Do Prostitution Laws Turn a John into a Rapist? Evidence from Europe*

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Abstract

We identify a causal effect of the liberalization and prohibition of commercial sex on rape rates, using the staggered legislative changes in European countries. We find that liberalizing prostitution leads to a significant decrease in rape rates, while prohibiting it does the opposite. These results are stronger when the rape under-reporting problem is less severe and when it is more difficult for men to obtain sex via marriage/partnership. We also provide the first evidence on the asymmetric effect of prostitution regulation on rape rates: The magnitude of prostitution prohibition is much larger than that of prostitution liberalization. Our placebo tests show that prostitution laws only affect rape and have no impact on non-sexual crimes. Overall, our results indicate that prostitution is a substitute for sexual violence and that the recent global trend of prohibiting commercial sex (especially the Nordic model) could have unforeseen consequences of proliferating sexual violence.

Keywords: Sex Work, Prostitution, Rape, Commercial Sex, Sex Crime

JEL Classification: J16, J47, J48, K23, K42

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"If you expel prostitution from society, you will unsettle everything on account of lusts."

St. Augustine (354-430 AD)[1]

1. Introduction

Prostitution has always been controversial. The U.S. government defines it as "inherently harmful and dehumanizing" (U.S. State Department, 2007, p. 27). As maintained by the radical feminist movement, prostitution, the result of an existing patriarchal societal order, is a synonym for exploitation and male domination (Weitzer, 2005).[2] In 1949, the United Nations (UN) asserted that prostitution "endanger[s] the welfare of the individual, the family and the community."[3] In opposition, many international organizations[4] have called for liberalization of prostitution with the intention of preventing the industry from going underground, creating a safer environment, and reducing the spread of sexually transmitted infections (STIs) (Amnesty International, 2015). Despite these debates, the effects of prohibiting/liberalizing commercial sex on society are under-studied. In this paper, we shed light on this issue from the perspective of sex crime (i.e., rape).

We expect prostitution to affect rape via the substitution mechanism. Considering that commercial sex and rape are two alternatives for men to obtain sex, we expect liberalizing prostitution to reduce rape rates, because it increases the supply, affordability, and safety of sex services. In contrast, banning commercial sex induces its scarcity, pushes suppliers into the darkness of the shadow market, drives costs up, and imposes a higher health, safety, and social risk, which decreases the attractiveness of commercial sex as compared to rape.[5]

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[1] Augustine of Hippo, Christian church father, philosopher, saint, De Ordine, 2.4.12. Variant: "If you do away with harlots, the world will be convulsed with lust," often cited as from Richards (1994, p. 118).

[2] For further theoretical discussion on prostitution, see: Barry (1995); Farley (2004); Jeffreys (1997); MacKinnon (1989).

[3] The UN Convention for the Suppression of the Exploitation of the Prostitution of Others, p.1.

[4] Among them, The World Health Organization (WHO), Amnesty International, The Joint United Nations Program on HIV/AIDS (UNAIDS), The Human Rights Watch, The United Nations Population Fund, etc.

[5] It is worth noting that the penalty for rape is at least as high as the penalty for acquiring banned commercial sex. We are not suggesting that rape is on average less costly to men than acquiring banned commercial sex. Instead, after the cost of obtaining commercial sex becomes higher due to prostitution bans, the relative cost of rape over commercial sex

Our tests exploit the staggered legal changes of prostitution laws in 31 European countries from 1990-2017. This empirical setting is appealing for four reasons. First, the driving forces behind governments' decisions to alter their prostitution policies are either providing safer working conditions and reducing the spread of STIs (the case of liberalizing sex work) or enhancing gender equality and social moral standards (the case of prohibiting commercial sex). These legislative changes are not introduced to affect rape rates; thus, any potential effect on rape rates is likely to be an unintended consequence. Second, these staggered legal changes enable us to identify their effect on rape rates in a difference-in-differences framework (see, e.g., Bertrand et al., 2004). Because multiple shocks affect different countries at different time, we can avoid a common identification challenge faced by studies with a single shock: the potential noise coinciding with the shock that directly affects rape rates (Roberts and Whited, 2013). Third, during our sample period, eight countries liberalized prostitution, while six prohibited it. This allows us to examine both the treatment and the reverse treatment effects. Last, European judicial definitions of rape are better harmonized, and rape statistics show high conformity levels (Harrendorf, 2012), which enables us to better identify the causal effects of commercial sex in a cross-country setting.

We find that liberalizing prostitution leads to a significant decrease in rape rates, whereas prohibiting it does the opposite. We also find that such an effect is asymmetric: The economic magnitude of prohibiting commercial sex is about four times as large as that of liberalizing it. On average, countries that liberalize commercial sex experience a decline in their rape rate by approximately three cases per 100,000 population, relative to countries that experience no legal changes in prostitution. In contrast, countries that prohibit prostitution experience an increase in their rape rate by approximately 11 cases per 100,000 population, relative to countries that

becomes smaller. Thus, the likelihood for a marginal man to obtain sex via raping over commercial sex will become higher.

experience no legal changes in prostitution. These results are economically notable, considering that the sample average rape rate is nine per 100,000 population.

The identifying assumption central to a causal interpretation of the difference-in-differences specification is that both the treated and control groups share parallel trends prior to a country's policy change. We show that the pre-treatment trends of these two groups are indeed indistinguishable, and that most of the impact of prostitution laws on rape occurs after the change, which suggests a causal effect.

Furthermore, we implement triple-differences tests to examine two possible sources of heterogeneity in the treatment effect. First, considering the well-known fact that rapes are likely to be under-reported, we provide evidence that the effect of prostitution laws on rape rates is stronger when the rape under-reporting problem is weaker. Second, in addition to commercial sex and rape, a third way for men to obtain sex is via their marriage/partnership. We show that the effect of prostitution laws on rape rates is more pronounced when it is more difficult for men to obtain sex via marriage/partnership.

Next, prostitution policy models can be further classified under one of the following groups, from the most relaxed to the most restrictive: decriminalization (including abolitionism and new abolitionism), legalization, criminalization, and the Nordic model. We separately examine the effects of these different prostitution models on rape rates. Among the prostitution liberalization models, we find that decriminalization (in particular abolitionism) has a stronger effect on reducing rape than legalization. Among the prostitution prohibitions models, we find that the Nordic model has a stronger effect on increasing rape than criminalization.

We perform a number of robustness checks on our main findings. First, we implement a placebo test and show that a change in a country's prostitution laws has no effect on non-sexual crimes (such as homicide, burglary, robbery, etc.). This result indicates that the observed relationship

between prostitution laws and rape rates is unlikely due to some confounding legal change that affects a country's overall criminal activities. Second, we match each country liberalizing prostitution to a country prohibiting it. We show that our main inference is unchanged based on the matched sample analysis. Last, we provide evidence that our main inference is largely unchanged after addressing the potential bias associated with the relatively small number of clusters and the heterogeneity in the timing of treatments.

Several single-country studies in the recent economic literature indicate that prostitution decriminalization helps reduce rape and prostitution criminalization tends to increase rape. For example, Ciacci and Sviatschi (2016) find that the openings of indoor prostitution venues in New York City are associated with a decrease in sexually coercive acts. Nguyen (2016) shows that lowering the entry barriers to massage parlors in California is associated with a significant decrease in local rape offences. Bisschop et al. (2017) find that opening legal street prostitution zones in 25 Dutch cities is associated with a decrease in sexual assaults. Cunningham and Shah (2018) demonstrate that Rhode Island's rape rate has fallen since the liberalization of indoor prostitution, and that the rape rate slightly increases after Rhode Island re-criminalizes its indoor prostitution. Ciacci (2021) provides evidence that Sweden's implementation of the Nordic model leads to an increase in rape. Similarly, Backus and Nguyen (2021) show that the 2015 criminalization of sex work in Northern Ireland increases violence against women.

Our paper complements these studies in the following three ways. First, by examining the legal changes on not only prostitution liberalization but also prostitution prohibition, we provide the first evidence on the asymmetric effect of prostitution regulation on rape: The impact of prostitution prohibition is much larger than that of prostitution liberalization. This asymmetry implies that our previous understanding of the relation between prostitution and sex crime is incomplete. These findings on prostitution prohibition are particularly timely and relevant considering the recent trend

of prohibiting commercial sex globally. Although this anti-prostitution trend is aimed at enhancing gender equality and reducing human trafficking for sexual exploitation, we provide evidence that commercial sex bans could have severe unforeseen consequences of proliferating sexual violence. Our findings have important policy implications, because sexual violence causes long-lasting harm to its victims and imposes weighty economic burdens on society.[6]

Second, previous studies focus on a single country's distinct example of a statutory change. However, a country-specific setup foregoes important country-level characteristics, such as gender norms, marriage rate, sex imbalance, etc. With a sample of 31 European countries, our cross-country approach enables us to shed insights on how the differences in countries' social environment influence the effects of prostitution regulation on rape rates.

Third and last, considering that prostitution regulation models vary in different countries, our cross-country framework allows us to gain a deeper understanding of the heterogeneous effects of these models. For example, we provide the first empirical evidence that the Nordic model (i.e., penalizing men for buying commercial sex) has a larger impact on increasing rape than models that penalize women for supplying commercial sex.

Our study also contributes to the literature on the drivers of rape. A large literature in non-economics disciplines suggests that power imbalance between genders is an important driver for rape. For example, Johnson (2014) points out that rape is more likely to occur in societies with larger power imbalance between men and women. Scully (1988) and Kelland (2014) state that gender imbalance of power causes men's lack of self-control, as it allows men to erase women as significant

[6] The damaging impacts of sexual violence on the physical, psychological, social, and economic well-being of the assaulted and society as a whole consist of tangible (police and justice interventions; support services for victims; health care; lost productivity, etc.), and intangible costs (e.g., loss of quality of life). Taking the U.S. as an example, rape results in more than $122,000 in costs per victim and nearly $3.1 trillion to the economy over the lifetimes of all 25 million victims in the U.S. population (Peterson et al., 2017). Accordingly, one in 20 women in the EU has been raped after the age of 15 (around 9 million women), and one in 10 has experienced some form of sexual violence (FRA, 2014).

beings and see them as men's possessions. Brownmiller (1981) indicates that rape can be viewed as something keeping men powerful and women powerless and therefore maintaining the gender power imbalance. Complementing this strand of literature, we provide evidence that the availability of commercial sex can serve as men's substitutes to rape and thus has a significant effect on rape rates.

2. Background on European Prostitution Legislation

Historians agree that prostitution was first legalized in the sixth century BCE by Solon, who established state-supported brothels and taxed prostitutes. The sixteenth century introduced the association of prostitution with contagious disease, causing brothels to be outlawed in many European countries. Attitudes reverted in the nineteenth and twentieth centuries: Instead of trying to outlaw the practice, many governments chose to regulate the sex industry. Based on the premise that it was easier to administer a legal business rather than an illegal trade, professional fornication was decriminalized in Switzerland in 1942, Spain in 1995, and Denmark in 1999. In 2000, the symbol of European red light districts, the Netherlands, turned sex work into a fully legal industry.[7]

Sex work occurs in a plethora of forms (street prostitution, brothels, escorts, virtual sex); its legal status ranges from vaguely permissible or lawful but unregulated to a regulated profession to an enforced crime. Categorization is typically based on governing the demand/supply side; the type of service permitted (indoor: brothels, apartments, hotels, nightclubs and pubs, parlors and windows, or outdoor: street prostitution); and the third-party involvement (solicitation, operation of a brothel, and living off the profits of prostitution). Legislative models largely fall under one of the following groups, from the most relaxed to the most restrictive: decriminalization (including abolitionism and

[7] For details about the history and theory of prostitution, refer to Bullough and Brundage (1982), Otis (1985), Rossiaud (1988), MacKinnon (1989), Barry (1995), Karras (1996), Weitzer (2010), and Farley (2004).

new abolitionism), legalization, criminalization, and the Nordic model.[8]

According to the decriminalization stance, as a labor just like any other, prostitution should not be subject to special regulation or laws, i.e., there are no criminal penalties for sex work (neither indoor nor outdoor sexual services are prohibited). This model of state tolerance without intervention is often referred to as abolitionism. The new abolitionism is developed on the basis of the former model: Indoor and outdoor prostitution are not prohibited but the existence of brothels is explicitly outlawed. As an illustration, commercial sex in Denmark is not illegal but keeping a brothel is an offense punishable by imprisonment for up to four years (Article 228 of the Danish Criminal code). Owning or running a brothel in Luxembourg carries the danger of up to a three-year incarceration and a maximum fine of 50,000 EUR (Article 379 of the Criminal Code).

Legalization (also known as regulationism) refers to the specific regulation and control of sex work through criminal law, labor law or other legislation. The regulation allows prostitution within certain limits. The extent and type of regulation take the form of work permits, licensing, and instituting tolerance zones. Prostitutes are registered by local authorities and are in some cases obliged to undergo medical checkups. The Dutch approach lets municipalities license and spatially restrict brothels, cap their number in certain areas, and close them if they have negative consequences for communities (Hubbard et al., 2008). A prerequisite for legal sex work in Greece is the "Certificate of Profession," which can be obtained by unmarried women only with a valid residence permit. Under the legalization framework in Germany for instance, sex workers have access to social benefits, including health, unemployment, and pension insurances.

The antipode, criminalization (also known as prohibitionism), condemns all aspects of the sex

[8] A widely used classification is the three-fold categories "decriminalization," legalization," and "criminalization" (see, e.g., West, 2000; Harcourt et al., 2005; Östergren, 2017). Decriminalization is usually further subdivided into "abolitionism" and "new abolitionism" (Di Nicola et al., 2005), while criminalization is usually further subdivided into criminalizing of the supply or demand side (Bernstein, 2007; Munro and Della Giusta, 2008; Dewey and Kelly, 2011; Skilbrei and Holmström, 2013).

industry as violation of human rights and dignity and prosecutes both prostitutes and clients (the nature and extent of punishment varies from administrative offense fine, prison sentence, and the extreme example of death penalty). Such are the prevailing opinions in the United States, Asia and the Middle East. Current representatives in our sample are Croatia and Lithuania.

An alternative criminalization was initiated by Sweden with the Act of Prohibiting the Purchase of Sexual Services that came into force on January 1, 1999. The so-called Nordic model or End Demand model—apotheosis of the Swedish feminists who have consistently argued since the 1980s that men who buy prostituted women should be criminalized (Ekberg, 2004)—is aimed at stamping out the root cause of prostitution: demand. Conviction for purchasing comes up with a hefty penalty of a fine or up to a year's imprisonment and applies to all types of sexual services, irrespective of whether consumed on the street, in brothels or in massage parlors. Table 1 presents the detailed regulation forms of our sample countries as of 2017 (the end of our sample period).

The boundaries of these models are sometimes blurry (Barnett et al., 2011). For instance, the Danish policy falls under the new abolitionist framework because outdoor sex labor is not prohibited, whereas working in a brothel is. However, it is legal to work in an apartment. The Greek approach is categorized as legalization, albeit, an "imperfect" one: Outdoor prostitution is considered a crime, yet providing commercial sexual services in state-run regulated brothels and apartments is perfectly legal. The subtle differences are in the very details, but we do not aim at placing a specific country's regime under the label of legalization or abolitionism or new abolitionism with unshakeable conviction. Our goal is to apply a holistic approach and track how a statutory change from overall illegal to legal prostitution (and vice versa) affects sex crime. Therefore, we consider commercial sex as legal in a country if sexual services are overall available and accessible, and no side in the transaction (supply or demand) is prosecuted. That is, we classify decriminalization (abolitionism and new abolitionism) and legalization as legislative frameworks of legal prostitution. We set aside

the technicalities of whether sex work is permitted, say, in an apartment but not in a club or window, as long as in general it is available, accessible and not prosecuted. On the opposite side, we combine criminalization and the Nordic model as the set of illegal prostitution.

Panels A and B of Table 2 present the legislative changes adopted in the countries that liberalize (i.e., decriminalize/legalize) and prohibit (i.e., criminalize prostitution/clients), respectively. During our sample period, Spain (1995), Denmark (1999), Hungary (1999), the Netherlands (2000), Germany (2002), Slovenia (2003), Latvia (2008), and Romania (2014) liberalized prostitution, whereas Sweden (1999), Croatia (2000), Norway (2009), Iceland (2009), France (2016) and Ireland (2017) prohibited prostitution.

After a country liberalizes prostitution, commercial sex is greatly enhanced. For instance, Häggström (2016) finds that Germany's adoption of the Prostitution Act in 2002 has led to a dramatic increase in the transaction value of its sex industry. In contrast, after prohibition, commercial sex is significantly reduced. For example, as a result of the Sex Buyer Law in Sweden in 1999, the number of female prostitutes decreased from 2,500 before the reform to no more than 1,500 in 2002 (Ekberg, 2004), and the number of clients has shrunk by 80% (Danna, 2007).

The main motivators for liberalizing commercial sex include protecting human and labor rights of sex workers, ameliorating public health and safety risks, severing the links between prostitution and crime, and preventing human trafficking.[9] Additional government stimuli are the lucrative tax and tourism revenues from a commercial sex industry. For illustration, in 2002,

[9] It is interesting to note that both those supporting and those opposing commercial sex believe that they can help reduce human trafficking. Those calling for prostitution prohibition argue that the expansion of the sex market (when it becomes legal) increases the demand for prostitutes and thus boosts trafficking flows (since the demand cannot be otherwise fulfilled). On the contrary, those who call for prostitution liberalization claim that this improves the conditions of the industry (it is not a black market anymore) and allows it to legitimately recruit women, which makes resorting to trafficking less attractive. See, for example, Hughes (2000), Di Nicola et al. (2005), Cho et al. (2013), Jakobsson and Kotsadam (2013), Akee et al. (2014), and Lee and Persson (2018).

following a thirty-year political process, Germany passed the Prostitution Act, which removed the general prohibition on full sex service and allowed workers in the industry to obtain regular working contracts. The law's rationale was that prostitution should not be considered immoral since it is not sex work per se that promotes oppressive values but rather the production of marginalized, degraded prostitution (Zatz, 1997). When the industry was condemned, prostitutes did not have any right to claim counter-performance because agreements regarding sexual services were invalid (German Civil Code, 138). Accordingly, the legislators' intention was to eliminate this discrimination by enabling legally effective employment relationships that would ensure lawful action to pay, facilitate access to social insurance, and improve health conditions at work. In addition, the Act was projected to curb human trafficking and provide sex workers with an easier way out of the industry.

The leading reasons behind the prohibition of commercial sex are that it is "incompatible with the dignity and worth of the human person," is intrinsically abusive, and incites human trafficking (UN, 1949, p.1). Taking Sweden as an example, since the early 1980s, Swedish feminists have consistently argued that prostitution should be outlawed. In 1987, ROKS—the National Organization for Women's Shelters and Young Women's Shelters in Sweden—presented this demand to the female parliamentarians. Due to their dedicated lobbying and the strong civil will of Sweden's female politicians, the Law that Prohibits the Purchase of Sexual Services was approved and came into force on January 1, 1999 (Ekberg, 2004). The offense comprises all forms of sexual services, regardless of whether purchased on the street, in brothels, from escorts, etc.; procuring and operating a brothel remained illegal, too. The main catalyst for reform was the public belief that prostitution was irreconcilable with gender equality and inseparably linked with human trafficking. The Law was designed to have a normative function: to manifest that women are not commodities to be bought, and to exterminate prostitution by tearing up its root cause—male demand.

3. Hypothesis Development

Suppose that a man could obtain sex in two ways: as a john (i.e., purchaser of commercial sex) or as a rapist (i.e., sexual assailant), and that he would make the choice based on the costs and benefits of these two options.[10] We expect prostitution liberalization to reduce rape via the substitution mechanism: Men on the margin may choose prostitution over rape if prostitution becomes cheaper and more easily available, and may do the opposite if prostitution becomes costlier and less accessible.

From the cost perspective, liberalization decreases the cost of commercial sex. Lee and Persson (2018) show that prostitution liberalization expands the size of the sex market, cuts entry costs for sex workers, and lowers prices of sex services. Cunningham and Shah (2018) find that transaction prices for sex service decrease by 33% after legalization. In addition to monetary costs, policies that recognize prostitution as a legal job reduce the stigma associated with it, which further increases the marginal willingness to pay for sex (Della Giusta et al., 2009; Della Giusta, 2010).

From the benefit perspective, liberalization increases the accessibility and quality of commercial sex services. Legalized prostitution expands the overall commercial sex market, attracts more sex workers in the industry, and in turn, increases the variety of choices for clients. In Germany, for instance, since legalization of commercial sex in 2002, the number of sex workers has more than tripled: At least 400,000 prostitutes are now working in a multitude of venues, ranging from "flat-rate" sex clubs and "sex boxes" in street-walking zones to "mega-brothels," and even the biggest eBay-style sex auction webpage (gesext.de). Furthermore, liberalization mitigates health risk by implementing regular medical examinations, enforcing licensing, and promoting safer sex (Gertler and Shah, 2011). Loff et al. (2000) find an 80-fold higher prevalence of bacterial STI among illegal

[10] It is worth pointing out that rape and commercial sex may not be perfect substitutes, as rape is not only about obtaining sex but also about using violence, coercion and control to acquire sex.

street workers compared to legal sex laborers. Cameron et al. (2021) show that legalized sex work is associated with fewer STIs and more condom use. Cunningham and Shah (2018) document that female gonorrhea incidence declines by 47% after prostitution decriminalization.

Based on the discussion above, prostitution liberalization decreases the cost and increases the benefits for men to obtain sex via commercial sex (as compared to raping). Therefore, we expect that prostitution liberalization reduces rape rates. It is worth noting that we expect prostitution liberalization to reduce rape rates for both the sex workers and the general population. Farley (2005) points out that a black market for prostitution increases sexual violence against sex workers. After prostitution is liberalized, more illegal sex workers switch to the relatively safer legal sector and gain more legal protection, and the incidence of rape among all sex workers decreases. Regarding rape among the general population, the increased access to legal prostitution may allow for better matching of commercial sex buyers and sellers. Potential offenders who would normally commit acts of sexual assault in the general population can find better quality matches in a consensual outlet with voluntary sex workers (Bhuller et al. 2013; Ciacci and Sviatschi, 2016). As a result, the incidence of rape in the general population may fall after prostitution is liberalized.[11]

Based on the same rationale, we expect that prostitution prohibition increases rape rates, because prostitution prohibition decreases the availability of commercial sex and increases the cost for men to obtain sex via prostitution. Broadly consistent with this prediction, Thornhill and Thornhill (1983) and Thornhill and Palmer (2000a, 2000b) point out that when consensual sex becomes more difficult rape will increase, as it is an adaptive strategy in the human evolutionary environment. In Farley et al.'s (2011) survey of men who had purchased sex from women, more

[11] Given that our data only report rape rates for the general population (including sex workers), we cannot separately examine the effect of prostitution regulation on sex workers and non-sex workers. Nonetheless, this could be an interesting question for future research.

than 50% of participants stated that if prostitution did not exist then they would be more likely to rape women.

Moreover, regarding the symmetry of the effect of prostitution prohibition and liberalization, we expect the magnitude of prostitution prohibition to be larger than that of prostitution liberalization for the following three reasons. First, existing literature has well documented the phenomenon of asymmetry in crime (see, e.g., Glaeser et al., 1996; Calvó-Armengol et al., 2007; Mocan and Bali, 2010). That is, once an individual engages in criminal activities (for example, raping), his legal human capital depreciates and his criminal human capital appreciates, which makes it difficult to switch back to the legal sector. In other words, it is naturally more difficult for a policy to reduce a certain crime than an opposite policy to increase the crime.

The second reason could be related to persistent habit consumption. Individuals derive utility not only from their level of current consumption but also from how it compares to their past consumption: Once they are used to a certain level of consumption, it drives their future demand (Ravina, 2007). This applies to goods deemed harmful to society and individuals, such as alcohol, tobacco, drugs, gambling, and pornography. Thus, in the case of prohibiting prostitution, men may have already formed the habit of obtaining sex via prostitution. A ban on commercial sex breaks such a habit and induces men to seek alternative ways of obtaining sex (such as raping). However, in the case of liberalization, commercial sex was previously banned and thus people had no pre-existing habit of consuming commercial sex. That is, prostitution prohibition could have a larger effect on changing people's behavior than prostitution liberalization, because the former likely breaks people's pre-existing habit of obtaining sex.

Last, after prostitution is liberalized, it may take time and effort to go through the administrative procedure, set up facilities, recruit and train sex workers, etc. Generally, such start-up costs play an important role in delaying the creation of a new business (Ciccone and Matsuyama,

1996; Fonseca et al., 2001). In contrast, when commercial sex is banned, the effect is immediate. As seen in Norway for example, results were instant and dramatic one year after the introduction of the sex purchase law: In 2010 all known brothels in Oslo were closed (Raymond, 2013). In other words, it is usually easier to shut down a certain business than to develop a new one, which may further contribute to a stronger effect of prostitution prohibition than prostitution liberalization.

In summary, we expect that prostitution liberalization leads to a decrease in the rape rate and that prostitution prohibition leads to an increase in the rape rate. We also expect an asymmetric effect: The magnitude of prostitution prohibition on the rape rate is larger than that of prostitution liberalization.

4. Data and Variable Construction

We analyze how the legal changes in prostitution policies affect rape rates in 31 European countries (the 28 European Union (EU) members plus the European Free Trade Association (EFTA) countries Iceland, Norway, and Switzerland).[12] We track the legal status of prostitution and the corresponding reforms by examining the Sex Work Laws provided by the Institute of Development Studies, the U.S. Human Rights Reports, and numerous news articles from each country. In the time span covered, commercial sex was liberalized (decriminalized/legalized) in eight countries (referred to as liberalized countries henceforth; see Table 2 Panel A), and it was outlawed (criminalized prostitution/its clients) in six countries (referred to as prohibited countries henceforth; see Table 2 Panel B).[13] We collect the number of police-recorded rape offences from Eurostat.[14] As described

[12] Liechtenstein, the fourth EFTA member, is not included because of its very small population and lack of data.

[13] The control countries include: Austria, Belgium, Bulgaria, Cyprus, Czechia, Estonia, Finland, Greece, Italy, Lithuania, Luxembourg, Malta, Poland, Portugal, Slovakia, Switzerland, and United Kingdom. It is also worth noting that while the United Kingdom voluntarily ended its EU membership in 2020, it was a member all through our sample period 1990-2007.

[14] Eurostat is the statistical office of the EU, and its mission is to provide comparable and high-quality statistics for Europe. The aim is to enable crime statistics to provide a basis for deciding on, planning, and implementing EU policies.

by the data vendor, the full definition of rape is: "Sexual penetration without valid consent or with consent as a result of intimidation, force, fraud, coercion, threat, deception, use of drugs or alcohol, abuse of power or of a position of vulnerability, or the giving or receiving of benefits."[15] In cases where rape rates are missing in Eurostat, we collect such information from the UN Office on Drugs and Crime (UNODC) and national statistics. Country characteristics are obtained from World Bank's and OECD's national accounts data; the number of police officers and the ratio of women to men are from Eurostat. The data on migration and the marital status of the population is gathered from the UN Department of Economic and Social Affairs, Population Division and Eurostat. The Gender Inequality Index, constructed by the United Nations Development Program (UNDP), is retrieved from the Human Development Reports. Our final sample consists of 841 country-year observations from 1990 to 2017. We start in 1990 because crime statistics become widely available at that time. Variable definitions are provided in the Appendix.

Table 2 Panel C provides summary statistics. On average, countries in our sample have 9.21 rape cases per 100,000 population, a GDP per capita of 26,155 USD, a population of 16.3 million, an unemployment rate of 8.38%. The average number of women per 100 men is 105. In our sample countries, the police officers and immigrants account for 0.33% and 9.24%, respectively, of the population on average. In terms of other crime rate, the average homicide, burglary, and robbery rates are 2.43, 294.63, and 100.29 per 100,000 population, respectively.

In Table 2 Panel D, we compare the characteristics between the liberalized countries and the control countries (the ones that never experience any changes in prostitution regulation during our sample period). We find that liberalized countries (relative to control countries) have a larger

Eurostat collects data from the member states, but also works together with them to refine and harmonize European statistics.

[15] This definition of rape is generally gender-neutral and males might also be victims of rape. However, the overwhelming majority of rape victims are women (Rennison, 2002).

population, a slightly lower percentage of police officers, and fewer incidences of robbery. In Table 2 Panel E, we compare the characteristics between the prohibited countries and the control countries. We find that relative to control countries, prohibited countries have a higher rape rate, a higher GDP per capita, a smaller number of women per 100 men, a lower percentage of police officers, a higher percentage of immigrants, smaller gender inequality, and lower homicide and robbery rates. It is ideal for the treatment group and control group to be relatively similar among observable dimensions. However, if not, one can directly include control variables in the regression specification (Roberts and Whited, 2003).

5. Empirical Results

5.1 Visual Illustration

Figure 1A plots the trend of average rape rate in prohibited countries, liberalized countries, and control countries, respectively. There are two facts worth highlighting. First, the rape rate increases over time across all the three groups of countries. Second, the increase in rape rate in prohibited countries is clearly more evident than that in the other two groups. From 1990 to 2017, the average rape rate in prohibited countries increases from 7.70 to 36.81 cases per 100,000 population (an increase of 5 times). In contrast, the rape rate increases from 6.49 to 9.71 cases per 100,000 population (an increase of 50%) in liberalized countries, and from 4.67 to 8.48 cases per 100,000 population in control countries (an increase of 81%).

Figure 1B depicts the difference-in-differences effect of banning commercial sex on rape rates in the prohibited countries relative to control countries. We follow Autor et al. (2006) in constructing the graph. The *y*-axis plots the rape rate; the *x*-axis shows the time relative to law passage, ranging from ten years prior until ten years after (year 0 denoting the event year). The plot represents the point estimates of the coefficients β_n from the regression:

$$Rape\ rate_{i,t} = \alpha + \sum_{n=-10}^{10} \beta_n * Ban\_year_{i,t+n} + Year\ FE + \varepsilon_{i,t,} \quad (1)$$

where *i* indexes country, and *t* indexes year. Ban_year_{t+n} is a dummy variable indicating the year relative to the legislative reform in country *i* and year *t*.[16] The sample used in this estimation consists of the countries that prohibit commercial sex and those that make no policy changes to prostitution's legal status in our sample period. We drop the countries in which commercial sex is liberalized in our sample period, to ensure that liberalizing prostitution does not confound the estimated impact of banning it. The coefficient of interest, β_n, is an estimate of the before-after change in the outcome variable in countries that prohibit commercial sex, relative to the analogous result in countries that make no policy changes on prostitution. As shown in Figure 1B, rape rates increase gradually and consistently after restricting sex work. In the year prior to the prohibition, the β_{-1} coefficient is approximately 5.5; in the year after the prohibition, the corresponding coefficient of β_1 is approximately 13 (more than two times as large as that of β_{-1}). In ten years after banning commercial sex, the coefficient of β_{10} is 25 (almost 4.5 times as large as that of β_{-1}).

Accordingly, Figure 1C captures the difference-in-differences impact of liberalizing prostitution on rape rates in liberalized countries relative to control countries. The graph outlines the estimates of the coefficients β_n from the regression:

$$Rape\ rate_{i,t} = \alpha + \sum_{n=-10}^{10} \beta_n * Liberalize\_year_{i,t+n} + Year\ FE + \varepsilon_{i,t.} \quad (2)$$

Liberalize_year is a dummy variable denoting the year relative to liberalizing prostitution in country *i* and year *t*. In order to avoid any confounding effects of prohibition, we drop all the countries that have banned commercial sex in the sample period. In other words, this time we only estimate the before-after effect on rape rates in the countries that liberalize commercial sex, compared to the corresponding outcome in the countries where no statutory changes governing

[16] Taking Sweden for example (which banned prostitution in 1999), Ban_year_{t+2} takes the value of one for Sweden in 2001, and zero otherwise.

prostitution occurred. As shown in Figure 1C, rape rates decrease gradually and consistently after liberalizing sex work. In the year prior to the liberalization, the β_{-1} coefficient is approximately 0.28; in ten years after the liberalization, the coefficient of β_{10} is roughly -1.3.

In summary, these three figures provide preliminary evidence that prohibiting prostitution increases a country's rape rate, while liberalizing prostitution decreases rape.[17] Moreover, the magnitude of prostitution prohibition seems much larger than that of prostitution liberalization.

5.2 Baseline Regression

During our sample, changes in the legal status of prostitution occur in several countries in different years, which enables us to examine the before-after effect of the regulatory reforms in affected countries (the treatment group) compared to the before-after effect in countries where no legislative amendments took place (the control group). This is a difference-in-differences test design in multiple treatment groups and multiple time periods, as employed by Imbens and Wooldridge (2009). We implement this test through the following regression:

$$Rape\ rate_{i,t} = \alpha + \beta_1 Legal\ prostitution_{i,t} \tag{3}$$

$$+\beta_2 Country\ characteristics_{i,t-1} + Country\ FE + Year\ FE + \varepsilon_{i,t}.$$

The dependent variable measures the number of rape cases per 100,000 population recorded at the national level. The indicator *Legal prostitution* takes the value of one if prostitution is legal (i.e., decriminalized or legalized) in country *i* in a given year, and zero otherwise. *Legal prostitution* can change either from zero to one (i.e., commercial sex is liberalized in a country) or from one to zero (i.e., commercial sex is prohibited in a country). The year fixed effects enable us to control for

[17] It is worth pointing out that the liberalization effect illustrated in Figure 1C has a large error band, while the baseline regression reported in column (3) of Table 3 indicates a significant liberalization effect. Different from the baseline regression, in Figure 1C, we decompose the *Prostitution liberalization* indicator into 21 indicators (from $Liberalize\_year_{i,-10}$ to $Liberalize\_year_{i,+10}$), and plot the coefficients on these 21 indicators accordingly. Possibly because more parameters cause losses of degrees of freedom, the corresponding standard error increases.

intertemporal trends of sex crimes. The country fixed effects allow us to control for time-invariant differences in sexual crimes across countries.

Existing literature shows that when the number of clusters is small, the failure to control for within-cluster error correlation can lead to misleadingly small standard errors, and consequently deceptively large t-statistics and low p-values (Angrist and Pischke, 2008; Conley and Taber, 2011; Cameron and Miller, 2015). Considering that we have approximately 30 countries, we apply the correction for the small number of clusters using wild cluster bootstrapping by country (Roodman et al., 2019), and report the corresponding p-values throughout the paper. [18]

The employed country fixed effects lead to β_1 being estimated as the within-country differences before and after the policy change as opposed to similar before-after differences in countries that did not make such a change during the same period (Imbens and Wooldridge, 2009).

It is helpful to consider an example. Suppose we want to estimate the impact of prostitution liberalization on rape in Germany in 2002. We can subtract the country's rape rate before liberalization from the new rape rate after liberalization. However, economy-wide shocks may occur at the same time and affect sex crimes. Choosing a control country, for example, Austria (which did not alter its prostitution policy), would help difference away such factors. We calculate the same difference in Austria. Finally, we compute the difference between these two differences, which represents the incremental effect of the policy change on Germany's rape rate compared to Austria's. One important difference between this example and our regression framework is that our regression accounts for the fact that there are many law changes over time. The staggered law changes mean

[18] The underlying idea is to generate a large number of bootstrap samples that mimic the distribution from which the actual sample was obtained. Then, using the same test procedure as for the original sample, each bootstrap sample is used to compute a bootstrap test statistic. The bootstrap p-value is then calculated as the proportion of the bootstrap statistics that are more extreme than the actual one from the original sample. For more details on the procedure see 8.3, "Difference-in-differences with few treated clusters" of Roodman et al. (2019). As shown in the Internet Appendix, we also report the p-values based on robust standard errors clustered by country and our inference is unchanged.

that our control country is not restricted to countries that never change its prostitution law. As explained in Bertrand and Mullainathan (2003), the control group includes all countries not altering its prostitution regulation at time *t*, even if they have already altered the regulation or will alter it later on.

As shown in Table 3, the coefficients on *Legal prostitution* are negative and significant in all specifications. In column (1) we only include *Legal prostitution*, country, and year FEs. The coefficient estimate is -7.087 and significant at the 1% level. In column (2), we additionally control for various country characteristics and obtain similar results. The coefficient on *Legal prostitution* is -7.070 and is significant at the 1% level. Our *Legal prostitution* indicator captures both the liberalization and prohibition of commercial sex. Considering that we are interested in identifying any asymmetric effect of prostitution laws on rape, we next conduct our difference-in-differences tests separately for the events associated with liberalization and prohibition of commercial sex. By doing so, we are able to identify any asymmetric effect in a more straightforward way.

In column (3), the regression specification follows column (2), except that we exclude countries that prohibit prostitution in our sample period. Removing these observations ensures that banning prostitution does not confound the estimated impact of liberalizing it. *Prostitution liberalization* is an indicator variable, which takes the value of one beginning in the year when a country liberalizes prostitution, and zero otherwise. The coefficient on *Prostitution liberalization* is -2.729 and significant at the 1% level. This result indicates that, as compared to countries that made no changes in prostitution laws, the rape rate in countries that liberalize prostitution decreases by about three cases per 100,000 population. This effect is economically sizeable given that the sample average rape rate is 9.21 cases per 100,000 (i.e., a decrease of 32%). Bisschop et al. (2017) find that legal street prostitution zones in the Netherlands are associated with a 30–40% decrease in sexual

abuse and rape. Nguyen (2016) finds reducing costs for opening massage parlors leads to a decrease in rape offenses in California by approximately 28%. Our estimate of the impact of prostitution liberalization is comparable to these studies.

Column (4) presents the results of examining the effects of prostitution prohibition on rape rates. To ensure that the prostitution liberalization in our sample period does not confound the estimated impacts of prostitution prohibition, we exclude countries that liberalize prostitution during our sample period. The key independent variable is the *Prostitution prohibition* indicator, which takes the value of one beginning in the year when a country prohibits commercial sex (criminalizes prostitution/clients), and zero otherwise. We find a significant increase in rape rates in countries that prohibit prostitution relative to countries that made no changes in prostitution laws. The coefficient on *Prostitution prohibition* is 11.451, indicating that banning prostitution leads to an increase in rape rates by about 11 cases per 100,000 population. This magnitude is about four times as large as that of liberalizing prostitution, consistent with our conjecture on the asymmetric effect of prostitution regulation on sex crimes.[19]

Taken together, we find that a country's rape rate is significantly increased (decreased) when that country bans (liberalizes) commercial sex. These results provide support to a causal effect of commercial sex on sex crimes.[20] Moreover, we provide the first evidence on the asymmetric effect

[19] Existing literature on the magnitude of prostitution prohibition on rape is mixed. For example, Cunningham and Shah (2018) show that the re-criminalization of indoor prostitution in Rhode Island has an insignificant effect on rape. Backus and Nguyen (2021) find that the criminalization of purchasing sexual services in Northern Ireland increases sexual assaults by 15%-20%. Ciacci (2021) finds that banning the purchase of commercial sex in Sweden is associated with an increased reported rape by 47%.

[20] Among the control variables, the coefficient on the unemployment rate is significantly negative, indicating that higher unemployment is associated with lower rape rates. This finding is consistent with existing literature that unemployment is positively associated with property crime but is negatively associated with violent crime (Cantor and Land, 1985; Raphael and Winter-Ebmer, 2001). This is because the unemployed are less involved in public interactions and thus their social opportunities for delinquency are reduced.

of prostitution regulation: The effect of prostitution prohibition is much larger in magnitude than that of prostitution liberalization.

5.3 The Pre-treatment Trends

The validity of difference-in-differences estimation depends on the parallel trends assumption: Absent the prostitution laws, sex crimes would have evolved in the same way in both the treatment and control groups. Table 4 presents the results that investigate the pre-trend between the treated group and the control group. In particular, we define five dummy variables to designate the year relative to the prostitution law enactment. For example, *Year 0* is the event year, in which the policy change takes place; *Year −1* is one year before the policy change; *Year +1* is one year after the policy change; *Year 2+* indicates that it is two or more years after the policy change.

In column (1) of Table 4, we re-estimate column (3) of Table 3 by replacing *Prostitution liberalization* with the five indicator variables (*Year−2* to *Year 2+*) explained above. Since we focus on the liberalization of commercial sex, these variables indicate the year relative to the liberalization of prostitution. The coefficients on the *Year−2* and *Year −1* indicators are especially important because their significance and magnitude indicate whether there is any difference between the treatment and the control groups prior to the policy change. The coefficients on these indicators are close to zero and not statistically significant, suggesting that the parallel trend assumption is not violated. Moreover, the impact of prostitution liberalization starts to show up after the enactment: The coefficient on *Year 2+* is significantly negative.

In column (2) of Table 4, we focus on prohibition of commercial sex and re-estimate column (4) of Table 3 by replacing *Prostitution prohibition* with the five indicators (*Year−2* to *Year 2+*). Since we focus on the prohibition of commercial sex, these variables indicate the year relative to the prohibition. We find that the treated and the control groups share similar trends prior to the policy change: The coefficients of *Year−2* and *Year–1* are not significantly different from zero. The

positive effect of prostitution prohibition on a country's rape rate shows up after the policy change: The coefficients on *Year +1* and *Year 2+* are significantly positive.

Overall, Table 4 confirms that the treated group and the control group share a similar trend in their rape rates prior to the law changes, thus supporting the parallel trends assumption. Moreover, Table 4 also indicates that most of the impact of prostitution laws on rape rate occurs *after* these laws are enacted, which suggests a causal effect.

5.4 Heterogeneous Treatment Effect

In this section, we implement triple-differences tests to explore two possible sources of heterogeneity in the treatment effect.

5.4.1 The Rape Under-Reporting Problem

It is widely documented that reported rapes are likely to be an underestimate of the actual number of offenses (Cunningham and Shah, 2018). Various barriers stop victims from disclosing sexual harassment: shame, denial, depression, fear or retaliation, uncertainty of how to report, lack of information, etc. Generally, references at the European level indicate that somewhere between 2% and 10% of rapes are reported.[21] It is worth noting that the rape under-reporting problem could make us underestimate the effect of prostitution regulation on sexual crime for the following two reasons.

First, sex workers, who are often victims of physical and sexual abuse (Bisschop et al., 2017), will be more likely to report rape after prostitution is liberalized, as they are no longer engaging in illegal activities (WHO, 2005; Cunningham and Shan, 2018). Accordingly, this should work against us finding a negative effect of prostitution liberalization on a country's rape rate (because sex workers are more likely to report rape after liberalization). Similarly, prohibiting

[21] According to the EU-wide 2014 Fundamental Rights Agency (FRA) Survey on violence against women, less than 15% of victims reported their most serious incident of sexual violence (FRA Survey, 2014).

commercial sex marginalizes prostituted women and thus discourages them from reporting sex crimes (Bridgett and Robinson, 1999), which likely works against us finding a positive effect of prohibition on a country's rape rate (because sex workers are less likely to report rape after prohibition).

Second, with regard to the general population, although their tendency to report rape may not be correlated with the legislative changes in prostitution laws, their under-reporting problem may still make us underestimate the effect of prostitution laws. Suppose that only β percentage of the actual rapes among the general population is reported ($0<\beta<1$) and that prostitution laws change the actual rape rate from M cases to N cases per 100,000 population. In this situation, although the actual effect of prostitution laws on rape rates is (N−M), the estimated effect based on reported rape data is only $\beta*$(N−M). When $\beta\rightarrow 0$ (i.e., the rape underreporting problem is extremely severe), the estimated effect of prostitution laws will also be biased toward zero. When β increases from zero to one, the estimated effect from our regression analysis would also increase accordingly.

Based on the discussion above, we expect our results to be stronger when the under-reporting problem becomes less serious. To empirically examine this conjecture, we focus on three proxies to measure the extent of rape under-reporting.

First, over the last few decades, women have become more likely to report sexual assault (Lovett and Kelly, 2009; Amnesty International, 2018).[22] Therefore, in the latter period of our sample, the problem of under-reporting should be mitigated to some extent and thus our treatment effects should be larger. To test this implication, in Table 5 column (1) we define the *Latter period*

[22] There are a variety of reasons for this trend, including the women's movement challenging gender stereotypes and sexual violence taboos, increased media attention and social awareness, the emergence of support services (sexual assault centers, rape crisis lines, self-help groups), new guidelines and training in some countries for police and prosecutors, etc.

indicator variable as taking the value of one for the period from 2003 onward (the midpoint of our sample period 1990-2017), and zero otherwise. We then re-estimate Table 3 column (2) by adding the interaction *Legal prostitution*×*Latter period* (and dropping the year fixed effects). The coefficient on the interaction is significantly negative, indicating that our treatment effect is stronger in the latter period (when the rape under-reporting problem is likely less severe).

Second, an important factor affecting the propensity to report sexual violence is gender equality: Women are less likely to report sex crime when they are in a more disadvantaged position relative to males (García-Moreno et al., 2005; Lovett and Kelly, 2009; Heise 2011). We use the Gender inequality index (GII) developed by the UN Development Program to measure a country's gender inequality. GII is a composite of three different indices (reproductive health, empowerment, and economic status), and its value ranges from zero (where women and men fare equally) to one (where females fare as poorly as possible in all measured dimensions).[23] We define the *High gender inequality* indicator variable as taking the value of one if GII is higher or equal to its sample average, and zero otherwise. We then re-estimate Table 3 column (2) by adding the interaction *Legal prostitution*×*High gender inequality*. As shown in Table 5 column (2), the coefficient on the interaction is significantly positive, indicating that our treatment effect is weaker in countries with greater gender inequality (when the rape under-reporting problem is likely more severe).

Third, considering that Eastern Europe (relative to other parts of Europe) has a weaker rule of law and public confidence in the criminal justice system, and thus a more severe rape under-reporting problem (Von Hofer, 2000), we expect our treatment effect to be weaker in Eastern Europe. We define the *Eastern Europe* indicator variable as taking the value of one if the country is located

[23] The GII reflects gender-based disadvantages in three dimensions: reproductive health, measured by maternal mortality ratio and adolescent birth rates; empowerment, measured by proportion of parliamentary seats occupied by females and proportion of adult females and males with at least some secondary education; and economic status, measured by labor market participation rate.

in Eastern Europe, and zero otherwise.[24] We then re-estimate Table 3 column (2) by adding the interaction *Legal prostitution×Eastern Europe*. As reported in Table 5 column (3), the coefficient on the interaction is significantly positive, indicating that our treatment effect is weaker in Eastern Europe (when the rape under-reporting problem is likely more severe).

Overall, the results in Table 5 indicate that our treatment effect is stronger when the problem of rape under-reporting is weaker. The results are also consistent with our conjecture that the rape under-reporting problem tends to make our results underestimated.

5.4.2 Obtaining Sex via Marriage/Partnership

For men in relationships, there is a third way to obtain sex: via their marriage/partnership. Thus, we expect our treatment effect to be stronger in countries with low marriage/partnership rates. To investigate this matter, we calculate the total number of married persons as a percentage of a country's population (*Married*). Next, in Table 6 column (1), we define the *Low marriage* indicator as taking the value of one if *Married* is below the sample mean, and zero otherwise. Then, we re-estimate Table 3 column (2) by adding the interaction *Legal prostitution×Low marriage*. The coefficient on the interaction is significantly negative (-4.771), indicating that our treatment effect is stronger in countries with low marriage rate (where men are less likely to obtain sex via marriage).

Family patterns in Europe have changed substantially over the recent decades: Marriage has declined, while non-marital cohabitation, or consensual union, has increased (Thomson et al., 2019). Considering that the *Low marriage* indicator only captures the information about legal marriage while many couples may live in consensual union (rather than being formally wedded), we focus on the percentage of single adults. To this end, we obtain data on marital status (total number of single

[24] In accordance with the UN M49 standard classification, the Eastern European countries in our sample are Bulgaria, Czechia, Hungary, Poland, Romania, and Slovakia (https://unstats.un.org/unsd/methodology/m49), plus Croatia, Cyprus, and Greece, which have similarly low levels or rule of law, and are often classified as Southeaster European countries.

persons in a given year) and compute the total number of single persons as a percentage of the population (*Single*). We further define the *High single* indicator as taking the value of one if the percentage of single population is greater than or equal to the sample mean, and zero otherwise. We then re-estimate Table 3 column (2) by adding the interaction *Legal prostitution×High single*. As reported in Table 6 column (2), the coefficient on the interaction is significantly negative (-6.455), indicating that our treatment effect is stronger in countries with high single rate (where men are less likely to obtain sex via marriage/partnership).

As another robustness check, we use the number of women per 100 men to capture the gender imbalance in a country. Marriage squeeze—the effect on marriage of an imbalance between the number of males and females in a certain society—has long been recognized as a significant factor influencing contemporary marriage behavior (Akers, 1967). Prior research (e.g., Guttentag and Secord, 1983; Pedersen, 1991; South and Lloyd, 1992) shows that it is more difficult for men to find a spouse/partner (and thus obtain sex via a romantic relationship) in countries with greater gender imbalance. For that reason, we define the *Low sex ratio* indicator as taking the value of one if the number of women per 100 men (aged 15-64) is below the sample mean, and zero otherwise. We then re-estimate Table 3 column (2) by adding the interaction *Legal prostitution×Low sex ratio*. Table 6 column (3) reports the results: The coefficient on the interaction is significantly negative, indicating that our treatment effect is stronger in countries with fewer women per 100 men (where men are less likely to obtain sex via a romantic relationship).

Overall, the results in Table 6 indicate that the effect of prostitution laws on rape rate is more pronounced when it is more difficult for men to obtain sex via marriage/partnership.

5.5 Different Types of Prostitution Policy Models

As we detailed in Section 2, prostitution policy models vary from willful ignorance or accepting sex work as a valid form of labor (decriminalization) through regulating it as a licensed business (legalization) to prohibiting it as an illicit, degrading activity (criminalization) or restraining it as an expression of male dominance and sexual exploitation (Nordic model). In this section, we separately analyze different prostitution models and identify their effects on rape.

We first examine the two types of liberalized prostitution: decriminalization and legalization. Decriminalization implies the removal of criminal penalties associated with all or some forms of sex work, which is generally treated like any other legitimate occupation. Under legalization, prostitution is allowed only within certain specified limits and is subject to some mandatory requirements, such as regular health checks, licensing, work permits, and adhering to tolerance zones. The primary distinction between the two models is the absence of specific regulation and control within the framework of decriminalization. That is, decriminalization (as compared to legalization) provides a more tolerant environment for commercial sex. Thus, we expect that the effect of decriminalization on reducing rape is stronger than that of legalization. To examine this notion, we define the *Decriminalization* indicator as taking the value of one beginning in the year when a country decriminalizes prostitution, and zero otherwise. Similarly, *Legalization* is an indicator variable taking the value of one beginning in the year when a country starts regulating its sex trade under the legalized prostitution model, and zero otherwise. The regression specification in Table 7 column (1) is the same as that in column (2) of Table 3, except that we replace *Legal prostitution* with the four indicators: *Decriminalization*, *Legalization*, *Criminalization*, and *Nordic model*. The coefficient on *Decriminalization* is -3.969, and the coefficient on *Legalization* is -3.458; both coefficients are statistically significant. This result reveals that, while both types of liberalization

reduce rape rates, the effect of decriminalization (the more lenient environment for commercial sex) is (slightly) stronger than that of legalization.

It is worth noting that decriminalization can be further separated into the abolitionism model and the new abolitionism model (Di Nicola et al., 2005). Under abolitionism, the state resolves to tolerate the sex industry and not to intervene; both outdoor and indoor prostitution are permitted. Under the model of new abolitionism, outdoor and indoor prostitution are permitted too, but the existence of brothels is explicitly banned. We define two additional indicator variables: *Abolitionism* and *New abolitionism*, which are set equal to one beginning in the year when a country adopts the respective policy approach. In column (2) of Table 7 we re-estimate Table 7 column (1) by replacing *Decriminalization* with *Abolitionism* and *New abolitionism*. The estimated coefficient on *Legalization* is -3.370 (significant at the 5% level), whereas the coefficient on *Abolitionism*—the model providing the most liberal sex market—is almost double: -6.510 (significant at 5%). In contrast, the coefficient on *New abolitionism* is only -1.397 and not statistically significant, indicating that the new abolitionism model (only permitting outdoor and indoor prostitution while keeping brothels banned) has little effect on rape. This result is understandable considering that brothels play an important role in the commercial sex industry by reducing the fixed cost of location, providing security, and mitigating information asymmetry between buyers and sellers (Farmer and Horowitz, 2013).

Table 7 also shows different effects of the two forms of prostitution prohibition: criminalization and the Nordic model. Unlike criminalization, which prohibits prostitution as morally impermissible and makes selling sex, organizing it, sometimes buying it, or all of this illegal, the Nordic model reprimands the purchase of sexual services. The *Criminalization* indicator is defined as taking the value of one beginning in the year when sex work is criminalized in a country, and zero otherwise. Likewise, we create the *Nordic model* indicator variable. In both columns, the

coefficient on *Nordic model* is much larger in magnitude than that on *Criminalization.* Taking column (2) for example, the coefficient on *Nordic model* is 15.554 (significant at the 1% level), while the coefficient on *Criminalization* is much smaller in size (0.829) and is not statistically significant. These results are understandable considering that one advantage of prostitution over rape is that men usually face lower legal risk for obtaining sex via commercial sex than via rape. The Nordic model (as compared to the criminalization model) increases men's legal risk for purchasing commercial sex, makes prostitution a less attractive substitute to rape, and thus increases men's propensity to commit a sex crime.

Overall, among the prostitution liberalization models, we show that decriminalization (in particular abolitionism) has a stronger effect on reducing rape than legalization. Among the prostitution prohibition models, the Nordic model has a stronger effect on increasing rape than criminalization.

5.6 Robustness Check

5.6.1 Placebo Tests: Evidence on Other Crime

It is possible that prostitution laws are confounded with other legal changes that affect a country's overall criminal activities. To investigate this possibility, in this subsection we implement a placebo test to examine whether prostitution laws affect other (non-sexual) crimes such as homicide, burglary, robbery, etc.

In Table 8 columns (1)-(4), we focus on prostitution liberalization and re-estimate Table 3 column (3) by using measures of other criminal activities as the dependent variables. The dependent variable in column (1) is *Homicide*, which measures the number of intentional homicide cases per 100,000 population. In column (2), the dependent variable *Burglary* is the number of burglary and housebreaking cases per 100,000 population. In column (3), we examine *Robbery* as the dependent variable, which is the number of robbery cases per 100,000 population. In column (4), the

dependent variable is the sum of *Homicide*, *Burglary*, and *Robbery*. None of the coefficients on *Prostitution liberalization* is significantly different from zero, and the economic magnitude is also small. Taking column (4) for example (where the dependent variable is *Total crime*), the coefficient on *Prostitution liberalization* is 30.906 and not significant from zero (p-value=0.655). Considering that the sample average of *Total crime* is 291.78, the economic magnitude of *Prostitution liberalization* is small. Similarly, in Table 8 columns (5)-(8), we focus on prostitution prohibition and re-estimate Table 3 column (4) accordingly. None of the coefficients on *Prostitution prohibition* is significantly different from zero either.

In summary, Table 8 indicates that prostitution laws only affect sex crimes and have no impact on other crime activities. This result suggests that the observed relationship between prostitution laws and a country's rape rate is less likely driven by some confounding event that affects that country's overall criminal activities.[25]

5.6.2 Matched Sample Analysis

In this section, we perform a robustness check of our main results by matching each country prohibiting prostitution to a country liberalizing it. Specifically, we randomly match each prohibited country to a liberalized country and re-estimate Equation (3). Given that we have six prohibited countries and eight liberalized countries (listed in Table 2 Panels A and B, respectively), we form 28 unique matched samples.[26] We then re-estimate the baseline regression in Table 3 column (2)

[25] As reported in Table IA7 of the Internet Appendix, we control for *Total crime* in our baseline regression, and we find that our inference is largely the same.

[26] The number of unique samples that can be drawn is the number of possible combinations that can be obtained from taking a sample of six countries from a set of eight countries (each chosen sample consists of six liberalized and six prohibited countries). That is, $C(8,6) = \frac{8!}{6!(8-6)!} = 28$.

and save the corresponding 28 coefficients on *Prostitution prohibition*.[27] By doing so, we can avoid any possible bias associated with forming matched samples based on a particular criteria.

Figure 2 plots the distribution of these coefficients. The distribution ranges from 7.88 to 13.84 with a mean of 11.33. These results indicate that rape rates in countries prohibiting prostitution increased by 7.88-13.84 cases per 100,000 population, more than the rates in countries liberalizing prostitution. Overall, our main inference is unchanged based on the matched sample analysis.

5.6.3. Goodman-Bacon Decomposition

Goodman-Bacon (2021) shows that standard difference-in-differences estimates can be biased when multi treatments occur in different times, partially because earlier treatment cohorts serve as controls for later treatment groups. Given that we exploit 14 staggered legal changes in different years, we follow Goodman-Bacon (2021) and Goodman-Bacon et al. (2019) to perform a Bacon decomposition of difference-in-differences estimation with variation in treatment timing. The two-way fixed effects difference-in-differences model is a weighted average of all possible 2x2 difference-in-differences estimators in the data. The results are presented in Table 9: Panel A re-estimates Table 3 column (3) and Panel B re-estimates Table 3 column (4). The decomposition shows comparisons amongst timing groups (earlier treated vs. later; later treated vs. earlier), comparisons of timing groups to units never receiving treatment (treated vs. never treated), and the component resulting from within-group variation in controls. The findings attest that only around 10% (11.2% in the *Prostitution liberalization* sample and 12.6% in the *Prostitution prohibition* sample) of the difference-in-differences estimates are derived from comparisons of countries with heterogeneity in treatment timing. What matters is that the major part of the difference-in-differences

[27] Given that there are only two types of countries in this matched analysis (prohibited countries and liberalized countries), we only include *Prostitution prohibition* in the regression. Instead, we could include *Prostitution liberalization* (instead of *Prostitution prohibition*); in this case, the coefficient of *Prostitution liberalization* will be the same in magnitude but opposite in sign to that of *Prostitution prohibition.*

estimates comes solely from the comparisons of treated and untreated units (84.9% in the prostitution liberalization sample; and 82.7% in the prostitution prohibition sample). Moreover, both estimates are very similar to our baseline regression results: the coefficient on *Prostitution liberalization* is -2.155 (as compared to -2.729 reported in Table 3 column (3)) and the coefficient on *Prostitution prohibition* is 13.517 (as compared to 11.451 reported in Table 3 column (4)). In summary, our main inference is largely unchanged after addressing the potential bias associated with the heterogeneity in the timing of treatments.

5.6.4. Alternative Difference-in-differences Methods

To further address the heterogeneity in timing of treatment, we apply three alternative difference-in-differences methods, including (1) the method proposed by Callaway and Sant'Anna (2021), (2) the method proposed by Sun and Abraham (2021), and (3) the stacked difference-in-differences method proposed by Cengiz et al. (2019).

The first two estimators, developed by Callaway and Sant'Anna (2021) and Sun and Abraham (2021), are closely related. We first estimate the individual cohort-time-specific treatment effects, allowing for treatment effect heterogeneity; we then aggregate these treatment effects to produce the overall treatment effects. However, these two methods differ methodologically regarding flexibility, accommodation of covariates, choice of control groups, and inference (Baker et al., 2022). As described in Cengiz et al. (2019), the idea for stacked difference-in-differences is to create event-specific clean 2×2 datasets, for the treated groups and "clean" control groups within the treatment window. We then stack all these clean 2×2 datasets together and estimate a two-way fixed-effects difference-in-differences regression with dataset-specific unit- and time-fixed effects.[28]

[28] The STATA commands for the three estimation methods are csdid, eventstudyinteract, and stackedev, respectively.

Table 10 Panel A reports the static effect estimates of the impacts of prostitution liberalization on rape rates. The sample includes countries that were treated during the sample period over the years -5 to +15 relative to their treatment year (denoted as year 0) and clean control countries (never-treated observations) for all sample years with available data. The coefficients on *Prostitution liberalization* are -2.051 (the method of Callaway and Sant'Anna (2021)), -1.874 (the method of Sun and Abraham (2021)), and -1.779 (the stacked difference-in-differences method), respectively; all the coefficients are significant at the 5% level. The economic magnitude of these coefficients is comparable to that from our baseline regression in column (3) of Table 3 (-2.729).

Table 10 Panel B reports the static effect estimates of the impacts of prostitution prohibition on rape rates. The coefficients on *Prostitution prohibition* are 13.487 (the method of Callaway and Sant'Anna (2021)), 12.790 (the method of Sun and Abraham (2021)), and 12.824 (the stacked difference-in-differences method), respectively; all the coefficients are significant at or below the 5% level. The economic magnitude of these coefficients is comparable to that from our baseline regression in column (4) of Table 3 (11.451).

Overall, these results indicate that our main inference is largely unchanged (both statistically and economically) under alternative difference-in-differences methods.

6. Conclusions

In this paper, we investigate the effect of legislative changes in prostitution policies on rape rates. Based on staggered legal changes in European countries over the last three decades and a difference-in-differences framework, we find that prohibiting commercial sex leads to a significant increase in rape rates and that liberalizing it results in a significant decrease in rape rates. We also provide the first evidence on the asymmetric effect of prostitution regulation on the rape rate: The magnitude of prostitution prohibition is significantly larger than that of prostitution liberalization.

Our parallel trends tests show that there is no pre-treatment difference in the time trend of rape rates between treatment and control countries, and that the change in rape rates occurs after the legal changes, which suggests a causal effect. Our heterogeneous test shows that the treatment effect is stronger when the rape under-reporting problem is smaller and when men are less likely to obtain sex via marriage/partnership. We further examine the effect of different types of prostitution regulation (i.e., decriminalization, legalization, criminalization, Nordic model, etc.); we show that decriminalization (in particular abolitionism) has a stronger effect on reducing rape than other liberalization models, while the Nordic model has a stronger effect on increasing rape than other prohibition models. Our placebo tests show that prostitution laws have no impact on non-sexual crimes, indicating that our finding is unlikely driven by some confounding event that affects a country's overall criminal activities. Finally, we show that our main inference is unchanged based on the matched sample analysis and is robust to addressing the potential bias associated with the small number of clusters and the heterogeneity in the timing of treatments.

In the last few years, the anti-prostitution movement, fueled by ideological concerns of gender inequality and human trafficking, has gained momentum. The classification of prostitution as patriarchal oppression and the outlawing of commercial sex have been spreading: In 2014 the European Parliament adopted a non-binding resolution in favor of prostitution prohibition. Anti-prostitution policies were implemented in South Korea (2004), South Africa (2007), Canada (2014), and Israel (2018). Even Nevada, the only U.S. state with legal brothels, has recently revived the debate to have them banned (Joseph, 2019). Our results suggest that policies aimed at prohibiting prostitution can have severe unintended consequences of proliferating sexual violence.

It is worth noting that the legal changes in prostitution laws might not be random. It is possible that the country is doing so as part of a general program to improve female social status, and is thus accompanying prostitution laws with other policies that may affect rape rates. Although we

implement several analyses to address this concern (such as controlling for various country characteristics, matched sample analysis, placebo tests, etc.), we acknowledge that these analyses may not fully address this non-randomness issue associated with prostitution laws. Readers should be aware of this possible limitation when deciding how our findings might be generalized.

Finally, our paper mainly focuses on rich industrialized nations. Prostitution markets and the corresponding legal institutions work differently in developing and developed countries (Farley et al., 2004), and thus some of our findings may not apply generally to other developing countries. It would be a fruitful area for future research to explore the effect of prostitution regulation on rape in developing countries.

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Table 1. Prostitution Legal Status in our Sample Countries

This table presents the detailed regulation forms of our sample countries as of 2017 (the end of our sample period). Legal prostitution consists of the models of legalization and decriminalization (further subdivided into abolitionism and new abolitionism). Legalization: Prostitution is allowed within certain limits and is subject to mandatory requirements (e.g., regular health checks, licensing, work permits, and adhering to tolerance zones). Decriminalization: Criminal penalties associated with all or some forms of sex work are removed and prostitution is generally treated as a legitimate occupation. Abolitionism: Sex work is not prohibited, but profiting from another person's sex selling is usually criminalized. New abolitionism: Sex work is not prohibited, but operating a brothel is explicitly outlawed. Illegal prostitution consists of the models of criminalization and the Nordic model. Criminalization: Prostitution is prohibited as morally impermissible; this model makes selling sex, organizing it, sometimes buying it, or all of this illegal. Nordic model: Prostitution is not prohibited, but prostitution clients are criminalized.

Legal			Illegal	
Legalization	Decriminalization		Criminalization	Nordic model
	Abolitionism	New abolitionism		
Austria	Czechia	Bulgaria	Croatia	Iceland
Germany	Portugal	Belgium	Lithuania	Norway
Greece	Slovakia	Cyprus		Sweden
Hungary	Slovenia	Denmark		France
Latvia	Spain	Estonia		Ireland
Switzerland		Finland		
The Netherlands		Italy		
United Kingdom		Luxembourg		
		Malta		
		Poland		
		Romania		

Table 2. Summary Statistics

Our sample consists of 841 country-year observations from 1990 to 2017. Panel A lists the countries in which prostitution was liberalized (liberalized countries). Panel B lists the countries in which prostitution was prohibited (prohibited countries). Panel C presents summary statistics of the full sample (including liberalized countries, prohibited countries, and control countries). Panel D compares the characteristics between liberalized countries and control countries. Panel E compares the characteristics between prohibited countries and control countries. Variable definitions are provided in the Appendix.

Panel A. Prostitution Liberalization

Country	Law	Enactment Year
Spain	Criminal Code, Article 188	1995
Denmark	Criminal Code (Straffeloven), Chapter 24	1999
Hungary	Act LXXV of 1999 on Organized Crime	1999
the Netherlands	Criminal Code, Lifting of the brothel ban	2000
Germany	Prostitution Act	2002
Slovenia	Criminal Code, Article 175	2003
Latvia	Cabinet Regulation No. 32 Regarding Restriction of Prostitution	2008
Romania	The Penal Code of Romania (Law no. 286/2009)	2014

Panel B: Prostitution Prohibition

Country	Law	Enactment Year
Sweden	Sex Purchase Act (*Brottsbalk 6.11*)	1999
Croatia	Act on Misdemeanors against Public Peace and Order, Article 12; Criminal Code, Article 175	2000
Norway	Norwegian General Civil Penal Code (*Straffeloven*) Section 202a	2009
Iceland	Penal Code, Chapter XXII (Sexual Offenses), Article 206	2009
France	Law 2016-444	2016
Ireland	Criminal Law (Sexual Offences) Act 2017	2017

Panel C: Summary Statistics

Variable	Mean	Std. Deviation	P25	Median	P75
Rape rate	9.21	9.78	3.83	6.36	10.20
GDP per capita	26,155	20,585	11,078	22,543	36,961
Population (million)	16.30	21.40	3.55	7.93	15.50
Unemployment rate	8.38	4.51	5.00	7.53	10.43
Women per 100 men	105.36	4.23	102.40	104.70	106.50
Police officers (%)	0.33	0.14	0.25	0.33	0.42
Gender inequality index	0.18	0.09	0.11	0.17	0.25
Immigrants (%)	9.24	7.65	3.64	8.08	11.88
Homicide rate	2.43	3.22	1.00	1.39	2.27
Burglary rate	294.63	258.37	131.20	211.50	408.50
Robbery rate	100.29	258.37	29.60	54.65	100.70
Crime rate	397.68	388.43	168.88	294.87	501.00

Panel D: Liberalized Countries vs. Control Countries

	Liberalized countries		Control countries		Test of difference	
	Mean (1)	Median (2)	Mean (3)	Median (4)	t-test (1)-(3)	Wilcoxon test (2)-(4)
Rape rate	6.65	5.62	7.05	5.62	-0.40	0.00
GDP per capita	22,054	17,715	24,550	19,375	-2,495	-1,660
Population (million)	22.03	10.37	12.24	7.63	9.78***	2.74***
Unemployment rate	8.71	7.36	8.40	7.65	0.31	-0.29
Women per 100 men	106.07	104.25	105.94	105.30	0.13	-1.05***
Police officers (%)	0.31	0.30	0.37	0.35	-0.06***	-0.05***
Immigrants (%)	8.47	8.77	9.21	6.15	-0.74	2.62*
Gender inequality index	0.20	0.16	0.19	0.19	0.00	-0.03
Homicide rate	2.73	1.31	2.66	1.54	0.07	-0.23
Burglary rate	295.63	196.80	294.50	210.20	1.14	-13.40
Robbery rate	71.54	59.15	125.98	54.35	-54.44*	4.80
Total crime	291.78	208.05	332.97	231.90	-41.19	-23.85

Panel E: Prohibited Countries vs. Control Countries

	Prohibited countries		Control countries		Test of difference	
	Mean (1)	Median (2)	Mean (3)	Median (4)	t-test (1)-(3)	Wilcoxon test (2)-(4)
Rape rate	18.53	15.46	7.05	5.62	11.48***	9.84***
GDP per capita	37,045	32,563	24,550	19,375	12,495***	13,188***
Population (million)	14.29	4.56	12.24	7.63	-2.04	-3.07**
Unemployment rate	8.02	7.60	8.40	7.65	-0.38	-0.05
Women per 100 men	102.81	102.00	105.94	105.30	-3.14***	-3.30***
Police officers (%)	0.29	0.27	0.37	0.35	-0.08***	-0.08***
Immigrants (%)	10.43	10.57	9.21	6.15	1.13*	4.42***
Gender inequality index	0.14	0.13	0.19	0.19	-0.06***	-0.06***
Homicide rate	1.39	1.10	2.66	1.54	-1.28***	-0.44***
Burglary rate	293.60	296.40	294.50	210.20	-0.89	86.20
Robbery rate	66.78	37.00	125.98	54.35	-59.19**	-17.35**
Total crime	271.55	256.61	332.97	231.90	-61.42*	24.71

Table 3. Effect of Prostitution Law on Rape Rate

This table reports the difference-in-difference tests that examine the impact of legal changes in prostitution on rape rates. The regression specification is provided in Equation (3). Our sample consists of 841 country-year observations in the period 1990-2017. The dependent variable *Rape rate* measures the number of reported rape cases per 100,000 population. The indicator variable *Legal prostitution* takes the value of one if prostitution is legal in a given country in a given year, and zero otherwise. The indicator variable *Prostitution liberalization* takes the value of one, beginning in the year when a country liberalizes prostitution, and zero otherwise. The indicator variable *Prostitution prohibition* equals one beginning in the year when a country prohibits prostitution, and zero otherwise. In columns (1) and (2), we use a full sample. In column (3), we estimate the effect of prostitution liberalization on rape rates; to avoid any confounding effects of prostitution prohibition, we exclude all country-year observations in countries which prohibited prostitution. In column (4), we estimate the effect of prostitution prohibition on rape rates; to avoid any confounding effects of prostitution liberalization, we exclude all country-year observations in countries which liberalized prostitution. Variable definitions are provided in the Appendix. P-values based on wild cluster bootstrapping by country are reported in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable = *Rape rate*	(1)	(2)	(3)	(4)
Legal prostitution	-7.087***	-7.070***		
	(0.009)	(0.001)		
Prostitution liberalization			-2.729**	
			(0.011)	
Prostitution prohibition				11.451***
				(0.002)
Ln (GDP per capita)		-5.165***	-3.744***	-6.225***
		(0.001)	(0.008)	(0.003)
Ln (Population)		2.532	0.776	4.924
		(0.595)	(0.836)	(0.485)
Unemployment rate		-0.167**	-0.126*	-0.172
		(0.043)	(0.059)	(0.122)
Women per 100 men		-0.682*	-0.456	-0.602
		(0.083)	(0.184)	(0.334)
Police officers		-0.788	-1.572	1.789
		(0.891)	(0.689)	(0.799)
Immigrants		-0.154	-0.107	-0.125
		(0.599)	(0.657)	(0.752)
Gender inequality index		33.343	11.210	38.419
		(0.145)	(0.420)	(0.341)
Constant	13.370***	92.253	80.428	47.497
	(0.000)	(0.360)	(0.269)	(0.691)
Observations	841	841	675	621
Year FEs	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes
Adjusted R^2	0.776	0.815	0.792	0.838
Mean dependent variable	9.21	9.21	6.97	10.11
# of control countries	17	17	17	17
# of treated countries	14	14	8	6

Table 4. Testing for Pretreatment Trends and Reversals

This table investigates the pre-treatment trends between the treated and control groups. The variables *Year – 2*, *Year – 1*, *Year 0* (Event year), *Year + 1*, and *Year 2+*, indicate the year relative to the legal change in prostitution. *Year 0* is the event year. The regression specification in column (1) is the same as that in Table 3 column (3), except that we replace the *Prostitution liberalization* indicator with the five year indicators specified above. Similarly, the regression specification in column (2) is the same as that of column (4) in Table 3, except that we replace the *Prostitution prohibition* variable with the five year indicators specified above. Variable definitions are provided in the Appendix. P-values based on wild cluster bootstrapping by country are reported in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable = *Rape rate*	Prostitution liberalization (1)	Prostitution prohibition (2)
Year – 2	-0.490	0.995
	(0.256)	(0.700)
Year – 1	-0.283	-1.127
	(0.624)	(0.670)
Year 0 (Event year)	-0.659	1.900
	(0.323)	(0.147)
Year + 1	-0.794	4.637***
	(0.263)	(0.000)
Year 2 +	-2.929**	14.354**
	(0.015)	(0.018)
Ln (GDP per capita)	-3.852***	-6.366***
	(0.008)	(0.001)
Ln (Population)	0.836	7.001
	(0.802)	(0.335)
Unemployment rate	-0.131*	-0.171
	(0.065)	(0.127)
Women per 100 men	-0.434	-0.472
	(0.209)	(0.448)
Police officers	-1.533	3.642
	(0.681)	(0.664)
Immigrants	-0.106	-0.144
	(0.656)	(0.670)
Gender inequality index	12.112	36.331
	(0.394)	(0.333)
Constant	77.926	2.241
	(0.308)	(0.985)
Observations	675	621
Year FEs	Yes	Yes
Country FEs	Yes	Yes
Adjusted R^2	0.791	0.852

Table 5. Heterogeneous Treatment Effects: The Rape Under-Reporting Problem

This table reports the heterogeneous treatment effects based on the rape under-reporting problem. The dependent variable *Rape rate* measures the number of reported rape cases per 100,000 population. The indicator variable *Legal prostitution* takes the value of one if prostitution is legal in a particular country and year, and zero otherwise. In column (1), the indicator variable *Latter period* takes the value of one for the period from 2003 onwards (the midpoint of our sample period), and zero otherwise. In column (2), the indicator variable *High gender inequality* takes the value of one if *Gender inequality index* is higher or equal to its sample mean, and zero otherwise. In column (3), the indicator variable *Eastern Europe* takes the value of one if the country is located in Eastern Europe, and zero otherwise. Variable definitions are provided in the Appendix. P-values based on wild cluster bootstrapping by country are reported in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable = *Rape rate*	(1)	(2)	(3)
Legal prostitution	-3.177**	-9.089***	-8.691***
	(0.021)	(0.002)	(0.003)
Legal prostitution × Latter period	-7.767**		
	(0.039)		
Legal prostitution × High gender inequality		5.592**	
		(0.025)	
Legal prostitution × Eastern Europe			7.135**
			(0.049)
Latter period	11.259***		
	(0.002)		
High gender inequality		-1.732	
		(0.350)	
Eastern Europe			-24.192***
			(0.000)
Ln (GDP per capita)	-2.171**	-7.196***	-5.928***
	(0.023)	(0.000)	(0.000)
Ln (Population)	12.177**	6.912	0.361
	(0.028)	(0.139)	(0.933)
Unemployment rate	-0.053	-0.201***	-0.174**
	(0.566)	(0.001)	(0.025)
Women per 100 men	-0.984**	-0.568	-0.775**
	(0.033)	(0.114)	(0.027)
Police population	8.535	3.056	-2.628
	(0.242)	(0.603)	(0.618)
Immigrants	0.121	0.031	-0.137
	(0.506)	(0.864)	(0.622)
Gender inequality index	-0.981		26.651
	(0.948)		(0.214)
Constant	-59.929	33.669	147.344
	(0.531)	(0.689)	(0.101)
Observations	841	841	841
Year FEs	No	Yes	Yes
Country FEs	Yes	Yes	Yes
Adjusted R^2	0.813	0.824	0.823

Table 6. Heterogeneous Treatment Effects: Marriage/Partnership

This table reports the heterogeneous treatment effects based on marriage/partnership rate. The dependent variable *Rape rate* measures the number of reported rape cases per 100,000 population. The indicator variable *Legal prostitution* takes the value of one if prostitution is legal in a particular country and year, and zero otherwise. The indicator variable *Low marriage* takes the value of one if the percentage of married population is below the sample mean, and zero otherwise. The indicator variable *High single* takes the value of one if the percentage of single population is greater or equal to the sample mean, and zero otherwise. The indicator variable *Low sex ratio* takes the value of one when the number of women per 100 men (aged 15-64) is below the sample mean, and zero otherwise. Variable definitions are provided in the Appendix. P-values based on wild cluster bootstrapping by country are reported in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable = *Rape rate*	(1)	(2)	(3)
Legal prostitution	-4.325***	-2.645	-2.577
	(0.003)	(0.104)	(0.154)
Legal prostitution × Low marriage	-4.771*		
	(0.052)		
Legal prostitution × High single		-6.455**	
		(0.040)	
Legal prostitution × Low sex ratio			-6.023*
			(0.052)
Low marriage	3.109		
	(0.214)		
High single		5.081**	
		(0.048)	
Low sex ratio			2.114
			(0.485)
Ln (GDP per capita)	-5.284***	-5.222***	-5.641***
	(0.000)	(0.000)	(0.000)
Ln (Population)	0.968	3.425	5.669
	(0.833)	(0.382)	0.178
Unemployment rate	-0.167**	-0.174**	-0.239***
	(0.038)	(0.031)	(0.008)
Women per 100 men	-0.760**	-0.772**	
	(0.026)	(0.024)	
Police population	-2.696	0.419	1.817
	(0.624)	(0.935)	(0.748)
Immigrants	-0.114	-0.142	-0.068
	(0.675)	(0.603)	(0.747)
Gender inequality index	25.387	27.318	35.108*
	(0.228)	(0.166)	(0.092)
Constant	126.552	84.711	-28.476
	(0.176)	(0.292)	(0.705)
Observations	841	841	841
Year FEs	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes
Adjusted R^2	0.822	0.824	0.822

Table 7. Different Types of Prostitution Policy Models

This table reports the difference-in-differences tests that examine the impact of different prostitution policy models on rape rates. The dependent variable *Rape rate* measures the number of reported rape cases per 100,000 population. The indicator variables *Legalization*, *Decriminalization*, *Abolitionism*, *New abolitionism*, *Criminalization*, and *Nordic model* flag the respective prostitution policy models for a given country in a given year. Details of these models are provided in Section 2. In column (1), the regression specification is the same as that in Table 3 column (2), except that we replace *Legal prostitution* with the *Legalization*, *Decriminalization*, *Criminalization* and *Nordic model* indicator variables. In column (2), we further replace *Decriminalization* with the *Abolitionism* and *New abolitionism* indicator variables. Variable definitions are provided in the Appendix. P-values based on wild cluster bootstrapping by country are reported in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable = *Rape rate*	(1)	(2)
Legalization	-3.458*	-3.370*
	(0.052)	(0.057)
Decriminalization	-3.969*	
	(0.068)	
Abolitionism		-6.510**
		(0.031)
New abolitionism		-1.397
		(0.458)
Criminalization	0.956	0.829
	(0.538)	(0.525)
Nordic model	15.601***	15.554***
	(0.000)	(0.000)
Ln (GDP per capita)	-3.898***	-4.214***
	(0.008)	(0.004)
Ln (Population)	1.870	1.683
	(0.684)	(0.682)
Unemployment rate	-0.110	-0.121*
	(0.106)	(0.074)
Women per 100 men	-0.586	-0.628*
	(0.110)	(0.087)
Police officers	-0.715	-1.048
	(0.908)	(0.850)
Immigrants	-0.139	-0.113
	(0.601)	(0.665)
Gender inequality index	28.102	23.344
	(0.238)	(0.345)
Constant	74.473	85.732
	(0.372)	(0.296)
Observations	841	841
Year FEs	Yes	Yes
Country FEs	Yes	Yes
Adjusted R^2	0.839	0.841

Table 8. Placebo Tests: Effect of Prostitution Law on Other Non-Sexual Crime

This table reports the difference-in-differences tests that examine legal changes in prostitution on other non-sexual crimes. *Homicide* is the number of homicide cases per 100,000 population. *Burglary* is the number of burglary and housebreaking cases per 100,000 population. *Robbery* is the number of robbery cases per 100,000 population. *Total crime* is the sum of *Homicide*, *Burglary*, and *Robbery*. Columns (1)-(4) follow the regression specification of Table 3 column (3); columns (5)-(8) follow the regression specification of Table 3 column (4). Variable definitions are provided in the Appendix. P-values based on wild cluster bootstrapping by country are reported in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Homicide (1)	Burglary (2)	Robbery (3)	Total crime (4)	Homicide (5)	Burglary (6)	Robbery (7)	Total crime (8)
Prostitution liberalization	0.399	80.989	-35.917	30.906				
	(0.667)	(0.140)	(0.417)	(0.655)				
Prostitution prohibition					0.785	91.599	27.937	41.814
					(0.269)	(0.364)	(0.411)	(0.464)
Ln (GDP per capita)	0.217	-94.825	-121.848	-222.467***	0.049	-85.715	-136.811	-292.151***
	(0.832)	(0.172)	(0.314)	(0.008)	(0.981)	(0.430)	(0.273)	(0.008)
Ln (Population)	12.643**	103.018	-543.504	-56.964	9.419**	394.421	-314.620	173.711
	(0.043)	(0.813)	(0.631)	(0.726)	(0.036)	(0.378)	(0.539)	(0.395)
Unemployment rate	-0.047	-0.449	2.274	-4.042	0.025	-0.240	0.227	-5.966
	(0.499)	(0.845)	(0.224)	(0.154)	(0.427)	(0.949)	(0.903)	(0.244)
Women per 100 men	0.458	16.823	7.979	5.996	0.533	24.548	11.973	18.961
	(0.202)	(0.219)	(0.469)	(0.736)	(0.280)	(0.178)	(0.246)	(0.304)
Police officers	10.644*	-116.045	472.790	67.677	8.348*	-128.515	373.612	327.856
	(0.059)	(0.711)	(0.260)	(0.742)	(0.060)	(0.801)	(0.450)	(0.259)
Immigrants	0.235	-0.863	6.348	-7.833	0.168	-2.615	5.807	-11.477
	(0.282)	(0.896)	(0.246)	(0.457)	(0.286)	(0.587)	(0.264)	(0.209)
Gender inequality index	20.139*	-117.867	-242.862	147.738	24.961	386.814	-231.224	535.068
	(0.088)	(0.818)	(0.557)	(0.769)	(0.208)	(0.535)	(0.762)	(0.424)
Constant	-260.612***	-2,193.300	8,834.510	2,397.788	-214.945**	-7,804.647	4,960.066	-2,083.180
	(0.010)	(0.716)	(0.440)	(0.468)	(0.035)	(0.246)	(0.456)	(0.631)
Mean dependent variable	2.73	295.63	71.54	291.78	1.39	293.60	66.78	271.55
Observations	664	532	528	675	609	484	476	621
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.780	0.757	0.497	0.506	0.834	0.700	0.492	0.486

Table 9. Goodman-Bacon Decomposition

This table reports the results from the difference-in-differences decomposition of Goodman-Bacon (2021). Panel A re-estimates Table 3 column (3); Panel B re-estimates Table 3 column (4). The decomposition presents comparisons amongst timing groups, comparisons of timing groups to units that never received treatment (treated vs. untreated), and the component due to within-group variation in controls.

Panel A: Prostitution Liberalization

	Coefficient	Total Weight
Timing group comparisons	-0.764	0.112
Never treated vs. timing group comparisons	-2.155	0.849
Within-group variation from covariates	-15.913	0.040

Panel B: Prostitution Prohibition

	Coefficient	Total Weight
Timing group comparisons	5.263	0.126
Never treated vs. timing group comparisons	13.517	0.827
Within-group variation from covariates	-19.624	0.047

Table 10. Alternative Difference-in-differences Methods

This table reports the static effect estimates from alternative difference-in-differences methods to examine the impact of legal changes in prostitution on rape rates. Columns (1)-(3) apply the method in Callaway and Sant'Anna (2021), the method in Sun and Abraham (2021), and the stacked difference-in-differences approach, respectively. The sample includes countries that were treated during the sample period over the years -5 to +15 relative to their treatment year (denoted as year 0) and clean control countries (never-treated observations) for all years with available data. P-values based on standard errors clustered by country are reported parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Prostitution Liberalization

Dependent variable = *Rape rate*	Callaway and Sant'Anna (2021)	Sun and Abraham (2021)	Stacked difference-in-differences
	(1)	(2)	(3)
Prostitution liberalization	-2.051**	-1.874**	-1.779**
	(0.034)	(0.049)	(0.013)

Panel B: Prostitution Prohibition

Dependent variable = *Rape rate*	Callaway and Sant'Anna (2021)	Sun and Abraham (2021)	Stacked difference-in-differences
	(1)	(2)	(3)
Prostitution prohibition	13.487**	12.790***	12.824**
	(0.038)	(0.000)	(0.017)

Figure 1: Effect of Prostitution Law on Rape

Figure 1A presents the average rape rates in liberalized countries, prohibited countries, and control countries, respectively. The y-axis in Figure 1A denotes the number of rape cases per 100,000 population. Figure 1B shows a visual difference-in-differences test examining the effect of prostitution prohibition on rape rates in prohibited countries relative to control countries. The y-axis in Figure 1B denotes the coefficients of β_{-10} to β_{10} estimated from Equation (1); the x-axis in Figure 1B shows the time relative to the year of legislative change (ranging from ten years prior to law enactment until ten years after) with year 0 denoting the event year. The 90% confidence intervals are based on robust standard errors clustered by country. Similar to Figure 1B, Figure 1C shows a visual difference-in-differences test examining the effect of prostitution liberalization on rape rates in liberalized countries relative to control countries (i.e., β_{-10} to β_{10} estimated from Equation (2)).

Figure 1A: Trend in Average Rape Rate

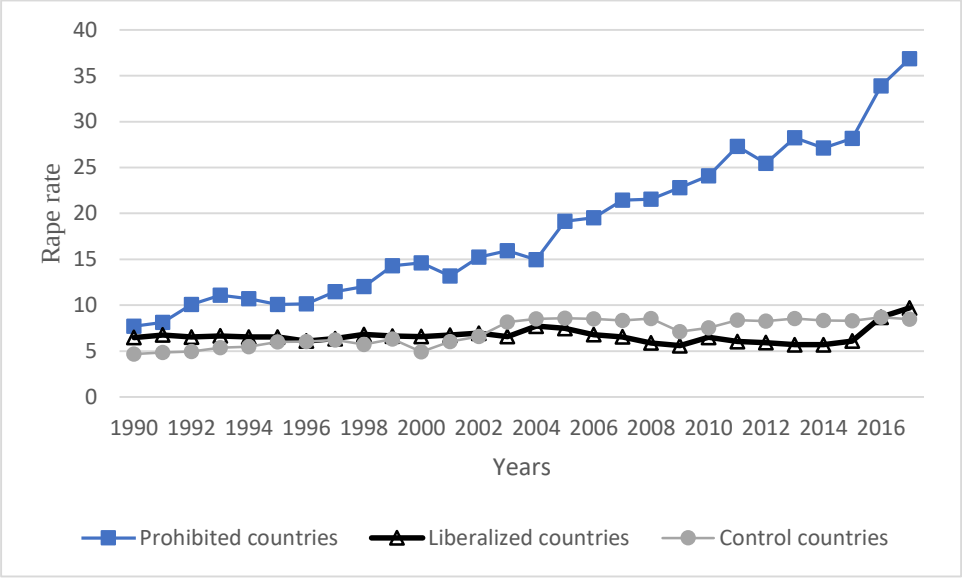


Figure 1B: Effect of Prohibiting Prostitution on Rape

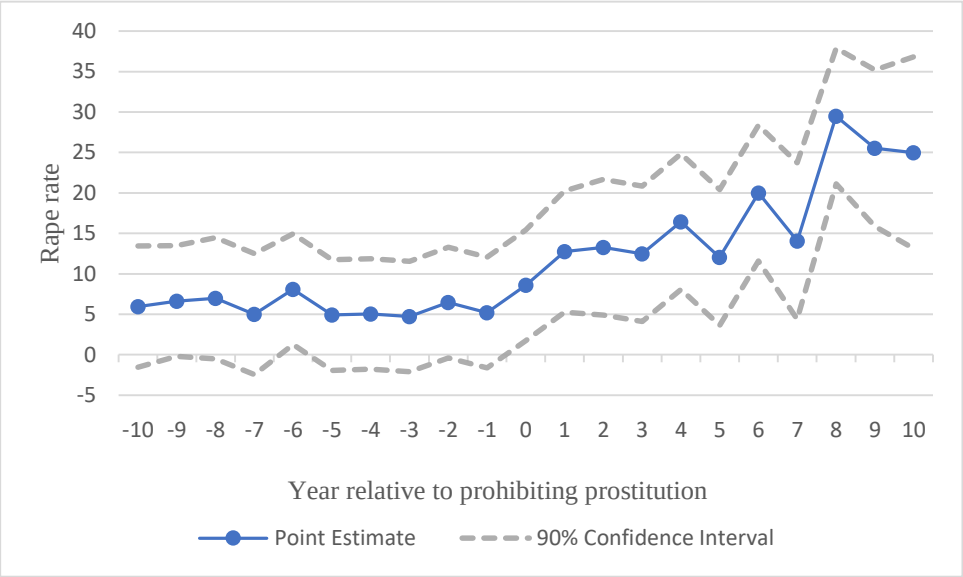


Figure 1C: Effect of Liberalizing Prostitution on Rape

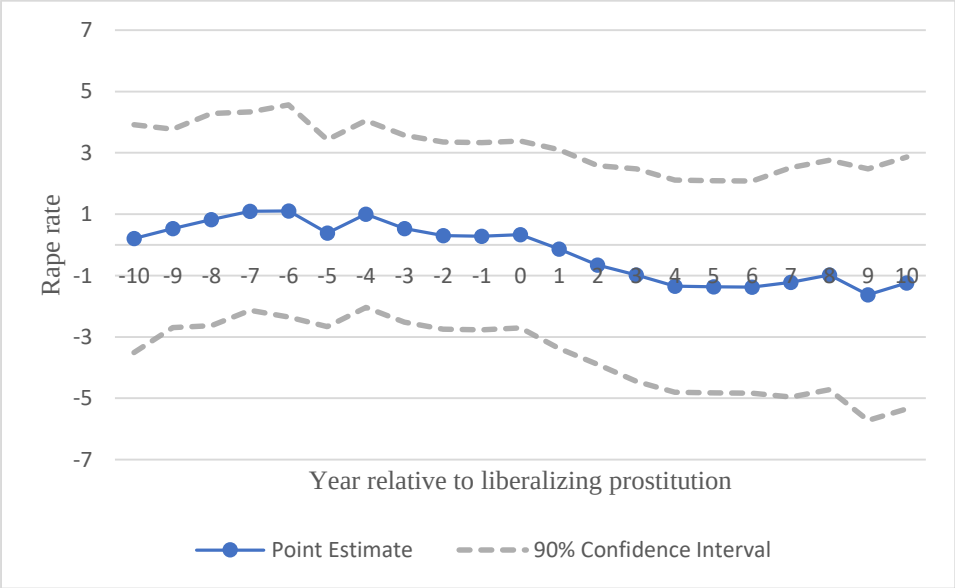
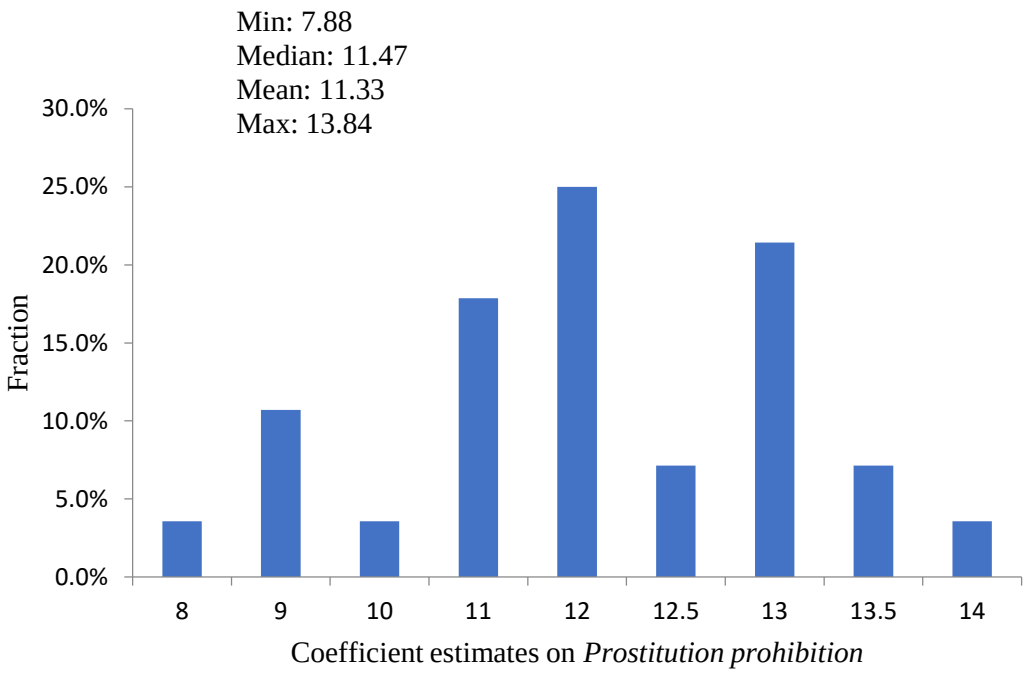


Figure 2: Matched Sample Analysis

We randomly match each of the six prohibited countries to each of the eight liberalized countries (listed in Table 2 Panels A and B, respectively), and form 28 unique matched samples. Based on these matched samples, we then re-estimate the baseline regression in Table 3 column (2) and save the corresponding 28 coefficients on *Prostitution prohibition*. This figure plots the distribution of these coefficients.



Appendix: Variable Definition

Variable	*Definition*
Burglary	Number of burglary and domestic housebreaking cases per 100,000 population.
Gender inequality index	A composite measure, reflecting inequality in achievements between women and men in three dimensions: reproductive health, empowerment and the labor market. It ranges from zero to one.
Homicide	Number of intentional homicide cases per 100,000 population.
Immigrants	Number of immigrants as percentage of national population.
Legal prostitution	Indicator variable that takes the value of one if prostitution is legal (i.e., decriminalized or legalized) in a given country in a given year, and zero otherwise.
Ln (GDP per capita)	Natural logarithm of gross domestic product (GDP) per capita (US$).
Ln (Population)	Natural logarithm of national population.
Police officers	Number of police officers as percentage of national population.
Prostitution liberalization	Indicator variable that takes the value of one beginning in the year when a country legalizes prostitution, and zero otherwise.
Prostitution prohibition	Indicator variable that takes the value of one beginning in the year when a country prohibits prostitution, and zero otherwise.
Rape rate	Number of police-recorded rape offences per 100,000 population.
Robbery	Number of robbery cases per 100,000 population.
Total crime	The sum of intentional homicides, burglary and robbery per 100,000 population.
Unemployment rate	Number of unemployed persons as a percentage of the labor force.
Women per 100 men	Number of females per 100 males.

Internet Appendix

Do Prostitution Laws Turn a John into a Rapist? Evidence from Europe

Table IA1. Effect of Prostitution Law on Rape Rate (Robust Standard Errors Clustered by Country)

This table is the same as Table 3, except that we report p-values based on robust standard errors clustered by country in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable = *Rape rate*	(1)	(2)	(3)	(4)
Legal prostitution	-7.087***	-7.070***		
	(0.010)	(0.003)		
Prostitution liberalization			-2.729***	
			(0.009)	
Prostitution prohibition				11.451***
				(0.006)
Ln (GDP per capita)		-5.165***	-3.744**	-6.225***
		(0.004)	(0.016)	(0.003)
Ln (Population)		2.532	0.776	4.924
		(0.623)	(0.826)	(0.450)
Unemployment rate		-0.167**	-0.126*	-0.172
		(0.036)	(0.062)	(0.129)
Women per 100 men		-0.682*	-0.456*	-0.602
		(0.080)	(0.090)	(0.198)
Police officers		-0.788	-1.572	1.789
		(0.899)	(0.697)	(0.816)
Immigrants		-0.154	-0.107	-0.125
		(0.554)	(0.600)	(0.681)
Gender inequality index		33.343	11.210	38.419
		(0.140)	(0.352)	(0.277)
Constant	13.370***	92.253	80.428	47.497
	(0.000)	(0.360)	(0.269)	(0.691)
Observations	841	841	675	621
Year FEs	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes
Adjusted R^2	0.776	0.815	0.792	0.838
Mean dependent variable	9.21	9.21	6.97	10.11
# of control countries	17	17	17	17
# of treated countries	14	14	8	6

Table IA2. Testing for Pretreatment Trends and Reversals (Robust Standard Errors Clustered by Country)

This table is the same as Table 4, except that we report p-values based on robust standard errors clustered by country in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable = *Rape rate*	Prostitution liberalization (1)	Prostitution prohibition (2)
Year – 2	-0.490	0.995
	(0.310)	(0.602)
Year – 1	-0.283	-1.127
	(0.647)	(0.617)
Year 0 (Event year)	-0.659	1.900
	(0.339)	(0.164)
Year + 1	-0.794	4.637***
	(0.294)	(0.000)
Year 2 +	-2.929***	14.354***
	(0.009)	(0.008)
Ln (GDP per capita)	-3.852**	-6.366***
	(0.014)	(0.001)
Ln (Population)	0.836	7.001
	(0.814)	(0.302)
Unemployment rate	-0.131*	-0.171
	(0.056)	(0.115)
Women per 100 men	-0.434	-0.472
	(0.127)	(0.291)
Police officers	-1.533	3.642
	(0.700)	(0.637)
Immigrants	-0.106	-0.144
	(0.601)	(0.622)
Gender inequality index	12.112	36.331
	(0.317)	(0.271)
Constant	77.926	2.241
	(0.308)	(0.985)
Observations	675	621
Year FEs	Yes	Yes
Country FEs	Yes	Yes
Adjusted R^2	0.791	0.852

Table IA3. Heterogeneous Treatment Effects: The Rape Under-Reporting Problem (Robust Standard Errors Clustered by Country)

This table is the same as Table 5, except that we report p-values based on robust standard errors clustered by country in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable = *Rape rate*	(1)	(2)	(3)
Legal prostitution	-3.177**	-9.089***	-8.691***
	(0.016)	(0.001)	(0.001)
Legal prostitution × Latter period	-7.767*		
	(0.065)		
Legal prostitution × High gender inequality		5.592**	
		(0.012)	
Legal prostitution × Eastern Europe			7.135***
			(0.005)
Latter period	11.259**		
	(0.013)		
High gender inequality		-1.732	
		(0.340)	
Eastern Europe			-24.192***
			(0.002)
Ln (GDP per capita)	-2.171**	-7.196***	-5.928***
	(0.021)	(0.002)	(0.001)
Ln (Population)	12.177**	6.912	0.361
	(0.040)	(0.162)	(0.933)
Unemployment rate	-0.053	-0.201***	-0.174**
	(0.530)	(0.002)	(0.027)
Women per 100 men	-0.984**	-0.568	-0.775**
	(0.044)	(0.105)	(0.042)
Police population	8.535	3.056	-2.628
	(0.213)	(0.610)	(0.627)
Immigrants	0.121	0.031	-0.137
	(0.494)	(0.857)	(0.581)
Gender inequality index	-0.981		26.651
	(0.934)		(0.195)
Constant	-59.929	33.669	147.344
	(0.531)	(0.689)	(0.101)
Observations	841	841	841
Year FEs	No	Yes	Yes
Country FEs	Yes	Yes	Yes
Adjusted R^2	0.813	0.824	0.823

Table IA4. Heterogeneous Treatment Effects: Marriage/Partnership (Robust Standard Errors Clustered by Country)

This table is the same as Table 6, except that we report p-values based on robust standard errors clustered by country in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable = *Rape rate*	(1)	(2)	(3)
Legal prostitution	-4.325***	-2.645**	-2.577*
	(0.010)	(0.048)	(0.073)
Legal prostitution × Low marriage	-4.771*		
	(0.053)		
Legal prostitution × High single		-6.455**	
		(0.024)	
Legal prostitution × Low sex ratio			-6.023**
			(0.016)
Low marriage	3.109		
	(0.187)		
High single		5.081**	
		(0.036)	
Low sex ratio			2.114
			(0.421)
Ln (GDP per capita)	-5.284***	-5.222***	-5.641***
	(0.003)	(0.003)	(0.003)
Ln (Population)	0.968	3.425	5.669
	(0.833)	(0.411)	(0.224)
Unemployment rate	-0.167**	-0.174**	-0.239***
	(0.037)	(0.031)	(0.005)
Women per 100 men	-0.760**	-0.772**	
	(0.047)	(0.042)	
Police population	-2.696	0.419	1.817
	(0.636)	(0.936)	(0.753)
Immigrants	-0.114	-0.142	-0.068
	(0.650)	(0.566)	(0.759)
Gender inequality index	25.387	27.318	35.108
	(0.219)	(0.170)	(0.125)
Constant	126.552	84.711	-28.476
	(0.176)	(0.292)	(0.705)
Observations	841	841	841
Year FEs	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes
Adjusted R^2	0.822	0.824	0.822

Table IA5. Different Types of Prostitution Policy Models (Robust Standard Errors Clustered by Country)

This table is the same as Table 7, except that we report p-values based on robust standard errors clustered by country in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable = *Rape rate*	(1)	(2)
Legalization	-3.458**	-3.370**
	(0.015)	(0.019)
Decriminalization	-3.969***	
	(0.008)	
Abolitionism		-6.510***
		(0.000)
New abolitionism		-1.397
		(0.251)
Criminalization	0.956	0.829
	(0.372)	(0.432)
Nordic model	15.601***	15.554***
	(0.000)	(0.000)
Ln (GDP per capita)	-3.898**	-4.214***
	(0.012)	(0.005)
Ln (Population)	1.870	1.683
	(0.679)	(0.704)
Unemployment rate	-0.110	-0.121*
	(0.106)	(0.085)
Women per 100 men	-0.586*	-0.628*
	(0.082)	(0.052)
Police officers	-0.715	-1.048
	(0.902)	(0.853)
Immigrants	-0.139	-0.113
	(0.582)	(0.643)
Gender inequality index	28.102	23.344
	(0.192)	(0.278)
Constant	74.473	85.732
	(0.372)	(0.296)
Observations	841	841
Year Fes	Yes	Yes
Country FEs	Yes	Yes
Adjusted R^2	0.839	0.841

Table IA6. Placebo Tests: Effect of Prostitution Law on Other Non-Sexual Crime (Robust Standard Errors Clustered by Country)

This table is the same as Table 8, except that we report p-values based on robust standard errors clustered by country in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	Homicide (1)	Burglary (2)	Robbery (3)	Total crime (4)	Homicide (5)	Burglary (6)	Robbery (7)	Total crime (8)
Prostitution liberalization	0.399	80.989	-35.917	30.906				
	(0.563)	(0.123)	(0.406)	(0.675)				
Prostitution prohibition					0.785	91.599	27.937	41.814
					(0.187)	(0.261)	(0.488)	(0.483)
Ln (GDP per capita)	0.217	-94.825	-121.848	-222.467**	0.049	-85.715	-136.811	-292.151**
	(0.819)	(0.185)	(0.317)	(0.047)	(0.966)	(0.409)	(0.282)	(0.028)
Ln (Population)	12.643***	103.018	-543.504	-56.964	9.419**	394.421	-314.620	173.711
	(0.005)	(0.788)	(0.408)	(0.749)	(0.014)	(0.314)	(0.411)	(0.468)
Unemployment rate	-0.047	-0.449	2.274	-4.042	0.025	-0.240	0.227	-5.966
	(0.358)	(0.862)	(0.361)	(0.245)	(0.467)	(0.947)	(0.925)	(0.261)
Women per 100 men	0.458*	16.823	7.979	5.996	0.533*	24.548	11.973	18.961
	(0.077)	(0.182)	(0.333)	(0.661)	(0.077)	(0.141)	(0.211)	(0.201)
Police officers	10.644**	-116.045	472.790	67.677	8.348**	-128.515	373.612	327.856
	(0.013)	(0.739)	(0.275)	(0.765)	(0.022)	(0.770)	(0.423)	(0.301)
Immigrants	0.235	-0.863	6.348	-7.833	0.168	-2.615	5.807	-11.477
	(0.163)	(0.880)	(0.227)	(0.437)	(0.158)	(0.638)	(0.214)	(0.297)
Gender inequality index	20.139*	-117.867	-242.862	147.738	24.961*	386.814	-231.224	535.068
	(0.060)	(0.822)	(0.567)	(0.780)	(0.070)	(0.539)	(0.694)	(0.450)
Constant	-260.612***	-2,193.300	8,834.510	2,397.788	-214.945**	-7,804.647	4,960.066	-2,083.180
	(0.010)	(0.716)	(0.440)	(0.468)	(0.035)	(0.246)	(0.456)	(0.631)
Mean dependent variable	2.73	295.63	71.54	291.78	1.39	293.60	66.78	271.55
Observations	664	532	528	675	609	484	476	621
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.780	0.757	0.497	0.506	0.834	0.700	0.492	0.486

Table IA7. Effect of Prostitution Law on Rape Rate (Controlling for Other Non-sexual Crime)

Columns (1)-(3) of this table replicates columns (2)-(4) of Table 3 by additionally controlling for *Total crime* (the sum of intentional homicides, burglary and robbery per 100,000 population). P-values based on wild cluster bootstrapping by country are reported in parentheses. The superscripts ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable = *Rape rate*	(1)	(2)	(3)
Legal prostitution	-7.077***		
	(0.001)		
Prostitution liberalization		-2.790***	
		(0.009)	
Prostitution prohibition			11.310***
			(0.002)
Ln (GDP per capita)	-4.485***	-3.308**	-5.267**
	(0.001)	(0.010)	(0.012)
Ln (Population)	2.459	0.888	4.354
	(0.620)	(0.819)	(0.537)
Unemployment rate	-0.153*	-0.118*	-0.152
	(0.053)	(0.064)	(0.148)
Women per 100 men	-0.701*	-0.468	-0.664
	(0.095)	(0.204)	(0.322)
Police officers	-1.174	-1.705	0.713
	(0.839)	(0.690)	(0.918)
Immigrants	-0.133	-0.091	-0.088
	(0.617)	(0.699)	(0.804)
Gender inequality index	32.473	10.920	36.664
	(0.172)	(0.455)	(0.370)
Total crime	0.003*	0.002	0.003*
	(0.055)	(0.467)	(0.067)
Constant	89.108	75.721	54.332
	(0.381)	(0.315)	(0.662)
Observations	841	675	621
Year FEs	Yes	Yes	Yes
Country FEs	Yes	Yes	Yes
Adjusted R^2	0.821	0.802	0.845
Mean dependent variable	9.21	6.97	10.11
# of control countries	17	17	17
# of treated countries	14	8	6