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Abstract

In the United States today, more 300 jurisdictions (cities, counties and states) refuse to deport illegal immigrants even with criminal records in spite federal immigration law. Do such sanctuary jurisdictions necessarily attract more illegal aliens and as a consequence suffer from higher unemployment rates and more crime? In this paper we formally investigate these questions and discuss the conditions leading to such results. Examined also are the effects on immigration from raising minimum wages, enhancing tougher anti-crime policies and providing unemployment benefits to illegal immigrants.

Keywords: Illegal immigration, sanctuary city, frictional unemployment, crime, minimum wage

1 Introduction

In the U.S. there are more than 300 jurisdictions (cities, counties and states) today which refuse to deport illegal immigrants even with criminal records in

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spite of federal immigration law. In this paper we formally analyze the consequences of the decision for a jurisdiction to become a sanctuary - a policy we dub sanctuarization. Our analysis focuses on local residents' two main concerns. Does sanctuarization worsen unemployment? Does it give rise to more crime? To address these questions, we present a dynamic model in which both natives and immigrants commit crimes when unemployed. Workers can be unemployed for two reasons: minimum wage laws and search friction. More specifically, it is assumed that firms employing native workers are bound by the minimum wage law but that those employing illegal immigrants can evade the law, instead negotiating the wages directly and continuously with their employees; see, e.g., Pissarides (2000) and Rogerson, Shimer and Wright (2005).

As for modeling crime, we assume that individuals commit crime only when the benefit from crime exceeds its cost. Following Burdett et al. (2003), the cost of crime consists of the disutility of being arrested, convicted and incarcerated in prison. For illegal immigrants, there is an additional cost: the risk of being deported to their home countries. A sanctuary city eliminates this risk, which tends to increase the net benefit of crime and hence the immigrant's welfare. However, this risk elimination does not necessarily cause an influx of illegal immigrants into a sanctuary city. The reason is that sanctuarization causes the immigrant's wage to rise and hence labor demand to fall. If labor demand falls so much, immigrants move out of the jurisdiction instead of moving in there despite its decision to become a sanctuary. Thus, sanctuary cities do not necessarily attract more illegal immigrants and as a consequence suffer more crime compared with non-sanctuary cities. However, sanctuary cities always suffer from higher unemployment rates.

In addition to sanctuarization, we also examine the effects of other policies sanctuary cities may undertake to protect their native residents as well as illegal

immigrants. The following are our main findings. First, extending unemployment benefits to illegal immigrants enhances the effects of sanctuarization. On the other hand, enhancing anti-crime policies countervails them. Raising minimum wages to protect native workers does not increase their unemployment rates and may even increase aggregate employment - a result which may be of interest in the line of research investigating the positive relationship between minimum wages and employment (e.g., Card and Krueger 1994).

We conclude this section with a brief review of relevant literature. Formal analysis of illegal immigration dates back to Ethier (1986), who has studied immigration policy for a small host country which suffers from unemployment due to wage rigidity. His work has stimulated numerous extensions; see, e.g., Djajić 1987, Bond and Chen 1987, and Woodland and Yoshida 2006. Recent attention has turned to frictional unemployment.¹ For example, Liu (2000) has studied the model in which natives negotiate the wage with employers while immigrants receive a given fraction of the native's equilibrium wage. Chassamboulli and Palivos (2014) and Battisti et al. (2017) have regarded immigrants as legal and heterogeneous from natives with respect to substitutability with capital. These studies differ from ours in that they consider exogenous immigration inflows.² The present paper is also related to the recent analysis of immigration policy in a multi-country model by Miyagiwa and Sato (2018). Their focus however is on intergovernmental immigration policy conflict.³

The remainder of the paper is organized in four sections. The next section presents the model. Section 3 presents the main results. Section 4 investigates the effects of related policy measures: (a) extending unemployment benefit cov-

¹In addition, Carter (1998) has applied the Shapiro-Stiglitz efficiency-wage model to generate unemployment. In a two-country model Ortega (2000) has shown that the world is better with free labor mobility than labor autarky even in the presence of frictional unemployment.

²All three works contain calibration results based on the data from the U.S. (Liu 2000, Chassamboulli and Palivos 2014) and from multiple countries (Battisti et al. 2017).

³Also see, e.g., Mayr et al. (2012), Giordani and Ruta (2013), and Bandyopadhyay and Pinto (2017) in this literature

erages to illegal immigrants, (b) enhancing anti-crime measures and (c) raising the minimum wages. Section 5 concludes.

2 Model

In this section we present a continuous-time model of a jurisdiction (e. g., a city) in which firms produce the homogeneous good, which serves as numeraire.

2.1 Immigration decisions

A typical foreign-born worker has the lifetime welfare F if he stays in his country. If he decides to immigrate (illegally) to the destination country, he incurs a real travel cost τ to reach the border of that country. When crossing the border, he is apprehended by border patrol agents with probability $\beta \in (0, 1)$ and sent home. If he evades apprehension, he enters the country, chooses a jurisdiction j and looks for a job there. Thus, if we let U_{mj} denote his lifetime welfare during unemployment in jurisdiction j , an immigrant's expected net welfare equals $\beta F + (1 - \beta)U_{mj} - \tau$. For an interior equilibrium this welfare must equal his stay-at-home welfare F , i. e., $\beta F + (1 - \beta)U_{mj} - \tau = F$. Further, immigrants naturally choose to settle in the jurisdiction that gives them the highest welfare, so in equilibrium all jurisdictions yield the common welfare $U_{mj} = U_m$. Dropping the subscript j in the above equation, we can write:

$$U_m = F + T \tag{1}$$

where $T \equiv \tau/(1 - \beta)$ is the generalized cost of immigration. This equation shows that U_m depends on the tightness of border control β but is independent of local government policy.

2.2 Search

We now fix a jurisdiction and suppose that it is inhabited by N_n native workers and N_m illegal immigrants. (The subscript n and m denote native workers and immigrants, respectively.) We take N_n as exogenous but determine N_m endogenously. If we let I_i denote the number of individuals serving time in prison, the actual labor force is given by $L_i = N_i - I_i$.

There is no centralized labor markets in the model. Jobs are created when job seekers and firms with vacancies are matched randomly according to some matching function. Suppose that a job seeker finds a firm at rate $a(\nu)$ and a firm finds a job seeker at rate $q(\nu)$ per instant, where ν denotes the number of vacancies per job seeker. These two rates are not independent but related negatively by the equation $\nu q(\nu) = a(\nu)$ due to the homogeneity of the matching function. We write this relation as $q = q(a)$ and denote its derivative by $q'(a) < 0$, assuming differentiability.

2.3 Crime and punishment

In modeling crime we follow Burdett et al. (2003) in that individuals commit crime only if the benefit of crime exceeds its cost. However, for a complete analysis the presence of two types of workers gives rise to eight separate cases to consider, depending on the permutations over who commit crime and when. To keep the analysis under control, we focus in this paper only on the case in which workers commit crime only when they are unemployed. The selection of this case is justified by only unemployed workers have sufficient time to look for opportunities to commit crime. This has corroborating evidence. For example, Raphael and Winter-Ebmer (2001) have found that higher unemployment causes more crime, especially on property crime.

An unemployed type- i worker has the welfare U_i . Assume that he stumbles

on an opportunity to commit crime at exogenous rate θ per instant. If he does not commit crime, he secures welfare U_i . Should he commit a crime, however, he immediately gains the gross benefit $g > 0$ but runs the risk of getting arrested, convicted and imprisoned, which occurs with probability $\alpha \in (0, 1)$ and reduces his welfare to P_i . Of course he keeps welfare U_i if he is not arrested. Thus, crime has the expected benefit $g + \alpha P_i + (1 - \alpha)U_i$. An individual commit crime if this net welfare exceeds the secure welfare U_i , or

$$g + \alpha(P_i - U_i) > 0.$$

We assume this condition holds within the relevant parameter values.

We next calculate the welfare P_i from incarceration. Assume that a convicted criminal serves the average time $1/\phi$ in prison, where the Poisson rate $\phi > 0$ reflects a priori uncertainty in sentencing. The Poisson rate also indicates that a convict is released from prison at rate ϕ per instant. When released, a native worker moves to unemployment and looks for a job, causing the welfare change from P_n to U_n . If we assume that convicts receive no income, we can relate these two welfare values by the Bellman equation

$$rP_n = \phi(U_n - P_n).$$

With r denoting the rate of time preference, the left-hand side of this equation converts P_h into flow values whereas the right-hand side takes the standard form in financial economics for decomposing the asset value into the flow income ($= 0$ here) and the expected capital gain $\phi(U_n - P_n)$. Thus

$$P_n = \phi U_n / (r + \phi). \tag{2}$$

Immigrants differ from natives in that they may face deportation risk when

released from prison. Let $\delta \in [0, 1]$ denote this risk ($\delta = 0$ in a sanctuary jurisdiction). When an immigrant is deported to his home country, his welfare changes from P_m to F ; otherwise, he moves to unemployment, causing the welfare change $U_m - P_m$. Thus P_m satisfies the Bellman equation:

$$rP_m = \phi[\delta F + (1 - \delta)U_m - P_m].$$

Recalling that U_m is exogenous by (1), the above equation uniquely determines the equilibrium P_m

$$P_m = [\delta F + (1 - \delta)U_m]\phi/(r + \phi) = [F + (1 - \delta)T]\phi/(r + \phi) \quad (3)$$

subject only to the jurisdiction's policy parameters ϕ and δ .

Finally, victims of criminal activity suffers the exogenous welfare loss l . We assume that everyone in the labor force is equally likely to fall victim to crime (thus, the unemployed are also victimized while convicts are not) and obtain the victimization rate π endogenously below.

2.4 Firms

Every firm with a vacancy is identical and has the asset value V . A typical firm incurs search cost c and is matched with a worker at rate $q(a)$ as already mentioned. Search is undirected; that is, a firm does not know beforehand whether it will be matched with a native or an immigrant. It knows only that it will be matched with an immigrant with probability $\mu \in (0, 1)$. After a match, however, a firm learns a worker's type i and enjoys the asset value J_i . These asset values are related by the Bellman equation

$$rV = -c + q[\mu(J_m - V) + (1 - \mu)(J_n - V)],$$

where the bracketed term on the right denotes the “expected capital gain” from a match. Free entry drives V to zero, transforming the above equation into

$$\mu J_m + (1 - \mu)J_n - c/q(a) = 0. \quad (4)$$

The left-hand side is the normalized value of job creation. The equation will be referred to as the job-creation equation.

When matched with a type- i worker, a firm produces y_i units of the homogeneous good per instant. A firm matched with a native worker is bound by the minimum wage law and receives the flow profit $y_n - \underline{w} > 0$, where \underline{w} denotes the minimum wage. All active firms face idiosyncratic bankruptcy risk with the Poisson rate λ . Thus, the asset value J_n of the firm in question satisfies the Bellman equation

$$rJ_n = y_n - \underline{w} + \lambda(V - J_n).$$

With $V = 0$, this equation gives us the asset value

$$J_n = (y_n - \underline{w})/R \quad (5)$$

where we write

$$R \equiv r + \lambda.$$

A firm employing an immigrant is assumed to be able to evade the minimum wage law and negotiate the wage w_m directly and continuously with a worker. Since all firms bankrupt at rate λ , the asset value J_m satisfies the Bellman equation

$$rJ_m = y_m - w_m - \lambda J_m,$$

yielding

$$J_m = (y_m - w_m)/R. \quad (6)$$

2.5 Workers

When employed, a native worker receives the minimum wage \underline{w} . When the firm goes bankrupt (at rate λ), he moves to unemployment, suffering the welfare loss $U_n - E_n$. Thus, an employed native's welfare E_n satisfies the Bellman equation

$$rE_n = \underline{w} + \lambda(U_n - E_n) - \pi l, \quad (7)$$

where the last term on the right is the expected welfare loss due to crime per instant. When unemployed, a native receives unemployment benefits b_n and finds a job at rate a , which boosts his welfare from U_n to E_n . He also commits crime at the rate θ per instant for the net benefit

$$g + \alpha(P_n - U_n) > 0.$$

Thus, an unemployed native's welfare U_n must satisfy the Bellman equation

$$rU_n = b_n + a(E_n - U_n) + \theta[g + \alpha(P_n - U_n)] - \pi l,$$

where the last term on the right-hand side implies that unemployed workers also fall victim to crime. By virtue of (2) we can rewrite the net benefit as

$$g + \alpha(P_n - U_n) = g - \eta U_n > 0,$$

where $\eta = \frac{r\alpha}{r+\phi}$. Substituting this and solving the two Bellman equations, we obtain

$$E_n = [(r + a + \theta\eta)\underline{w} + \lambda(b_n + \theta g) - (R + a + \theta\eta)\pi l] / [R(r + \theta\eta) + ra] \quad (8)$$

$$U_n = [a\underline{w} + R(b_n + \theta g) - (R + a)\pi l] / [R(r + \theta\eta) + ra]. \quad (9)$$

Similarly, we have the Bellman equation

$$rE_m = w_m + \lambda(U_m - E_m) - \pi l \quad (10)$$

for an employed immigrant and

$$rU_m = b_m + a(E_m - U_m) + \theta[g + \alpha(P_m - U_m)] - \pi l \quad (11)$$

for an unemployed immigrant. We assume that b_m , unemployment benefits for illegal immigrants, is initially zero until later we examine the implications of extending unemployment benefits to illegals.

2.6 Determination of the immigrant's wage

An immigrant's wage is determined through Nash bargaining. Let $\gamma_m \in (0, 1)$ denote an immigrant's relative bargaining power. Nash bargaining implies that γ_m determines a worker's share of the total surplus generated by a match; that is, γ_m satisfies

$$E_m - U_m = \gamma_m(E_m - U_m + J_m - V).$$

Recalling that $V = 0$, we can rewrite the above as

$$(1 - \gamma_m)(E_m - U_m) = \gamma_m J_m \quad (12)$$

We can use (6) to substitute for J_m . To evaluate the left-hand side expression, let us rewrite the net benefit from crime as

$$S \equiv g + \alpha(P_m - U_m) \quad (13)$$

(note that S is exogenous). Substitute this into (11) and subtracting the resulting equation from (10) yields the desired expression

$$E_m - U_m = \frac{w_m - b_m - \theta S}{R + a}. \quad (14)$$

Substituting this into (12), we get

$$w_m = \frac{\gamma_m(R + a)y_m + R(1 - \gamma_m)(b_m + \theta S)}{R + \gamma_m a}. \quad (15)$$

Substitution of the wage into (6) and (14) yields

$$J_m = \frac{(1 - \gamma_m)[y_m - (b_m + \theta S)]}{R + \gamma_m a} \quad (16)$$

$$E_m - U_m = \frac{\gamma_m[y_m - (b_m + \theta S)]}{R + \gamma_m a} \quad (17)$$

2.7 Unemployment

We next determine the unemployment rates u_i . Given the labor force L_i , $(1 - u_i)L_i$ of type- i workers are employed while $u_i L_i$ are unemployed. Thus, $\lambda(1 - u_i)L_i$ employed workers lose their jobs and join unemployment while $a u_i L_i$ of the unemployed find jobs and move out of unemployment. In a steady state these two numbers must be equal and hence

$$u_i = \lambda/(\lambda + a) = u; \quad (18)$$

the unemployment rates are identical between natives and immigrants and depend on the job-acquisition rate a . Therefore the proportion of immigrants in the unemployment pool equals

$$(u_m L_m)/(u_m L_m + u_n L_n) = L_m/(L_m + L_n).$$

By the law of large numbers this ratio must equal the probability μ that a firm is matched with an immigrant:

$$\mu = L_m/(L_m + L_n) \tag{19}$$

Further, with uL_i type- i workers unemployed, θuL_i commit crime per instant and $\alpha\theta uL_i$ are arrested and sent to prison. Meanwhile, there are I_i type- i individuals in prison and ϕI_i are released per instant. In a steady state these numbers must equal; that is, $\phi I_i = \alpha\theta uL_i$. Hence

$$I_i = \alpha\theta uL_i/\phi. \tag{20}$$

Substitution into the identity $N_i = L_i + I_i$ enables us to relate the size of the labor force to the total population:

$$L_i = \frac{\phi}{\phi + \alpha\theta u} N_i \tag{21}$$

Finally, we compute the victimization rate. Since $\theta u(L_m + L_n)$ crimes are committed on $(L_m + L_n)$ individuals per instant, the victimization rate equals

$$\pi = \theta u = \theta\lambda/(\lambda + a) = \pi(a).$$

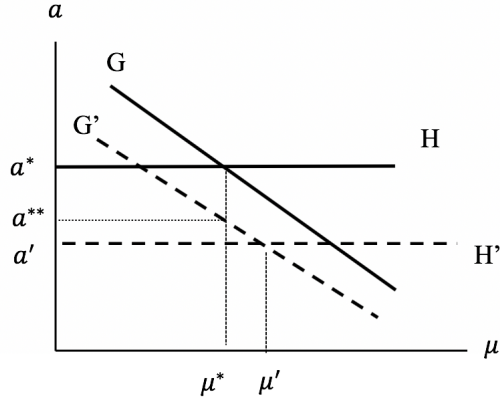


Figure 1: $G_\mu = J_m - J_n < 0$

This rate is inversely related to the job-acquisition rate due to the derivative

$$\pi_a = -\theta u / (\lambda + a) < 0.$$

This completes the description of the model.

2.8 Equilibrium

To solve the model we first substitute from (17) into (11) to obtain

$$H(a, S) \equiv \frac{a\gamma_m[y_m - (b_m + \theta S)]}{R + \gamma_m a} + (b_m + \theta S) - l\pi(a) = rU_m \quad (22)$$

The expression $H(a, S)$ represents an unemployed immigrant's flow welfare. In a steady state, this welfare flow equals rU_m defined by (1) due to free mobility of immigrants across jurisdictions. Thus, the above equation enables us to determine the equilibrium rate a , which we write a^* . In figures 1 and 2 below, equation (22) is represented by the schedule labeled H .

We next substitute for J_m and J_n from (16) and (5) respectively to rewrite the job-creation equation (4) as

$$G(a, \mu, S) \equiv \mu J_m + (1 - \mu)J_n - c/q(a) = 0. \quad (23)$$

The expression $G(a, \mu, S)$ represents the expected net profit from entry, which must equal zero in a steady state due to free entry of firms. In figures 1 and 2 we represent this equation by the schedule G . Differentiation yields

$$G_a = -\frac{\mu\gamma_m J_m}{R + \gamma_m a} + cq'/q^2 < 0$$

$$G_\mu = J_m - J_n = \frac{(1 - \gamma_m)[y_m - (b_m + \theta S)]}{R + \gamma_m a} - \frac{y_n - w}{R} \quad (24)$$

so G schedule is downward-sloping if $G_\mu < 0$ (or $J_n > J_m$) as in figure 1 and upward-sloping if $G_\mu > 0$ as in figure 2 below. Substituting a^* into (23), we can uniquely determine μ^* , the equilibrium probability with which firms are matched with immigrants. In the figures, the equilibrium a^* and μ^* are given by the intersection of the H schedule and the G schedule.

Once a^* and μ^* are determined, the other equilibrium values follow readily. The unemployment rates depend only on a ; thus $u^* = \lambda/(\lambda + a^*)$. So does the immigrant's wage via (15). Substituting u^* into (21) gives us the equilibrium native labor force

$$L_n^* = \frac{\phi}{\phi + \alpha\theta u^*} N_n. \quad (25)$$

We can then get the number of natives in prison from $I_n^* = N_n - L_n^*$. Substitution of L_n^* and μ^* into (19) gives us the immigrant labor force

$$L_m^* = \mu^* N_n / (1 - \mu^*) \quad (26)$$

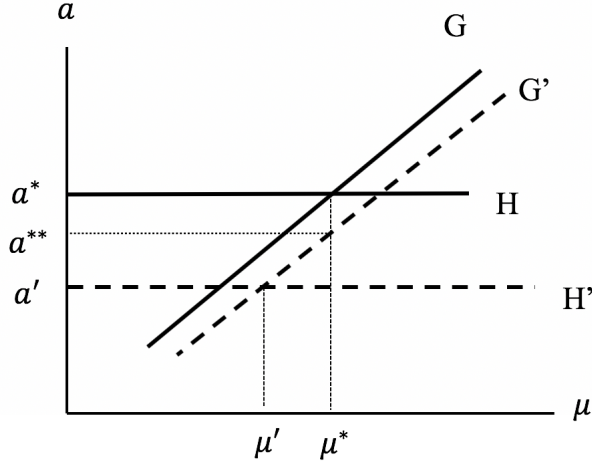


Figure 2: $G_\mu = J_m - J_n > 0$

which shows that the immigrant labor force grows only if μ^* increases. Substituting u^* and L_m^* into (20), we get the number of immigrants in prison: $I_m^* = \frac{\alpha\theta u^* \mu^*}{\phi(1-\mu^*)} N_n$. The total immigrant population is calculated from the identity: $N_m = L_m + I_m$; namely,

$$N_m^* = \frac{\mu^*}{1-\mu^*} \left(1 + \frac{\alpha\theta\lambda}{\phi(\lambda+a^*)} \right) N_n$$

3 Sanctuary City

We are now ready to study the effect of sanctuarization, i.e., a decision to decrease deportation risk δ , given $\delta > 0$. Since $dS/d\delta = (dS/dP_m)(dP_m/d\delta) > 0$ by (3), the effect of sanctuarization can be studied by observing the effect of increasing S . Differentiating (22) with respect to S yields

$$da^*/dS = -H_S/H_a < 0$$

where

$$H_S = \frac{\theta R}{R + \gamma_m a} > 0$$

$$H_a = \frac{R(E_m - U_m)}{R + \gamma_m a} - l\pi_a > 0.$$

Thus, sanctuarization decreases the equilibrium a , shifting the H schedule downward, say to H' , as shown in figures 1 and 2. A falling a causes the unemployment rate and the immigrant's wage to increase.

Proposition 1. (a) $da^*/dS < 0$; (b) $du^*/dS > 0$; (c) $dw_m^*/dS > 0$.

To see the effect on μ , we differentiate (23) to obtain

$$d\mu^*/dS = -(G_a da^*/dS + G_S)/G_\mu = \frac{H_S G_a - G_S H_a}{H_a G_\mu}.$$

The derivative

$$G_S = -\frac{(1 - \gamma_m)\theta\mu}{R + \gamma_m a} < 0,$$

says that sanctuarization decreases the expected profit from entry, other things being equal. To sign $d\mu^*/dS$, we make appropriate substitutions to rewrite

$$\begin{aligned} & H_S G_a - G_S H_a \\ &= \left(-\frac{\mu\gamma_m J_m}{R + \gamma_m a} + cq'/q^2 \right) \frac{R\theta}{R + \gamma_m a} - \left(-\frac{(1 - \gamma_m)\theta\mu}{R + \gamma_m a} \right) \left(\frac{R(E_m - U_m)}{R + \gamma_m a} - l\pi_a \right) \end{aligned}$$

$$= \frac{\theta}{R + \gamma_m a} \left[\frac{Rc q'}{q^2} - (1 - \gamma_m) \mu l \pi_a \right]. \quad (27)$$

where the second equality follows from 12). Both terms in the bracketed expression are negative because $q' < 0$ and $\pi_a < 0$; hence (27) cannot be uniquely signed. Recalling that $H_a > 0$, however, we obtain

Proposition 2. $d\mu^*/dS > 0$ if and only if

$$\left[\frac{Rc q'}{q^2} - (1 - \gamma_m) \mu l \pi_a \right] G_\mu > 0. \quad (28)$$

We now show that condition (28) holds in figure 1 but is violated in figure 2. To this end, note that condition (28) is equivalent to

$$(H_S G_a - G_S H_a) G_\mu > 0.$$

Assume for now that $H_S G_a - G_S H_a > 0$. Then, condition (28) is satisfied in figure 1, where $G_\mu < 0$ but violated in figure 2, where $G_\mu > 0$. We next demonstrate that $H_S G_a - G_S H_a > 0$ if and only if

$$da/dS|_H < da/dS|_G < 0; \quad (29)$$

where

$$\partial a / \partial S|_H = -\frac{H_S}{H_a} = -\frac{\theta R}{R(E_m - U_m) - (R + \gamma_m a) \pi_a} < 0.$$

$$\partial a / \partial S|_G = -\frac{G_S}{G_a} = -\frac{\mu \theta (1 - \gamma_m)}{\mu \gamma_m J_m - (R + \gamma_m a) c q' / q^2} < 0$$

are obtained by differentiating (22) and (23), respectively. These derivatives indicate how much each schedule shifts downward (a falls) as a result of sanctuarization. The demonstration of our claim is immediate because taking the

difference yields

$$\partial a / \partial S|_H - \partial a / \partial S|_G = -\frac{H_S}{H_a} + \frac{G_S}{G_a} = -\frac{H_S G_a - G_S H_a}{H_a G_a}.$$

where $G_a < 0$ and $H_a > 0$. Thus under condition $H_S G_a - G_S H_a > 0$ the H schedule shifts down more than the G schedule as in figures 1 and 2, where the schedule H shifts to H' and the schedule G shifts to G' . As a result, μ is increased in figure 1 and decreased in figure 2, in consonance with proposition 2.

As we show in the appendix, a , μ and all the other variables (with the exception of the unemployment rates) jump immediately to the new stationary values without transition dynamics - a common property of equilibrium unemployment models (Pissarides 2000). However it is still useful to understand intuitively why they change the way they do.

We have seen that elimination of deportation risk raises the unemployed immigrant's welfare above the steady-state value rU_m . This cannot persist in equilibrium. To reach a new steady state the job-acquisition rate a must fall sufficiently to counterbalance the initial welfare increase. At the same time, the initial welfare increase implies that immigrants have a higher reservation utility in wage bargaining, which emboldens them to demand higher wages (proposition 1) and turns the expected profit from entry negative in the job-creation equation. This cannot persist in equilibrium, either, calling for changes in a and μ to bring the profit up to zero in a new steady state.

Figure 1 shows that a must fall to a' to counterbalance the initial welfare increase. However, a needs to fall only to a^{**} to bring the profit up to the steady-state value, holding μ constant. In fact, at $a' < a^{**}$, the profit overshoots its target and becomes positive. This overshooting must be corrected by a change in μ . Since $G_\mu = J_m - J_n < 0$, the required correction calls for μ to rise to μ'

to bring the profit down to zero. The situation depicted in figure 2 is similar except that, since $G_\mu = J_m - J_n > 0$ there, the profit can be brought down to zero by a fall in μ as stated in proposition 2.

The case with $H_S G_a - G_S H_a < 0$ is analyzed analogously. Since the schedule G shifts down more than the schedule H , when the welfare is restored to its equilibrium value uU_m , the profit undershoots its target. This shortfall is redressed by a decrease in μ when $G_\mu < 0$ and an increase in μ when $G_\mu > 0$ in consistence with proposition 2.

Since sanctuarization raises the unemployment rates (proposition 1), more natives turn to crime and end up in prison. As a result, a new native labor force is smaller by (25). In contrast, a new immigrant labor force may be greater; (26) shows that the immigrant labor force is larger ($dL_m/dS > 0$) if and only if $d\mu/dS > 0$. If there are more immigrants in the labor force, a higher unemployment rate implies that more of them are unemployed and hence committing more crime. Even if fewer of them are in the labor force, more immigrants may be unemployed due to a higher unemployment rate. Thus, it is still possible that there is more crime by immigrants. The next proposition summarizes the above findings.

Proposition 3:

(a) Sanctuarization increases crime by natives and diminishes the native labor force.

(b) If (28) holds, sanctuarization results in a greater immigrant labor force and more crime by immigrants.

(c) If condition (28) is violated, sanctuarization diminishes the immigrant labor force but there may still be more crime by immigrants.

We close this section by examining the welfare impact of sanctuarization. The unemployed immigrant's steady-state welfare is fixed at U_m by (1) and

hence insensitive to the local government's policy changes. By virtue of (17) the employed immigrant's welfare satisfies

$$E_m = U_m + \frac{\gamma_m[y_m - (b_m + \theta S)]}{R + \gamma_m a}.$$

Differentiation yields

$$dE_m/dS = -\theta\gamma_m/(R + \gamma_m a) - \gamma_m(E_m - U_m)/(R + \gamma_m a)(da^*/dS) \quad (30)$$

Substituting for da^*/dS and arranging the result, we get

$$dE_m/dS = \frac{\theta\gamma_m l\pi_a}{R(E_m - U_m) - (R + \gamma_m a)l\pi_a} < 0;$$

employed immigrants are always harmed, independently of the sign of G_μ . This welfare loss is due to an increase in the victimization rate.

As for natives, differentiation of (9) and (8) with respect to a yields, respectively:

$$dU_n/da = \frac{R[(r + \theta\eta)\underline{w} - r(b_h + \theta g) - \theta\eta\pi l]}{[R(r + \theta\eta) + ra]^2} - \frac{(R + a)l\tilde{\pi}_a}{R(r + \theta\eta) + ra} > 0$$

$$dE_n/da = \frac{\lambda[(r + \theta\eta)\underline{w} - r(b_h + \theta g) - \theta\eta\pi l]}{[R(r + \theta\eta) + ra]^2} - \frac{(R + a)l\tilde{\pi}_a}{R(r + \theta\eta) + ra} > 0.$$

Since $da/dS < 0$, $dU_n/dS < 0$ and $dE_n/dS < 0$. Natives are harmed by sanctuarization not only because the victimization rate is higher but because the job-acquisition rate has declined.

Proposition 4: Sanctuarization always harms natives.

4 Extensions

4.1 Unemployment benefits for illegal immigrants

Many sanctuary cities not only shield illegal immigrants from deportation but provide them with unemployment benefits. An inspection shows that b_m and S appear only in the form $(b_m + \theta S)$ and that neither term appears independently of each other anywhere in the model. It follows immediately that an increase in b_m has qualitatively the same effect as an increase in S .

Proposition 5: Providing illegal immigrants with unemployment benefits has qualitatively the same effects as sanctuarization.

4.2 Anti-crime policy

Our model is also useful in evaluating the effects of anti-crime policies. In our model the jurisdiction can crack down on crime by catching more criminals (increasing α) and/or meting out longer sentences to convicted criminals (lowering ϕ). Both these measures generate the effects qualitatively opposite to those yielded by sanctuarization. The reason is that both policy parameters appear only as components of S in (22) and (23) and nowhere else in the model. For example, increasing α decreases S ($dS/d\alpha = P_m - U_m < 0$), decreasing the unemployment rates by proposition 1. However, the preceding analysis implies that lower unemployment rates do not necessarily mean less crime. If (28) holds, an increase in α induces a fall in μ , causing the immigrant labor force to shrink by virtue of (26). Then, we can conclude with certainty that a low unemployment rate implies less crime by immigrants. However, if (28) is reversed, μ increases, expanding the immigrant labor force. In this case, there can be more crime by immigrants in spite of a fall in unemployment rates. Turning to the native labor force, it is evidently clear that a lower unemployment rate implies

natives commit fewer crimes. However, since the arrest rate is higher, more native criminals are caught and imprisoned. As a result, the native labor force can be smaller; cf. (25). The results from meting out tougher sentences (a fall in ϕ) have similar effects because $dS/d\phi = r\alpha P_m/(r + \phi) > 0$.

A community can also fight crime through more enhanced neighborhood watch. Increased degrees of vigilance lower θ , making it more difficult for criminals to find opportunities to commit crime. Since θ appears only in the form θS in (22) and (23), this policy also countervails sanctuarization like the other two anti-crime policies examined above. However, there is one difference. With falling unemployment rates, we have $dL_n/d\theta < 0$ by (25); an increase in vigilance expands the native labor force unambiguously while reducing the number of crimes committed by natives. We summarize the findings in

Proposition 6. (a) All three anti-crime policies countervail sanctuarization, reducing unemployment rates and lowering the immigrant's wage.

(b) If (28) is satisfied, all three anti-crime policies result in a smaller immigrant labor force and less crime by immigrants.

(c) Increased vigilance results in less crime by natives while enlarging the native labor force.

4.3 Raising the minimum wage

In recent years, many jurisdictions have raised minimum wages. What are the impacts of such a policy change in the presence of immigration? An increase in w makes employment of native labor more expensive, decreasing the expected profit through (5), but it has no impact on equation (22). In other words, an increase in minimum wages shifts down the schedule G while keeping the schedule H intact. As a result, raising the minimum wage has no effect on the job-acquisition rate. Hence, the unemployment rates are unaffected. It follows

that it has effect neither on the size of the native labor force nor on the number of crimes committed by natives.

A downward shift of the schedule G causes μ^* to fall if $G_\mu < 0$, shrinking in the immigrant labor force and decreasing crime by immigrants. If $G_\mu > 0$, these results are reversed so that there are more immigrants in the labor force. In this case, since the native labor force is unaffected, we observe an increase in total employment as a result of higher minimum wages, the possibility that has caught attention since the work by Card and Krueger (1994). We summarize the effect of higher minimum wages in

Proposition 7.

- (a) $da^*/d\underline{w} = du^*/d\underline{w} = 0$,
- (b) $dL_n^*/d\underline{w} = 0$; $dI_n^*/d\underline{w} = 0$
- (c) $dL_m^*/d\underline{w} < 0$ and $dI_m^*/d\underline{w} < 0$ if and only if $G_\mu < 0$.

4.4 Alternative wage determination schemes

We have so far assumed that natives are paid the minimum wage while illegal immigrants negotiate wages directly with employers. While we believe this is a most relevant scenario in many jurisdictions, in this subsection we explore the implications of alternative scenarios. First, suppose that both natives and immigrants negotiate wages with employers. Then, by an appeal to the analogous procedures used above, we can determine the native wage and the asset value of firms employing natives:

$$J_n = \frac{(1 - \gamma_n)(y_n - b_n)}{R + \gamma_n a}$$

where γ_n is the measure of a native's bargaining power. Substituting this into the job-creation equation (23) gives us the following restatement of proposition 2:

Proposition 2': $d\mu^*/dS > 0$ if and only if

$$\left[\frac{Rc q'}{q^2} - (1 - \gamma_m)\mu l \pi_a - \left(\frac{\gamma_n(1 - \mu)J_n}{R + \gamma_n a} \right) \left(\frac{R\theta}{R + \gamma_m a} \right) \right] G_\mu > 0.$$

The addition of the third term makes the bracketed expression more likely to be negative compared with our original model but does not affect our qualitative results.

As a second alternative, suppose that both natives and illegal immigrants are paid the minimum wage. Then, sanctuarization has no effect on the asset value of firms employing immigrants and hence leaves the the G schedule intact. As the H schedule shifts down, μ increases if and only if $G_\mu = J_m - J_n < 0$. Thus these alternative scenarios yield results similar to those stated in propositions 1 and 2.

5 Concluding remarks

We have presented a model of a jurisdiction (city, country and state) and studied the effect of sanctuarization. Sanctuarization eliminates deportation risk for illegal immigrants, making the jurisdiction more attractive to illegal immigrants, other things being equal. However, sanctuarization also diminishes labor demand, a point that has received little attention. If too many jobs are destroyed, immigrants find the jurisdiction less attractive in spite of its sanctuary status. Thus, sanctuary cities do not necessarily attract more illegal immigrants nor suffer from more crime by immigrants compared with non-sanctuary cities.

We have also examined the effect of other related policies available to jurisdictions. Extending unemployment insurance benefits to illegal immigrants is qualitatively identical to sanctuarization whereas anti-crime policies have countervailing effects. Raising minimum wages has no effect on unemployment rates

and may even increase total employment in the jurisdiction.

The foregoing results are derived from the model where both native and immigrants commit crime when they are unemployed but not when they are employed. Although we believe this is the most relevant scenario, it may be useful to extend the analysis to other taxonomical cases. Alternative modeling strategies are also conceivable; for example, instead of having unemployed workers commit crime, we could introduce heterogeneity among workers so that crime is committed only by those individuals having compunction towards crime below a cutoff level. All these extensions are left for future research.

Appendix

Out-of-steady-state dynamics

When the economy moves out of steady-state values, the equation for the asset values of a firm employing an immigrant is modified to

$$rJ_m = y_m - w_m + \lambda(V - J_m) + \dot{J}_m, \quad (31)$$

where the dot indicates time derivatives ($\dot{x} = dx/dt$). The equations for the welfare of an employed and unemployed immigrants undergo similar changes:

$$rE_m = w_m + \lambda(U_m - E_m) - \pi l + \dot{E}_m \quad (32)$$

$$rU_m = a(E_m - U_m) + b_m + \theta S - \pi l + \dot{U}_m. \quad (33)$$

These three equations combine to yield

$$(r + \lambda)(E_m - U_m + J_m - V) = y_m - b_m - \theta S - a(E_m - U_m) + \dot{J}_m + \dot{E}_m - \dot{U}_m \quad (34)$$

If we let Σ_m denote the total surplus from a match, then

$$\Sigma_m = E_m - U_m + J_m - V$$

and hence

$$\dot{\Sigma}_m = \dot{E}_m - \dot{U}_m + \dot{J}_m - \dot{V}.$$

Since firms can enter freely and that immigrants can move freely across jurisdictions at any date, we can put $V = \dot{V} = 0$ and $\dot{U}_m = 0$ while U_m is given by (1). Substituting these values, we can rewrite (34) as

$$R\Sigma_m = y_m - b_m - \theta S - a(E_m - U_m) + \dot{\Sigma}_m$$

where $R = r + \lambda$ as in the main text. Nash bargaining implies that $E_m - U_m = \gamma_m \Sigma_m$. Substituting this, we can rewrite the above equation as

$$(R + \gamma_m a)\Sigma_m = \dot{\Sigma}_m + y_m - b_m - \theta S. \quad (35)$$

Letting $R + \gamma_m a(t) \equiv P(t) > 0$ and $y_m - b_m - \theta S \equiv z > 0$, the above equation is written more compactly:

$$\dot{\Sigma}_m(t) - P(t)\Sigma_m(t) + z = 0$$

This differential equation has the general solution

$$\Sigma_m(t) = e^{\int_0^t P(x)dx} \int_0^t z e^{-\int_0^x P(v)dv} dx + c e^{\int_0^t P(x)dx}$$

where c is a positive constant. Regardless of $a(t)$, $P(x) > 0$ and hence $\Sigma_m(t)$ does not converge. Thus (35) holds only if $\dot{\Sigma}_m = 0$; that is,

$$\Sigma_m = \frac{y_m - b_m - \theta S}{R + \gamma_m a}$$

is stationary. This implies that when the economy is disturbed, a jumps immediately to its new steady-state value. This is in reflection of agents' forward-looking behavior (rational expectations) and is standard in the equilibrium unemployment models (Pissarides 2000). The absence of transition dynamics implies that the number of jobs and the immigrant's wage also jump immediately to their stationary values. Since $V = \dot{V} = 0$, the job-creation equation

$$\mu J_m + (1 - \mu) J_n - c/q = 0.$$

holds at any date. The surplus-sharing rule gives us $J_m = (1 - \gamma_m)\Sigma_m$ and hence the job-creation equation implies that

$$\dot{\mu} = 0;$$

thus, μ also jumps immediately to its stationary value, forcing L_m to do the same. In contrast, the unemployment rate adjusts slowly according to the equation

$$\dot{u} = -(\lambda + a)u + \lambda$$

converging to the steady-state rate $u^* = \lambda/(\lambda + a)$. This indicates that the number of immigrants in prison changes according to the differential equation $\dot{I}_m = \theta\alpha u(t)L_m - \phi I_m$. (Although immigrants with criminal records in non-sanctuary cities are deported with probability δ when released prison, they are immediately replaced by new immigrants.) Thus, if we do not care about the identities of individual immigrants, the equilibrium outcome is as if all

immigrants move to unemployment when released from prison.)

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