Bang for Your Buck: STI Risk *and* Pregnancy Risk as Sources of the Price Premium for Unprotected Sex

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Road Map

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- I introduce a compensating differential for pregnancy risk as a novel source of the premium for unprotected sex through a simple model that incorporates both STI risk and pregnancy risk.
- I empirically test for both using a rich panel dataset from Robinson and Yeh(2011) of 19,041 sexual transactions by 192 sex workers in Busia, Kenya collected during 2005 and 2006.

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- I find a price premium for STI risk is USD 2 or 24 percent of average price, while the price premium for pregnancy risk is USD 10 or five times the premium for STI risk.
- I also test if clients' disutility for condoms, another competing theory, is also a source of the price premium for unprotected sex and find that it is not.

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- There is a need to target both sex workers and clients through comprehensive interventions that incorporate sex worker fertility preferences.

Sources of the Price Premium for Unprotected Sex

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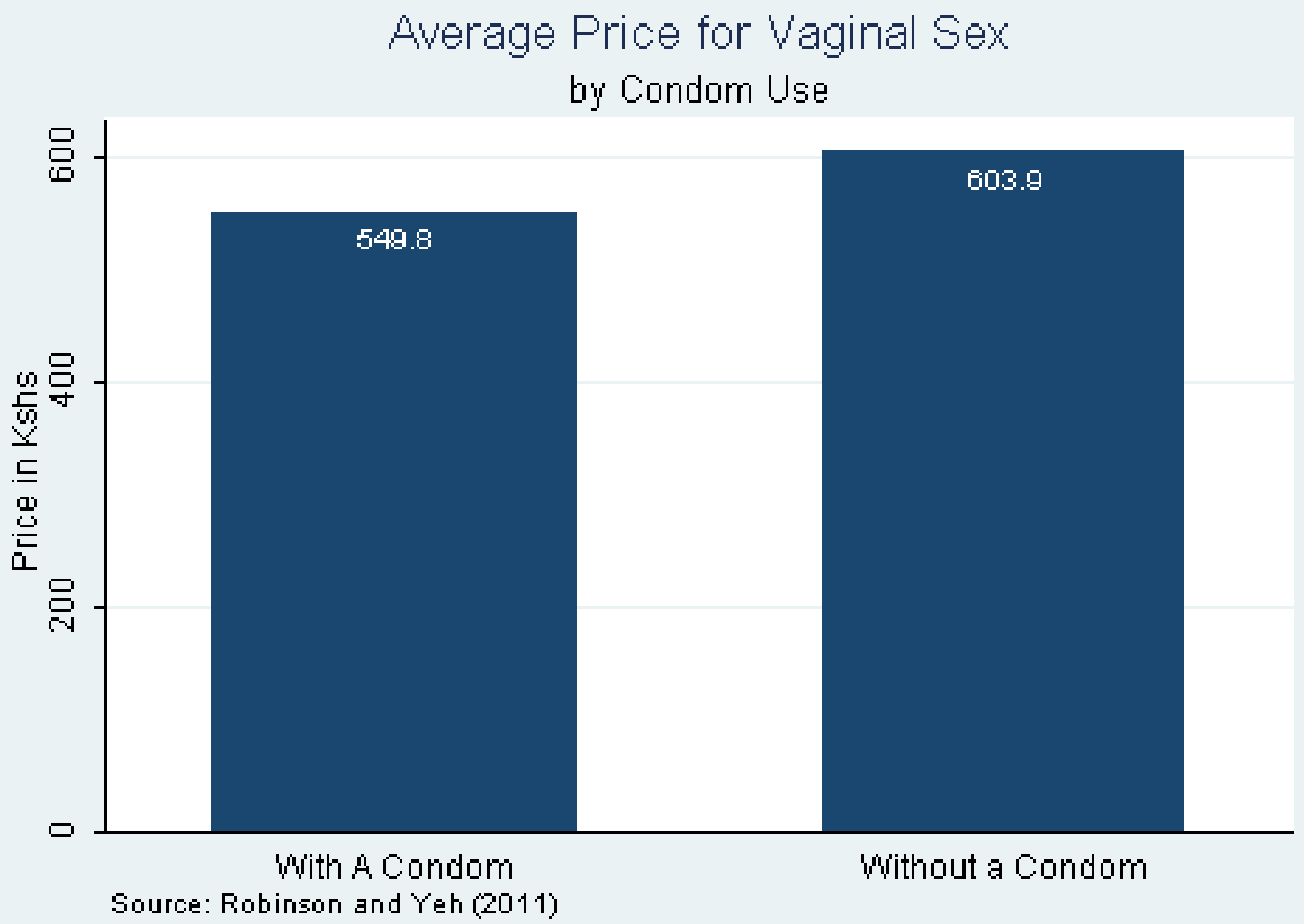
  - Ecuador (Arunachalam and Shah 2013)

Price Premium


Average Price for Vaginal Sex
by Condom Use
Price in Kshs
0
200
400
600
549.8
603.9
With A Condom
Without a Condom
Source: Robinson and Yeh (2011)

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- STI prevalence increases with price for unprotected sex.
- Arunachalam and Shah (2013) use local STI prevalence and find that a 1 percentage point increase in the local disease rate increases the premium for unprotected sex by 33 percent.
- But they also find a premium for unprotected sex in places where STI prevalence is *zero*.

Pregnancy Risk

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- So, the inference that unprotected sex is transacted at a higher price than protected sex as compensation for increased STI risk is far from robust.
- Any empirical test of the compensating differential for STI risk must exclude the possibility of other costs which are also prevented through condom use and which sex workers might potentially wish to avoid, such as pregnancy.

A Simple Model

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- Let Q be sexual transactions.
- Let G and S be the probability of getting pregnant and contracting an STI, respectively (where of course $(0 \leq G \leq 1$ and $0 \leq S \leq 1)$.

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- Where in this case G and S are both zero so that her expected pay off to supplying contracepted sex reduces to;

$$P_2 Q \tag{3}$$

- Her decision rule is thus very simply to supply unprotected sex if and only if (1) is greater than (2), but to simplify, I let Q equal to 1, so that the sex worker is making this decision each time she engages in transactional sex or;

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$$P_1 - GC_g - SC_s > P_2 \tag{4}$$

- I can thus bring GC_g and SC_s to the other side, and get;

$$P_1 > P_2 + GC_g + SC_s \tag{5}$$

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  - The price received for unprotected sex (i.e. the price premium) exceeds the price received for contracepted sex in the sex market and,
  - The sum of the interaction between the probabilities of getting pregnant and getting STIs, and the costs of pregnancy and STI transmission.

Measuring Main Variables

- STI Risk

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  - $NoCondom \times NoBirthControl \times ProbabilityofPregnancy$
- Clients' Disutility for Condoms
  - $NoCondom \times Disutility$

Probability of Pregnancy

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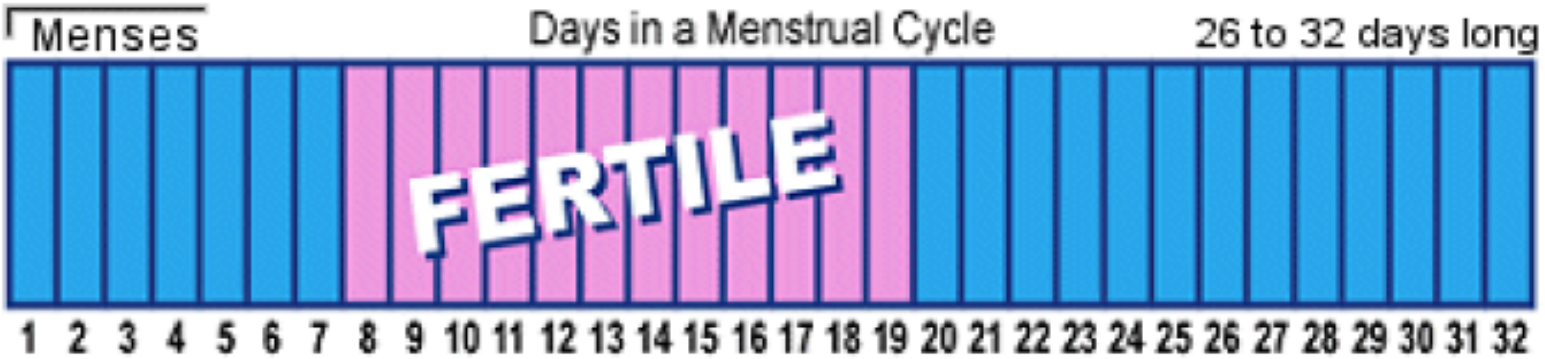
- But it does not.
- It does, however, have two variables that allow me to know at least the 1st through to the 5th days of the menstrual cycle, and be able to approximate the probability of pregnancy for each sexual transaction.

- The variables are dummies that $= 1$ if a sex worker reports menstruating the day before; and $= 1$ if a sex worker reports menstruating the day of the recorded sexual transactions.



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  - If a sex worker reports menstruating the day before and reports menstruating the day of the recorded sexual transactions, then she is either on the 2nd, 3rd, or 4th day of her menstrual cycle.

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  - But what I can estimate is the probability that a sex worker is on a day within her fertile window period (The 12 days between days 8 and 19).
  - So, I divide 12 by 27 and get 0.44444444444.

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  - I assign the average of the probabilities for days 2 (zero), 3 (0.001), and 4 (0.002) whenever a sex worker reports having menstruated the day before and the day of the recorded sexual transactions.
  - I multiply the probability of being on a day within the fertile window (0.44444444444) with the probability of pregnancy for a woman who has sexual intercourse every other day (0.33, from Wilcox et al. 1995) and get 0.14666666666, which I assign to a sexual transaction that occurred with a sex worker who reports not having menstruated the day before or the day of the recorded sexual transaction.

Specification

$$P_{irt} = \beta_0 + \beta_1 NC + \beta_2 RL + \beta_3 (NC \times RL) + \sum_{s=1}^{S} \beta^s \gamma_{irt}^s + \sum_{c=1}^{C} \beta^c \omega_{irt}^c + \alpha_i + \tau_t + \epsilon_{irt} \quad (1)$$

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- Where:
  - NC is No Condom
  - RL is Risky Client
  - PP is Probability of Pregnancy
  - NB is No Birth Control

Summary Statistics

Sex Workers

Summary Statistics

Age	28.43
	(6.98)
Start Age	18.67
	(5.14)
Years of Education	9.20
	(2.69)
Number of Biological Children	2.06
	(1.83)
Never Married	0.44
	(0.50)
Cohabitating	0.13
	(0.33)
Can Read Kiswahili	0.95
	(0.21)
Can Write Kiswahili	0.88
	(0.33)
Luo	0.51
	(0.50)
Luhya	0.39
	(0.49)
HIV Knowledge Test Score (0-1 Scale)	0.94
	(0.06)
Hourly Wage from Sex Work (Ksh)	151.77
	(92.24)
Hourly Wage from Other Work (Ksh)	41.07
	(38.54)
Observations	192

Note: Means are presented with standard deviations in parentheses.

Clients

Summary Statistics

Disutility for Condoms	0.45
	(0.45)
Risky Clients	0.46
	(0.46)
Uncircumcised Clients	0.25
	(0.40)
Poor Clients	0.09
	(0.26)
Clean Clients	0.62
	(0.44)
Handsome Clients	0.54
	(0.46)
Luhya	0.25
	(0.40)
Luo	0.24
	(0.39)
Kikuyu	0.14
	(0.32)
Somali	0.06
	(0.23)
Government	0.27
	(0.41)
Truck Driver	0.19
	(0.36)
Boda Boda (Bike Taxi) Driver	0.08
	(0.25)
Observations	3,656

Note: Means are presented with standard deviations in parentheses.

Transactions

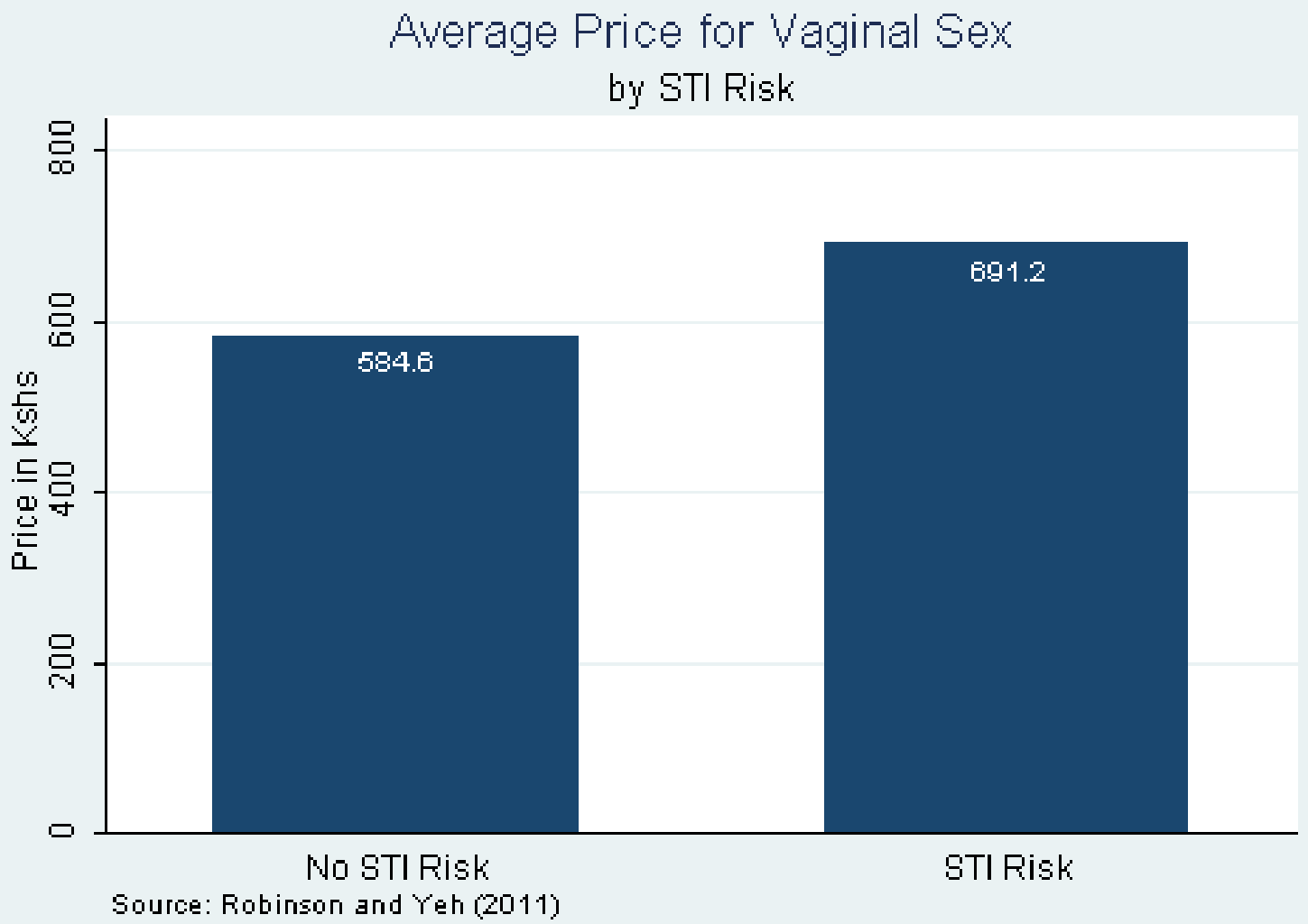
Summary Statistics

Price for Sexual Transaction (Ksh)	509.51
	(286.41)
Unprotected Vaginal Sex	0.08
	(0.14)
STI	0.03
	(0.07)
STI Risk	0.03
	(0.10)
Birth Control	0.60
	(0.49)
Probability of Pregnancy	0.13
	(0.05)
Pregnancy Risk	0.003
	(0.02)
Observations	192

Note: Means are presented with standard deviations in parentheses. Please also note that pregnancy risk and probability of pregnancy are calculated at the transaction level.

Results

STI Risk


Average Price for Vaginal Sex
by STI Risk
Price in Kshs
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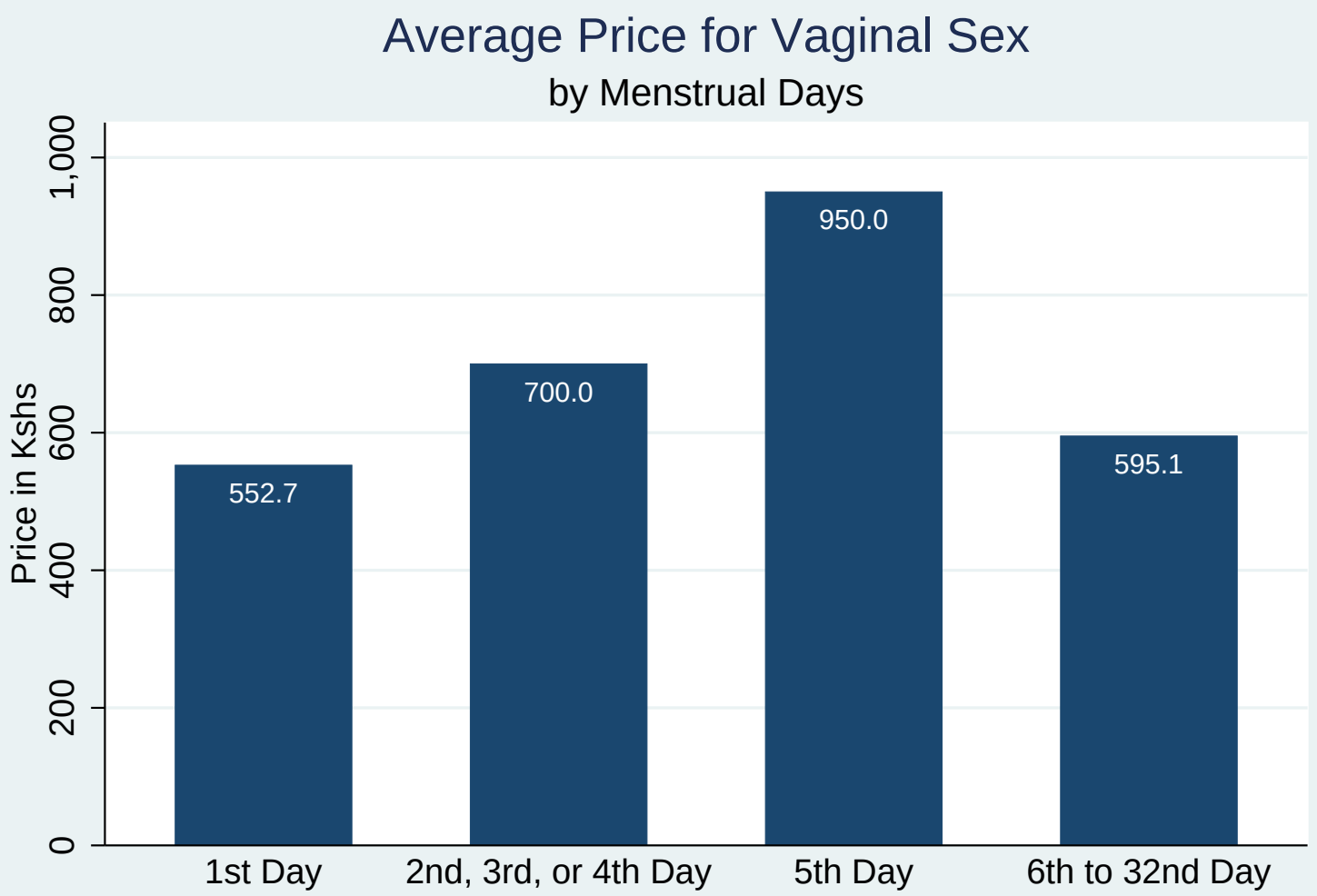
200
400
600
800
584.6
691.2
No STI Risk
STI Risk
Source: Robinson and Yeh (2011)

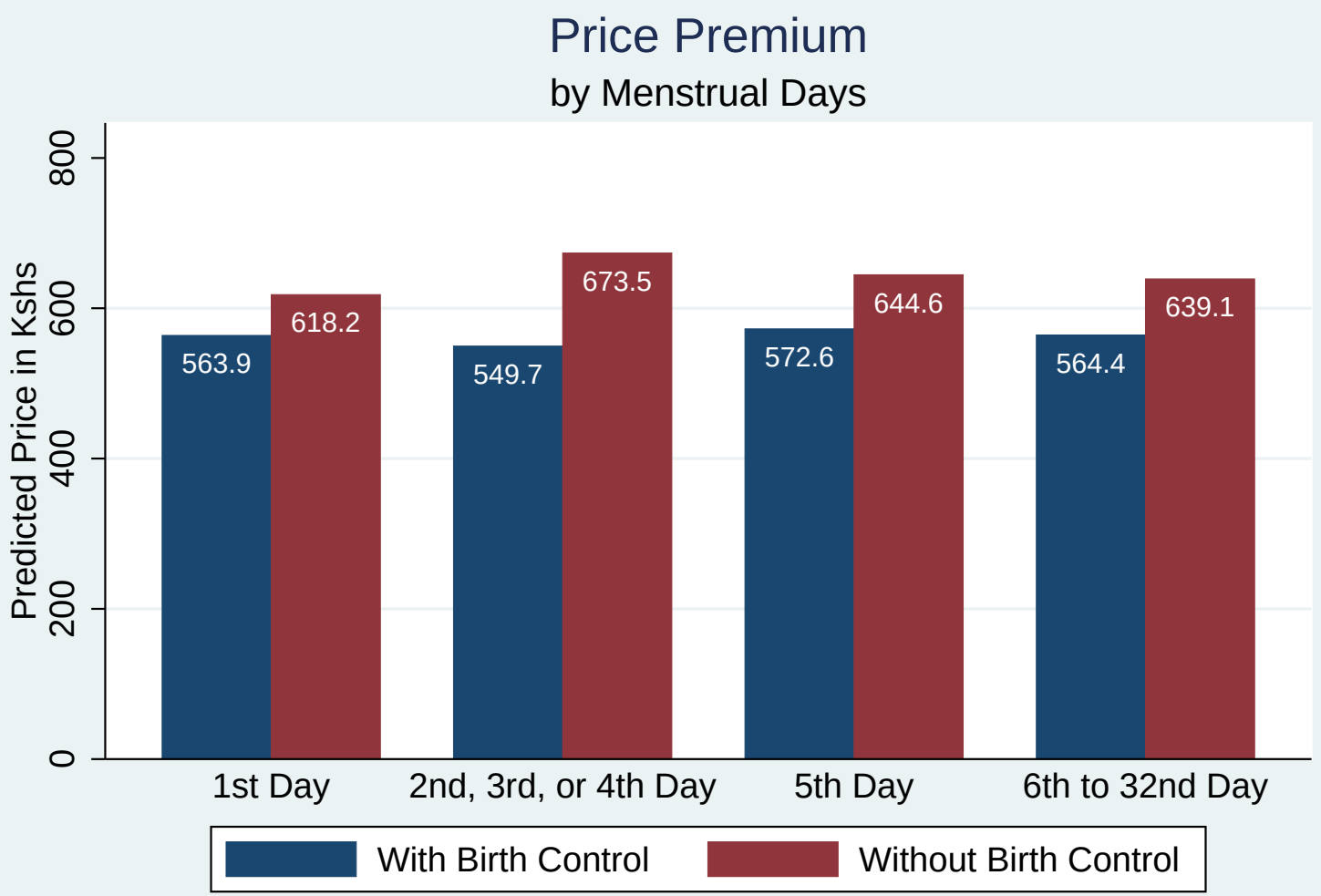
STI Risk as a Source of the Price Premium for Unprotected Sex

	(1) Ksh	(2) Ksh	(3) Ksh	(4) Ksh
No Condom			-4.263	1.325
			(31.17)	(30.12)
Risky Client			-10.95	-3.104
			(26.02)	(27.16)
No Condom*Risky Client	128.9*	142.7**	138.5*	143.4*
	(72.20)	(68.87)	(74.98)	(77.80)
Sex Worker Controls	No	Yes	No	Yes
Client Controls	No	Yes	No	Yes
Time Dummies	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
Constant	574.8***	609.8***	578.0***	609.8***
	(75.16)	(78.59)	(75.98)	(79.02)
Kshs[e]	588.1	590	588.1	590
Sexual Transactions	2506	2378	2506	2378
R-Squared	0.00915	0.0203	0.00926	0.0203
F Statistic	1.593	4.534	1.523	4.258

Notes:
a. Standard errors clustered at the sex worker level in parentheses.
b. *** 1% level of confidence.
c. ** 5% level of confidence.
d. * 10% level of confidence.
e. Mean of Ksh.

Pregnancy Risk


Average Price for Vaginal Sex
by Menstrual Days
Price in Kshs
0
200
400
600
800
1,000
552.7
700.0
950.0
595.1
1st Day
2nd, 3rd, or 4th Day
5th Day
6th to 32nd Day
Source: Robinson and Yeh (2011)



Source: Robinson and Yeh (2011)

Pregnancy Risk as a Source of the Price Premium for Unprotected Sex

	(1) Ksh	(2) Ksh	(3) Ksh	(4) Ksh
No Condom			32.02	4.063
			(37.66)	(26.32)
Probability of Pregnancy			319.2	514.1**
			(267.4)	(230.1)
Probability of Pregnancy*No Birth Control			-368.1	-992.9**
			(447.3)	(413.4)
No Condom*Probability of Pregnancy*No Birth Control	714.6*	708.8**	499.6	716.0**
	(363.5)	(292.3)	(433.2)	(349.6)
Sex Worker Controls	No	Yes	No	Yes
Client Controls	No	Yes	No	Yes
Time Dummies	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
Constant	536.5***	654.3***	493.2***	641.2***
	(53.38)	(151.1)	(63.89)	(154.4)
Kshs[e]	553.7	536.8	553.7	536.8
Sexual Transactions	6361	3493	6361	3493
R-Squared	0.00282	0.0133	0.00345	0.0148
F Statistic	1.301	1.902	1.449	2.068

Notes:
a. Standard errors clustered at the sex worker level in parentheses.
b. *** 1% level of confidence.
c. ** 5% level of confidence.
d. * 10% level of confidence.
e. Mean of Ksh.

STI Risk and Pregnancy Risk as Sources of the Price Premium for Unprotected Sex

	(1) Ksh	(2) Ksh	(3) Ksh	(4) Ksh
No Condom			-33.22	-31.02
			(36.87)	(42.79)
Risky Client			-19.55	-15.35
			(25.89)	(27.04)
No Condom*Risky Client	76.31	71.70	101.8	92.41
	(73.70)	(69.77)	(82.20)	(86.08)
Probability of Pregnancy			650.0**	649.4**
			(292.9)	(267.1)
Probability of Pregnancy*No Birth Control			-1071.9**	-961.3*
			(478.6)	(507.6)
No Condom*Probability of Pregnancy*No Birth Control	593.7	667.7	801.5*	860.9
	(399.8)	(438.4)	(479.8)	(565.7)
Sex Worker Controls	No	Yes	No	Yes
Client Controls	No	Yes	No	Yes
Time Dummies	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes
Constant	498.0***	533.3***	476.5***	501.6***
	(91.37)	(153.5)	(100.1)	(153.2)
Kshs[e]	589.1	591.7	589.1	591.7
Sexual Transactions	2246	2133	2246	2133
R-Squared	0.0123	0.0233	0.0152	0.0258
F Statistic	2.514	4.062	2.881	4.614

Notes:
a. Standard errors clustered at the sex worker level in parentheses.
b. *** 1% level of confidence.
c. ** 5% level of confidence.
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e. Mean of Ksh.

Robustness

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- Sex workers are pregnancy risk averse.

Conclusion and Take Aways

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- So is a compensating differential for pregnancy risk.
- The relationship between pregnancy risk, however needs to be explored with better data.
- Public policy should incorporate fertility preferences in trying to eliminate this price premium.
- Eliminating or reducing the price premium for unprotected sex will reduce sex workers' incentives, both at the intensive and extensive margins, to supply unprotected sex.

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