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International Spillovers from Prostitution Regulation: The "Nordic Model" and Sex Tourism

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Abstract

We investigate the causal effect of the asymmetric criminalization of prostitution on sex tourism. We exploit legal reforms in five countries that switched from systems where prostitution was legal (Norway, Sweden, Ireland, Canada), or where only buying sex was legal (France), to the “Nordic model” where only buying is criminalized. Using a difference-in-differences approach on data from Google trends and tourism statistics, we estimate the impact of the reforms on tourism flows to neighboring countries and popular sex tourism destinations. We find significant effects for countries where prostitution was legal, but not for France where selling sex was prohibited.

Keywords: Prostitution; Nordic model of prostitution; Regulation; Sex tourism; Google Trends; Policy spillovers.

JEL Codes: D04, I18, J47, K14, K42.

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1 Introduction

In 1999 Sweden introduced the so-called Nordic model of prostitution legislation, an innovative asymmetric legislation which criminalizes the purchase, but not the selling, of sexual services. Starting with Norway in 2009, other countries adopted this model in the following years or are discussing to do so. Changes in prostitution regulation can be expected to impact not only the market for prostitution in the country adopting the new law, but also sex trade as well as other outcomes in neighboring countries (Lee and Persson, 2022).

In this paper, we focus on a relatively understudied potential channel for these impacts: sex tourism, defined as the flows of sex market customers who exploit differences in the regulation of prostitution across countries, and travel to places where prostitution is more tolerated or legal. This phenomenon is complex, costly, and has been associated with several negative outcomes in receiving countries, including the spread of sexually transmitted infections (Herold and Van Kerkwijk, 1992), human trafficking (Brooks and Heaslip, 2019), and child exploitation (Newman et al., 2011). Over time, globalization and the democratization of airfares played a significant role in enabling individuals to travel worldwide, thereby facilitating sex tourism (Wonders and Michalowski, 2001). Despite the significance of this practice, and the obvious relevance to it of the legislation on prostitution, there is a lack of empirical studies that explore the connection between the two. Understanding this link is crucial for the effective design of prostitution legislation and other related policies. This has been recently highlighted at the policy level by a report drafted by the European Parliament calling for common guidelines on prostitution for all EU states: *"We need a Europe-wide approach so that the demand and market for prostitution does not simply move to the next Member State."*¹

In principle, there may be two contrasting effects on sex tourism following this change in the prostitution legislation. On the one hand, the increase in the total cost for buyers could lead to a decline in domestic demand, prompting individuals who look for sexual services to travel to foreign countries where prostitution is legal or well established, which becomes relatively cheaper. On the other hand, the change in the legislation might affect people's attitudes towards prostitution in general (Kotsadam and Jakobsson, 2011; Leheny, 1995), potentially reducing demand for both domestic prostitution and foreign sex tourism, to the extent that the new norm is internalized by buyers. However, the change in prevalent

¹https://www.europarl.europa.eu/doceo/document/A-9-2023-0240_EN.html

attitudes might motivate buyers to seek sexual services abroad to avoid the disapproval of their society, potentially leading to an increase in sex tourism.²

This study examines the causal effect of implementing asymmetric prostitution laws on sex tourism by leveraging changes in prostitution laws in four countries. These countries switched from systems where both buying and selling sex were legal (Norway, Ireland, Canada) or where only purchasing sex was legal (France), to a system where only the buyer's side is criminalized. We examine two forms of tourism: cross-border tourism, which involves short-distance travel, often by car; and international tourism to distant destinations. To investigate the former, we leverage the variability in prostitution legislation between bordering countries, around the Canada-US border and the France-Germany border. We exploit differences in fines and prison sentences for buying sexual services in several US states, to test whether the implementation of the new prostitution law in Canada affects the revealed interest of US residents for Canadian municipalities near the border, in particular from the states with high punishments. Symmetrically in the France-Germany case, the legal status of prostitution varies at the municipality level in the recipient country. We therefore explore whether the French reform induces any change in the interest among French residents towards the German municipalities close to the border where prostitution is legal.

For international tourism, we analyze changes in interest, as expressed by Google searches, for a list of sex tourism destinations compared to other popular travel destinations, originating in countries that have adopted the new laws. We also inspect differences in tourism patterns between countries that have adopted the Nordic model and other countries, towards two popular sex tourism destination, Thailand and the Philippines, where appropriate data are available.

To try quantify sex tourism flows, we complement standard tourism statistics with google searches. In particular, we rely on Google searches of a set of geographic destinations, chosen according to criteria we detail later. This approach enables us to obtain detailed statistics on a weekly basis and examine expression of interest at the city level, beyond the country level.³ A detailed description of the data and sources of variation we exploit

²As Sunstein (1996) puts it, "*law might attempt to express a judgment about the underlying activity in such a way as to alter social norms.*" This may happen in various ways. Posner (2002) argues that people internalize norms to signal that they are of "good type." McAdams and Rasmusen (2007) argue that new laws may affect the incentives that underlie norms by changing perceptions of what incurs disapproval or by creating a new basis for shame. Funk (2007) showed that even in presence of purely symbolic fines, the legal abolition of the voting duty in Switzerland significantly reduced voting turnout.

³Google searches have been widely adopted in research across various fields, such as medicine, health,

is provided in Section 4.

Our primary method of identification utilizes difference-in-differences regressions, which leverage variations in the timing of the reforms across different countries, as well as geographic differences in prostitution regulation. Additionally, we employ an event study approach to explore the time-dynamics of the impact in more detail.

Our main results suggest that harsher penalties for buying sexual services lead to significant spillover effects in the form of sexual tourism to countries with more lenient legislation. In temporal coincidence with Nordic model reforms, we observe a decline in Google searches (which we consider an indicator of tourism interest) related to Canadian municipalities originated in US states with high fines; a significant increase of foreign tourism to two popular sex tourism destinations, Thailand and the Philippines, from the four reform countries; and an increase in Google searches for international sexual tourism attractions originating from these same countries, relative to other well-known tourist attractions within the same cities. We find however no differential change in foreign tourism to German municipalities where prostitution is legal, or in the interest for such municipalities expressed by French Google searches, that might credibly be associated with the French reform.

The paper is structured as follows. Section 2 provides a review of previous contributions in this area. Section 3 clarifies the background of the reforms, and Section 4 presents the data we use. Section 5 describes our methodology and our results are discussed in Section 6. Finally, Section 7 concludes.

2 Literature review

Similar to the case of other undesirable or morally grey activities, the approaches available to the legislator when dealing with prostitution, as alternatives to full *laissez-faire*, are of two main types: regulation imposing constraints on the activity, for example specifying times of the day or geographic areas where it is allowed, or mandating regular health checks for licensed prostitutes; or outright criminalization, accompanied by more or less severe punishments. The pros and cons of switching from one to the other approach are hotly debated, while observing empirically the potential impacts is challenging. The

business, and economics. According to a review by Kholodilin et al. (2010), search-based tourism predictions provide an accurate approximation to actual flows.

prostitution market is considered a semi-coerced market, where a portion of the supply is involuntary, similar to the human organ and surrogacy markets. While regulation of prostitution allows for voluntary sex transactions that can benefit all parties involved, it may also facilitate sex trafficking and exploitation. Lee and Persson (2022) propose a hybrid model, which involves licensing prostitutes and criminalizing clients who purchase sex from unlicensed ones, in an attempt to restore the outcomes that arise under *laissez-faire* without trafficking. Other theoretical studies that discuss the effects of legal regimes on prostitution include Edlund and Korn (2002) and Immordino and Russo (2015, 2016), but they don't deal with cross-border spillovers.

Our paper contributes to the empirical literature that studies the effects of different prostitution regulations. By and large, the recent empirical studies with a robust causal identification seem to indicate that a more liberal legislation of sexual services is associated with more positive outcomes for society as a whole, with more uncertain effects on sex workers themselves.⁴ For example, Bisschop et al. (2017) show that the opening of legal street prostitution zones, known as *tippelzones*, in The Netherlands decreases sexual abuse and drug-related crime in the general population. Cunningham and Shah (2018) analyzes the unexpected decriminalization of indoor prostitution in Rhode Island between 2003 and 2009 and finds an increase in the indoor market, along with a decline in rape offenses as well as gonorrhea incidence in the overall population. Cunningham et al. (2023) investigate the geographic expansion of the erotic services section of Craigslist, a popular advertisement website, and report a 10-17% decrease in female homicide rates. This decrease is attributed to the possibility for prostitutes to use online platforms to screen potential clients and work mostly indoors. Ciacci and Sviatschi (2021) find that the opening of indoor prostitution establishment in a neighborhood decreases sex crime prevalence in the general population by 7-13% with no effect on other types of crime. Our contribution to this body of knowledge is the consideration of spillover effects *to other countries*, finding additional negative externalities generated by the criminalization of prostitution. Our results imply therefore that the positive effects observed by previous studies are a lower bound, and the overall impact of criminalizing prostitution can be greater than previously examined when we take into account spillovers to other countries.

⁴These studies tend to focus on outcomes measured in the general population, which therefore include effects on the market participants confounded with spillovers to other groups. Unfortunately there are no good data to study directly the effects on sex workers and their clients. One study using the mostly incomplete statistics on international sex trafficking (Cho et al., 2013) finds that, in a large cross-section, countries that have legalized prostitution tend to see higher levels of reported human trafficking entering their borders. This is however a simple correlation, and the causal link might go in either direction.

One may now wonder whether the Nordic model, consisting of only partial criminalization and being characterized by proponents as a *third way* between full criminalization and liberalization, leads to different outcomes. The first academic paper studying the effects of the Nordic model we are aware of is Kotsadam and Jakobsson (2011). Using survey data from Norway and Sweden, it shows that people in Oslo supported the view that buying sex should be illegal to a larger extent than before the law, and young people were more likely to change their views following the legal change. More recently, Ciacchi (2018) studied the effect of the Nordic model on rapes using Swedish regional data. The study relies on the availability and distance of flights to sex-tourism destinations as an instrument to break the endogeneity problem between rapes and fines, and finds that reported rapes increased by 47% between 1999 and 2014. According to these studies, the main advantage of criminalization, even only partial as in the Nordic model, would be the normative feedback documented by Kotsadam and Jakobsson (2011). Just as with full criminalization, however, Ciacchi (2018) shows that this may have spillovers on other crimes.⁵

Our study is also related to the other academic papers that use Google Trends. The use of Google Trends for academic research can be traced back to Ginsberg et al. (2009), who found that Google searches related to the flu accurately predicted its spread across different regions of the United States. Since then Google searches have been widely used for academic research in different fields, including IT, communications, medicine, health, business and economics.⁶ An early study by Choi and Varian (2012) find that online searches are correlated with the current level of economic activity, for example the volume of queries on a particular automobile might be helpful for predicting its sales. Ayyoubzadeh et al. (2020) predicted the number of positive COVID-19 cases in Iran based on Google searches. Brodeur et al. (2021) look for significant changes in search terms related to well-being, such as loneliness or sadness, during the COVID-19 lockdowns in Europe and the US. These studies showcase the usefulness of Google searches, notwithstanding the low precision of their predictions, when they can be combined with other data, especially in settings where these are scant. We contribute to this literature by using Google Trends to document an illegal behavior, a common case for which official statistics are usually not available or problematic.⁷ In this context, Google Trends are a

⁵Incidentally, the mechanism leveraged by Ciacchi (2018) highlights the potential spillover from the Nordic model on sexual tourism which we propose to investigate in the present study.

⁶Extensive reviews of research papers based on Google Searches can be found in Jun et al. (2017) and Rovetta (2021).

⁷The lack of and need for comparable data for effective policy-making is again highlighted by the

valuable resource that can substitute or complement other sources of data.

Finally, this paper is also more generally related to the empirical literature that studies the spillover effects of law enforcement. For instance, Knight (2013) finds significant policy externalities of gun regulation in terms of cross-state gun trafficking. It shows that firearms tend to flow from U.S. states with weak laws to states with strict laws. Negative externalities, such as increased violence and homicides, have also been associated with the prohibition of alcohol and drugs in the U.S. (Miron, 1999) or with law enforcement actions against the drug market in Mexico (Dell, 2015).⁸ There is also evidence of spillover effects abroad: Naranjo (2010) and Hao and Cowan (2020) find that domestic law enforcement against drugs increases drug distribution activities in other countries/states.

3 The reforms: the Nordic model in different contexts

The Nordic model originated in Sweden in 1999. Both Norway and Iceland criminalized buying sex in a similar way in 2009, which gave the legislation its nickname. More recently, similar laws have been introduced in Ireland, Canada, France and Israel. While 1999 is too early for sufficient internet penetration, which leads us to exclude Sweden from our analysis, Iceland is excluded because of data availability constraints related to a very small market. The May 2020 Israeli reform⁹, occurring in the middle of the Covid-19 pandemic, is also excluded. Our empirical investigation is thereby limited to three countries: Norway, Ireland, and Canada. We also look at the reform in France, however with the important caveat that it is a rather different case.

Even though it is not established whether criminalization increases or reduces trafficking compared to legalization and regulation, the stated objectives for implementing the law in Norway was to prevent and reduce human trafficking. By criminalizing the purchase of sex the Norwegian government also wanted to change attitudes in the population, to reduce the size of the Norwegian sex market, and to prevent entry into prostitution, thereby reducing possible sexual exploitation of men and women as sex workers (Strøm et al., 2014).

recent EU Parliament report mentioned in the introduction: *"[We] regret the lack of reliable accurate data comparable across countries related to prostitution."*

⁸Werb et al. (2011) review 15 studies that evaluate the impact of drug law enforcement on drug market violence and find that 93% of them report an adverse impact on violent crime.

⁹https://en.wikipedia.org/wiki/Prostitution_in_Israel

On December 6, 2014, Canada changed its law, with the stated objective of reducing the demand for sexual services to protect women and girls (Allen and Rotenberg, 2021). The sanction for buying sex, up to 5 years imprisonment plus mandatory minimum fines ranging from 500 to 2,000 Canadian dollars, was now higher than in all but three of the neighboring US states (Montana, Pennsylvania, and Idaho).¹⁰

Ireland followed in March 2017.¹¹ The fine for purchasing sexual services was fixed at 500 EUR for a first offence, and 1000 EUR for subsequent ones, while higher penalties apply, including prison, if the seller is trafficked.

3.1 France

In April 2016, the French government promulgated a law with the aims of ending prostitution and fighting related human trafficking.¹² Buying sexual services which was previously legal became now forbidden and punished by a fine of 1,500 EUR. It should be stressed here that the French reform is fundamentally different from the others. While in all other countries prostitution was not regulated before the introduction of the Nordic model, in France it was already criminalized. However, it was the seller of sexual services who was subject to criminal sanctions rather than the buyer. This hyperconservative legislation aligned the interests of the police (mostly men) with the interests of the clients (also mostly men)¹³ in blaming and going after the mostly female sex workers. While this alignment is broken by the reform, it is not clear to what extent and at what pace enforcement might have picked up given the new law's sharp contrast with prevailing norms. For this reason we treat France as a special case.¹⁴

¹⁰The maximum prison sentence is the same in all the three states, 5 years, however maximum fines vary: 10,000 USD in Montana and Pennsylvania, 50,000 USD in Idaho. Other bordering states have varying jail sentences and/or fines. Of non-bordering states, only Florida has higher punishment, with 5 years imprisonment plus 5,000 USD fine. Nevada is the only state with legal but regulated prostitution.

¹¹https://en.wikipedia.org/wiki/Prostitution_in_the_Republic_of_Ireland

¹²https://en.wikipedia.org/wiki/Prostitution_in_France

¹³In 2005, 14% of patrol officers were female (Van Ewijk, 2012).

¹⁴If we think about the two potential effects from criminalization that we outlined in the introduction, i.e. the impact on cost and the impact on norms, we expect them to play out differently in this case. In the domestic market, sex workers are not punished any longer, which could potentially drive up supply. On the other hand, the expected cost of purchasing is substantially increased, which could depress demand on the domestic market but also at the same time shift demand abroad. At the same time, while the moral signal associated with criminalization was already there, it was assigning the blame in the opposite direction, explicitly condoning the purchase of sexual services. All in all, depending on the relative strength and direction of cost vs norm impact, the effect in France might be expected to be weaker than in other countries.

4 Data

We compiled different data sets based on tourism statistics and Google searches obtained from Google Trends.¹⁵ When collecting data from Google Trends, we focus on searches related to geographic locations rather than terms specifically related to the sex industry or a combination of the two. The reason is twofold. Firstly, to utilize search data as a proxy for tourism flows or at least tourism interest, a geographic element must be included. For instance, a search originating in Canada concerning the term "prostitute" would not provide any information about sex tourism from Canada to Thailand. Admittedly, searches for geographic names may be a noisy indicator of sex tourism interest. However, searches for generic sex-market terms would also mix up the intention for sex tourism with various other related behaviors. Going back to the example above, a search for the term "prostitute" originating in Canada would include all sorts of searches within Canada as well, and only have a very feeble connection to actual searches for prostitutes in another country, i.e. sexual tourism. Given our specific sources of variation, outlined below, our analysis is better equipped to handle the noise in the geographic searches compared to using generic sex-trade terms as an alternative. Second, searches that combine both a geographic term and a sex-market term, like "prostitute Thailand," would yield sparse data since Google searches for bigrams significantly decrease in volume compared to one-word searches. Again, given that we trust the ability of our identification strategy to deal with noise, we choose a more noisy but more dense proxy over a potentially more precise yet sparser measure.¹⁶

Canada-US border: Residents of the United States and Canada are exempted from screening at the border between the two countries and can move freely without a visa. Statistics on cross-border trips of Canadian and US residents are not collected by either country's statistical office, except at a very aggregated temporal and geographical level. In this context, data from Google Trends are a valuable substitute.

We collected data on Google searches originated in each U.S. state and related to all the municipalities with a population greater than 30,000 inhabitants located in the Canadian provinces at the border with the U.S. The searches are on a weekly basis and the time period goes from one year before to one year after the adoption of the Nordic model in

¹⁵Methodological considerations concerning the data provided by Google Trends are discussed in Appendix A.

¹⁶Examples of google searches' results using one-words and combined words are provided in Appendix B.

Canada.

We also gathered information on penalties for buying sexual services, in terms of the dollar fine and length of imprisonment, which vary across U.S. states. The fines range from a minimum of \$1,000 to a maximum of \$50,000, and the length of imprisonment ranges from a minimum of two months to a maximum of 60 months, which is the same as in Canada after the reform.

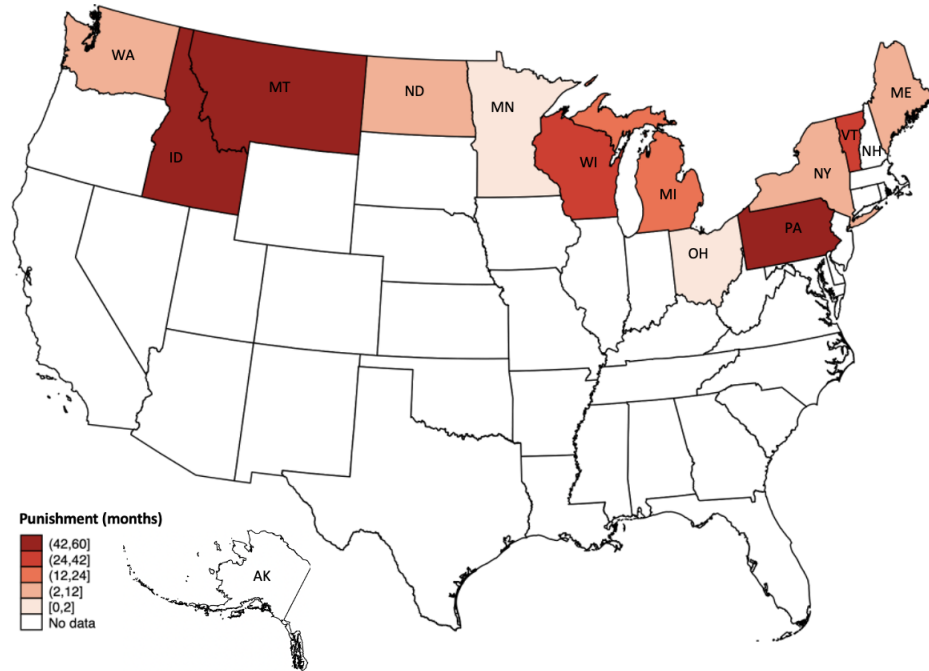


Figure 1: Months of punishment for buying sexual services across the United States

Notes: The map shows the months of punishment for buying sexual services across the States at the border with Canada.

Table 1: Searches of Canadian municipalities originated in the US

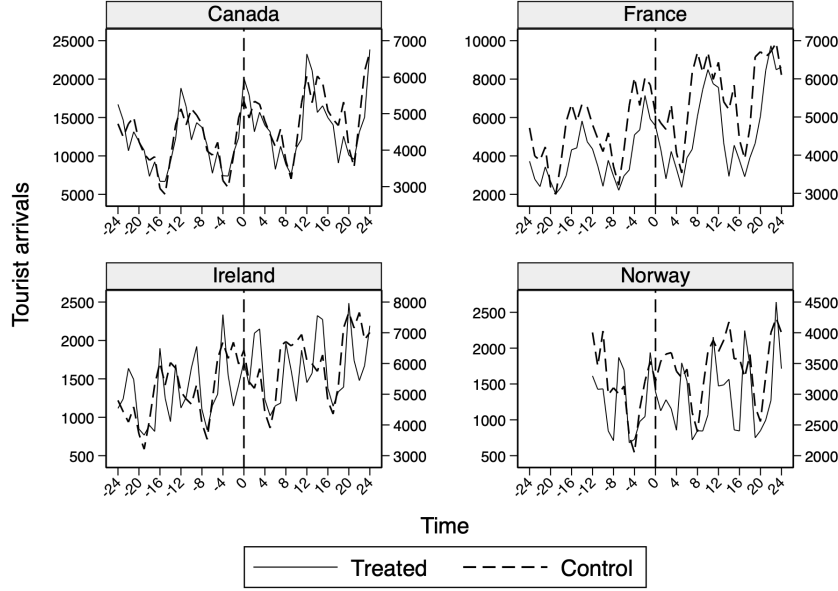
	(1)	(2)	(3)
	N	Mean	SD
Low Punishment	56888	35.28	21.94
High Punishment	18096	30.13	21.29

Notes: This table shows the summary statistics of the searches originated in US states. The *High Punishment* group includes states where the punishment for buying sexual services is the same as in Canada or higher, while *Low Punishment* includes states with a lower punishment.

Thailand and the Philippines: Monthly visitor arrivals to Thailand from 2013 to 2020, differentiated by country of origin, are available at the Ministry of Tourism of Thailand’s website. This includes, thus, pre- and post-reform data on tourism arrivals from Canada, France and Ireland, but only post-reform data for Norway. We restrict our sample to countries in Europe and North America, including the four countries affected by the reform.

The data for the Philippines were collected from the website of the Department of Tourism and include the number of tourist arrivals in the country per month from 2008 to 2020. The extended time frame of the data allows for the analysis of visitor arrivals from Canada, France, Ireland and Norway. As for the case of Thailand, we restrict our sample to origin countries within Europe and North America. Figure 2 plots the number of tourist arrivals to the Philippines from the four countries of interest against the control group. Flows are clearly increasing over time, despite a marked seasonal pattern. However no clear difference between the two groups of countries stands out to visual inspection. The pattern of arrivals to Thailand (not shown) is similarly ambiguous.

Figure 2: Number of tourist arrivals to Philippines



Notes: On the horizontal axis is the time variable. Time is normalized such that 0 is for each country the month when the reform came into force. On the vertical axis is the number of tourist arrivals to the Philippines. The solid line represent tourist arrivals from Canada, France, Ireland and Norway. The dotted line represents the number of tourists from all other countries.

Sex tourism destinations: We collected Google searches for the names of popular sex tourism destinations and other popular tourism destinations, originating from Canada, France, Ireland, and Norway. We chose touristic attractions within a sample of cities known for high levels of sex tourism. For each city, we included searches for attractions associated with sex tourism, such as red-light districts, and other famous tourist attractions.¹⁷ Table 2 reports summary statistics.

¹⁷For example, in the case of Amsterdam, searches for the red-light district, De Wallen, were included in the treatment group, while searches for the Van Gogh Museum were included in the control group. The complete list is reported in Appendix C.

Table 2: Summary statistics of google searches

	(1)	(2)	(3)
Attractions			
Sex tourism	6283	24.09	19.78
Control	7725	22.49	18.21

Notes: This table shows the summary statistics for google searches of tourism destinations originated in France, Canada, Ireland and Norway. The treatment groups include popular sex tourism destinations (attractions) while the control group include other popular destinations (attractions).

France-Germany border: While prostitution is generally permitted under national law in Germany, individual states have the authority to regulate it at a more detailed level, resulting in variation at the level of the *Gemeinde* (municipality). We focus on two of the three German *Bundesländer* bordering France: Baden-Württemberg and Saarland.¹⁸ We gathered information on the legal status of prostitution in different municipalities by contacting each administrative authority. From the state-level statistics departments, we collected the number of tourism arrivals to and overnight stays in all municipalities with a population larger than 30,000 inhabitants within the two states, as smaller municipalities are exempted by law, disaggregated by domestic vs foreign origin. We also collected Google searches for these municipalities' names originating in France over the time period from one year before to one year after the French reform. The tourism arrivals are on monthly basis and the searches are on weekly basis.

Finally we calculated the distance of each municipality from the French border using QGIS.

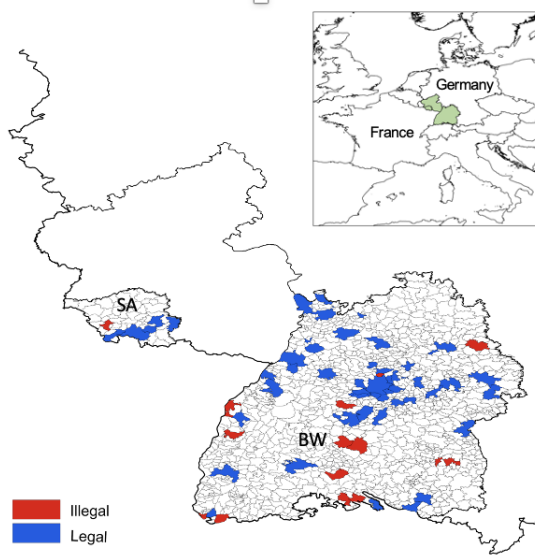
¹⁸France also borders the state of Rheinland-Pfalz. However, the administrative structure is by far an outlier in this state: it is very decentralized and has the highest number of *Gemeinde* (municipalities), despite being the seventh largest state, resulting in the smallest average *Gemeinde*. Our efforts to collect administrative information on the legislation in this territory have resulted in a very limited patchy mapping, therefore we decided to exclude this state from the analysis.

Table 3: Summary statistics searches of German municipalities originated in France

	Legal	Not Legal
Population	89571	35854
Distance (Km)	66	66
Searches	32.24	32.42
Municipalities (N)	47	14
Observations	4780	1456

Notes: This table shows the summary statistics for German municipalities originated in France. The *Legal* group includes municipalities where prostitution is legal. Distance in the distance from the french border.

Figure 3: Legal status of prostitution across German municipalities



Notes: The map displays the legal status of prostitution across German municipalities in two of the three bordering states with France. Blue is for municipalities where prostitution is legal, while red is for municipalities where it is illegal.

5 Empirical models

To capture the causal impact of the reforms on sex tourism we use the standard difference-in-differences (DiD) approach pioneered by Card and Krueger (1994). We estimate several variations of the following standard DiD equation:

$$Y_{it} = \alpha + \beta_1 Post_t + \beta_2 Treat_i + \beta_3 Treat_i \times Post_t + \epsilon_{it}, \quad (1)$$

where Y_{it} is the outcome for entity i at time t , α is the intercept, $Post_t$ is a dummy equal to 1 after the reform and 0 otherwise, and $Treat_i$ is the treatment variable. The coefficient of interest is β_3 which captures the causal impact of the change in policy on the outcome of interest.

The necessary assumption of parallel trends implies that, absent the law change, the difference in the outcome of interest between two groups of entities would have been constant over time. Everything else equal, given that nothing else changed that could affect the outcome at the same exact time, we interpret this as reflecting in large part a change in sex tourism.

We also employ an event study specification to complement the DiD analysis (Clarke and Tapia-Schythe, 2021). The general equation we estimate is the following:

$$Y_{it} = \alpha + \sum_k \beta_k D_{it+k} \times Treat_i + \epsilon_{ist}, \quad (2)$$

where α is the intercept, Y_{it} is the outcome for entity i at time t , D_{it+k} equals one for the k^{th} period before/after the policy, and $Treat_i$ is a dummy which takes value 1 when the observation belongs to the treatment group and 0 otherwise. The key coefficients of interest are the β_k 's, which capture the change in the dependent variable at a given week or month prior or subsequent to the law change.

The different specifications for the DiDs and the event studies are reported in the following subsections.

Canada-U.S.: For the Canada-U.S. case, we exploit the variation in the punishment for buying sexual services in the different U.S. states as a treatment. We estimate the following equation:

$$Y_{ist} = \alpha_t + \alpha_i + \alpha_s + \beta_1 Post_t + \beta_2 Punishment_i + \beta_3 Post_t \times Punishment_i + \epsilon_{ist}, \quad (3)$$

where Y_{ist} represents searches originating in U.S. state i for Canadian municipality s in week t , and $Post_t$ indicates weeks after the Canadian reform, starting at the beginning of December 2014. The treatment variable $Punishment_i$ is either an indicator taking the value one if punishment for buying sex is the same or higher in state i compared to Canada, and zero otherwise; or a continuous variable equal to the number of months of

prison for buying sexual services in state i . The variables α_t , α_i , and α_s are fixed-effects for time, state and municipality. The parallel trends assumption here requires that the time trends in the number of searches would have been the same across U.S. states with different punishment, absent the Canadian reform.

Given that we have relatively high-frequency data, we estimate also the dynamic impact of the policy using the following event-study regression:

$$Y_{ist} = \sum_{k=-20}^{20} \beta_k D_{t+k} * Punishment_s + \alpha_{i*s} + \epsilon_{ist}, \quad (4)$$

where Y_{ist} and $Punishment$ are defined as above, each D_{t+k} equals one for the k^{th} period before/after the reform in Canada, and α_{i*s} represent origin state- times destination-fixed effects. The key coefficients of interest are the β_k :s, which capture the change in the dependent variable in a given week prior or subsequent to the law change.

Thailand and the Philippines: In this case, the treatment group consists of the countries that have adopted the Nordic model, with other countries in Europe and North America as the control group. We estimate different regressions using the number of arrivals to the Philippines and Thailand as the main dependent variable. We use the following equation:

$$Y_{it} = \alpha_{ym} + \alpha_i + \beta_1 Post_{it} + \beta_2 RC_i + \beta_3 Post_{it} * RC_i + \epsilon_{it}, \quad (5)$$

where Y_{it} is the number of tourist arrivals to Thailand or the Philippines from country i during month t . $Post_{it}$ is the time indicator, equal to 1 for all the periods after the law went into effect in country i ; and α_{ym} and γ_i are year-month fixed effects to control for seasonal changes, and origin-country fixed effects, respectively. The variable RC_i , for *Reform Country*, is a dummy variable equal to one when the country of origin is either Canada, Ireland, Norway or France, and zero otherwise.

The parallel trends assumption requires that the difference in tourism flows to Thailand and the Philippines, which include an unknown share of sexual tourists, across different origin countries would have been constant over time, absent the law change.

We further estimate the following dynamic equation:

$$Y_{ist} = \sum_{k=-24}^{24} \beta_k D_{it+k} * RC_i + \gamma_i + \epsilon_{ist}, \quad (6)$$

where each D_{it+k} equals one for the k^{th} period before/after the reform in country i , RC_i is a dummy which takes value 1 when the observation belongs to the treatment group (reform countries) and 0 otherwise, and γ_i represents country-of-origin fixed effects. The key coefficients of interest are the β_k :s, which capture the relative number of tourists arriving from treatment vs control countries in a given month prior or subsequent to the law change.

Sex tourism destinations: We use the Google searches of sex tourism destinations and other tourism destination originated in Canada, France, Norway and Ireland as main dependent variable. We use a list of popular tourism attractions that have a renown for sexual tourism, as described in the previous section. The control group is composed of touristic destinations that are renowned for other reasons than sex tourism. We estimate the following regression equation:

$$Y_{ist} = \alpha_t + \gamma_i + \delta_s + \beta_1 Post_{it} + \beta_2 ST_s + \beta_3 Post_{it} * ST_s + \epsilon_{ist}, \quad (7)$$

where the dependent variable Y_{ist} is searches from country i for destination s in week t . As before, $Post_{it}$ is the binary treatment, equal to 1 for all the periods after the law went into effect in country i ; and ST_s , for *Sex Tourism*, is a dummy variable equal to one when the destination s is in the treatment group and zero otherwise. We include week fixed effects (α_t) to control for seasonality, origin-country fixed effects (γ_i) to take into account the heterogeneity of the effects across countries, and destination-city fixed effect, δ_s . The parallel trends assumption implies that the difference in searches between sex tourism destinations and other popular destinations within the same city and across origin countries would have been the same absent the reform.

France-Germany: In this case, we exploit the variation of German prostitution regulation, at the municipality level. The treatment group consists of municipalities where prostitution is allowed at least to some extent, while the control group is composed of municipalities where it is wholly banned.

We estimate two different regressions using the number of tourist arrivals and the Google searches as dependent variable. We use the following specification:

$$Y_{it} = \alpha_t + \alpha_i + \beta_1 Post_t + \beta_2 Legal_i + \beta_3 Post_t \times Legal_i + \epsilon_{it}, \quad (8)$$

where Y_{it} represents the number of tourists arriving from abroad to German municipality i in month t , $Post_t$ represents the months after the French reform, and $Legal_i$ is a dummy variable equal to one if prostitution is legal in municipality i , and zero otherwise. Finally, $\alpha_t + \alpha_i$ are time and municipality fixed effects. We estimate the same regression with the Google searches where Y_{it} represents the searches originated from France of municipality i at time t .

The parallel trends assumption here requires that the change over time in the number of arriving tourists (respectively Google searches from France) would have been the same across different municipalities, irrespective of the legal status of prostitution in the municipality, absent the French reform.

6 Results

This section reports the results from the estimation of the empirical models in the same order as presented in Section 5.

Canada-US: The results of estimating regression 3 are presented in Table 4. The dependent variable is Google searches for Canadian municipalities originating in each U.S. state each week from one year before to one year after the Canadian reform. The treatment variable enters our regressions in two ways: i) as a dummy equal to one when the punishment for buying sex in the U.S. state of origin is the same as (or higher than) in Canada, and zero otherwise (*Same*); and ii) as a continuous variable equal to the length of prison sentence in months (*Prison*).

Column (1) shows that after the Canadian reform introduced punishment for buying sex in Canada, interest for sexual tourism as captured by Google searches went down in particular in states with high punishment. Column (2) confirms this result introducing the punishment intensity linearly. In Column (3) the result is robust to using the logarithm of the searches.

Table 4: Searches for Canadian locations originated in the US

	(1)	(2)	(3)
	Searches	Searches	Log Searches
Post \times Same	-0.519 (0.089)		-0.029 (0.003)
Post \times Prison		-0.011 (0.075)	
Adj. R-Square	0.129	0.129	0.058
Observations	74984	74984	65995

Standard errors clustered at the destination level.

Notes: This table reports results from DID regressions. The dependent variable is the weekly index of Google Trends for searches for municipalities in Canada originated in the US states. *Prison* is a continuous variable equal to the number of months of prison while *Same* is a dummy equal to one when the punishment is the same as in Canada or higher. All the regressions include week and state fixed effects. Standard errors are clustered at the municipality level.

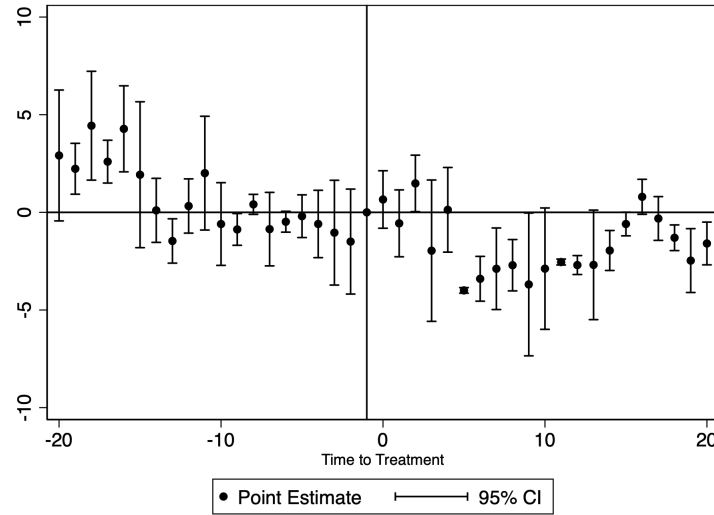


Figure 4: Searches of Canadian cities in treatment vs control States

Notes: The horizontal axis is the time variable. Time is normalized such that 0 is the month when the reform came into force. The vertical axis is the number of searches from US states with high punishments in deviation from control states.

Figure 4 plots the results of estimating equation 4. Even if there are visible seasonality patterns in searches, the difference between searches originating in treated and control states is clearly going from positive or zero before the reform (i.e., same or more searches in states with higher punishment) to negative after.

Thailand and the Philippines: The results of the estimation of equation 5 for the number of tourist arrivals to the Philippines and Thailand are shown in Table 5. To make the comparison of the number of tourist arrivals possible across countries, the dependent variable has been rescaled to have a mean of zero and a standard deviation of one within country of origin. We find that the number of tourists arriving from countries that just introduced the Nordic model increased by 0.312 standard deviation points in the Philippines and 0.158 standard deviation points in Thailand, compared to those arriving from other countries. Results are robust to clustering the standard errors for the case of the Philippines, while become marginally insignificant for the case of Thailand.¹⁹ Figure 5 shows the coefficients over time. Although they display seasonal patterns, the increase after the reform is clear over the following two years. The fact that the spread between treated and control countries is not significantly different from zero is evidence of parallel trends.

Table 5: DID Regressions Results - The Philippines and Thailand

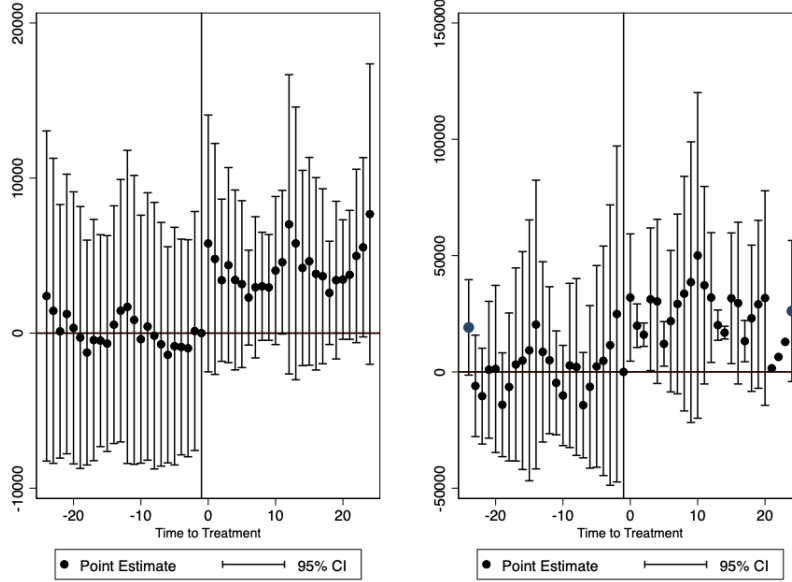
	(1)	(2)
	The Philippines	Thailand
RC \times Post	0.340 (0.0662)	0.158 (0.0886)
Constant	-0.0295 (0.0132)	-0.0211 (0.0213)
Observations	3,134	1,312
Country cluster SE	0.124	0.104
Country-year cluster SE	0.129	0.101

Robust standard errors in parentheses.

Notes: The dependent variable is the number of tourist arrivals to the Philippines (column (1)) and Thailand (column (2)) standardized within the country of origin. The regressions include year-month and country of origin fixed effects.

¹⁹We discuss corrections for the staggered-adoption design in Appendix D.

Figure 5: Event study - The Philippines and Thailand



Notes: The horizontal axis is the time variable. Time is normalized such that 0 is the month when the reform came into force. The vertical axis is the number of tourist arrivals to the Philippines (in the left panel) or Thailand (in the right panel) from reform countries in deviation from control countries.

Sex tourism destinations: The results on Google searches using the list of sex tourism attractions *within* cities are presented in this section. In Table 6 we present our results from estimating regression 7. Including the full sample of countries that have adopted the Nordic model, the estimates are not statistically significant, and when we run separate regressions for each country that adopted the new law, we find a statistically significant coefficient only for Ireland, and it is negative. In all other countries, searches for attractions with a sex tourism connotation went up relative to other tourism attractions within the same cities, however not significantly.²⁰

²⁰These destinations are of course very heterogeneous in terms of distance from the origin country. In Table 11 we focus on the sample of shorter flying distance (in the bottom quartile, or below 1,25 hours flight). The reform has the effect of increasing these searches differentially. This sample is however considerably smaller.

Table 6: DID Regressions Results - Attractions

	(1)	(2)	(3)	(4)	(5)
	All	Canada	France	Ireland	Norway
Post \times ST	0.289 (0.529)	0.311 (1.336)	0.649 (1.494)	-1.497 (0.764)	1.300 (0.830)
Observations	14,008	3,811	4,429	2,781	2,987

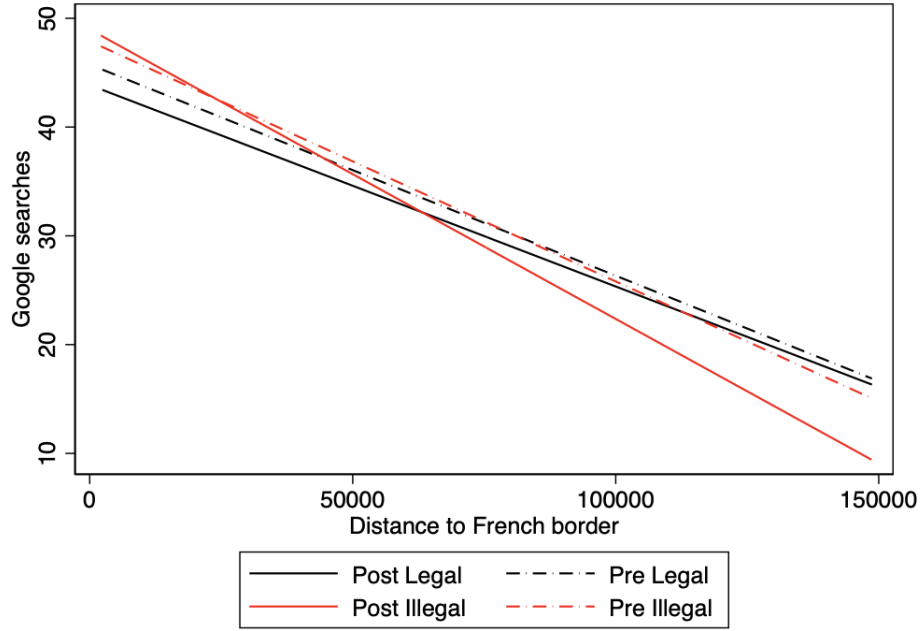
Standard errors clustered at destination level.

Notes: This table presents the results of DiD regression analyses. The dependent variable is the weekly index of Google Trends for searches related to city attractions. Column 1 displays the results for the sample of all four countries from which the searches originate. Columns 2 to 5 show the results for searches originating from Canada, France, Ireland, and Norway. All of the regressions include both week-fixed effects and destination-city fixed effects. The regressions displayed in Column 1 also include country of origin fixed-effects.

French-German border: We find no differential change in search behavior in France based on the legal status of prostitution in the searched German municipalities.

There is however a different gradient to distance. This is visualized in Figure 6. Within the bordering states, municipalities farther away from the French border are searched less frequently. This slope becomes more negative after the reform (i.e., even fewer searches for more distant cities), however only in municipalities with no legal prostitution. The solid and dashed black lines, indicating post- and pre-reform search interest at varying distance from the french border for municipalities with legal prostitution, are remarkably close. The red solid line, instead, is visibly tilted compared to the dashed red line, indicating lower searches for more distant municipalities without legal prostitution status.

Figure 6: Searches of German municipalities originated in France



Notes: The figure shows the slope of the weekly index of Google Trends for searches for municipalities in Germany originated in France on the municipality's distance from the French border.

Table 7: Searches from France for German municipalities

	(1) All	(2) Close	(3) Far
Post \times Legal	0.612 (0.451)	-1.708 (0.111)	2.934 (0.015)
Adj. R-Square	0.569	0.596	0.381
Observations	6234	3115	3119

Robust standard errors in parenthesis.

Notes: The dependent variable is the weekly index of Google Trends for searches for municipalities in Germany originated in France. All the regression include time fixed effects and municipality fixed effects.

Table 7 presents the results from the estimation of equation 8 using the number of searches

as outcome. This confirms that, on average, searches for municipalities with legal prostitution do not change after the reform, and in particular not close to the border. The difference between searches for municipalities where prostitution is legal compared to illegal is positive and significant only farther away from the border. However we know from Figure 6 that this positive difference is driven by a decrease in the latter rather than an increase in the former.

How does this reflect in actual tourism flows? Table 8 shows that foreign tourism (from all origins) to municipalities where prostitution is legal decreases after the reform compared to other places, and this difference is driven by municipalities farther away from the French border.

All in all, there seems to be a decrease in both interest and tourism flows to German municipalities, but this happens far away from the French border and in a way not systematically related to the legal status of prostitution in each municipality. We find therefore no reason to attribute these effects to the introduction of the Nordic model in France.

Table 8: Foreign tourism arrivals to German municipalities

Close				
	(1)	(2)	(3)	(4)
	Arrivals, ln	Overnight, ln	Arrivals, ch	Overnight, ch
Post \times Legal	-0.0357 (0.0759)	-0.155 (0.0850)		
Legal			5.883 (7.067)	-1.075 (7.880)
Observations	676	676	236	234
Far				
Post \times Legal	-0.104 (0.0306)	-0.0974 (0.0314)		
Legal			-7.583 (1.711)	-7.555 (1.999)
Observations	736	736	256	256

Robust standard errors in parentheses.

Notes: The dependent variable is the monthly inflow of foreign tourists to, and number of overnight stays at, municipalities in Germany, by distance to the French border.

7 Conclusions

In this paper, we study the causal effects of criminalizing the purchase of sexual services on sex tourism. Through diverse data and multiple sources of variation, we present a comprehensive view of cross-border spillovers caused by this prostitution legislation. We find a decline in Google searches, which serve as indicators of tourism interest, including sexual tourism, related to Canadian municipalities following the implementation of the Nordic model in Canada. This decrease is more pronounced in US states with stricter penalties for purchasing sex, where searches were more common prior to the reform. Seen from the point of view of Canada, these results suggest that adopting such legislation can benefit countries that are potential destinations for sexual tourism, in terms of reducing such activity. However, seen from the sending country, they also imply, indirectly, that harsher penalties for buying sexual services lead to stronger spillover effects in the form of sexual tourism to neighboring countries with more lenient legislation.

In the case of France, instead, we don't find any change in Google searches for, nor tourism flows to, German municipalities close to the French border where prostitution is legal. Recalling that the French legislation was quite different before the reform, already criminalizing (the sale of) sexual services, this finding points to the importance of pre-reform legislation and prevalent norms.

When bunching the four reform countries together, although results are not very robust, we observe a differential rise in tourism flows originating from these countries to the Philippines and Thailand, countries notorious for being sexual tourism destinations, at a time coinciding with the legislative changes. Additionally, in the period after the reform, we note an increase in Google searches for international sexual tourism destinations originating from these same countries, relative to other well-known tourist attractions within the same cities, at least within a certain proximity.

In conclusion, we find evidence of detrimental impacts of the Nordic model legislation on other countries in terms of increased sex tourism. We believe it is important to consider these spillover effects when formulating effective policies for the domestic market for sexual services. Measures such as raising public awareness about sex tourism and its adverse consequences, as well as imposing stricter penalties that encompass the purchase of sexual services even abroad, can help mitigate these negative effects.²¹ Simultaneously,

²¹The Norwegian ban on the purchase of sexual services, for example, is extra-territorial, i.e. it extends to Norwegians outside of the territory of Norway.

as the case of Canada shows, there is evidence to support the notion that implementing harsher punishments for buying sexual services may effectively alleviate the issue of sexual tourism in destination countries.

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Appendices

A Methodological note on Google Trends

Google Trends releases unbiased samples of Google search data, rather than the universe of searches. Given that the sample changes every day, we downloaded Google trends data every day for one month and averaged out the values to get a more accurate estimate of Google searches in the period of interest. Data provided by Google Trends do not report the absolute number of searches. Google Trends utilizes a normalization process that standardizes search results across both geography and time to enable comparison between terms. The resulting values range from 0 to 100 and represent the relative popularity of the term within the temporal interval of interest with respect to all the other searches. In detail, each data point is divided by the total searches of the geography and time range it represents, to compare relative popularity; the resulting values are then scaled on a range of 0 to 100 based on a topic 's proportion to all searches on all topics. Very low values are censored and appear as "0".

B Google bigrams

In the table below, we present the search results for both one-word searches and combined searches, originating from the four countries within our sample one year before and after the reform. We also include searches originated from around the world to demonstrate that even with a larger and more diverse sample, the data points remain too sparse to yield meaningful results. Given the lack of output for combined searches, our analysis focuses solely on the single-word search data.

Table 9: Examples of bigram VS unigram searches

Search Term	Canada	France	Ireland	Norway	Worldwide
	12/2013-12/2015	04/2015-04/2017	03/2016-03/2018	2008/01-2010/01	2004-2023
De Wallen	13.45	30.11	7.8	6.15	15.87
De Wallen + (prostitutes, escorts)	NA	NA	NA	NA	NA
Red light districts Amsterdam	NA	NA	NA	NA	NA
Soi Cowboy	12.73	12.31	NA	11.92	40.08
Soi Cowboy + (prostitutes, escorts)	NA	NA	NA	NA	NA
Red light districts Bangkok	NA	NA	NA	NA	NA
Istedgade	12.18	11.84	NA	5.64	50.21
Istedgade + (prostitutes, escorts)	NA	NA	NA	NA	NA
Bangla Road	12.70	15.90	NA	7.41	35.63
Bangla Road + (prostitutes, escorts)	NA	NA	NA	NA	NA

Notes: This table presents the mean of google trends results for one-words searches and combined words searches. NA stands for "not available" and it means that there are not enough search data for that term.

C Lists of sexual tourism destinations

City	Sexual Attractions	Other
Amsterdam	De Wallen	Vangogh Museum
Antwerp	Villa Tinto	Grote Markt
Bangkok	Soi Cowboy	Patpong, Watpho
Barcelona	La Rambla	La Sagrada Familia
Berlin	Tiergarten, Schoneberg	Branden Burggate, Reichstag
Brussels	Gare Du Nord, Rue De Brabant, Avenue Louise	Grand Place, Mini Europe, Atomium
Copenhagen	Istedgade	Tivoli Gardens, Nyhavn, The Little Mermaid
Hamburg	Reeper Bahn	St Pauli, Speicher Stadt, Hafen City
Patong	Bangla Road	Patong Beach, Freedom Beach
Pattaya	Walking Street	Jomtien Beach, Rosarito
Prague		Charles Bridge, Prague Castle
Rio de Janeiro	Copacabana, Ipanema	Sugarloaf Mountain
Tijuana	Zona Norte	
Tokyo	Kabukicho	Yanaka

D Staggered DiD

Recent papers argue that standard DiD regression estimates with staggered treatment timing are often biased (e.g. De Chaisemartin and D’Haultfœuille, 2020; Callaway and Sant’Anna, 2021; Goodman-Bacon, 2021). We start with replicating Table 10, computing the average post-treatment effect however re-weighting the treatment groups following the correction for dynamic effects developed by De Chaisemartin and D’Haultfœuille (2020). While effect size is the same or even larger for the case of Thailand, the procedure reveals that there is enough heterogeneity in the treatment effects for the different groups that it is possible that some of them are negative, and that their average is 0. Figure 7 further shows that, while comparisons of treated groups vs never-treated is almost always positive and close to the average (with one exception), the other comparisons vary more in size and sign, in particular when earlier treated are compared to later treated used as controls, the effect is always negative.

Figure 8 shows how the ATT is distributed across the different treatment groups, using the Callaway and Sant’Anna (2021) method. When it comes to dynamic effects over time, aggregating the treatment effects by length of treatment, rather than by calendar month as in Figure 5 we find no clear pattern.²²

Table 10: DID Regressions Results - The Philippines and Thailand

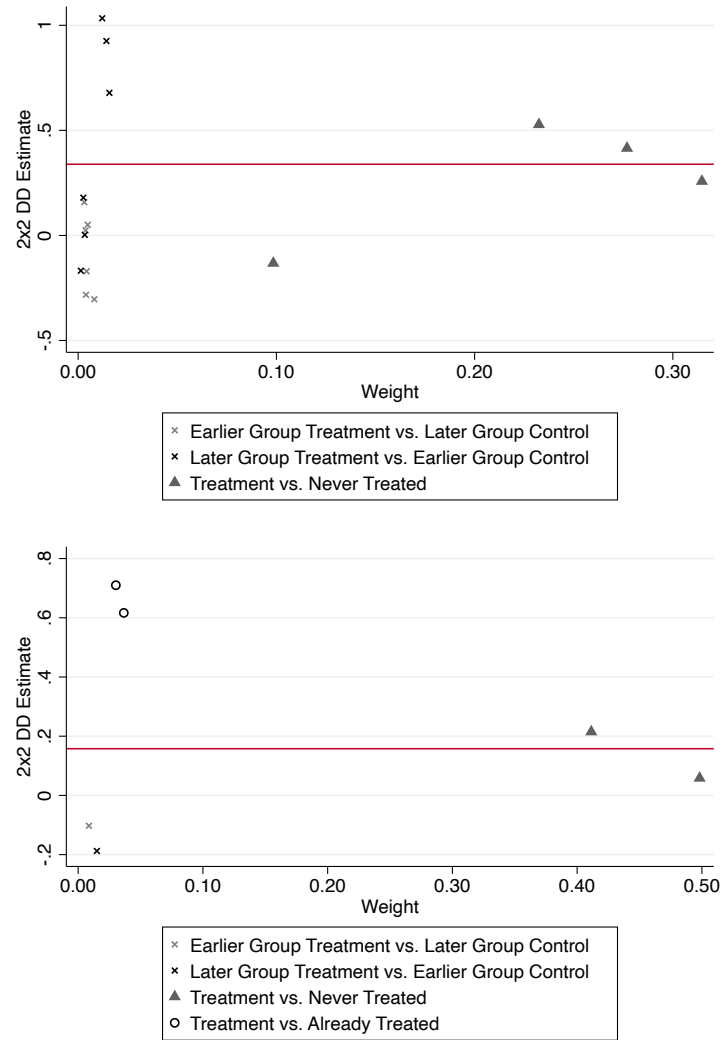
	(1)	(2)
	The Philippines	Thailand
RC \times Post	0.346	0.251
	(0.306)	(0.242)

Robust standard errors in parentheses.

Notes: The dependent variable is the number of tourist arrivals to the Philippines (column (1)) and Thailand (column (2)) standardized within the country of origin. The regressions include year-month and country of origin fixed effects.

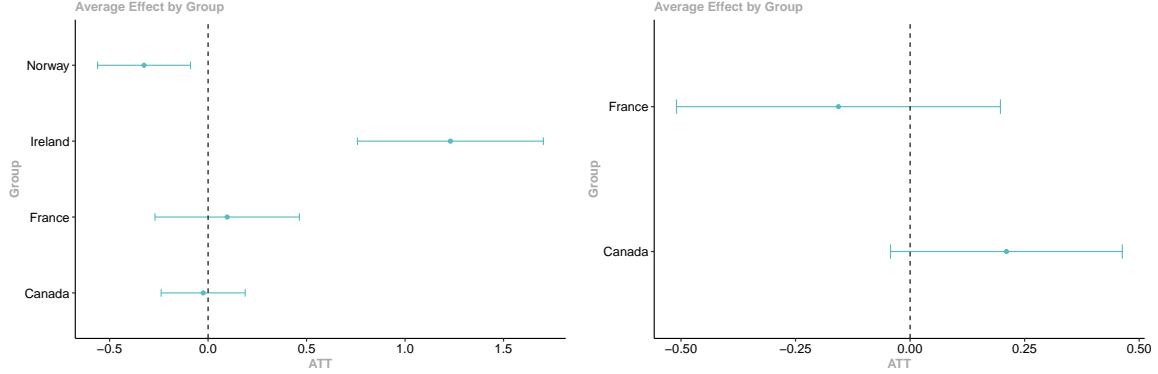
²²Figure not shown, can be requested to the authors.

Figure 7: Bacon decomposition - The Philippines and Thailand



Notes: The horizontal axis is the time variable. Time is normalized such that 0 is the month when the reform came into force. The vertical axis is the number of tourist arrivals to the Philippines (in the left panel) or Thailand (in the right panel) from reform countries in deviation from control countries.

Figure 8: Callaway and Sant’Anna group ATT



Notes: The figure plots group-specific ATT of the reform on tourist arrivals to the Philippines (in the left panel) or Thailand (in the right panel) from reform countries in deviation from control countries.

E Google searches of close-by attractions

We split the sample of Table 6, acknowledging that the change in behavior induced by the reform might be sensitive to distance. Searches for sex-tourism attractions increase differentially compared to other tourism attractions within the same cities in the admittedly smaller sample within the lowest distance quartile. This criterion excludes Canada, and the sample is composed by searches for only 5 cities (Amsterdam, Antwerp, Brussels, Hamburg and London), by 53% originating in France.

The time periods around each reform during which we measure the outcome do not overlap across treatment groups (i.e. countries). Therefore we believe that the issues related to staggered implementation do not apply to this case. If we nevertheless re-weight the group-specific ATTs following De Chaisemartin and D’Haultfœuille (2020), the heterogeneity is such that, although the resulting average effect is larger, it is not significantly different from 0.

Table 11: DID Regressions Results - Attractions by distance

	(1)	(2)	(3)
	All	Short flight	Long flight
Post \times ST	0.292 (0.529)	1.455 (0.665)	-0.0387 (0.703)
Observations	14008	3090	10918

Standard errors clustered at destination level.

Notes: This table presents the results of DiD regression analyses. The dependent variable is the weekly index of Google Trends for searches related to city attractions. All of the regressions include both week-fixed effects and destination-city fixed effects.