make a Referral (N=333 workers)

| Dep. Var.: | Would refer (0 or 1) | | Normed willingness to refer | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Job attractiveness (normalized) | 0.211*** | 0.197*** | 0.386*** | 0.341*** |
| | (0.036) | (0.040) | (0.072) | (0.078) |
| Employer attractiveness (normalized) | 0.074** | 0.083** | 0.302*** | 0.337*** |
| | (0.037) | (0.041) | (0.072) | (0.079) |
| Demographic controls | No | Yes | No | Yes |

Notes: Controls cover gender, race, 6 age categories, and 4 education categories. In columns 1 and 2, the DV is 1 if someone chose 5-7 and is 0 if someone chose 1-4 on a scale from (1) very unlikely to (7) very likely. In columns 3 and 4, the DV is the normalized value of the 1-7 score. The question was not asked to people who were unemployed or self-employed.

schedules, communicating with staff regarding turnover events, and training the new workers. For workers, we focus on cashiers who are by far the largest group of grocery worker hires. Each newly hired worker undergoes a two-day (=16 cashier hours) formal training. After this, a mentor (another cashier) also spends two hours with each newly hired worker. Summing up, the cost of this time is about €150.

In addition, the head of HR informed us that there were 23 employees in the HR office whose job is to perform administrative tasks related to hiring and turnover. Inclusive of their monthly salaries, as well as the rent and utility cost of housing their offices, we assume these workers have a total monthly cost of €10,000 per month. This entails about €35 per turnover event. Finally, the firm needs to pay job advertising costs and uniform costs for new workers, which we assume add about €65 per turnover event.

Combining all direct costs together yields roughly €250 per turnover event.

**Total costs.** Beyond administrative costs, turnover also often has consequences in terms of productivity (Blatter et al., 2012; Boushey and Glynn, 2012). Turnover events can be disruptive to incumbent workers' productivity and new workers often require time to get up to full speed. Blatter et al. (2012) study total hiring costs (inclusive of direct costs and lost productivity) for different types of firms and jobs using rich data from Switzerland. For large firms like ours (i.e., for firms with 100+ employees), Blatter et al. (2012) estimate average hiring costs to be 17 weeks of salary. For the job of cashier, the average hiring cost (i.e., across firms of different sizes) is 10 weeks, and they find that hiring costs increase in skill. Because Blatter et al. (2012) do not report hiring costs specifically for cashiers in large firms, we assume an intermediate value. To be conservative, we weight skill as more important than firm size, and assume a hiring cost of 12.5 weeks, which translates into a monetary value of €1,150.[9,10] Since Blatter et al. (2012) do not include costs that turnover

[9]For cashiers, Blatter et al. (2012) estimate that direct recruitment costs comprise 21% of total hiring cost for cashiers. This is very close to the value of €250 that we use.

[10]Rather than making an assumption based on Blatter et al. (2012), an alternative approach we have experimented with is to relate store-level turnover to store-level profits using our data. For example, there is a negative relation between turnover and profit in a regression of store-level monthly profit per worker on store-level monthly turnover, store fixed effects, and time fixed effects. And adding the costs from such an approach with the direct costs, we can arrive at a similar level of profit to the assumed value of €1,150.

may have on the firm's reputation or talent pool, our estimates may be somewhat conservative regarding long-run cost.

## A.10 Profit Calculation Details (Section 7)

**Absences.** We do not account for absence in the profit calculation, as there is no impact of ERP on absence. In addition, the overall absence difference between referrals and non-referrals is not statistically significant.

**Profit gain from incumbents.** We calculate the turnover benefits from pre-RCT incumbents using the residual in total savings in turnover costs after the savings from referral and non-referral hires is taken out. That is:

$$\begin{aligned} \text{Savings from pre-RCT incumbents} &= \text{Total savings in turnover costs} \\ &- \text{Savings from referrals hired in RCT} \\ &- \text{Savings from non-referral hires in RCT} \end{aligned}$$

**Pr(both).** To calculate $Pr(both)$, i.e., the probability that both the referrer and referral stay 5 months, we count up the number of instances where both parties stayed five months divided by the total number of referrals. Our data extend 5 months after the RCT, so we are able to see 5 months of data post-referral for all referrals made during the RCT. We use a single number for $Pr(both)$ as opposed to letting it vary by referral bonus group.

### A.10.1 Firmwide ERP Rollout and Different Jobs

In order to calculate profits under the firmwide ERP rollout starting in January 2017, we need to make some additional assumptions beyond those made in the RCT. This is for two reasons. First, the firm rolled out the new ERP (€30 upon hire, €100 after 3 months) to the entire firm at once and did not randomize. Second, as discussed in the main text in footnote 19, during the rollout (i.e., starting January 2017), we only observe data on who makes referrals, not on who is referred.

**Contribution to turnover savings from referrals hired during the rollout.** These savings are given by $\theta_r^R t_r^R c$, where $\theta_r^R$ is the share of observations from referrals in the rollout and $t_r^R$ is the attrition benefit of referrals relative to non-referrals in the rollout. The superscript "R" is for rollout, whereas the subscript "r" is for referral.

Because we do not observe who is referred in the rollout, we take $\theta_r^R$ to be the share of observations from referrals in the RCT times the ratio of referrals made per hire in the rollout relative to the RCT.

Since we do not have experimental variation in the rollout ERP, we make an assumption about $t_r^R$ using rough extrapolation of the RCT results. In the RCT, the difference between referral and non-referral attrition decreases as the size of the bonus increases in Table 4. Given that R120 has a referral/non-referral attrition difference of roughly 6pp per month, for a higher bonus of €30 + €100, we assume $t_r^R = 5$pp per month.

**Total savings in turnover costs from rollout.** During the RCT, the overall impact of the ERP on employee turnover did not systematically vary with the level of the referral bonus, as can be seen in the odd columns of Table 5. Thus, for the profit calculations, we assume that total turnover savings from the rollout ERP is the same as total turnover savings from the RCT ERPs, plus the incremental benefit of turnover savings from referrals hired during the rollout relative to during the RCT.[11]

**Different jobs.** To calculate overall turnover benefits of the RCT ERP separately by job, we perform our main turnover regression separately by job. The overall turnover benefits during the rollout is assumed the same as during the RCT, plus incremental benefits from referral hires. The turnover savings from referrals are scaled using referrals per hire. The attrition difference between referrals and non-referrals is given by the data during the RCT and is assumed to be 5pp per month in the rollout.

## A.11 Further Discussion on the Reasons for Few Referrals Other than Job Attractiveness (Section 8)

**Were employees unaware of the ERPs?** The firm took many steps to ensure that the ERPs would be well-understood and well-publicized to workers. This included the letters and posters described in Section 2, plus phone calls to ensure that store managers publicized the ERPs, plus guidance to regional managers to ensure that store managers were compliant. Also, in the fall 2016 survey, we asked workers if they were aware that the firm welcomed referrals, and 87% said yes in treatment stores. This indicates persistent awareness of the ERPs even though many workers attrited during the RCT. Further, in Panel B of Table 8, the explanation of employees not being aware of the ERP / not knowing how it worked shows quite limited support. A related issue would be if people forgot about the ERPs after a few months. In such a scenario, some referrals would be made after the ERPs were introduced, but effects would peter out over time. However, Figure 3 shows that this is not the case.

**Did workers not have friends looking for jobs?** If employees do not have friends to refer, then an ERP may have little impact on referrals. However, we believe that this explanation is unlikely to explain our results for three reasons. First, during 2016, the unemployment rate was roughly 8% (and much higher for youth who make up a sizable share of the firm's workforce), so there was a significant share of people who were unemployed. Second, in the *During RCT Surveys of Store Managers and Employees* listed in Table 8, not having friends to refer received much less support than grocery jobs being undesirable as an explanation for the result. For example, while 48% of managers mentioned grocery jobs being undesirable as an explanation, only 10% mentioned employees not having friends to refer. Third, the firm has operations throughout the country where it is located, in both urban and rural areas. Even if someone had moved or had social contacts living elsewhere in the country, those social contacts could have found a job at a local facility.

**Was the referral process difficult?** Store employees could have perceived it as burdensome to call the HR department to register a referral. We do not think this is a

[11]That is, $t^R c = tc + \left(\theta_r^R t_r^R c - \theta_r t_r c\right)$, where $t^R$ is the impact of the rollout ERP on turnover relative to no ERP; $t$ is the impact of the RCT ERP on turnover; $\theta_r$ is the share of observations from referrals in the RCT; and $t_r$ is the difference in attrition between referrals and non-referrals during the RCT.

strong explanation because the process was designed to be very brief (just a few questions about how someone knows their referral). The store have relatively low opportunity cost of time, given that they are willing to work for just over €2 per hour. Given the possibility of earning €135 in one treatment arm, it seems unlikely that a short phone call would be of sufficient cost to dissuade someone from making a referral.[12]

**Was the expected value of the bonus too low?** Given the five-month tenure requirement for a referral to be paid, would this make the expected value of the bonus too low? In our data, the chance that both referral and referrer stay for five months after the referral is hired is about 45%. This means that the bonus is worth $15 + .45 * 50$=€37.5 in the R50 treatment, €55.5 in R90, and €69 in R120. Relative to a post-tax monthly wage of roughly €300 for cashiers, this still is a sizable bonus (about 13-23% of monthly salary). Though our judgment of what is a "sizable bonus" may be subjective, the literature on incentives shows strong effects of bonuses of this magnitude.

After the RCT, the rollout ERP paid €30 at hire, plus €100 after 3 months. Since about 60% of referrals during the RCT would have lead to payments, the expected value of the new bonus was €90. This is even larger than R120, and also provides the money sooner.

# Appendix B Theory Appendix

## B.1 Solving the Model

**Prediction 1.** *Higher referral bonuses will increase referrals.*

Given the firm launches an ERP program with the bonus value $\widetilde{b}$, the employee utility functions will be as follows:

$$U^I(R = 1) = (1-\sigma)b + \sigma(m+q) + B(\sigma) \tag{7}$$

$$U^I(R = 0) = B(\sigma) = B(\sigma) \tag{8}$$

Thus, the probability, $r$, that the employee will refer their friend is equal to:

$$r = Pr(U^I(R=1) > U^I(R=0)) = Pr((1-\sigma)b + \sigma(m+q) > 0) = 1 - F(m^*),$$

where $m^* = -\frac{1-\sigma}{\sigma}b - q$. To analyze how bonuses affect the share of referral made, we have:

$$\frac{\partial r}{\partial b} = f(m^*) \cdot \frac{1-\sigma}{\sigma}$$

which is positive.

**Prediction 2.** *Referrals will be of higher quality than non-referrals. However, as referral bonuses increase, the quality of referrals decreases.*

The average match quality of a referred worker is equal to $H^r \equiv E[m|m > m^*]$, whereas the average match quality of a non-referred worker is $E[m]$. Thus, $H^r \geq E[m]$ for

[12] Of course, if people are highly present-biased (e.g., Madrian and Shea, 2001), this could help explain why they are not willing to make referrals. We cannot rule this out, but it seems unlikely in our case.

any $m^*$ in support of $F(\cdot)$. Because $\frac{\partial m^*}{\partial b} = -\frac{1-\sigma}{\sigma} < 0$, we have $\frac{\partial H^r}{\partial b} < 0$. Intuitively, as $b$ increases, $E$ is willing to refer someone who is less suitable for the job, and average referral quality decreases.

**Prediction 3.** *Having an ERP increases retention. This should occur even in store where no referrals are made.*

We separately consider the retention of incumbent and new workers. As a result of having an ERP, the incumbent worker believes the firm believes that $\Sigma = \sigma$. Thus, they become more likely to stay. This occurs even in stores where no referrals are made because the mechanism involves respect, not referrals. Specifically, the probability of an incumbent worker staying is $G(B(\hat{\Sigma}))$, which is increasing in $\hat{\Sigma}$. Turning to the new worker, no referrals occur without an ERP, and an ERP generates positive referrals because $m$ is continuous. Thus, since referrals are of higher than non-referrals (Proposition 2), having an ERP increases retention among the new worker. Since workers are either an incumbent or a new worker, overall retention increases.

**Prediction 4.** *As long as the referral bonus is not too large, having an ERP increases firm profits. The relationship between referral bonuses and firm profits from hiring referrals (vs. hiring non-referrals) is ambiguous.*

We begin with proving the second sentence first. In the Prediction 3, we have shown that an ERP increases retention, thus it has positive indirect effect on the firm's profit. The direct effect is positive, $H^r - \widetilde{b} > E[m]$, as long as the referral bonus, $\widetilde{b}$ is sufficiently small. To analyze how the size of the referral bonus affects profits from referrals we have:

$$\frac{\partial \pi}{\partial \widetilde{b}} = \frac{\partial r}{\partial \widetilde{b}} \left( H^r - \widetilde{b} - E[m] \right) + r \left( \frac{\partial H^r}{\partial \widetilde{b}} - 1 \right), \tag{9}$$

where the first term is positive (provided $\widetilde{b}$ is relatively small), and the second term is negative.

Now consider the overall impact of an ERP on firm profits. That is, compare $r\big(E[m|m > m^*] - \widetilde{b}\big) + (1-r)E[m] - c(1-G(\sigma))$ with $E(m) - c(1-G(0))$. Here, $c(1-G(\sigma)) < c(1-G(0))$ and $r\big(E[m|m > m^*] - \widetilde{b}\big) + (1-r)E[m] > E[m]$ provided that $\widetilde{b}$ is sufficiently small. Therefore, having an ERP increases firm profits.

**Prediction 5.** *More referrals will be made for attractive jobs than for less attractive jobs. Suppose that $f'(m^*) < 0$, which occurs if referrals are few. Then, the more attractive the job, the more responsive are referrals to bonuses.*

To analyze the relevance of job attractiveness for the decision to refer, note that $\frac{\partial r}{\partial q} = f(m^*)$, which is positive because people value their friends and to refer them for better jobs. To see how job quality affects the responsiveness of referrals to bonuses, note that $\frac{\partial^2 r}{\partial b \partial q} = -f'(m^*)\frac{1-\sigma}{\sigma}$. Thus, if $f'(m^*) < 0$, then $sgn\big(\frac{\partial^2 r}{\partial b \partial q}\big) = -sgn(f') = +$. This seems likely to hold if only a minority of workers make referrals.[13]

[13] E.g., if $m$ has a normal (or log-normal) distribution, if the quality cutoff $m^*$ is above the argmax of $f$, then $f' < 0$.

## B.2 Discussion of Model Assumptions

The model simplifies many aspects of reality. This subsection discusses our model assumptions.

**The referral bonus is paid upon hire.** In reality, the referral bonus is only paid partially upon hire, with most of the bonus paid only if the referrer and referral stay five months. If this encourages both parties to stay, this will only further accentuate the prediction that referrals stay longer, as well as that incumbent workers stay longer under ERPs. The model also is static, whereas reality is dynamic. Thus, $m$ should be interpreted as outcomes over time at the firm instead of outcomes at one time. Thus, referral and non-referral hires also become incumbents capable of making referrals, so our predictions on the retention of incumbents actually cover the retention of all workers.

**The incumbent has social preferences toward their friend, not toward the firm.** We assume that the incumbent worker only has potential social preferences toward their friend, not toward the firm. If the worker had potential social preferences toward the firm, all predictions of the mode would be the same. The key feature of the model is that having an ERP involves delegating the hiring decision to the incumbent worker, and doing so is only valuable if the worker cares about the match quality of a referred worker. The incumbent worker may do so because they care about their friend (and the firm also happens to benefit from higher match quality) or because they directly care about the firm. In our model, the firm also has zero outside information outside of potential referrals.[14] Also, while we assume that the friend and firm equally benefit from match quality for simplicity, this assumption is not required.

**The level of the referral bonus and respect.** We assume that a worker's true social preferences can only take two values, and we do not analyze the worker updating their sense of respect in reflection of the particular value of $\widetilde{b}$. If worker social preferences can take many values, then choosing higher values of $\widetilde{b}$ could communicate that the firm has a particularly high belief about the value of altruism for a worker. On the other hand, outside our model, choosing a very high value of $\widetilde{b}$ could communicate other messages, such as that making referrals is an unpleasant task (Benabou and Tirole, 2003). Thus, because of these competing effects, we set this aspect aside. One can also examine empirically whether larger referral bonuses tend to have larger impacts on incumbent workers. Conditional on having a referral bonus, we do not observe a clear relation between the level of the bonus and incumbent retention effect.

**Worker's perception of firm belief updating.** The incumbent worker believes that the firm initially believes that the worker has $\Sigma = 0$ for sure. After seeing the ERP, the incumbent worker recognizes that the firm would not have the ERP unless the firm recognized that $\Sigma = \sigma$. Such belief updating is not consistent with Bayes' Rule, since a Bayesian will never update if they believe that the initial value of some event occurring is 0. This assumption is made entirely for simplicity of the model. One could alternatively assume that the worker believes that the firm believes that the worker has $\Sigma = \sigma$ with a

[14] Because of this, the decision to fully delegate hiring to incumbent workers via referrals is a prediction of the model, not an assumption.

50% probability, and that seeing the ERP leads the worker to update to believe that the firm believes that $\Sigma = \sigma$ for sure.

# Appendix C Data Appendix

**Referrals data.** Beyond the 88 referrals reported in Section 4, there is also one additional referral made that we cannot match to other records. Store managers were not eligible to participate in the ERP, as they have general authority over hiring decisions. Our analysis on the overall attrition impacts of ERPs includes store managers, but results are similar if store managers are excluded.

**Age.** Although we find a significant difference between referral and non-referral hires in age, we do not control for age in our main regressions. Date of birth is only available at the time of hire or attrition (and is not available in monthly payroll records), causing age to be missing for workers joining the firm before 2014 who never attrite. This causes age to be missing in a fashion that is correlated with attrition (i.e., people with missing age are more likely to never attrite). However, results are robust if we control for age while restrict attention to individuals hired during our data (who thus consistently have age data). Age is missing for 24 workers hired during the RCT.

**Gender.** When worker gender is missing, we impute it based on name by using gender-specific endings that exist in the language of the country where our firm is based. After imputation, gender is missing for one grocery worker hired during the RCT.

**Race.** The firm's personnel data do no contain variables for race or nationality, as racial/ethnic heterogeneity is very limited in the country we study.

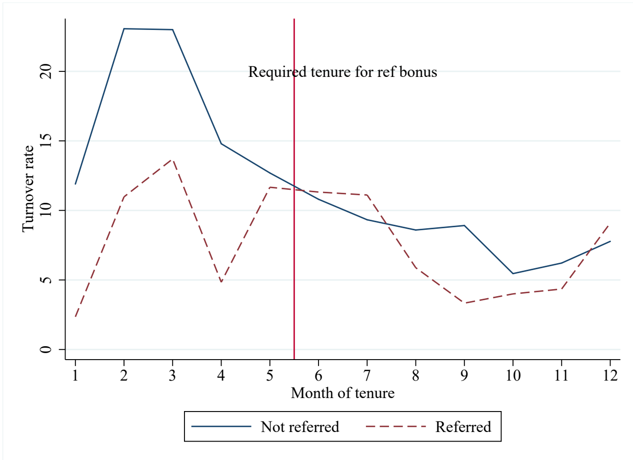
**Attrition codes.** Employees receive up to 4 attrition codes, which are assigned by the store manager. We classify someone as "fired" if any of the 4 codes indicate a termination for cause. Exit codes are missing for many workers exiting before 2015m4. In contrast, starting in 2015m4 and after, exit codes are missing for less than 4% of terminations. Thus, we restrict our analysis of quits and fires to 2015m4 and after.

**Multiple spells.** Some workers in our data have multiple spells, where they return to working at the firm after a break in the record. In our population of workers, it is not uncommon to take breaks in employment. When a worker has multiple spells, we only count the final attrition event, and not the earlier ones. In addition, if a worker has a date of hire which is more recent than the current date, we assign the date of hire to that worker's earliest date on record. Our results are similar if we instead consider only the most recent spell.[15] For referrals made in the RCT, we impose that referral spells be counted so as to not exclude referrals, for reasons of statistical precision. That is, for a small number of people who are hired as a referral despite having an earlier spell, we count those as separate spells. Results are similar if we do not do this.

[15] That is, the results are similar if we do not assign hire dates to the earliest date on record, and instead merely drop observations which have negative tenure.

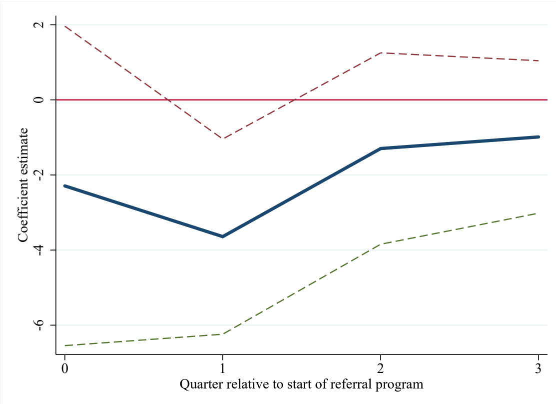
# Appendix D Additional Figures and Tables

**Figure D1:** Attrition Hazard for Referrals vs. Non-referrals

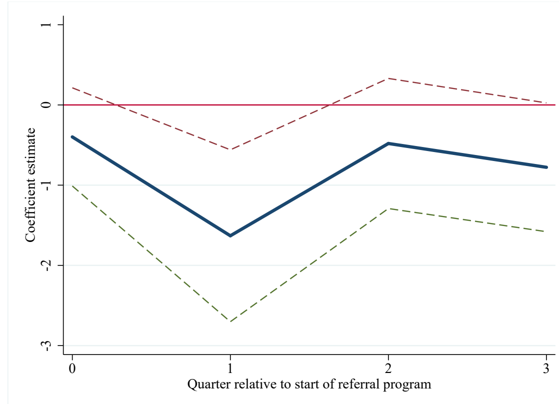



Notes: This figure shows the monthly quiz hazard as a function of worker tenure comparing referred vs. non-referred workers. The sample is grocery workers hired during the RCT. The referral and referrer must stay 5 months after the referral is hired in order for the referrer to be paid. The vertical tenure threshold line is drawn in between x=5 and x=6 because both referral and referrer must stay at least 5 months.

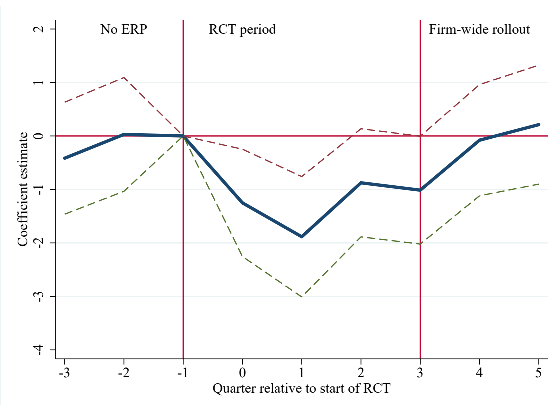
**Figure D2:** Event Studies on Impact of ERPs: Additional Subsamples and Outcomes



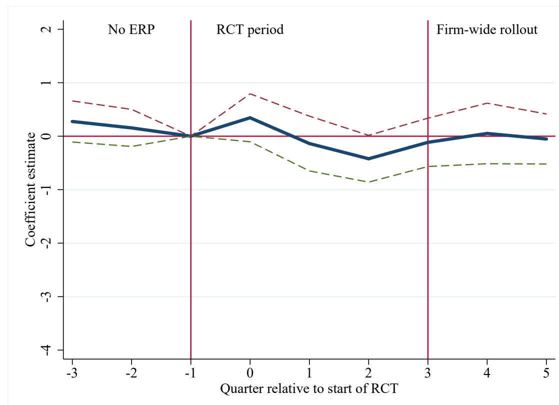

(a) Sample is New Hires During RCT




(b) Sample is Incumbents During RCT




(c) Outcome is Voluntary Exits ("Quits")




(d) Outcome is Involuntary Exits ("Fires")

Notes: These figures are similar to the main event study in panel (a) of Figure 5. The difference is they analyze different samples or look at different individual outcomes (other than overall attrition). Panel (a) analyzes grocery workers hired during the RCT, whereas panel (b) analyzes grocery workers who were incumbents at the firm when the RCT began (i.e., they had been hired in the past). For both panel (a) and panel (b), it is not possible for the event study to go before the RCT because RCT hires and RCT incumbents do not attrite prior to the start of the RCT. Panel (c) analyzes voluntary attrition as the outcome variable, whereas panel (d) analyzes involuntary attrition. In panels (c) and (d), there are only 3 quarters graphed before the RCT because information on exit codes only begins in 2015m4.

**Table D1:** Robustness Check on Comparing Referrals vs. Non-referrals: Further Controls

| Dep. var.: | Attrition (0-1) x 100 | | | Monthly absences | | |
|---|---|---|---|---|---|---|
| Method: | Linear Probability Model | | | Negative Binomial | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Hire was referred | -7.55*** | | | -0.11 | | |
| | (1.24) | | | (0.29) | | |
| Referred X first 5m | | -9.17*** | | | -0.37 | |
| | | (1.59) | | | (0.34) | |
| Referred X after 5m | | -3.73* | | | 0.38 | |
| | | (1.95) | | | (0.64) | |
| Referred X R50 | | | -11.97*** | | | 0.51 |
| | | | (1.96) | | | (0.58) |
| Referred X R90 | | | -6.51*** | | | -0.13 |
| | | | (2.19) | | | (0.70) |
| Referred X R120 | | | -7.18*** | | | -0.34 |
| | | | (1.89) | | | (0.35) |
| Observations | 14,879 | 14,879 | 14,879 | 14,879 | 14,879 | 14,879 |
| MDV if referred=0 | 15.91 | | 15.91 | 1.362 | | 1.362 |
| Workers | 3796 | | 3796 | 3796 | | 3796 |
| MDV in first 5m if ref=0 | | 17.75 | | | 1.152 | |
| MDV after first 5m if ref=0 | | 9.100 | | | 2.143 | |
| F(R50 vs. R90) | | | 0.07 | | | 0.49 |
| F(R50 vs. R120) | | | 0.08 | | | 0.20 |

Notes: This table is similar to Table 4. The difference is we additionally control for store fixed effects. Because we control for store fixed effects, we no longer control for pre-RCT means of store-level variables.
* significant at 10%; ** significant at 5%; *** significant at 1%

**Table D2:** The Impact of the ERPs on Monthly Absence

| Type of workers: | All | All | All | All | Hires | Hires | Inc | Inc |
|---|---|---|---|---|---|---|---|---|
| Sample period: | RCT | RCT | Pre &RCT | Pre &RCT | RCT | RCT | RCT | RCT |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| R0 | -0.04 | | | | -0.01 | | -0.03 | |
| | (0.10) | | | | (0.16) | | (0.11) | |
| R50 | -0.04 | | | | -0.17 | | 0.02 | |
| | (0.11) | | | | (0.17) | | (0.13) | |
| R90 | 0.04 | | | | -0.05 | | 0.07 | |
| | (0.11) | | | | (0.17) | | (0.11) | |
| R120 | 0.07 | | | | 0.01 | | 0.07 | |
| | (0.11) | | | | (0.16) | | (0.12) | |
| ERP | | 0.01 | | | | -0.05 | | 0.04 |
| | | (0.09) | | | | (0.14) | | (0.09) |
| R0 X RCT | | | -0.19* | | | | | |
| | | | (0.10) | | | | | |
| R50 X RCT | | | -0.03 | | | | | |
| | | | (0.11) | | | | | |
| R90 X RCT | | | 0.05 | | | | | |
| | | | (0.10) | | | | | |
| R120 X RCT | | | -0.15 | | | | | |
| | | | (0.11) | | | | | |
| ERP X RCT | | | | -0.08 | | | | |
| | | | | (0.08) | | | | |
| Store FE | No | No | Yes | Yes | No | No | No | No |
| Observations | 74,188 | 74,188 | 203,798 | 203,798 | 14,879 | 14,879 | 55,953 | 55,953 |
| MDV if ERP=0 | 1.452 | 1.452 | 1.288 | 1.288 | 1.329 | 1.329 | 1.492 | 1.492 |
| Workers | 10,003 | 10,003 | 16,942 | 16,942 | 3,796 | 3,796 | 5,870 | 5,870 |

Notes: This table is similar to Table 5 except the outcome is monthly absences and the specifications are negative binomial instead of OLS. To ensure the likelihood converges, for the year-month of hire dummies, month-years of hire at or before 2002m1 are lumped together. * significant at 10%; ** significant at 5%; *** significant at 1%

**Table D3:** Impact of having an ERP on Store-level Outcomes

| Dep. var.: | Log hours | Log shrinkage rate | Log sales per worker | Log operational profits per worker |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| ERP | -0.012 | -0.025 | 0.020 | 0.020 |
| | (0.015) | (0.024) | (0.015) | (0.021) |
| Observations | 3,017 | 2,993 | 2,993 | 2,989 |
| Mean dep. var. | 7.886 | -3.793 | 9.109 | 7.530 |

Notes: Standard errors clustered at the store level. An observation is a store-month. All columns include the controls listed in footnote 20, plus region dummies, year-month dummies, and pre-RCT store-level mean of the dependent variable. The shrinkage rate is shrinkage divided by net sales. Operational profits per worker are store-level net sales minus cost of goods minus wages minus overheads * significant at 10%; ** significant at 5%; *** significant at 1%

**Table D4:** The Impact of the ERPs on Attrition: Restrict to Stores with No Referrals Made during the RCT

| Type of workers: | All | All | All | All | Hires | Hires | Inc | Inc |
|---|---|---|---|---|---|---|---|---|
| Sample period: | RCT | RCT | Pre &RCT | Pre &RCT | RCT | RCT | RCT | RCT |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| R0 | -1.01** | | | | -1.07 | | -1.05*** | |
| | (0.39) | | | | (1.13) | | (0.34) | |
| R50 | -0.54 | | | | -1.08 | | -0.47 | |
| | (0.51) | | | | (1.54) | | (0.44) | |
| R90 | -1.62*** | | | | -3.13** | | -1.29*** | |
| | (0.42) | | | | (1.39) | | (0.37) | |
| R120 | -1.00** | | | | -3.29** | | -0.49 | |
| | (0.47) | | | | (1.40) | | (0.41) | |
| ERP | | -1.02*** | | | | -1.93* | | -0.85*** |
| | | (0.35) | | | | (1.05) | | (0.29) |
| R0 X RCT | | | -0.93** | | | | | |
| | | | (0.47) | | | | | |
| R50 X RCT | | | -1.16** | | | | | |
| | | | (0.55) | | | | | |
| R90 X RCT | | | -1.79*** | | | | | |
| | | | (0.43) | | | | | |
| R120 X RCT | | | -1.10** | | | | | |
| | | | (0.48) | | | | | |
| ERP X RCT | | | | -1.21*** | | | | |
| | | | | (0.39) | | | | |
| Store FE | No | No | Yes | Yes | No | No | No | No |
| Observations | 59,677 | 59,677 | 164,860 | 164,860 | 11,536 | 11,536 | 45,490 | 45,490 |
| MDV if ERP=0 | 6.677 | 6.677 | 5.434 | 5.434 | 17.24 | 17.24 | 4.362 | 4.362 |
| Workers | 8034 | 8034 | 13725 | 13725 | 2964 | 2964 | 4800 | 4800 |

Notes: This table is similar to Table 5 except we restrict attention to workers in stores where no referrals are ever made during the RCT. * significant at 10%; ** significant at 5%; *** significant at 1%

Table D5: Mediation Analysis for Impact of ERPs on Attrition

| Dep. Var.: | Referred (0-1) | Refs made to date | Attrition (0-1) x 100 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| ERP | 0.007*** | 0.009*** | -0.97*** | -0.93*** | -0.92*** | -0.92*** | | | |
| | (0.002) | (0.002) | (0.34) | (0.34) | (0.34) | (0.34) | | | |
| Hire was referred | | | | -6.36*** | -6.35*** | -6.33*** | | -6.33*** | -6.33*** |
| | | | | (1.34) | (1.33) | (1.33) | | (1.35) | (1.35) |
| Refs made to date | | | | | -0.54 | | | | -0.51 |
| | | | | | (0.85) | | | | (0.87) |
| Refs made in last 5m | | | | | | -1.74* | | | |
| | | | | | | (0.92) | | | |
| Refs made not in last 5m | | | | | | 1.76 | | | |
| | | | | | | (1.71) | | | |
| R0 | | | | | | | -1.00** | -1.00** | -1.00** |
| | | | | | | | (0.40) | (0.40) | (0.40) |
| R50 | | | | | | | -0.47 | -0.42 | -0.42 |
| | | | | | | | (0.45) | (0.45) | (0.45) |
| R90 | | | | | | | -1.59*** | -1.52*** | -1.51*** |
| | | | | | | | (0.38) | (0.39) | (0.39) |
| R120 | | | | | | | -0.81* | -0.74* | -0.74* |
| | | | | | | | (0.42) | (0.42) | (0.42) |
| Observations | 74,188 | 74,188 | 74,188 | 74,188 | 74,188 | 74,188 | 74,188 | 74,188 | 74,188 |
| MDV if ERP=0 | 4.8e-4 | 0 | 6.677 | 6.677 | 6.677 | 6.677 | 6.677 | 6.677 | 6.677 |
| Workers | 10,003 | 10,003 | 10,003 | 10,003 | 10,003 | 10,003 | 10,003 | 10,003 | 10,003 |

Notes: Standard errors clustered at the store level. All columns show OLS models. The controls are the same as in Table 5. The sample is workers at the firm during the RCT. "Refs made to date" means a person's running sum of referrals made to date during the RCT. "Refs made in last 5m" is a person's running sum of referrals during the last 5 months. "Refs made not in last 5m" is a person's running of sum of referrals made during the RCT while excluding referrals made during the previous 5 months. * significant at 10%; ** significant at 5%; *** significant at 1%

**Table D6:** Demographic Homophily

| | (1) Age | (2) Female |
|---|---|---|
| Age of referrer | 0.45*** | |
| | (0.12) | |
| Referrer is female | | 0.36** |
| | | (0.14) |
| Observations | 60 | 84 |
| Mean dep. var. | 27.71 | 0.774 |

Notes: There are fewer observations in column 1 because referrers are missing age if they were hired before the start of the data and do not attrite during the data. We control for month of hire and whether someone is a cashier.

# Appendix E Documents Used in the RCT and in the Firmwide ERP Rollout

We first present the letters given to workers in the RCT. These are followed by Figure E1, which shows the posters that were used in the 2017 firmwide ERP rollout.

[FIRM logo]

*Dear Employee,*

Over the last couple of years, FIRM has dedicated a lot of its attention and resources to ensuring the quality of its products and services, as well as investing in the development and renovation of its stores. We believe that we are on the right path to becoming one of the best and most appealing grocery stores in COUNTRY!

In order to become a market leader, we continuously seek out the best employees, who can become permanent members of our large team. Right now, we also invite you to join our recruitment process and to recommend a friend, a relative, or an acquaintance for a job at one of our FIRM stores.

**How can I recommend my friend, relative, or acquaintance?**

1. Find a candidate who, in your opinion, would fit a vacant position in your or any other stores in which we are looking for employees (information on new positions available will be provided by your store manager).
2. Call and register* your recommended candidate.
   *register by calling us at XXX (YYY, regional human resources manager)
3. Send your recommended candidate to a store where positions are available.

We believe that together with your help we can find professional employees and create a friendly work environment for every one of you!

Best wishes,
[FIRM logo]

Notes: This is a translated and redacted version of the letter employees received in the R0 group during the RCT.

[FIRM logo]

*Dear Employee,*

Over the last couple of years, FIRM has dedicated a lot of its attention and resources to ensuring the quality of its products and services, as well as investing in the development and renovation of its stores. We believe that we are on the right path to becoming one of the best and most appealing grocery stores in COUNTRY!

In order to become a market leader, we continuously seek out the best employees, who can become permanent members of our large team. Right now, we also invite you to join our recruitment process and to recommend a friend, a relative, or an acquaintance for a job at one of our FIRM stores. If they get hired, the person who recommended them (you) will receive a **bonus!**

**How can I recommend my friend, relative, or acquaintance?**

1. Find a candidate who, in your opinion, would be suitable for a vacant position in your or any other stores in which we are looking for employees (information on new positions available will be provided by your store manager).
2. Call and register* your recommended candidate.
   *register by calling us at XXX (YYY, regional human resources manager)
3. Send your recommended candidate to a store where positions are available.
4. **If your recommended candidate:**
   - Fits the requirements of a position
   - Is hired and stays in employment for at least 5 months

**We will award you a bonus €ABC!** (after tax)

**IMPORTANT!**

- The bonus is awarded after taxes are deducted. A part of this bonus – **€**15 – you will receive after your candidate gets hired (included in your next month's salary), while the rest of this bonus will be given 5 months after you and your recommended employee have worked through that period (5 months) at our company.
- Please be aware that the whole bonus will be paid out only if your recommended candidate is hired and only after they have completed 5 months of employment at our company.
- The bonus and its payouts will be organized directly by the Human Resources department; therefore, it is very important to call and register your candidate before you send them to a store.

We believe that together with your help we can find professional employees and create a friendly work environment for every one of you!

Best wishes,
[FIRM logo]

Notes: This is a translated and redacted version of the letter employees received in the R50, R90, and R120 groups during the RCT. The amount ABC was 50, 90, or 120 euros depending on treatment.

**Figure E1:** Posters Used during the 2017 Firmwide ERP Rollout


Notes: This is a translated and version of the posters during the 2017 firmwide ERP rollout (with identifying firm information redacted). From left to right, the posters are for grocery store workers, logistics workers, and food production workers, respectively. Except for the different pictures, the posters are the same.

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