Human Trafficking and Regulating Prostitution*

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Abstract

Certain markets are illicit because the supply is *partly* coerced, but little is known about the optimal regulation of such markets. We model a prostitution market with voluntary and coerced prostitutes and ask what regulation can restore the benchmark outcome that would arise under laissez-faire absent coercion. Whereas current policies – decriminalization, criminalization of the buy or sell sides, and licensing – are ineffective against trafficking or harm voluntary suppliers, we show that an alternative policy can restore the benchmark outcome. Our results are relevant to the ongoing debate about decriminalizing prostitution and provide guidance for empirical work on prostitution regulation.

Keywords: Prostitution, trafficking, illegal goods, forced labor, coercion, slavery
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1 Introduction

Trade in a wide range of goods and services – including drugs, human organs, prostitution, and surrogacy – is often illegal. In many cases, the law intends to stop consumption entirely. Not all examples fit this category, however. Instead, certain markets involve both desirable and undesirable trade. This includes what we will call *semi-coerced* markets, where part of the supply is involuntary: Organ transplants are a pinnacle of modern medicine, but forced organ harvesting is socially undesirable. Voluntary sex transactions can be mutually beneficial, but sex trafficking is socially undesirable. Barring complex custody questions, surrogacy – a woman carrying a pregnancy for another person or couple – may meet the wants of the couple and the carrier; but forced surrogacy is socially undesirable. In fact, coercive labor relations have been common in many markets throughout history, and while since abolished in most forms, the International Labor Organization (ILO) estimates that there are still over 12.3 million forced workers worldwide (Andrees and Belser, 2009). Others estimate that about 600,000 are trafficked every year in the sex industry alone (Kara, 2009).

The regulatory objective in semi-coerced markets is not to stop consumption, but to stop coercion without infringing on voluntary supply. As the problem of clandestine, present-day slavery gains traction in policy circles, the debate often reveals that much is unknown about the optimal regulation of semi-coerced markets, and this paper starts to fill this gap. While our analysis is cast within the context of prostitution markets – within which it easily relates to current policies and the public debate – the broader points are likely applicable to other markets with forced and voluntary labor.

The debate about the regulation of sex markets was revived by Amnesty International's recent decision to support worldwide decriminalization of sex trade.[1] On one hand, voluntary sex workers argue that decriminalization helps all suppliers – voluntary as well as coerced – because it brings the sex market out of the underground.[2] Critics, on the other hand, argue that decriminalization invites trafficking. Both sides of this debate condemn trafficking, but since traffickers tend to evade prosecution, the search for alternative means has turned into a controversy about whether all prostitution should be banned.[3] There are two points of contention: First, there is disagreement about the *impact* of prostitution policy, with one side arguing that trafficking flourishes in a decriminalized market and the other that criminalization is, at best, futile against traffickers. Second, even if criminalization curbs trafficking, a *conflict* of interest remains as the law comes at the expense of voluntary prostitutes, forcing them underground where their safety is more at risk.

This lack of consensus on optimal policy is also reflected in the range of current regulatory policies

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[1]This debate has a long history (e.g., United Nations, 1959; Woolston, 1921). The New York Times (2012, 2015) gives an overview of key arguments. For a broad discussion, see Chuang (2010) and MacKinnon (2011).

[2]A UN commission cited similar concerns in its call to decriminalize prostitution (The Guardian, 2013).

[3]According to the U.S. Department of State (2011), in 2011, 4,239 out of 7,206 suspects were convicted of trafficking worldwide, and 41,210 trafficking victims were identified. While significant in absolute terms, conviction rates are small in comparison to overall trafficking estimates (at approximately 10 percent).

around the world, which include (a) decriminalization, (b) criminalizing prostitutes (which we refer to as the "traditional" model), (c) criminalizing johns (the "Swedish" model, as it was pioneered in Sweden), and (d) licensed prostitution (the "Dutch" model). Moreover, the link between policy and trafficking seems ambiguous: nearly every regulatory policy, except the Swedish model, is represented among the world's top trafficking destinations, as illustrated in Figure 1.

This paper informs this debate by using economic theory to analyze the optimal regulation of semi-coerced markets. Our analysis proceeds in two steps. First, we evaluate each of the policies (a) to (d) currently in place around the world. As we will see, none of them are capable of restoring the outcome that arises under laissez-faire absent trafficking. Second, we ask whether an optimal policy exists, which could implement this outcome.

Key to our model is the explicit differentiation between voluntary and coerced supply. Voluntary suppliers are not coerced into participation by a third party.[4] Their income from prostitution must thus at least match the forgone income from alternative job opportunities. An important literature has documented that, in practice, prostitution is better paid than many other low-skill, labor-intensive professions, and has proposed two explanations for this premium: a compensating differential for *occupational hazards* such as increased health risks (Rao et al., 2003; Gertler et al., 2005; Levitt and Venkatesh, 2007; Robinson and Yeh, 2011; Shah, 2013; Arunachalam and Shah, 2013); and a compensating differential for depreciated *marriage prospects* (Edlund and Korn, 2002; Edlund et al., 2009).[5] Which matters more may vary by cultural context, work environment, or market segment, so we choose an integrative approach and incorporate both in our framework.

Involuntary prostitutes are coerced into selling sex by traffickers who extort their income. Formally, coercion can be thought of as a labor relationship in which the employer relaxes the employee's participation constraint by lowering the latter's reservation utility, e.g., through violence or the threat thereof (Acemoglu and Wolitzky, 2011). That is, while traffickers incur the costs of running their criminal activity, they do not internalize the "participation costs" borne by their victims, such as those reflected in the compensating differential that voluntary prostitutes require. Essentially, traffickers and voluntary prostitutes supply the same good, but since traffickers do so through coercion, the two modes of supply have inherently different cost structures.

In Section 2, we begin with an analysis of an unregulated, decriminalized market for sex. We first characterize the equilibrium that would arise in the absence of trafficking, with only voluntary prostitution. This is the benchmark outcome that the regulator aims to restore in the presence of trafficking. We then introduce traffickers into the model and show, assuming direct prosecution is difficult, that decriminalization generically cannot eradicate trafficking because of the aforemen-

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[4]Voluntary prostitutes encompass women who choose to sell sex because it is lucrative, but also women who turn to prostitution because they find themselves forced to do so by economic circumstance. In the latter case, the term "voluntary" may not be the ideal description; for this reason, we use the terms "voluntary" and "non-coerced" interchangeably to underscore the fact that the key differentiator between voluntary and coerced supply in our framework is that voluntary suppliers are not forced into prostitution *by a third party*.

[5]Della Giusta et al. (2009) propose social stigma as another explanation for the premium. In our model, social stigma would be functionally equivalent to occupational hazards, and in addition, could be cast as a contributing factor to disadvantages in the mating market.

tioned cost differences.

Section 3 analyzes the effect of criminalization, first of the sell side and then of the buy side. We find that the presence of coerced supply can upend two orthodox policy arguments. First, the standard *indirect taxation* logic may fail: Proponents of criminalization argue that costs levied on sex trades (final goods) pass through to traffickers (intermediate producers) and thus make their business less profitable. What this argument overlooks is that the costs fall unequally on voluntary prostitutes and traffickers due to coercion, whereas market price adjustments affect them equally. Put differently, the law raises the compensating differential required by voluntary suppliers and induces some of them to exit, but if not all do, the ensuing price increase is large enough to sustain that differential for the voluntary suppliers who remain. But a price increase of such magnitude overcompensates traffickers, who do not fully internalize the costs borne by prostitutes, thus effecting a subsidy.

This "overcompensation effect" makes the impact of criminalization non-monotonic. For example, higher arrest rates raise trafficking as long as some supply is voluntary, but reduce trafficking once all voluntary supply has exited the market. Thus, depending on parameters (a point elaborated on in Section 6), criminalization as well as decriminalization can increase trafficking. This means that neither side of the debate is necessarily wrong, and is consistent with the ambiguous link between (de)criminalization and trafficking.

Second, in semi-coerced markets, the *legal incidence* of taxes or penalties is not irrelevant. This is because part of the supply is coerced, and therefore fails to respond to certain penalties imposed on suppliers. All demand, on the other hand, is voluntary. This "asymmetric voluntariness" of the market has the crucial implication that buy-side and sell-side criminalization differ in their potential to eradicate trafficking. Criminal punishment of prostitutes, however severe, always weakly increases trafficking (sometimes strictly via the overcompensation effect). By contrast, sufficient punishment of johns could in principle deter all demand for prostitution and thus eliminate trafficking. This may explain why the Swedish model is the only policy that is not represented among top trafficking countries.

In Section 4, we evaluate the Dutch model of licensed prostitution. The general argument for occupational licensing is that it ensures quality of supply, though critics accuse it of being a facade for creating cartel rents within the licensed occupation by reducing supply.[6] In sex markets, this criticism is moot because the objective *is* to screen out "low-quality," trafficked supply. So long as the Dutch model can accomplish the intended restriction in licensed supply – by not granting licenses to trafficking victims – it dominates two of the three previously analyzed policies. First, it is more effective against trafficking than the traditional model. This is because, by legalizing voluntary supply, it avoids the overcompensation effect. Second, by criminalizing unlicensed supply, it is more aggressive on trafficking than decriminalization, while permitting the same level of voluntary supply. While the Dutch model dominates the traditional model and decriminalization, however, it

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[6]Critics favor certification to signal quality without limiting entry. Kleiner and Krueger (2013) estimate that about 30 percent of the U.S. labor force works in licensed occupations and provide evidence in support of the criticism.

does not have the potential of the Swedish model to eradicate trafficking, which will persist in an "underground" market serving johns to whom it does not matter if their counterparty is unlicensed (so long as the price is "right"). This is because the Dutch model imposes penalties on the "wrong" side of the market – the supply side.

Our analysis enables a comparison of current policies along the main dimensions spanning the public discourse: effectiveness against trafficking (impact) and infringement of voluntary prostitution (conflict). The traditional model (criminalizing prostitutes) is dominated by the Swedish model (criminalizing johns), and decriminalization is dominated by the Dutch model (licensed prostitution). Choosing between the undominated models involves a trade-off. The Dutch model permits voluntary supply but cannot eliminate trafficking. The Swedish model can eliminate trafficking, but only if it also eliminates voluntary supply. Thus, this asks of lawmakers to weigh the war on trafficking against the civil liberties of voluntary prostitutes. Indeed, an emerging consensus view is that these two models are currently the "main legislative options" although "based on opposing views of the system of prostitution" (European Women's Lobby, 2012).

From this one may be tempted to conclude that tension between the impact and conflict dimensions is inevitable in prostitution market regulation. But in Section 5 we look beyond current policy and propose that this tension may be resolved by a hybrid of the Dutch and Swedish models: licensing prostitutes and criminalizing sex *purchases* from unlicensed ones. Johns will discount unlicensed transactions, pricing in the risk of arrest. The price differential induces voluntary suppliers to self-select into the licensed sector, leaving only trafficking in the unlicensed sector. Given this separation, severe penalties for purchases in the unlicensed sector can divert all demand to voluntary suppliers in the licensed sector, thereby destroying traffickers' business. This restores the benchmark outcome set by the laissez-faire equilibrium absent coercion. Seen through the insights of Sections 3 and 4, the optimality of the Dutch-Swedish model rests on a disarmingly simple logic: it is uniquely tailored to deal with both of the policy distortions created by semi-coerced supply, the overcompensation effect (through licensing, as the Dutch model) and asymmetric voluntariness (by targeting demand, as the Swedish model).

Section 6 presents model extensions that stress three implications for empirical work.[7] First, the impact of (de)criminalization is context-dependent. For example, criminalization likely curbs trafficking in countries with high gender equality, but may raise trafficking in countries where female labor market participation is low. Second, political support for a ban on prostitution likely depends on the same factors that determine its effect on trafficking. That is, "selection" (into adoption of a policy) and "impact" (of the policy) can covary, reinforcing concerns that laws successful in some countries could backfire in countries hesitant to adopt them. Third, in the presence of cross-border flows, laws that raise a country's *own* trafficking inflow may reduce *global* trafficking levels. Hence, focusing only on the country that adopts a particular law may capture partial effects that are

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[7]Evaluating the impact of prostitution laws on trafficking empirically is challenging due to lack of data. Recent work by Cho et al. (2013) and Jakobsson and Kotsadam (2013) has made important progress with indices based on data by the United Nations Office of Drugs and Crime (UNODC) and the International Labour Office (ILO). Both studies find that (countries with) stricter laws against prostitution are associated with smaller trafficking (in)flows.

opposite to its global impact.

Our paper contributes to the theory on illegal goods. The classic policy objective in this literature is to stop consumption of the good in question, but legalization may be optimal if illegal activity generates significant negative externalities (Becker et al., 2006). In addition, Thursby et al. (1991), Cho et al. (2013), and Hsiang et al. (2016) note that, when there is desirable and undesirable trade, legalization need not always reduce illicit activity. Whether it does depends on supply and demand elasticities in the two market segments, which may in turn depend on many factors. This ambiguity motivates empirical analyses in those papers. This paper narrows down the difference between desirable and undesirable trade to whether supply is voluntary or coerced, and microfounds this distinction within a prostitution model. This allows us to isolate how the presence of coerced supply distorts the impact of policies, which we use to evaluate policies for markets where coercion is the main regulatory concern. Our main result, the derivation of a novel optimal policy, illustrates the benefits of both the narrow focus and the normative perspective.[8]

The motivation to unpack the controversy about sex trafficking and prostitution through a model is owed to recent theoretical analyses of coercive labor relationships. Acemoglu and Wolitzky (2011) study a principal-agent model with moral hazard in which the principal can reduce the agent's reservation utility through the use of costly coercion ("guns"), and in turn the general-equilibrium relationship between labor scarcity and coercion levels. We abstract from many of the aspects included there (such as e.g., agent effort) but borrow the core idea that coercion means that agents' participation constraints need not be (fully) respected. We embed this idea in a market where coerced and voluntary suppliers compete and, assuming that coercion itself is difficult to prosecute, examine how "product market" regulations affect the two types of supply. Friebel and Guriev (2006) develop another theory of trafficking in which illegal migrants agree ex ante (at the origin) to bondage ex post (at the destination) as commitment to repay their smugglers for financing the transport. This alternative theory also has interesting policy implications, but since no ex ante partipation constraint is violated in the (migrants') entry decision, we conjecture that neither the overcompensation effect nor asymmetric voluntariness would emerge if "non-trafficked" competitors were added into the model.

Our analysis also contributes to the theoretical literature on prostitution by integrating voluntary sex work and trafficking, and microfounding differences in their response to criminalization. Edlund and Korn (2002) and Della Giusta et al. (2009) develop positive theories of voluntary prostitution. Akee et al. (2014) focus exclusively on trafficking flows, and study how law enforcement impacts those flows in a transnational setting. Immordino and Russo (2015) focus exclusively on voluntary prostitution and compare the merits of various policies. Cameron and Collins (2003) and Collins and Judge (2010) study demand-side determinants. Farmer and Horowitz (2013) examine the role of pimps as (non-coercive) intermediaries. In separate work, Lee and Persson (2016) study the influence of prostitution laws on violence encountered by *voluntary* prostitutes inside the market for sex.

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[8]We discuss how factors other than coercion would affect our results at the end of Sections 3.2 and 5.2.

There is also a large empirical literature on prostitution, though only a few recent works identify the impact of policy on the sex market. Gertler and Shah (2011) show that tightened law enforcement in one sector increases the price of sex in that sector and pushes sex workers into another, parallel sector. Cunningham and Shah (2018) analyze the reverse policy change, decriminalization, and show that it induces market expansion and price decreases. Bisschop et al. (2017) study how legalization and introduction of licensing in the Netherlands affected market sizes, prices, and the security of prostitutes.[9] The findings in these papers are consistent with our model.

2   Decriminalized Prostitution

We start by studying a decriminalized market for prostitution. This is an unregulated market with no licensing, no "red light districts," and no laws prohibiting the sale or purchase of sex. We analyze this market in two steps. First, we assume that all prostitution is voluntary (not coerced by a third party) and characterize the equilibrium outcome. In the second step, we add sex trafficking and examine its impact on the equilibrium outcome.

2.1   Voluntary (non-coerced) prostitution

Without being coerced by someone else, a woman deciding whether to become a prostitute faces the standard economic problem of comparing the expected income to the anticipated costs. The equilibrium income of a non-coerced prostitute – i.e., the price of sex – therefore depends on, and must compensate for, the costs of prostitution. As in any labor market decision, one cost of choosing to work as a prostitute is the foregone earnings from another job, if available. On top of this standard opportunity cost, the literature on prostitution has highlighted two additional costs of working in the market for sex: occupational hazards such as increased disease risk (see, e.g., Rao et al., 2003; Gertler et al., 2005; Arunachalam and Shah, 2013) and marriage market opportunity costs, such as a worse pool of potential spouses or worse treatment inside marriage (Edlund and Korn, 2002; Edlund et al., 2009). In order to fully characterize the costs of prostitution that have been highlighted in the literature, our framework incorporates both of these additional costs of working as a prostitute. We do this by modeling two markets for sexual interaction (as Edlund and Korn, 2002): a labor market for prostitution and a marriage market.

Population. There is a mass of females and a mass of males with the size of each group normalized to one.[10]

Labor supply endowments and the "regular" labor market. Each person has one unit of labor to supply, and there is an exogenous labor market where men face wage y and women wage w (when not selling sex).

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[9]Also see Cunningham et al. (2017), who relate the safety of prostitutes to the introduction of an online sex market clearinghouse, and Ciacci and Sviatschi (2018) who analyze the impact of openings of (legal) adult entertainment businesses on sex crime.

[10]This implies a sex ratio of one. It is straightforward to extend our model to other sex ratios, with the simple effect that the demand for prostitution increases with the share of men. We abstract from this effect in our analysis to focus on other determinants of prostitution.

Markets for sexual interaction. Sexual interaction between men and women occurs in two markets: First, there is a market for prostitution where (non-reproductive) sex is sold at unit price p_s and valued by men at e per unit. A woman can convert her unit of labor supply to $s > 1$ units of non-reproductive sex, but the occupational hazards of prostitution impose disutility h on her. Second, sexual interaction also occurs in a marriage market (reproductive sex). Men place value k on marriage and must pay spouses a "price of marriage" p_m, which can also be interpreted as (investment into the) "quality of marriage." For simplicity, we assume women value neither marriage nor non-reproductive sex intrinsically.[11] Strictly speaking, the marriage market need not be a market for *marriage*; throughout the paper we use the terms "marriage" and "mating" interchangeably, as monogamous relations do not require marriage and may graduate through various stages (Persson, forthcoming).

Female economic problem. Each woman chooses either to marry and work in the "regular" labor market or to be a prostitute, and picks the option that maximizes her total income. A concern with modeling these as mutually exclusive options is that it is inconsistent with real-world evidence that prostitutes sometimes simultanously hold other jobs (Cunningham and Kendall, 2014) and are not necessarily less likely to be legally married (Arunachalam and Shah, 2008). However, this assumption is made for convenience only; it merely simplifies the analysis and does not drive our results. As we discuss further below, our results emerge so long as prostitutes face some form of "discount" outside of the market for sex, such as lower "prices" (e.g., lower income from regular labor or worse treatment by the spouse in the marriage market) or lower "quality" (e.g., fewer available working hours or a worse pool of potential spouses).[12]

Male economic problem. Each man allocates his whole labor income to his marriage or to prostitution or divides it between both, and he maximizes his consumption utility. By construction, the number of unmarried men is equal to the number of prostitutes, denoted by n.[13]

Key parameters. Defining the following parameters will facilitate the exposition of our analysis:

$$\omega \equiv w + h \qquad \text{(female effective wage)}$$

$$\rho \equiv \frac{y}{\omega} \qquad \text{(effective wage ratio)}$$

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[11]Specifying intrinsic female preferences over mating and prostitution would allow parameter constellations for which women buy sex from men in one or both markets. As is, the model restricts attention to the case where men buy sex from women, and it only remains to specify the parameters for which both markets exist (Assumption 1 below). This "gender-biased" modeling choice simplifies the analysis.

[12]An article on Nevada's *legal* brothels illustrates how prostitutes are socially stigmatized in a manner that, by any reasoning, excludes them from parts of the "regular" labor and mating markets (Ditmore 2009):

> Some counties and towns impose some extraordinary restrictions on commercial sex workers. The net effect of these regulations is to separate sex workers from the local community. Some jurisdictions require brothel prostitutes to leave the county when they are not working, while others take the opposite tack, forbidding them to leave the brothel where they work. Some do not allow the children of the women who work in the brothels to live in the same area.

[13]In Edlund and Korn (2002), a man spends all his income on sex or marriage, or both, and on consumption. For simplicity we dispense with his consumption, whose addition would not alter our main findings. For empirical support of the assumption that (also) married men buy commercial (extra-marital) sex, see, e.g., Farley et al. (2011), who analyze a sample of U.S. commercial sex buyers and find that about half of all men who patronize prostitutes are married.

$$\sigma \equiv \frac{se}{k} \qquad \text{(male preference ratio)}$$

First, because prostitution entails a utility cost h due to occupational hazards, h can be interpreted as a premium on work in the regular labor market, on top of the wage w. We let ω denote this "effective female wage" in the regular labor market, $\omega \equiv w + h$. Second, to capture wage inequality in the regular labor market, we define the "effective wage ratio" as the ratio between men's and women's effective wages in the regular labor market, $\rho \equiv \frac{y}{\omega}$. The higher is ρ, the higher are male earnings relative to female effective earnings in the regular labor market. Third, the "preference ratio" σ measures men's intrinsic valuation of s units of prostitution relative to one unit of marriage. A low σ means that men, depending on perspective, value prostitution less or discount it more.

The following parametric assumption ensures positive prices and allows us to focus on equilibria in which there is activity in both markets:

Assumption 1. $\sigma > 1$ *and* $\rho \in [\frac{1}{\sigma-1}, \frac{\sigma}{\sigma-1}]$.

The constraint on σ ensures that men's demand for prostitution is positive in equilibrium, while the constraint on ρ ensures that some but not all women choose to supply prostitution in equilibrium.

Equilibrium. An equilibrium of this model is a triple (p_m, p_s, n) that satisfies the following conditions:

$$sp_s - h = p_m + w \qquad (1)$$
$$\frac{p_s}{e} = \frac{p_m}{k} \qquad (2)$$
$$nsp_s = (1-n)(y - p_m) + ny \qquad (3)$$

Women must be indifferent between working as a prostitute and their outside options ((1)). Men must be indifferent to shifting income between the two types of sex, which requires that the per-util prices of sex are equalized ((2)). Markets clear when all male income not spent on marriage is spent on prostitution ((3)). Note that, since women and men are homogenous groups in our setup, both voluntary supply and male demand are perfectly elastic in p_s, all else equal. This has the benefit that we isolate the effect of *coercion* on the impact of policies. We elaborate on this point (and discuss alternative elasticities) at the end of Section 3.2.

The two indifference conditions (1) and (2) yield unique marriage and prostitution prices, denoted by p_m^* and p_s^*, respectively. Given the prices, the market clearing condition (3) pins down a unique size of the prostitution market (number of prostitutes), denoted by n^*.

Proposition 1 (Social Optimum). *In a decriminalized market without sex trafficking, the equilibrium is $p_s^* = \frac{\omega}{s(1-1/\sigma)}$, $p_m^* = \frac{\omega}{\sigma-1}$, and $n^* = \rho - \frac{1}{\sigma-1}$.*

Proof. See the text above. $\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad$ □

The outcome described by Proposition 1 is the benchmark outcome that, in the presence of trafficking, the social planner wants to restore using regulation.

Before introducing trafficking, we examine what drives economic behavior in this market.

Corollary 1. *In a decriminalized market in the absence of trafficking, voluntary prostitution (i) decreases with women's effective wage in the regular labor market ω but (ii) increases with men's wage y and men's valuation of prostitution relative to marriage σ.*

Proof. This follows directly from Proposition 1. $\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\square$

A rise in women's effective wage ω (i.e., in wage w or in occupational hazards h) raises the opportunity cost of working as a prostitute, and thus lowers the supply of prostitution. A rise in male income y or male fondness of prostitution relative to marriage σ increases the demand for prostitution.[14] Together these comparative statics imply that, for constant average income, voluntary prostitution increases with the effective wage ratio $\rho = \frac{y}{w}$, that is, when men earn more relative to women in the regular labor market. Finally, note that the wage premium that prostitutes earn in excess of their outside options in the regular labor market is $\Delta \equiv s p_s^* - w = h + p_m^*$, reflecting the main explanations proposed in the literature: compensating differentials for occupational hazards h and the foregone marriage premiums p_m^*.

2.2 Sex trafficking

The United Nations Convention against Transnational Organized Crime (2000) defines trafficking as the "recruitment, transportation, transfer, harboring or receipt of persons by means of threat of force, fraud, deception, or the abuse of power." Common to the "means" listed at the end is that they are used to make a person take an action against her own interest, or in economic jargon, even though her participation constraint is actually violated. This corresponds to the definition of coercion in Acemoglu and Wolitzky (2011)'s model, where principals choose coercive effort to lower agents' reservation utilities when "hiring" them, thus violating the latter's intrinsic participation constraints. In essence, coercion is a costly way to avoid compensating agents for their participation costs. We introduce the simplest possible version of this idea into our model: by incurring a given cost of coercion (trafficking), a trafficker can fully ignore a woman's participation constraint and force her to sell sex.

Not integral to the definition of trafficking is cross-border transportation. Indeed, some estimate that most trafficking victims in the United States are domestic (Estes and Weiner, 2001). Here we abstract from cross-border issues, but we will discuss them later in Section 6.3.

Costs of trafficking. The total number of trafficking victims is denoted n_t, with subscript t indicating trafficking. We assume traffickers incur a cost $c(n_t)$ per trafficked woman that is a function of the total number of trafficking victims n_t with the following properties:

Assumption 2. *$c(\cdot)$ is differentiable, $c'(\cdot) > 0$, $c(0) = 0$, and $c(1) > y$.*

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[14]The effect of y can be different if men's intrinsic valuation of marriage changes with income. For example, Edlund and Korn (2002) consider a model extension where men care about child quality, and child quality increases with the income pooled in marriage. In this setting, voluntary prostitution can decrease with male income. We abstract from this aspect since we focus on sex trafficking which, as we will show, unambiguously increases with male income. Indeed, as will be clear from our results later, the predictions of our model on sex trafficking would be stronger if a rise in male income were to reduce voluntary prostitution.

$c'(\cdot) > 0$ implies that trafficking exhibits decreasing returns to scale. The idea is that, as n_t grows, scale and competition make it more difficult for (each of) the traffickers to conceal their activity from law enforcement or to find and appropriate victims. This assumption has intuitive appeal, but is made for analytical convenience and all results remain if we dispense with it.[15] The boundary assumptions $c(0) = 0$ and $c(1) > y$ rule out that all or no women are trafficked.

Revenue and profits of trafficking. Trafficked prostitutes sell sex at the same competitive price as voluntary ones, but their revenues are fully extorted by their traffickers. Assuming free entry, we impose that traffickers make zero profit in equilibrium:

$$sp_s = c(n_t). \tag{4}$$

Note that the traffickers pocket all of the profits and incur costs that are independent of the trafficking victim's participation costs. This means that trafficking victims receive *zero* compensation for foregone labor income, foregone mating opportunities, or the occupational hazards of prostitution. Thus, $c(n_t)$ is purely the cost of (organizing the) coercive activity, and coercion is complete insomuch as the victims are not compensated *at all*. This is perhaps extreme but not crucial; the main insights remain valid as long as there is *some* coercion so that trafficking victims are not fully compensated for participation costs.

Total prostitution. Total prostitution n is now the sum of trafficked prostitution n_t and voluntary prostitution n_v. Two possible cases emerge in equilibrium: $n_t < n$ (case A) and $n_t = n$ (case B). In case A, the market is served by coerced and voluntary prostitutes. In case B, all women strictly prefer working in the regular labor market over prostitution (rather than being indifferent), so the demand for prostitution is met exclusively by trafficking. We describe each case in turn.

Case A: Equilibrium under co-existence. When trafficked and voluntary prostitutes coexist in the market, the equilibrium is characterized by the indifference and market clearing conditions (1)-(3) in a decriminalized market without trafficking, along with the traffickers' zero profit condition (4). Recall from Section 2.1 that (1)-(3) uniquely pin down prices p_s^* and p_m^*, and total prostitution n^*. It remains to decompose total prostitution into voluntary and coerced. Using p_s^* in (4),

$$\frac{\omega}{1 - 1/\sigma} = c(n_t), \tag{5}$$

yields a unique solution $n_t > 0$. If this solution is smaller than n^*, we indeed have coexistence with $n_v = n^* - n_t$.

Case B: Equilibrium with only trafficking. By contrast, if the solution to (5) exceeds n^*, the women's indifference condition (1) must be replaced by $sp_s - h \leq p_m + w$. Then, (2) and (3) pin

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[15]This assumption is convenient, as it ensures that the equilibrium value of n_t is a smooth function of all parameters. It is not essential to our results, however: With non-decreasing returns to scale, the direction of the impact of the various policies analyzed further below would remain the same, with the difference that trafficking would respond in a "bang-bang" fashion, discontinuously switching between inexistence and maximum scale.

down prices for prostitution and marriage as a function of $n = n_t$:

$$p_s = \frac{y\sigma}{s(n\sigma + 1 - n)} \qquad \text{and} \qquad p_m = \frac{y}{n\sigma + 1 - n}.$$

Substituting the expression for p_s into (4),

$$\frac{y\sigma}{n\sigma + 1 - n} = c(n), \tag{6}$$

yields a unique solution for n, all of which is trafficking in this case.[16]

Next, we compare the equilibrium in a decriminalized market in the presence of trafficking to the benchmark equilibrium absent of trafficking.

Proposition 2 (Decriminalized Market). *In a decriminalized market, trafficked prostitutes always make up a strictly positive share of the prostitution market. If some women voluntarily choose to supply sex, so that trafficked and voluntary prostitutes coexist in the market (case A), then the size of the prostitution market is the same as in the benchmark equilibrium, but for each trafficked prostitute, one less woman chooses to voluntarily supply sex. If trafficking crowds out all voluntary prostitution (case B), then the (entirely coerced) prostitution market is larger than in the benchmark equilibrium, and the prices of both prostitution and marriage are lower than in the benchmark equilibrium.*

Proof. See the text above. □

The reason trafficking captures a strictly positive share of a decriminalized prostitution market *is* coercion: Traffickers internalize the revenue from prostitution, but neither hazards nor opportunity costs borne by the trafficked prostitutes. This represents a "cost advantage" for traffickers relative to voluntary prostitutes, who internalize revenues as well as those costs. This cost advantage of traffickers over voluntary prostitutes offsets trafficking costs (at least, up to a certain scale) and hence enables them to seize part of, or the entire, market.

In case A, traffickers' cost structure is such that they want to supply $n_t < n^*$ trafficked prostitutes (recall n^* is the market size in the benchmark equilibrium). The remainder of the market is serviced by women who voluntarily choose to sell sex. These voluntary prostitutes are the marginal entrants who – just as in the benchmark equilibrium – pin down the price of sex. Thus, in case A, the prices in and the sizes of the prostitution and marriage markets are the same as in the benchmark equilibrium; the difference in the presence of traffickers is that some voluntary prostitution is crowded out by trafficking.

In case B, trafficking is so cheap that traffickers supply as many prostitutes as there are in the benchmark equilibrium or more, driving the price of prostitution below the participation cost of voluntary prostitutes and seizing the whole market. The (coerced) supply of cheaper sex also puts downward pressure on the price, or quality, of marriage for women. So, on top of coercing their

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[16]To see that the equilibrium solutions of the two cases connect smoothly, note that the solutions to (5) and (6) are identical if and only if $\frac{y\sigma}{n_t\sigma + (1 - n_t)} = \frac{w}{1 - 1/\sigma}$. This, when solved for n_t, is equivalent to $n_t = n^*$. That is, the two solutions coincide once, and do so exactly at the point where trafficking completely displaces voluntary prostitution.

victims, traffickers in this case impose a negative externality even on those women who are not coerced to supply sex.

2.3 Contraction, substitution, and asymmetry

The crux of a semi-coerced sex market is that voluntary prostitutes and traffickers compete to supply the same good (non-reproductive sex) but operate under inherently different cost structures. The cost differences stem from the fact that traffickers externalize through costly coercion some of the costs borne by prostitutes, such as forgone labor income, forgone mating opportunities, and occupational hazards. Hence, changes in these factors affect the costs of the two types of suppliers differently and thereby shift their relative market shares. Because this will also be the key to understanding the impact of prostitution laws, we illustrate this before turning to policy analysis with a pair of corollaries that revisit the "supply-side" and "demand-side" comparative statics from Corollary 1.

Corollary 2. *Consider a decriminalized market in the presence of trafficking. A long as some women choose to supply sex voluntarily (case A), an increase in women's effective wage in the regular labor market ω yields a reduction in voluntary prostitution and in the total size of the prostitution market, but an increase in trafficking. Once ω is so high that no woman chooses to supply sex voluntarily (case B), further increases in ω have no effect on the prostitution market.*

Proof. See Appendix. $\square$

.Recall that the effective wage $\omega = w + h$ comprises a prostitute's outside option in the regular labor market w and the occupational hazards of working as a prostitute h. For low ω, voluntary prostitution and trafficking coexist in the market (case A). An increase in ω affects voluntary prostitutes and traffickers differently. For voluntary prostitutes, the higher ω raises the participation costs and causes some to exit the prostitution market (part i of Corollary 1). For traffickers, there is no such direct effect of ω, as they do not internalize the participation costs of their victims. Traffickers are affected indirectly, however, since the exit of voluntary prostitutes raises the price of prostitution, until the compensating differential reflects their higher participation costs. This makes trafficking *more* attractive, so the supply of trafficking victims increases. This effect applies so long as there are voluntary prostitutes in the market. Once ω is so high that no more women enter into prostitution by their own volition (case B), further increases in ω have no effect on the (now fully coerced) prostitution market.

Corollary 3. *Consider a decriminalized market in the presence of trafficking. As long as some women choose to supply sex voluntarily (case A), a decrease in men's relative preference for prostitution σ yields a reduction in voluntary prostitution and in the total size of the prostitution market, but an increase in trafficking. Once σ is so low that no woman chooses to supply sex voluntarily (case B), further decreases in σ reduce the size of the (entirely coerced) prostitution market, and hence the number of trafficked prostitutes. Thus, there is a non-monotonic relationship between men's preference for prostitution σ and the prevalence of trafficking.*

Proof. See Appendix. □

Recall that a decrease in the male preference ratio σ means men's fondness of marriage relative to prostitution increases. This raises the demand for marriage and lowers the demand for prostitution. When trafficking and voluntary prostitution coexist (case A), the demand shift pulls non-coerced women out of the prostitution market into the marriage market. As a result, there is a decrease in voluntary prostitution (part ii of Corollary 1). One might also expect a decrease in trafficking when demand shifts from prostitution to marriage. Perhaps surprisingly, this is not the case because the exit of voluntary suppliers from the prostitution market offsets the downward pressure on the price of prostitution generated by the demand shift, and in fact, will push the price of prostitution *up* until the compensating differential reflects the increased price of marriage, $\Delta = h + p_m^*$. This makes trafficking *more* attractive, as traffickers do not internalize p_m^*. This effect disappears, however, once p_m^* is so high that every woman prefers marriage to prostitution (case B), from which point onward any further decreases in σ reduce trafficking.

These corollaries bring out two crucial aspects of semi-coerced markets. The first aspect is that any increase in the participation costs of prostitutes – occupational hazards, forgone other labor income, or forgone gains from mating opportunities – reduces overall prostitution since the supply of non-reproductive sex becomes costlier, and at the same time, widens the comparative advantage of traffickers since they do not internalize any such cost. As a result, the *contraction* of the overall prostitution market comes hand in hand with more trafficking as *substitution* for voluntary prostitution, while the two types of supply coexist. The second aspect is that, when there is no (more) voluntary prostitution, the parameters in the women's participation constraint no longer impact the prostitution market (Corollary 2), whereas the parameters in the men's consumption choice continue to have an impact (Corollary 3). This reflects the *asymmetry* that part of the supply but none of the demand is insensitive to costs that determine *voluntary* participation.

3 Criminalizing Prostitution

The first policy that we analyze is an outright ban on prostitution. The simple argument for such a law is that making the trade of the final good (non-reproductive sex) more expensive or difficult discourages the supply thereof, including trafficking. In this section, we establish an important caveat to (the last part of) the argument: In semi-coerced markets, it is rather plausible that a ban leads to more trafficking (over some range), not because of confounding factors but because of the nature of trafficking as a coercive activity. For clarity, we analyze laws against the *sale* of sex and the *purchase* of sex separately to isolate the impact of each measure.

3.1 Criminalizing prostitutes (Traditional model)

We refer to laws against the sale of sex as the "traditional" model because most governments in the world criminalize sex work. Moreover, before Sweden's prostitution law reform in 1999, johns

were rarely prosecuted even in countries where the law on the books criminalized both sides of the market.[17]

Modeling criminalization of the sale of sex. Assume that the police is ordered to arrest prostitutes, but because policing is imperfect, a prostitute only faces a probability $q < 1$ of being arrested. We abstract from the public resources spent on law enforcement and consider only the effect on prostitution. When a prostitute is arrested, her income is confiscated and she bears a criminal penalty κ_s. Traffickers remain undetected and go unpunished, though they lose the income from trafficked prostitutes that are arrested.[18]

The law also raises the "cost of doing business" as sex transactions are handled differently to escape law enforcement. Some incremental costs, denoted by l_1, are administrative (e.g., communication, payment, or location choice) and incurred by both traffickers and voluntary prostitutes. Other costs, denoted by l_2, are experiential (e.g., a less hygienic or more unsafe work environment) and borne only by those directly involved in the sexual exchange, i.e., by prostitutes but not traffickers.[19] In sum, when the sale of sex is criminalized, both voluntary prostitutes and traffickers face higher costs and expect some loss of income.

Equilibrium conditions. Criminalization of prostitutes affects the equilibrium conditions that characterize supply: The women's indifference condition (1) and the traffickers' zero-profit condition (4) must be modified to, respectively,

$$s(1-q)p_s - h - l_1 - l_2 - q\kappa_s = p_m + w \tag{7}$$

$$s(1-q)p_s = c(n_t) + l_1. \tag{8}$$

We can conveniently rewrite (7) as $s(1-q)p_s = p_m + w + h'$, where $h' \equiv h + l_1 + l_2 + q\kappa_s$ is a modified occupational hazard measure that reflects the increased costs of being a prostitute.

Next, we derive the equilibrium under criminalization of the sale of sex and compare it with the equilibrium that obtains under decriminalization in the presence of trafficking.

Proposition 3 (Traditional Model). *Criminalizing prostitutes always reduces the total size of the prostitution market. As long as some women choose to supply sex voluntarily (case A), criminalizing prostitutes reduces voluntary prostitution but increases trafficking. When no woman chooses to supply sex voluntarily (case B), penalties on prostitutes that are partly borne by traffickers reduce*

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[17]The 1959 United Nations Study on Traffic in Persons and Prostitution noted at the time that "whenever the law inflicts penalties on the client as well as on the prostitute, experience shows that, in practice, the repressive measures are enforced on the prostitute alone" (p.11).

[18]Empirically, the risk of conviction for traffickers seems negligible; not only is their risk of arrest small but their victims are often too afraid to testify against them. For example, although trafficking is illegal in the United States, only 130 traffickers were convicted from 2001 to 2005; estimates suggest that this represents a mere 3% of all traffickers (Kara, 2009). This does not rule out that laws against prostitution increase the cost of avoiding arrest even for traffickers. This cost is included in the traffickers' cost function $c(n_t)$.

[19]Using natural experiments, Cunningham and Shah (2018) and Nguyen (2015) provide the first evidence that criminalization has a positive *causal* effect on (experiential) hazards of working as a prostitute. Specifically, their findings suggest that it increases the number of gonorrhea cases and rape charges, both of which are strongly associated with "underground" prostitution. In the theoretical analysis of Lee and Persson (2016), criminalization also exposes prostitutes to more violence by johns and law enforcement officers.

trafficking, and penalties that prostitutes bear alone have no impact on the level of trafficking. Thus, the criminalization of prostitutes cannot in general eradicate trafficking.

Proof. A complete proof is in the Appendix but parts are reproduced in the text below. □

Criminalizing prostitutes makes (the supply of) non-reproductive sex costlier. This shifts activity out of the prostitution market into the marriage market, so the former shrinks. But the two kinds of suppliers in the prostitution market are affected differently. If not coerced, women only work as prostitutes if the price of prostitution covers all the participation costs they incur. Therefore, as long as some women continue to supply sex voluntarily (case A), the price of prostitution adjusts to compensate them for all of the burdens imposed by the ban. That is, the ban causes the prostitution market to shrink until the price of prostitution satisfies (7) and (2):

$$p_s = \frac{\omega'}{s(1 - 1/\sigma')}. \tag{9}$$

Note here that $\omega' \equiv \frac{w+h'}{1-q}$ is the female effective wage modified to account for the increase in occupational hazards (h') and for income from prostitution being "taxed" at the rate q. In addition, the male preference ratio $\sigma' \equiv (1-q)\sigma$ is modified to capture the indirect effect that the "tax" on prostitution shifts some consumption into the marriage market, similar to a change in male preferences, and thereby increases the price of marriage p_m.

Now, since the new equilibrium price (9) is set to compensate for the changes induced by the law in *all and any* of the participation costs of prostitutes – including every occupational hazard and foregone marriage gains – it *over*compensates traffickers who do not internalize all of those costs. To see this formally, plug (9) into the traffickers' zero-profit condition (8) and write out ω' and h'. After some rearranging of terms, this yields

$$\frac{\omega + l_2 + q\kappa_s}{1 - 1/\sigma'} + \frac{l_1}{\sigma' - 1} = c(n_t). \tag{10}$$

The left-hand side is strictly larger in (10) than in (5), implying a larger solution for n_t than under decriminalization in the presence of trafficking. Moreover, the number of trafficking victims n_t increases in l_1, l_2, $q\kappa_s$, and even in q alone (through σ') when $q\kappa_s$ is held constant; that is, it increases with *any* parameter change reflecting a stricter (enforcement of the) ban. This is obvious in the case of experiential hazards l_2 and criminal penalties κ_s because these are experienced only by the prostitutes and not by the traffickers. It is less obvious, however, in the case of administrative costs l_1 or the "tax rate" q (holding $q\kappa_s$ constant), both of which affect traffickers and voluntary prostitutes alike. In this case, the result relies on the indirect effect that any price increase in the prostitution market shifts male demand to the marriage market, which increases the price of marriage p_m (until the men's indifference condition (2) is restored). This increase in p_m, in turn, represents an increase in prostitutes' opportunity costs that is not internalized by traffickers but feeds back into the price of prostitution, thus adding to the overcompensation effect. (Without this

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feedback effect, l_1 and q *per se* would have zero effect on n_t.)[20]

When the burdens imposed by the ban reach the point at which all women prefer marriage to prostitution, the prostitution market is served exclusively by trafficking victims (case B). From this point onward, further increases in burdens that are shared by traffickers (q or l_1) reduce trafficking, while further increases in burdens that are experienced only by prostitutes (l_2 and κ_s) have no impact on the market.

This analysis yields three (sets of) insights. First, since the traditional model infringes on voluntary prostitution, it can never restore the benchmark outcome of Proposition 1. Second, in markets where there (still) is voluntary prostitution, it *increases* trafficking, thus moving *both* types of supply in the wrong direction further away from the benchmark outcome. The "overcompensation effect" that drives this result operates through compensating differentials for occupational hazards and forgone mating opportunities, which are the main explanations proposed in the literature for the wage premium earned by prostitutes. Third, the traditional model does turn effective against trafficking after it has eliminated voluntary prostitution, but only law enforcement measures that raise the detection rate (q) or induce traffickers to intensify countermeasures to avoid detection (l_1) reduce trafficking. By contrast, criminal penalties (κ_s) or other burdens (l_2) imposed on prostitutes are ineffective against trafficking, and worse, harm victims that already suffer from being trafficked. Since detection is arguably one of the most challenging tasks in law enforcement, it stands to reason that the traditional model can in general not eradicate trafficking.

3.2 Criminalizing johns (Swedish model)

We now turn to the Swedish model, which criminalizes the buy side instead of the sell side.

Modeling criminalization of the purchase of sex. Assume that the police is ordered to arrest johns but not prostitutes. Arrests occur after sex transactions and a john's probability of being arrested is $q < 1$. If arrested, a john who bought x units of sex receives a criminal penalty of $x\kappa_b$. (This proxies for the idea that the likelihood of being arrested increases with the frequency of purchases.) The revenue from prostitution is not confiscated, but the need for secrecy may again increase suppliers' administrative costs by l_1 and experiential hazards by l_2, as in Section 3.1.[21] In addition, we now consider such incremental costs, denoted by l_3 (per unit of sex), also for johns.

Equilibrium conditions. Under these assumptions, the law changes the men's and women's indif-

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[20]That a shift in male demand between prostitution and marriage affects prostitutes' opportunity costs is the key mechanism in Edlund and Korn (2002). A similar feedback effect arises if the social stigma associated with prostitution decreases with the prevalence of prostitution.

[21]Lee and Persson (2016) show theoretically that the Swedish model may expose prostitutes to, on average, more violent johns. Such a "radicalization" of the market has been lamented in Norway after its adoption of the Swedish model (Bjørndahl, 2012).

ference conditions and the traffickers' zero-profit condition to

$$sp_s - h - l_1 - l_2 = p_m + w \tag{11}$$

$$\frac{p_s}{e - q\kappa_b - l_3} = \frac{p_m}{k} \tag{12}$$

$$sp_s = c(n_t) + l_1 \tag{13}$$

We compare the equilibrium under criminalization of the purchase of sex with the equilibrium that obtains under decriminalization in the presence of trafficking.

Proposition 4 (Swedish Model). *Criminalizing johns always reduces the total size of the prostitution market. As long as some women choose to supply sex voluntarily (case A), criminalizing johns reduces voluntary prostitution but increases trafficking. When no woman chooses to supply sex voluntarily (case B), penalties on johns reduce trafficking, and if high enough, can eradicate it.*

Proof. A complete proof is in the Appendix but parts are reproduced in the text below. □

Criminalizing johns shifts demand from the prostitution market to the marriage market. Since demand shifts do not discriminate between different types of supply, one might expect that at least certain aspects of the Swedish model unambiguously decrease trafficking. (This argument is, in fact, often made by proponents of this policy.) This is not the case, however. As under the traditional model, an overcompensation effect arises. As long as some women continue to supply sex voluntarily (case A), the price of prostitution adjusts to

$$p_s = \frac{\omega''}{s(1 - 1/\sigma'')} \tag{14}$$

where the modified female effective wage $\omega'' \equiv w + h''$ reflects the increased occupational hazards $h'' \equiv h + l_1 + l_2$, while the modified male preference ratio $\sigma'' \equiv \frac{s(e - q\kappa_b - l_3)}{k}$ reflects that the hazards imposed on johns (with the consequent demand shift) are akin to a shift in male preferences toward marriage that raises prostitutes' mating opportunity costs. Thus again, the price adjustment compensates voluntary prostitutes for increases in occupational hazards and in forgone mating gains, which overcompensates traffickers who do not internalize those increases. As a result, trafficking increases. With the price in (14), the traffickers' zero-profit condition (13) yields

$$\frac{w + h + l_2}{1 - 1/\sigma''} + \frac{l_1}{\sigma'' - 1} = c(n_t). \tag{15}$$

Like (10) for the traditional model, (15) shows that even for the Swedish model the number of trafficking victims n_t increases in l_1, l_2, l_3, q, and κ_b, that is, with *all and any* parameter changes indicating a stricter (enforcement of the) ban.

A difference arises between sell-side and buy-side bans, however, if and once they push all voluntary prostitution out of the market (case B). Common to both laws in this case is that hazards imposed on prostitutes (l_2) become irrelevant whereas traffickers remain affected by measures that

necessitate greater effort to evade detection (l_1). The difference is that, while criminal penalties on prostitutes (κ_s) also become irrelevant, increases in criminal penalties on johns (κ_b) retain their negative effect on demand and thus have the potential to eradicate all of it, *and trafficking with it*, even if detection is imperfect.[22]

In essence, Propositions 3 and 4 about the effect of prostitution bans can be understood as manifestations of the general properties of semi-coerced markets discussed in Section 2.3: Either ban makes transactions of (non-reproductive) sex costlier, which leads to a *contraction* of the prostitution market. At the same time, some of the cost increases are experiential and opportunity costs borne by prostitutes that traffickers externalize through coercion, which increases their comparative advantage and leads to a *substitution* of voluntary prostitution with trafficking. Finally, that trafficking could be eradicated (once all voluntary prostitution is gone) through penalties for johns but not through penalties for prostitutes is a reflection of the *asymmetric voluntariness* in semi-coerced markets. Figure 2 depicts all these effects.

We are now at a point to explain how perfect elasticity of voluntary supply (and demand) plays into our results. Under coexistence (case A), it causes costs imposed on prostitutes by a ban to fully pass through to prices. If traffickers internalized those costs (via their victims), their cost increases would match the price increases one-for-one such that there would be *no* change in trafficking. Thus, modeling voluntary participation as perfectly elastic is a means to isolate how the presence of coercion biases the effect of bans, enabling us to pinpoint the overcompensation effect.

Outside this knife-edge case, the impact on trafficking depends on additional factors that influence how the market (price) responds, such as wage dispersion or demand heterogeneity. Such circumstancial factors have ambiguous effects, meaning that it is unclear whether bans increase or decrease trafficking even aside from the effects of coercion.[23] Hence, introducing them adds *more* caveats regarding the impact of bans on trafficking. Conversely, the purpose of abstracting from them is to single out what is arguably the most fundamental caveat: the very nature of coercion causes bans to favor coercion.

For other aspects of our analysis, the modeling choice of perfect elasticity is immaterial. It does not matter for results that hinge on asymmetric voluntariness (such as the superiority of the Swedish model over the traditional model), nor for any of the subsequent analyses on licensed prostitution, the ranking of existing policies, and the optimal policy.

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[22]The question whether there exists a level of criminal penalties that could completely eliminate trafficking is related to Posner (1985). In Posner's theory, the goal of criminal punishment is to deter the criminal offense and push the agents towards voluntary market exchanges. In our analysis, the punishment is applied to both types of transactions, i.e., to transactions with trafficked and with voluntary prostitutes.

[23]The point that criminalization can increase or decrease illegal activity depending on the various demand and supply elasticties has been made in the context of various markets that involve legal and illegal segments (e.g., Thursby et al., 1991; Cho et al., 2013; Hsiang et al., 2016).

4   Regulating Prostitution

A number of countries, notably the Netherlands, have regulated prostitution markets. This approach differs from decriminalization in that it imposes registration, licensing, or zoning requirements on prostitutes, but subject to these constraints, prostitution is legal. The aim is to create a safe working environment for prostitutes, free from coercion and the hazards of working "underground." As is characteristic of occupational licensing systems, the regulation thus serves a quality-control or "gatekeeping" function. In this section, we compare the Dutch model to the other regulatory approaches analyzed above – decriminalization, the traditional model, and the Swedish model.

4.1   Licensed prostitution (Dutch model)

Modeling licensed prostitution. Suppose the government allows prostitutes to sell sex if they are licensed, while any unlicensed sale of sex is illegal.[24] Voluntary prostitutes can obtain a license at negligible cost, but trafficking victims cannot pass the licensing test. That is, we assume that licensing works exactly as intended, without any enforcement problems, and ask what it can achieve under these ideal conditions. This is merely a simplification in that the comparison of the Dutch model to the other policies leads to the same set of qualitative conclusions as long as some, even if not all, trafficked prostititutes can be denied access to licenses.

A prostitute who sells sex without a license (i.e., works "underground") faces a probability $q < 1$ of being arrested. If arrested, she forfeits her income and bears a criminal penalty κ_s. As before, traffickers remain undetected but lose income when their prostitutes are arrested, and working "underground" imposes administrative hazards l_1 and experiential hazards l_2, though the latter only on prostitutes.

Equilibrium conditions. Men now choose between two prostitution markets, a licensed one and an unlicensed one, whose market prices are denoted $p_{s,l}$ and $p_{s,u}$, respectively. For both markets to exist, men must be indifferent between them, which requires uniform prices: $p_s = p_{s,l} = p_{s,u}$. Such prices, in turn, imply that voluntary prostitutes prefer to work in the licensed market, as their expected income in the unlicensed market, $(1-q)p_s - l_1 - l_2$, is lower. Trafficked prostitutes must work in the unlicensed market because they cannot obtain licenses. That is, voluntary and trafficked prostitutes face identical prices but different arrest probabilities.[25]

Since the law permits voluntary prostitutes to work, it does not impose (further) hazards on them. Similarly, since the law does not criminalize johns, it does not alter their preferences over prostitution and marriage. So, neither the women's nor the men's indifference condition changes. However, since traffickers must operate in the non-licensed sector, their zero-profit condition changes

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[24]The traditional system of (enforcing) occupational licensing punishes unlicensed suppliers because it was designed to protect consumers from bad suppliers (rather than to protect suppliers from coercion).

[25]Evidence of supply shifts towards prostitution market *sectors* that are less subject to criminalization is provided by Cunningham and Shah (2018) regarding outdoor and decriminalized indoor prostitution, and Nguyen (2015) regarding the illicit prostitution sector and the quasi-legal massage parlor sector.

to

$$(1-q)sp_s = c(n_t) + l_1. \tag{16}$$

Thus, the equilibrium is determined by (1)-(3) and (16).

We first compare the equilibrium under the Dutch model with the equilibrium that arises under decriminalization in the presence of trafficking, and defer a comparison with (the two models of) criminalization to Section 4.2.

Proposition 5 (Dutch Model). *A policy of licensing prostitutes and criminalizing unlicensed prostitutes decreases trafficking and increases voluntary prostitution. Penalties on unlicensed prostitutes cannot eradicate trafficking.*

Proof. See the text below. □

As long as some women enter the prostitution market voluntarily (case A), the prices of prostitution and marriage, p_s and p_m, as well as the total number of prostitutes n are the same under the Dutch model as under decriminalization, as they are pinned down by the same conditions (1)-(3). But there is less trafficking under the Dutch model, as the number of trafficking victims n_t that solves the traffickers' zero-profit condition (16) is smaller than the one that solves the corresponding condition (4) under decriminalization. Given the total number of prostitutes is the same, this also implies a higher number of voluntary prostitutes under the Dutch model.

The intuition is simple. Recall that traffickers crowd out (some) voluntary prostitutes in a decriminalized market because coercion yields a cost advantage (Proposition 2). The Dutch model counters this advantage and thus "reverses" the crowding-out by making transactions harder or costlier for (unlicensed) trafficked prostitutes than for (licensed) voluntary ones.[26] Indeed, by (16), the number of trafficking victims decreases in the rate q at which unlicensed prostitutes are detected and in the costs l_1 traffickers incur to avoid their prostitutes from being detected, and since total prostitution remains the same, business ceded by traffickers is reclaimed by voluntary prostitutes. Hence, replacing a laissez-faire approach with the Dutch model moves a prostitution market toward the benchmark outcome on both key dimensions: impact (on trafficking) and conflict (vis-à-vis voluntary suppliers). In other words, the Dutch model *dominates* decriminalization in this respect.

The only drawback of the Dutch model compared to decriminalization is that trafficking victims, while fewer in number, must work in a harsher, criminalized environment. This is of concern because the Dutch model cannot *eradicate* trafficking by raising criminal penalties κ_s on unlicensed prostitutes, as these penalties are not internalized by traffickers (note that (16) is independent of κ_s). Given detection is challenging in practice (i.e., q and l_1 are small), some trafficking generally persists under the Dutch model in a parallel "underground" market serving johns that do not care about the background of their counterparty so long as the price is "right."[27]

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[26]This effect is there, albeit weaker, even if the licensing procedure is imperfect but has some discriminatory power.

[27]Illegal brothels have been shown to operate in parallel to legal ones in the Netherlands (Simons, 2008) and Turkey (Smith, 2005). In Nevada, even though prostitution outside of licensed brothels is illegal, escort services offering sexual services occupy about 140 pages of the Las Vegas Yellow Pages. In 2009 the Federal Bureau of

4.2 Comparison of licensing with criminalization

It is important to recognize that the Dutch model is superior to decriminalization not only because it makes *some* attempt to go after trafficked prostitution, but also because of what it does *not* do. After all, we have shown earlier that criminalization can backfire. Indeed, a key feature of the Dutch model is that it does not raise the compensating differential required by voluntary prostitutes, and thus avoids the overcompensation effect. More specifically, it does not raise occupational hazards for voluntary prostitutes, nor does it shift male expenditure out of the prostitution market into the marriage market, which would raise the opportunity cost of prostitutes. The best way to show that this is key to the efficacy of the Dutch model is a comparison with criminalization.

Corollary 4. *As long as some women choose to supply sex voluntarily (case A), a policy of licensing prostitutes and criminalizing unlicensed prostitutes leads to less trafficking and more voluntary prostitution than criminalization (of either the sale or purchase of sex).*

Proof. This follows from Propositions 3 and 4, which shows that decriminalization dominates either type of criminalization in case A, and Proposition 5, which shows that the Dutch model in turn dominates decriminalization. □

Corollary 4 may surprise people familiar with the debate on prostitution policy in two ways. The first twist is that the Dutch model dominates decriminalization on the one hand and criminalization on the other, instead of sitting in-between these polar opposites in terms of impact. So, in markets where some prostitution is voluntary, introducing the Dutch model has the same qualitative impact no matter whether the starting point is laissez-faire or full prohibition. In either case, it hurts traffickers and helps voluntary prostitutes, and so moves the market unambiguously towards the benchmark outcome.

The second twist is that the intuition behind Corollary 4 upends the common perception that the Dutch model, while respecting the civil liberties of voluntary prostitutes, is "weak" against traffickers because the legal sector camouflages their activity, and hence grows weaker than full criminalization with every trafficking victim that is snuck into or hidden inside the legal sector. This view paints the Dutch model as a compromise. On the contrary, our results reveal it as a win-win policy, with the Dutch model growing stronger than full criminalization against traffickers with every voluntary prostitute that moves into the legal sector, because this mitigates the overcompensation effect. In other words, allowing for a legal sector is what renders the Dutch model *stronger*, not weaker, than full criminalization against trafficking, *even if it camouflages (part of) it.*[28]

Investigation identified Las Vegas – a city without licensed prostitution – as one of the 14 U.S. cities with the highest rates of child prostitution (Whaley, 2010).

[28]In fact, even under the extreme assumption that all trafficking victims can hide in or behind the legal sector (due to imperfect licensing or general camouflaging effects), the equilibrium simply converges to the outcome under decriminalization and thus merely reverts the overcompensation effect that causes criminalization to backfire (Propositions 3 and 4). However, for the Dutch model to outdo (rather than be equivalent to) decriminalization, it is necessary that not all trafficking victims can hide in or behind the legal sector. In other words, it requires that transactions are more difficult under the Dutch model than under a laissez-faire regime for at least some (even if not all) trafficked prostitutes.

The comparison in Corollary 4 does not cover parameter constellations under which the traditional or Swedish model eliminates voluntary prostitution (which cannot happen under the Dutch model unless voluntary prostitution is already inexistent under decriminalization). For identical arrest probabilities q, the Dutch model dominates the traditional model even in such cases, as the price of prostitution is higher, and hence trafficking more attractive, under the traditional model than under the Dutch model (which makes the market more competitive due to voluntary supply in the licensed sector). By contrast, the Swedish model can always be made more effective than the Dutch model against trafficking:

Corollary 5. *There exists a criminal penalty on johns κ_b such that criminalizing johns leads to strictly less trafficking than a policy of licensing prostitutes and criminalizing unlicensed prostitutes, for any criminal penalty on unlicensed prostitutes κ_s.*

Proof. This follows directly from Propositions 4 and 5. $\square$

This is because sufficiently severe criminal penalties against johns can deter *all* demand, whereas criminal penalties against prostitutes, licensed or not, fail to deter trafficked supply. Thus, enforcing compliance with licensing requirements by penalizing unlicensed suppliers – which is how occupational licensing is usually enforced – is effective when supply is voluntary, but ineffective when such suppliers are coerced. Corollary 5 is obviously a consequence of the asymmetric voluntariness in semi-coerced markets that we have mentioned before.

4.3 Ranking existing policies

To conclude our analysis so far, we will rank the four basic types of policies that are currently being implemented around the world in terms of their *impact* on trafficking and the *conflict* they create vis-à-vis voluntary prostitutes, that is, the two policy dimensions we outlined in the introduction of this paper.

As for criminalization, the Swedish model (criminalizing johns) dominates the traditional model (criminalizing prostitutes). While either model generates the overcompensation effect when trafficked and voluntary prostitution coexist, only the Swedish model has the potential to eradicate trafficking through criminal penalties once all voluntary prostitutes have exited the market (Propositions 3 and 4). The traditional model is further dominated by the Dutch model (Corollaries 4 and 5). The Swedish model, however, is dominated by none of the other existing policies, being the only one that could eradicate trafficking.

As for policies that permit (some) prostitution, decriminalization is dominated because the Dutch model goes after at least some trafficked prostitution within the unlicensed sector, and does so without generating the overcompensation effect by virtue of the licensed sector (Proposition 5). The Dutch model is not dominated, especially by none of the criminalization approaches because, unlike those, it does not infringe on voluntary prostitution.

This leaves, as the undominated options, the Swedish model and the Dutch model. While the Swedish model can eradicate trafficking, it limits voluntary transactions. Conversely, the Dutch

model does not limit voluntary transactions but cannot be as aggressive on trafficking. The choice between these models therefore confronts policymakers with a dilemma: whether to protect potential victims from being trafficked or the civil liberties of voluntary prostitutes (to pursue an occupation of choice in a safe environment). This calls for regulatory priorities, which in turn results in (for lack of data, typically inconclusive) disputes about the empirical prevalence of trafficked versus voluntary prostitution. As discussed in the introduction, this tension is at the heart of the contemporary debate on prostitution policy.[29]

Finally, note that the (process of elimination that produces the) above ranking depends neither on the assumption that voluntary supply and demand are perfectly elastic nor on the assumption that trafficking and voluntary supply are fully separated under the Dutch model. Even with one or both of these assumptions relaxed, the traditional model is dominated by the Swedish model, while decriminalization is dominated by the Dutch model (provided the latter achieves *some* separation).

5   Restoring the Benchmark Outcome

Our comparison of the policy approaches that are used in practice comes to the conclusion that none of them is capable of restoring the benchmark outcome that emerges in a laissez-faire market in the absence of coercion. In this section, we show that another policy approach could, in principle, restore the benchmark outcome and thus dominates all existing ones, as before, abstracting from the public resources spent on implementing the policy (Section 5.1). We also discuss additional benefits of this policy and under what circumstances it does not dominate all other policies (Section 5.2).

5.1   Dutch-Swedish model

The ranking of existing policies in Section 4.3 contains clues to the optimal policy. Consider why the undominated policies, the Dutch model and the Swedish model, are tougher than the traditional model on trafficking. The Dutch model criminalizes sellers like the traditional one, but does not backfire because it avoids the *overcompensation effect* by having voluntary supply in a licensed sector. The Swedish model shares the overcompensation effect with the traditional one, but can at least eradicate trafficking after all voluntary prostitutes are gone because it criminalizes buyers in a market with *asymmetric voluntariness.* Hence, what gives them an edge is that each addresses one of the two key distortions that semi-coerced markets confront policy with. From this insight it is a small step to seeing that the defining elements of these models are not mutually exclusive and might engender an even more effective policy if combined.

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[29]Our analysis treats voluntary supply as socially desirable. Waltmann (2011) argues that *all* prostitution is a form of exploitation based on gender biases and inequalities in society, a view that can be cast in terms of the hypothesis that voluntary prostitution would not exist if society were "fair and equal." Note that Proposition 4 implies that, if the social planner's objective instead is to eliminate *all* prostitution, as opposed to eliminating only trafficking, then the social planner can implement this objective using the Swedish model.

Modeling licensed prostitution with criminalization of johns who buy sex from unlicensed prostitutes. Suppose the government issues licenses to voluntary prostitutes and criminalizes the purchase of sex from unlicensed ones. A john who buys x units of sex from unlicensed prostitutes is arrested with probability q, and if so, bears a criminal penalty $x\kappa_b$. Unlicensed prostitutes are not prosecuted and keep their income. As under the Swedish model, the need to avoid detection imposes the additional costs l_1, l_2, and l_3, but only on participants in the unlicensed sector.

Equilibrium conditions. Under this policy, men value licensed prostitution and unlicensed prostitution differently. Their valuation of licensed sex remains $e_l = e$, while their valuation of unlicensed sex drops to $e_u = e - q\kappa_b - l_3$. For both to be in demand, men must be indifferent between them, which requires unlicensed sex to be sold at a discount: $p_{s,u} = p_{s,l} - q\kappa_b - l_3$. Due to this price wedge, voluntary prostitutes prefer the licensed sector, where they are also spared additional hazards. As under the Dutch model, trafficking and voluntary prostitution, if coexistent, are thus separated across two sectors and face different prices.

The equilibrium conditions under are therefore

$$sp_{s,l} = p_m + w \tag{17}$$
$$\frac{p_{s,l}}{e}, \frac{p_{s,u}}{e_u} = \frac{p_m}{k} \tag{18}$$
$$(n - n_t)sp_{s,l} + n_t sp_{s,u} = (1 - n)(y - p_m) + ny \tag{19}$$
$$sp_{s,u} = c(n_t) + l_1 \tag{20}$$

where (17) is the women's indifference condition, (18) the men's indifference condition (across all three markets), (19) the market clearing condition that all male income not spent on marriage is spent on the two prostitution sectors, and (20) the traffickers' zero-profit condition in the unlicensed sector.

As before, we describe the equilibrium under this policy relative to the equilibrium under decriminalization in the presence of trafficking, but the last part of the description subsumes a comparison with all other policies.

Proposition 6 (Dutch-Swedish Model). *A policy of licensing prostitutes and criminalizing the purchase of sex from unlicensed prostitutes decreases trafficking and increases voluntary prostitution. High enough penalties on johns in the unlicensed sector can eradicate trafficking and restore the benchmark outcome.*

Proof. See Appendix. □

On the supply side, as discussed before, criminalizing purchases in the unlicensed sector creates a price wedge that induces voluntary prostitutes to self-select into the licensed sector, leaving only trafficked prostitutes in the unlicensed sector. This separation puts this policy on par with the Dutch model in bypassing the overcompensation effect. On the demand side then, given the supply separation, imposing severe penalties on johns in the unlicensed sector diverts all demand away from trafficked prostitutes in the unlicensed sector to the voluntary ones in the licensed sector,

thereby depriving traffickers of business, like the Swedish model except without limiting voluntary transactions. Thus, the Dutch-Swedish model dominates the two models it is a hybrid of.

5.2   A caveat and additional advantages

For the Dutch-Swedish model to restore the benchmark outcome and dominate all other policies, its licensing procedure must work as intended and fully screen out trafficked prostitutes. With a poorly designed or executed, or corruptible, licensing procedure, the Dutch-Swedish model lets trafficking slip into the licensed sector and no longer dominates the Swedish one. But it remains undominated, and for a given level of fraudulent licensing, still dominates the Dutch model because it can at least eliminate trafficked prostitution outside of the licensed sector.

This caveat notwithstanding, the Dutch-Swedish model also has a couple of advantages over the Dutch and Swedish models regarding implementation and effectiveness.

a. *General camouflage.* As discussed earlier, one major concern with the implementation of the Dutch model is that the licensed sector may provide traffickers with background camouflage that helps to conceal their activity, even if they cannot obtain illegitimate licenses. In our model this would mean that, relative to a full ban, creating a licensed sector reduces the detection rate q. Under the Dutch model, under which the detection rate q and the costs associated with avoiding detection l_1 are the only measures effective against traffickers in the unlicensed sector, this weakens enforcement so that trafficking levels are higher than they would be without the camouflage effect (though possibly still lower than under a ban given the licensed sector also eliminates the overcompensation effect.) By contrast, under the Dutch-Swedish model, any reductions in q and l_1 can be offset by raising the penalty κ_b on johns in the unlicensed sector to fully maintain the deterrence by which it diverts demand to the licensed sector, and hence its effectiveness against trafficking. In other words, even if a camouflage effect decreases the likelihood of being caught, punishments can always be made so severe that johns are nonetheless deterred from engaging suppliers that cannot prove proper licensing. The analogue in the Dutch model does not work due to asymmetric voluntariness: severe punishments may scare trafficked prostitutes, but never scare them "*away.*"

b. *Proportionality.* The Swedish model and the Dutch-Swedish model both possess the potential to eradicate trafficking by imposing *sufficiently severe* criminal penalties on all johns or johns in the unlicensed sector, respectively. But the required severity may run counter to a principle in criminal justice that the punishment of a crime should be proportional to the severity of the crime itself, as per an old maxim *culpae poena par esto* ("the punishment should fit the crime") in Roman law. This issue is arguably more salient for the Swedish model because it criminalizes all transactions, even those that involve fully consenting individuals, in which case a severe punishment may seem disproportionate. The Dutch-Swedish model allows voluntary transactions within the licensed sector, so severe punishment of johns in the unlicensed sector is more justified: those men would be aware that unlicensed prostitutes are forced to have sex

with them, and could therefore be judged complicit in the act of coercion and even guilty of rape. Accordingly, it might be easier to legislate (sufficiently) severe penalties.

c. *Inelastic demand.* Another essential requirement for the Swedish model and the Dutch-Swedish model to be toughest on trafficking is that no part of demand is unresponsive to criminalization. This is the aspect of asymmetric voluntariness that matters for our results. There exist, however, reasons other than voluntariness that can render demand (in)elastic, and the Dutch-Swedish model is the better policy against trafficking in such cases. For instance, suppose some men are practically impossible to deter from buying sex, even with harsh penalties, because they are effectively excluded from the marriage market or have specific sexual preferences.[30] This is an obstacle for the Swedish model, which eliminates trafficking only to the extent that it *eliminates demand*. By contrast, it poses less of a problem for the Dutch-Swedish model, which *diverts demand* to only *eliminate trafficking*. That is, the Dutch-Swedish model can stop trafficking even when some demand is inelastic, because it can accommodate the latter within the licensed sector.

d. *Double victimization.* Policies that criminalize sellers, whether in general or only in an unlicensed sector, create a form of double victimization for trafficking victims, who first suffer at the hands of their traffickers and could then suffer further in the criminal justice system. This underlies, as noted at the end of Section 4.1, the one downside the Dutch model has relative to decriminalization: although the Dutch model decreases trafficking (and increases voluntary prostitution), it makes matters worse for those who continue to be trafficked. The Dutch-Swedish model mitigates double victimization in that it does not criminalize sellers, and more, eliminates the problem altogether when it eradicates trafficking.

e. *Substitution effects.* As explained at the end of Section 3.2, we deliberately abstract from substitution effects that can cause criminalization (of the buy or sell side) to have an ambiguous effect on trafficking even absent coercion, depending on relative supply and demand elasticities (e.g., Thursby et al., 1991; Cho et al., 2013; Hsiang et al., 2016). By contrast, the Dutch-Swedish model (like the Dutch model) unambiguously reduces trafficking for any reasonable elasticities, since licensing (if successful) ensures that the substitution effect always runs one way: trafficked supply is replaced with voluntary supply.

6   Further Implications

This section concludes our analysis by highlighting some predictions of the theory that are relevant to empirical analyses of the impact of prostitution laws, in particular for the external validity of studies exploiting policy changes in individual countries (Sections 6.1 and 6.2) and for evaluating domestic policies when there are equilibrium effects on cross-border flows (Section 6.3).

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[30]Inelastic demand plays a central role in Becker et al. (2006)'s argument that criminalization can increase the resources spent on illicit activities, and as a result, may increase economic deadweight losses. Demand inelasticity is also central to Akee et al. (2014)'s result that stricter law enforcement can increase transnational trafficking.

6.1 When does (de)criminalization reduce trafficking?

As shown in Section 3, criminalizing (the sale or purchase of) prostitution can increase or decrease trafficking depending on the prevalence of voluntary prostitution. In our model, so long as some women choose to supply sex voluntarily, criminalization increases trafficking (and conversely, decriminalization decreases trafficking); however, when there is no (more) voluntary prostitution, criminalization decreases trafficking (and decriminalization increases trafficking). This raises the question what factors make criminalization or decriminalization more likely to decrease trafficking. Our next result frames this in terms of decriminalization, the policy most recently recommended by Amnesty International.

Corollary 6. *Decriminalization is more likely to decrease trafficking when male-female wage inequality in the regular labor market is higher, occupational hazards of prostitution are lower, and male preferences toward prostitution are higher.*

Proof. See Appendix. □

Intuitively, decriminalization decreases trafficking when the environment is conducive to voluntary prostitution. We know from Section 2 that there is more voluntary prostitution in a laissez-faire market when, on the supply side, women face lower wages in the regular labor market or when the occupational hazards of prostitution are lower (or both), and on the demand side, when men's preferences towards prostitution, relative to marriage, increase. Conversely, criminalization decreases trafficking when the environment is unfavorable to the emergence of voluntary prostitution in a laissez-faire market.

Figure 4 illustrates, in an example where initially prostitutes are criminalized (traditional model), the impact of decriminalization – for a range of female effective wages $\omega \equiv w + h$. The vertical axis on the right shows the level of voluntary prostitution in the decriminalized market, captured by the dotted line, which is high when the effective female wage is low. The vertical axis on the left shows the difference between the trafficking level in the decriminalized market and the trafficking level under the traditional model, denoted as Δ_t and captured by the solid line. So, $\Delta_t < 0$ means that decriminalization reduces trafficking. For low levels of the effective female wage, when voluntary prostitution is high, decriminalization decreases trafficking ($\Delta_t < 0$). As we move from left to right and the effective female wage rises, there is less voluntary prostitution in the decriminalized market; and so, above some threshold for the effective female wage, decriminalization increases trafficking ($\Delta_t > 0$). Decriminalization can thus harm or help traffickers, depending on the latent level of voluntary prostitution in the decriminalized market (as determined by effective female wages in this example).

Corollary 6 suggests caution in drawing conclusions from the impact of a policy reform in one country or setting about the potential impact of such a reform elsewhere. In concrete terms, even if decriminalization were to spur trafficking in a country with low wage inequality (such as Sweden), the same law could decrease trafficking in a country where this is not the case (such as South Korea, an example we return to later). Similarly, if one market segment (e.g., street prostitutetion) involves

greater occupational hazards than another segment (e.g., high-end escort services), decriminalization might increase trafficking in one but decrease it in the other.

6.2 Adoption of (de)criminalization

Country characteristics that affect the impact of prostitution laws may simultaneously affect the political support for them. Men in our model always want a laissez-faire market because it leads to the lowest price of both prostitution and marriage, that is, for sex in general. By contrast, among non-trafficked women who choose whether to work in the prostitution market, the support for criminalization depends on their outside options such as the conditions they face in the regular labor market or in the marriage market.

To illustrate this point, we introduce wage heterogeneity among women. For simplicity, we set occupational hazards in a decriminalized market to zero, $h = 0$, so that the women's effective wage is equal to their wage in the regular labor market, $\omega = w$. As a benchmark, suppose first that all men and women earn the same in the regular labor market, $\omega = w = y$. In this case, no voluntary prostitution emerges because the regular labor market offers women sufficiently attractive alternatives.[31] Importantly, this means that all women support criminalization, on the buy or sell side, because reducing consumption of sex from trafficked prostitutes increases women's rents in the marriage market.

Now, consider a simple model extension with a "thin" demand for women in the regular labor market: Suppose woman i's effective wage is given by $w = yi$, where $i \in [0, 1]$. That is, women "at the top" ($i = 1$) earn as much as men, but everyone else earns less with wages declining at a slope of one. The average female wage is $\overline{\omega} = \frac{y}{2}$ and the average male-female wage gap is $\Delta \equiv y - \overline{\omega} = \frac{y}{2}$. In a decriminalized market, the price of prostitution p_s is pinned down by (1) to (3) as before, except that yn replaces ω in (1). Solving these equations for sp_s yields a quadratic solution with a unique positive value for the equilibrium income of a prostitute:

$$ sp_s = \Delta \frac{2\sigma}{\sigma - 1} \left[-\frac{1}{2(\sigma - 1)} + \sqrt{\frac{1}{4(\sigma - 1)^2} + 1} \right]. \tag{21} $$

In this setting, women voluntarily working as prostitutes are not unequivocally in support of criminalization. Consider, for example, criminalizing johns to the point where prostitution is eliminated. This would improve voluntary prostitute i's income only when $y + \omega_i \geq sp_s$. All the voluntary prostitutes for whom this inequality is violated oppose the criminalization, for the simple reason that their options outside of prostitution are too unattractive.[32] Note also that the inequality is

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[31]For some women to choose prostitution, they must prefer it to the regular labor market or be indifferent between the two options. In the case of indifference, equilibrium conditions (1)-(3) must hold, yielding the solution in Proposition 1, except with $w = y$ and $h = 0$. However, the number of prostitutes violates the boundary condition $n^* \leq 1$ since $n^* = \frac{y}{y} - \frac{1}{\sigma - 1} \leq 1 \Leftrightarrow 1 \leq 1 - \frac{1}{\sigma}$. At the same time, if all women (prefer to) work as prostitutes, each earns y (one man's wage spent on prostitution). This also invokes a contradiction, as each woman would prefer to receive $y + p_m^* > y$ by marrying and working in the regular labor market.

[32]If we choose $y = 1$ and $\sigma = 2$, as for Figures 2 to 4, this is the case for all $i \lesssim .24$.

more likely to be violated (i.e., for a larger number of prostitutes) when the average wage gap Δ is larger.

South Korea offers an interesting example of this. In 2004, it adopted the Swedish model and significantly increased law enforcement and criminal penalties for johns. When the law was enacted, South Korean sex workers took to the streets (Salmon 2004):

> [E]nforcement of the law has also sparked angry showdowns between women in favor of the law and those against it. When the crackdown began, fistfights were reported between prostitutes and women activists.

Such protests have since been recurrent in South Korea (e.g., AP News 2011), which exhibits a large male-female income gap. This stands in contrast to other countries that have adopted the Swedish model, such as Sweden, Norway, and Iceland, where male-female income gaps are among the smallest in the world (OECD, 2009, Table 2) and where the law enjoys broad support and has not set off public demonstrations.

This discussion suggests the possibility that political momentum against prostitution is increasing in parameters that reduce voluntary prostitution, such as gender income equality. However, low levels of voluntary prostitution also make criminalization more effective against trafficking. This reinforces concerns that policies effective in countries that adopt them could backfire in countries that lack the political initiative to adopt them. In other words, selection (into) and impact (of a policy) are not independent of each other.

6.3 Cross-border effects

Our analysis has focused on the impact of prostitution laws in a single country. In practice, however, laws enacted in one country may affect the demand and supply of prostitution in other countries. On the demand side, the channel for such cross-border effects is sex tourism. On the supply side, traffickers who operate internationally can respond to legislation in one country by moving operations elsewhere.

To highlight the impact of these effects, we consider a simple extension of our model to two countries, A and B, each of which is described by our baseline model. The wages y and w, men's intrinsic preferences k and e, and the occupational hazard h are the same in both countries. As in our baseline model, non-coerced women choose whether to work in the domestic prostitution market or to marry domestic men and work in the domestic regular labor market. The key change is to allow for sex tourism and international trafficking: men can buy sex domestically and abroad, and traffickers can traffic prostitutes to both countries.

We start from a (typical) setting where the sale of sex is criminalized in both countries and voluntary and trafficked supply co-exist, and ask what happens if one of the two countries decriminalizes prostitution.

Corollary 7. *Suppose Country A and Country B are identical, with the traditional model (criminalization of prostitutes) in place, and with the same levels of coexistent voluntary and trafficked*

prostitution. If Country A decriminalizes prostitution, while prostitution remains illegal in Country B, the prostitution market grows in Country A and shrinks in Country B, as men from Country B become sex tourists in Country A. After the decriminalization, there is more trafficking to Country A than to Country B, and the level of trafficking to Country A may be higher than before the decriminalization. The aggregate level of trafficking, to both countries, falls.

Proof. See Appendix. □

Decriminalization in Country A causes the price of sex to fall there, which attracts johns from Country B, where prostitution is still illegal. This, in turn, puts downward pressure on the price of sex in Country B. In our simple model, the prostitution market in Country B in fact collapses. For women in Country B to be willing to offer prostitution so cheaply that they can compete with Country A's prostitution market, the price of marriage in Country B must decrease. But before reaching a level at which women in Country B enter prostitution, the price reaches a level at which men in Country B prefer to marry domestic women and buy prostitution abroad. Thus, after the reform, all prostitution market activity is absorbed by Country A, and men from Country B become sex tourists.

While deliberately simple, this extension raises an interesting point. A policy evaluation of the causal impact of decriminalization in Country A on prostitution in Country A might, correctly, find that the policy reform increased trafficking to Country A. Also, a post-reform cross-country regression would find that national trafficking levels are negatively associated with the stringency of domestic laws against prostitution, since there will be less trafficking to Country B. From these observations one might reasonably infer that the traditional model run by Country B is more effective against trafficking than the decriminalization by Country A. Ironically, however, it is the decriminalization by Country A that reduces (the global level of) trafficking, whereas the traditional model in Country B actually increases it.

The presence of cross-border effects thus warrants (a) studying also the impact on other countries when evaluating a prostitution law reform, (b) caution when drawing conclusions from impacts of local reforms on local trafficking levels about the effectiveness of the specific local prostitution policies in fighting trafficking globally, and (c) care when interpreting cross-country correlations between national prostitution policies and national trafficking levels.[33] There is suggestive evidence of cross-border effects from a Swedish Government (2010) report on changes in the prostitution market following its adoption of the Swedish model in 1999:

> [T]he prevalence of street prostitution was about the same in the three capital cities of Norway, Denmark and Sweden before the ban on the purchase of sexual services was introduced here, but the number of women in street prostitution in both Norway and Denmark subsequently increased dramatically. In 2008, the number of people in street

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[33]One can extend these arguments to provide an alternative explanation for why transnational trafficking flows may increase with (the degree of) criminalization in both source and destination countries, as in Akee et al. (2014). Our explanation does not depend on demand inelasticity but instead on semi-coerced supply.

prostitution in both Norway and Denmark was estimated to be three times higher than in Sweden. (p. 7)

The report also reviews two surveys of Swedish men documenting "that it was more common to buy sex abroad than in Sweden" (p. 32) and quotes a study according to which the number of Nigerian prostitutes in Norway increased "due, in part, to changes in the prostitution markets in European countries, for example, the criminalization of the purchase of sexual services in Sweden in 1999" (p. 20). Conversely, Gothenburg, a Swedish city close to Norway, saw a large increase in Nigerian prostitutes after 2009, when sex purchases were criminalized *also* in Norway (p. 20). Last, the report notes that the number of foreign prostitutes in the Scandinavian region increased after the Swedish law was passed.

7   Concluding Remarks

In certain illicit markets, part of the supply involves the use of, or threat of, violence to coerce the provision of the good or service in question. In such "semi-coerced" markets, the regulatory objective is not to prohibit all trade, but to prevent coercion without infringing on voluntary exchange. Regulatory policy must therefore be evaluated along two dimensions: What is the *impact* of a policy on coercive activity? How much does the policy *conflict* with voluntary supply?

This paper theoretically evaluates policies for semi-coerced markets within the context of prostitution markets, where coerced supply – i.e., sex trafficking – and voluntary sex work often coexist, and where the policy debate has been shaped by disagreement along the impact and conflict dimensions. We identify two ways in which the presence of coercion skews "tax incidence" arguments, which we term the *overcompensation effect* and *asymmetric voluntariness*. We then compare existing policy approaches with respect to impact and conflict, and find that criminalizing johns (Swedish model) dominates criminalizing prostitutes, and that licensed prostitution (Dutch model) dominates decriminalization. The choice between the two superior policies exhibits a tension between impact and conflict: While the Swedish model is more effective against trafficking, the Dutch model accommodates voluntary prostitutes.

The reason the Swedish and Dutch models are superior to decriminalization and to the traditional model of criminalizing prostitutes, respectively, is that each addresses one of the two policy distortions caused by coercion: the former exploits asymmetric voluntariness and the latter avoids the overcompensation effect. Looking beyond policy approaches currently in use, we then show that a combination of the key features of the Swedish and Dutch models addresses both aspects simultaneously. Under this "Dutch-Swedish" model, prostitutes must be licensed and johns who purchase sex from unlicensed prostitutes are severely criminalized. In our model, this is the only policy that restores the benchmark outcome that would emerge in a laissez-faire market absent coercion, that dominates all other policy approaches, and that resolves all tensions between impact and conflict.

Our analysis represents only one of various perspectives that can be taken on the question of prostitution regulation. On the one hand, the notion of violence could be expanded from involuntary

prostitution to include also violence perpetrated against voluntary prostitutes, for example, by johns, pimps, and even law enforcement officers. We have studied the policy implications of such "transactional" violence in a companion paper (Lee and Persson, 2016). On the other hand, one may question the premise of our analysis that voluntary prostitution is socially desirable. In practice, this view is challenged by many, and as far as we can tell, there are three categories of criticism. First, some view all prostitution as *structural violence*, that is, exploitation based on societal biases and inequalities (Waltmann, 2011), a view that can be cast as the hypothesis that voluntary prostitution would not exist in a fair and equal society. Second, even when acting voluntarily, individuals may unwittingly inflict self-harm. If such *weak agency* is pervasive, there is scope for paternalistic laws that restrict individual freedom (Loginova and Persson, 2013). Third, there are *moralistic arguments* that the trade of sex may erode values and norms to the detriment of society, and prostitution laws may perform an expressive function in this regard.[34] All these are open and important questions, but beyond the scope of our analysis. As for the question of how prostitution markets should be regulated if the main policy concern is trafficking or violence against prostitutes, however, our results in this paper and in the companion paper mentioned above provide a systematic and hopefully constructive discussion.

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[34]Kotsadam and Jakobsson (2011) present evidence that prostitution laws may indeed affect social norms, at least those towards the commercial exchange of sex.

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Figures

Country	Prostitution	Soliciting	Pimps/Brothels	Top Destination for Trafficking?
USA				
Thailand				
Japan	Partly Illegal[b]		Illegal[a]	
Israel				
Italy	Decriminalized			Yes
Spain			Partly Illegal[c]	
Belgium				
Netherlands		Regulated		
Germany				
Turkey				
Sweden	Partly Illegal[d]		Illegal	No

[a] In Nevada, some counties allow regulated brothels.
[b] Only the sale of *coital* sex is illegal.
[c] Brothels are not illegal, but *exploitative* management of brothels or prostitutes ("pimping") is.
[d] Only the *purchase* of sex is illegal.
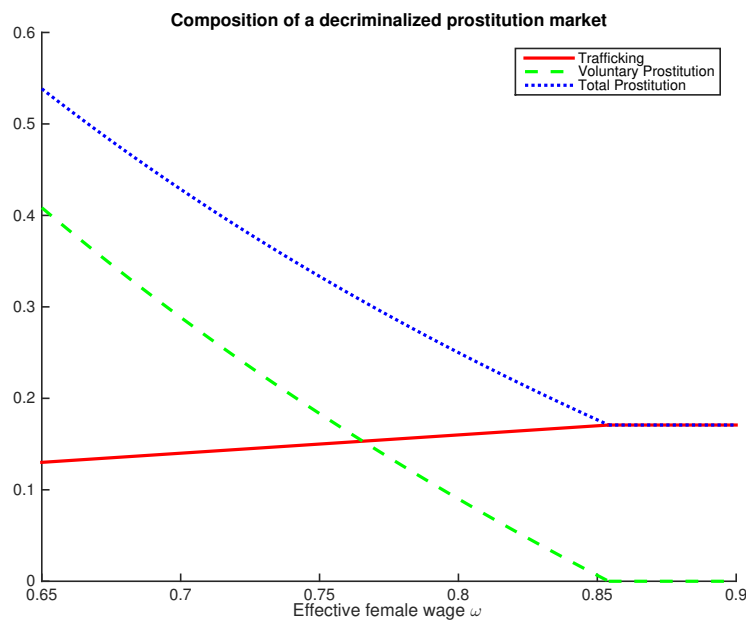
Figure 1: Prostitution laws around the world

Figure 2: Contraction and substitution in a decriminalized prostitution market. The x-axis displays the female effective wage in the regular labor market ω. The y-axis displays the number of trafficked prostitutes (red solid line), the number of voluntary prostitutes (green dashed line), and the sum of the two, i.e., the total size of the prostitution market (blue dotted line). As the female effective wage ω, and hence the (opportunity) cost of prostitution, increases, overall prostitution decreases, but there is also a shift from voluntary prostitution to trafficking. For this graph, we chose $c(n_t) = cn_t$, $c = 10$, $y = e = k = 1$, and $s = 2$.
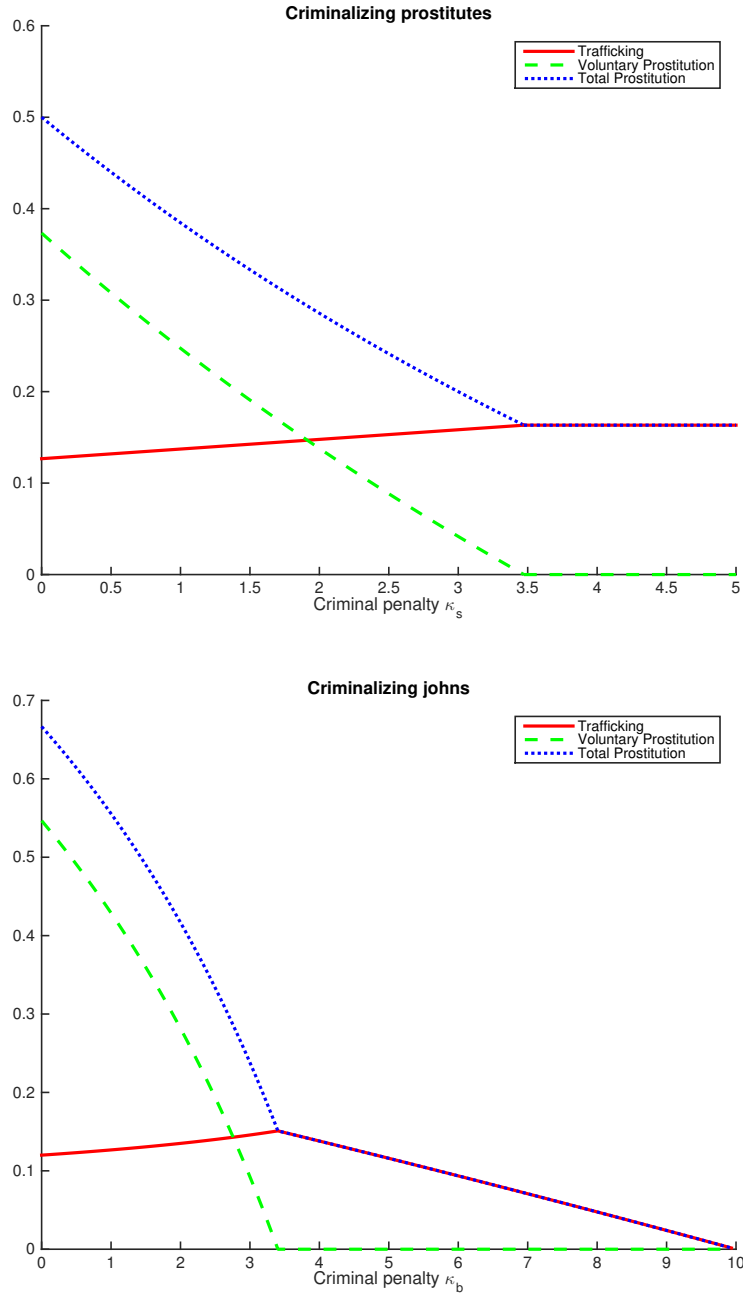
Figure 3: Sell-side versus buy-side criminalization. We compare the traditional model and the Swedish model in terms of how criminal penalties imposed on prostitutes (κ_s) or johns (κ_b) under the respective legal regimes impact the size and composition of the prostitution market, for a given arrest probability $q = .05$. The effective female wage is set to $\omega = .6$. All incremental occupational hazards other than criminal penalties are, for simplicity, set to $l_1 = l_2 = l_3 = 0$. All other parameters are the same as in Figure 2.
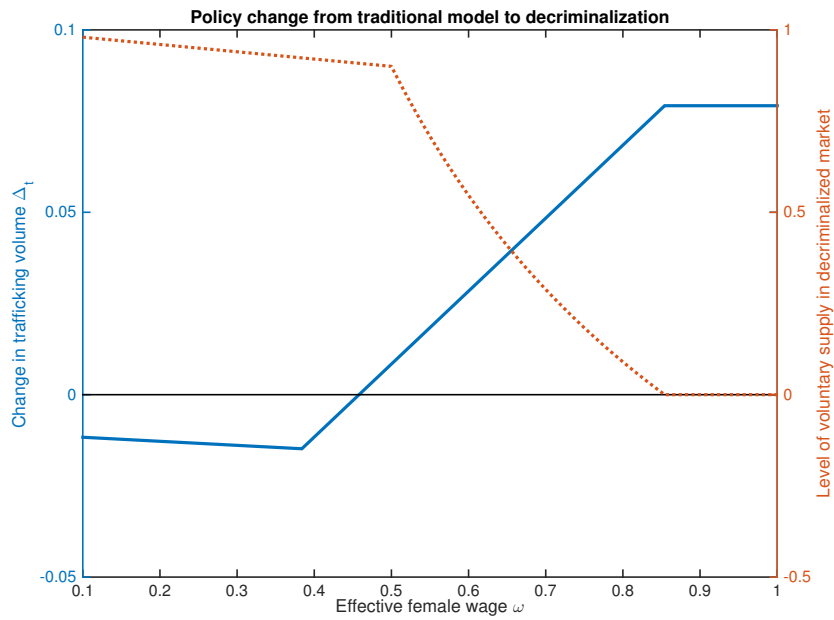
Figure 4: Ambiguous impact of decriminalization. Decriminalizing prostitution decreases trafficking when the environment is conducive to voluntary prostitution in a decriminalized market, which in this example is the case when the effective female wage is low. Conversely, decriminalization increases trafficking when the incentives for voluntary prostitution are low even in a decriminalized market. Except for the effective female wage, which we vary here, all parameters are the same as for the traditional model (criminalizing prostitutes) in Figure 3.

Proofs

Corollaries 2 and 3

Case A: Equilibrium under coexistence. The equilibrium values for the total number of prostitutes and for the price of sex are, respectively, n^* and p_s^* in Proposition 1. Raising ω of lowering σ decreases n^* (cf. Corollary 1) but increases p_s^*. Higher p_s^* imply, via the traffickers' zero-profit condition (4), a larger number of trafficking victims n_t^*, which in turn implies less voluntary prostitution n_v^* given that the total number of prostitutes decreases.

Case B: Equilibrium with only trafficking. All equilibrium conditions for this case, derived in the text above Proposition 2, are independent of ω. As for σ, rewrite the left-hand side of (6) as $\frac{y}{n+\frac{1-n}{\sigma}}$ and note that it increases in σ for all $n\epsilon\,(0,1)$, which implies that the solution n^* to (6) increases with σ.

Proposition 3

Case A: Equilibrium under coexistence. Using the men's indifference condition (2) to rewrite the market-clearing condition (3) as $n = \frac{y}{sp_s}\frac{\sigma}{\sigma-1} - \frac{1}{\sigma-1}$ shows that the total number of prostitutes decreases in the price of prostitution. The price of prostitution is obtained by jointly solving the women's indifference condition (7) and the men's indifference condition (2), which yields the solution in (9). This solution increases in all criminalization parameters $\{q, \kappa_s, l_1, l_2\}$, which in turn implies that the total number of prostitutes decreases in them. To compute the impact on trafficking, insert the price of prostitution (9) into the traffickers' zero-profit condition (8), which yields equation (10). The left-hand side of (10) increases in all criminalization parameters $\{q, \kappa_s, l_1, l_2\}$, so the number of trafficking victims n_t that solves (10) increases in them, since $c(.)$ is strictly increasing. This also implies that the number of voluntary prostitutes decreases in all criminalization parameters $\{q, \kappa_s, l_1, l_2\}$, considering that the total number of prostitutes declines.

Case B: Equilibrium with only trafficking. Using the men's indifference condition (12) in the market-clearing condition (3) yields a solution for the price of prostitution as a function of the total number of prostitutes n, all of which are trafficked in this case: $p_s = \frac{\sigma}{n(\sigma-1)+1}\frac{y}{s}$. Inserting this solution into the traffickers' zero-profit condition (13) yields

$$(1-q)\frac{y\sigma}{n\sigma+1-n} - l_1 = c(n).$$

The left-hand side is, for all n, smaller here than in (6), which is the corresponding equation for case B under decriminalization, implying a smaller solution for n. Also, the left-hand side decreases in q and l_1, which implies that the marginal impact of q and l_1 on n is negative. By contrast, the solution for n is independent of κ_s and l_1.

Proposition 4

This proof follows the same general steps as the proof of Proposition 3.

Case A: Equilibrium under coexistence. Define $h'' \equiv h + l_1 + l_2$, $\omega'' \equiv w + h''$, and $\sigma'' \equiv \frac{s(e - q\kappa_b - l_3)}{k}$, and rewrite the women's and men's indifference conditions (11) and (12) as $sp_s = p_m + w''$ and $sp_s = \sigma'' p_m$, respectively. Using the modified men's indifference condition to rewrite the market-clearing condition (3) as $n = \frac{y}{sp_s} \frac{\sigma''}{\sigma'' - 1} - \frac{1}{\sigma'' - 1}$ shows that the total number of prostitutes decreases in the price of prostitution p_s and in the modified male preference ratio σ''. The modified men's and women's indifference conditions jointly yield the price of prostitution in (14), which increases in all criminalization parameters $\{q, \kappa_b, l_1, l_2, l_2\}$. Since σ'' also (weakly) increases in those parameters, this implies that the total number of prostitutes decreases in them. Next, inserting the price (14) into the traffickers' zero-profit condition (13) yields equation (15). The left-hand side of (15) increases in all criminalization parameters $\{q, \kappa_b, l_1, l_2, l_2\}$, so the number of trafficking victims n_t that solves (15) increases in them, given that $c(.)$ is strictly increasing. This also implies that the number of voluntary prostitutes decreases in all criminalization parameters $\{q, \kappa_b, l_1, l_2, l_2\}$, considering that the total number of prostitutes declines.

Case B: Equilibrium with only trafficking. Using the modified men's indifference condition $sp_s = \sigma'' p_m$ in the market-clearing condition (3) yield a solution for p_s as a function of n, all of which are trafficked in this case: $p_s = \frac{\sigma''}{n(\sigma'' - 1) + 1} \frac{y}{s}$. Inserting this solution into the traffickers' zero-profit condition (13) yields

$$\frac{y\sigma''}{n\sigma'' + 1 - n} - l_1 = c(n).$$

The left-hand side is, for all n, smaller here than in (6), which is the corresponding equation for case B under decriminalization, implying a smaller solution for n. Also, the left-hand side decreases in q, κ_b, l_1, and l_3. Large enough κ_b turn σ'' and so the left-hand side negative, in which case trafficking drops to zero.

Proposition 6

The indifference conditions (17)-(18) yield unique equilibrium prices $p_{s,l} = p_s^*$, $p_m = p_m^*$, and $p_{s,u} = \frac{\sigma_u w}{s(\sigma - 1)}$ where $\sigma_u \equiv \frac{se_u}{k}$ is the male preference ratio with respect to *unlicensed* sex relative to marriage. As voluntary prostitutes have access to the licensed market, the prices of licensed sex and marriage are the same as in the decriminalized market. One measure of the wedge between licensed and unlicensed prostitution prices is the price ratio $\frac{p_{s,l}}{p_{s,u}} = \sigma_u$, which equals the male preference ratio towards unlicensed sex, which reflects the impact of the criminalization of johns in the unlicensed sector.

Using the price of unlicensed prostitution $p_{s,u}$ in the traffickers' zero-profit condition (20) yields

$$\frac{\sigma_u}{\sigma} \frac{w}{1 - 1/\sigma} - l_1 = c(n_t). \tag{22}$$

A comparison to (5) shows that the law reduces trafficking (since $\sigma_u < \sigma$ and $l_1 \geq 0$). Last, inserting all prices into the market clearing condition yields

$$n = \rho - \frac{1}{\sigma - 1} + \frac{\sigma - \sigma_u}{\sigma - 1} n_t, \tag{23}$$

which shows that, as the law decreases n_t, it also decreases total prostitution. Furthermore, since the demand for unlicensed sex is positive only if $\sigma_u > 1$, it must be that $\frac{\sigma - \sigma_u}{\sigma - 1} < 1$ as long as the unlicensed market is active. Thus, (23) implies that total prostitution does not decrease as much as trafficking, which in turn implies that voluntary prostitution increases.

Finally, for $\kappa_b > \frac{e - l_3 - k/s}{q}$, we have $\sigma_u < 1$, which is to say that in this case the male preference ratio towards unlicensed sex is so low that demand in the unlicensed market vanishes, and trafficking with it. Without competition from traffickers in the (rest of the) market, the outcome in the licensed sector is the same as in a laissez-faire market free from coercion.

Corollary 6

Recall that due to the overcompensation effect, criminalization increases trafficking as long as there is voluntary prostitution (Propositions 3 and 4). Hence, criminalization is more likely to increase trafficking (and conversely, decriminalization is more likely to reduce trafficking) when a decriminalized market exhibits a larger level of voluntary prostitution. Given coexistence of both types of prostitution, the level of voluntary prostitution equals $n_v = n^* - n_t$, where n^* is the total level of prostitution as determined in Proposition 1, and n_t is the level of trafficking as determined by the zero-profit condition $sp_s^* = c(n_t)$. Thus, voluntary prostitution in a decriminalized market is higher – and hence decriminalization is more likely to decrease trafficking – for higher n^* and lower p_s^*. By Proposition 1, an increase in effective wage inequality ρ raises n^* (but does not affect p_s^*), and an increase in the male preference ratio (with respect to prostitution relative to marriage) σ both raises n^* and lowers p_s^*. Finally, an decrease in the occupational hazard h lowers the female effective wage $\omega \equiv w + h$, and thereby increases effective wage inequality ρ.

Corollary 7

Given that the countries are identical, we consider a symmetric equilibrium in the benchmark setting, for which we can apply the coexistence solution derived in Section 3.1 (traditional model): The prices of prostitution are

$$p_{s,A}, p_{s,B} = \frac{\omega'}{s(1 - 1/\sigma')},$$

and the prices of marriage are (hence by (7))

$$p_{m,A}, p_{m,B} = \frac{w + h'}{\sigma' - 1}$$

with h', ω', and σ' defined as in Section 3.1. Further, the country levels of prostitution are

$$n_A, n_B = \frac{y}{sp_s}\frac{\sigma}{\sigma - 1} - \frac{1}{\sigma - 1},$$

while the level of trafficking in each country is $n_t'/2$, where

$$\frac{\omega + l_2 + q\kappa_s}{1 - 1/\sigma'} + \frac{l_1}{\sigma' - 1} = c(n_t'). \tag{24}$$

Now suppose that country A decriminalizes prostitution. As a result, the women and men of country A face the indifference conditions (1) and (2) from Section 2.1 (decriminalization) with respect to *domestic* prices. These conditions yield a new domestic price $p_{s,A}^* = \frac{\omega}{s(1-1/\sigma)}$, which is smaller than $p_{s,A}$ since $\omega < \omega'$ and $\sigma > \sigma'$.

This attracts johns from country B, where prostitution is still illegal, and puts downward pressure on the price of sex there. Indeed, there is demand in country B's prostitution market only if in addition to men in country B weakly preferring domestic prostitution to marriage,

$$sp_{s,B} \leq \sigma p_{m,B}, \tag{25}$$

the price of domestic prostitution is competitive,

$$p_{s,B} \leq p_{s,A}^*. \tag{26}$$

At the same time, there is voluntary supply in country B's prostitution market only if women in country B weakly prefer prostitution to marriage,

$$(1 - q)sp_{s,B} \geq p_{m,B} + w + h'. \tag{27}$$

Thus the prostitution market in country B is active only if (25)-(27) hold simultaneously. As it turns out, this cannot be achieved.[35] Intuitively, for women in country B to be willing to sell prostitution so cheaply that they can compete with country A's prostitution market, the price of marriage in country B must fall. But before the price reaches a level at which women in country B would enter prostitution, it reaches a level at which the men in country B prefer to marry domestic women and buy prostitution abroad.

In an equilibrium where there is no prostitution in country B, the following conditions must

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[35](25) and (27) jointly define a set of $p_{s,B}$. This set is non-empty only if $p_{m,B} \geq \frac{w+h'}{(1-q)\sigma-1}$. (26) and (27) also define such a set, which is non-empty only if $p_{m,B} \leq \frac{(1-q)\omega}{1-1/\sigma} - w - h'$. These two conditions, in turn, are compatible only if $\frac{w+h'}{(1-q)\sigma-1} \leq \frac{(1-q)\omega}{1-1/\sigma} - w - h'$. Note that, if the last inequality is violated for $h' = h$, it is *a fortiori* violated for $h' > h$. For $h' = h$ (in which case $w + h' = \omega$), the inequality would be $\frac{\omega}{(1-q)\sigma-1} \leq \frac{(1-q)\omega}{1-1/\sigma} - \omega$. This can be rearranged to $(1-q)\sigma \geq \sigma$, which is false. (In deriving this contradiction, recall that $\sigma' \equiv (1 - q)\sigma$ must be larger than 1 for voluntary prostitution to exist under the traditional model, i.e., for coexistence in our benchmark setting.)

hold: The women in country B must weakly prefer marriage to prostitution,

$$(1-q)sp_{s,B} \leq p_{m,B} + w + h',$$ (28)

and the men in country B must weakly prefer marriage to spending more on prostitution in country A,

$$\frac{p^*_{s,A}}{e} \geq \frac{p_{m,B}}{k}.$$ (29)

These two conditions can be jointly satisfied.[36] To pin down the price of marriage in country B, we let men spend the minimum on marriage to maximize their consumption of sex. This means setting the price of prostitution in country B to the lowest level that is compatible with all demand for prostitution flowing to country A, $p_{s,B} = p^*_{s,A}$, and choosing $p_{m,B}$ such that the indifference condition (28) for the women in country B binds. This yields

$$p_{m,B} = \max \left\{ (1-q)\frac{\omega}{1-1/\sigma} - w - h', 0 \right\}.$$

In this equilibrium, the entire prostitution market is absorbed by country A, and men from country B become sex tourists. Even if autarkic, country A's prostitution market would grow after the decriminalization. Sex tourism from country B reinforces that growth. Traffickers send their victims to country A with the total level of trafficking now given by $sp^*_{s,A} = c(n_t)$, or

$$\frac{w}{1-1/\sigma} = c(n_t).$$ (30)

A comparison of (30) with (24) shows that total trafficking decreases after decriminalization. (This is the same comparison as between (10) and (5).)[37] But it need not fall below $n'_t/2$.[38] Thus, while the decriminalization reduces the total level of trafficking across both countries, it may raise trafficking in country A.

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[36]Rewrite (28) as $p_{m,B} \geq (1-q)sp_{s,B} - w - h'$, and (29) as $p_{m,B} \leq \frac{\omega}{\sigma-1}$ after substituting for $p^*_{s,A}$. These inequalities can hold simultaneously only if $(1-q)sp_{s,B} - w - h' \leq \frac{\omega}{\sigma-1}$. This holds, for example, for $p_{s,B} = p^*_{s,A}$ in which case the inequality becomes $(1-q)\sigma\frac{\omega}{\sigma-1} - w - h' \leq \frac{\omega}{\sigma-1}$. If this holds for $h' = h$, it holds a fortiori for $h' > h$. For $h' = h$, the inequality reduces to $q \geq 0$, which is true.

[37]Recall that this result obtains because we assume that there is voluntary prostitution. If there is initially no voluntary prostitution, decriminalization can increase trafficking.

[38]Whether that is the case depends on the parameters and the shape of $c(\cdot)$.