Are All STI Epidemics Self-Limiting?*

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Abstract

As sexually transmitted infection (STI) prevalence rises, individuals substitute away from risky sex; this behavioral response renders STI epidemics self-limiting. In the commercial sex sector, however, prostitutes draw a compensating differential for engaging in unprotected sex, mitigating their propensity to use condoms. Using evidence from sex workers in Ecuador, we find that the compensating differential for risky sex is increasing in local prevalence of STIs. A one percentage point increase in the local STI rate increases the premium for non-condom sex by 17 percent. Market forces may curb the self-limiting nature of STI epidemics.

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1 Introduction

To a greater extent than other epidemics, the spread of sexually transmitted infections (STIs) is shaped by individuals' behavioral responses. Economists have argued that behavioral responses to STI prevalence generate a self-limiting incentive effect of epidemics. With an increase in awareness of the risk of contracting disease, individuals substitute away from risky sex toward abstinence (Kremer, 1996); toward protected sex (Ahituv, Hotz, and Philipson, 1996); or away from sex with men toward sex with women (Francis, 2008). Viewing risky sex much like other commodities in the market, economists anticipate that demand declines as the expected cost increases (Posner, 1992).

Evidence from the commercial sex sector, however, suggests that market forces may dampen the self-limiting feature of STI epidemics. Sex workers draw a compensating differential for engaging in risky unprotected sex (Gertler, Shah, and Bertozzi, 2005; Rao, Gupta, Lokshin, and Jana, 2003). If this compensating differential increases with higher STI prevalence, market forces effectively draw sex workers into engaging in risky sex.

In this paper we examine the responsiveness of the premium for risky sex to the local prevalence of STIs. Our focus is the commercial sex sector, which enables us to estimate price elasticities for disease risk. Using transaction-level data from Ecuadoran sex workers on type of sex provided, condom usage, and client characteristics, we estimate compensating differentials for unprotected vaginal and anal sex. Since each sex worker provided details of her last three transactions, we are able to employ a fixed effects estimator to control for worker-specific variation. We find that the premium for risky sex increases with local disease prevalence. More precisely, we find that a one percentage point increase in local STI prevalence is associated with a 17 percent increase in the price of an unprotected vaginal sex transaction. This premium is higher for unprotected anal sex.

This finding is of interest for two reasons. First, that the compensating differential for risky sex increases with disease prevalence indicates that the market dampens the self-limiting feature of STI epidemics. As the expected cost of risky sex rises, the compensating

differential rises as well, leaving the marginal sex worker indifferent between unprotected and protected sex. (Approximately ten percent of sex workers in the sample provided both protected and unprotected sex within the last three transactions.)

A premium for risky sex that increases with prevalence also indicates that the supply-side conditional price elasticity (with respect to disease prevalence) is weakly higher that the demand-side elasticity. That is, as clients' expected cost of contracting disease increases, their willingness-to-pay for risky sex (relative to safe sex) declines, but this decline is more than offset by the decline in sex workers' willingness-to-accept. This indicates that existing public health campaigns aimed at the commercial sex sector, which are almost universally targeted at sex workers, may be less efficiacious than campaigns targeted at clients.

Second, the sex sector bears an importance disproportionate to its size. 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). In developing countries in particular, sex workers play a central role in the spread of HIV and other STIs as they have higher infection rates and more sexual partners relative to the general population (UNAIDS, 2002). Twenty-three percent of sex workers in our sample had some STI in the last year; this rate is much higher than the general adult population. Non-fatal STI infections are considered important by epidemiologists partly because untreated STIs facilitate transmission of HIV (Centers for Disease Control & Prevention, 2004). Oster (2005) argues that non-fatal STIs can account for much of the difference between U.S. and African HIV transmission rates.

The market's effect of mitigating individuals' inclination to avoid risky sex in the commercial sex sector indicates that as awareness of STIs increases, individuals in the sex sector may be less likely to respond by limiting their risky sex behavior than individuals outside the sex sector who draw no such compensating differential. The result is that as STI prevalence increases, the fraction of sex incurred by high prevalence individuals relative to the population as a whole increases. As Kremer (1996) shows, if the proportion of sex incurred by high

prevalence individuals increases, there may exist equilibria in which exist the likelihood of an STI epidemic persisting increases, even if the overall amount of sex declines. As such, we offer a new justification for Kremer's (1996) concern with the persistence of STI epidemics that does not depend on the fatalism of high-activity individuals.

Our paper sits at the intersection of two literatures in economics: the new literature on economic epidemiology, and the literature on compensating differentials for occupational risk. First, particularly in the wake of HIV/AIDS, behavioral responses to STI epidemics and public health interventions have proved a topic of considerable interest to economists. Economists have studied behavioral responses to information campaigns and public health interventions (Kremer, 1996; Geoffard and Philipson, 1996; Gersovitz and Hammer, 2004; Auld, 2003); public testing (Boozer and Philipson, 2000; Philipson and Posner, 1993, 1995); and criminal prosecution (Delavande, Goldman, and Sood, 2007). Empirical work has confirmed that individuals are more likely to use condoms when local STI prevalence increases (Ahituv, Hotz, and Philipson, 1996; Auld, 2006). Conversely, decreases in expected cost of an STI epidemic (either by decreasing the probability of infection or the disutility associated with the disease) lead to increases in risky sexual behavior (Lakdawalla, Sood, and Goldman, 2006; Mechoulan, 2007).

Dating from Smith (1993 [1776]) and possibly before, economists have long posited the existence of compensating differentials for occupational risk—see Rosen (1986) for a survey. Viscusi (1992) and Cousineau, Lacroix, and Girard (1992) document compensating differentials in a variety of occupations. In the commercial sex sector, Gertler, Shah, and Bertozzi (2005) find that Mexican sex workers draw a risk premium of approximately 15% per transaction to engage in unprotected sex; using a different empirical strategy, Rao, Gupta, Lokshin, and Jana (2003) estimate an even larger premium for sex workers in India. Robinson and Yeh (2008) provide evidence from Kenya that women respond to these economic incentives by providing risky sex when faced with economic shocks; they find that sex workers are 11% more likely to engage in unprotected sex on days in which a household member falls ill.

2 Survey and Data

The data we use in this paper were collected in 2003 in a baseline survey for an impact evaluation of the Frontiers Prevention Project, a national Ecuadorian HIV/AIDS and STI prevention project. Approximately 2800 female sex workers were interviewed in eight cities with relatively high HIV/AIDS prevalence (Quito, Guayaquil, Machala, Esmeraldas, Santo Domingo, Quevedo, Milagro, and Daule). In each city, the universe was first mapped to develop a sample frame. Potential worksites were identified in interviews with key informants (e.g., sex workers, pimps, madams, bar owners, workers at nongovernmental organizations, medical personnel, taxi drivers, police). Sex workers were surveyed both at worksites and at meeting places. While every attempt was made to maximize representativeness of the sex worker population, the mapping likely omits many sex workers, such as women who occasionally sell sex from home. Since formal sites of sex work (brothels and areas reputed as sex work locales) are probably overrepresented, the sample is likely biased toward sex workers with a large number of clients.

The survey includes detailed sex worker characteristics, risk behavior indicators, and labor supply information. Particularly valuable for our purposes in this paper, the survey includes retrospective details of each sex worker's previous three transactions, yielding 8,500 observations at the transaction level. Since most respondents have more than three transactions per week, the retrospective data are typically less than a week old. The retrospective nature allows us to create a panel without attrition consisting of multiple transactions for each sex worker.

To minimize misreporting and collect the highest quality data, sex workers were trained and hired to be the enumerators. Research has found that members of groups often feel more comfortable responding to sensitive issues with members of their own peer groups (Ozer, Weinstein, Maslach, and Siegel, 1997). Sex workers' participation in the project probably contributed to high survey response rates (over 95 percent).

In addition to the questionnaire, biologicals (urine and blood) were collected from each

sex worker. With this direct measure of STI status, we are not forced to rely on self-reports of health status, which may be systematically mismeasured (Lokshin and Ravallion, forthcoming). We code a sex worker as having an STI if she tests positive for chlamydia and/or gonorrhea. Since our question of interest is how the sex market responds to the current disease environment they currently face, we do not consider more serious long-term STIs such as syphilis or viral STIs such as herpes simplex, which is cumulative (once infected, the individual always tests positive).

3 The Market for Commercial Sex in Ecuador

As in most of Latin America, sex work is decriminalized and regulated in Ecuador. Sex workers are required to maintain an occupational health license certifying their health status, pay regular visits to health clinics, and undergo STI testing every four to six months. In practice, however, many sex workers do not comply with regulation requirements. Using the same dataset as in this paper, Gertler and Shah (2007) study the effects of Ecuador's health regulation on STI outcomes.

Sex workers around the world tend to be younger, less educated, and better paid than female workers in the general population (Ahlburg and Jensen, 1998; Edlund and Korn, 2002; Lim, 1998). This pattern holds in our sample (Arunachalam and Shah, 2008). The summary statistics in Table 1 indicate that sex workers have completed approximately 7 years of education and their mean age is 27. Almost 50 percent are married or in civil union partnerships and over 80 percent have children. Interestingly, the demographic composition of these Ecuadoran sex workers is very similar to that of sex workers in Mexico (Gertler, Shah, and Bertozzi, 2005) and Kenya (Robinson and Yeh, 2008).

Table 1 gives descriptive statistics broken down by categories of self-reported condom use in the sex worker's last three transactions. Column 1 includes sex workers who did not use a condom in any of their last three transactions; Column 2 describes sometimes users of condoms; and Column 3 corresponds to always users. Reported condom use is relatively high

in Ecuador compared to sex workers elsewhere. Eighty-two percent of sex workers reported condom use in all of their last three transactions. These rates are similar to Mexico (where sex work is also legalized and partly regulated) (Gertler, Shah, and Bertozzi, 2005) but more frequent than sex worker populations in India (Rao, Gupta, Lokshin, and Jana, 2003), Kenya (Robinson and Yeh, 2008), and Chicago (Levitt and Venkatesh, 2007). While our empirical strategy depends on self-reported condom usage, we are able to verify whether the sex workers possessed condoms at the time of the survey. Sixty percent of respondents reported having at least one condom available with her at the time of the interview; the enumerator was able to verify this claim in 97% of cases. This rate of condom possession is roughly twice that observed among street prostitutes in Los Angeles (Lillard, 1998). Only a quarter of sex workers who reported no condom use within the last three transactions possessed condoms at the time of the interview, while for the other categories this fraction is above sixty percent. Respondents also reported the number of condoms available (the Pearson correlation with the enumerator's own observation is .98); also as we might expect, this number is larger for women who sometimes used and always used condoms in the previous three transactions.

Average transaction price is approximately seven US dollars, and (prior to controlling for characteristics) does not vary by condom use category. However, average weekly earnings are significantly higher for sex workers who always use condoms, partly since these women are also more likely to work in brothels or nightclubs, where rates of client arrival are much higher. Table 1 shows that sex workers who used condoms in all of the previous three transactions reported nearly twice the number of clients last week as sex workers who had unprotected sex in all three transactions.

A few of the survey questions allow us to assess behavioral response to STI prevalence. The 95% of sex workers who report having ever used a condom were asked whether they habitually check the condoms' expiration date. Encouraging sex workers to check expiration dates is a common part of STI interventions and considered a measure of knowledge about STIs. Sixty-two percent of sex workers who always use condoms reported positively to

checking condom expiration dates, compared to only 21 percent of non-condom users.

Finally, Table 1 shows that STI prevalence is lower among sex workers who report having used a condom in the previous three transactions. STI prevalence is 7 percent amongst never users, 6 percent amongst sometimes users, and 5 percent for always users.

Transaction characteristics are described in detail in Table 2. The presentation anticipates our empirical design, which exploits variation in worksite and services provided. In Columns 1-4 transactions are disaggregated by worksite: brothel, nightclub, street, or "other" (which includes massage parlors, hotels, truck stops, or the sex worker's home). Column 5 includes only the subsample of women we denote as "switchers," who worked in at least two different locations in their last three transactions—about 20 percent of transactions in the sample were provided by switchers. Table 2 illustrates that transaction prices vary from 6 to 14 US dollars, with "switchers" earning the most per transaction. Vaginal sex is almost always provided as a service, and in some cases, anal, oral and non-sexual services (massage, stripping, talking, or masturbation) are also provided.

To address the central research question, we construct a measure of STI prevalence that captures the risk that a sex worker faces in each transaction. Our measure of local prevalence varies by the type of worksite within each city. For each sex worker, we generate a location specific STI prevalence which is the STI prevalence within that location and city, excluding her own STI status. The average local STI prevalence across cities is reported in Table 2 as "local STI rate." In four of the eight of the cities in our sample, the street has the highest STI prevalence. Across cities, local STI prevalence in the street averages 15 percent, compared to 6 percent in brothels and nightclubs and 2 percent in other worksites. The street has the highest rate of non-condom use (35 percent) compared to brothels (6 percent), nightclubs (9 percent), and other worksites (25 percent).

While we do not have information from clients directly, Table 2 includes transaction-level reports by the sex workers about client characteristics. Sex workers were asked to describe their last three clients' cleanliness, wealth, appearance, and country of origin. Sex workers

described most of their clients as "clean." Only five percent were described as foreign. Respondents were also asked whether a given transaction was with a "regular" client; about half of transactions involved regular clients, except in nightclubs where about a third of transactions were with regulars. Nightclub clients are also more likely to be reported as wealthy and attractive.

Sex workers were also asked to record their subjective perceptions of individual clients' STI status. In Table 2, a client in a given transaction is coded as "risky" if the sex worker thought he had a higher than average likelihood of being HIV positive. Only one to two percent of transactions involved risky clients, with little variation across locations.

4 The Compensating Differential for Risky Sex

Before examining responsiveness to STI prevalence, we begin with an analysis of the compensating differential for risky sex. We model the log price of a transaction as a linear stochastic function of condom use. The empirical specifications closely resemble those in Gertler, Shah, and Bertozzi (2005), although we omit any analysis of the bargaining that may affect the risk premium. To control for sex worker specific variation and unobservable sex worker heterogeneity, we include a sex worker fixed effect in all specifications. We begin with a parsimonious specification regressing the log transaction price on condom use; in later specifications we control for services provided. While we do not have data from clients and therefore cannot include client fixed effects, we attempt to control for client heterogeneity by using sex worker reports of client characteristics. The most complete models interact non-condom use with other risk measures such as engaging in anal sex; having sex with a "risky client" (high subjective likelihood of being HIV positive); and whether the sex worker checks the expiration date on condoms (columns 3-6).

Table 3 reports the regression results. The coefficient of 0.15 on non-condom use in column 1 represents a 16 percent risk premium, which declines to 15 percent when we control for client characteristics and services provided (column 2). The estimated magnitude

of the risk premium for unprotected sex is almost exactly the same as that for Mexican sex workers (Gertler, Shah, and Bertozzi, 2005). Column 2 also displays a premium for risky services provided. For anal sex, the riskiest type of sex transaction in our data, the coefficient of 0.37 corresponds to a 45 percent premium relative to vaginal sex. We then interact anal sex with non-condom use, which results in an additional 14 percent premium (column 3). When a sex worker engages in non-condom use with a risky client she receives a 43 percent premium (column 4). Similarly, when the sex worker has STI knowledge (checks condom expiry) and engages in non-condom use, there is an additional 18 percent premium (column 5). In columns 6 and 7 we display results from double interactions of "Non-condom use×Anal sex×Risky client" and "Non-condom use×Anal sex×Checks expiry". As expected, the interactions are positive and significant at the .01 level, indicating that risky types of sex draw an even larger premium when the sex worker has knowledge of STIs or the client seems particularly risky.

Taken together, the results reported in Table 3 show that sex workers draw a premium for unprotected sex comparable to that previously estimated in the literature. Furthermore, consistent with our interpretation of this premium as a compensating differential, sex workers draw a premium for other risky types of services—engaging in inherently risky types of sex; completing a transaction with a risky client; and for engaging in risky sex with a risky client.

5 The Risky Sex Premium and Local STI Prevalence

We now turn to the main specification of the paper. Indexing sex workers by i and transactions by j, we estimate equations of the form:

$$P_{ij} = \alpha + \sum_k \phi_k X_{jk} + \sum_l \varphi_l W_{lj} + \beta NC_{ij} + \gamma STI_{ij} + \delta(NC_{ij} \times STI_{ij}) + \theta_i + \epsilon_{ij} \qquad (1)$$

Here, P_{ij} is the log price of a transaction. Again, to control for sex worker specific

variation and unobservable sex worker heterogeneity, we include the sex worker fixed effect (θ_i). We use k to index the client's characteristics in each transaction, given as X_{jk}. Services provided in each transaction are given by W and indexed by l. NC_{ij} is a dummy indicating that a condom was not used in the transaction; STI_{ij} is the local STI rate; $NC_{ij} \times STI_{ij}$ is the interaction of non-condom use and the local STI rate; and ϵ_{ij} is a mean-zero random disturbance.

The main coefficient of interest is δ, which is the interaction between non-condom use and local STI prevalence. While the risk premium for unprotected sex is given by β, the δ term captures the additional premium for non-condom use as local STI rates increase.

Table 4 displays the regression results of Equation 1. Columns 1-3 build to our favored specification in column 4, which includes all control variables (including client characteristics and services provided). We find that a one percentage point increase in the STI rate, increases the premium for non-condom use by approximately 17 percent. This result is statistically significant at the .05 level. As economic theory would predict, the risk premium responds to the increase in disease as sex workers are in fact being compensated for providing risky services in riskier environments.

In columns 5 and 6 we restrict to different subsamples to assess the robustness of the empirical result. Since sex workers who always or never use condoms may attract client types who differ along some unobservable dimensions, column 5 reproduces the specification in column 4 for the subsample of women who sometimes use condoms. The estimated risk premium remains statistically significant and is slightly higher in magnitude: a one percentage point increase in local STI prevalence increases the risk premium by 25 percent.

The model in column 6 excludes sex workers who never switch locations. Again there may be some concern that sex workers who never switch locations may have different risk preferences and/or attract different types of clients along some unobservable dimension. However, our main result is robust to the exclusion of non-switchers.

6 Behavioral Response to Local STI Prevalence

Perhaps the central tenet of the new field of economic epidemiology is that individuals respond to increased risk of contracting disease by substituting away from risky behavior choices (Philipson, 2000). While the compensating differential for risky sex may indeed increase with STI prevalence, this effect does not necessarily eliminate individuals' behavioral response. In Table 6 we report the results of probits where the dependent variables capture potential behavioral responses to local STI prevalence. In columns 1-3 the dependent variable is non-condom use; columns 4-6 use whether a sex worker checks the expiration date on her condoms; and columns 7-9 investigate the relationship between anal sex (the riskiest type of service provided) and local STI prevalence. For each variable, we begin with a parsimonious specification with only local STI prevalence and city dummies as regressors (columns 1, 4, and 7); we then add clients' characteristics as additional controls and cluster standard errors at the individual sex worker level (columns 2, 5, and 8); and the most complete specification adds sex worker characteristics as well as city fixed effects (columns 3, 6, and 9).

Column 1 of Table 6 indicates that a 1 percent increase in local STI prevalence results in a 1.4 percentage point decrease in non-condom use. As additional controls for client characteristics and city fixed effects are added in column 2, where standard errors are also clustered at the individual sex worker level, the effect declines slightly to 1.3 percentage points. This translates to an 11 percent decrease in non-condom use. The estimate is unchanged when sex worker characteristics are added to the set of controls (column 3).

Other behavioral responses are also consistent with accounts that draw a causal link between local STI prevalence and a behavioral response. The results in Columns 4-6 indicate that sex workers are more likely to check the expiration dates of condoms in higher disease environments. In the most complete specification, we find that a sex worker is .6 percentage points more likely to check the expiration date of her condoms for a 1 percent increase in local STI prevalence (column 6).

Finally, the results in columns 7-9 indicate that when disease prevalence increases, sex

workers may be less likely to perform anal sex. These results are not as robust however; while the coefficient remains negative and declines only slightly in magnitude as additional controls are added, the measure is much less precise when additional controls are added and errors are clustered at the individual level, and the estimate loses statistical significance in columns 8 and 9.

In these specifications we are unable to incorporate sex worker fixed effects; thus, there may be important unobserved sources of heterogeneity that are driving the association of STI prevalence with condom use. With this caveat in mind, however, it does seem that while the compensating differential for risky sex increases with STI prevalence, the effect is not sizable enough to completely eliminate the type of behavioral response that scholars have found with respect to HIV/AIDS (Ahituv, Hotz, and Philipson, 1996; Auld, 2006). As local STI prevalence increases, sex workers and their clients are responding by engaging in less risky sex, and the evidence in Table 6 indicates that sex workers may be trying to mitigate the increased risks in other ways as well.

7 Conclusion

Epidemiological models suggest that the behavioral response of high-activity core groups is critical to the course of an epidemic (Shahmanesh, Patel, Mabey, and Cowan, 2008). Understanding the economic incentives shaping the commercial sex market is crucial to effective targeting of public health interventions. Our empirical finding of a risk premium that increases with local STI prevalence indicates that targeting interventions at sex workers may be less effective than campaigns designed to target their clients.

Furthermore, the responsiveness to STI prevalence of high risk relative to low risk groups can determine the course of the epidemic, even if overall prevalence rates fall (Kremer, 1996). If high risk people reduce their activity by a smaller proportion than low risk individuals, the composition pool of available partners will worsen, increasing the probability of pairing with a high risk individual. The compensating differential for risky sex that we identify in

this paper operates on a core group at risk for STI infection—and possibly no other group in the population. The behavioral response of individuals in the general population, combined with the market's mitigating effect on this response in the core group, may serve to dampen the self-limiting nature of STI epidemics.

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Table 1: Summary Statistics—Sex Workers by Condom Use

	Never Uses Condoms (1)	Sometimes Uses Condoms (2)	Always Uses Condoms (3)
Age	30.7	31.6	27.2
	(.59)	(.64)	(.15)
Education (years)	6.2	6.8	7.6
	(.20)	(.25)	(.07)
Married/civil union (=1)	.50	.44	.48
Has children (=1)	.87	.91	.86
STI knowledge[a] (=1)	.45	.55	.74
Has condoms (=1)	.26	.60	.64
Number condoms	6.7	11.1	12.4
	(.83)	(1.6)	(.41)
Checks condom expiry[b] (=1)	.21	.40	.62
Attractive (=1)	.15	.19	.30
Earnings last week (US$)	53.4	75.4	123.9
	(4.28)	(8.54)	(3.45)
Average price (US$)	7.1	6.9	7.2
	(.54)	(.66)	(.15)
Clients last week	12.3	15.0	23.5
	(.91)	(1.19)	(.65)
Works in brothel[c] (=1)	.49	.54	.64
Works in nightclub[c] (=1)	.13	.13	.22
Works in street[c] (=1)	.06	.04	.02
Works in other[c,d] (=1)	.39	.40	.16
STI (=1)	.07	.06	.05
Sample Size	288	228	2317

Note: Observations are by sex worker. Standard errors for continuous variables are given in parentheses. The categories are defined based on condom use in the respondent's last three transactions.

[a] "STI knowledge" is coded as a 1 if the sex worker answers "higher" to the question: "If someone has a sexually transmitted infection, is there a higher or lower probability that they will contract HIV/AIDS?", where the other options are "same"; "lower"; "don't know."

[b] "Checks condom expiry" is only asked of sex workers who report having used a condom; the response is coded as 1 for a positive response to the question: "When you use a condom, do you check the expiration date?".

[c] The fraction of women in each work category does not sum to 1 as some sex workers worked in more than one location.

[d] "Works in other" indicates that the sex worker's worksite is a massage parlor, hotel, truck stop, or her home.

Table 2: Summary Statistics—Transactions by Location

	Brothel	Nightclub	Street	Other[a]	Switchers[b]
	(1)	(2)	(3)	(4)	(5)
Transaction Price (US$)	5.7	11.6	6.3	9.4	13.9
	(.08)	(.36)	(.77)	(.35)	(.83)
No condom use (=1)	.09	.06	.35	.25	.19
Local STI rate	.06	.06	.15	.02	.04
	(.00)	(.00)	(.01)	(.00)	(.00)
Regular client (=1)	.50	.33	.56	.64	.45
Clean client (=1)	.88	.90	.89	.90	.90
Handsome client (=1)	.12	.14	.11	.11	.16
Rich client (=1)	.06	.14	.06	.07	.12
Foreign client (=1)	.04	.06	.07	.04	.06
Risky client[c] (=1)	.02	.01	.01	.01	.02
Vaginal sex (=1)	.99	.97	.99	.96	.91
Anal sex (=1)	.02	.02	.03	.03	.04
Oral sex (=1)	.07	.08	.05	.09	.14
Non-sex services[d] (=1)	.01	.02	0	.03	.05
Sample size	5179	1652	152	1628	583

Note: Observations are by sex transaction. Standard errors for continuous variables are given in parentheses.
[a] "Other" location indicates that the transaction took place in a massage parlor, hotel, truck stop, or the sex worker's home.
[b] "Switchers" refers to sex workers who worked in more than one location during their last three transactions.
[c] "Risky client" is coded as 1 if the sex worker responds "very likely" to the question: "Relative to the average client, how likely was this client to have HIV/AIDS?" where the other options are "same as average"; "unlikely"; "not a chance."
[d] "Non-sex services" include massage, stripping, talking, or masturbation.

Table 3: Premium for Risky Sex

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
No condom	.15	.14	.13	.12	.07	.11	.07
	(.02)***	(.02)***	(.02)***	(.02)***	(.03)***	(.02)***	(.03)***
Anal sex		.37	.33	.37	.37	.34	.29
		(.03)***	(.04)***	(.03)***	(.03)***	(.04)***	(.07)***
No condom×Anal sex			.13			.04	-.07
			(.07)*			(.07)	(.09)
No condom×Risky client				.43		.26	
				(.1)***		(.1)***	
No condom×Checks expiry					.18		.11
					(.04)***		(.04)***
Anal×Risky client						-.31	
						(.2)	
Anal×Checks expiry							.08
							(.08)
No condom×Anal×Risky client						2.47	
						(.36)***	
No condom×Anal×Checks expiry							1.06
							(.16)***
Constant	1.74	1.69	1.68	1.69	1.69	1.69	1.69
	(.004)***	(.01)***	(.01)***	(.01)***	(.01)***	(.01)***	(.01)***
Client characteristics	N	Y	Y	Y	Y	Y	Y
F statistic	54.54	38.86	35.66	37.14	37.12	33.54	34.12
Sample size	8489	8489	8489	8489	8489	8489	8489

Note: Transaction-level regressions with sex worker fixed effects; dependent variable is log transaction price (mean 1.76 US$). Vaginal sex is the omitted service category. ***indicates significance at 1% level, ** at 5% level, * at 10% level.

Table 4: Risk Premium Increases with Local STI Prevalence

	(1)	(2)	(3)	(4)	(5)	(6)
No condom	.13	.06	.05	.06	.05	.33
	(.02)***	(.03)*	(.03)*	(.03)*	(.04)	(.16)**
Local STI rate	-2.76	-3.26	-3.18	-3.01	-2.63	-3.29
	(.48)***	(.51)***	(.5)***	(.5)***	(.97)***	(1.18)***
No condom×Local STI rate		1.3	1.3	1.03	1.23	3.04
		(.42)***	(.42)***	(.41)**	(.61)**	(1.81)*
Constant	1.89	1.91	1.86	1.84	1.66	2.08
	(.03)***	(.03)***	(.03)***	(.03)***	(.08)***	(.12)***
Client Characteristics	N	N	Y	Y	Y	Y
Services Provided	N	N	N	Y	Y	Y
F Statistic	38.29	28.67	25.16	33.44	7.16	3.84
Sample size	8382	8382	8382	8382	700	532

Note: Transaction-level regressions with sex worker fixed effects; dependent variable is log transaction price (mean 1.76 US$). Columns (1)-(4) include the entire sample; column (5) excludes always and never users of condoms, column (6) excludes sex workers who never switch locations. Client characteristics include regular, clean, handsome, rich, foreign, and risky. Services provide include anal, oral, vaginal and non-sexual services. ***indicates significance at 1% level, ** at 5% level, * at 10% level.

Table 5: Risk Premium Increases with City STI Prevalence

	(1)	(2)	(3)	(4)
No condom	-.005	-.009	-.01	-.01
	(.04)	(.04)	(.04)	(.07)
No condom×City STI rate	2.67	2.63	2.5	2.47
	(.66)***	(.65)***	(.64)***	(.99)**
Constant	1.74	1.7	1.68	1.53
	(.004)***	(.01)***	(.01)***	(.06)***
Client Characteristics	N	Y	Y	Y
Services Provided	N	N	Y	Y
F statistic	35.48	25.99	36.79	7.61
Sample Size	8489	8489	8489	708

Note: Transaction-level regressions with sex worker fixed effects; dependent variable is log transaction price (mean 1.76 US$). Column (4) excludes women who always or never use of condoms. Client characteristics include regular, clean, handsome, rich, foreign, and risky. Services provided include anal, oral, vaginal and non-sexual services. ***indicates significance at 1% level, ** at 5% level, * at 10% level.

Table 6: Behavioral Responses to Local STI Prevalence

	Non-Condom use			**Checks condom expiry**			**Anal sex**		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
STI local prevalence	-1.41	-1.29	-1.27	.68	.62	.55	-.85	-.65	-.7
	(.23)***	(.61)**	(.58)**	(.18)***	(.31)**	(.31)*	(.45)*	(.73)	(.75)
Client characteristics	N	Y	Y	N	Y	Y	N	Y	Y
Sex worker characteristics	N	N	Y	N	N	Y	N	N	Y
City fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y
Clustered standard errors	N	Y	Y	N	Y	Y	N	Y	Y
χ^2	528.8	278.6	324.7	332.3	133.4	171.62	41.8	46.4	51.9
Sample size	8549	8549	8526	8784	8771	8747	8784	8771	8747

Note: marginal effects from transaction-level probit regressions. The dependent variable in columns (1)-(3) is non-condom use (mean .12); in columns (4)-(6) it is whether the sex worker habitually checks the expiration dates on her condoms (mean .56); and in columns (7)-(9) it is whether the transaction included anal sex (mean .02). "Clustered standard errors" are at the sex worker level. ***indicates significance at 1% level, ** at 5% level, * at 10% level.