Sex Work and Infection:

What's Law Enforcement Got to Do with it?*

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Abstract

Several countries are pursuing the regulation of commercial sex work in order to decrease the spread of sexually transmitted infections (STIs) and reduce the probability of a generalized HIV/AIDS epidemic. In many Latin American countries, the commercial sex market is composed of two sectors, brothel and street, where the latter is characterized by riskier behavior (e.g., lower rates of condom use) and higher prevalence of STIs. This paper studies the public health effects of enforcing licensing requirements in a two-sector commercial sex market, where enforcement varies between sectors. Specifically, we use nationally representative data from Ecuador to examine the effects of enforcement in brothels vs. enforcement in the street on STI prevalence, exploiting regional variation in the frequency of police visits. The findings indicate that increasing enforcement in the street sector significantly decreases STIs by 8 percent, yet enforcement in the brothel sector has no effect on disease outcomes. This paper proposes a theoretical model that explains this divergence as a consequence of both a price effect and a sectoral choice effect. Increased enforcement raises the price of commercial sex, decreasing demand for sex. Fewer clients implies less disease transmission. The sectoral choice effect indicates that increased enforcement in one sector decreases the relative returns of that sector. For example, increased street enforcement encourages some street sex workers into the less risky brothel sector, improving overall public health. However, increased brothel enforcement encourages some unlicensed brothel sex workers into the street sector, exacerbating public health problems. To minimize perverse incentive effects of regulation, enforcement should take into account the underlying characteristics of the commercial sex market, and should be concentrated in the sector which is marked by lower condom use and higher STI prevalence.

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1 Introduction

Developing countries are increasingly looking to new policies to stave off a likely HIV/AIDS epidemic. Several countries are pursuing the regulation of commercial sex work in order to decrease the spread of sexually transmitted infections (STIs) and thus reduce the probability of a generalized HIV/AIDS epidemic.[1] Elevated rates of sexually transmitted infections raise concerns as untreated STIs facilitate quicker transmission of the HIV virus (Centers for Disease Control & Prevention 2004). In poor countries, sex workers play a central role in preventing the spread of sexually transmitted infections as they have higher infection rates and more sexual partners relative to the general adult population (UNAIDS 2002). Therefore, regulating sex work could be instrumental in reducing the spread of disease to the population as a whole.

The regulation of sex work creates a legal sex sector in which sex workers are monitored for disease and encouraged to use condoms. In Latin America, it entails a health license requiring frequent STI and HIV/AIDS tests as well as medical check-ups, and sex workers pay out-of-pocket fees for all these medical services.[2] Surprise raids are conducted by local police to enforce licensing requirements, and sex workers are fined if they are found to be in violation. There is a vast amount of research in the economics literature suggesting that increased enforcement of regulation decreases various social ills such as crime (Becker 1968), environmental pollution (Downing and Watson 1974), and drug use (Desimone and Farrelly 2001). However, very little existing research tests the potential benefits of sex worker regulation.

In this paper, we study the public health effects of enforcing sex worker licensing requirements in a two-sector commercial sex market where enforcement varies between sectors. We collect a nationally representative sex worker dataset from Ecuador in 2004 to examine the effects of enforcement in brothels vs. enforcement in the street on STI prevalence, exploiting regional variation in enforcement levels. In the brothel sector, enforcement is relatively high and the majority of sex workers have the license; however, some do remain unlicensed. The street sector is more underground and is characterized by riskier behavior, higher STI prevalence, and significantly less enforcement of the license.

[1] Some countries where regulatory policies have been debated and/or implemented are Argentina, Australia, Belgium, Canada, Kenya, Mexico, New Zealand, and Thailand (Platt 2001; Kohm and Selwood 2004; Jordan 2005).

[2] In most Northern European countries, when sex work is regulated by the government, sex worker STI/HIV/AIDS tests are subsidized by the government.

The major finding of this paper is that increasing police presence in the street sector (the technically unregulated sector) is most effective in decreasing disease. We find that increasing enforcement by one police visit per month in the street significantly decreases sexually transmitted infections by 8 percent. The second major finding is that increasing enforcement by one police visit per month in the brothel sector has no significant effect on disease outcomes. We propose a partial equilibrium model[3] that explains this divergence as a consequence of both a price effect and a sectoral choice effect. We then test the predictions of the model with the data.

The model predicts that the cost of enforcement increases the minimum a sex worker is willing to accept for both condom and non-condom sex. This implies that prices increase for condom and non-condom sex. As prices increase, demand for commercial sex decreases and the overall number of clients decreases (both condom and non-condom use clients). Therefore, the price effect of enforcement works through the increase in overall prices, as fewer clients implies less disease.

Increased enforcement imposes an additional cost which decreases the relative returns of one sector to another, so sex workers may switch sectors. For example, increased street enforcement decreases the relative benefit of working in the street. Street sex workers, especially those on the margin, are now more likely to choose the brothel sector. Increasing street enforcement unambiguously improves public health outcomes by encouraging sex workers to enter the brothel sector where STI prevalence is lower. Increasing enforcement in the brothel sector however, induces counteracting effects. Some unlicensed brothel sex workers may choose to comply with the licensing requirements (and undertake less risky behavior as a result), but others may move to the street sector where they will be exposed to greater risk of infection.

We test the predictions of the model and find that the price effect and sectoral choice effect hold only for the street sector. We find that increased street enforcement increases the price of non-condom use and decreases the overall number of clients in the street sector. In addition, we find that sex workers are less likely to join the street sector as enforcement increases. This explains the significant decrease in overall disease through increases in street enforcement. Our results for the unlicensed brothel sector also explain why increased enforcement in the brothel sector has no significant effect on disease outcomes. Prices in the unlicensed brothel sector do not increase significantly with enforcement, so there is no decrease in the overall number of clients. In addition,

[3]It is an extension of our previous model in Gertler, Shah, and Bertozzi (2005)

the percent of sex workers leaving the unlicensed brothel sector for a given increase in enforcement is minimal. In fact, simulations show that the sex workers who leave the unlicensed brothel sector, switch to the street sector. The result of this sectoral movement is worse public health outcomes.

In this paper we show that increased enforcement can improve public health outcomes, however the design of enforcement is critical. More specifically, we find that increasing enforcement in certain sectors has the potential to exacerbate public health problems. Current enforcement of regulation in Ecuador is somewhat effective, but dampened due to sectoral shifting by unlicensed sex workers who leave the brothel sector to avoid being fined. The findings in this paper indicate that the efficacy of regulation does not result from stricter enforcement in the brothel sector but rather from clamping down on sex workers in the street sector. To minimize perverse effects of regulation, enforcement should take into account the underlying characteristics of the commercial sex market and should be concentrated in the sector which is marked by lower condom use and higher STI prevalence.

2 Background

2.1 Health in Ecuador

Ecuador is an interesting country to study because like many other developing countries, it does not have a generalized HIV/AIDS epidemic. In fact, the national Ecuadorian adult HIV/AIDS prevalence is low. In 2003 it was 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 et al. 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 had some STI in the last year, and this rate is much higher than the general adult population.

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 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 which focus on treating STIs will most likely decrease HIV transmission rates. In Ecuador and much of Latin America, regulating the sex market has been a key policy response to decrease the spread of STIs. However, very little

is known about the effectiveness of such policies.

2.2 The Regulation

In Ecuador there is no law which criminalizes sex work. In fact, the only legal document in which sex work is mentioned is the national Health Code of Ecuador (Tamayo 2004). This law states that sex work inside of "sitios cerrados" (closed establishments) should be monitored by the Ministry of Health. Closed establishments include brothels, bars, and nightclubs.[4] However, this law does not mention other more informal sex worker sites such as the street. A sex worker in Ecuador has three possible work choices: (i) the brothel sector where she can comply with licensing requirements, (ii) the brothel sector where she can choose to defy the licensing requirements and risk getting fined, and (iii) the street sector where she is technically not required to have the license, yet police occasionally check for it.[5]

Monitoring of sex work has taken the form of a "carnet," which is an occupational license certifying good health status of a sex worker. 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 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 gynaecological 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 (3 dollars for an Elisa[6] or 18 dollars for a Western Blot[7]), syphilis tests every 2 months (1 dollar), and chlamydia and herpes every 4 months (10 dollars). Sex workers 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. The license is revoked with a positive HIV test result and can be suspended during STI outbreaks.

In focus groups, sex workers report that there is a lot of aggravation and hassle associated with

[4] These closed establishments make up the brothel sector in this paper.

[5] This may seem strange that the license is officially not required in the street sector, yet is still enforced. This is simply because enforcement implies a police visit where a fine is collected. Police know they can extract money from sex workers in the street sector, so they do. In addition, the data indicates that while current enforcement levels in the street sector are positive, they are quite low and close to zero visits per month.

[6] A sensitive immunoassay that uses an enzyme linked to an antibody or antigen as a marker for the detection of a specific protein, especially an antigen or antibody. It is often used as a diagnostic test to determine exposure to a particular infectious agent, such as the AIDS virus, by identifying antibodies present in a blood sample.

[7] A more specific HIV test to confirm if someone is truly HIV positive, as there are other conditions which may give a false positive ELISA screening test. This test is only conducted if the Elisa results are inconclusive.

maintaining the license. While this system of sex worker health regulation is very similar to that of various northern European countries, sex workers in Ecuador and most of Latin America must pay out of pocket fees for all expenses incurred. The medical services are not subsidized by the government in Ecuador. Therefore, sex workers find it very costly to pay for the exams, tests, and medicine. In addition, there is often only one health center in town which treats sex workers. Travel to that one clinic and waiting to be seen by the doctor can take the majority of an entire day. This is obviously time which could be spent working or doing other things. The point to note about the license is that it is expensive. Acquiring and maintaining a license is very costly to sex workers, especially when the opportunity cost of time is included. As a result, enforcement of health regulation could have the unintended consequence of encouraging sex workers to work in underground areas where enforcement is virtually non-existent and sexual practices 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 et al. 2003), enforcement could actually promote risky behavior.

2.3 Enforcement and Fines

While the license is obtained and maintained through the local Ministry of Health office, enforcement of licensing requirements is done by local police. Enforcement is defined as the average frequency of police visits per month to check sex worker licenses in each sector. Since local Ministries of Health do not have the resources to enforce the license, jurisdiction of enforcement is governed by the local police. Most cities in Ecuador have a concentrated red light district where brothels are located. The same is true for the street sector. To enforce the license, police conduct sectoral raids in these areas. Raids are simply large scale exercises to check as many sex worker licenses as possible. Both sex workers and police report that raids are always surprise visits.

The national Health Code does not mention open sex work sites such as the street sector in its law. This has resulted in some grey area with respect to the street sector. Officially, it would seem that sex workers on the street are not required to have a license. In practice however, street sex workers report that police do occasionally check for licenses. Similarly, police also report that they check street sex workers for licenses, but that visits to the brothel sector are more frequent. Therefore, while enforcement levels are much higher in the brothel sector, there is some enforcement occurring in the street sector.

Sex workers who do not have a license or have an expired license are fined. This is simply a transfer of money from sex worker to police, and no medical visit is enforced by the police. Sex workers report the first fine is generally around 20 dollars, and the fine increases for repeat offenders. In addition, repeat offenders become known to local police which often results in more aggravation and/or harassment from local police. Interviews with sex workers indicate that street sex workers are more likely to be thrown in jail than brothel sex workers. While enforcement is much lower in the street sector, the fine for street sex workers is often larger.

Since we exploit the regional variation in enforcement levels to identify the effect of enforcement of health regulation on STI outcomes, we must understand why we observe variation in enforcement across cities. For example, any unobservable sex worker or client characteristics correlated with enforcement would bias our results. In the next section, we explore this issue qualitatively and in Section 4.1, we further explore the robustness of our results testing various hypotheses of the relationship between enforcement levels and sex worker, city or client characteristics.

2.4 Why is there Variation in Enforcement?

The data collection process included numerous in-depth interviews with police, health officials, and sex workers to gain a better understanding of how enforcement levels in each city are determined. We wanted to investigate why we observe so much variation in enforcement levels across cities. For example, if it is the case that local police are responding to conditions in their city such as high disease rates or moral attitudes against commercial sex, then our estimates of the effect of enforcement on STI outcomes would be biased.

Interviews with police and Ministry of Health officials suggest that enforcement is simply a result of overall decisions made by the local police in each city. In one interview, a doctor at the Ministry of Health in Quito[8] says "The Ministry of Health does not have the capacity or funding 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 being driven by disease.

In interviews with local police, we asked them to report the number of hours spent enforcing

[8]This sentiment was shared by many Ministry of Health doctors we interviewed in various cities.

various types of regulation such as food hygiene rules, panhandling laws, and the sex worker license. We wanted to gain an understanding of police priorities when enforcing various similar laws. Figure 1 illustrates the results of this exercise. It appears that cities which spend more hours enforcing the sex worker license also tend to spend more hours enforcing all other regulations as well. Different cities have different attitudes toward overall governance and enforcement of regulation.

Certain types of governments are more active and have a tendency to enforce all types of regulation more. In Ecuador, the cities which enforce the sex worker license more (and all other regulations), tend to be led by left leaning parties who believe in more active government involvement. Cities which 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 implies we can rule out the possibility that police are enforcing more for reasons related to morality or church leaders condemning sex work as more church attending cities enforce less.

The qualitative evidence suggests that police are not enforcing because of high rates of disease or moral sentiments regarding commercial sex. It seems that cities with higher enforcement have more active enforcement of all types of regulation and tend to be led my more left leaning parties. This suggests that city enforcement levels are not likely to be correlated with unobservable sex worker or client characteristics. However, we further explore this issue statistically in Section 4.1.

3 Survey and Data

3.1 The Survey

In Ecuador, there are approximately 30,000 female sex workers (IJCG/INSP 2003). This number is obviously an underestimate as sex workers are a hard-to-reach population due to the clandestine nature of their work. As part of the evaluation of the Frontiers Prevention Project (FPP), a national Ecuadorian HIV/AIDS and STI prevention project, a survey of female sex workers was conducted in collaboration with the Juan Cesar Garcia Institute in 2003-04. The cities that were selected for the FPP were identified as cities with relatively high HIV/AIDS prevalence. The baseline survey was conducted in the following eight cities: Quito, Guayaquil, Machala, Esmeraldas, Santo Domingo, Quevedo, Milagro, and Daule. Three of these cities, Machala, Milagro, and Daule were randomly selected to be comparison sites for the intervention.[9] This paper uses only the first round of data

[9]The intervention targets "high risk" groups (i.e. sex workers, men who have sex with men, and injecting drug users) and consists of HIV/AIDS prevention and education activities to increase risk knowledge and decrease risky

collection as the second round is yet to be collected.

The universe of sex workers in each city was mapped to develop a sample frame. 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, this type of mapping will obviously miss some informal situations such as the case in which a woman occasionally sells sex out of her home. The bias in favor of more formal sex work sites implies a likely bias in favor of sex workers who have a larger number of clients.

Sample size was calculated in order to measure changes in condom use between the baseline and follow-up surveys with 90 percent power and a 5 percent significance level. Information was collected from approximately 3000 female sex workers. This is the largest survey of sex workers ever conducted in Ecuador, and is quite large in general. Very few, if any countries have conducted a national survey of their sex worker population.

The socioeconomic questionnaire was developed by a multidisciplinary team with the participation of local researchers. The survey includes detailed sex worker characteristics and retrospective information of the last three transactions. In order to minimize misreporting and collect the highest quality data, sex workers were trained and hired to be the enumerators. It has been shown that members of groups often feel more comfortable responding to sensitive issues with members of their own peer groups (Ozer et al. 1997). Survey response rates were over 95 percent and this is most likely due to sex worker participation in the project as enumerators. The interviews took place at sex worker work places and sex worker meeting points.

A very unique component of this survey was the collection of urine and blood samples from each sex worker which were tested for syphilis, chlamydia, gonorrhea, and HSV. This implies that we do not need to rely on self reports of health status. Self-reports are often very subjective and mismeasured and result in biased regression results(Strauss and Thoman 1998). The STI measure used in this paper captures a positive test outcome for syphilis, chlamydia, and/or gonorrhea. These infections can be treated and cured by antibiotics. In contrast, HSV is viral and once a sex worker is infected with HSV, she will always test positive.[10]

Community level surveys were also implemented in each city. Police officers, establishment

behavior among these groups.

[10]HSV is a more cumulative measure of disease.

owners, and Ministry of Health officials were interviewed to gain a better understanding of health regulation enforcement.

3.2 Descriptive Statistics

3.2.1 Sex workers characteristics

Table 1 provides a description of sex workers from the street and brothel sectors in Ecuador. The sample sizes are 1633 licensed brothel workers, 667 unlicensed brothel workers, and 640 street sex workers. Licensed brothel sex workers earn slightly more per hour than unlicensed brothel sex workers (5.51 dollars vs. 5.19 dollars) and significantly more than street sex workers who earn 4.13 dollars per hour. In terms of client numbers, licensed brothel sex workers have more clients per week. They have 26 clients per week compared to 19 for unlicensed brothel and 13 for street sex workers. This implies that licensed sex workers perform significantly more sex acts per week. However on average, street sex workers do receive higher prices per transaction.

Condom use among sex workers is relatively high. Eighty-eight percent of licensed sex workers used condoms in all of their last three transactions compared to 77 percent of unlicensed brothel sex workers and 61 percent in the street sector. In terms of STI prevalence, 7.4 percent of sex workers with a license tested positive for syphilis, chlamydia, and/or gonorrhea compared to 8.3 percent on the street. Street sex workers seem to engage in riskier behavior as they use condoms less often and have higher STI rates.

Sex workers in the brothel sector have an average of one more year of education and tend to be younger. In terms of demographics such as children and marital status, women in the street and brothel sectors appear to be fairly similar. At the end of each interview, sex workers were rated by their interviewer on personal characteristics such as their beauty and communication abilities. The scores indicate that brothel sex workers are more attractive and have better communication skills than street sex workers.

3.2.2 Client characteristics

Client characteristics as reported by sex workers are also summarized in Table 1. Sex workers from the street sector report a higher percentage of regular clients relative to sex workers in the brothel sectors. Clients who frequent the brothel sector tend to be slightly richer and more handsome than street clients. Interestingly, sex worker perceptions of clients across sectors are fairly similar in

terms of client cleanliness.

3.2.3 Enforcement variable

In each city, police officers were interviewed about the frequency of visits to the brothel and street sector 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 2. The values in Table 2 are the mean visits per month by the police to each sector. On average, the mean number of visits is 0.2 visits per month in the street sector and 1.3 visits per month in the brothel sector. In almost every city, the police visit the the brothel sector more often than the street sector.

4 Reduced Form Effect of Regulation on STIs

The purpose of this section is to determine whether or not enforcement of health regulation affects overall disease. In Table 3, we regress sex workers' STI test results on the variables of interest, enforcement in the brothel and street sectors. Since the dependent variable is dichotomous, estimation best takes the form of a probit regression. In column (1), we establish the base model with the enforcement variables as the only regressors. In column (2) we include sex worker characteristics as additional controls. In column (3)-(4), we increase the set of regressors to include city level characteristics and demand side client characteristics to ensure robustness of our estimates. Here, variables such as the city sexratio and male education are included to control for geographic characteristics. In order to address concerns that the largest city may be driving the results, we omit sex workers from Guayaquil, the largest city in the sample in column (5). All specifications are clustered and the reported coefficients are marginal effects.

We find that increasing enforcement in the street sector by an additional police visit per month significantly reduces disease outcomes by approximately 8 percent. However, enforcement in the brothel sector does not significantly affect STI outcomes. The results indicate that sex workers with children are more likely to have an STI, and older women are slightly less likely to have an STI. Age might be capturing experience, and more experience could be negatively correlated with disease. Attractive sex workers are significantly less likely to have an STI. This result may be due to bargaining power as attractive sex workers are more likely to be able to negotiate condom use and/or better work conditions for themselves.

In column (3), city level characteristics are included in the specification to control for potential geographic heterogeneity. The sex ratio is a significant predictor of STI outcomes. This result implies that the higher the ratio of men to women in a city, the more likely a sex worker will test positive for an STI. In column (4) client characteristics are included as regressors to control for demand side heterogeneity, but none are significant.

After controlling for various sex worker, client, and city level characteristics, Table 3 indicates that increasing enforcement in the street sector by one police visit per month decreases disease by 8 percent. Yet increasing enforcement in the brothel sector has no significant effect on STI outcomes.

However, to credibly isolate the effect of enforcement of health regulation on public health outcomes, it is also necessary to examine the nature of enforcement itself. Clearly, if enforcement is systematically correlated with unobservable city, sex worker, or client characteristics, this would introduce bias into the empirical results. We explore this topic in depth in Section 4.1 and provide suggestive evidence that enforcement is in fact idiosyncratic in nature.

4.1 Robustness of Enforcement Variable

Enforcement of health licensing has the potential to bias the estimation results in two important ways. First and foremost, governments could select enforcement levels based on characteristics of the population. This type of endogenous program placement would bias the results. For example, police might enforce more in richer cities to extract higher fines. They might also enforce more in areas where sex workers are more likely to take risks and thus have higher disease prevalence. 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 which would bias the estimates. Now, let's examine each case in turn.

Jurisdiction over enforcement of the licensing requirement occurs at the city level. If local governments select enforcement levels based on unobservable characteristics of the population, then the estimation results will be biased. While we have already shown in Section 2.4 that it does not appear to be the case that police are enforcing more in response to disease rates or other population risk preferences, we now test this hypotheses to check the robustness of our results.

We first test whether 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 4, column (1) we check whether enforcement is correlated with

sex worker risk preferences. We use a measure of whether or not the sex worker likes taking risks as our dependent variable. As the regression results indicate, enforcement has no significant effect on sex worker risk preferences. Therefore, we can conclude that local enforcement decisions are not driven by sex worker risk preferences or as a response to disease.

Logically, one might expect enforcement to be greater in richer cities as local police could extract higher fines in richer cities. To investigate the relationship between enforcement and income levels, average non-sex worker earnings[11] are compared to brothel and street enforcement levels by city. We construct a scatter plot with enforcement on the vertical axis and earnings on the horizontal axis. We fit predicted values to the scatter to check for trends in the data. The results of this exercise are given in Figure 2. As the figure indicates, there is no significant relationship between average city level earnings and enforcement.

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 4, column (2) we test whether enforcement is driving the decision to migrate. We construct a variable which defines a sex worker as a migrant if she migrated within the past five years. Since city level elections occur every four years and 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 does not support any claim that cities are enforcing based on infection rates or risk preferences of sex workers or clients. In addition, enforcement is not significantly correlated with the individual decision to migrate. The reduced form results in Table 3 appear to be robust to systematic correlation between enforcement levels and unobservable city, client or sex worker

[11] We use the 2003 National Employment Survey, the ENEMDU, (Encuesta de Empleo, Desempleo y Subempleo) to generate city level earnings data. This is data collected by the National Census and Statistics Institute (INEC) in Ecuador.

characteristics.

In the next section, we develop a model to fully understand why additional police visits in the street sector improve public health outcomes yet additional police visits in the brothel sector do not. We propose a partial equilibrium model which indicates that enforcement increases the price of sex by raising the minimum a sex worker is willing to accept. This decreases the demand for commercial sex, and less demand for sex implies less disease transmission. In addition, increased enforcement also affects the sectoral choice decision, especially for sex workers on the margin. Increasing enforcement on the street imposes a cost on street sex workers. This shifts some women off the street into the brothel sector, where incentives to use condoms are higher and STI prevalence lower. Increasing enforcement in the brothel sector induces some unlicensed brothel sex workers to leave this sector, but public health outcomes are ambiguous. Unlicensed brothel sex workers may either choose to comply with the health regulation and obtain a license or move to the street sector, which is characterized by riskier behavior and a higher prevalence of sexually transmitted infections.

5 A Model of Commercial Sex with Regulation

We now formalize this view of the commercial sex market with regulation in a simple bargaining model. We propose a partial equilibrium model which is an extension of our previous model in Gertler, Shah, and Bertozzi (2005). We begin by specifying the payoff functions and then describe the equilibrium prices, condom use and number of clients. In the model, the cost of enforcement increases the minimum a sex worker is willing to accept for both condom and non-condom sex. Prices increase for commercial sex and the overall number of clients decreases. This implies that the number of clients with whom condoms are used (and not used) decreases. The effect of enforcement therefore works through the increase in overall prices, as less clients implies less overall disease. Enforcement of the regulation will not affect the probability of condom use with any given client. This depends on the distribution of client and sex worker risk preferences.

5.1 Payoff functions

Let the client's maximum willingness to pay (utility) for sex with the sex worker be V, and his maximum willingness to pay not to use a condom (disutility) be β. Then his payoff from condom-

protected sex with the sex worker is $V - \beta - P^c$, where P^c is the price he pays her for protected sex. His payoff from having unprotected sex with her is $V - P^{nc}$, where P^{nc} is the price he pays her for unprotected sex. Without loss of generality, we normalize the client's payoff from the next best alternative use of his time to be zero.[12]

The price a sex worker receives for protected sex is P^c, and for unprotected sex it is P^{nc}. However, when she supplies sex without a condom, γ is her disutility from exposing herself to risk of infection by not using a condom. In addition, a sex worker faces a potential cost if she is checked by the police for her license and either does not have one or it is not up to date. The probability of enforcement is given by Π, and the fine she pays for the violation is F. The higher the probability of enforcement, the more likely a sex worker will be checked and have to pay a fine.

We assume that the sex worker expects to get W from the next best use of her time. The value of the outside option plus the potential cost of enforcement, $W + \Pi F$ is the minimum that she is willing to accept to provide protected sex, and $W + \gamma + \Pi F$ is the minimum she is willing to accept to provide unprotected sex.[13]

5.2 Equilibrium prices

Since this is a model of free choice, a sex worker will supply unprotected sex only if both agree not to use a condom. This will be the case if the payoff from non-condom use is greater or equal to the payoff from condom use for both parties. For the client this implies that the marginal cost of not using a condom ($P^{nc} - P^c$) is less than or equal to his disutility from condom use, β. For the sex worker, this implies that her marginal revenue from not using a condom ($P^{nc} - P^c$) is greater than or equal to her disutility from risking infection by not using a condom, γ. Therefore, assuming that they are able to negotiate an acceptable price for sex, they will not use a condom if $\beta > \gamma$, i.e. the maximum that he is willing to pay not to use a condom is greater than the minimum that she is willing to accept to take the risk; and $V > W + \gamma + \Pi F$, i.e. the client's maximum willingness to pay for sex is greater than the sex worker's costs associated with non-condom sex.

We solve for the equilibrium prices using a Roth-Nash bargaining framework. We begin with the case where they use a condom. In this case, we choose P^c to maximize $(V - \beta - P^c)^\alpha (P^c -$

[12] His disutility from using a condom need not be positive. Indeed, if the client prefers not to risk infection and therefore prefers to use a condom, then β is negative.

[13] Here too we don't assume that γ is necessarily positive; if a sex worker prefers to supply sex without a condom her disutility associated with not using a condom would be negative.

$W - \Pi F)^{(1-\alpha)}$ where α is the client's bargaining power and $(1-\alpha)$ is the sex worker's bargaining power. Then, the equilibrium price of protected sex is:

$$P^c = (1-\alpha)(V-\beta) + \alpha(W + \Pi F) \tag{1}$$

The equilibrium price is a weighted average of the maximum that the client is willing to pay for protected sex and the minimum the sex worker is willing to accept to supply protected sex. The more the client values sex with the sex worker, the higher the price, bounded by his maximum willingness to pay for protected sex. The more the client dislikes using a condom, the lower the price, bounded by her minimum willingness to accept. The greater the probability of enforcement of the license, the higher the price.

In the case where $\beta > \gamma$ and $V > W + \gamma + \Pi F$, we solve for the price of unprotected sex by maximizing $(V - P^{nc})^{\alpha}(P^{nc} - \gamma - \Pi F - W)^{(1-\alpha)}$. The equilibrium price of unprotected sex is:

$$P^{nc} = (1-\alpha)V + \alpha(W + \gamma + \Pi F) \tag{2}$$

The price of unprotected sex is a weighted average of the maximum the client is willing to pay for unprotected sex with the sex worker and the minimum that the sex worker is willing to accept for supplying unprotected sex. The minimum she is willing to accept is her expected payoff from her outside option plus her disutility from taking the risk by not using a condom plus the cost of enforcement. The more the client values unprotected sex with the sex worker, the higher the price will be. Similarly, the greater the cost of enforcement, the greater the price.

5.3 Equilibrium condom use

Subtracting (1) and (2) gives us the price differential between unprotected and protected sex:

$$P^{nc} - P^c = (1-\alpha)\beta + \alpha\gamma \tag{3}$$

The price differential increases the larger the client's disutility from using a condom and the bigger the sex worker's disutility from taking the risk. The greater the sex worker's bargaining power, the higher the price differential and the closer it gets to the client's maximum willingness to pay to not use a condom.

Interestingly, the cost of enforcement does not affect the price differential for condom use.[14] Enforcement should not affect the relative differential between the price of condom and non-condom

[14] $\frac{\partial(P^{nc} - P^c)}{\partial \Pi} = 0$

use, and thus will not affect the probability of condom use for a given client. However, enforcement will affect the overall price of condom and/or non-condom use.[15] As the probability of enforcement increases, the price of condom and non-condom use will increase by αF which is the fine paid by the sex worker times the client's bargaining power. Due to enforcement of the license, the sex worker's minimum willingness to accept increases. In other words, the price of condom and non-condom use increases with enforcement.

5.4 Equilibrium number of clients

Since the cost of enforcement increases the price of sex by some amount αF, we expect an overall decrease in the number of clients for sex workers in the street sector and those who are unlicensed in the brothel sector. For licensed brothel sex workers, $F = 0$. Since total clients fall, this also implies that the number of clients with whom condoms are used (and not used) decreases. However, it is important to note that regulation does not change the incentives to use condoms with a given client. This will depend on the distribution of client and sex worker risk preferences.

5.5 Discussion

5.5.1 Price effect of enforcement

The model is useful to point out that enforcement of regulation raises the minimum amount a sex worker is willing to accept for commercial sex. This results in an increase in prices and a decrease in the number of clients. Less clients implies less disease. The regulatory structure does not change incentives to use condoms with any given client, it results in fewer transactions overall. Figure 2 illustrates the implications of the model.

Figure 2 displays a demand function which the sex worker faces, where the vertical axis is the client's disutility from condom use (β) and the horizontal axis is his maximum willingness to pay for sex (V). The demand function is overlaid with a given set of sex worker conditions, where $\overline{\gamma}$ is her disutility from non-condom use, $W + \Pi F$ is the minimum she is willing to accept to engage in condom sex, and $W + \Pi F + \overline{\gamma}$ is the minimum she is willing to accept to engage in non-condom sex. The shaded region illustrates those transactions where condoms are used, the striped region where condoms are not used, and no transactions occur in the plain region.

[15] $\frac{\partial P^{nc}}{\partial \Pi} = \frac{\partial P^{c}}{\partial \Pi} = \alpha F$

The figure is useful to illustrate that the number of condom and non-condom transactions will depend on client and sex worker preferences. For example, if we increase sex worker disutility from non-condom use, the number of transactions where condoms are used increases and the number of non-condom transactions decreases. Therefore given client demand, the overall number of condom and non-condom transactions will depend on the distribution of γ. Similarly, if we increase the cost of enforcement, the total number of transactions decreases. There is a decrease in both condom and non-condom transactions, however the overall numbers of each type of transaction will depend on the distribution of client and sex worker preferences.

5.5.2 Sectoral choice effect of enforcement

Until now we have only discussed the price effect of enforcement within each sector. However, enforcement may also induce sex workers to shift sectors. Increased enforcement imposes a cost on sex workers and may decrease the returns of one sector relative to another, so sex workers may switch sectors. For example, increased street enforcement decreases the relative benefit of working in the street. Street sex workers, especially those on the margin, are now more likely to choose the brothel sector. In this case, increasing enforcement on the street should unambiguously improve public health outcomes as sex workers will choose the brothel sector where STI prevalence is lower and condom use higher. It is important to note here that we assume away the possibility of exit from the sex industry. Responses from surveys suggest that while sex workers may be eager to leave the sex market, they are unwilling to do so unless earnings in their new job are equivalent (Lim 1998). This is usually unlikely as sex work is very well paid relative to other "unskilled" female jobs in developing countries (Edlund and Korn 2002). Suggestive evidence supports the claim that full time sex workers rarely exit the sex market.

Increasing enforcement in the brothel sector induces counteracting public health effects. The increased cost of enforcement does not affect licensed brothel sex workers as they do not face any additional cost from enforcement. These women already comply with the regulation requirements. It does affect unlicensed brothel sex workers, and these women face two choices. They can obtain a license and become licensed brothel sex workers or move to the street sector. We would expect improvements in public health outcomes if these sex workers start complying with licensing requirements. However, if these sex workers move to the street sector where disease is higher and condom use lower, this would result in worse public health outcomes. Increasing enforcement in the brothel

sector has the potential to exacerbate public health problems.

5.5.3 Predictions of the model

To sum up, the price predictions of the model are:

1. Enforcement increases the price of condom and non-condom sex for street and unlicensed brothel sex workers.

2. Demand decreases resulting in fewer clients for street and unlicensed brothel sex workers—this includes both condom and non-condom transactions.

3. Enforcement does not affect the probability of condom use with a given client of given risk preferences.

The sectoral choice predictions of the model are:

1. The probability of choosing the street sector decreases as enforcement in the street sector increases. The relative utility from the street sector decreases with increased enforcement so we expect street sex workers to move to the brothel sector.

2. The probability of choosing the unlicensed brothel sectoral choice decreases as enforcement in the brothel sector increases. The relative utility for unlicensed sex workers in this sector decreases with increased enforcement, so we expect sex workers to either get a license or move to the street.

6 Estimation Results

6.1 Within Sector Estimation

Our empirical objective is to test the predictions from the model. Theory illustrates that increased enforcement increases the minimum a sex worker is willing to accept for commercial sex. This implies that enforcement should increase prices. We use an econometric specification very similar to the estimation strategy employed in our previous paper, Gertler, Shah, and Bertozzi (2005) to test the effect of enforcement on prices. We take advantage of the fact that we have transaction data and multiple transactions for each sex worker by including a sex worker fixed effect. The sex worker fixed effect controls not only for γ but also for the value of the sex workers outside option.

The fixed effect controls for bias from both unobserved sex worker heterogeneity and client selection based on unobserved sex worker characteristics.

Table 5 displays the results from the estimation where the dependent variable is the log transaction price. As we are interested in the effects of enforcement on transaction price, the key variables in this analysis are street and brothel enforcement. However, enforcement does not vary within sex worker. This means that identification of these coefficients in the fixed-effects estimator comes from the interaction between non-condom use, the sex workers sector, and enforcement. Our coefficients of interest will be on the interaction terms "non-condom use*enforcement*street" and "non-condom use*enforcement*unlicensed brothel". We build up to the interactions of interest in column (3) by starting with a simple base model first with non-condom use as the only regressor.

In column (1) of Table 5, the estimate results indicate that the average premium for non-condom use is 12 percent and it is statistically significant from zero at the .01 level. Interestingly, the premium for non-condom commercial sex in Ecuador is similar to the Mexican premium for non-condom commercial sex estimated in Gertler, Shah, and Bertozzi (2005). In column (2) we interact non-condom use with the sex workers' sector and find that the premium for non-condom sex varies from 9-14 percent depending on the sector. In column (3), we present the results for the interactions of importance:"non-condom use*enforcement*street" and "non-condom use*enforcement*unlicensed brothel."

We find that increased enforcement in the street sector, does raise the price of non-condom sex by approximately 10 percent. This result is significant at the .01 level and is completely consistent with the theoretical model. The model predicts that enforcement should increase the price of sex by increasing the minimum a sex worker is willing to accept to participate in a commercial sex transaction–and it does. The coefficient on "non-condom use*enforcement*unlicensed brothel" is not significantly different from zero. Our preferred estimates, presented in column (4) of Table 5, are the fixed-effects estimates of the enforcement variables of interest with additional transaction level controls for client characteristics and services provided. The enforcement results are robust to the additional controls. The effect of enforcement on the street decreases slightly to an 8 percent increase in prices for non-condom sex, and the effect of brothel enforcement on unlicensed brothel sex worker prices remains insignificant. In terms of client characteristics, regular, rich, and foreign clients pay more per transaction. Anal and oral sex also pay a premium relative to vaginal sex (the

omitted service category).

Given the results from the fixed effect price regressions in Table 5, we expect a decrease in the number of street clients due to the significant increase in street prices and no effect on clients in the unlicensed brothel sector since brothel enforcement has no significant price effect. Estimating the effect of enforcement on the number of clients for sex workers in their respective sector is problematic due to the selection issue. Sex workers may have unobservable characteristics which are correlated with both the sectoral choice decision and the number of clients they service. For example, a sex worker who chooses the street might have a low γ, i.e. more likely to take risks, and this might also imply she is more likely to service a greater number of clients. Estimating the effect of street enforcement on the number of street clients without controlling for the sectoral choice decision would result in biased coefficients.

We employ heckman selection regressions 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. Enforcement in both sectors will influence the initial sectoral choice decision. However, once a sex worker makes that decision and chooses a sector, only enforcement in her sector will affect outcomes such as number of clients last week. Tables 6 and 7 display the second stage results of these regressions for the street and unlicensed brothel sector, respectively. [16] These regressions are estimated at the sex worker level and include the same set of controls as the STI reduced form estimates in Table 3. We do not estimate these regressions for sex workers in the licensed brothel sector as enforcement should not affect outcomes such as clients last week. Enforcement works through the increase in prices (denoted by ΠF in the model). Sex workers with licenses should not face any additional cost associated with enforcement since they comply with the regulations (their $F = 0$).

Table 6 reports the heckman estimation results for the street sector where the dependent variable is number of clients last week in column (1), number of clients last week with whom a condom was used in column (2), number of clients last week with whom a condom was not used in column (3), and ln earnings last week in column (4). The street sector estimation results confirm the predictions of the theoretical model. Since street prices increase with enforcement, we expect a decrease in the dependent variables of columns (1)-(3). In fact, for a one standard deviation increase in street

[16] The results from the estimation of the first stage selection equation are given in Tables 12 and 13 in the Appendix.

enforcement, street sex workers will service 3.2 less clients per week. This is approximately a 25 percent decrease in the number of clients per week, and this result is significant at the .01 level. Similarly, street sex workers will use condoms with 2.4 less clients per week and not use condoms with .83 less clients per week. These results are also significant at the .01 and .05 level, respectively. As the model predicts, there is an overall reduction in street clients both with whom condoms are and are not used.

Table 7 reports the heckman estimation results for the unlicensed brothel sector where the dependent variables are the same as those discussed above in Table 6. Since enforcement in the brothel sector has no significant price effects, we expect enforcement to have no significant effect on the dependent variables in columns (1)-(3). The estimation results confirm our theory. Brothel sector enforcement has no significant effect on the total number of clients last week. In addition, it does not affect the number of clients with whom a condom was used. However, it does significantly decrease the number of clients with whom condoms were not used last week.

In the street sector regressions, the Mills ratio is significant for two of the dependent variables: number of clients last week and number of clients with whom condoms were used, implying that there is some selection on unobservables. A given sex worker who is more likely to choose the street sector also has characteristics which will make her less likely to have more clients and less likely to have more clients clients with whom a condom was used. In the unlicensed brothel sector, the only significant Mills ratio is when the dependent variable is number of clients with whom a condom was used. This implies that a sex worker who is more likely to choose the unlicensed brothel sector is also less likely to increase the number of clients with whom a condom was used.

The last prediction of our model for the within sector component is that enforcement should not affect the probability of condom use with a given client of given risk preferences. To test this prediction we regress non-condom use on sectoral enforcement. Since our dependent variable of interest is non-condom use, these regressions are estimated at the transaction level, not the sex worker level. However, we still must control for selection into sector and thus use the same selection correction technique described above. We predict the sectoral choice decision using enforcement from the other sector and then estimate the effect of enforcement on non-condom use. Because we have three transactions per sex worker, we bootstrap the standard errors to adjust for multiple observations per woman. We include additional controls such as services provided as they also

affect non-condom use.

Table 8 reports the results of the second stage of the heckman regressions.[17] Column (1) reports results for the unlicensed brothel sector and column (2) the street sector. In both sectors, enforcement is not driving the decision to engage in non-condom or condom use as the coefficient is not significantly different from zero. It appears that for any given client, enforcement does not affect the probability of condom use as predicted by our model. The results indicate that sex worker risk knowledge and risk preferences are significant predictors of condom use. The more risk knowledge a sex worker has, the less likely she is to engage in non-condom use. In addition, regular clients are more likely to engage in non-condom use with sex workers, again in both sectors. This implies that sex workers probably trust regular clients more as they are more likely to engage in non-condom use with them. Regular clients also pay more as illustrated in Table 5. In the following section, we test the across sector predictions of the model and discuss the results.

6.2 Across Sector Estimation

In this section we estimate the sectoral choice decision which sex workers face as a function of enforcement and various other sex worker, client, and city level characteristics. We know from the model that enforcement decreases the relative benefit of one sector compared to another for street and unlicensed brothel sex workers. This implies that street and unlicensed brothel sex workers, especially those on the margin, are more likely to switch sectors given an increase in enforcement. We conclude with simulations of the model to better understand how changes in enforcement affect the sectoral choice decision and thus disease outcomes.

To assess the sectoral decision made by sex workers, we require a methodology which allows us to simultaneously estimate how individual characteristics and sectoral characteristics affect the sectoral decision in a three-choice setting. The multinomial probit (MNP) allows for this (Hausman and Wise 1978). The MNP model estimates the coefficients of the model without assuming that the errors are identically and independently distributed.[18] The MNP model is very flexible in that it allows for errors to be correlated across choices (Alvarez and Nagler 1994). For example, the error terms between the choice of brothel licensed and brothel unlicensed may be correlated,

[17] Table 14 in the Appendix reports the first stage selection into sector regressions.

[18] The multinomial logit model and the conditional logit model are unattractive because they do not allow for correlation between the error terms (i.e., assume $\varepsilon_{ij} \perp \varepsilon_{ik}$ for $j \neq k$) This assumption is known as the independence of irrelevant alternatives (Hausman and Wise 1978).

and the MNP allows for this. We estimate parameters that vary across sectors for the choice and individual-specific characteristics. A normalization sets one of the choices to zero, and hence $j-1$ vectors of parameters are actually estimated.

Table 9 reports the results from the sectoral choice multinomial probit. The omitted base category in each specification is the licensed brothel sector. Column (1) reports estimation results of the full model including controls for sex worker characteristics, city level characteristics, and client characteristics. Column (2) omits the largest city, Guayaquil as a robustness check. The concern is that the large city might be driving the results. However, the coefficients of interest on the enforcement variables do not change significantly in column (2).

We find that enforcement is a strong predictor of sectoral choice. In both the street and the unlicensed brothel sector, increasing enforcement reduces the probability of sex workers choosing these sectors. These results are significant at the .01 percent level. We find that for an additional police visit per month in the street sector, there is a 40 percent decrease in the probability of sex workers choosing the street sector relative to the licensed brothel sector. Similarly, but to a much smaller magnitude, increasing enforcement in the unlicensed brothel sector leads to a 2 percent decrease in the probability of choosing this sector relative to the base. These results are consistent with the predictions from the model.

The results on the individual level characteristics indicate that the more risk knowledge a sex worker has, the more likely she will join the licensed brothel sector. The same woman is least likely to choose the street, as might be expected. The street sector is characterized by riskier behavior so women with high γ's would choose the licensed brothel sector or even the unlicensed brothel, relative to the street sector. In addition, the more educated and younger sex workers are also least likely to choose the street sector. These results allude to the fact that the more "ideal" sex workers, in terms of observable characteristics will choose the licensed brothel sector.

We include several client characteristics in the multinomial probit to control for potential demand-side client heterogeneity as client characteristics will be important in determining the prices paid. Handsome clients increase the probability of the unlicensed brothel sector being chosen while regular clients increase the probability of the street sector being chosen.

In the next section we simulate changes in enforcement using estimates from the multinomial probit to understand how sex workers switch sectors and thus affect overall disease rates change.

6.2.1 Enforcement simulations and disease outcomes

We conduct a policy experiment to understand how increasing enforcement affects disease outcomes. We simulate changes in enforcement in each sector to see how the percentage of sex workers in each sector changes. From the summary statistics in Table 1 we know that the street sector has the highest disease rate and the lowest levels of condom use. Therefore, how sex workers shift sectors as a function of enforcement has serious implications for disease. We calibrate the model and increase street enforcement from 0 to 1 standard deviation of enforcement, 0 to 2 standard deviations, and 0 to 3 standard deviations, holding brothel sector enforcement constant. The results of this exercise are reported in Table 10 and shown graphically in Figure 3. We conduct the same experiment for the unlicensed brothel sector and the results are reported in Table 11 and illustrated graphically in Figure 4.

The results for the street sector are very interesting. Increasing street enforcement from 0 to .2 police visits per month results in a 6 percent decrease in sex workers choosing the street sector. Increasing this amount to .6 visits per month (3sd) results in an almost 20 percent decrease in sex workers choosing the street. The majority of these sex workers shift to the unlicensed brothel sector, yet some do move to the licensed brothel sector. This is a substantial decrease in the share of women choosing the street sector and has amazing implications for disease. By shifting women out of the high disease and low condom use sector through increased street enforcement, we expect a decrease in overall STI rates. This is precisely what the reduced form estimates in Table 3 report.

In Table 11 we simulate increases in brothel enforcement from 0 to 5.1 visits per month, keeping street sector enforcement constant. At 1.7 brothel visits per month (1sd), 22.5 percent of women are in the unlicensed brothel sector, compared to 56 percent in the licensed brothel sector and 21.5 percent in the street sector. From 0 to 1.7 police visits per month in the brothel sector, there is a 6.25 percent decrease in sex workers choosing the unlicensed brothel sector. Increasing enforcement from 0 to 5.1 visits per month (3sd), there is a 17 percent decrease in sex workers choosing the unlicensed brothel sector. In theory this could be great for public health outcomes if these sex workers were shifting to the licensed brothel sector. However, Table 11 indicates that the majority of these women are shifting to the street sector. This implies that increasing enforcement in the brothel sector is actually shifting women to the riskier sector where disease rates are higher and condom use lower. These simulation results also help explain the reduced form estimates in Table

3 which report that increasing enforcement in the brothel sector has no significant effect on STI outcomes.

The street and brothel sector simulations are depicted graphically in Figures 2 and 3, respectively. Figure 2 illustrates that additional police visits in the street sector decrease the probability of the street being chosen, which leads to a decrease in overall STI prevalence. This corresponds exactly to the predictions of the model. Figure 3 illustrates that increasing brothel sector enforcement decreases the probability of unlicensed sectoral choice, but the majority of these sex workers shift to the street sector.

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. This implies that more cost-effective interventions should target the street sector, especially since increasing enforcement in the brothel sector has the potential to exacerbate public health problems.

7 Conclusions

It is widely believed that regulating the sex market improves overall public health outcomes. However, these claims were relatively unsubstantiated prior to this work. This paper offers both empirical and theoretical insights into the regulation of sex work in Ecuador.

We find that additional police visits in the street sector are most effective in reducing disease. Current enforcement of regulation is somewhat effective, but dampened due to sectoral shifting by unlicensed sex workers in the brothel sector to avoid being fined. In fact, licensing works not so much by enforcing the license in the highly regulated brothel sector, but by clamping down on the street market. Increased enforcement increases street prices, reducing the overall number of street clients. In addition, the multinomial probit results indicate that increasing enforcement in the street sector by one police visit per month decreases the probability of sex workers choosing this sector by 40 percent. The reduced form estimates show that this translates into an overall decrease in STI prevalence by 8 percent. Therefore, both the price and sectoral choice effect in the street sector unambiguously improves public health outcomes.

Increasing enforcement in the brothel sector has the potential to exacerbate public health prob-

lems as it induces unlicensed sex workers to either comply with health regulations or shift to the risky street sector. If more sex workers choose the street, then increasing enforcement in the brothel sector will only aggravate public health outcomes. Therefore, it is not simply enforcement which matters, but the type of enforcement.

The most effective type of enforcement should take into account the underlying characteristics of the commercial sex market, and should be concentrated in the sector which is marked by lower condom use and higher STI prevalence. If unlicensed women are choosing the street due to high licensing costs, then offering them financial incentives to keep them in the regulated brothel sector is one policy option. For example, increasing the availability and reducing the price of condoms, STI and HIV/AIDS testing makes non-condom use relatively more expensive. In addition, interventions to educate street sex workers about the risks of unprotected sex may change their risk preferences, reduce the share of time allocated to non-condom use, and possibly induce sex workers into the brothel sector.

This paper has focused mostly on supply side issues of the commercial sex market. However, if clients are willing to frequent the street sector in search of risky sex, then sex workers in the street sector will continue to provide risky services. In fact, very little is known about the demand side of the commercial sex market as clients are numerous and more difficult to target. Analyzing demand side heterogeneity and its effects on public health outcomes is an area of further research.

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Table 1: Sex Worker Summary Statistics

Variable	**Brothel Licensed**	**Brothel Unlicensed**	**Street**
	Mean	Mean	Mean
	(Std. dev.)	(Std. dev.)	(Std. dev.)
Hourly earnings($)	5.51	5.19	4.13
	(9.16)	(9.35)	(7.88)
Clients per week	26.27	18.70	13.01
	(30.58)	(28.56)	(19.62)
STI(=1)	0.074	0.081	0.083
	(0.262)	(0.273)	(0.276)
Condom always used(=1)	.881	.774	.606
	(.324)	(.419)	(.489)
Client suggested non-condom use(=1)	.029	.038	.064
	(.168)	(.191)	(.244)
Experience(years)	3.92	3.02	6.47
	(4.17)	(4.20)	(6.84)
Age(years)	27.37	25.92	31.59
	(7.03)	(7.14)	(9.94)
Education(years)	7.8	7.49	6.48
	(3.27)	(3.34)	(3.64)
Married/Civil union(=1)	0.49	0.44	0.47
	(0.5)	(0.497)	(0.5)
Children(=1)	0.85	0.85	0.88
	(0.36)	(0.36)	(0.33)
Attractive sex worker(=1)	0.32	0.29	0.16
	(0.47)	(0.46)	(0.37)
Communication skills(=1)	.79	.801	.634
	(.400)	(.399)	(.482)
Regular client(=1)	.477	.413	.606
	(.42)	(.41)	(.40)
Clean client(=1)	.888	.871	.882
	(.315)	(.336)	(.322)
Handsome client(=1)	.115	.149	.101
	(.32)	(.36)	(.30)
Rich client(=1)	.079	.084	.061
	(.27)	(.28)	(.24)
Sample Size	1633	667	640

The STI variable includes sex workers who tested positive for chlamydia, gonorrhea, and/or syphilis. These are bacterial diseases and can be treated easily with antibiotics.
The summary statistics are calculated at the sex worker level.

Table 2: Enforcement: Police Visits (per month)

City	**Enforcement, Brothel (per month)**	**Enforcement, Street (per month)**	
	Mean	Mean	SW Sample Size
Machala	4.0	0.507	457
Quito	3.68	0.13	416
Milagro	0.4	0.4	298
Quevedo	0.4	0.38	419
Esmeraldas	0.2	0.05	303
Guayaquil	0.088	0.012	418
Daule	0.034	0.018	281
Santo Domingo	0.034	.034	347
All cities	1.28	0.203	2939
(std. dev)	(1.68)	(.194)	

The overall enforcement mean is 1.01 visits per month with a standard deviation of 1.54.

Table 3: "STI Positive" Probit

	(1)	(2)	(3)	(4)	(5)
	Base Model	SW Characs	City Characs	Client Characs	Exclude Guayaquil
Enforcement brothel	-0.007	-0.006	0.001	0.000	-0.007
	(0.00)**	(0.00)	(0.01)	(0.01)	(0.01)
Enforcement Street	-0.045	-0.044	-0.086	-0.083	-0.091
	(0.02)*	(0.04)	(0.04)**	(0.04)**	(0.03)***
Risk knowledge		0.010	0.008	0.010	0.008
		(0.00)**	(0.00)*	(0.00)**	(0.01)
Doesn't take risks		-0.013	-0.015	-0.014	-0.015
		(0.02)	(0.02)	(0.02)	(0.02)
Age		-0.002	-0.002	-0.002	-0.002
		(0.00)***	(0.00)***	(0.00)***	(0.00)***
Children		0.020	0.020	0.020	0.024
		(0.01)***	(0.01)***	(0.01)***	(0.01)***
Married/Civil union		-0.003	-0.001	-0.001	0.000
		(0.01)	(0.01)	(0.01)	(0.01)
Education		-0.001	-0.001	-0.001	-0.001
		(0.00)	(0.00)	(0.00)	(0.00)
Attractive		-0.013	-0.018	-0.018	-0.016
		(0.01)**	(0.01)***	(0.01)***	(0.01)***
Sex ratio			0.006	0.006	0.005
			(0.00)***	(0.00)***	(0.00)***
Male education			-0.011	0.001	0.134
			(0.15)	(0.14)	(0.15)
Regular client				-0.015	-0.010
				(0.01)	(0.01)
Clean client				-0.009	-0.005
				(0.01)	(0.01)
Handsome client				-0.010	-0.015
				(0.02)	(0.02)
Rich client				0.015	0.017
				(0.02)	(0.02)
Clustered	N	Y	Y	Y	Y
Chi2	16.5	70.1	107.8	176.3	358.7
Sample size	2937	2910	2910	2910	2494

The reported coefficients are marginal effects from probit regressions where the dependent variable is "has a STI(=1)". The mean of the dependent variable is .077.
*** indicates significance at 1% level, ** at 5% level, * at 10% level.

Table 4: Sex Worker Enforcement Validity Checks

Dep variable:	Doesn't take Risks	SW Migrated
	(1)	(2)
Enforcement brothel	0.009	-0.050
	(0.01)	(0.04)
Enforcement street	-0.074	-0.000
	(0.05)	(0.29)
Risk knowledge	0.079	0.023
	(0.03)**	(0.02)
Age	-0.001	-0.009
	(0.00)	(0.00)***
Children	0.020	-0.000
	(0.01)	(0.03)
Married/Civil union	-0.013	-0.050
	(0.01)	(0.02)*
Education	0.007	0.007
	(0.00)***	(0.00)*
Attractive	0.016	0.024
	(0.01)	(0.03)
Sex ratio	0.003	0.040
	(0.00)	(0.03)
Male education	-0.025	0.687
	(0.20)	(1.42)
Regular client	0.016	-0.159
	(0.02)	(0.04)***
Clean client	0.053	-0.014
	(0.02)**	(0.03)
Handsome client	-0.008	0.053
	(0.03)	(0.05)
Rich client	0.028	0.019
	(0.02)	(0.04)
Constant	0.533	-3.424
	(0.29)	(2.90)
Clustered	Y	Y
F	12.88	29.97
Sample Size	2914	2914

The reported coefficients are from an OLS model.
*** indicates significance at 1% level, ** at 5% level, * at 10% level.

Table 5: Price Fixed Effects Model

	(1)	(2)	(3)	(4)
No condom	.118 (.019)***			
Street*no condom		.135 (.031)***	.052 (.042)	.037 (.041)
Street*no condom*enforcement			.488 (.168)***	.413 (.163)**
Unlicensed brothel*no condom		.138 (.041)***	.151 (.048)***	.147 (.047)***
Unlicensed brothel*no condom*enforcement			-.02 (.036)	-.038 (.035)
Licensed brothel*no condom		.086 (.033)***	.086 (.033)***	.088 (.032)***
Regular client				.028 (.009)***
Clean client				.007 (.013)
Handsome client				.009 (.01)
Rich client				.126 (.014)***
Foreign client				.056 (.021)***
Anal sex				.394 (.033)***
Oral sex				.115 (.02)***
Constant		1.737 (.003)***	1.737 (.003)***	1.689 (.013)***
F statistic	35.4	12.3	9.1	33.7
Sample size	8461	8461	8461	8461

This table presents estimates from a sex worker fixed effects model. The dependent variable is the ln price per transaction and its mean is 1.75.
The omitted service category is vaginal sex.
*** indicates significance at 1% level, ** at 5% level, * at 10% level.

Table 6: Enforcement and the Street Sector

Dep Variable:	# **Clients last week**	# **Clients condoms used**	# **Clients condoms not used**	ln **Earnings last week**
Mean of dep var:	13.01	10.27	2.73	4.20
	(1)	(2)	(3)	(4)
Enforcement Street	-16.453	-12.207	-4.165	-0.663
	(2.07)***	(2.69)***	(2.07)**	(0.26)**
Risk knowledge	3.258	4.849	-1.643	0.264
	(0.84)***	(1.09)***	(0.98)*	(0.11)**
Doesn't take risks	2.327	2.599	-0.321	-0.001
	(2.45)	(2.42)	(1.40)	(0.17)
Age	-0.100	-0.124	0.036	-0.029
	(0.10)	(0.10)	(0.10)	(0.00)***
Children	1.448	2.418	-1.233	-0.114
	(4.74)	(3.71)	(1.03)	(0.31)
Married/Civil union	3.304	2.548	0.826	0.254
	(2.23)	(2.04)	(0.60)	(0.13)*
Education	0.590	0.587	-0.020	0.064
	(0.30)*	(0.25)**	(0.19)	(0.02)***
Attractive	4.324	6.076	-1.605	0.242
	(4.06)	(4.17)	(1.06)	(0.24)
Sex ratio	1.449	1.135	0.284	0.035
	(0.24)***	(0.27)***	(0.35)	(0.03)
Male education	47.71	51.28	-3.89	1.19
	(10.40)***	(12.21)***	(8.16)	(1.09)
Regular client	-1.96	-3.99	1.99	0.006
	(2.31)	(1.67)**	(1.84)	(0.09)
Clean client	-0.020	1.951	-2.373	0.343
	(1.54)	(1.76)	(1.33)*	(0.29)
Handsome client	-2.777	-5.359	2.452	-0.017
	(3.54)	(2.62)**	(1.72)	(0.22)
Rich client	9.082	9.949	-0.880	0.487
	(5.37)*	(4.42)**	(1.74)	(0.24)**
Constant	-141.457	-116.573	-21.976	0.870
	(26.69)***	(28.91)***	(28.76)	(3.06)
Mills ratio	-1.22	-1.14	0.297	-.195
	(.446)**	(.487)**	(4.85)	(.162)
Chi2	38.67	60.87	381.4	65.80
Clustered	Y	Y	Y	Y
Sample size	2879	2874	2874	2743

These are heckman regressions for the street sector.
*** indicates significance at 1% level, ** at 5% level, * at 10% level.

Table 7: Enforcement and the Unlicensed Brothel Sector

Dep Variable:	**# Clients last week**	**# Clients condoms used**	**# Clients condoms not used**	**Earnings last week**
Mean of dep var:	18.7	17.02	1.86	4.66
	(1)	(2)	(3)	(4)
Enforcement brothel	1.330	2.135	-1.166	-0.014
	(1.60)	(1.79)	(0.39)***	(0.08)
Risk knowledge	6.994	8.095	-1.038	0.325
	(1.33)***	(1.26)***	(0.72)	(0.11)***
Doesn't take risks	0.376	3.148	-2.822	-0.097
	(2.19)	(2.97)	(1.37)**	(0.18)
Age	-0.225	-0.285	-0.029	-0.029
	(0.11)**	(0.10)***	(0.09)	(0.02)*
Children	-7.982	-6.315	-1.328	-0.145
	(3.68)**	(3.53)*	(0.96)	(0.12)
Married/Civil union	6.649	5.928	0.466	0.316
	(2.01)***	(2.28)***	(0.65)	(0.11)***
Education	0.243	0.260	-0.035	0.056
	(0.37)	(0.38)	(0.09)	(0.02)***
Attractive	2.621	2.794	-0.513	0.026
	(2.92)	(3.05)	(0.73)	(0.13)
Regular client	2.274	1.706	-0.498	0.174
	(2.44)	(2.32)	(1.24)	(0.22)
Clean client	-3.995	-3.069	-1.231	-0.257
	(4.22)	(6.42)	(1.23)	(0.12)**
Handsome client	8.586	8.164	1.292	0.475
	(5.83)	(5.77)	(1.84)	(0.36)
Rich client	-9.745	-8.924	-0.796	0.099
	(4.24)**	(4.07)**	(1.47)	(0.23)
Sex ratio	-0.889	-1.587	1.107	-0.018
	(0.76)	(0.86)*	(0.43)***	(0.05)
Male education	-72.653	-95.624	38.683	-2.020
	(38.34)*	(42.33)**	(15.50)**	(2.24)
Constant	126.261	194.241	-113.164	6.628
	(78.91)	(88.92)**	(47.22)**	(5.26)
Mills ratio	-2.83	-3.32	4.55	.324
	(1.68)	(1.33)**	(4.35)	(.604)
Chi2	40.6	45.92	208.9	72.29
Clustered	Y	Y	Y	Y
Sample size	2875	2866	2866	2657

These are heckman regressions for the unlicensed brothel sector.
*** indicates significance at 1% level, ** at 5% level, * at 10% level.

Table 8: Enforcement and Condom Use

Dep Variable:	**Unlicensed Brothel**	**Street**
	Non-condom use	**Non-condom use**
Mean of dep var:	.153	.267
	(1)	(2)
Enforcement Brothel	-0.173	
	(0.18)	
Enforcement Street		-0.540
		(0.64)
Risk knowledge	-0.344	-0.480
	(0.16)**	(0.22)**
Doesn't take risks	-0.232	-0.327
	(0.24)	(0.19)*
Age	0.038	0.028
	(0.02)**	(0.02)
Children	-0.186	-0.174
	(0.19)	(0.18)
Married/Civil union	0.149	0.085
	(0.13)	(0.12)
Education	0.012	-0.039
	(0.02)	(0.04)
Attractive	-0.045	-0.218
	(0.13)	(0.18)
Communication	-0.214	-0.245
	(0.16)	(0.22)
Regular client	0.333	0.436
	(0.13)**	(0.26)*
Clean client	-0.070	-0.176
	(0.12)	(0.16)
Handsome client	-0.035	0.053
	(0.12)	(0.13)
Rich client	-0.180	-0.245
	(0.17)	(0.22)
Foreign client	0.521	0.256
	(0.33)	(0.21)
Anal sex	0.247	0.426
	(0.32)	(0.32)
Oral sex	0.166	0.528
	(0.20)	(0.24)**
Sex ratio	0.067	-0.066
	(0.12)	(0.06)
Male salary	-0.001	-0.003
	(0.00)	(0.00)
Female salary	0.442	-0.241
	(0.43)	(0.59)
Constant	-9.066	7.003
	(14.67)	(6.78)
Chi2	17.2	16.96
Clustered	Y	Y
Sample size	8686	8673

These are heckman regressions estimated at the transaction level, and the standard errors are bootstrapped. The omitted service is vaginal sex.
*** indicates significance at 1% level, ** at 5% level, * at 10% level.

Table 9: Multinomial Probit Results

	Full Model		**No Guayaquil**	
	(1)		**(2)**	
Sector choice	Brothel Unlicensed	Street	Brothel Unlicensed	Street
Enforcement^{+}	-.132	-1.169	-.162	-1.407
	(.05)***	(.439)***	(.055)***	(.459)***
Risk knowledge	-.27	-.282	-.346	-.355
	(.089)***	(.119)**	(.075)***	(.109)***
Doesn't take risks	-.342	-.488	-.328	-.419
	(.203)*	(.203)**	(.22)	(.226)*
Age	-.02	.028	-.027	.023
	(.008)***	(.006)***	(.006)***	(.008)***
Children	.13	.076	.159	-.081
	(.133)	(.157)	(.157)	(.169)
Married/Civil union	-.102	.047	-.145	.139
	(.098)	(.121)	(.091)	(.148)
Attractive	-.16	-.092	-.154	-.124
	(.133)	(.154)	(.149)	(.174)
Communication	-.476	.053	-.453	.037
	(.146)***	(.075)	(.158)***	(.085)
Education	-.019	-.05	-.017	-.041
	(.008)**	(.021)**	(.009)*	(.025)*
Sex ratio	.147	.043	.147	-.011
	(.042)***	(.17)	(.042)***	(.179)
Male Education	5.959	12.447	6.641	14.203
	(2.02)***	(7.42)*	(2.13)***	(7.32)*
Rich client	.092	.45	.178	.431
	(.22)	(.294)	(.228)	(.311)
Handsome client	.522	-.175	.241	-.405
	(.311)*	(.282)	(.221)	(.296)
Clean client	-.12	.051	-.08	.088
	(.146)	(.175)	(.151)	(.184)
Regular client	-.264	.365	-.28	.528
	(.121)**	(.216)*	(.135)**	(.165)***
Constant	-14.913	-6.474	-14.825	-1.066
	(4.43)***	(17.9)	(4.49)***	(18.7)
Clustered	Y	Y	Y	Y
Chi2	591.22	591.22	511.66	511.66
Sample Size	2910	2910	2494	2494

+ The marginal effect of the enforcement variable (evaluated at the mean) for the street sector is -.40 (standard error of .147) and -0.018 for the unlicensed brothel sector (standard error of 0.01).
The mean of enforcement in the street sector is 0.2 police visits per month and the mean in the brothel sector is 1.3 police visits per month.
The omitted sector is licensed brothel.
*** indicates significance at 1% level, ** at 5% level, * at 10% level.

Table 10: Street Enforcement Simulations

Street Enforcement Level	Brothel Licensed %in sector	Brothel Unlicensed %in sector	Street %in sector	% Decrease in Street
0	55.7	22	22.3	
0.2 (1 sd)	56	23	21	5.8
0.4 (2 sd)	57	24	19	14.8
0.6 (3 sd)	57	25	18	19.3

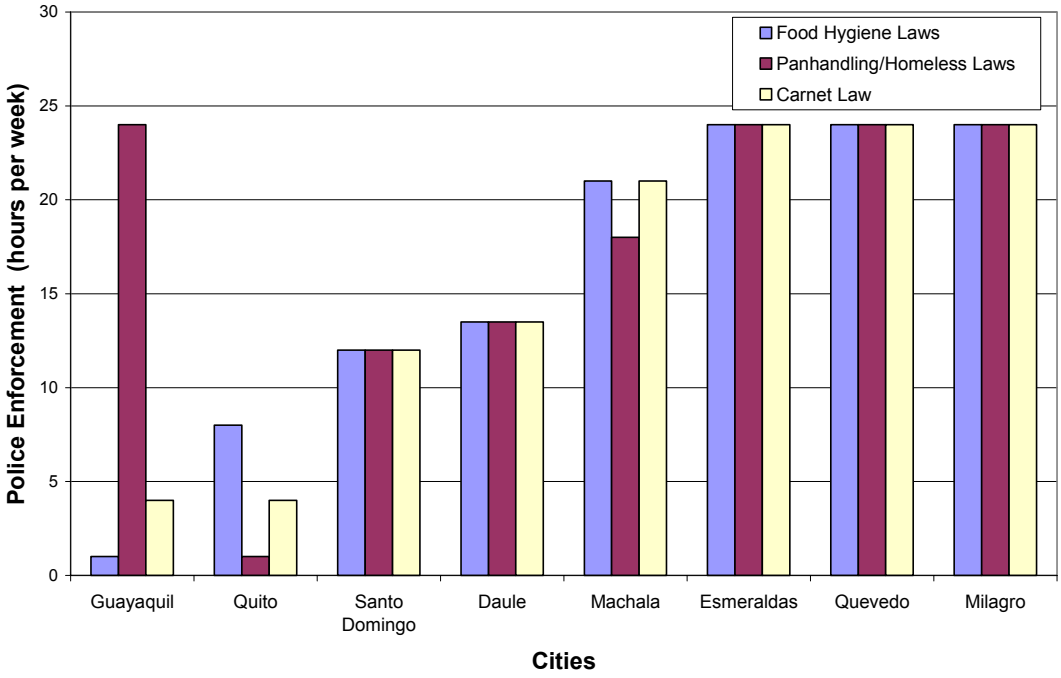
Increase street enforcement and hold other sector enforcement constant.

Table 11: Unlicensed Brothel Enforcement Simulations

Brothel Enforcement Level	Brothel Licensed %in sector	Brothel Unlicensed %in sector	Street %in sector	% Decrease in Brothel Unlicensed
0	56	24	20	
1.7 (1 sd)	56	22.5	21.5	6.25
3.4 (2 sd)	56	21	23	12.5
5.1 (3 sd)	55	20	25	16.7

Increase unlicensed brothel sector enforcement and hold other sector enforcement constant.

Figure 1: Police Enforcement Priorities



Enforcement(Visits per month)
0
1
2
3
4
3
3.2
3.4
3.6
3.8
Non−Sex Worker Earnings(ln)
95% CI
Brothel_Enforcement
Fitted values
Fitted values
95% CI
Street_Enforcement

Figure 3: Transactions and Condom Use

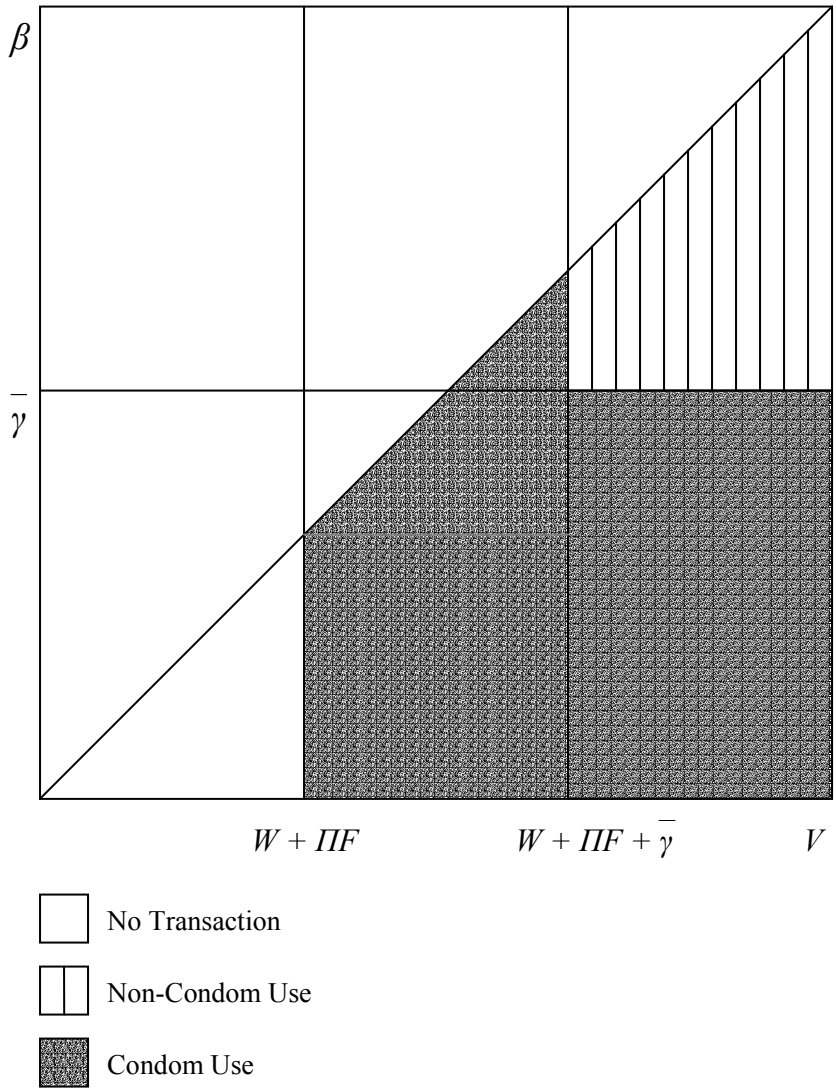


Figure 4: Sectoral Choice and Street Enforcement

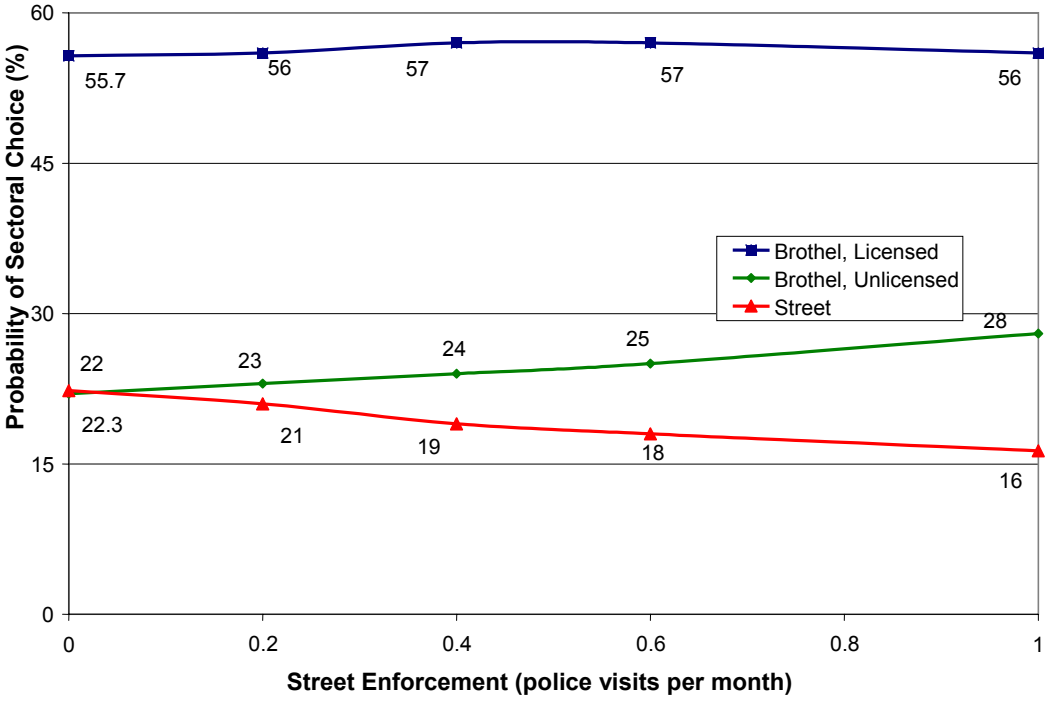


Figure 5: Sectoral Choice and Brothel Enforcement

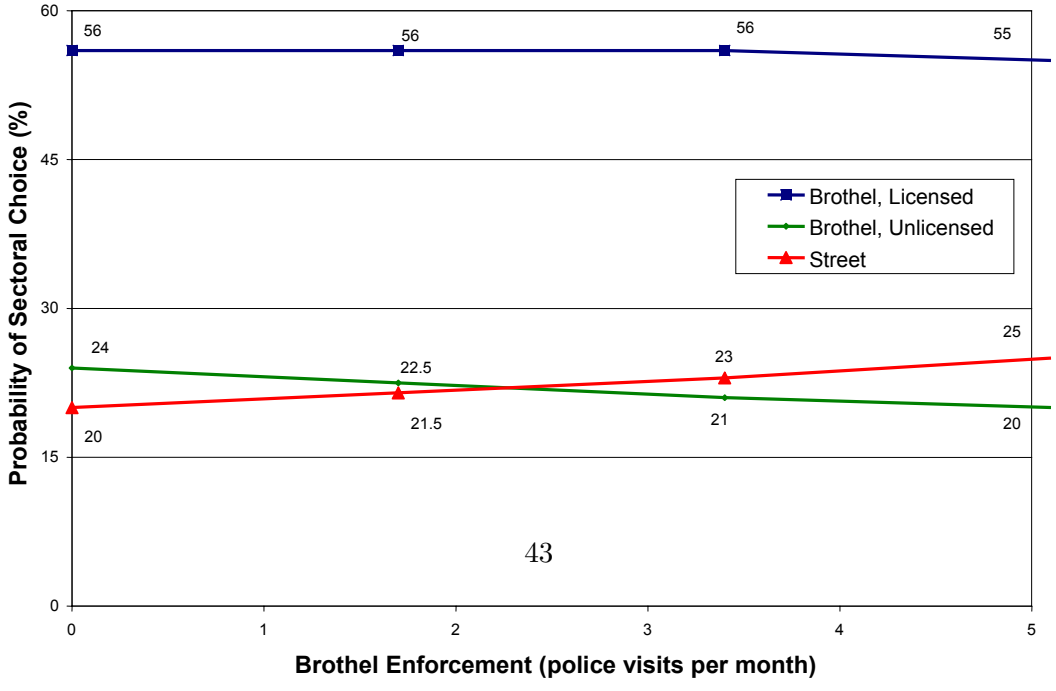


Table 12: Selection Equations for Enforcement in the Street Sector

Dep Variable:	**# Clients Last week**	**# Clients Condoms used**	**# Clients Condoms not used**	**Earnings Last week**
	(1)	(2)	(3)	(4)
Enforcement brothel	0.077	0.077	0.076	0.094
	(0.04)**	(0.04)**	(0.03)**	(0.04)**
Enforcement Street	-0.453	-0.473	-0.467	-0.432
	(0.24)*	(0.24)*	(0.22)**	(0.27)
Risk knowledge	-0.238	-0.228	-0.229	-0.237
	(0.07)***	(0.07)***	(0.06)***	(0.08)***
Doesn't take risks	-0.293	-0.289	-0.289	-0.236
	(0.16)*	(0.16)*	(0.12)**	(0.17)
Age	0.030	0.030	0.030	0.033
	(0.00)***	(0.00)***	(0.00)***	(0.00)***
Children	0.004	0.015	0.014	0.084
	(0.16)	(0.17)	(0.09)	(0.16)
Married/Civil union	0.035	0.032	0.032	0.049
	(0.07)	(0.06)	(0.06)	(0.07)
Education	-0.049	-0.049	-0.049	-0.054
	(0.02)***	(0.02)***	(0.01)***	(0.02)***
Attractive	-0.189	-0.193	-0.193	-0.192
	(0.08)**	(0.09)**	(0.07)***	(0.10)*
Regular	0.466	0.466	0.466	0.386
	(0.17)***	(0.16)***	(0.07)***	(0.16)**
Clean client	0.102	0.137	0.137	0.086
	(0.13)	(0.13)	(0.12)	(0.13)
Handsome client	-0.247	-0.248	-0.248	-0.260
	(0.21)	(0.21)	(0.14)*	(0.22)
Rich client	-0.086	-0.079	-0.079	0.078
	(0.18)	(0.18)	(0.15)	(0.17)
Sex ratio	-0.088	-0.086	-0.086	-0.097
	(0.03)***	(0.03)***	(0.02)***	(0.03)***
Male education	-0.614	-0.511	-0.486	-0.926
	(1.16)	(1.17)	(0.91)	(1.36)
Constant	7.554	7.312	7.300	8.205
	(2.93)***	(2.92)**	(1.82)***	(3.36)**
Clustered	Y	Y	Y	Y
Sample size	2879	2874	2874	2743

This is the output for the selection equation regressions for the street sector.
*** indicates significance at 1% level, ** at 5% level, * at 10% level.

Table 13: Selection Equations for Enforcement in the Unlicensed Brothel Sector

Dep Variable from 2nd stage	**# Clients Last week**	**# Clients Condoms used**	**# Clients Condoms not used**	**Earnings Last week**
	(1)	(2)	(3)	(4)
Enforcement brothel	-0.144	-0.138	-0.137	-0.126
	(0.04)***	(0.04)***	(0.03)***	(0.03)***
Enforcement street	0.638	0.597	0.586	0.717
	(0.23)***	(0.22)***	(0.19)***	(0.19)***
Risk knowledge	-0.086	-0.094	-0.095	-0.018
	(0.08)	(0.08)	(0.06)	(0.10)
Doesn't take risks	-0.049	-0.042	-0.042	-0.182
	(0.16)	(0.16)	(0.13)	(0.15)
Age	-0.024	-0.024	-0.024	-0.028
	(0.01)***	(0.01)***	(0.00)***	(0.01)***
Children	0.110	0.111	0.111	0.078
	(0.10)	(0.10)	(0.08)	(0.08)
Married/Civil union	-0.095	-0.086	-0.086	-0.045
	(0.09)	(0.08)	(0.06)	(0.09)
Education	0.000	0.001	0.000	-0.013
	(0.01)	(0.00)	(0.01)	(0.01)*
Attractive	-0.070	-0.069	-0.069	-0.053
	(0.10)	(0.10)	(0.06)	(0.09)
Regular client	-0.293	-0.289	-0.289	-0.288
	(0.11)***	(0.11)***	(0.07)***	(0.14)**
Clean client	-0.124	-0.121	-0.120	-0.127
	(0.12)	(0.13)	(0.10)	(0.13)
Handsome client	0.419	0.426	0.425	0.566
	(0.21)**	(0.21)**	(0.12)***	(0.22)**
Rich client	0.113	0.119	0.118	0.023
	(0.20)	(0.20)	(0.13)	(0.19)
Sex ratio	0.113	0.112	0.112	0.095
	(0.01)***	(0.01)***	(0.01)***	(0.01)***
Male education	4.43	4.27	4.26	4.13
	(1.05)***	(0.99)***	(0.81)***	(0.77)***
Constant	-11.79	-11.68	-11.68	-9.99
	(1.43)***	(1.35)***	(1.56)***	(1.39)***
Clustered	Y	Y	Y	Y
Sample size	2875	2866	2866	2657

This is the output for the selection equation regressions for the unlicensed brothel sector.
*** indicates significance at 1% level, ** at 5% level, * at 10% level.

Table 14: Selection Equations for Enforcement and Condom Use

Dep Variable:	**Unlicensed Brothel Sector**	**Street Sector**
	(1)	(2)
Enforcement brothel	-0.250	0.143
	(0.05)***	(0.09)*
Enforcement street	1.330	-0.941
	(0.31)***	(0.31)***
Risk knowledge	-0.135	-0.199
	(0.06)**	(0.07)***
Doesn't take risks	-0.039	-0.173
	(0.12)	(0.11)
Age	-0.025	0.032
	(0.00)***	(0.00)***
Children	0.106	0.033
	(0.08)	(0.10)
Married/Civil union	-0.116	0.054
	(0.05)**	(0.06)
Education	0.002	-0.044
	(0.01)	(0.01)***
Attractive	-0.073	-0.122
	(0.06)	(0.06)**
Communication	0.109	-0.256
	(0.07)	(0.08)***
Regular client	-0.175	0.304
	(0.05)***	(0.05)***
Clean client	-0.047	0.152
	(0.07)	(0.08)**
Handsome client	0.185	-0.091
	(0.06)***	(0.07)
Rich client	0.068	-0.117
	(0.09)	(0.08)
Foreign client	-0.194	0.126
	(0.12)*	(0.12)
Anal sex	0.024	0.228
	(0.20)	(0.17)
Oral sex	0.078	0.117
	(0.10)	(0.10)
Sex ratio	0.160	-0.114
	(0.03)***	(0.03)***
Male salary	0.003	-0.001
	(0.00)*	(0.00)
Female salary	1.173	-0.564
	(0.29)***	(0.33)*
Constant	-22.585	13.027
	(3.17)***	(4.52)***
Clustered	Y	Y
Sample size	8686	8673

These are the selection equations for the non-condom use heckman regressions estimated at the transaction level.
The omitted service is vaginal sex.
*** indicates significance at 1% level, ** at 5% level, * at 10% level.