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Oded Stark, Marcin Jakubek

Faculty of Economics and Social Sciences  
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Oded Stark

Universities of Bonn, Tuebingen, and Warsaw

and

Marcin Jakubek

Polish Academy of Sciences, Warsaw, Poland

Mailing Address: Oded Stark  
ZEF, University of Bonn  
Genscherallee 3  
D-53113 Bonn  
Germany

E-mail Address: [ostark@uni-bonn.de](mailto:ostark@uni-bonn.de)

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## **Abstract**

This chapter investigates the impact of the imposition of sanctions for employing illegal migrants on the welfare of native laborers. In response to such sanctions, managers in a firm may be reassigned from the supervision of production to the verification of the legality of the firm's labor force. The chapter analyzes three different conditions of the host country's labor market: full employment, voluntary unemployment, and minimal wage in combination with involuntary unemployment. It is shown that when the sanctions are steep enough, a profit-maximizing firm will assign managers to verification, which impedes the firm's productivity. The impact on the wages and / or employment of the native laborers depends on the efficiency of the verification technology, namely on the percentage of the "filtered out" illegal laborers in relation to the fraction of reassigned managers. If this efficiency is not high enough, the sanctions bring in their wake consequences that fly in the face of the very aim of their introduction: the welfare of the native laborers will take a beating.

*Keywords:* Employer sanctions; Illegal migrant laborers; Welfare of native laborers

*JEL classification:* D21; I38; J21; J61; K31; L51

## 1. Introduction

The enthusiasm of the U.S. legislative chambers for employer sanctions has not subsided over time. In September 1984 the Simpson-Mazzoli bill for U.S. immigration reform died in a Senate-House conference committee, but the commitment to bring it back to life was strong. In September 1985, the U.S. Senate passed a revised version of the bill, The Immigration Control Bill, which then went to the House, and became public law in 1986 as Immigration Reform and Control Act (IRCA). The essence of the immigration reform bill was employer sanctions: it would be illegal to hire an illegal alien. Penalties for employers who knowingly hire illegal aliens would be up to \$10,000 per alien. The rationale underlying the proposed employer sanctions may be found in the “Immigration Reform and Control” - Report of the Committee on the Judiciary, United States Senate, April 21, 1983 (S.529). “We believe there have been generally adverse job impacts, especially on low income, low-skilled Americans, who are the most likely to face direct competition, even though we also perceive a degree of economic growth from the use of ‘cheap’ labor” (p. 5). A quarter of a century later, in September 2010, senators Leahy and Menendez introduced into the U.S. Senate another comprehensive immigration-reform bill. The bill calls for employers to pay more attention to checking the legal status of their employees and mandates some form of verification. And once again, “[t]he logic is simple. Economic migrants are looking for work; if employers were not hiring them, the incentive to cross illegally would be a lot smaller.” (*The Economist*, November 18, 2010).

In 2007, the U.S. government mandated all federal agencies to use E-verify, an internet-based system that compares information from an employee’s Form I-9 with governmental data in order to check employment eligibility.<sup>1</sup> In 2009, the mandate to use E-verify was extended to all federal contractors. By 2011, individual States such as Arizona, Utah, Georgia, Alabama, Mississippi, and South Carolina enacted E-verify mandates for all employers. In June 2011, a bill to mandate all employers in the U.S. to use E-verify was introduced in the U.S. House of Representatives. The new immigration laws created stricter requirements for businesses hiring workers and harsher punishments for anyone who employs an illegal immigrant. It is noteworthy that the U.S. government has been switching to an

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<sup>1</sup> Every employer in the U.S. has to fill in Form I-9 for every employee. The Form consists of information and supporting documents provided by the employee. Although employers are required to collect information, filling in the I-9 Form is distinct from verifying the validity of the information. E-verify provides employers with a tool that helps them refrain from hiring illegal workers.

enforcement policy based less on raids targeting workers, and more on I-9 audits of employers, which is very costly to the firm.

On the other side of the Atlantic, the European Union legislature too was considering employer sanctions. In a Directive from June 2009, the European Parliament and the Council of the European Union admitted that “a key pull factor for illegal immigration into the EU is the possibility of obtaining work in the EU without the required legal status. Action against illegal immigration and illegal stay should therefore include measures to counter that pull factor.” A proclaimed remedy to the said factor is “general prohibition on the employment of third-country nationals who do not have the right to be resident in the EU, accompanied by sanctions against employers who infringe that prohibition” (Directive 2009/52/Ec of the European Parliament and of the Council of 18 June, 2009).

The fervor to enact and act on legislation that penalizes employers for employing illegal aliens has not been matched with a corresponding research zeal aimed at deciphering the impact of employer sanctions on the welfare of native laborers, even though the latter issue must have been a linchpin of the entire legislative effort.

Whether the decision to implement policies aimed at thwarting illegal migration is undertaken for economic reasons or is motivated by populist perceptions and the common belief that illegal migrants “steal” jobs from the natives, is an issue outside the confines of the present chapter. Here we attend to a specific question: whether one such policy - namely employer sanctions - can be detrimental to the welfare of the native laborers who are the intended beneficiaries of the policy. We address this question by analyzing the response of employers to the introduction of this policy.

Compared with other measures against illegal migrants, for example border control, employer sanctions appear to constitute a more effective deterrent: fines for employing illegal migrants decrease the propensity to employ such laborers and render their prospect of finding jobs in the destination country slimmer; the very incentive to migrate in the hope of obtaining a higher wage in the developed country than in the home country is reduced considerably. In comparison, border control constitutes rather a temporary barrier which is treated by would-be illegal migrants merely as a nuisance. For example, Donato et al. (1992) report that a Mexican migrant, if caught at the U.S. border, usually tries again until he succeeds.

In spite of this apparent advantage, employer sanctions may not constitute a perfect remedy to the malaise of illegal migration. Although some studies (for example, Bean et al.,

1990) report a decrease in illegal border crossings from Mexico to the U.S. following the enactment of the Immigration Reform and Control Act, other studies find that it had only a small or negligible effect on the perceptions of the prospect of employment in the U.S. in Mexican sending communities (Cornelius, 1990; Massey et al., 1990).

Studies of the impact of employer sanctions on the welfare of native laborers also fall short of yielding an unequivocal verdict. For example, in the general equilibrium model of Hill and Pearce (1990), employer sanctions can make employers more reluctant to employ workers at all; the fear of employing illegal migrants can decrease the wages and / or employment of natives or of legal migrants when the risk that an illegal will “slip through” the recruitment procedure is taken into account. Katz and Stark (1985) derived the same result albeit in a partial equilibrium setting. Empirical work by Cobb-Clark et al. (1995) reveals that the wages of low-skilled natives decreased after the U.S. government introduced sanctions for employing non-legal migrants when IRCA was enacted in 1986. Fry et al. (1995) divide the sanctions imposed by IRCA between “paperwork fines” (fines for not complying with the requirements to document the legality of each employed worker) and “hiring fines” (fines for knowingly employing illegals). They find that “paperwork fines” lower average metropolitan wages because the bureaucratic burden constitutes an added cost of hiring. Additionally, imposition of the sanctions was reported to result in wage- and employment-discrimination of legal workers from ethnic groups perceived by employers to be “at risk” of being “contaminated” by illegal migrants (consult, for example, Lowell et al., 1995; Bansak, 2005).

The logic underlying the enactment of employer sanctions (the notion that illegal migrants “steal” jobs from the natives and reduce the natives’ welfare) and the consequences of resorting to sanctions are in some dispute in the received literature, which delineates a variety of conditions under which the inflow of illegal workers does, or does not, improve the welfare of the native population. For example, Myers and Papageorgiou (2000) argue that if migrants enjoy redistributive public services, they can cause a collapse of the welfare system. In such a situation, the host country can benefit from opening its gates to illegal migrants rather than to legal ones, so as to sever the link between the presence of migrant workers and the welfare system. Stark (2007) presents a different mechanism in which the illegal status of migrants works in favor of the host economy: their illegal status implies that migrants are likely to be expelled. Returning to their country of origin entails reduced earnings when the wage at origin is lower than the wage at destination. This prospect induces illegal migrants to exert more work effort than legal migrants who are not subjected to such a threat. Carter

(2005) reports that although illegal migration increases the returns to capital, the welfare effect on low-skilled natives is conditional on the segmentation of the labor market between migrant-dominated and native-dominated jobs. Davila and Pagan (1997) argue that the enactment of IRCA in such a manner that a weakly-monitored agriculture sector becomes a “safe heaven” for illegal migrants (in contrast to the highly-monitored manufacturing and construction sectors) could intensify segmentation. Djajić (1997) considers a setting in which the welfare effect of migration depends on the segregation of natives and illegal migrants between the “official” sectors of the host country and its “underground” economy where employers are out of the reach of sanctions for employing illegal migrants. If low-skilled natives work in the “underground” economy and their mobility to “official” sectors is limited, their wages decrease when illegal migrants take jobs in the “underground” economy, whereas when jobs in the “underground” economy are taken only by illegal workers or when low-skilled natives can easily find employment in the “official” sectors, the effect on the welfare of the natives is neutral or positive.

In the U.S. where, as already noted, employer sanctions have been in place for more than three decades now, and where new ones could be enacted, the cumulative diversity in the assessment of the manner in which the enactment of employer sanctions impinges on the welfare of native laborers invites a systematic treatment of the issue under the various labor market conditions that have prevailed in the U.S. economy over this period. Such an analysis could yield an overall conclusion and inform legislators and policy-makers alike.

In our first cut on this topic (Stark and Jakubek, 2012), we presented a model in which a firm at the risk of being sanctioned for employing illegal migrants can find it optimal to reassign some of its management input from the supervision of production to the verification of the legality of its labor force. That preliminary analysis, conducted under the simplifying assumptions of full employment in the host country and a rudimentary efficiency of the technology of verification of the employed laborers, indicates that when a government introduces sanctions that are steep enough to trigger a “defensive” reaction of the firms, the welfare of the native laborers inevitably worsens. In the current chapter we depart from these assumptions in two important respects. First, to deliver a judgment independently of the specific prevailing labor market conditions, we analyze how employer sanctions influence the behavior of the firm under alternative configurations or regimes of the host economy’s labor market: full employment; voluntary unemployment; and minimal wage setting in conjunction with involuntary unemployment. Second, to avoid succumbing to a technological straight

jacket of a one-to-one relationship between the fraction of management time assigned to verification of the legal status of laborers and the efficiency of this verification, we allow for a varying efficiency of verification. Efficiency is measured by the ratio of the fraction of illegal laborers “filtered out” to the fraction of management time assigned to verification of the laborers’ legal status. Two of the major themes of this chapter are thus the role of the verification technology as a tool that policy makers should consider, and how the inefficiency of verification takes a toll on the welfare of native laborers.

In the next section we present our model and analyze the impact of the imposition of sanctions for employing illegal migrants on the welfare of native laborers under three distinct conditions of the labor market of the host country. In the first, full employment configuration, we show that firms find it optimal to apply measures aimed at verifying the legal status of their laborers if the sanction for employing illegal migrants is high enough. We argue that in terms of the decrease in production efficiency, the cost of resorting to verification is reduced productivity which, in turn, if the verification efficiency is low, can decrease the returns to labor and, consequently, also the wage paid to laborers (natives and illegal migrants alike). In the second configuration, unemployment arises as we allow the supply of labor to vary with the market wage: with regard to the migrants, we can review this change in supply as a revision of the decision to migrate in response to the wage offered in the host country. As in the first configuration, if the sanction is set at a high enough level, firms employ verification measures that interfere with production efficiency. Depending on the efficiency of verification, these measures can again lower the wages of native laborers and migrants alike. In the third configuration, with a minimal wage in place and involuntary unemployment among native laborers, if the firm employs verification measures, production efficiency again takes a beating. The inability to counteract the sanction by lowering wages leads the firm to reduce its labor force albeit, as a consequence of the verification, the composition of the employed labor force shifts in favor of the natives. The efficiency of verification determines whether this shift is offset by a drop in overall employment and higher unemployment of natives or whether, if the efficiency is high enough, the natives gain as workplaces are freed up by the “filtered out” illegal laborers. Section 3 concludes.

All in all, our analysis suggests that regardless of the particular configuration that replicates the underlying economic reality of the host country’s labor market, the decision to institute employer sanctions should be closely linked to the efficiency of the verification



measures that firms will employ as a “defensive” response. If this efficiency is not sufficiently high, the outcome of the policy will be the opposite of that which the policy seeks to serve.

## 2. The benchmark model

Here, we briefly recount the basic setup of the model of Stark and Jakubek (2012). Consider a “host” country,  $H$ , with a labor force  $\bar{L} = \bar{L}_N + \bar{L}_M$  that consists of  $\bar{L}_N$  native laborers (including possibly legal migrants), and  $\bar{L}_M$  illegal migrants. Each laborer is endowed with one unit of efficiency labor (skill-wise, the labor force is then homogeneous). There are  $n$  identical firms using a constant-returns-to-scale Cobb-Douglas production technology to produce a single consumption good the price of which is normalized as one. The firms employ two production inputs: labor and management.<sup>2</sup> Management input is measured in units of time devoted to supervising the production process. Thus, in this setting managers are those who provide “supervision,” distinct from other employees who supply “labor.” There is an upper bound on management time which, to begin with, is met. Thus, if another task requires management’s attention, that will have to come at the expense of supervision time. From the basic properties of the constant-returns-to-scale Cobb-Douglas production function it follows that in competitive economy  $H$ , the aggregate output of  $n$  firms, employing  $L_i$  ( $i = 1, \dots, n$ ) laborers (efficiency units of labor) and  $M_i$  units of management time to supervise production, can be expressed as the output of a single “representative” firm,

$$Y(L, M) = L^\alpha M^{1-\alpha},$$

where  $L = \sum_{i=1}^n L_i$ ,  $M = \sum_{i=1}^n M_i$ , and  $\alpha \in (0, 1)$  is the output elasticity of labor.

Let the government of  $H$  employ measures to sanction the employment of illegal laborers. The rationale of applying these measures is to protect the native laborers from being hurt by the inflow of illegal laborers, either in terms of a decrease in their wages as a result of the increased supply of labor, or in terms of an increase in unemployment. Let a parameter  $T > 0$  measure how stern is the penalty imposed on a firm for each illegal laborer found on its premises.<sup>3</sup>

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<sup>2</sup> As the inflow of illegal laborers is unlikely to change the stock of capital in country  $H$ , we omit it from the production function, treating it as a constant normalized at one.

<sup>3</sup> To be closer to the real-world implementation of an immigration policy based on employer sanctions, we can interpret  $T$  as the penalty times the (perceived by employer) probability of being inspected by the immigration

We assume that absent (costly) actions regarding verification of the legal status of laborers, a firm has no way of recognizing whether a laborer that it employs is legal or illegal. Therefore, initially among the employed  $L$  laborers, the percentage of legal and illegal laborers will be the same as in the overall labor force  $\bar{L}$ . However, the firm can reallocate some of its management input from supervising production to verification of laborers' legal status. The fraction of management time devoted to this task is measured by the parameter  $v \geq 0$ . We assume that the number of illegal migrants employed by the firm reduces then from  $L_M$  to  $(1-uv)L_M$ . The exogenous parameter  $u > 0$  describes the relationship between the fraction of management time assigned to verification of the laborers' legal status and the efficiency of this verification, namely the fraction of illegal laborers "filtered out." Because this efficiency cannot be greater than one ( $uv \leq 1$ ), nor can the firm assign more than 100 percent of its managers' time to verification ( $v \leq 1$ ), we assume that  $v \in [0, \min\{1/u, 1\}]$ . This implies that  $uvL_M$  of the firm's illegal employees are "filtered out." Correspondingly, verification results in fines of only  $(1-uv)L_M T$ .

## 2.1. Full employment in the host economy

We assume that initially the entire labor force,  $\bar{L} = \bar{L}_N + \bar{L}_M$ , is employed.<sup>4</sup> Then, if the firm does not apply any measure to verify the legal status of the laborers it hires, the fines paid for all the employed illegal laborers will amount to  $\bar{L}_M T$ . An optimizing firm will, however, try to avoid being burdened by this penalty.

We analyze the optimal behavior of the profit maximizing firm. The firm has to decide how to optimally divide its management time between a fraction, measured by  $v$ , to be dedicated to verification of the laborers' legal status, and the complementary fraction, measured by  $1-v$ , to be assigned to supervising production. The firm's output when  $(1-v)M$  management time is devoted to supervising production is

$$Y[L(v), M, v] = [L(v)]^\alpha [(1-v)M]^{1-\alpha},$$

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agency. However, to concentrate on essentials, we measure the sternness of the policy using only one parameter.  
<sup>4</sup> We assume that the number of illegal laborers or an approximate estimate of that number is public knowledge, as is the labor supply function of the illegal laborers, which we employ in the next subsection.

where  $L(v) = \bar{L}_N + (1-uv)\bar{L}_M$  is the input of labor after the “filtering out” of  $uv\bar{L}_M$  illegal migrants. The function of the profits of the firm is

$$\begin{aligned}\pi &= Y[L(v), M, v] - w(v)L(v) - mM - (1-uv)\bar{L}_M T \\ &= [L(v)]^\alpha [(1-v)M]^{1-\alpha} - w(v)L(v) - mM - (1-uv)\bar{L}_M T,\end{aligned}\quad (1)$$

where  $w(v)$  is the wage paid to a laborer, and  $m$  is the wage payment to a unit of management time. To further concentrate on essentials, we assume that the wage payment to a unit of management is given exogenously (for example, as a result of collective bargaining), whereas the wage payment to a laborer is determined according to the marginal product of labor.<sup>5,6,7</sup> This usage is

$$\begin{aligned}w(v) &= \frac{dY[L(v), M, v]}{dL(v)} = \alpha [L(v)]^{\alpha-1} [(1-v)M]^{1-\alpha} \\ &= \alpha [\bar{L}_N + (1-uv)\bar{L}_M]^{\alpha-1} [(1-v)M]^{1-\alpha}.\end{aligned}\quad (2)$$

From (1) and (2) we get that the firm’s optimization problem is

$$\begin{aligned}\max_{v \in \{0, \min\{1/u, 1\}\}} \pi &= \max_{v \in \{0, \min\{1/u, 1\}\}} \left\{ Y[L(v), M, v] - w(v)L(v) - mM - (1-uv)\bar{L}_M T \right\} \\ &= \max_{v \in \{0, \min\{1/u, 1\}\}} \left\{ (1-\alpha) [\bar{L}_N + (1-uv)\bar{L}_M]^\alpha [(1-v)M]^{1-\alpha} - mM - (1-uv)\bar{L}_M T \right\}.\end{aligned}\quad (3)$$

From (3) we have that

$$\frac{d\pi}{dv} = u\bar{L}_M T - (1-\alpha)M \left\{ (1-\alpha)\bar{L}_N + [1-\alpha(1-u)-uv]\bar{L}_M \right\} [\bar{L}_N + (1-uv)\bar{L}_M]^{\alpha-1} [(1-v)M]^{-\alpha} \quad (4)$$

and that

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<sup>5</sup> Even when the firm undertakes verification measures, it cannot wage-discriminate between native and migrant laborers; the  $(1-uv)\bar{L}_M$  illegal migrants who “slip through” the verification cordon are indistinguishable from the natives.

<sup>6</sup> The firm could perceive the penalty for employing illegals as an additional cost of labor: it could shrink its demand for labor so as to reduce the probability of employing illegals, and / or lower wages so as to factor the expected penalty into the cost of labor. Due to the complexity of the calculations that follow, in the evaluation of the marginal product of labor here (as well as in Subsections 2.2 and 2.3), we disregard this effect. However, because it leads to a decrease in employment and / or in wages, it only exacerbates the deleterious effect of sanctions on the welfare of natives.

<sup>7</sup> From the perspective of the welfare of all the natives (managers and laborers combined, given that managers are natives), the assumption of a fixed price of management time enables us to concentrate on the distributional consequences of employer sanctions for laborers. If the price of management time were to be freed up, the total wage bill would essentially be fixed in our constant returns to scale model, so that any loss to laborers would be a gain to managers. And then, natives as a whole would not be harmed in this model.

$$\frac{d^2\pi}{dv^2} = -\frac{(1-\alpha)^2 a\bar{L}_N^2 M [\bar{L}_N + (1-uv)\bar{L}_M]^{\alpha-2} [\bar{L}_N + (1-u)\bar{L}_M]^2 [(1-v)M]^{-\alpha}}{1-v} < 0. \quad (5)$$

We denote the (negative of the) second term in (4) as

$$F(v) = (1-\alpha)M \left\{ (1-\alpha)\bar{L}_N + [1-\alpha(1-u)-uv]\bar{L}_M \right\} [\bar{L}_N + (1-uv)\bar{L}_M]^{\alpha-1} [(1-v)M]^{-\alpha}.$$

We can interpret  $F(v)$  as the marginal loss in productivity experienced by the firm as a result of shifting  $v$  fraction of management time from supervising production to verification activities. The amount  $u\bar{L}_M T$  in (4) is the marginal gain from avoiding the penalty. We note that

$$\left. \frac{d\pi}{dv} \right|_{v=0} = u\bar{L}_M T - F_0, \quad (6)$$

where

$$F_0 \equiv F(0) = (1-\alpha)M \left[ (1-\alpha)\bar{L}_N + (1-\alpha + \alpha u)\bar{L}_M \right] (\bar{L}_N + \bar{L}_M)^{\alpha-1} M^{-\alpha} > 0.$$

We see that for a small enough sanction for employing an illegal migrant, namely for  $T < \frac{F_0}{u\bar{L}_M}$ , we have that  $\left. \frac{d\pi}{dv} \right|_{v=0} < 0$  which, in conjunction with (5), informs us that for such a small penalty, the marginal gain from avoiding the penalty is lower than the marginal loss in productivity from reallocating the management input, and therefore we postulate a border solution  $v^* = 0$  for  $T \in \left( 0, \frac{F_0}{u\bar{L}_M} \right)$ . In such a case, the sanction is neutral for the firm's behavior, that is, the firm finds it optimal to pay a low fine and retain all its managers supervising production.

For  $T > \frac{F_0}{u\bar{L}_M}$ , however, we have that  $\left. \frac{d\pi}{dv} \right|_{v=0} > 0$ . Therefore, the firm finds it optimal to reassign some of its management from supervising production to verification activities, which bears negatively on the firm's production efficiency. In such case, we have that  $v^* > 0$ .

The aggregate welfare of the native laborers,  $W$ , can be measured by their wage earnings,

$$W = \bar{L}_N w(v). \quad (7)$$

Combining (7) and (2) we have that

$$\frac{dW}{dv} = \bar{L}_N \frac{dw}{dv} = -[\bar{L}_N + (1-u)\bar{L}_M] \left\{ (1-\alpha)\alpha\bar{L}_N M [\bar{L}_N + (1-uv)\bar{L}_M]^{\alpha-2} [(1-v)M]^{-\alpha} \right\}. \quad (8)$$

Because for  $v, uv < 1$  the term in curly brackets in (8) is positive, the sign of  $\frac{dW}{dv}$  in (8) depends on the sign of the term  $[\bar{L}_N + (1-u)\bar{L}_M]$ , which defines the following constraint on the efficiency of managerial verification: if

$$u < \frac{\bar{L}_N}{\bar{L}_M} + 1, \quad (9)$$

that is, if  $[\bar{L}_N + (1-u)\bar{L}_M] > 0$ , then we have that  $\frac{dW}{dv} < 0$  and, therefore, the welfare of the native laborers will be hurt if the firm elects to assign managerial time to verification measures which, as we showed before (recalling (6)), happens if  $T > \frac{F_0}{u\bar{L}_M}$ . On the other hand,

if  $u > \frac{\bar{L}_N}{\bar{L}_M} + 1$ , the welfare of the native laborers improves ( $\frac{dW}{dv} > 0$ ) as the firm efficiently

“filters out” illegal migrants from the cadre of its employees. Looking closer at the condition in (9), we can expect that  $\bar{L}_N \gg \bar{L}_M$  because the number of foreign (illegal) laborers in the economy is typically much smaller than the number of legal laborers. This means that, in turn, for sanctions to have a positive effect on natives’ welfare, the efficiency of managerial verification has to be quite high ( $u \gg 1$ ).

We therefore conclude that in a regime of full employment, the effect of employer sanctions - in the form of penalty to the firm for engaging illegal laborers - on the welfare of native laborers depends on two factors. First, when the penalty is too low to trigger a reaction by the firm, the sanctions are welfare-neutral. Second, when the penalty is high enough for the firm to find it optimal to sacrifice some production efficiency in order to decrease the fines that it would be required to pay, the welfare effect depends on the efficiency of the verification. Looking at the last expression in (2), we see that the wage paid to laborers is determined by the interplay between a decrease in productivity caused by the reassignment of managers (from  $M^{1-\alpha}$  to  $[(1-v)M]^{1-\alpha}$ ) and a decrease in the supply of labor (from  $\bar{L}_N + \bar{L}_M$  to  $\bar{L}_N + (1-uv)\bar{L}_M$ ), where the latter has a positive impact on wages. If the efficiency of verification is low (recalling (9)), the loss of productivity caused by employing verification

measures will dominate, and wages will decline. If the efficiency of verification is high, the positive labor supply effect will dominate.

## 2.2. Voluntary unemployment in the host economy

We now extend the preceding labor market configuration by allowing the labor supply of natives and migrants to vary with the market wage. Specifically, we assume that the supply of native labor,  $L_N$ , is given by

$$L_N = Aw,$$

where  $A > 0$ , and that the supply of migrant labor,  $L_M$ , is given by

$$L_M = Bw,$$

with  $B > 0$ .<sup>8</sup> As before, we assume that by allocating a fraction  $\nu$  of its management time to verification, the firm can “filter out” a fraction  $u\nu$  of the illegal migrants. Therefore, the total supply of labor in the host country in response to wage  $w$ , taking into account the “filtering out” through verification, is

$$L^S = L_N + (1 - u\nu)L_M = [A + (1 - u\nu)B]w. \quad (10)$$

The profits of the firm are

$$\begin{aligned} \pi &= Y - wL - mM - (1 - u\nu)L_M T \\ &= L^\alpha [(1 - \nu)M]^{1-\alpha} - wL - mM - (1 - u\nu)L_M T. \end{aligned} \quad (11)$$

To enable us to present our findings in a neat analytic form, we assume that  $T \geq 0$ ; allowing  $T = 0$  stands for the case in which sanctions are not imposed.

We next solve for the wage rate that clears the labor market. We first show that the welfare of the native laborers falls if the firm employs verification measures. We then show that when the imposed sanction is high enough, the firm will indeed resort to verification.

From (11), profit maximization with respect to the labor input yields

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<sup>8</sup> By using linear labor supply functions we make the implicit assumption that the populations of natives and migrants are large enough not to be “exhausted” by employment, namely the equilibrium obtained in the labor market is distant from the point at which the labor force becomes constrained by the size of the population. (The configuration in which the entire labor force is employed was analyzed in the preceding subsection).

$$\frac{d\pi}{dL} = \alpha L^{\alpha-1} [(1-\nu)M]^{1-\alpha} - w = 0,$$

which translates into the optimal demand for labor in the host economy

$$L^D = \left\{ \frac{w}{\alpha [(1-\nu)M]^{1-\alpha}} \right\}^{\frac{1}{\alpha-1}}. \quad (12)$$

Equalizing the demand for labor (12) with the supply of labor (10) yields

$$\left\{ \frac{w^*}{\alpha [(1-\nu)M]^{1-\alpha}} \right\}^{\frac{1}{\alpha-1}} = [A + (1-u\nu)B] w^* \quad (13)$$

and thus

$$w^* = \alpha^{\frac{1}{2-\alpha}} \left[ \frac{A + (1-u\nu)B}{(1-\nu)M} \right]^{\frac{1-\alpha}{\alpha-2}}. \quad (14)$$

To assess the wellbeing of the native laborers in this setting, we note that among the employed there will be

$$L_N^* = A w^* \quad (15)$$

native laborers. Then, from (14) and (15) we get that the aggregate welfare of the native laborers is

$$W = L_N^* w^* = \alpha^{\frac{2}{2-\alpha}} A \left[ \frac{A + (1-u\nu)B}{(1-\nu)M} \right]^{\frac{2\alpha-2}{2-\alpha}}.$$

We have that

$$\frac{dW}{dv} = -[A + (1-u)B] \frac{2\alpha^{\frac{2}{2-\alpha}} (1-\alpha) A M^{\frac{2(1-\alpha)}{2-\alpha}} (1-\nu)^{\frac{\alpha}{\alpha-2}} [A + (1-u\nu)B]^{\frac{3\alpha-4}{2-\alpha}}}{2-\alpha},$$

and because the main fractional term in the preceding formula is positive, the sign of  $\frac{dW}{dv}$  depends on the sign of the term  $[A + (1-u)B]$ . Similarly as in the full employment setting (recalling (9)), for a relatively low efficiency of verification, that is, for

$$u < \frac{A}{B} + 1, \quad (16)$$

we have that the welfare effect of employing verification is negative, namely  $\frac{dW}{dv} < 0$ ,

whereas for  $u > \frac{A}{B} + 1$ , the welfare of the native laborers will increase if the firm implements

verification measures (set  $v$  at a level higher than zero) in response to governmental sanctions.

To assess whether the firm will indeed implement verification measures, we investigate the problem of the firm choosing the optimal level of management time allocated to verification procedures, given the equilibrium wage  $w^*$  and the equilibrium employment level which, from (10) and (14), is

$$L^* = [A + (1 - uv)B]w^* = \left\{ \frac{[(1 - v)M]^{\alpha-1}}{\alpha[A + (1 - uv)B]} \right\}^{\frac{1}{\alpha-2}}.$$

Expressing the firm's profits as a function of  $w^*$  and  $L^*$ , we have

$$\pi^* = \pi(L^*, w^*) = (L^*)^\alpha [(1 - v)M]^{1-\alpha} - w^* L^* - mM - (1 - uv)L_M^* T,$$

where  $L_M^* = Bw^*$ . Then, we have that

$$\begin{aligned} \left. \frac{d\pi^*}{dv} \right|_{v=0} &= T \frac{\alpha^{\frac{1}{2-\alpha}} B \{ (A+B)(1-\alpha) + u[A(2-\alpha) + B] \} \left( \frac{A+B}{M} \right)^{\frac{\alpha-1}{2-\alpha}}}{(2-\alpha)(A+B)} \\ &\quad - \frac{(1-\alpha)\alpha^{\frac{\alpha}{2-\alpha}} [2(1-\alpha)(A+B) + \alpha uB]}{(2-\alpha)} \left( \frac{A+B}{M} \right)^{\frac{2(\alpha-1)}{2-\alpha}}. \end{aligned} \quad (17)$$

Because

$$G \equiv \frac{\alpha^{\frac{1}{2-\alpha}} B \{ (A+B)(1-\alpha) + u[A(2-\alpha) + B] \} \left( \frac{A+B}{M} \right)^{\frac{\alpha-1}{2-\alpha}}}{(2-\alpha)(A+B)} > 0$$

and

$$H \equiv \frac{(1-\alpha)\alpha^{\frac{\alpha}{2-\alpha}} [2(1-\alpha)(A+B) + \alpha uB]}{(2-\alpha)} \left( \frac{A+B}{M} \right)^{\frac{2(\alpha-1)}{2-\alpha}} > 0,$$

we have that

$$\left. \frac{d\pi^*}{dv} \right|_{v=0} = TG - H.$$



Therefore, the derivative  $\left. \frac{d\pi^*}{dv} \right|_{v=0}$  is negative for  $T = 0$ . From the continuity of (17) with respect to  $T$ , we get that this derivative is also negative for sufficiently small values of  $T$ , meaning that as long as the government sanctions for employing illegal laborers do not exceed a certain limit, say  $T_0 \equiv \frac{H}{G}$ , the firm will not assign its managers to verification activities. However, when the government sanction is increased beyond  $T_0$ , we will have that the derivative in (17) will be positive, meaning that the firm will employ some positive level of verification.

The effect on the welfare of the native laborers depends then on condition (16). If the efficiency of verification is low (if (16) is satisfied), the welfare effects for the native laborers will be negative. Because we expect that  $A \gg B$ , namely the supply response of the native laborers to wage is high compared to the supply response of illegal migrants to wage, in order to reverse the inequality in (16) the efficiency of verification has to be relatively high ( $u \gg 1$ ).

In sum, just as in the first configuration (Subsection 2.1), here too we find that a small sanction is neutral to the firm's behavior. However, if the sanction is set at a high enough level, the firm will react by implementing measures; the "fate" of the natives is determined by the efficiency of the managerial verification procedures.

### 2.3. Minimal wage setting with involuntary unemployment in the host economy

We next study a configuration with a minimal wage setting, say at  $w_0$ , in conjunction with involuntary unemployment. In comparison with the preceding setting, the firm can again find it optimal to reallocate some of its managers to verification tasks. This tilts the composition of the employed labor force in favor of the natives. However, the reassignment of managers reduces production efficiency which, in turn, leads to a reduction in the marginal product of labor and, because the firm cannot reduce wages, to a decrease in the demand for labor.

To see this formally, we express the firm's profits as

$$\begin{aligned} \pi &= Y - w_0 L(v) - mM - L_M(v) T \\ &= [L(v)]^\alpha [(1-v)M]^{1-\alpha} - w_0 L(v) - mM - L_M(v) T, \end{aligned} \tag{18}$$

where  $L_M(v)$  is the number of employed illegals. The optimal employment level is derived from equalizing the marginal product of labor with the exogenously given minimal wage  $w_0$ :

$$\frac{dY}{dL(v)} = w_0 \Leftrightarrow \alpha [L(v)]^{\alpha-1} [(1-v)M]^{1-\alpha} = w_0. \quad (19)$$

Expressing the employment level in (19) as a function of the intensity of the verification  $v$ , we get that

$$L(v) = \left\{ \frac{w_0}{\alpha [(1-v)M]^{1-\alpha}} \right\}^{\frac{1}{\alpha-1}}. \quad (20)$$

From the assumptions that “unfiltered” illegals are indistinguishable from the natives, and that the allocation of a fraction  $v$  of the firm’s management time to verification “filters out” a fraction  $uv$  of the illegal migrants, we get that among the employed  $L(v)$  laborers, the number of native laborers is

$$L_N(v) = \frac{\bar{L}_N}{\bar{L}_N + (1-uv)\bar{L}_M} L(v), \quad (21)$$

and that the number of illegal migrants is

$$L_M(v) = \frac{(1-uv)\bar{L}_M}{\bar{L}_N + (1-uv)\bar{L}_M} L(v), \quad (22)$$

where  $\bar{L}_N$  and  $\bar{L}_M$  are, respectively, the total numbers of native laborers and illegal migrants in the host country. Therefore, the welfare of the native laborers is given by

$$W = w_0 L_N(v). \quad (23)$$

From combining (20), (21), and (23), we get that

$$\frac{dW}{dv} = -[\bar{L}_N + (1-u)\bar{L}_M] \frac{\bar{L}_N w_0 \left\{ \frac{\alpha}{w_0 [(1-v)M]^{1-\alpha}} \right\}^{\frac{1}{1-\alpha}}}{(1-v) [\bar{L}_N + (1-uv)\bar{L}_M]^2}.$$

Because the main fractional term in the last expression is positive, the sign of  $\frac{dW}{dv}$  depends on the sign of the term  $[\bar{L}_N + (1-u)\bar{L}_M]$ , which translates into a condition on the verification efficiency measures that is identical to the condition in (9), namely  $\frac{dW}{dv} < 0$  if

$$u < \frac{\bar{L}_N}{\bar{L}_M} + 1. \quad (24)$$

Thus, and again, if the firm elects to employ verification measures, the welfare of the native laborers will depend on the efficiency of the verification technology in relation to the numbers of legal and illegal laborers in the economy.

By inserting (20) and (22) into (18) we can rewrite the firm's profits as

$$\pi = M \left\{ w_0^{\frac{\alpha}{\alpha-1}} \alpha^{\frac{\alpha}{1-\alpha}} (1-v) - \left[ w_0 + T \frac{(1-uv)\bar{L}_M}{\bar{L}_N + (1-uv)\bar{L}_M} \right] w_0^{\frac{1}{\alpha-1}} \alpha^{\frac{1}{1-\alpha}} (1-v) - m \right\}. \quad (25)$$

Differentiating (25) with respect to  $v$  at the point  $v = 0$  yields

$$\left. \frac{d\pi}{dv} \right|_{v=0} = T \frac{w_0^{\frac{1}{\alpha-1}} \alpha^{\frac{1}{1-\alpha}} \bar{L}_M [\bar{L}_N (1+u) + \bar{L}_M]}{[\bar{L}_N + \bar{L}_M]^2} - w_0^{\frac{\alpha}{\alpha-1}} M \left( \alpha^{\frac{\alpha}{1-\alpha}} - \alpha^{\frac{1}{1-\alpha}} \right).$$

Because  $\alpha^{\frac{\alpha}{1-\alpha}} - \alpha^{\frac{1}{1-\alpha}} > 0$  for  $\alpha \in (0,1)$ , then for small values of  $T$  we will have that

$\left. \frac{d\pi}{dv} \right|_{v=0} < 0$  and, therefore, the firm will not reallocate its management to verification.

However, there exists a critical level of the sanction that makes  $\left. \frac{d\pi}{dv} \right|_{v=0} > 0$ . When this level is

crossed, the firm will find it optimal to assign managers to verification duties. Then, the welfare effect for the native laborers will depend again on the efficiency of the verification measures (recalling (24)), akin to the results of the preceding two configurations.

### 3. Conclusions

We studied the response of an optimizing firm to the introduction of employer sanctions of varying degrees of severity. We conducted our inquiry in three different conditions in the labor market of the host economy: full employment; voluntary unemployment; and

involuntary unemployment in conjunction with a minimal wage setting. In all three regimes, the benefit to the native laborers from the introduction of sanctions depends on the efficiency of the verification measures employed by the firm. When the penalty is set at a high enough level,<sup>9</sup> a “defense” mechanism is triggered, causing the firm to sacrifice production efficiency and shift managers’ time from supervising production to verifying the legality of employees. If the efficiency of verification is low, this response results in a reduction of the returns to labor (wages) in the full employment regime and in the voluntary unemployment regime, and to a reduction in employment (of both natives and illegals) in the voluntary unemployment regime and in the minimal wage with involuntary unemployment regime, leading to a reduction in the welfare of the native laborers in each of the studied regimes. Thus, employer sanctions may have consequences that fly in the face of the very aim of their introduction.

Interestingly, the conditions on the efficiency of verification (namely (9), (16), (24)) are such that when the number of illegal laborers (measured either by  $\bar{L}_M$  or indirectly by the parameter  $B$ ) is high, the required efficiency to make native laborers better off after the imposition of sanctions is lower than when there are few illegal laborers in the economy. Consequently, employer sanctions as a device aimed at securing the welfare of native laborers are more likely to succeed in economies in which the illegal labor force is substantial, or in countries to which, as a result of, for example, lax border control, migration is fairly easy.

Throughout we have assumed a constant stock of management input in the economy. If the firm were able to hire more managers for verification duties and thereby avoid sacrificing productivity, the outcome of enacting sanctions could be different. However, we contend that, first, an increase in the supply of management time without an increase in  $m$  (the wage of managers) is rather unlikely and, second, because the sanctions subject the firm to additional costs, we would not expect the firm to be in a position to offer a higher  $m$ , which would increase the supply of managers, because the marginal product of managerial time is

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<sup>9</sup> According to the U.S. “Official Website of the Department of Homeland Security” (<https://www.uscis.gov/i-9-central/penalties>) the penalties are indeed quite high. A September 24, 2019 summary by The Society for Human Resource Management (SHRM, <https://www.shrm.org/resourcesandtools/hr-topics/talent-acquisition/pages/do-employers-face-consequences-hiring-unauthorized-workers.aspx>) reads as follows: “Civil penalties for employers hiring or continuing to employ undocumented workers range from as low as \$573 per unauthorized employee for a first offense to \$22,927 per employee for second and third offenses. Employers can face criminal charges, and owners and managers can face up to six months in prison if a pattern of hiring unauthorized workers is established.”

The penalties can add up to a considerable sum if investigators find out that undocumented workers were employed for a long period. For hiring illegal workers between 2003 and 2012, a Texas waste management company was fined \$5.5 million (<https://www.dallasnews.com/business/jobs/2018/08/30/waste-management-s-hiring-practice-in-west-texas-leads-to-5-5-million-penalty-over-immigrant-labor/>).

already lowered by the reallocation to verification duties. Thus, an increase of the prevailing management input following the introduction of employer sanctions is unlikely.

It might be argued that the way the verification of the legal status of the firm's labor force enters the analysis, namely that it taxes managers' time but not laborers' time, is not the only way to model verification. For example, it could have been assumed that verification takes primarily laborers' time; that, first round, the cost of verification is borne by the laborers; or that the production function of checking the status of laborers is the same as the regular production function (namely takes managers' and laborers' time in the same way as the production of the consumption good). Or even, for the purpose of verification, that laborers can become managers. What works against such possibilities, however, is that they involve turning the subjects of verification into verifiers: if the firm knew which laborers are legal and can become verifiers, and which laborers are illegal and cannot, the very tenet of the chapter would collapse. Moreover, there is an inherent and natural risk that laborers will turn a blind eye to the illegal status of fellow laborers. Thus, the need to assign managers - and not laborers - to the task of verification underlies the model's assumption.

As a final note: when it comes to the formation of immigration policies aimed at protecting the wellbeing of native workers, what at first sight can appear appealing may turn out to be adversarial. For example, Stark and Byra (2020) have shown that a policy of deportation of undocumented migrants can boomerang. Stark and Byra assume that the intensity of deportation serves as an indicator to the remaining undocumented migrants when they assess the probability of being deported. Stark and Byra find that a higher rate of deportation induces undocumented migrants to work harder. Assuming that the purpose of deportation policy is to reduce the aggregate labor supply of undocumented migrants in order to raise the wages of low-skilled native workers, Stark and Byra conclude that the policy can backfire: an increase in the labor supply of the remaining undocumented migrants can more than offset the reduction in the labor supply arising from the deportation of some undocumented migrants. Here, as in the study by Stark and Byra, the behavioral responses of others who are affected by a policy rather than of those who are the intended direct targets of the policy need to be taken account of so as to see to it that, inadvertently, the policy will not backfire.

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