

Decriminalizing Indoor Sex Work: Effect on Quantity of Transactions

Andrea Kwan

Advisor: Professor Hilary Hoynes

University of California, Berkeley

Department of Economics

May 2016

Abstract

In 2003-2009, Rhode Island decriminalized indoor sex work, and this paper focuses on effects the judicial decision had on the size of the indoor sex market, comprising of escort, massage, and S&M services. In 2003-2009, Rhode Island showed an average increase of 2-3 transactions per month compared to its synthetic control. As the judicial decision was unexpected, there are no anticipatory effects, but rather, event study analysis shows that number of transactions remained unchanged from 2003-2006. Statistically significant increases are first observed in 2007, and by 2009, Rhode Island has 17 more transactions per month compared to its synthetic control. After re-criminalization of indoor sex work, trends in event study analysis showed only a slight dip, and continued increasing after. Segmenting indoor sex workers into high-end, mid-range, and low-end shows that the policy affected mid-range workers the most, only had a mild effect on high-range workers, and did not affect low-end workers at all.

I. Introduction

Over the past decade, the rise of e-commerce transformed and disrupted a lot of industries. For customers, it has redefined convenience and allowed information flow and transparency that just was never there before. Markets for illegal goods and services are subject to the same effect. If anything, the rise of e-commerce and the internet makes it easier to buy and sell illegal goods and services: it reduces search cost, which often constitutes a large share of the total price for pornographic images, Nazi memorabilia, and black market pharmaceuticals (Goldsmith and Wu, 2006).

The same trend can be observed in commercial sex work. Prostitution is illegal in most places in the U.S., yet it seems to thrive and grow with the help of the Internet. To some people, the word “prostitution” may still conjure up images of girls with heavy make-up, high heels and form-fitting dresses, standing around street corners, trying to solicit clients outdoors.

Cunningham and Kendall (2011) argue that this is no longer the case for most sex workers. They claim that the U.S. prostitution market has shifted primarily from an outdoor market to an indoor one, meaning most solicitation happens online. A report by the Urban Justice Center (2005) estimates that the indoor sex market comprises up to 85% of all sex work activity in the U.S. since as far back as 2005.

With the ease and convenience brought by the Internet, the market can be very responsive to changes in the external environment. This paper focuses on one specific scenario: the unexpected decriminalization of indoor sex work in Rhode Island from 2003 to 2009 (Arditi, 2009) and how it affected the market size of indoor sex work.

The judicial decision is first analyzed within the economic and temporal context, recognizing that the effect of the Great Recession has to be captured at least partially by

controlling for unemployment rates. I then explore options for a suitable control group, ultimately creating a synthetic state resembling Rhode Island in terms of unemployment rate, population, and pre-2003 trends in indoor sex activity. The effect of decriminalization is estimated using a differences-in-differences (DiD) model, within which results indicate that Rhode Island had a larger indoor sex market compared to its synthetic control. Nuances of the model are further explored in a series of event study graphs, in which I find that quantity of indoor sex transactions first decrease from 2003 to 2006, and then gradually increase. The trend even continues after indoor sex work was recriminalized in 2009. Segmenting all sex workers into high-end, mid-range, and low-end workers allows us to gain more insight into how the judicial decision affected different groups of workers: the mid-range segment expanded the quickest, while low-end workers were basically unaffected during the treatment period.

Commercial sex work is an interesting topic to study because of its ethical implications. In a report published by the United Nations Office on Drugs and Crime, it is cited that almost 6 in 10 identified trafficking survivors were trafficked for sexual exploitation, sold by pimps or agencies into prostitution. It has been argued that indoor sex work typically involves less exploitation and more control over working conditions. Some social scientists have proposed a system which involves decriminalization of indoor sex work, but few governments have been willing to experiment with the policy (Weitzer, 2011). Cho, Dreher and Neumayer (2013) wrote about the effect of legalizing prostitution on human trafficking. But since data measuring the scope of human trafficking is still lacking in a lot of ways, first exploring the effects of legalizing prostitution on the composition and characteristics of the sex market might provide a more solid starting point. If we are able to quantify the possible effects of such a policy on the growth of the sex market, we might have a better idea of how the flow of human trafficking will be affected,

and maybe then, governments will have a better idea on what the best legal system is to curb human trafficking.

I am hardly the first person to look at Rhode Island's history of decriminalizing prostitution. My contribution to the literature is by looking at the effect of decriminalization on market size from different perspectives. The event study allows us to look at how the rate of growth of the indoor sex market in Rhode Island varies over time. Segmenting sex workers into high-end, mid-range, and low-end workers allows us to see how the same policy affects different workers differently. Hopefully this provides a starting point and launching pad for future research to build upon.

II. Decriminalization of Indoor Sex Work in Rhode Island

The key event that began the history of decriminalization of prostitution in Rhode Island is COYOTE's lawsuit against Rhode Island in 1976. COYOTE—Call Off Your Old Tired Ethics—is an organization advocating for sex worker rights. Its goals are to decriminalize sex work, as well as eliminate social stigma. (COYOTE LA, "What is COYOTE?") In 1976, The Rhode Island chapter of COYOTE filed a complaint against the Attorney General of the State of Rhode Island and the Chief of Police of the City of Providence. Their complaint was on the grounds that R.I.G.L. §11-34-5¹ violated constitutional rights of privacy and association, and that the statute was discriminatorily enforced against women in sex work -related cases.

¹ Prior to May 1980, R.I.G.L. §11-34-5 read: It shall be unlawful for any person to secure, direct or transport, or offer to secure, direct or transport another for the purpose of prostitution, or for any other lewd or indecent act; or to loiter in or near any thoroughfare or public or private place for the purpose of inducing, enticing, soliciting, or procuring another to commit lewdness, fornication, unlawful sexual intercourse or any other indecent act; or to commit or in any manner induce, entice, or solicit, or procure a person in any thoroughfare, or public or private place or conveyance to commit any such act; or to receive or offer or agree to receive any person into any place, structure, house, building, room, or conveyance for the purpose of committing any such acts, or knowingly permit any person to remain therein for any such purposes, or to, in any way, aid or abet or participate in any of the acts or things enumerated herein. Any person found guilty under this section, shall be subject to imprisonment in the adult

In 1980, before the Court had made a decision, the Rhode Island legislature amended the statute. This is partly in response to public outcry against public solicitation for prostitution on the streets in the West End of Providence. The Speaker of the House at the time, Matthew Smith, believed that the legislative solution is reducing streetwalking from a felony to a misdemeanor, thereby streamlining the prosecution process, since a jury trial is no longer needed. As a result, R.I.G.L. §11-34-5 was amended, deleting the prohibition against loitering to solicit another for prostitution or any indecent act. A new statute, R.I.G.L. §11-34-8, was created and reduced street solicitation from a felony to a misdemeanor. With the amendment to R.I.G.L. §11-34-5, *COYOTE et al. v. Dennis J. Roberts, II et al.* was dismissed by all parties involved.

In December 1980, Chief Judge Raymond James Pettine issued an opinion on *COYOTE v. Roberts*, noting that changes made to R.I.G.L. §11-34-5 were substantive, and appeared to him “to have decriminalized the sexual act itself, even when undertaken for remuneration,” even considering the fact that “all preparatory activity”, such as transporting or receiving a person into a house for the purpose of prostitution, “remains felonious.” (*COYOTE v. Roberts* 502 F. Supp. 1342, 1980) However, members of the 1980 General Assembly deny that this was the goal of passing the amendment. Senator John F. McBurney III explained that the only reason a bill that decriminalized prostitution would win unanimous approval by the General Assembly is that “they didn’t know what they were voting for.” John Revens, a lawyer who served the General Assembly for nearly four decades, agrees that “[the 1980 General Assembly] would never sponsor a bill decriminalizing prostitution if they knew what it was. No way. Not in a million years.” (Arditi, 2009)

correctional institutions not to exceed five (5) years.

The ramifications of the amended §11-34-5 statute were never challenged until 2003. In *Rhode Island ex rel. City of Providence v. Choe*, Providence police arrested a dozen massage parlor employees under “Operation Rubdown”, a sting operation. The case went to court, and the District Court judge ultimately ruled in favor of the massage parlor employees.

Although the legality of indoor sex work was immediately known to parties involved in the legal case, the spread of information was slow in 2003. In private interviews conducted by Cunningham and Shah (2014), criminal defense attorney Michael Kiselica noted that the courtroom was relatively empty the day the decision for *Rhode Island v. Choe* was read, and no articles appeared in *The Providence Journal*, a major newspaper serving Rhode Island. Even among lawyers, the uptake of information seemed slow. Searches on Lexis Nexis, a legal research database, shows that the first time “decriminalization prostitution Rhode Island” was searched for is in 2005, two years after the 2003 decision on *Rhode Island v. Choe* and twenty-five years after the 1980 amendment on R.I.G.L. §11-34-5 (Cunningham and Shah, 2014).

In 2009, Rhode Island legislature introduced a bill, S 0596, to recriminalize prostitution: the act of prostitution itself is considered a misdemeanor if it is a first-time offense.

All in all, although the public policy change that led to the decriminalization of indoor sex work in Rhode Island was technically introduced in May 1980, the discovery of the legal loophole was in 2003. Therefore, the period of decriminalization is considered to be 2003-2009 for the purposes of this paper. It is also noteworthy that the first evidence of decriminalization of prostitution being public knowledge is in 2005, because if that were the case, we should expect transactions of sexual services to remain stable from 2003-2005, and observe an increase from 2005-2009.

III. Conceptual Framework

a. The Indoor Sex Market

The sex industry can be split into two broad sectors: outdoors (includes streetwalking, unplanned opportunistic sex work) and indoors (includes saunas, brothels, escort agencies, web-based sex work). This split is referenced in different research papers, such as Sanders (2004), Cusick and Hickman (2005), and Cunningham and Kendall (2011). Roughly speaking, the outdoor sex market is the more “traditional” type of sex work, where solicitation happens on the streets. Within the past decade, the rise of internet use, in particular that of e-commerce, has played an influential role in facilitating the indoor market. The Urban Justice Center estimates that by 2005, indoor sex work already constitutes up to 85% of all sex work activity in the United States. Ofcom (2015) estimates that people are spending twice as much time online in 2015 compared to 2005. The increased usage of the internet has not only caused a displacement of street prostitutes by indoor ones, but was found to lead to a growth in the overall sex market (Cunningham and Kendall, 2011).

This paper focuses on the effects of decriminalization on the indoor sex market because of the nature of the policy created (R.I.G.L. §11-34-8 criminalizes the outdoor sex activities but not indoor sex activities), and the growing importance of the indoor sex market. The particular types of indoor sex work studied are: escort, massage, and S&M services.

b. Economic Context

It is difficult to collect accurate data in the U.S. commercial sex market due to its illegal nature, making empirical work difficult to conduct. Research has, however, focused on the

theoretical aspects of drivers of the market. In theory, decriminalization leads to a decrease in costs to both buyers and sellers, so both supply and demand would shift outwards.

On the demand side, research supports an increase in commercial sex activity following decriminalization. Holt and Blevins' research findings (2010) indicate the importance of online discussion and sharing of information for clients to identify and solicit sex workers, as well as manage risk. Roby and Tanner (2008) found that social acceptance is another important factor in clients' decision to solicit sexual services. Both of these theories would predict an increase in demand for commercial sex following its decriminalization, as decriminalization would lower the perceived risk of arrest, increase the amount of online discussion, and increase social acceptance of soliciting sexual services.

The effects of decriminalization on supply, however, is ambiguous. In Guista, di Tommaso, and Strom (2007), stigma plays a central role in determining quantities supplied. They argue that based on economic sociology literature in embeddedness and social capital, people care about the effects of their actions on their social standing, and being engaged in commercial sex work typically brings with it negative stigma. Recent economic literature has also pointed out that sex workers earn relatively high wages, suggesting that sex workers are motivated by monetary factors (Edlund and Korn, 2002). On the one hand, decriminalization decreases the level of stigma attached to sex work, but the effect of decriminalization on wages is ambiguous, since it depends on the shift in supply relative to the shift in demand. However, because decriminalization decreases stigma and the probability and cost of arrest, it is more likely than not that decriminalization will lead to an increase in supply of sex workers. In literature discussing the legalization of marijuana and its effects on supply, it was also ambiguous whether decreases in costs imposed by prohibition might be offset by cost increases in the form of taxes

and regulatory policies (Egan and Miron, 2006). A safe assumption to make in this paper, therefore, is that the direction of supply movement is ambiguous, and any changes in quantity transacted cannot be attributed directly to supply changes.

Another important factor to consider is the time frame of the Rhode Island policy change (2003-2009). This time frame overlaps with the Great Recession, which is generally accepted to be between the years 2007 and 2010. Along with the economic downturn, disposable income generally decreases, leading to a decrease in demand for a normal good, and unemployment rate increases, possibly increasing supply, if people view commercial sex work as a preferable alternative to other options after losing their jobs. To gauge how big of an effect the Great Recession had, we can explore how state level unemployment rates correlate with quantity of transactions. Results are shown in Figure 1.

When simply graphing the frequency of service by the unemployment rate, it does not seem like unemployment rate has a strong correlation with frequency. But when controlling for state dummies and state populations (state population likely to have a direct impact on how often commercial sex transactions happen within certain states), the magnitude and statistical significance of unemployment rates as a predictor of commercial sex activity increases substantially. The coefficient is -11.9, with a 95% confidence interval of -13.7 to -10.0, which means that for every increase of 1 percentage point in the unemployment rate, we can expect an average decrease of 10-14 transactions per month per state. The regression line is also shown in Figure 1. All things equal, a higher unemployment rate is correlated with a lower quantity in the indoor sex market, so we should expect to see a decrease in quantity during the years 2008-2010, which is what we observe in overall trends in transactions within the U.S. (Figures 2) to some degree. It is important, then, to control for unemployment rate when running further analysis.

IV. Data

a. TER Database

Although the act of prostitution or the preparatory activities leading to prostitution may be criminalized in a lot of countries, the advertisement of prostitution is generally accepted. As such, the online world contains a wealth of data regarding different attributes of workers in the industry and market characteristics. Although data collected from different sources on the internet tends to be scattered and heterogeneous in nature, focusing on select few databases allows for data to be gathered in a systematic manner, mitigating one of the traditional limitations of empirical work on commercial sex markets (Cunningham and Kendall, 2011).

To obtain the best gauge of the total amount of commercial sex activity in the indoor market, I examine what is believed to be the largest dataset currently available, TheEroticReview.com (“TER”). TER is a reputation website that has been described as “a Yelp for sex workers” (Cunningham and Shah, 2014). Sex workers are encouraged to update and maintain a profile describing their different characteristics, such as hair color, race, and services provided. Clients share reports and reviews of sex workers they purchase services from. TER has long been one of the largest and most reputable review website for sex workers. In fact, it is the first review website with a fully searchable database incorporated, with reviews dating back to 1998 (Milrod and Monto, 2012). Today, it has over 1,281,905 total reviews of 238,501 sex workers across 14 different countries.

To prevent overly biased or hateful reviews, or sex workers posting fake reviews to bolster their own ratings, TER has a team of employees who validate the authenticity of reviews (TER, 2016). Around 10% of those who log into TER post reviews, and there is no evidence that

this ratio fluctuates over time (Milrod and Monto, 2012). Although this is not a large number, it provides a general sense of the magnitude of the size of the indoor sex market, and serves as a good baseline estimate.

b. Summary Statistics

Aggregating across all U.S. sex workers, I find that most sex workers serve coastal areas, as shown in Figure 2. The reasons for this have not been explored in literature, although part of it might also be due to the scale effect—more population-dense states, such as California, tend to have a higher concentration of sex workers. Number of sex workers were also concentrated around big cities.

Figure 3 shows the level of commercial sex activity in the U.S. over time. The general trend seemed cyclical, as movements of data reported on TER—a proxy for total indoor sex market activity—seemed to roughly track the fluctuations of general economic conditions, particularly entering into the Great Recession. The same trends are not observed in Rhode Island, however. As shown in Figure 4, indoor sex activity remained flat and close to zero until late 2005, after which a considerable increase is observed.

Figure 5 focuses on 2003-2009, the time period in which indoor prostitution was decriminalized in Rhode Island. It plots the number of transactions aggregated by month, with Rhode Island transactions in blue and the rest of the U.S. in red. Each data point is expressed as the percentage change relative to January 2003. Indoor sex activity in Rhode Island showed a more-than-tenfold increase through 2003-2009, when the indoor sex market was decriminalized. The U.S. trend stayed relatively stable, within 100% of January 2003 numbers. Hence the motivation for this paper: does the decriminalization of the indoor sex market contribute to the

increase in indoor sex activity in Rhode Island? If so, how much of the increase can be attributed to decriminalization?

To answer this question effectively, a suitable control group must be chosen. One option is to compare Rhode Island with other U.S. states, and Table 1 shows some limitations of this approach. Table 1 charts some of the major demographic markers of sex workers among three different groups: U.S. workers as a whole, sex workers in Rhode Island from 1998 to 2002, and sex workers in Rhode Island from 2003 to 2009. Characteristics of workers in these three groups are vastly different. Comparing U.S. workers (column 1) and Rhode Island 1998-2002 (column 2), obvious differences are: the Rhode Island market is much smaller (7 workers compared to 155,301), real hourly prices are higher on average and have much less of a variance (implying that services are of higher quality and more homogeneous when compared to the rest of the U.S.), and all of the workers are white (vs. 55.0% in the rest of U.S.). Comparing sex worker characteristics in the Rhode Island pre-2003 and post-2003 groups, after discovery of the legal loophole, the Rhode Island indoor sex market got significantly larger, increasing from 7 workers to 156. Prices decreased across the market by around 15-40% depending on the quartile, and there seem to be more of the older sex workers and younger sex workers entering the market, as the age distribution got wider. The indoor sex market went from 100% white to having 25% minorities. All in all, the demographic composition of the Rhode Island indoor sex market is quite different after the legal loophole was discovered. The U.S. market also differs from the Rhode Island pre-2003 market in the some key demographic indicators, and may not be a good control for gauging the effect of Rhode Island's decriminalization of indoor sex work. In the next section, I construct a synthetic control for Rhode Island and will use it to identify the "best"

control group among U.S. states to compare against Rhode Island under decriminalization of indoor sex work.

V. The Model

a. Synthetic Control

As shown in the previous section, aggregating across all non-Rhode Island states might not be a good control for indoor sex activity in Rhode Island. So I construct a synthetic control that uses optimization methods to create an “artificial state” from statewide data on indoor sex transactions. This artificial state is optimized to resemble Rhode Island in terms of unemployment rate, population, and pre-2003 transaction trends. The synthetic control generated by the algorithm has the following composition:

$$\text{Synthetic } RI = 0.453 \times NH + 0.516 \times NM + 0.03 \times UT, \quad (1)$$

where NH = New Hampshire, NM = New Mexico, UT = Utah. After the policy was introduced, Rhode Island’s trend in indoor sex transactions did not deviate from the trend of synthetic Rhode Island until 2006, which is not unexpected, since the first evidence of Rhode Island’s decriminalization of prostitution being public knowledge is in 2005 (more details in Section II). After 2006, however, Rhode Island transaction trends deviates noticeably from that of synthetic Rhode Island, showing a much larger increase.

Synthetic Rhode Island performs decently well in the two main control variables studied, deviating from Rhode Island 0.05 percentage points in unemployment rate, and around 65% in population. In this paper, I assume that the synthetic Rhode Island constructed is the best control group for Rhode Island based on data available, although more controls can definitely be added as predictor variables.

Using only unemployment rate and state population as control variables, the red dotted line shown predicts what Rhode Island's transaction trends would be like had it not decriminalized indoor sex work. The significant difference between Rhode Island trends (black solid line) and synthetic Rhode Island trends (red dotted line) suggests that something other than unemployment rate, population, or past trends is driving the increase in indoor sex activity.

b. Difference-in-Differences Model

To further test whether the increase is due to discovery of the legal loophole decriminalizing indoor sex work, the following DiD model is run for data from 1998-2009, with 2009 being significant since 2009 is the year when Rhode Island legislature passed a bill recriminalizing indoor sex work:

$$q_{st} = \beta_1 RI_s + \beta_2 D_t + \beta_3 RI_s \times D_t + \beta_4 UR_{st} + \beta_5 Pop_s + \varepsilon \quad (2)$$

Here, q = quantity of reviews posted on TER, RI = dummy for transactions happening in Rhode Island, $D = 1$ if $t \geq$ January 2003, UR = unemployment rate, Pop = population, s = index for state, t = index for month, and ε is the error term.

In Model (1), where the rest of the U.S. was used as a control for Rhode Island and none of the control variables are included, the coefficient for $RI_s \times D_t$ is -69.92, with a 95% confidence interval of -415.40 to 72.85, which renders coefficient β_3 not statistically different from 0. Under this model, it is difficult to say if Rhode Island's 2003 court decision affected quantity of transaction in the indoor sex market at all. Model (2) uses the rest of the U.S. as a control group as well, but factors in control variables unemployment rate and population. β_3 is -162.4 under this model, and is negative within the 95% confidence interval, meaning that Rhode Island's 2003 court decision led to less indoor sex activity when compared to the rest of the U.S.

However, when compared with a more suitable control group—synthetic Rhode Island— β_3 becomes statistically significantly positive, indicating that Rhode Island had an average of 2-3 more transactions in the indoor sex market per month.

c. Event Study

What causes the difference in predictions when using these two different control groups, and which one is actually a better control for Rhode Island? I use an event study to try to answer these questions. To run an event study, the DiD model from Equation (2) is modified to include dummy variables for the years 1998-2016. The goal is to observe how the coefficient for $RI_s \times D_t$ changes over time, providing richer information than the one coefficient from the DiD models alone:

$$q_{st} = \alpha RI_s + \beta_t D_t + \gamma_t RI_s \times D_t + \delta UR_{st} + \theta Pop_s + \varepsilon \quad (3)$$

This model is basically the same as Equation (2), except $\beta_t D_t$ and $\gamma_t RI_s \times D_t$ are no longer individual terms but represent vectors of length t . The model represented in Equation (3) is run using the rest of the U.S. and synthetic Rhode Island as control groups respectively. Results are shown in Figures 7 and 8.

The main observation from these graphs is that, when using the rest of the U.S. as a control, the event study graph shows pre-trends, in that coefficients γ_t for the interaction variable was already trending downwards prior to 2003, the treatment year. This shows that the rest of the U.S. is unsuited as a control group to Rhode Island because of endogenous treatment effects. In other words, because of the gradual decrease in γ_t even before the treatment period, we cannot attribute negative γ_t 's during the treatment period to the treatment itself. Even if DiD Model (2) seems to show that the 2003 court decision led less indoor sex activity relative to the rest of the

U.S., based on the event graph, we cannot conclude that the difference in indoor sex activity is caused by the 2003 court decision.

Figure 8, however, shows that synthetic Rhode Island is a good control. During the pre-treatment period, γ_t 's are statistically equal to 0, showing no pre-trends. After 2003, the year of the court decision, γ_t remained close to 0 for 3 years, meaning that the court decision did not seem to have an effect on quantity of indoor sex transactions. This is in part expected, due to the 2-3 year lag before information is disseminated to the public, as referenced in Section II. During years 2007-2009, the event study graph shows an unambiguous increase in indoor sex activity relative to synthetic Rhode Island trends, and the speed of growth is faster every year. In 2009, the year when the indoor sex market is recriminalized, growth of the market slowed, as shown by a slight dip in the graph. However, market growth rate picked up not long after, suggesting that even after the indoor sex market is recriminalized, the number of transactions increased at an even greater rate. Criminalization in itself was not enough to curb the growth of the indoor sex market.

VI. Results

Overall, the Rhode Island 2003 court ruling that exposed the amended statute that decriminalized indoor sex work led to an increase in number of TER reviews, which is used in the paper as a proxy for overall activity in the indoor sex market. When compared to synthetic Rhode Island, comprised of New Hampshire, New Mexico, and Utah with various weights, level of transactions do not change by much in years 2003-2006. In years 2007-2009, Rhode Island has around 5-25 more reviews per year, which, when considering the ratio of TER members who

submit reviews, can easily lead to 50-250 more transactions per year (Milrod and Monto, 2012). Unemployment rates and population levels were found to be important variables to control for.

VII. High-End, Mid-Range, and Low-End Workers

With a quantified effect of the ruling on the overall activity in the Rhode Island indoor sex market, I now look at whether the policy affects all workers in the market equally.

As sexual services are widely considered to be heterogeneous, splitting workers up into three groups according to their predicted price of services—high-end (top 25%), mid-range (middle 50%), low-end (bottom 25%)—and looking at how the court ruling affected each group differently should be interesting. TER collects a wide range of characteristics of sex workers (see Table 4). Using data from 231,810 sex workers from the U.S., I run a regression with every field in Table 4 as well as a dummy for whether or not the field includes missing data, since not every sex worker fills out every single field in their profiles. Based on results of the regression, predicted hourly prices for their primary service is generated for every sex worker. Sex workers are then sorted into high-end, mid-range, and low-end based on their predicted real hourly prices.

An event study against synthetic Rhode Island controlling for unemployment rate was run within each of the groups to see how the Rhode Island 2003 court decision affected each group (Figures 9-11). Comparing the three figures, indoor sex activity increased first among mid-range workers. The coefficient for their interaction variable first becomes statistically positive in 2006. The corresponding year with high-end and low-end workers are 2008 and 2013 respectively. Considering that the period of decriminalization is 2003-2009, the policy did not affect transaction quantities among low-end workers at all. All in all, the high-end and mid-range sex worker groups responded quickest to the 2003 court decision, but the magnitude of change is

largest among mid-range and low-end sex worker groups. Their maximum coefficients were 18.6 and 21.8 respectively, while the maximum coefficient for high-end workers was just 7.0.

Combining these findings with the summary statistics of these three groups of workers in Table 5, it can be observed that high-end and mid-range workers provide a higher proportion of escort services and lower proportion of massage services, and mid-range and low-end workers have a higher proportion of minority sex workers. Whether these are the true reasons to the speed and magnitude of responses in number of transactions to decriminalization still has to be tested rigorously.

VIII. Conclusion and Discussion

This study identifies key considerations when studying the Rhode Island decriminalization of indoor sex work, and provides different ways of looking at the effect it has on market size.

First, due to the time frame of the period of decriminalization, controlling for unemployment rate is hugely important in analyses. After controlling for state population, every percentage point increase in unemployment rate is correlated with a decrease in number of reviews by around 12. This study has also shown that the rest of U.S. will not be a suitable control group for Rhode Island due to pre-trends in event study analysis.

Analysis shows that decriminalization did increase the size of the indoor sex market in Rhode Island. From the DiD model, the Rhode Island indoor sex market outperforms that of its synthetic control by an average of 2.3 reviews per month during the years 2003-2009. The event study shows that levels of indoor sex activity actually stayed constant in 2003-2006, but in 2007-2009, it showed a significant increase of around 15-20 reviews per month compared to synthetic

Rhode Island levels. It continues to outperform synthetic Rhode Island even after indoor sex work is recriminalized in 2009, reaching over 40 more reviews compared to the synthetic control. Most of these results can be reconciled with the context of Rhode Island's decriminalization history. After the 2003 court ruling that effectively decriminalized indoor sex market, there was no indication that the general public was aware of the fact until 2005, when searches started appearing in legal databases, and articles in newspapers. The ratio of users on TER who leave reviews is less than 10%, so if we multiply the numbers by 10, we can get an estimate on the total increase in indoor sex activity as measured on TER alone.

Many of the further questions raised by this study lies in the segmenting of indoor sex workers. Most of the effect of decriminalization was on the mid-range group, which showed a rate of growth more than double that of the high-end group. During the period of decriminalization, the rate of growth of the low-end group was not even statistically significant. Since now we know that decriminalization in Rhode Island mostly affected the mid-range group, trying to figure out who exactly they are and why they were affected the most is important in driving future policy decisions. As mentioned in the introduction, policy decisions relating to commercial sex work is interesting because of its moral and ethical implications. And while economic research should not be aiming to make a judgment call, its role is to provide as much robust, objective information to aid decision-making processes as possible.

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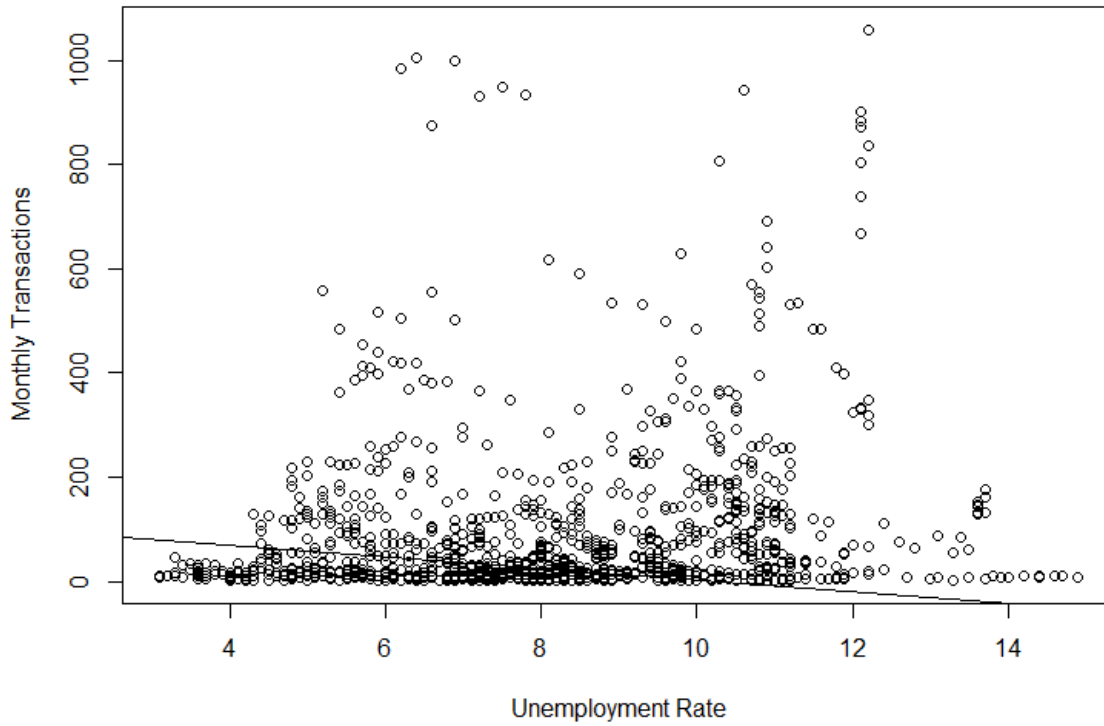
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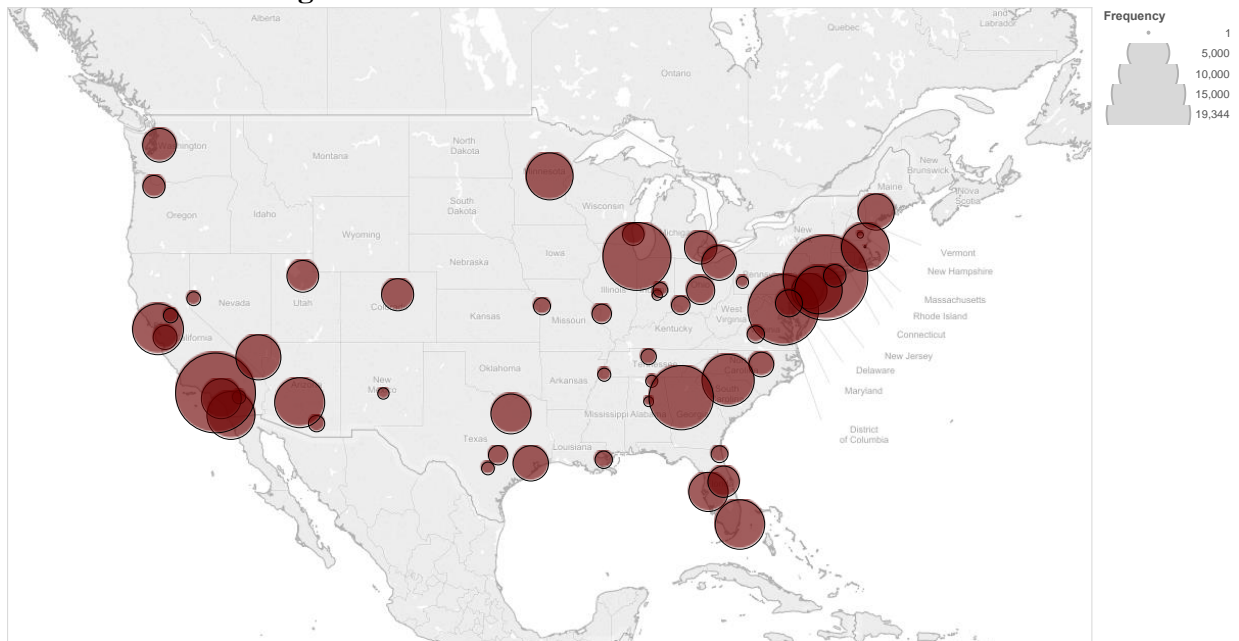
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Figure 1: Correlation between Unemployment Rate and Sexual Service Transactions



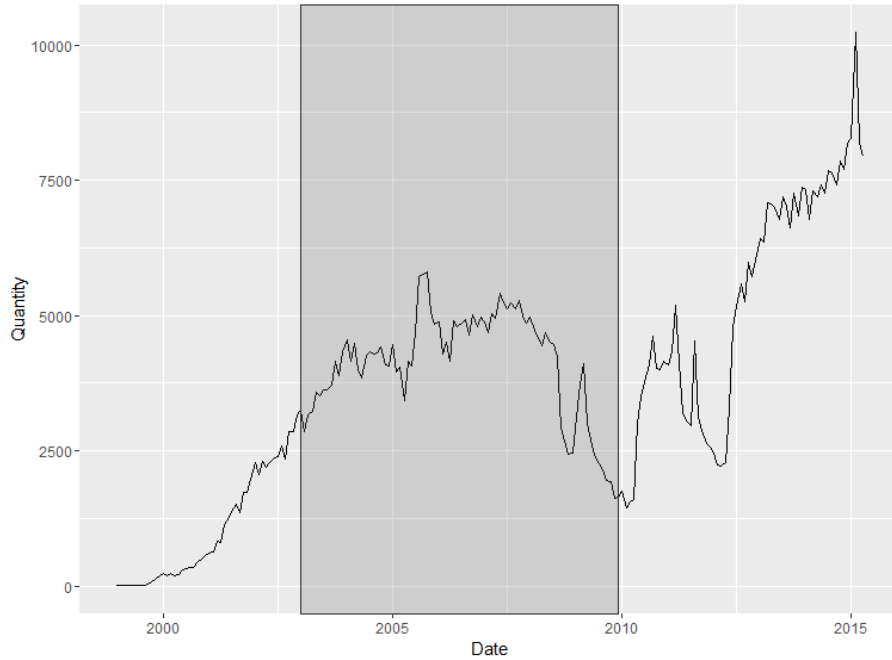
Notes: Unemployment rates are taken monthly by state from the Federal Reserve Bank of St. Louis. Monthly transactions are an aggregate of reviews posted on TheEroticReview.com based on state. Regression controls for state dummies and 2010 state population taken from the Census Bureau.

Figure 2: Distribution of U.S. Sex Workers on TER



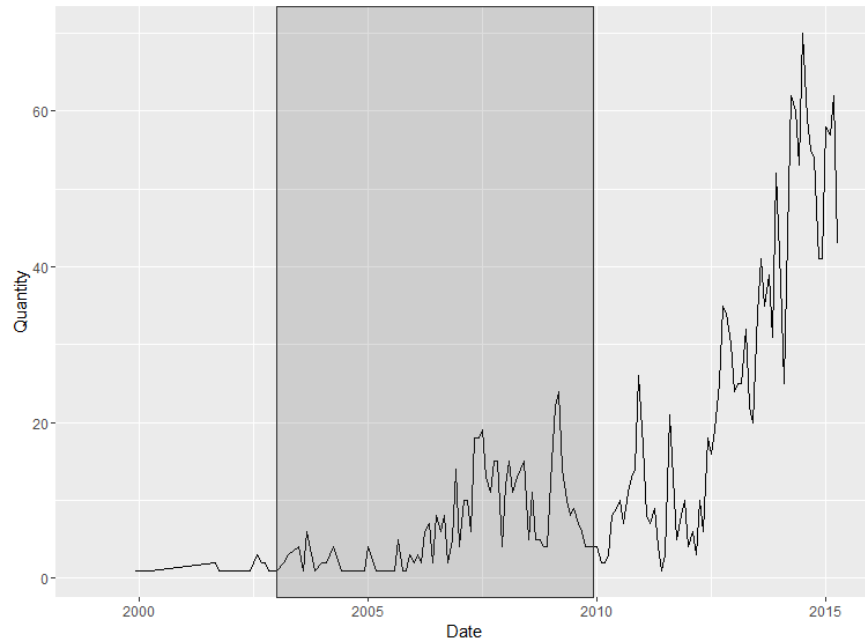
Notes: Profiles of individual sex workers from 1998-2016 were extracted from TER, and then aggregated by cities. The size of the bubble correlates with the number of unique profiles in those cities.

Figure 3: Commercial Sex Activity in the U.S.



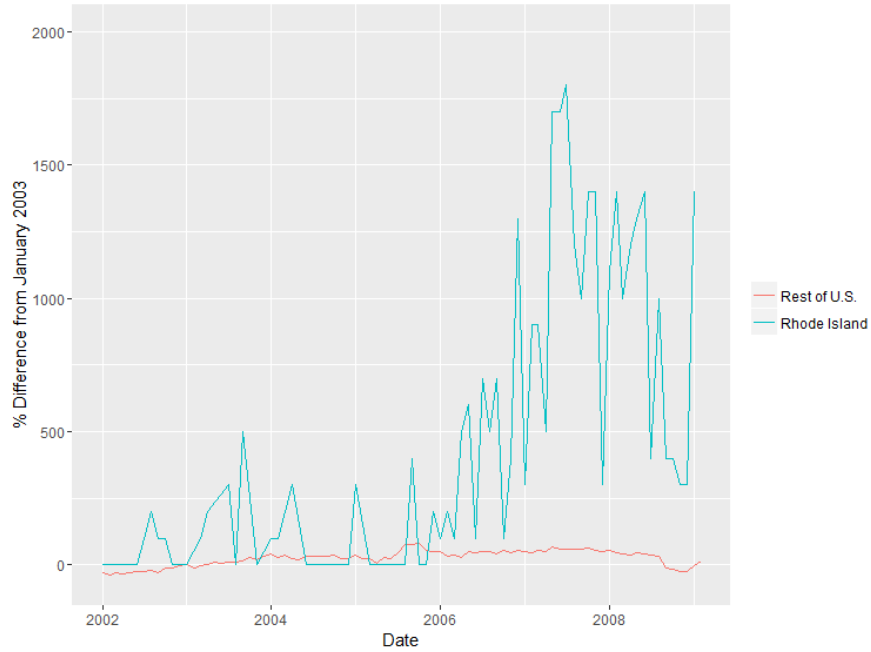
Notes: Total number of reviews from 1998-2015 were harvested from TER, and then aggregated by amount per month. Each data point represents the total number of unique reviews in the U.S. for each month. The highlighted portion of the graph represents the period of time when prostitution in Rhode Island was decriminalized (2003-2009).

Figure 4: Commercial Sex Activity in Rhode Island



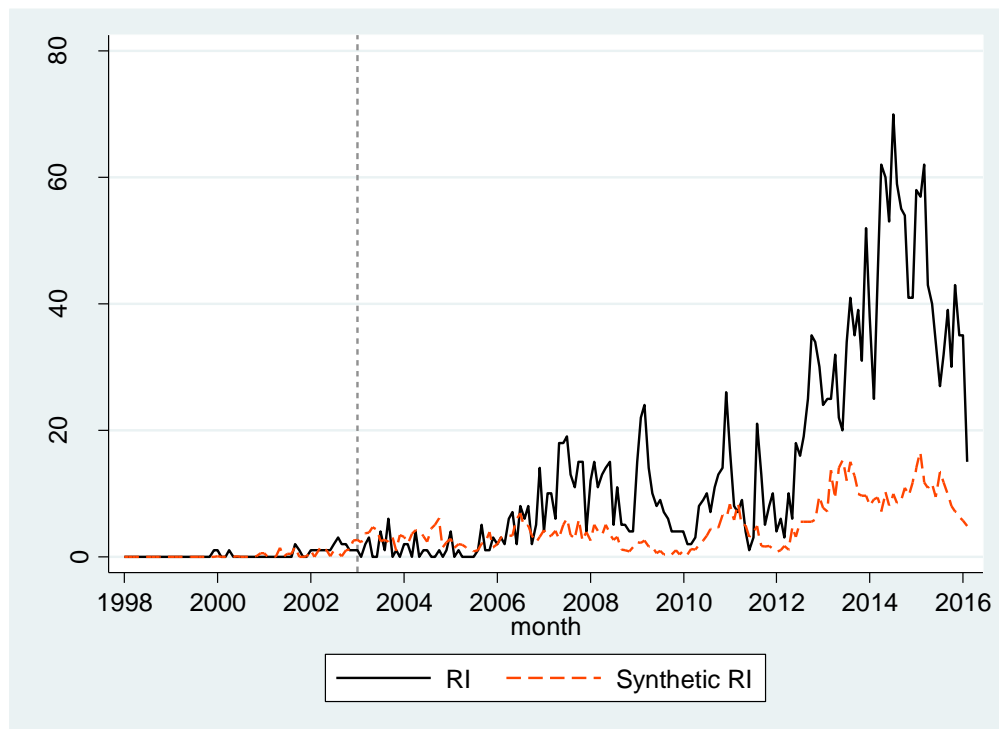
Notes: Total number of reviews for sex workers serving Rhode Island from 1998-2015 were harvested from TER, and then aggregated by amount per month. Each data point represents the total number of unique reviews for Rhode Island sex workers each month. The highlighted portion of the graph represents the period of time when prostitution in Rhode Island was decriminalized (2003-2009).

Figure 5: Difference in Commercial Sex Activity Using January 2003 as a Base Year



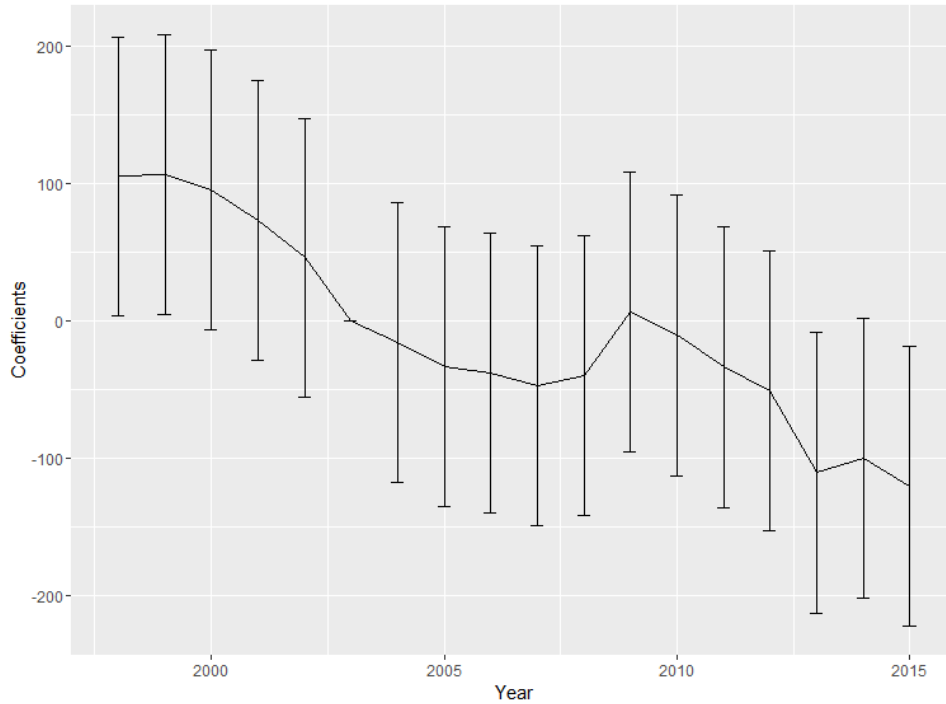
Notes: Aggregate monthly data used to compile Figures 3&4 were used. % difference was generated by this formula: $\frac{q_{s,t} - q_{s,200301}}{q_{s,200301}} \times 100\%$, where s represents the region (RI or rest of U.S.), and month is January 2003 when $t=200301$. is January 2003 when $t=200301$.

Figure 6: Rhode Island and Synthetic Rhode Island Commercial Sex Activity



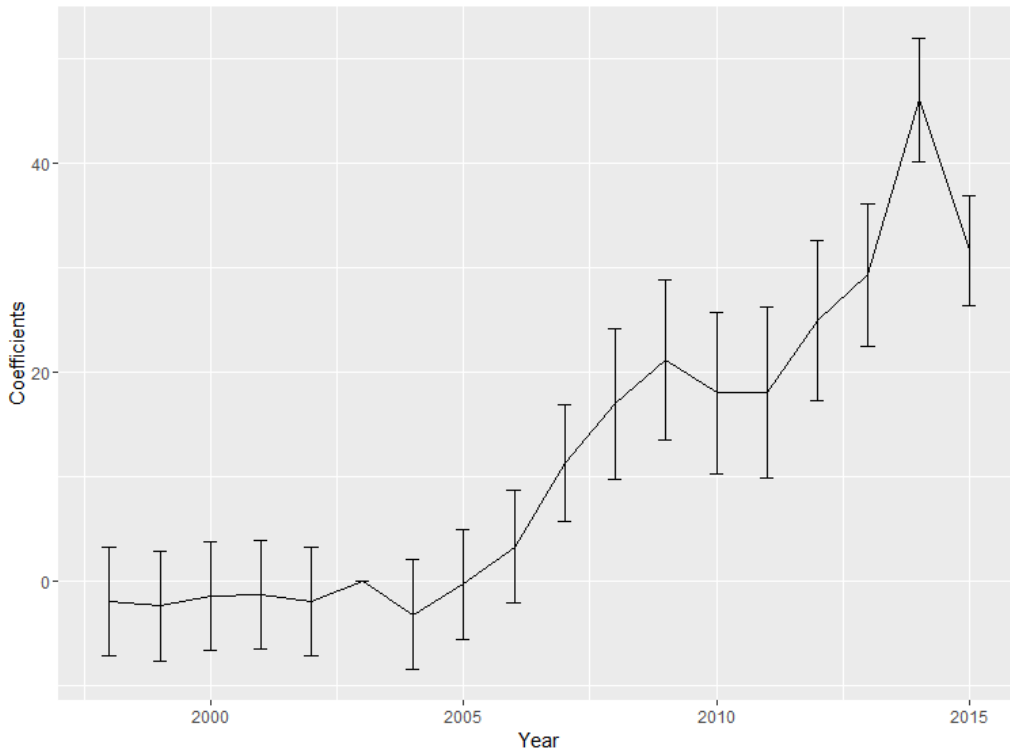
Notes: RI line graph is constructed the same way as Figure 4. Synthetic RI line graph is constructed using the Synth package in Stata, using amount of reviews aggregated by month for every other state as inputs.

Figure 7: Event Study Graph Using Rest of U.S. as a Control



Notes: Graphing γ_t in model represented by Equation (3), $t=1998-2016$. Data sources in Table (3) notes.

Figure 8: Event Study Graph Using Synthetic RI as a Control



Notes: Graphing γ_t in model represented by Equation (3), $t=1998-2016$, except population control variable is dropped. Data sources in Table (3) notes.

Figure 9: High-End Workers Event Study Graph

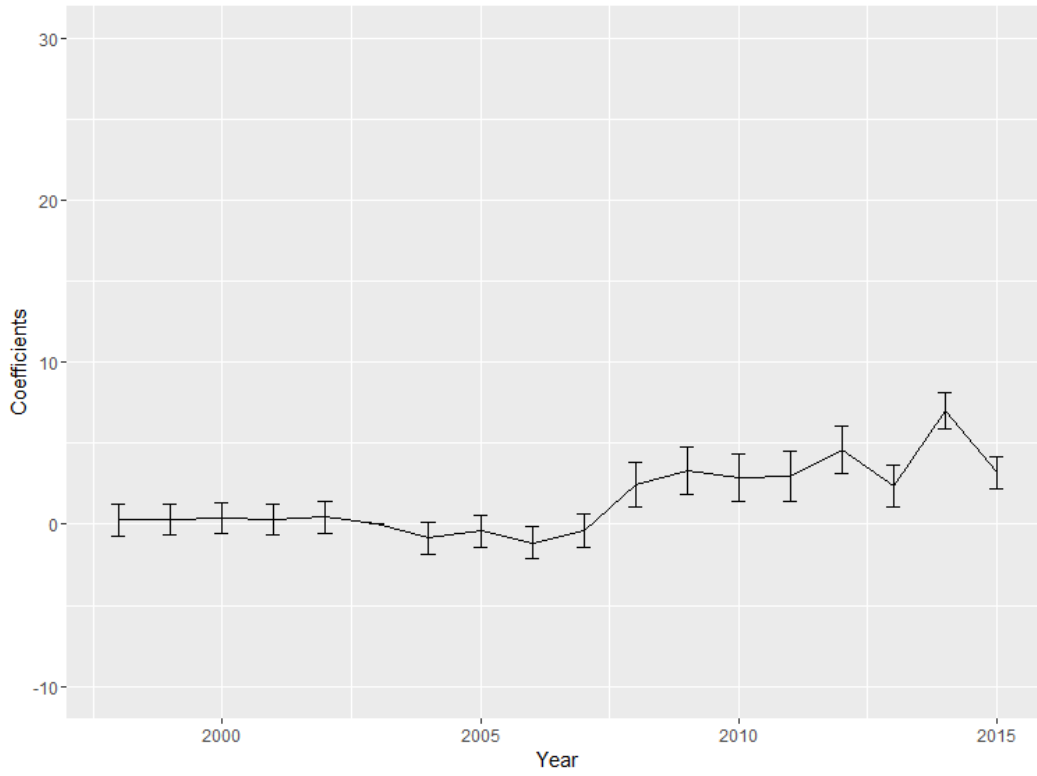


Figure 10: Mid-Range Workers Event Study Graph

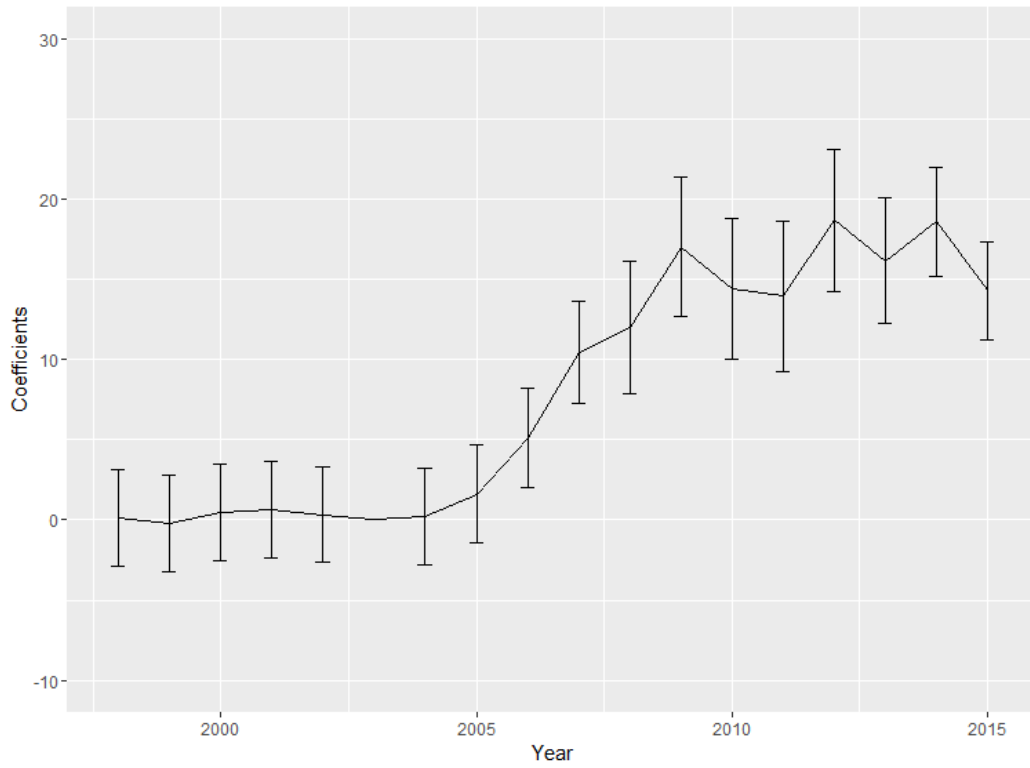


Figure 11: Low-End Workers Event Study Graph

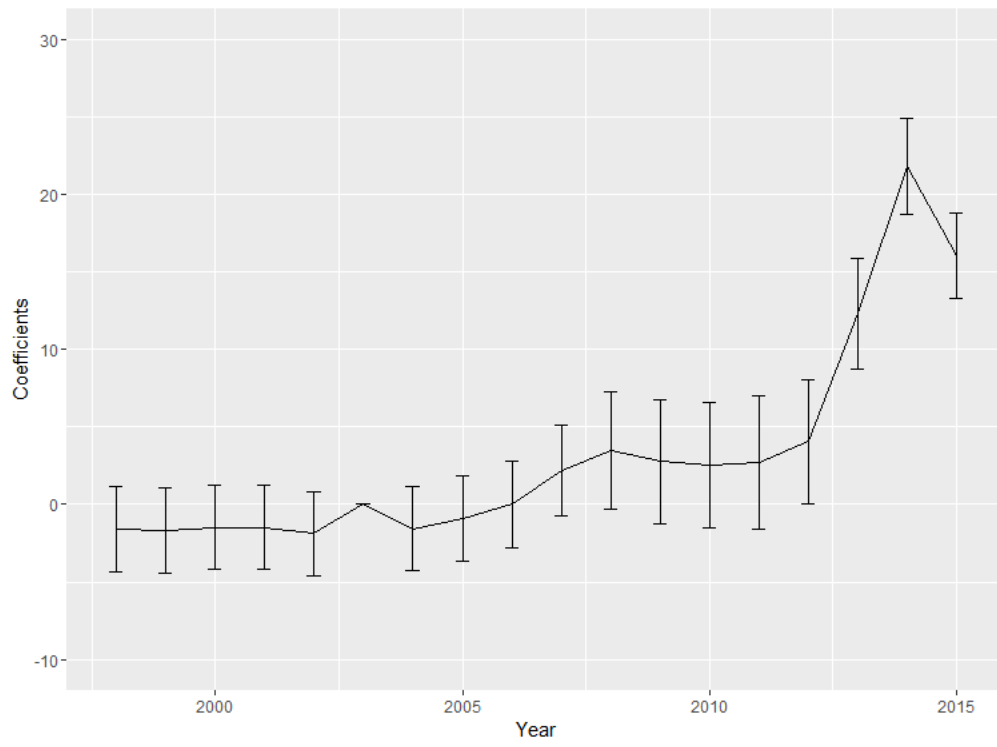


Table 1: Summary Statistics in TER Data on Sex Workers

	US (1)	RI 1998- 2002 (2)	RI 2003- 2009 (3)	% Change in RI, Post-2003 (4)
Number of Providers	155,301	7	156	8500%
Unemployment Rate	5.21%	4.50%	6.44%	1.94%
Real Hourly Price Distribution				
Quartile 1	\$84.68	\$137.79	\$94.03	-31.71%
Quartile 2	\$109.42	\$147.89	\$112.44	-23.97%
Quartile 3	\$147.99	\$165.03	\$142.29	-13.78%
Quartile 4	\$22,909.51	\$777.78	\$459.85	-40.88%
Distribution of Providers by Type of Service				
Escort	87.6%	85.7%	94.8%	9.1%
Massage	12.3%	14.3%	5.2%	-9.1%
S&M	0.1%	0	0	N/A
Mean Age	26.9	29.4	26.2	-10.88%
Quartile 1	23	25.5	23	-9.80%
Quartile 2	23	28	23	-17.86%
Quartile 3	28	33	28	-15.15%
Quartile 4	50	38	48	26.32%
Ethnicity				
White	55.0%	100%	74.4%	-25.6%
African American	13.5%	0%	10.9%	10.9%
Asian	15.7%	0%	4.5%	4.5%
Hispanic	14.7%	0%	10.3%	10.3%
Middle Eastern	0.7%	0%	0%	0%
Native American	4.8%	0%	0%	0%

Notes: (4) = ((3)-(2))/(2) * 100%, unless difference in percentage points is required. Unemployment rates are taken monthly by state from the Federal Research Bank of St. Louis.

Table 2: Rhode Island and Synthetic Rhode Island Comparison (1999-2002)

	RI	Synthetic RI
Unemployment Rate	4.48%	4.37%
Population	1,052,567	1,741,814

Notes: Synthetic RI produced through Synth package in Stata, composition detailed in Equation (1)

Table 3: Difference-in-Differences Regression Results (Number of Monthly Transactions as Dependent Variable)

	Rest of US as Control		Synthetic RI as Control	
	(1)	(2)	(3)	(4)
Rhode Island	-69.92 (94.54)	190.9 (62.53)	0.088 (0.543)	0.041 (0.535)
Post-2003	176.8 (7.605)	193.3 (5.382)	2.580 (0.424)	2.450 (0.420)
Rhode Island * Post-2003	-171.3 (124.5)	-162.4 (82.26)	2.979 (0.715)	2.306 (0.735)
Unemployment Rate		-13.44 (1.577)		0.425 (0.135)
Population (in millions)		18.81 (0.238)		
R ²	0.100	0.607	0.348	0.368

Notes: Monthly transactions are an aggregate of reviews posted on TheEroticReview.com based on state. Synthetic RI constructed according to equation (1). Unemployment rates are taken monthly by state from the Federal Research Bank of St. Louis. Regression controls for state dummies and 2010 state population taken from the Census Bureau. Population is also used as regression weights.

Table 4: Characteristics Available for Each Sex Worker on TER

General Information	Appearance	Services	Cost
Rating – overall	Real photo	(various types of services,	Type of Service
Rating – looks	Photo accurate	specifics omitted due to	Length
Rating – performance	Build	explicit nature)	Price
Agency / Independent	Height		
Primary Service	Ethnicity		
City	Transsexual		
Other city serviced	Age		
Incall/outcall	Breast Size		
Services delivered as promised	Hair Color		
	Breast Cup		
Smokes	Hair Type		
On time	Breast Implants		
Availability (daytime / nighttime)	Hair Length		
	Breast Appearance		
Porn star	Piercings		
	Tattoos		

Table 5: Summary Statistics for High-End, Mid-Range, Low-End Workers

	High-End	Mid-Range	Low-End
Number of Providers	46,903	92,794	46,306
Real Hourly Price Distribution			
Quartile 1	\$121.43	\$86.34	\$63.60
Quartile 2	\$158.56	\$109.80	\$84.30
Quartile 3	\$212.90	\$139.34	\$101.86
Quartile 4	\$22,909.51	\$12,787.05	\$1,316.12
Distribution of Providers by Type of Service			
Escort	84.0%	86.7%	60.8%
Massage	3.1%	8.4%	26.3%
S&M	0.3%	0.1%	0.0%
Mean Age	27.1	26.7	27.7
Quartile 1	23	23	23
Quartile 2	23	23	28
Quartile 3	28	28	33
Quartile 4	50	50	50
Ethnicity			
White	66.3%	53.5%	42.9%
African American	8.4%	12.6%	19.5%
Asian	9.6%	16.3%	20.4%
Hispanic	13.2%	14.8%	14.1%
Middle Eastern	0.8%	0.7%	0.5%
Native American	0.5%	0.5%	0.6%