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ARTICLE

Rebranding ex-convicts

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We develop a theoretical model explaining how the problem of poor labor market outcomes for ex-convicts might be alleviated by an external intervention. While employers wish to avoid associating with those who will end up returning to crime, they cannot be certain from the available information which convicts will reoffend and which will not. We illustrate that, notwithstanding this informational asymmetry, a government (or a civic society) can nevertheless design a costly, yet net socially beneficial program through which some ex-convicts can credibly convey their good intentions to employers. Such a "rebranding" program can help more ex-convicts find legitimate work, with fewer electing to return to crime than would otherwise have been the case.

1 | INTRODUCTION

Surveys of employers show that the stigma of a criminal record is substantial for ex-convicts seeking employment (e.g., Holzer, Raphael, & Stoll, 2006; Pager, 2007). Recent studies of ex-convict populations report that roughly half remain jobless up to a year after their release (e.g., Visher, Debus-Sherrill, & Yahner, 2011). Convicts thereby become discouraged in their search for work or avoid formal employment opportunities preemptively (Travis, 2005). According to a study by the Bureau of Justice Statistics in the United States, the rate of recidivism is significant: within three years of release, about two-thirds of released prisoners are rearrested (Durose, Cooper, & Snyder, 2014) and 4 out of 10 are reincarcerated (Pew Center on the States, 2011).[1]

We develop a theoretical model explaining how this problem of poor labor market outcomes for ex-convicts might be alleviated to some degree. This model draws on the basic idea of an equilibrium with self-confirming beliefs in the presence of asymmetric information (e.g., Arrow, 1973; Coate & Loury, 1993; Fang, 2001). We focus on what we take to be an essential feature of the labor market for ex-convicts, namely, the idea that employers wish to avoid associating with those who will end up returning to crime, but employers cannot be certain from the available information which convicts will reoffend and which will not. However, the convicts themselves are presumed to know their own intentions. Hence, our theoretical model focuses on this asymmetric information as well as on the attendant issues of *adverse selection* in this market.

Our main objective by introducing this model is to illustrate that, notwithstanding this informational asymmetry, a government (or a civic society) can nevertheless design a costly, yet net socially beneficial program through which

[1] Refer to National Research Council (2014) for a comprehensive study of incarceration in the United States and Loury (2008) for the social problems originating from the poor labor market outcomes for ex-convicts.

some ex-convicts can credibly convey their good intentions to employers. Such a program can help more ex-convicts find legitimate work, with fewer electing to return to crime than would otherwise have been the case.

Our approach to the adverse selection issue differs significantly from Spence's (1973) signaling theory. In his well-known model, the assumption that an individual's productivity is negatively correlated with his or her program participation (e.g., education) cost plays a critical role in deriving the labor market equilibria that solve the problem of adverse selection. In our signaling model, however, the program participation cost need not be correlated with one's value of a criminal activity. We show that for any fixed participation cost within a limited range, there exists an equilibrium that relieves employers' adverse selection problem. Importantly, this model has a potential to apply much more broadly than to the labor market for convicted felons. One example is discussed at the end of this paper.

The reminder of this paper is structured as follows. Section 2 introduces the basic framework of the model. Section 3 describes the labor market condition for ex-convicts and the possible labor market collapse. Section 4 proposes a costly but socially valuable "rebranding" program for the ex-convicts. Section 5 follows with a discussion of the welfare properties of the program. Section 6 discusses its implementation and presents the concluding remarks.

2 | BASIC FRAMEWORK

The key factor in this setup is the notion that, in a rational and self-interested manner, ex-convicts make choices about their future participation in criminal activities. Specifically, we imagine that newly released convicts choose to go straight and become law-abiding if and only if the perceived benefits from doing so exceed the costs. To keep things simple, we assume that the costs of going straight for any individual ex-convict are exogenous, which are the forgone gains from possible criminal participation in the future. However, in our model, the benefits from going straight are endogenous; in other words, they are not specified *a priori* but rather determined by the workings of the model itself. Specifically, these benefits will be reckoned in terms of the enhanced remuneration from legitimate work implied by an ex-convict's choice to go straight, as explained concretely below.

We take it that employers, when faced with an ex-convict job applicant, cannot know whether this particular individual is one who is determined to discontinue engaging in criminal acts. We capture this employer uncertainty in two steps. First, we posit that employers know the proportion of the overall convict population who will go straight.[2] We denote this aggregate belief of employers about the proportion of all ex-convicts who elect to go straight by π.

Second, we assume that when faced with a particular applicant drawn from the overall ex-convict population, employers have available to them some noisy idiosyncratic information about that individual that is relevant to assessing his or her future behavior, without being determinative of it. We model this idea by supposing that employers can see the result of a so-called "pass/fail test."[3] Our simple idea is that an ex-convict who is willing to commit crime in the future is more likely to "fail" than to "pass" such a test, while an ex-convict going straight is more likely to "pass."

For the sake of simplicity, we assume that the labor productivity of an ex-convict going straight is ω and the expected net productivity of an ex-convict who is possibly involved in a future criminal activity is zero. When confronted with a particular job applicant, we take it that employers make a wage offer to prospective ex-convict workers based on a test-inclusive assessment of the likelihood that this individual will go straight. Intuitively, the more confident is an employer that a worker is going straight, the higher will be the offered wage. This means that "passers" will receive more favorable terms for legitimate employment than will "failers."

Finally, we close our model by noting that since employers' wage offers to prospective ex-convict employees depend on whether an applicant "passes" or "fails" the employers' test, and since the likelihood of passing increases if an ex-convict elects to go straight, the employers' wage offers thereby imply that an expected benefits for ex-convicts—in terms of enhanced legitimate earnings—is associated with their making that decision. This anticipated gain of expected remuneration from legitimate work determines the incentive that ex-convicts have to go straight.

[2] This kind of information about the overall market might be gathered, for instance, from publicly available statistical reports and research studies.

[3] You can think of this "test" as including the results of an interview, review of an individual's public records, or assessment of the parole officer's report.

The following describes the relevant notations. The present value of possible criminal participation for an ex-convict in the future (hereafter "crime value") is denoted by c and the proportion of the ex-convict population with a crime value no greater than c is denoted by $G(c)$. We assume that ex-convicts' value of crime is uniformly distributed on the interval $[0, 2\mu]$: $G(c) = \text{Min}\{\frac{c}{2\mu}, 1\}$ for some $\mu > 0$. Thus, μ indicates the average present value of future possible criminal acts in the ex-convict population.

The "pass/fail test" outcome for a particular ex-convict is denoted by t. The probability that a straight (criminal) ex-convict passes (fails) the employer's test is denoted by p. As mentioned above, those going straight (willing to commit crime) pass (fail) with the probability $p > \frac{1}{2}$: $\Pr\{t = pass \mid \text{straight}\} = \Pr\{t = fail \mid \text{crime}\} = p > \frac{1}{2}$. Thus, parameter p reflects the accuracy of employers' information. We further assume that this employers' information is not "too accurate" in the labor market for ex-convicts, as follows:

Assumption 1. *Employers' information about criminal intentions is not so accurate that* $p \leqq (\frac{1}{2})[1 + (\frac{\mu}{\mu+2\omega})^{\frac{1}{2}}]$.

3 | LABOR MARKET ANALYSIS

In this section, we introduce the employers' wage offers to ex-convicts and the corresponding ex-convicts' incentives to go straight. Then, we search for the equilibrium in the labor market for ex-convicts.

3.1 | Employers' wage offers

Given some proportion π of the overall ex-convict population that employers believe to be going straight, competition will force employers' wage offers (W) to coincide with an ex-convict's expected productivity:

$$W(\pi, t) = \omega \cdot \Pr\{\text{“}straight\text{”} \mid t, \pi\} + 0 \cdot \Pr\{\text{“}crime\text{”} \mid t, \pi\},$$

where t is the test outcome (either pass or fail). By using Bayes's rule to compute the conditional probabilities, we get the following:

$$W(\pi, pass) = \frac{\omega p \pi}{p\pi + (1-p)(1-\pi)} \quad \text{and} \quad W(\pi, fail) = \frac{\omega(1-p)\pi}{(1-p)\pi + p(1-\pi)}.$$

Then, we may conclude that (i) $W(\pi, pass) > W(\pi, fail)$, for all $\pi \in (0, 1)$, (ii) $W(0, pass) = W(0, fail) = 0$, *and* (iii) $W(1, pass) = W(1, fail) = \omega$. That is, passers are offered wages at least as great as failers and, if an employer starts out believing that no (all) ex-convicts are going straight, then the offered wage is 0 (ω) to passers and failers alike. Moreover, with the aid of a bit of calculus, we see that (iv) $W(\pi, pass)$ is an increasing, concave function of π, while (v) $W(\pi, fail)$ is an increasing, convex function of π.[4] We make good use of these properties of the wage offer functions in the analysis that follows.

3.2 | Ex-convicts' incentive to go straight

Given the accuracy of employers' "test" information p, the expected legitimate earnings of an ex-convict going straight (V_1) is

$$V_1(\pi) \equiv pW(\pi, pass) + (1-p)W(\pi, fail),$$

while the expected legitimate earnings of an ex-convict returning to crime (V_0) is

$$V_0(\pi) \equiv (1-p)W(\pi, pass) + pW(\pi, fail).$$

[4] That is, the wage offered to failers rises with employer beliefs about the overall proportion of ex-convicts electing to go straight at an increasing rate, while the wage offered to passers also rises with an employer's belief, although at a decreasing rate.

Therefore, $V_1(0) = V_0(0) = 0$ and $V_1(1) = V_0(1) = \omega$. Hence, the wage offer incentive for an ex-convict going straight, denoted by $R(\pi)$, is

$$R(\pi) \equiv V_1(\pi) - V_0(\pi) = (2p-1) \cdot [W(\pi, pass) - W(\pi, fail)].$$

From the foregoing discussion, we are assured that $R(\pi)$ is a concave function of π and that $R(0) = 0 = R(1)$. Moreover, some simple calculations reveal that

$$R(\pi) = \frac{\omega(2p-1)^2\pi(1-\pi)}{p(1-p)+(2p-1)^2\pi(1-\pi)} = \omega\left[1 + \frac{p(1-p)}{(2p-1)^2\pi(1-\pi)}\right]^{-1},$$

that

$$\left.\frac{dR}{d\pi}\right|_{\pi=0} = \frac{\omega(2p-1)^2}{p(1-p)},$$

and that

$$R\left(\frac{1}{2}\right) = \omega(2p-1)^2 \geqq R(\pi), \quad \text{for all } \pi \in [0,1].$$

This last expression states that the maximum wage offer incentive for an ex-convict to go straight in this model is $\omega(2p-1)^2$, which occurs when employers believe that precisely half of the relevant population have, in fact, gone straight.

3.3 | Equilibrium in the labor market for ex-convicts

If an ex-convict elects not to go straight, he or she can still participate in the labor market, although his or her expected remuneration from doing so is reduced by the amount $R(\pi)$ relative to what it would have been had he or she gone straight. On the contrary, by going straight, this ex-convict has to give up his or her personal value for possible criminal participation, c. Hence, a newly released ex-convict will determine to go straight if and only if the wage offer incentive $R(\pi)$ is at least as great as his or her gains from future possible criminal participation, c, as summarized below:

"going straight" is the rational choice if $c \leq R(\pi)$,

while "willing to commit crime" is the rational choice if $c > R(\pi)$.

We conclude that the proportion of the overall ex-convict population who will, in fact, choose to go straight equals $G(R(\pi))$. Hence, in the context of this model, an "equilibrium employer belief" is any number $\pi^* \in [0,1]$ that solves the equation $\pi^* = G(R(\pi^*))$.

Figure 1 illustrates this logic of self-confirming employers' beliefs. By substituting the functional forms that we have assumed for $G(c)$ and derived for $R(\pi)$ and simplifying, we arrive at this equation defining an equilibrium belief, π^*:

$$\pi^* \cdot \left[\frac{\omega(2p-1)^2}{2\mu}\right](1-\pi^*) = \pi^* \cdot [\pi^* p + (1-\pi^*)(1-p)][\pi^*(1-p) + (1-\pi^*)p].$$

Note that $\pi^* = 0$ always solves the above equation, reflecting the fact that employers' believing that no ex-convicts will go straight is always a self-fulfilling prophecy in this model.[5] Furthermore, when $\pi^* = 0$ is the *only* value of π (in the unit interval) that solves this equation, the labor market for ex-convicts always collapses because of the problem of adverse selection.

Now, suppose $G(c)$ and $R(\pi)$ are such that $G(R(\pi)) < \pi$, $0 < \pi \leqq 1$, as depicted in Figure 2. Then, $\pi^* = 0$ is the *only* equilibrium employer belief. Clearly, given the concavity of $R(\pi)$ and linearity of $G(c)$ in our model, this condition is

[5] As $\pi \downarrow 0$, wage offers approach 0 for passers and failers alike, meaning that the return from going straight, $R(\pi) \downarrow 0$, and hence $G(R(\pi)) \downarrow 0$ as well.

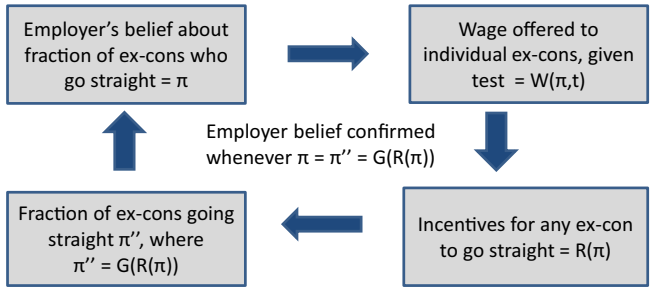

FIGURE 1 Equilibrium in labor market for ex-convicts

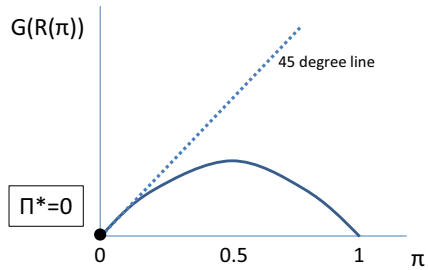

FIGURE 2 The labor market collapse for ex-convicts

obtained if and only if $\frac{d}{d\pi}[G(R(\pi))]\,|_{\pi=0} \leqq 1$, which amounts to $\frac{\omega(2p-1)^2}{2\mu \cdot p(1-p)} \leqq 1$, equivalent to $p \leqq (\frac{1}{2})[1+(\frac{\mu}{\mu+2\omega})^{\frac{1}{2}}]$.[6] This is precisely what our Assumption 1 requires, which concerns the lack of accuracy of employers' information about criminal intentions. Under such a circumstance, a massive market failure occurs since, despite the fact that "crime does not pay" for many ex-convicts (in that $w > c$), the only outcome that is consistent with rational behaviors by employers and ex-convicts is for all of the ex-convicts to reject going straight.

4 | REBRANDING PROGRAM FOR EX-CONVICTS

Supposing this to be the case, we wish now to envision a "rebranding" program for ex-convicts, proceeding along the following lines. There is to be a certifiable and costly activity (hereafter "the program") *with no productive content* (i.e., an ex-convicts' participation neither raises productivity ω nor lowers the value of criminal activity c) such that, before entering the labor market, ex-convicts choose whether to join this program or not. Let K denote the cost to an ex-convict for participating in this program. By deciding how onerous to make it, the program's designers can, in effect, choose the value of K. (With no loss of generality, we restrict attention to programs for which $0 < K < \omega$.) The behavioral protocol we envision is as follows:

1. Convicts decide whether to participate in the program. Program participation may be verifiable by employers (e.g., a certificate is issued that cannot be forged).
2. In addition, convicts also choose whether to go straight. They then enter the labor market.
3. Employers believe that a certain proportion of program participants and nonparticipants will go straight.

[6] To ensure the labor market collapse for ex-convicts (i.e., $G(R(\pi)) < \pi, \forall \pi \in (0,1]$), the concavity of $G(c)$ can also be adopted instead of its linearity assumption. Under the concavity, the market collapse condition $\frac{d}{d\pi}[G(R(\pi))]\,|_{\pi=0} \leqq 1$ amounts to $\frac{G'(0)\cdot\omega(2p-1)^2}{p(1-p)} \leqq 1$, which is equivalent to $p \leqq (\frac{1}{2})[1+(4\omega G'(0)+1)^{-\frac{1}{2}}]$.

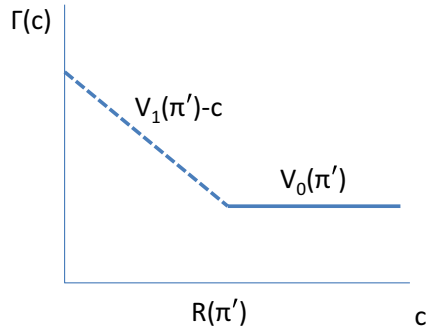

FIGURE 3 Incentive for program participation

4. Employers make wage offers to individual ex-convicts, conditional on program (non-) participation and on the observed test outcome. (For simplicity, we consider no other outside option and thus ex-convicts always accept positive wage offer.)
5. The equilibrium occurs when employers' beliefs about participants and nonparticipants are confirmed by ex-convicts' behaviors.

Now, we show how this costly "rebranding" program can be socially valuable when agents self-select. Let π' denote employers' prior beliefs about the proportion of certified program participants going straight. Hence, $R(\pi') = V_1(\pi') - V_0(\pi')$ now represents the value of going straight for program participants only, where $V_1(\pi')$ is the expected wage of an ex-convict program participant going straight and $V_0(\pi')$ is the expected wage of an ex-convict who joins the program and yet elects not to go straight. Then, an ex-convict program participant with his or her crime value c elects to go straight if and only if $V_1(\pi') - c \geqq V_0(\pi')$, equivalently $c \leqq R(\pi')$.

Therefore, when the "rebranding" program with employers' belief π' is introduced into the collapsed labor market ($\pi = 0$), the incentive to join this program, denoted by Γ, varies along one's crime value c:

$$\Gamma(c) = \begin{cases} V_1(\pi') - c & \text{if } c \leqq R(\pi') \\ V_0(\pi') & \text{if } c > R(\pi') \end{cases}.$$

Equivalently, we obtain $\Gamma(c) = \max\{V_1(\pi') - c, V_0(\pi')\}$. This incentive is depicted in Figure 3. As shown in this figure, $\Gamma(c)$ is a nonincreasing function of c, which implies the following proposition.

Proposition 1. *When a rebranding program is introduced into a collapsed labor market ($\pi = 0$), for those with a relatively low crime value ($c \leqq R(\pi')$), the lower is one's crime value c, the greater is the incentive to join the program (i.e., $\Gamma(c) = V_1(\pi') - c$), whereas the participation incentive is constant at the lowest level $V_0(\pi')$ for those with a relatively high crime value ($c > R(\pi')$).*

Given the participation cost K of such a rebranding program, only ex-convicts with a participation incentive $\Gamma(c)$ greater than (or equal to) K are willing to join the program. Thus, the logic of program participation induces the positive selection of less crime-value ex-convicts into the rebranding program. This result justifies the following "presumable" assumption: *employers continue to anticipate that all nonparticipants do not elect to go straight ($\pi = 0$) even after the introduction of the rebranding program.* Then, we achieve the following result.

Theorem 1. *For every $K \in (0, \omega)$, there is an (essentially unique) equilibrium with positive program participation, such that a positive proportion $\tilde{\pi}' \in (0, 1)$ of program participants elect to go straight, where $K = V_0(\tilde{\pi}')$. At such an equilibrium, all ex-convicts with $c < R(\pi')$ and some proportion ϕ of ex-convicts with $c \geqq R(\pi')$ join the program, where $\phi = \frac{G(R(\tilde{\pi}'))\cdot(1-\tilde{\pi}')}{(1-G(R(\tilde{\pi}')))\cdot\tilde{\pi}'}$.*

Proof. *See Appendix.* ■

Furthermore, for $K \geqq \omega$, there is no equilibrium with positive program participation, because at such an equilibrium participation cost K is always greater than the incentive to join the program $\Gamma(c)$ for any positive c; in other words, given $K \geqq \omega, \Gamma(c) = \max\{V_1(\pi') - c, V_0(\pi')\} < \omega \leqq K, \forall c > 0$.

The underlying mechanism behind the implementation of a rebranding program is as follows. By introducing a program with participation cost K, a policy designer sets up a suitable employers' belief about the program participants, which is consistent with $\tilde{\pi}' = V_0^{-1}(K)$. The rebranding program is effectively implemented when the actual proportion of program participants who choose to go straight meets the target employers' belief $\tilde{\pi}'$. This actual "going-straight" rate of program participants should be maintained with the policy designer's successful management of the proportion of high crime-value ex-convicts ($c > R(\tilde{\pi}')$) joining this program to the equilibrium level ϕ defined in Theorem 1.

We close by considering the welfare properties of the equilibria in our model with and without the proposed rebranding program. Under Assumption 1, the market for ex-convict labor collapses in the absence of a program, with all of them rejecting going straight. Net social welfare (per ex-convict) therefore equals μ. Now, suppose a rebranding program is introduced along the lines proposed above, with a real resource cost to participants of $K \in (0, \omega)$. Since employers pay wages equal to the expected productivity of workers, their net surplus from hiring program participants is necessarily zero. In addition, since ex-convicts with crime values $c > R(\tilde{\pi}')$ are indifferent about participation ($\because K = V_0(\tilde{\pi}')$), their net welfare, whether they join the program or not, equals c, which is the same as in the absence of any program.

Therefore, the introduction of a rebranding program changes the equilibrium payoff for only one group of agents in our model, namely, those with $c < R(\tilde{\pi}')$, who elect both to participate in the program and to go straight. For these ex-convicts, the equilibrium payoff in the presence of the program is $V_1(\tilde{\pi}') - K = V_1(\tilde{\pi}') - V_0(\tilde{\pi}') = R(\tilde{\pi}')$, while their payoff in the absence of any program is just c. Therefore, rebranding produces a net gain in welfare for these agents relative to the no-program situation of $R(\tilde{\pi}') - c > 0$. The following proposition summarizes this welfare result:

Proposition 2. *Program participants who go straight are strictly better off than they would have been in the absence of the program, while all other ex-convicts and employers are no worse off, implying that the introduction of such a program induces a (weak) Pareto improvement over the status quo ante.*

5 | SOCIALLY OPTIMAL REBRANDING

We are now ready to search for the socially optimal rebranding program. First, from Proposition 2, we conclude that the overall net surplus for society (NSS) associated with the introduction of the rebranding program, relative to the status quo ante, is

$$\text{NSS} = \int_0^{R(\tilde{\pi}')} [R(\tilde{\pi}') - c] dG(c) = \int_0^{R(\tilde{\pi}')} G(c) dc.$$

Now, the "optimal" program (characterized by participation cost K^{**}) maximizes NSS. Obviously, then, since the function $G(c)$ is strictly positive for $c > 0$, the optimal program is the one that, in the equilibrium, induces some proportion π^{**} of its participants to go straight such that

$$R(\pi^{**}) \geqq R(\pi'), \quad \text{for all } \pi' \in [0, 1],^7$$

with the corresponding costliness to participants of this optimal program being determined by the equation

$$K^{**} = V_0(\pi^{**}).$$

[7] One may consider that the total number of crime incidents should be included in the NSS calculation. Obviously, the number of crime incidents is positively associated with the proportion of ex-convicts who refuse to go straight, which amounts to $1 - G(R(\tilde{\pi}'))$. Thus, the number of crime incidents is also minimized only when $R(\tilde{\pi}')$ is maximized, which exactly coincides with the given result. Hence, we conclude that the inclusion of the number of offenses in the NSS calculation does not alter the identification of the socially optimal program.

As noted previously, the return from going straight $R(\tilde{\pi}')$ is maximized when employers believe that precisely half of the relevant ex-convict population have, in fact, elected to go straight, which is to say,

$$\pi^{**} = \frac{1}{2}.$$

Therefore, we conclude that the socially optimal rebranding program is calibrated such as to cost each participant the amount

$$\begin{aligned} K^{**} &= V_0\left(\frac{1}{2}\right) = (1-p)W\left(\frac{1}{2}, pass\right) + pW\left(\frac{1}{2}, fail\right) \\ &= 2\omega p(1-p). \end{aligned}$$

Thus, the more the optimal program for rebranding ex-convicts is onerous, the higher is the value of legitimate work and the less accurate is employers' information about workers' criminal intentions.

Moreover, the proportion of the ex-convict population $N(\tilde{\pi}')$, who in the equilibrium $(\tilde{\pi}')$ participate in the rebranding program, is given by $N(\tilde{\pi}') = \frac{G(R(\tilde{\pi}'))}{\tilde{\pi}'}$. Since $G(R(\tilde{\pi}'))$ is a concave function with $G(R(0)) = 0$, $N(\tilde{\pi}')$ is a decreasing function of $\tilde{\pi}'$. Therefore, we know that the more onerous the program (i.e., the greater K), the smaller the proportion of the ex-convict population that participates in the program. Then, in the socially optimal rebranding program with $\pi^{**} = 0.5$ and $K^{**} = 2\omega p(1-p)$, the proportion of the ex-convict population joining the program is

$$N(\pi^{**}) = \frac{G(R(\pi^{**}))}{\pi^{**}} = 2G\left(R\left(\frac{1}{2}\right)\right) = \left(\frac{\omega}{\mu}\right)(2p-1)^2.$$

Thus, as the size of the optimal program (in terms of the proportion of ex-convicts who participate in it) rises, the higher is the value of legitimate work, the smaller is the mean value of criminal participation, and the more accurate is the information available to employers.

6 | CONCLUDING REMARKS

According to the developed theory, we find that an effective rebranding program requires two important features: (1) verifiability and (2) reputation maintenance. If program participation cannot be verified, employers may refuse to use the information in their setting up of wage offers. For a program to be successfully implemented in the labor market, its participation cost level K should be consistent with its collective reputation (i.e., the proportion of program participants going straight), satisfying the condition $K = V_0(\pi')$ noted in Theorem 1.[8]

Therefore, we need a reliable public institution that provides a verification service to employers and is capable of long-run reputation maintenance. This actor does not need to be a government or a prison authority. A civic society or a nonprofit organization may run a successful reentry program for newly released ex-offenders as long as it earns public confidence.[9] One relevant program in this category is the Center for Employment Opportunities (CEO) based in New York City, which operates its offices in 16 American cities.[10] The CEO has a unique 75-day minimum paid work program. Each ex-convict who joins the program is assigned to a five-to-seven-person crew that cleans public facilities

[8] If the cost is somewhat lower than $V_0(\pi')$, all ex-convicts would want to join the program, leading to the lack of program validity. If this is somewhat greater than $V_0(\pi')$, only participants going straight will join the program ($\pi' = 1$), leading to the reputational free-riding problem ($\because R(\pi') = 0$), which means that the program no longer provides an incentive to go straight.

[9] However, the program cannot be operated by the ex-convicts themselves, because they have no incentive to manage reputation maintenance in the long run after finding their own jobs. For example, specific behaviors such as marriage, religious fervor, or removing tattoos may separate the low crime-value ex-convicts from the mass. However, these activities are still vulnerable to a lack of validity (if every ex-convict is willing to adopt the behaviors) or the reputational free-riding issue. Successful reputation maintenance may require a reliable long-standing public institution that can ensure the condition $K = V_0(\pi')$.

[10] The CEO, a leading reentry program that has helped more than 20,000 people find jobs upon release from prison, is backed by the so-called "pay for success" initiative, under which investors fund a public program that has a promising approach. If the program meets certain criteria, the government will have saved public money, which it then pays back to investors. The more the program succeeds, the larger the return to investors.

(e.g., courtrooms, community college buildings) and maintains public housing properties. A crew generally operates from 9 a.m. to 5 p.m. under the line-of-sight supervision of a supervisor to enforce the rules (e.g., punctuality, dress codes, and phone usage). Depending on the severity and frequency of a violation, participants may receive a verbal reprimand, lose a day's pay, be asked to attend a disciplinary meeting, or be terminated. Participants also receive daily feedback from their supervisors on their job performance through a small booklet called *Passport to Success*.[11] After the period of working for the CEO, participants are encouraged to present the graded passports during job interviews with employers as evidence of their work and performance (Broadus, Muller-Ravett, Sherman, & Redcross, 2016). By screening applicants for employers, the CEO acts as a kind of human resources department for ex-convicts.[12]

One may also argue that a careful evaluation must reject this sort of program on cost/benefit grounds because of its assumed zero "treatment effect" with no productive content. Yet, it is clear that this programmatic intervention would still be socially valuable—*precisely because it induces positive selection among participants*, which partially relieves employers' "adverse selection" information bind.

Finally, this study addresses the theoretical implications of controversial prison education programs. In the United States, such programs (GED, college degree, vocational training) have diminished since the 1990s. While some argue that the most effective way in which to keep people out of prison is to give them job skills that make them marketable employees, others contend that those programs punish law-abiding taxpayers who are already burdened with the increasing funding for correctional operations.

Over recent decades, scholars have accumulated empirical evidence that supports the premise that participation in correctional education while incarcerated reduces an individual's risk of recidivating and increases the odds of obtaining employment after release (Davis, Bozick, Steele, Saunders, & Miles, 2013). Opponents, however, are concerned about the possibility of selection bias. In other words, the higher rates of employment and lower rates of recidivism among correctional education participants may simply reflect inmates' temperament and be unrelated to exposure to the program. Our theoretical results reconcile these two contrasting views. The "selection bias" may play a critical role in the improvement of ex-convicts' labor market opportunities. Although the education program does not itself carry significant productive content, ex-convicts who place low value on criminal activities can credibly convey their good intentions to employers through the program.

As mentioned earlier, the theoretical finding in this paper has broader applicability beyond the labor market context. For instance, this same idea might be used to account for periodic and costly "franchise rebranding campaigns" wherein a franchise retailer "reinvents" itself from time to time by imposing costly (and seemingly meaningless) requirements on its current members in order to induce weaker members—who know who they are—to voluntarily withdraw. Or, equivalently, this same outcome could be achieved by creating a "superbrand" that is costly to attain, thereby allowing stronger members to acquire a new and more profitable identity of their own. Because agents' endowments are assumed to be private information, this kind of exclusionary regrouping can only be implemented in an incentive-compatible manner by imposing some real resource cost for continued group membership that weaker members could then elect not to pay. It is interesting to consider that owing to the problems of adverse selection, some kind of periodic "purging" of this sort might be the only way to keep the overall enterprise viable over time.

APPENDIX

Proof of Theorem 1

We first show that at any equilibrium, the equation in the theorem must hold. We then show how, given this equation, an equilibrium with the asserted properties can be constructed. Let there be an equilibrium in which some proportion π^* of program participants are believed by employers to be going straight. Suppose that $K > V_0(\pi^*)$. Then,

[11] Supervisors provide a rating from 1 to 5 on whether ex-convicts are on time, presentable, and hard working.

[12] According to a random assignment study by the MDRC, a research group that evaluates social policies, this CEO intervention cuts reoffending by 16–22% and is particularly helpful for those recently released and people at a high risk of recidivism (Redcross, Millenky, Rudd, & Levshin, 2012).

no ex-convict willing to commit crime (even after program participation) would join the program because the anticipated wage increase $V_0(\pi^*)$ is smaller than participation cost K, which means $\pi^* = 1$ in such an equilibrium. Thus, we obtain $K > V_0(1) = \omega$. However, we then arrive at the result that participation incentive $\Gamma(c)$ is smaller than K for any crime value c: $\Gamma(c) = \max\{V_1(\pi^*) - c, V_0(\pi^*)\} \leqq \omega < K$, $\forall c \in [0, 2\mu]$. Therefore, no ex-convict joins the program, and such a program cannot then exist. Likewise, suppose that $K < V_0(\pi^*)$. Then, all ex-convicts would want to join the program regardless of their criminal intentions because participation incentive $\Gamma(c) > K, \forall c \in [0, 2\mu]$, as implied in Figure 3. Nonetheless, this would mean the program conveys no information. Hence, from Assumption 1 that the test is not too accurate, the only equilibrium is $\pi^* = 0$, which implies $V_0(\pi^*) = 0$. This is indeed contrary to the given condition $K < V_0(\pi^*)$ and $K \in (0, \omega)$. Therefore, at any equilibrium, π^* must satisfy $K = V_0(\pi^*)$.

Since $V_0(\pi')$ is a strictly increasing function with $V_0(0) = 0$ and $V_0(1) = \omega$, the above equation defines a unique equilibrium program quality, $\tilde{\pi}'$, for every choice of the program design parameter $K \in (0, \omega)$, in which $\tilde{\pi}' = V_0^{-1}(K)$. Now, clearly, a program participant will go straight only if $c \leqq R(\tilde{\pi}')$. Moreover, all ex-convicts with $c < R(\tilde{\pi}')$ will find it rational to join the program and go straight, because the payoff from doing so is $V_1(\tilde{\pi}') - K = R(\tilde{\pi}')$, whereas the payoff from staying out of the program is c. Then, employers' beliefs are confirmed in this equilibrium if and only if some proportion ϕ of ex-convicts with $c \geqq R(\tilde{\pi}')$ also join the program and yet do not elect to go straight, with the complementary proportion $1 - \phi$ of these high crime-value ex-convicts not joining the program, where ϕ solves the equation

$$\tilde{\pi}' = \frac{G(R(\tilde{\pi}'))}{G(R(\tilde{\pi}')) + \phi[1 - G(R(\tilde{\pi}'))]},$$

so

$$\phi = \frac{\frac{G(R(\tilde{\pi}'))}{1-G(R(\tilde{\pi}'))}}{\frac{\tilde{\pi}'}{1-\tilde{\pi}'}}.$$

From Assumption 1, we know that $\pi' > G(R(\pi'))$ for all $\pi' \in (0, 1]$. Therefore, ϕ, as defined above, falls between zero and one. Moreover, since the condition $K = V_0(\tilde{\pi}')$ implies that reoffending ex-convicts are indifferent about program participation, their specified behavior in this equilibrium (some participating in the program, some not) is entirely consistent with rationality. Hence, this is indeed an equilibrium. Finally, it is easily seen that for K fixed, any two equilibria can differ only with respect to which of the high crime-value ex-convicts join the program, which is the sense in which the equilibrium being described here is "essentially" unique. ■

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REFERENCES

Arrow, K. (1973). The theory of discrimination. In O. Ashenfelter and A. Rees (Eds.), *Discrimination in labor markets* pp. 3–33. Princeton, NJ: Princeton University Press.

Broadus, J., Muller-Ravett, S., Sherman, A., & Redcross, C. (2016). *A successful prisoner reentry program expands: Lessons from the replication of the center for employment opportunities*. New York, NY: MDRC.

Coate, S., & Loury, G. (1993). Will affirmative-action policies eliminate negative stereotype? *American Economic Review*, *83*, 1220–1240.

Davis, L. M., Bozick, R., Steele, J., Saunders, J., & Miles, J. (2013). *Evaluating the effectiveness of correctional education: A meta-analysis of programs that provide education to incarcerated adults*. Santa Monica, CA: Rand Corporation.

Durose, M., Cooper, A., & Snyder, H. (2014). *Recidivism of prisoners released in 30 states in 2005: Patterns from 2005 to 2010* (Bureau of Justice Statistics Special Report NCJ 244205). Washington, DC: U.S. Department of Justice.

Fang, H. (2001). Social culture and economic performance. *American Economic Review*, *91*, 924–937.

Holzer, H., Raphael, S., & Stoll, M. (2006). Perceived criminality, criminal background checks and the racial hiring practices of employers. *Journal of Law and Economics*, *49*, 451–480.

Loury, G. (2008). *Race, incarceration, and American values: The Tanner lectures*. Cambridge, MA: MIT Press.

National Research Council. (2014). *The growth of incarceration in the United States: Exploring causes and consequences*. J. Travis, B. Western, & S. Redburn (Eds.). Washington, DC: The National Academics Press.

Pager, D. (2007). *Marked: Race, crime, and finding work in an era of mass incarceration*. Chicago, IL: University of Chicago Press.

Pew Center on the States. (2011). *States of recidivism: The revolving door of America's prisons*. Washington, DC: The Pew Charitable Trusts.

Redcross, C., Millenky, M., Rudd, T., & Levshin, V. (2012). *More than a job: Final results from the evaluation of the center for employment opportunities (CEO) transitional jobs program*. New York, NY: MDRC.

Spence, M. (1973). Job market signaling. *Quarterly Journal of Economics*, *87*, 355–374.

Travis, J. (2005). *But they all come back: Facing the challenges of prisoner reentry*. Washington, DC: Urban Institute Press.

Visher, C., Debus-Sherrill, S., & Yahner, J. (2011). Employment after prison: A longitudinal study of former prisoners. *Justice Quarterly*, *28*, 698–718.

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