

Sex Work and Infection: What's Law Enforcement Got to Do with it?*

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Abstract

A number of countries are pursuing the regulation of sex work in order to decrease the spread of sexually transmitted infections (STIs) and to reduce the probability of a generalized HIV/AIDS epidemic. We study the effects of enforcing licensing regulation laws on sex worker STI rates using nationally representative sex worker data from Ecuador. We find that increasing enforcement in the street sector significantly decreases STIs. However, increasing enforcement in the brothel sector increases the probability of a sex worker ever being infected with any STI. Increasing enforcement in the street shifts sex workers from the more risky street into the less risky brothels and increases street prices, reducing the overall number of street clients. As a result overall infection rates fall. In contrast, increasing enforcement in the brothel sector can exacerbate public health problems by inducing some unlicensed brothel sex workers into the riskier street sector.

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A large portion of the approximately 20,000 people who each day acquire the human immunodeficiency virus (HIV), are infected through unprotected sex with sex workers (UNAIDS, 2002). Indeed, sex workers play a central role in the spread of HIV and other sexually transmitted infections (STIs) as they have higher infection rates and more sexual partners relative to the general adult population in many countries (World Bank, 1999). A number of countries are trying to reduce the spread of sexually transmitted infections, especially the HIV virus, by regulating sex work.¹ These policies are especially interesting to countries with low HIV prevalence rates who are trying to lower the odds of a generalized pandemic through prevention efforts in key populations from which an HIV/AIDS pandemic could emanate such as sex workers.

Under regulation sex work is legal if the sex worker obtains a license certifying that she is healthy and clean of infection based on frequent STI tests as well as medical check-ups. The objective is to use universal testing to identify infected sex workers, remove them from the work force, and treat them before they return to work so as to prevent them from infecting others. This is consistent with the standard epidemiological model method of combating infectious disease epidemics such as an outbreak of influenza or TB, which is to identify those infected, isolate them from the general population, treat them if possible, and only return them to the general population when cured.

However, the standard epidemiological model is problematic in the case of combating STIs among sex workers because there are large costs to being tested as well as a large opportunity cost to being identified as infected and removed from the population. Typically, sex workers have to pay substantial fees for the tests both in terms of time and money, and they have substantial lost earnings from being isolated while being treated. In addition, if they are found to be HIV positive they cannot return to work as there is no cure. As a result, there is likely substantial non-compliance with the licensure regulations, thereby mitigating the effectiveness in reducing infection rates. Hence, in the case of sex work, the licensure regulation is typically accompanied by stiff penalties, both in terms of monetary fines and possible incarceration, for non-compliance.

¹Some countries where regulatory policies have been debated and/or implemented include Argentina, Australia, Belgium, Canada, Kenya, Mexico, New Zealand, and Thailand (Platt, 2001; Kohm and Selwood, 2004; Jordan, 2005). South Africa was contemplating legalizing and regulating its sex market in time for the 2010 World Cup.

In this paper, we study the effects of enforcing licensing regulation on sex worker STI rates using a nationally representative sex worker dataset from Ecuador that we collected in 2003. The dataset is unique in that it combines socio-economic information and labor supply with sex worker biological markers of sexually transmitted infections. In Ecuador, sex work is legal in institutions such as brothels and nightclubs with a license, but the police often treat soliciting on the street as illegal. Local police enforce licensing and the rules against solicitation on the street through surprise raids. Sex workers are fined and sometimes jailed if they are found to be in violation. Despite this, close to 30 percent of workers in brothels, bars and nightclubs do not comply with the licensure laws and slightly more than one-quarter of all sex workers are on the street.

We exploit regional variation in enforcement and find that sex worker STI rates are lower in cities where local police conduct more surprise raids on the street. We find the increased enforcement on the street is associated with a smaller number of sex workers having an STI, but, surprisingly, increased enforcement in the brothel is associated with higher infection rates. Specifically, we find that increasing enforcement by one standard deviation per month in the street is significantly associated with a 27 percent lower rate of sex workers being currently infected with syphilis, chlamydia, and/or gonorrhea and an 11 percent lower rate of ever having any STI. In contrast, we find increasing enforcement by one standard deviation in the brothel sector is significantly associated with a 16 percent higher probability of ever being infected with any STI.

We then examine the mechanisms by which enforcement affects infection rates and find that they are not necessarily the epidemiological identification of isolation and treatment of infected sex workers. We argue that enforcement theoretically changes market returns in two ways. First, increased enforcement raises the fixed costs of working on the street or in a brothel without a license relative to the less risky setting of working in a brothel and complying with the licensure regulation. Second, increased enforcement causes sex workers to raise their prices for both protected and unprotected sex, and thereby reduces the number of both types of sexual transactions and hence the risk of infection. We find strong empirical evidence that both pathways are operative in Ecuador.

Our examination of the pathways explains why increased enforcement on the street is

associated with lower STI rates, but increased enforcement in the brothels is associated with higher STI rates. Increased enforcement on the street raises the fixed costs of working on the street relative to working in a brothel with or without compliance. The brothel is a less risky setting as clients demand less unprotected sex and STI rates are lower. Indeed, we find in the empirical work that increased street enforcement is associated with higher participation in the brothel sector and lower participation in the street. On the other hand, increased enforcement in the brothel raises the fixed costs of working in a brothel without a license relative to both staying in the brothel with a license and relative to working on the street. In the empirical work we find increased brothel enforcement is associated with increased participation in the riskier street sector. This suggests that increased brothel enforcement causes some brothel workers without licenses to move to the street where there is more risk, though some do stay in the brothel and comply with the licensing requirements.

Our paper not only contributes to the literature on the economics of epidemiology, especially HIV/AIDS, but also to the literature on regulation and enforcement. Research shows that increased law enforcement can decrease various social ills such as crime (Becker, 1968; Levitt, 1997; Corman and Moci, 2000; Di Tella and Schargrodsky, 2004) and substance abuse such as cigarette smoking, binge alcohol drinking, and drug use (Grossman, 2005). To our knowledge, however, there is no existing research testing the effectiveness of sex worker regulation. In addition, our paper contributes to more general literature on regulatory offsetting effects where individuals and/or firms alter their behavior to mitigate the effectiveness of regulation (see for example, Crandall and Graham (1989); Levine and Staiger (2004); Di Tella and Schargrodsky (2004); Peltzman (1975); Peterson, Hoffer, and Millner (1995)).

We begin the paper by describing the institutional setting in terms of how the sex work industry in Ecuador is organized and regulated. We then describe our survey and data and use those data to examine the reduced form effects of increased enforcement on sex worker STI rates. We establish the major finding of this paper that increasing police presence in the street sector is most effective in decreasing disease. We also establish that increasing police enforcement in the brothel sector has no significant effect on current disease outcomes and increases the probability of a sex worker ever having had an STI. The rest of the paper is dedicated to sorting out the mechanisms to explain these reduced form results.

1 Background

Ecuador, like most countries, does not have a generalized HIV/AIDS epidemic. In fact, the 2003 national Ecuadorian adult HIV/AIDS prevalence was only 0.3 percent (UNAIDS, 2004). In 2000, the HIV/AIDS prevalence of sex workers in Guayaquil was 1.7 percent, 0.5 percent in Quito, and 1.1 percent in Esmeraldas (Chiribofa, Alaba, Almeida, Acosta, and Orozco, 2001). However, while the risk of HIV infection is low, the risk of being infected with another STI is much higher. Twenty-three percent of sex workers in our sample self-reported experiencing some type of STI in the last year and 52 percent reported ever having an STI. At the time of the survey, 8 percent of sex workers actually tested positive for chlamydia, syphilis, or gonorrhea. These STI rates are much higher than the general adult population in Ecuador.

The fact that the STI infection rate is so much higher than the HIV rate raises the concern of a likely rise in HIV infection in the near future (Centers for Disease Control & Prevention, 2004). This is because a high incidence of STIs means low condom use and untreated STIs facilitate easier transmission of the HIV virus. For example, Africa currently has very high HIV transmission rates and this is very likely due to high rates of untreated sexually transmitted infections (Oster, 2005). Policy interventions that focus on reducing and treating STIs will most likely decrease HIV transmission rates.

In Ecuador and much of Latin America, regulating the sex market through licensure has been a key policy response to decrease the spread of STIs. In Ecuador, there are thought to be about 40,000 female sex workers. This number is obviously an underestimate as sex workers are a hard-to-reach population due to the clandestine nature of their work. The majority of sex workers typically work in one of three environments: (i) the brothel sector where they comply with licensing requirements, (ii) the brothel sector where they do not comply with the licensing requirements and risk getting fined, or (iii) the street sector where sex workers are subject to substantial harassment by the police.

1.1 The Regulation

In Ecuador there is no law that criminalizes sex work. In fact, the only legal document in which sex work is mentioned is the national Health Code of Ecuador (Tamayo, 2004), which

states that sex work inside of ‘closed establishments’ should be monitored by the Ministry of Health. In this paper we refer to these closed establishments such as brothels and nightclubs as the “brothel sector.” However, this law does not mention other more informal sex worker sites such as the street, bus stops, parks, etc. We refer to these informal sites as the “street sector.” While there is no formal law, the police often treat solicitation on the street and other informal sites as illegal using regulations against loitering and/or vagrancy.

Monitoring sex work in brothels has taken the form of a “carnet,” which is an occupational license certifying good health status of a sex worker. The license has been designed in such a way that it is very difficult to forge. It looks like a passport that includes a photograph of the sex worker as well as official stamps with dates and signatures from doctors at the Ministry of Health each time the sex worker receives a health check-up. To obtain the license, sex workers must bring proper identification, two photographs, and negative test results for syphilis, chlamydia, and HIV/AIDS to the local Ministry of Health clinic. The license is revoked with a positive HIV test result and can be suspended during STI outbreaks.

The cost of the license is borne by the sex worker and is very expensive. The initial cost of all this is approximately 25 dollars. To keep the license updated, sex workers are required to return to the clinic every 8-15 days for a gynecological check-up. Each visit costs approximately 2 dollars, not including medicine and potential treatment if the sex worker tests positive for disease. Sex workers are also required to take HIV tests every 6 months. The initial HIV test costs 3 dollars, but if the results are inconclusive, then they must pay 18 dollars for a Western Blot.² In addition, they must take syphilis tests every 2 months (1-2 dollars), and chlamydia and herpes every 4 months (10 dollars).

In focus groups, sex workers report that the cost of obtaining and maintaining the license is very burdensome and there is a lot of aggravation and hassle associated with maintaining the license. Sex workers must pay the costs of lab fees associated with STI and HIV tests, medicine, transportation to the health clinic, and all other costs associated with acquiring and maintaining the license. Sex workers find it very costly to pay for the exams, tests, and medicine given an hourly wage of about US\$5 per hour. In addition, there is often only one health center in town that treats sex workers. Travel to that one clinic and waiting to be

²A more specific HIV test to confirm if someone is truly HIV positive, as there are other conditions which may give a false positive HIV screening test.

seen by the doctor can take the majority of an entire day. This is obviously time that could be spent working or doing other things. As a result, enforcement of health regulation could have the unintended consequence of encouraging sex workers to work in informal street areas where sexual practices are more risky. In other words, since regulation is costly to sex workers and clients are willing to pay a premium for non-condom sex (Gertler, Shah, and Bertozzi, 2005; Rao, Gupta, Lokshin, and Jana, 2003; Robinson and Yeh, forthcoming), enforcement could actually promote risky behavior.

1.2 Enforcement and fines

While the license is obtained and maintained through the local Ministry of Health office, local police are responsible for the enforcement of the licensing requirements in brothels and the ban on solicitation in the streets. Indeed, local Ministries of Health have neither the jurisdiction nor resources to enforce the license. Most cities in Ecuador are relatively small and have a concentrated red light district where brothels and street sex workers are located. Police conduct raids in these areas to check sex workers licenses and identify street workers. Raids are simply large-scale exercises to check as many sex worker licenses in brothels and street sites as possible. Both sex workers and police report that raids are always surprise visits. Importantly, brothel owners are not fined for employing unlicensed sex workers.³

In this paper, “enforcement” is defined as the average frequency of police raids per month to check sex worker licenses and the average frequency of police raids per month to find workers soliciting on the street in each city. While this is a crude measure, it captures the variation in numbers of raids across cities.⁴ Information from administrative records indicates that on average, police raid brothels about 1.28 times per month compared to about once every 5 months in the street sector. Interviews with sex workers confirm that the amount of enforcement is much higher in the brothel sector than in the street sector.

Brothel sex workers who do not have a license or have an expired license and sex workers on the street found soliciting are fined and can be ejected from the location. Brothel sex

³Sex workers have been suggesting that this rule be changed so that brothel owners instead of sex workers have to pay the fine for unlicensed sex workers. In addition, they have been pushing for the government to pay for all costs associated with obtaining and maintaining the carnet. However, at the time of the survey, the rule was that sex workers be fined and pay for all carnet expenses.

⁴The police were not able to give us information on how many sex workers are fined per raid.

workers report the first fine is generally around 20 US dollars, while street sex workers report paying substantially more and that they are many times jailed. Sex workers report that the fine increases for repeat offenders and in the extreme the police sometimes demand that sex workers pay the fine in sexual services. Repeat offenders become known, which results in more aggravation and harassment from the police.

Female sex workers were surveyed in the cities of Quito, Guayaquil, Machala, Esmeraldas, Santo Domingo, Quevedo, Milagro, and Daule. Enforcement in these 8 cities is a similar measure since red light districts are of a similar size. However, this is not the case for Guayaquil and Quito, the two largest cities in our sample which have various red light districts throughout the city.⁵

2 Data Collection

We use data on female sex workers collected in 2003 together with the Juan Cesar Garcia Institute as part of the Frontiers Prevention Project (FPP), a national Ecuadorian HIV/AIDS and STI prevention project. We developed the sampling frame by mapping the locations of the universe of sex workers. The mapping methodology first identified the gathering points for sex workers and then estimated the population size at each site. Potential sites were identified through interviews with key informants (i.e. taxi drivers, police, sex workers, pimps, madams, bar owners, workers at nongovernmental organizations, medical personnel, etc.). Every attempt was made to ensure that the survey was representative of the sex worker population. However, such an approach is biased in favor of sites that concentrate formal sex work and will miss many of the informal situations such as the case in which a woman occasionally sells sex out of her home. Target sample sizes were calculated on the basis of estimates of the prevalence of condom use, with 90 percent power and a 5 percent significance level. The resulting sample sizes are 1629 licensed brothel workers, 666 unlicensed brothel workers, and 619 street sex workers for a total of 2914 sex workers.

A multidisciplinary team, including local researchers, developed the survey questionnaire. In order to minimize misreporting and collect the highest quality data, former sex workers were trained and hired to be the enumerators as members of high risk groups often feel more

⁵We can estimate the main analysis excluding Guayaquil or Quito if there is concern these cities might be different relative to the other cities and are driving the results; the results are robust to this exclusion.

comfortable responding to sensitive issues with members of their own peer group. Interviews took place at sex worker work places and meeting points. In fact, survey response rates were extremely high and less than 5 percent of women refused to participate. The survey includes detailed sex worker characteristics, information about sex work history and recent transactions, and measures of STIs.

A unique component of this survey was the collection of urine and blood samples from each sex worker that were tested for syphilis, chlamydia, gonorrhea, and herpes simplex virus (HSV). Tables 1 and 2 provide a description of sex workers from the street and brothel sectors in Ecuador.

In each city, we also interviewed police officers at the local police station about the frequency of visits to the brothel and street sector (in the last month) to verify that sex workers were fulfilling their licensing requirements. The summary statistics of city enforcement levels, the explanatory variable of interest, are reported in Table 3. We also report the size of the population in each city as well as the size of the sample of sex workers from each city in Table 3.

3 Sex Work in Brothels and on the Street

The brothel sector functions quite separately from the street sector (see Tables 1 and 2). For example, sex workers who work on the street and clients who buy their services have different characteristics than those in brothels. Tables 1 and 2 indicate that women who work on the street are substantially older, are less attractive (as assessed by the interviewer), have less education, have less knowledge about the risk of STIs, are less risk adverse, and have worked twice as long in the sex industry than their counterparts in brothels. Street sex workers also report a higher percentage of their clients are regulars and that their clients are typically poorer and less handsome, and are twice as likely to demand unprotected (no condom) sex than clients who frequent brothels.

The police view the sectors separately and make enforcement decisions independently. This is in part a reflection of the fact that enforcement of the carnet in brothels is the enforcement of a specific health law, while street enforcement utilizes general vagrancy laws and is much more at the whim of specific police officers. Brothel enforcement is more

organized and systematic. In interviews, street sex workers report that police enforcement is much more arbitrary and abusive than reported by brothel sex workers. Police report that decisions to enforce in the street or brothel are made separately with street enforcement decisions being much more decentralized and less coordinated than brothel enforcement. In fact, the records recording raids and arrests are kept separately. In addition, police raid the brothel sector substantially more than the street sector. The values in Table 3 are the mean visits per month by the police to each sector. On average, police conduct 0.2 raids per month in the street sector and 1.3 raids per month in the brothel sector. Indeed, in almost every city, police report that they visit the brothel sector more often than the street sector.

Brothel sex workers earn substantially more than those on the street.⁶ Brothel sex workers have more clients per week. Specifically, they have 24 clients per week compared to 13 for street sex workers. The street price per transaction is slightly higher than the brothel price (8.44 vs. 7.06 dollars) unadjusted for service. However, street sex workers provide riskier services for this price (i.e. more anal sex, more non-condom sex). Moreover, when one takes into account time spent searching for clients and providing services, the hourly wage of brothel sex workers is substantially higher than the street wage. Brothel sex workers earn 5.43 compared to 4.14 dollars per hour for street workers.

Sex workers on the street are at higher risk of infection since they use condoms less often and have clients who demand riskier sexual services. Specifically, 86 percent of sex workers in brothels used condoms in all of their last three transactions compared to only 63 percent in the street sector. Much of this difference has to do with the fact that clients on the street are twice as likely to demand unprotected sex (i.e. not using a condom). In addition, while sex workers in brothels are often provided condoms on site, street workers must procure them themselves. This manifests itself in sex workers on the street being more likely to use condoms past their expiration date. Finally, clients on the street are twice as likely to request anal sex, which has a much higher STI transmission rate than vaginal sex.

These differences in risk behavior translate into higher STI rates on the street than in the brothels. We use three measures of STIs. The first measure, “STI,” is an indicator of a positive test for currently being infected with syphilis, chlamydia, and/or gonorrhea. While

⁶For a comparison of sex worker and non-sex worker socio-demographics and earnings in Ecuador, see Arunachalam and Shah (2008).

this variable is measured very precisely, it is a measure of infection of only three of many types of STIs at one moment in time. The second measure, “Ever any STI,” is an indicator of the sex worker’s self-report of ever having one of the following STI symptoms: genital warts, ulcers, anal inflammation, abnormal vaginal discharge, pain or blood while urinating, and/or genital swelling. This measure, while a self-report, captures many more STIs over a longer time horizon. The last measure, “Herpes,” is an indicator of a positive test for the presence of the herpes simplex virus (HSV). This is a lifetime measure of being exposed to one STI, since once a person is infected with HSV, she will always test positive. The three measures together provide a nice overview of infection rates in this market.

The summary statistics reported in Table 2 support the conclusion that street sex worker have higher STI rates than brothel workers. Specifically, 82 percent of brothel sex workers tested positive for herpes compared to 87 percent in the street. Fifty-one percent of sex workers in the brothel sector reported ever having an STI symptom, compared to 55 percent in the street.⁷ Seven percent of licensed brothel sex workers tested positive for syphilis, chlamydia, and/or gonorrhea compared to 9 percent in the street sector. While this may not seem like a large difference, these infection rates understate the difference in risk of infection considering that street workers see only 13 clients per week on average compared to 24 clients in the brothels. Hence, the infection rate per encounter must be substantially higher on the street than in the brothels than these differences suggest.

4 Reduced Form Effect of Regulation on STIs

In this section we investigate whether the enforcement of health regulation affects STI rates measured by three STI measures: (1) STI which equals one if the sex worker tests positive for syphilis, chlamydia, and/or gonorrhea, (2) Ever any STI which equals one if the sex worker reports ever having an STI symptom, and (3) Herpes which equals one if the sex worker tests positive for HSV. We regress these three measures against the level of enforcement (average number of raids per month) in the brothel and enforcement in the street plus various sets of controls. We include sex worker, city, and client characteristics as controls. The sex worker characteristics include a measure of risk preference and risk knowledge, age, marital status,

⁷HSV infection rates are higher than ever having an STI as HSV is often asymptomatic.

children, education, and beauty. The city level characteristics that control for potential geographic heterogeneity are the male to female sex ratio and average male education. The client characteristics include indicators for whether the client is regular, clean, handsome, and/or rich.

We estimate OLS regressions⁸ and cluster all standard errors at the city-sector level, where sector is brothel or street. We also report the standard errors clustered at the city level below the city-sector standard errors for comparison. We believe the results that are clustered at the city-sector level are the most appropriate because, as discussed in the previous section, the sectors function quite independently. The data show that they are different in terms of the sex workers who work in them, the clients who buy services, the nature of risk, and police decisions regarding enforcement.

4.1 Results

The results from these regressions are reported in Table 4. Each reported coefficient has two standard errors as we estimate two regressions per dependent variable. The first standard error is from a regression clustered at the city-sector level and the second standard error is from a regression clustered at the city level. In column 1 of Table 4, we find that increasing enforcement in the street sector by one standard deviation (approximately .2 visits) per month significantly reduces current infection rates by 2.1 percentage points. This translates to a 27 percent decrease in current STIs. However, enforcement in the brothel sector does not significantly affect current STI outcomes. The results in column 1 also indicate that more educated and attractive sex workers are less likely to have an STI. This result may be due to bargaining power as more attractive and educated sex workers are more likely to be able to negotiate condom use and/or better work conditions for themselves. While individual client characteristics are included as controls for demand side heterogeneity, none are significantly different from zero.

In column 2 of Table 4 we regress whether a sex worker self-reports ever having an STI on the same set of covariates. We find that increasing enforcement in the street sector by .2 visits (one standard deviation) per month, significantly reduces the probability of a sex

⁸The results are almost identical if we estimate probit regressions.

worker ever having an STI by 5.8 percentage points. This is approximately an 11 percent decrease in lifetime disease and is consistent with the results from column 1. Surprisingly, increasing enforcement in the brothel sector by one standard deviation significantly increases the probability that a sex worker will have an STI by 8.4 percentage points, which translates into a 16 percent increase. This result suggests that increasing brothel enforcement may exacerbate public health outcomes.

In column 3 of Table 4 we regress whether a sex worker has herpes on the same set of covariates. As we might expect, the signs on the coefficients are similar to the regression results in column 2 (since herpes and ever having an STI are similar measures). However, the standard errors become larger and the enforcement results, though the correct sign, are not statistically significant.

Though we prefer the results which are clustered at the city-sector level since the police report that decisions to enforce in the street or brothel are made separately, Table 4 indicates that our main results on street and brothel enforcement are robust to clustering at the city level as well. An additional concern is that we have a small number of clusters so that asymptotic distribution theory that applies to large samples may not apply here, which implies that our standard errors might be biased. To assess this possibility, we implement the wild cluster bootstrap technique recommended in Cameron, Gelbach, and Miller (2008) which adjusts for small numbers of clusters. Though the p values increase slightly, the main results are robust to this bootstrapping technique which adjusts for the small number of clusters. (The results from this bootstrapping exercise are available upon request.)

4.2 Causality

Can we interpret the above results as causal? A major concern with this interpretation is that enforcement may be correlated with unobservable city, sex worker, or client characteristics that are determinants of the probability of a sex worker having an STI. Indeed, enforcement has the potential to bias the estimation results in two important ways. First, governments could select enforcement levels based on population characteristics that are correlated with STI rates. For example, police might enforce more in richer, well-educated communities where clients are worried about infection and therefore there is more condom use and lower

STI rates. They might also enforce more in areas where sex workers are more likely to take risks and thus have higher disease prevalence. Alternatively, enforcement might be higher in areas with moral attitudes against commercial sex and hence lower STI rates. Secondly, sex workers could migrate to cities with lower (or higher) levels of enforcement based on individual risk preferences. This would result in selection problems that would bias the estimates.

In this section we investigate the possibility that there are omitted variables that are correlated with both enforcement and STI rates. We first discuss how enforcement levels are decided based on interviews with key government officials in the cities in our sample. Then we examine empirically whether there are correlations between observed socio-economic characteristics and access to municipal services using data from a large national household survey. We then consider correlations between enforcement and client characteristics; especially client risk preferences, and correlation between enforcement and sex worker risk preferences, and finally correlation with sex worker migration. The results of these analyses show no real correlation between a large number of characteristics and enforcement levels.

It is also important to keep in mind that our results cannot be explained by a simple story of omitted variables that are correlated with both enforcement and STI rates. This is because street enforcement and brothel enforcement have opposite effects on STI rates—more street enforcement is negatively correlated with STI rates and more brothel enforcement is positively correlated with STI rates. It is difficult to think of a plausible story where omitted variables are correlated with enforcement but have opposite effects on STIs depending on the type of enforcement.⁹ We discuss this more as we investigate plausible alternative hypotheses.

4.2.1 How are enforcement levels determined?

Local governments have jurisdiction over enforcement of the licensing requirement. We conducted numerous in-depth interviews with police, health officials, sex workers and establishment owners in all of the locations in our sample in order to gain a better understanding of how local enforcement levels in each city are determined. In these interviews, the police and Ministry of Health officials stated that enforcement is simply a result of overall decisions

⁹We thank an anonymous referee for pointing this issue out.

made by the local police in each city. In one interview, a doctor at the Ministry of Health in Quito says “The Ministry of Health does not have the capacity, funding or legal mandate to go out and enforce licensing requirements. That is up to the local police. However, the police are not terribly motivated by health concerns and enforce whenever they feel like it, depending on who the current police director is” (Tamayo, 2004). While this situation is obviously not ideal for those motivated by health concerns, it does imply that local police enforcement decisions are not necessarily being driven by disease.

In interviews with local police, we asked them to report the number of hours spent enforcing various types of regulation such as food hygiene rules, panhandling laws, and the sex worker license as we wanted to gain an understanding of police priorities when enforcing various similar laws. Figure 1 illustrates the results of these interviews. It appears that cities that spend more hours enforcing the sex worker license also tend to spend more hours enforcing all other regulations as well. Hence, the enforcement decision seems not to be specific to sex work, but rather related to the enforcement of all regulation in general across all sectors.

Certain types of governments are more active and have a tendency to enforce all types of regulation more. In Ecuador, the cities that tend to more rigorously enforce all regulations including the sex worker license, tend to be led by left-leaning parties who believe in more active government involvement. Cities that enforce less tend to be led by right-leaning parties. Interestingly, these right-leaning cities are also cities where police report a higher share of church attendance. This suggests we can rule out the possibility that police are enforcing primarily for reasons related to morality or church leaders’ condemnation of sex work, since police who attend church more work in cities that enforce less.

4.2.2 Municipality Services and Population Characteristics

The evidence suggests that police are not enforcing because of high rates of disease or moral sentiments regarding commercial sex, but rather because they have more active enforcement of all types of regulation. This raises the concern that higher enforcement occurs in municipalities that have wealthier and healthier populations and provide better municipal services (i.e. health programs, water and sanitation). Clients in these communities might be con-

cerned about STIs and be more likely to use condoms so that there are lower rates of STIs in the population; and sex workers who have access to better health care services may have their STIs treated more quickly thereby lowering the STI transmission rates.

We test this hypothesis by investigating the relationship between enforcement and various socio-demographic characteristics and access to government programs using the 2003 National Employment Survey, the ENEMDU (Encuesta de Empleo, Desempleo y Subempleo). This is a representative household survey collected by the National Census and Statistics Institute (INEC) in Ecuador. We construct various measures of education, employment, wage rates, ethnicity, health and nutrition programs, assets, and municipal services from each of the 8 cities. We then regress enforcement in the brothel sector and enforcement in the street sector on each of these measures. Each regression is estimated by OLS and the standard errors are clustered at the city level.

The results of this exercise are reported in Table 5. None of the estimated coefficients is significantly different from zero at the 5 percent level and only 3 of the 38 estimated coefficients is statistically significant at the 10 percent level. Given the results presented in Table 5, it appears that education, employment, wage rates, ethnicity, health and nutrition programs, assets, and municipal services are not correlated with sex worker regulation enforcement levels. This suggests that we can rule out the hypotheses that enforcement is correlated with general population characteristics or the provision of municipal services.

Moreover, our results are not likely to be explained by the possibility that sex workers who work in municipalities who enforce more also have access to better health services. First, HSV is not treatable and therefore its duration is unrelated to treatment. Second, because our enforcement results go in opposite directions (more street enforcement implies less disease and more brothel enforcement implies more); this story could only be consistent with the evidence on street enforcement, not brothel enforcement. It is unlikely that sex workers on the street have better access to health services and those in brothels have worse access to health services in cities that enforce more, especially since the summary statistics suggest street sex workers have less access to HIV health services.

4.2.3 Client Characteristics

We also conduct a similar exercise with client characteristics. In our survey, we ask the sex worker about the characteristics of the last 3 clients including age, cleanliness, wealth, whether they were a regular client, and whether the client requested not to use a condom. We regress each measure of enforcement on each of these client characteristics. Each regression is estimated by OLS and the standard errors are clustered at the city level. The results of this exercise are reported in Table 6. Out of these ten regressions, only one characteristic is correlated with street enforcement, rich clients. However, we control for the wealth of clients in all regressions. Importantly, client demanded non-condom use is not significantly correlated with enforcement. This suggests that clients preferences for risk are not driving police decisions to enforce more or less.

4.2.4 Sex Worker Risk Preferences

Do police enforce more in areas where sex workers take more risks? This would result in biased estimates due to systematic correlation of enforcement decisions and sex worker risk preferences. In Table 7, column 1 we check whether enforcement is correlated with sex worker risk preferences. We use a measure of sex worker risk preferences as our dependent variable that we label “doesn’t like risks.”¹⁰ As the regression results indicate, enforcement has no significant effect on sex worker risk preferences. Hence, it does not appear that local enforcement decisions are driving sex worker risk preferences or responding to local disease rates.

4.2.5 Sex Worker Migration

Another concern may be that sex workers migrate to cities with lower (or higher) levels of enforcement based on personal risk preferences. If this were the case, then selection problems would bias the results. In Table 7, column 2 we test whether enforcement is driving the decision to migrate. We construct a variable that defines a sex worker as a migrant if she migrated within the past five years. Since city level elections occur every four years and

¹⁰In the questionnaire we asked sex workers how important it is they not get infected with HIV. Those who responded that it is very important they not get infected with HIV are coded as a “1.” All other responses are coded as “0.”

the police director is usually re-appointed at that time, enforcement in the past 5 years is the relevant period for testing whether enforcement is driving the decision to migrate. The results indicate that there is no significant relationship between enforcement in either the brothel or street sector and the decision to migrate. These regression results reinforce findings from qualitative work. In focus groups, most sex workers respond they are most likely to migrate for financial opportunities, not because of enforcement of the license. In addition, because the license is enforced at the city level, it is non-transferable by law across cities. Sex workers who are already licensed find it difficult to migrate for work as the fixed cost of obtaining another license is quite high.

The evidence presented in this Section does not support any claim that municipality enforcement levels are set based on (omitted) factors that are correlated with STI rates. Specifically, we find no evidence that the enforcement rates are correlated with population socio-economic characteristics, access to health and other municipal services, client characteristics, sex worker or client risk preferences, or sex worker migration.

5 Behavioral Pathways

In this section, we investigate two behavioral pathways that explain the relationship between the negative relationship between street enforcement and STIs as well as the positive relationship between brothel enforcement and STIs. The first is that increased enforcement on the street causes sex workers on the margin to leave the riskier street sector in favor of the less risky brothel sector, thereby lowering overall STI rates. Similarly, increased enforcement in the brothel sector causes some unlicensed sex workers to leave the safer brothel sector for the riskier street sector rather than comply with licensure laws. The second explanation is that increased enforcement causes sex workers to raise prices thereby lowering the number of clients and hence the risk of infection.

5.1 Effect of Enforcement on Sectoral Choice

We estimate a joint model of sex worker choice of their work location, either street or brothel sector, or whether to obtain the carnet. We use this model to test the following two hypotheses related to enforcement and sectoral choice.

The first hypothesis is that increased enforcement on the street raises the fixed costs and makes working on the street less attractive relative to working in a brothel. As a result, some sex workers shift from the riskier street to the less risky brothel sector thereby reducing infection rates. Second, an increase in enforcement in the brothel sector raises the fixed costs of working in a brothel without a carnet and lowers the returns relative to working in a brothel with a carnet and relative to working on the street. This will cause some sex workers to obtain the carnet and continue to work in the brothel, but it will cause others to leave the brothel altogether for the street. Since the street is more risky, the effect could be to raise infection rates if enough sex workers choose the street as opposed to complying with carnet regulations.

We test these hypotheses by estimating a multinomial probit (MNP) model of sectoral choice. In this model, the sex worker compares her maximum returns working in a brothel with a carnet to working in a brothel without a carnet to working on the street. The costs of the carnet and enforcement of the carnet as well as enforcement on the street enter the payoff functions as fixed costs. We assume that sex workers choose the sector that has the highest expected return and that there are no barriers to entry.

Consider first the sector specific payoffs functions. If a sex worker chooses to work in a brothel, she is expected to have a carnet. Her payoff function, then, is the net revenue from selling protected and unprotected sex less the fixed cost of maintaining the carnet. If the sex worker chooses to work in the brothel without a carnet, then she is subject to the possibility of being caught in a police raid and fined. In this case, the return to working in a brothel without a carnet is the net revenues from supplying protected and unprotected sex less the expected fixed cost of being caught. Increased enforcement raises the fixed costs of being caught. Analogously, if the sex worker chooses to work on the street she faces some probability of being caught in a police raid and having to pay a fine. The return to working on the street is the net revenues from supplying protected and unprotected sex less the expected fixed cost of being caught.

Formally, we specify the returns to sex worker i living in community j from working in the licensed brothel sector (b), the unlicensed brothel sector (u), and on the street (s) are as follows:

$$U_{ijb} = R_{ijb} - C + \varepsilon_{ijb}$$

$$U_{iju} = R_{iju} - \lambda_u E_{ju} + \varepsilon_{iju}$$

$$U_{ijs} = R_{ijs} - \lambda_s E_{js} + \varepsilon_{ijs}$$

where:

U_{ijp} = return to sex worker i living in community j from working in sector p , where $p \in \{b, u, s\}$,

R_{ijp} = expected net revenue sex worker i living in community j earns from working in sector p ,

C = cost of complying with the license regulation and does not vary across community,

E_{jp} = number of enforcement visits per month in community j in sector p ,

λ_p = the probability that a sex worker is caught in a raid times the amount she is fined if caught during a police raid in sector p , and

ε_{ijp} is an individual random error term that captures individual sector preferences (e.g. risk) and is normally distributed.

While we do not know the expected net revenues that each sex worker would realize from each of the three sectors, we can parameterize the net revenues as a function of sex worker characteristics, client characteristics and community characteristics as follows:

$$R_{ijp} = \alpha_p + \sum_l B_{lp} X_{ilp} + \sum_m \delta_{mp} S_{mjp} + \tau_{ijp}$$

where the X_{il} are sex worker i 's characteristics and the S_{mjp} are client characteristics who frequent sector p in community j , and τ_{ijp} is an individual error term. Note that the net return functions have coefficients that vary by sector. All other potential costs are subsumed in the alternative specific intercept.

The probability of sex worker i choosing the street is:

$$\Pi_{ijs} = \text{Prob}(U_{ijs} > U_{ijb} \text{ and } U_{ijs} > U_{iju})$$

and the probabilities of sex worker i choosing the licensed and unlicensed sectors are similarly

defined. Then assuming that the error terms $\eta_{ijp} = \varepsilon_{ijp} + \tau_{ijp}$ are distributed multivariate normal, we can estimate the probability of choosing each sector as a multinomial probit. In all choice models, only the coefficients of $n - 1$ options are identified. Therefore, we set the licensed brothel as the default option and the estimated coefficients are interpreted as the effect of choosing sector p over the default option.

The MNP allows us to simultaneously estimate how individual and community characteristics affect the sectoral decision without assuming that the errors are identically and independently distributed. The MNP model is very flexible in that it allows for errors to be correlated across choices. For example, the error terms between the choice of brothel licensed and brothel unlicensed may be correlated. This does not impose any restrictions on the cross-partial effects of enforcement i.e. the effect of increased enforcement in the unlicensed sector on the probability of switching to the licensed brothel versus street sector.

Table 8 reports the results in marginal effects from the sectoral choice multinomial probit, clustered at the city level. We find that enforcement is a strong predictor of the sectoral choice decision. In both the street and the unlicensed brothel sector, increasing enforcement reduces the probability of sex workers choosing these sectors, relative to the licensed brothel sector. These empirical results are consistent with the predictions from the model. Interestingly, the marginal effects are quite similar for both sectors. Increasing enforcement in the street and/or the unlicensed brothel sector by one visit per month, reduces the probability of choosing that sector by 3 percent, relative to the licensed brothel sector. However, it is important to recall that street enforcement occurs .2 times per month on average while brothel enforcement occurs 1.3 times per month on average.

The results on the individual characteristics are sensible. We find that better educated sex workers who have more knowledge about risk and who do not like to take risks are more likely to choose the licensed brothel sector relative to working either on the street or in a brothel without a license. In addition, older and less attractive sex workers are more likely to choose the street sector and are less likely to work in a brothel without a license.

We include several client characteristics in the multinomial probit to control for potential demand-side client heterogeneity and we also include controls for average prices. We construct the average price for condom use by sector as well as the average price differential

between condom and non-condom prices by sector. The price difference between condom and non-condom use increases the probability of both the street and unlicensed brothel sector being chosen; however, the price of condom use decreases the probability of the street and unlicensed brothel sector being chosen relative to the licensed brothel sector. In addition, rich clients increase the probability of both the street and unlicensed brothel sector being chosen relative to the licensed brothel sector.

We now use the estimates to simulate how changes in enforcement affect the proportion of sex workers in each sector. Figure 2 shows that small increases in street enforcement shifts sex workers out of the high risk street into relatively lower risk brothels. By shifting women out of the high risk street sector into the lower risk brothel sector, increased street enforcement lowers overall STI rates. In Figure 3, increasing enforcement in the brothel sector reduces the number of unlicensed sex workers in the brothels. Approximately half of those leave the brothel in favor of street while the other half become licensed brothel workers. These simulation results help explain the reduced form estimates that show increasing brothel enforcement increases the probability of ever having an STI, since increasing brothel enforcement seems to shift some women into the riskier street sector, increasing their probability of getting an STI.

6 Effect of Enforcement on Price and Quantity

Another possible pathway by which enforcement could reduce STI transmission is that increased enforcement might cause sex workers to raise prices thereby lowering the demand for services and the number of transactions. The lower the number of unprotected sexual transactions, the less the sex worker is at risk to contract an STI and consequently reduces the STI rate.

How might this work? Increased street enforcement causes some sex workers to leave the street for the brothel reducing the supply of sex workers on the street. The reduction in supply increases price and reduces the number of sexual transactions both protected and unprotected. Enforcement in brothels causes unlicensed workers to switch to the street or stay in the brothel and comply with the carnet law. In the first case where sex workers leave for street, the enforcement would lower the supply of sex workers and therefore could raise

prices. However, in the second case where non-complying sex workers stay in the brothel but obtain the carnet, the supply of sex workers does not change. Indeed, clients and sex workers report that no one asks to see the carnet in the brothel and therefore having a carnet does not affect the demand for a particular sex worker. In this case, increased enforcement would not cause an increase in prices.

We test these predictions by estimating regression models for the $\ln(\text{price})$ and number of clients last week separately for those working in the street sector and those working in the unlicensed brothel sector as a function of enforcement in the sector, sex worker characteristics, client characteristics and community characteristics. One concern with these models is that sex workers self-select into the sector and part of the reason the sex worker chooses that sector might be correlated with unobservable characteristics that affect price and quantity. For example, risk taking sex workers may select into the street sector and charge lower prices.

We employ Heckman selection models to control for the sectoral choice decision and then estimate the effect of enforcement on the variable of interest. We use enforcement in the other sector as the exclusion restriction to predict the first stage sectoral choice decision. Specifically, enforcement in the street sector predicts entry into the unlicensed brothel sector but does not otherwise directly influence prices and quantities in the unlicensed brothel sector. Similarly, enforcement in unlicensed brothel sector affects entry into the street, but does not otherwise directly affect the price or quantity on the street. So enforcement in both sectors will influence the initial sectoral choice decision, but once a sex worker makes that decision and chooses a sector, only enforcement in her sector will affect the outcomes of interest such as price and the number of clients.

We find no significant effect of enforcement on either price or quantity in the brothel sector. The street sector estimation results confirm the predictions of the theoretical model. Street sector prices do significantly increase with enforcement and reduce the number of clients. Specifically, a one standard deviation increase in enforcement leads to a 12 percent increase in prices and a 23 percent reduction in the number clients on the street. These results are consistent with the reduced form results where street enforcement is negatively correlated with the current STI rate, but brothel enforcement and current STI rates are uncorrelated. (These results are available upon request from the authors).

7 Conclusions

Increasing the use of condoms by sex workers is a priority for countries working to prevent the spread of HIV and other STIs. A number of countries believe that regulating the sex market will improve overall public health outcomes through increased condom use and lower disease. However, these claims were relatively unsubstantiated prior to this work. This paper offers both empirical and theoretical insights into the regulation of sex work. Specifically, we examine how increased police raids to enforce no solicitation rules on the street and enforce licensure laws in the brothels affect the transmission of STIs.

We find that additional police raids in the street are most effective in reducing disease. Specifically, we find that a one standard deviation increase in raids is associated with a 27 percent reduction in current syphilis, chlamydia, and/or gonorrhea and an 11 percent reduction in the probability of ever having an STI. These results are consistent with the hypothesis that enforcement increases the fixed cost of working in the street relative to the less risky brothel and by raising prices. The results suggest that increasing enforcement in the street sector significantly shifts sex workers from the risky street into the less risky brothels. In addition, enforcement increases street prices, reducing the overall number of street clients both protected and unprotected. Therefore, both the price and sectoral choice effect in the street sector unambiguously improves public health outcomes.

We also show that increasing enforcement in the brothel sector has the potential to exacerbate public health problems; while it does induce some unlicensed sex workers to obtain a license, it also induces many unlicensed sex workers into the riskier street sector. Specifically, we find that increasing enforcement by one standard deviation in the brothel sector is significantly associated with a 16 percent higher probability of ever being infected with any STI.

Table 2 indicates that the street sector has the highest disease rate and the lowest levels of condom use. This implies that how sex workers shift sectors as a function of enforcement has serious implications for disease. These results indicate that the potential for public health gains from increasing enforcement in the street sector is tremendous. In terms of policy implications, increasing enforcement in the street has a much larger impact in decreasing disease than increasing brothel enforcement. In addition, only small increases in street

enforcement are needed to improve health outcomes. Therefore, it is important to note that for enforcement in the brothel sector to work, it needs to be complemented with strong enforcement in the street. This implies that more cost-effective interventions should target both the street and brothel sector, especially since increasing enforcement only in the brothel sector without commensurate enforcement on the street has the potential to exacerbate public health problems.

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Table 1: Sex Worker and Client Summary Statistics

	Brothel	Brothel Licensed	Brothel Unlicensed	Street	Difference Street-Brothel
Price per transaction (\$)	7.06 (12.0)	7.06 (14.04)	7.04 (9.18)	8.44 (20.9)	1.38*
Hourly earnings(\$)	5.43 (9.21)	5.51 (9.16)	5.19 (9.35)	4.14 (7.88)	-1.29**
Clients per week	24.0 (30.2)	26.3 (30.6)	18.7 (28.6)	13.1 (19.7)	-10.9***
Experience(years)	3.66 (4.19)	3.92 (4.17)	3.02 (4.20)	6.45 (6.82)	2.79***
Age(years)	26.9 (7.09)	27.4 (7.03)	25.9 (7.14)	31.5 (9.91)	4.6***
Education(years)	7.7 (3.3)	7.8 (3.27)	7.49 (3.34)	6.49 (3.64)	-1.21***
Married/Civil union(=1)	0.47 (0.49)	0.49 (0.5)	0.44 (0.5)	0.49 (0.5)	0.02
Children(=1)	.85 (0.36)	0.85 (0.36)	0.85 (0.36)	0.90 (0.30)	0.05***
Attractive sex worker(=1)	0.31 (0.46)	0.32 (0.47)	0.29 (0.46)	0.16 (0.37)	-0.15***
Regular client(=1)	0.46 (0.41)	0.48 (0.42)	0.41 (0.41)	0.62 (0.40)	0.16***
Clean client(=1)	0.88 (0.26)	0.89 (0.32)	0.87 (0.34)	0.89 (0.25)	0.01
Handsome client(=1)	0.13 (0.22)	0.12 (0.32)	0.15 (0.36)	0.10 (0.30)	-0.03**
Rich client(=1)	0.08 (0.21)	0.08 (0.27)	0.08 (0.28)	0.06 (0.24)	-0.02**
Sample Size	2295	1629	666	619	

We report means and standard deviations in parentheses by sector (licensed brothel, unlicensed brothel, or street). ***indicates the mean difference between the street and brothel sector is statistically significant at 1% level, ** at 5% level, * at 10% level.

Table 2: Sex Worker Risk Factors

	Brothel	Brothel Licensed	Brothel Unlicensed	Street	Difference Street-Brothel
STI(=1)	.08 (0.26)	0.07 (0.26)	0.08 (0.27)	0.09 (0.28)	0.01
Herpes(=1)	.82 (.38)	.83 (.37)	.79 (.79)	.87 (.33)	.05***
Ever any STI(=1)	0.51 (0.50)	0.51 (0.50)	0.51 (0.50)	0.55 (0.50)	0.04*
Anal sex(=1)	.03 (.14)	.03 (.13)	.04 (.19)	.06 (.23)	.03***
Condom always used(=1)	0.86 (0.35)	0.89 (0.31)	0.78 (0.42)	0.63 (0.49)	-0.23***
Checks condom expiration dates(=1)	.59 (.49)	.64 (.48)	.48 (.50)	.43 (.50)	-.16***
Client requested non-condom use	.05 (.21)	.04 (.21)	.06 (.23)	.10 (.30)	.05***
No access to HIV services(=1)	.08 (.28)	.05 (.22)	.16 (.37)	.17 (.38)	.09***
Had HIV test(=1)	.89 (.32)	.94 (.94)	.75 (.44)	.74 (.44)	-.15***
Doesn't like risk(=1)	0.96 (0.22)	0.97 (0.18)	0.94 (0.23)	0.91 (0.28)	-0.05***
Risk knowledge(=1)	0.72 (0.46)	0.74 (0.44)	0.66 (0.47)	0.61 (0.49)	-0.11***
Sample Size	2295	1629	666	619	

We report means and standard deviations in parentheses by sector (licensed brothel, unlicensed brothel, or street). The variable "STI" includes sex workers who tested positive for chlamydia, gonorrhea, and/or syphilis. "Herpes" indicates a positive test for HSV. "Ever any STI" is a self-report of any STI symptoms. ***indicates the mean difference between the street and brothel sector is statistically significant at 1% level, ** at 5% level, * at 10% level.

Table 3: Enforcement: Monthly Police Visits

City	Enforcement, Brothel (per month) Mean visits (1)	Enforcement, Street (per month) Mean visits (2)	Sex Worker (sample size) (3)	Population (sample size) (4)
Machala	4.0	0.507	453	157,607
Quito	3.68	0.13	413	1,371,461
Milagro	0.4	0.4	294	116,396
Quevedo	0.4	0.38	414	104,165
Esmeraldas	0.2	0.05	300	135,145
Guayaquil	0.088	0.012	416	1,570,011
Daule	0.034	0.018	279	65,534
Santo Domingo	0.034	.034	345	190,825
All cities (std. dev)	1.28 (1.68)	0.203 (.194)	2914	3,711,144

We report mean visits by police to enforce the regulation by city and sector in columns 1-2. In column 3 we report sex worker sample sizes by city, and in column 4 we report the population by city.

Table 4: “STI Positive” and Enforcement Regressions

Dependent variable:	Has STI	Ever any STI	Herpes
	(1)	(2)	(3)
Enforcement brothel	-.00 (.006) (.007)	.05 (.01)*** (.01)***	.03 (.02) (.03)
Enforcement street	-.11 (.05)** (.06)*	-.30 (.06)*** (.06)***	-.09 (.10) (.11)
Risk knowledge	.008 (.006) (.004)*	.02 (.02) (.02)	.03 (.02) (.02)
Doesn't like risk	-.02 (.03) (.02)	.05 (.04) (.04)	-.001 (.03) (.03)
Age	-.001 (.001) (.001)	-.001 (.001) (.001)	.007 (.001)*** (.001)***
Children	.03 (.01)*** (.01)**	-.009 (.02) (.02)	.07 (.02)*** (.02)***
Married/Civil union	.002 (.01) (.01)	.03 (.01)*** (.01)**	.02 (.01) (.02)
Education	-.003 (.001)* (.002)	-.006 (.004)* (.004)*	-.004 (.002)* (.002)*
Attractive	-.02 (.01)* (.009)**	.001 (.02) (.02)	.01 (.02) (.01)
Sexratio	.008 (.003)*** (.003)***	-.03 (.009)*** (.009)***	-.009 (.005)* (.006)*
Constant	-.63 (.25)** (.28)**	3.41 (.95)*** (.99)***	1.66 (.51)*** (.55)***
Client Characteristics	Y	Y	Y
Sample size	2914	2914	2914

We report coefficients from OLS regressions where the dependent variable is the biological outcome of “Has STI(=1)” (tested positive for chlamydia, gonorrhea, and/or syphilis) in column 1 (mean is .078); the self-report of “Ever had any STI(=1)” in column 2 (mean is .5195); and tested positive for “Herpes” or HSV in column 3 (mean is .821). In each row, the first standard error is clustered at the city-sector (brothel/street) level and the second standard error below is clustered at the city level. Client characteristics include male education, client is regular, good looking, rich, and clean.

*** indicates significance at 1% level, ** at 5% level, * at 10% level.

Table 5: Sex Worker Enforcement and City Demographics

Dependent variable:	Brothel Enforcement (1)	Street Enforcement (2)
Primary eligible & enrolled	.26 (.43)	-.036 (.02)
Secondary eligible & enrolled	.25 (.21)	.02 (.02)
Completed secondary school	-.1 (.07)	-.01 (.007)
Female completed secondary	-.06 (.07)	-.009 (.007)
Female employment	.25 (.17)	-.007 (.008)
Female weekly salary	.002 (.002)	-.000 (.0002)
Over 65	-.02 (.07)	-.002 (.01)
Mestizo	.33 (.33)	.04 (.03)
Handicapped	.07 (.26)	-.02 (.02)
No health insurance	-.5 (.42)	.04 (.03)
School breakfast program	-.49 (.42)	.01 (.04)
School lunch program	-.29 (.65)	.03 (.05)
Infant nutrition program	-.29 (.16)*	-.01 (.01)
Infant health card	.17 (.29)	-.03 (.03)
Dirt floor	-.29 (.22)	-.02 (.02)
Phone line	.31 (.5)	-.05 (.04)
Private shower	.39 (.39)	-.02 (.02)
No trash service	-.35 (.53)	.06 (.04)*
Non-piped water source	-1.01 (.61)*	.008 (.05)

We report coefficients from OLS regressions clustered at the city level, where each cell is a separate regression of enforcement (street or brothel) regressed on the variable of interest.

*** indicates significance at 1% level, ** at 5% level, * at 10% level.

Table 6: Enforcement and Client Characteristics

Dependent variable:	Brothel Enforcement (1)	Street Enforcement (2)
Regular client	.008 (.03)	-.23 (.25)
Clean client	.04 (.03)	.06 (.29)
Handsome client	.02 (.03)	.07 (.24)
Rich client	.03 (.05)	.94 (.3)***
Client requested non-condom use	.005 (.04)	-.657 (.362)

We report coefficients from OLS regressions clustered at the city level, where each cell is a separate regression of enforcement (street or brothel) regressed on the variable of interest. Sample size is 2914.

*** indicates significance at 1% level, ** at 5% level, * at 10% level.

Table 7: Does Enforcement Determine Sex Worker Risk or Migration Decisions?

Dependent variable:	Doesn't like Risks (1)	SW Migrated (2)
Enforcement brothel	0.01 (0.01)	-0.01 (0.02)
Enforcement street	-0.07 (0.05)	0.02 (0.13)
Risk knowledge	0.08 (0.03)**	0.03 (0.02)
Age	-0.00 (0.00)	-0.00 (0.00)
Children	0.02 (0.01)	0.02 (0.02)
Married/Civil union	-0.01 (0.01)	-0.01 (0.02)
Education	0.01 (0.00)***	0.00 (0.00)**
Attractive	0.02 (0.01)	0.02 (0.01)
Sexratio	0.00 (0.00)	0.01 (0.01)
Client Characteristics	Y	Y
Constant	0.53 (0.26)*	-0.70 (1.24)
F statistic	65.35	388.41
Sample Size	2914	2914

We report coefficients from OLS regressions clustered at the city level, where the dependent variable is sex worker “doesn't like risks” in column 1 and sex worker “migrated” in column 2. Client characteristics include male education, client is regular, good looking, rich, and clean.

*** indicates significance at 1% level, ** at 5% level, * at 10% level.

Table 8: Multinomial Probit Results

Sector choice	Brothel Unlicensed	Street
Enforcement brothel	-.033 (.018)*	–
Enforcement street	–	-0.028 (.007)***
Risk knowledge	-.02 (.02)	-.07 (.02)***
Doesn't like risks	-.02 (.04)	-.11 (.04)**
Age	-.01 (.001)***	.01 (.001)***
Children	.03 (.02)	.01 (.02)
Married/Civil union	-.03 (.02)*	.01 (.02)
Attractive	.004 (.02)	-.07 (.02)***
Education	-.00 (.00)	-.01 (.002)***
Rich client	.20 (.09)**	.16 (.06)***
Handsome client	.02 (.05)	.02 (.04)
Clean client	.16 (.12)	.14 (.08)
Regular client	-.04 (.04)	-.03 (.03)
Price condom	-.79 (.27)***	-.66 (.17)***
Price differential	.04 (.015)***	.04 (.01)***
χ^2	54.2	54.2
Sample Size	2685	2685

The reported coefficients are marginal effects from a multinomial probit (evaluated at the mean) where the omitted sector is the licensed brothel sector. Results are clustered at the city level.

*** indicates significance at 1% level, ** at 5% level, * at 10% level.

Figure 1: Police Enforcement Priorities of Various Laws By City

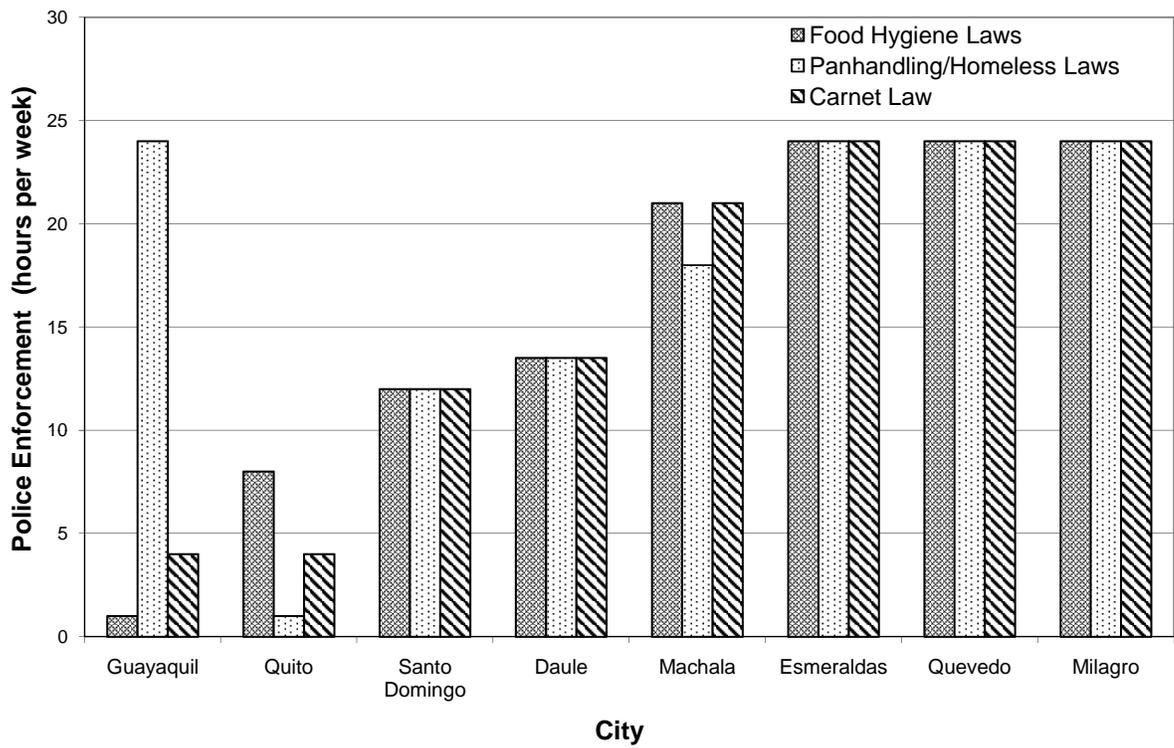


Figure 2: Varying Street Enforcement and Predicting the Sectoral Choice Decision

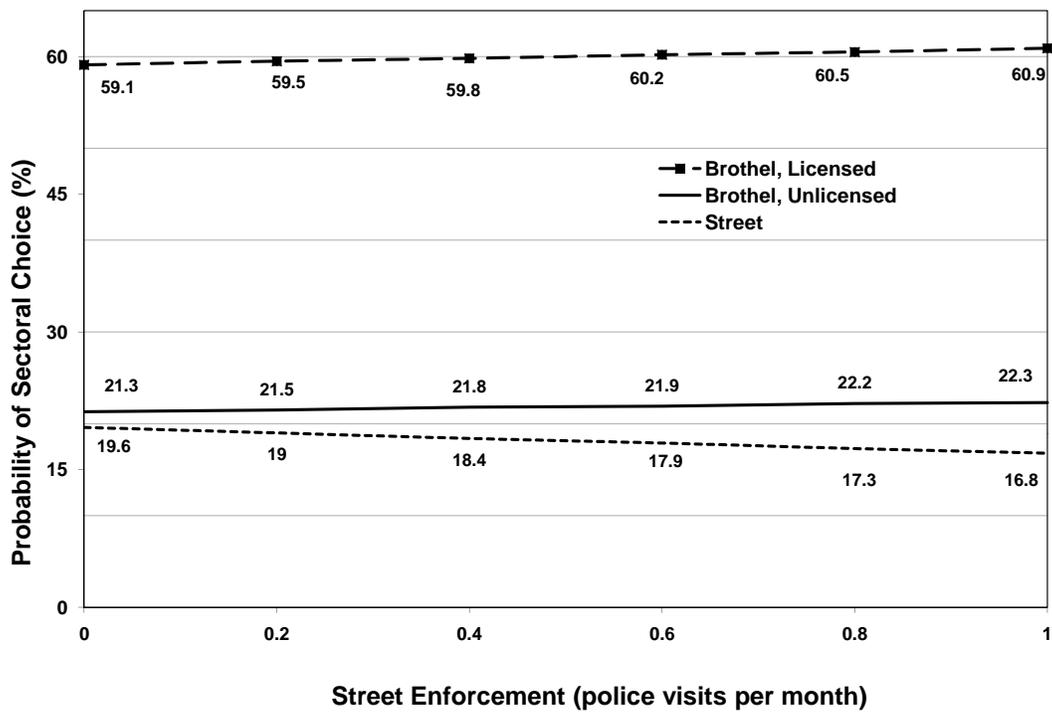


Figure 3: Varying Brothel Sector Enforcement and Predicting the Sectoral Choice Decision

