

Human Trafficking and Regulating Prostitution^{*}

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Abstract

Certain markets are illicit because part of the supply is 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

JEL Codes: J12, J16, J28, J46, J47, K42.

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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 some cases, the law is intended to eliminate all trade. In other cases, however, only some exchanges are socially undesirable. 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 may be mutually beneficial, but sex trafficking is socially undesirable. 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.

Little is known about optimal regulation of such semi-coerced markets, despite estimates suggesting that there are millions of forced workers world wide.¹ This paper begins to fill this gap by theoretically analyzing optimal regulation of a semi-coerced prostitution market. Specifically, we ask how prostitution should be regulated if some supply is trafficked and some is voluntary, under the assumption that the regulator wants to eliminate trafficking without infringing on voluntary supply.

This question is of central policy interest. The debate on prostitution regulation was recently revived by Amnesty International’s decision to support worldwide decriminalization of sex trade.² All sides of this debate condemn trafficking, but as traffickers tend to evade prosecution, the search for alternative means has turned into a debate about whether all prostitution should be banned.³ There are two points of contention: First, there is no consensus on 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 may remain if the law comes at the expense of voluntary prostitutes, forcing them underground where their safety is more at risk. This lack of agreement is reflected in the range of regulatory policies around the world, which include (a) decriminalization, (b) criminalizing prostitutes (which we refer to as the “traditional” model), (c) criminalizing johns (the “Swedish” model), and (d) licensed prostitu-

¹The International Labor Organization (ILO) estimates that there are over 12.3 million forced workers worldwide (Andrees and Belser 2009). Many of these forced laborers may work in the same markets as voluntary workers. For example, Kara (2009) estimates that about 600,000 individuals are trafficked every year in the sex industry.

²A UN commission came to similar conclusions in a call to decriminalize prostitution (The Guardian 2013). This debate has a long history (e.g., Woolston 1921, United Nations 1959). The New York Times (2012, 2015) surveys key arguments. For a broad discussion, see Chuang (2010) and MacKinnon (2011).

³The U.S. enacted the Trafficking Victims Protection Act (TVPA) in 2000. Some research suggests that it may have slowed the increase in sex trafficking charges filed by federal prosecutors (Judge and Boursaw 2018). Also see Farrell et al. (2019) on state laws aimed at combatting human trafficking. 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).

tion (the “Dutch” model). It does not help the debate that nearly every approach, except the Swedish model, is represented among the world’s top trafficking destinations (Figure 1).

Key to our theory is the differentiation between coerced and voluntary supply. Following [Acemoglu and Wolitzky \(2011\)](#), we model the coercive labor relationship as one where the employer (trafficker) can violate the employee’s (victim’s) participation constraint. Thus, coerced prostitutes are forced to sell sex by traffickers, who extort their revenue. Voluntary prostitutes, in contrast, pocket the revenue themselves and choose to sell sex only if this revenue exceeds the costs of selling sex. These costs include foregone earnings from other sources and, importantly, any “participation costs” stemming from, e.g., occupational hazards. Modeled in this way, voluntary suppliers include women who 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 emphasize that the differentiator between coerced and voluntary supply in our framework is that coerced suppliers are forced *by a third party*.

A crucial feature of the model is that, while voluntary and coerced prostitutes supply the same “good” to the market, their underlying production costs differ. Voluntary prostitutes’ sell sex so long as the price of sex exceeds foregone earnings and participation costs. Traffickers, in contrast, incur costs in running their criminal activity, but *do not internalize their victims’ participation costs*. This feature will turn out to be crucial for optimal regulation.

In Section 2 we begin our analysis by characterizing a key benchmark: the equilibrium in an unregulated, decriminalized market with only voluntary prostitutes. This is the *laissez-faire* outcome that the regulator in our model wants to restore in the presence of trafficking. Then, we add traffickers to the model.

Section 3 analyzes the effect of criminalization. This analysis upends two orthodox policy arguments. First, advocates of criminalization often argue that costs levied on sex trade (final goods) pass through to traffickers (intermediate producers) and make their business less profitable. What this argument overlooks is that the penalties fall unequally on voluntary prostitutes and traffickers, whereas market price adjustments affect them equally. Concretely, criminalization raises the compensating differential required by voluntary suppliers and induces some of them to exit, but if not all do, the ensuing market 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; consequently, trafficking increases. This “overcompensation effect” makes the effect of criminalization non-monotonic: Higher arrest rates raise trafficking as long as some supply is voluntary, but reduce trafficking once all voluntary supply has exited the market. Hence, our theory is consistent with arguments on both sides of the debate.

Second, in semi-coerced markets, the legal incidence of penalties is *not* irrelevant. This stems from the fact that part of the supply is coerced – and therefore fails to respond to certain

penalties imposed on suppliers – whereas all demand is voluntary. This “asymmetric voluntariness” has the crucial implication that buy-side and sell-side criminalization differ in their potential to eradicate trafficking: Criminal punishment of prostitutes always weakly increases trafficking. Sufficient punishment of johns (the Swedish model), by contrast, can deter all demand for prostitution and thus eliminate trafficking.

In Section 4, we turn to the Dutch model of licensed prostitution. This regulatory model grants licenses to – and thus legalizes – voluntary suppliers, but criminalizes unlicensed (trafficked) ones. Because it discriminates between voluntary and coerced supply, the Dutch model dominates both decriminalization and criminalization of prostitutes. However, it cannot eradicate trafficking. Instead, trafficking continues in an “underground” market serving johns to whom it does not matter that their counterparty is unlicensed (so long as the price is “right”). Intuitively, this is because the Dutch model imposes penalties on the “wrong” side of the market – the supply side.

Our analysis of existing policies thus boils down to a trade-off, summarized in Section 5, between the Dutch and Swedish models: The Dutch model permits voluntary supply but cannot eliminate trafficking; the Swedish model can eliminate trafficking, but only if it also eliminates voluntary supply. This asks of lawmakers to weigh the war on trafficking against the interests of voluntary prostitutes.

In Section 6, 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. Intuitively, sufficiently severe penalties for purchases in the underground sector can divert all demand to the licensed sector, and thereby destroy traffickers’ business. This optimal policy restores the benchmark outcome, the *laissez-faire* equilibrium absent coercion.

The final part of our analysis, in Section 7, discusses three concrete implications of our theory for empirical investigations of prostitution markets. First, because decriminalization can both increase and decrease trafficking – and the impact in a given context depends on factors such as gender wage inequality – a policy that works in one country may backfire in another. Second, the very factors that determine the impact of prostitution laws also influence the political support for these laws; in other words, policy is endogenous. Third, much like stricter environmental standards in one country may influence pollution in neighboring countries, when the demand and supply for sex can cross borders, prostitution laws adopted in one country has spillover effects abroad. In the case of prostitution laws, we show that these spillovers effects may dominate the home country effect – that is, a policy that reduces the level of trafficking at home can in fact increase the global level of trafficking. While concerns with external validity, endogeneity, and spillovers always exist, our theory provides micro-mechanisms underscoring that these issues may be of first order importance in empirical investigations of prostitution policy.

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 and Sekar (2016) note that, when there is desirable and undesirable trade, the impact of legalization on illicit activities depends in general on supply and demand elasticities. Our paper narrows down the distinction between desirable and undesirable trade to whether supply is voluntary or coerced, and study how the presence of coercion distorts the impact of policies.

The motivation to unpack the controversy about sex trafficking and prostitution through a model is owed to the theoretical analysis of coercive labor relationships by Acemoglu and Wolitzky (2011). We abstract from many elements included in their theory (e.g., employee effort) but borrow the core idea that coercion means that employees’ participation constraints need not be fully respected. We embed this idea in a model where coerced and voluntary suppliers compete and, assuming coercion itself is difficult to prosecute, study how “product market” regulations affect the two types of supply. Friebe and Guriev (2006) develop a theory in which illegal migrants agree (at the origin) to bondage (at the destination) as commitment to repay their smugglers for financing the transport. This theory has interesting policy implications, but because no ex ante participation constraint is violated in the migrants’ decision, neither the over-compensation effect nor asymmetric voluntariness would emerge if “non-trafficked” competitors were added into the model.

Our paper 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) study how law enforcement affects transnational trafficking flows. Immordino and Russo (2015) study the effect of various policies on voluntary prostitution. 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. Lee and Persson (2016) study the impact of prostitution laws on violence encountered by voluntary prostitutes.

Our theory is broadly consistent with the findings of a small but growing empirical literature analyzing the impact of prostitution policy on the market for sex. Gertler et al. (2011) show that stronger law enforcement in one sector increases the price of sex in that sector and pushes sex workers into another, parallel sector. In a similar vein, Cameron et al. (2021) and Azam et al. (2021) show that criminalization and the imposition of government restrictions on (otherwise legal) prostitution markets, respectively, induce exit of (voluntary) sex workers. Conversely, Chan et al. (2019) study a context in which reducing the costs of connecting clients and sex workers induces entry of sex workers, and Cunningham and Shah (2018) shows that decriminalization induces market expansion and price decreases. Further, Bisschop et al. (2017), Cunningham and Shah (2018), Nguyen (2015) present evidence that legalization or weaker law enforcement reduces rape charges – which are often associated with “underground prostitution”

– and, conversely, [Ciacci \(2018\)](#) and [Della Giusta et al. \(2019\)](#) show that stronger law enforcement raises rape charges and tilts demand towards riskier clients, respectively.⁴ In addition to these analyses studying particular contexts, [Cho et al. \(2013\)](#) and [Jakobsson and Kotsadam \(2013\)](#) present cross-country comparisons of (estimates of) trafficking flows and relate these to prostitution law.

2 Decriminalized Prostitution

We begin by looking at a decriminalized market for prostitution, an unregulated market with no licensing, no “red light districts,” and no laws against the sale or purchase of sex.

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 (expected) income to 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 documented that prostitution is often better paid than many other low-skill, labor-intensive professions and proposes that this premium compensates for two types of costs associated with selling sex: occupational hazards such as increased health risks (e.g., [Arunachalam and Shah 2013](#), [Gertler et al. 2005](#), [Levitt and Venkatesh 2007](#), [Rao et al. 2003](#), [Robinson and Yeh 2011](#), [Shah 2013](#)) and marriage market opportunity costs, such as a worse pool of potential spouses or worse treatment inside marriage ([Ciacci 2019](#), [Edlund and Korn 2002](#), [Edlund et al. 2009](#)). We incorporate both of these additional costs in our framework by modeling two markets for sexual interaction (as [Edlund and Korn \(2002\)](#)): a labor market for prostitution and a marriage market.⁵

Population. There is a mass of females and a mass of males with the size of each group, for simplicity, normalized to one.⁶

⁴Also see [Cunningham et al. \(2019\)](#) who relate the safety of prostitutes to the introduction of an online sex market clearinghouse, and [Ciacci and Sviatschi \(2020\)](#) on the impact of openings of (legal) adult entertainment businesses on sex crime. While we study how prostitution policy can lead to violence against women through trafficking, prostitution policy can also have spillovers onto women who do not work in the market for sex; see, e.g., [Berlin et al. \(2020\)](#) on domestic violence. Also, brothel closures have been shown to have spillovers onto other types of crime ([Giambona and Ribas 2020](#), [Soto and Summers 2020](#)) and onto house prices in the local area ([Giambona and Ribas 2020](#)).

⁵Occupational hazards may also include disliking sex work. Further, [Della Giusta et al. \(2009\)](#) propose social stigma as another explanation for the wage 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.

⁶The implied sex ratio of one is not important for our results. Extending our model to other sex ratios has the effect that the demand for prostitution increases with the share of men. Our analysis abstracts from this effect to focus on other determinants of prostitution.

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). Wage homogeneity among men is unimportant. We will discuss wage heterogeneity among women later (Section 3.3).

Markets for sexual interaction. Sexual interaction 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 pay spouses a “price of marriage” p_m , which can also be interpreted as (investment into the) “quality of marriage.” Strictly speaking, this need not be a market for *marriage*; throughout the paper we use “marriage” and “mating” interchangeably, as monogamous relations do not require marriage and may graduate through various stages (Persson 2020).

For simplicity, we assume women value neither marriage nor non-reproductive sex intrinsically.⁷

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 evidence that prostitutes sometimes simultaneously hold other jobs (Cunningham and Kendall 2017) and are not necessarily less likely to be legally married (Arunachalam and Shah 2008). However, this assumption is made for convenience only. 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).⁸

Male economic problem. Each man spends all his labor income on prostitution or marriage, or both, and he maximizes his consumption utility. Assuming that (also) married men buy commercial (extra-marital) sex is consistent with evidence (e.g., Farley et al. (2011)). We discuss later that adding other consumption goods does not alter the key insights if marriage

⁷Specifying 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 limits 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. We should also note that $s > 1$ is not crucial; it merely underscores that a prostitute can sell sex to many men such that prostitution can be more “lucrative” than marriage, even if men place a higher value on a marriage than on a unit of non-reproductive sex, i.e., $e < k$.

⁸An 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.

is a “normal good” (Section 3.3). By construction, the number of unmarried men equals the number of prostitutes, which we denote by n .

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

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

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

$$\sigma \equiv \frac{se}{k} \quad (\text{male preference for prostitution})$$

In the effective female wage ω , the occupational hazards h of working as a prostitute are interpreted as a premium on work in the regular labor market. The effective wage ratio ρ is a measure of gender inequality in the labor market. Last, the utility ratio σ measures men’s preference for s units of prostitution relative to (one unit of) marriage. A low σ means that men 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 $\rho \in \left(\frac{1}{\sigma-1}, \frac{\sigma}{\sigma-1}\right)$.

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. Under Assumption 1, the number of prostitutes n is strictly between 0 and 1 in equilibrium (as shown in the proof of the proposition below). Such an interior equilibrium is characterized by a triple (p_m, p_s, n) that satisfies the following three conditions:

$$sp_s - h = p_m + w \quad (1)$$

$$\frac{p_s}{e} = \frac{p_m}{k} \quad (2)$$

$$nsp_s = (1 - n)(y - p_m) + ny \quad (3)$$

The first two are indifference conditions. Women must be indifferent between working as a prostitute and their outside option ((1)); men must be indifferent to shifting expenditure across markets, which requires per-util prices of marriage and prostitution to equalize ((2)). The last is a market-clearing condition: all male income not spent on marriage is spent on prostitution ((3)).

The indifference conditions (1) and (2) pin down marriage and prostitution prices, p_m^* and p_s^* , respectively. With prices given, the market-clearing condition (3) yields the number of prostitutes, or size of the prostitution market, n^* .

Proposition 1 (Benchmark equilibrium). *The equilibrium in a decriminalized market without trafficking is $p_s^* = \frac{\omega}{s(1-1/\sigma)}$, $p_m^* = \frac{\omega}{\sigma-1}$, and $n^* = \rho - \frac{1}{\sigma-1}$.*

Proof. The interior equilibrium is derived in the text above. In the Appendix, we show that Assumption 1 rules out corner solutions. \square

In our setting, this is the outcome a regulator aims to restore in the presence of trafficking. The comparative statics of the benchmark equilibrium are:

Corollary 1. *In a decriminalized market without trafficking, voluntary prostitution increases with men’s wage y and their preference for prostitution σ , but decreases in women’s effective wage ω .*

Proof. This follows directly from Proposition 1. \square

A higher male income y or preference for prostitution σ increases the demand for prostitution. A higher female effective wage ω (i.e., wage w or occupational hazard h) raises the cost of working as a prostitute and hence lowers the supply of prostitution. For constant average income, this implies that voluntary prostitution increases with the effective wage ratio ρ , that is, when the gender income gap increases in favor of men.

A key element in our model is the difference between a prostitute’s labor income and what she could earn in the regular labor market, $\Delta \equiv sp_s^* - w$. The women’s indifference condition (1) implies that this difference in equilibrium equals

$$\Delta = h + p_m^*.$$

As argued in the literature, prostitutes earn a premium that compensates for occupational hazards h and the foregone marriage premium p_m^* . The equilibrium revenue from prostitution (in case A) is equal to the participation cost of voluntary prostitutes, $sp_s^* = w + \Delta$, which includes this compensating differential Δ . As we shall see, a policy’s impact on trafficking depends much on its effect on Δ .

2.2 Sex trafficking

Trafficking is the “recruitment, transportation, transfer, harboring or receipt of persons by means of threat of force, fraud, deception, or the abuse of power” (United Nations, 2000). Such “means” serve to make a person act against her true interest. This evokes the definition of coercive labor relations in Acemoglu and Wolitzky (2011) where principals can lower agents’ reservation utility when “hiring” them, thus violating the latter’s intrinsic participation constraints. That is, coercion is a costly way to avoid compensating workers for participation costs. We adopt the simplest version of this idea in our model: by incurring a cost of coercion, a trafficker can fully ignore a woman’s participation constraint and force her to sell sex.

Trafficking cost. Let n_t denote the total number of trafficking victims, with subscript t indicating trafficking. Traffickers incur a cost per trafficked woman, which we describe as a function of the total number of trafficking victims $c(n_t)$. We assume that

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

In words, $c'(\cdot) > 0$ means that trafficking exhibits decreasing returns to scale. We have in mind that, as n_t grows, scale and competition make it harder for traffickers to conceal their activity from law enforcement or to find and appropriate victims.⁹ The conditions $c(0) = 0$ and $c(1) > y$ rule out corner solutions, in which all or no women are trafficked.

Trafficking profit. Trafficked prostitutes generate the same revenue as voluntary ones, but their revenue is fully extorted by the traffickers. Assuming free entry, we impose that traffickers make zero profit in equilibrium:

$$sp_s = c(n_t). \quad (4)$$

In our model, trafficking victims receive no compensation for foregone labor income, foregone mating opportunities, or occupational hazards of prostitution. This is perhaps extreme but not crucial; the main insights obtain as long as there is *some* coercion such 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 . The possible equilibrium constellations are $n_t < n$ (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 to prostitution (rather than being indifferent), so 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, the equilibrium is characterized by the same indifference and market clearing conditions (1)-(3) as in a decriminalized market without trafficking, along with the traffickers' zero profit condition (4). As in Section 2.1, (1)-(3) 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),

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

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. If the solution to (5) is larger than n^* , the women's indifference condition (1) must be replaced by $sp_s - h \leq p_m + w$. Then, (2) and (3) pin down prices for prostitution and marriage as a function of $n = n_t$:

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

⁹This assumption has intuitive appeal and ensures that the equilibrium value of n_t is a smooth function. But it is not crucial: With non-decreasing returns to scale, the qualitative impact of policies is the same, with the difference that trafficking reacts in a “bang-bang” fashion, discontinuously switching between inexistence and maximum scale.

Substituting the latter expression for p_s into (4),

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

yields a unique solution for n , all of which is trafficking in this case.¹⁰

We now compare the equilibrium in a decriminalized market in the presence of trafficking with the benchmark equilibrium absent trafficking (Proposition 1).

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 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 voluntarily supplies 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. □

Coercion is the reason traffickers seize a positive share of a decriminalized prostitution market: Internalizing neither hazards nor opportunity costs borne by trafficked prostitutes gives traffickers a “cost advantage” over voluntary prostitutes. This cost advantage offsets trafficking costs up to some 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 voluntary prostitutes who – as in the benchmark equilibrium – are the marginal entrants that pin down the price of sex. Thus, prices and the sizes of the prostitution and marriage markets are the same as in the benchmark equilibrium; the impact of trafficking is that some voluntary prostitution is crowded out.

In case B, trafficking is so cheap that traffickers supply as many prostitutes as there are in the benchmark equilibrium or more, drive the price of sex below the participation cost of voluntary prostitutes, and seize the whole market. The (coerced) supply of cheaper sex also puts downward pressure on the price, or quality, of marriage for women. That is, on top of coercing their victims, traffickers in this case impose a negative externality on women’s mating experiences.

2.3 Comparative statics in a decriminalized market

In this section, we study the comparative statics of the equilibrium described in Proposition 2 with a focus on trafficking. It will be useful to discuss “supply-side” and “demand-side”

¹⁰The solutions to (5) and (6) coincide when $\frac{y\sigma}{n_t\sigma + (1-n_t)} = \frac{w}{1-1/\sigma}$, which yields $n_t = n^*$. That is, the solutions coincide once, at the point where trafficking fully displaces voluntary prostitution.

determinants separately.

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

Proof. See Appendix. □

Changes in ω affect the costs of voluntary prostitutes but not those of traffickers. For voluntary prostitutes, a higher ω raises participation costs, causing some to exit prostitution. For traffickers, ω has no such effect, as they do not internalize their victims’ participation costs. However, since the exit of voluntary prostitutes raises the price of sex to reflect the higher participation costs, traffickers *benefit* indirectly through higher revenues. Thus, trafficking increases. The indirect effect is there so long as there are voluntary prostitutes in the market (case A). Once ω is so high that no more women enter into prostitution voluntarily (case B), further increases in ω have no effect on the (now fully coerced) prostitution market. Figure 2 depicts these effects.

Corollary 3. *Consider a decriminalized market with trafficking. As long as some women supply sex voluntarily (case A), a decrease in men’s preference for prostitution σ yields a decrease in voluntary prostitution and in the size of the prostitution market, but an increase in trafficking. Once σ is so low that no woman supplies sex voluntarily (case B), further decreases in σ continue to reduce the size of the (now 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. □

A decrease in men’s preference for prostitution σ leads to a higher demand for marriage and a lower demand for prostitution. Men hence shift expenditure into the marriage market, which increases the price of marriage p_m^* . This in turn pulls non-coerced women out of the prostitution market into the marriage market. As a result, voluntary prostitution decreases. One may also expect trafficking to decrease as demand shifts from prostitution to marriage. But this is not always the case. As long as there are voluntary prostitutes in the market (case A), the compensating differential – and thus the price of sex – increases to reflect the increased price of marriage, $\Delta = h + p_m^*$. This makes trafficking *more* lucrative, as traffickers do not internalize their victims’ forgone utility from mating. This effect disappears once p_m^* is so high that no woman enters prostitution voluntarily (case B), from which point onward any further decreases in σ reduce trafficking.

The above comparative statics highlight three aspects of semi-coerced sex markets that will matter for the impact of policies. First, whether prostitution is primarily voluntary or trafficked depends on factors such as gender income equality and preferences with respect to marriage or mating, which can vary across countries, subpopulations, and over time. This is important because the nature of supply is a key point of contention in the policy debate.

Second, any increase in the participation cost of prostitutes – i.e., occupational hazards, forgone other labor income, or forgone utility from mating – decreases overall prostitution, but widens the cost advantage of traffickers who do not internalize such costs. The resulting contraction of the market hence comes hand in hand with an expansion in trafficking. To see this somewhat formally, note that trafficking increases with the price of sex p_s^* . In case A, the women’s indifference condition (1) implies $sp_s^* = w + \Delta$ (cf. the end of Section 2.1). Hence, any increase in w or Δ , which reduces voluntary prostitution, makes trafficking more lucrative.

Third, when there is no more voluntary prostitution (case B), the supply-side parameters w and h do not affect the prostitution market (Corollary 2), but the demand-side parameter σ continues to have an effect (Corollary 3). This reflects the asymmetry that part of supply but none of the demand is coerced.

3 Criminalizing Prostitution

The first policy we analyze is an outright ban on prostitution. The idea behind this approach is that making prostitution more difficult or expensive reduces the supply thereof, including trafficking. We will establish a caveat to (the last part of) this argument: Due to the nature of coercion, a ban on prostitution can lead to more trafficking.

3.1 Criminalizing prostitutes (Traditional model)

We refer to laws against the sale of sex as “traditional” because most countries criminalize sex work. Until 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.¹¹

Modeling criminalization of the sale of sex. Suppose the police arrests prostitutes, but because policing is imperfect, a prostitute faces a probability $q < 1$ of being apprehended. We abstract from public resources spent on law enforcement and consider only the effect on prostitution. When arrested, a prostitute loses her income and bears a criminal penalty κ_s . Traffickers remain undetected and go unpunished, but they lose the income from trafficked prostitutes that are arrested.¹²

¹¹The 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” (United Nations 1959, p.11).

¹²Empirically, 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. While trafficking is illegal in the United States, only 130 traffickers were convicted from 2001 to 2005; it has been estimated that this represents a mere 3% of all

The law also raises “costs 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 traffickers and by voluntary prostitutes. Other costs, denoted by l_2 , are experiential (e.g., a less hygienic or more unsafe work environment) and borne only by the prostitutes involved in the sexual exchange, but not by traffickers.¹³ Overall, when the sale of sex is criminalized, both voluntary prostitutes and traffickers face higher costs and expect some loss of income.

Equilibrium conditions. The law alters equilibrium conditions for supply: The women’s indifference condition and the traffickers’ zero-profit condition, respectively, change to

$$(1 - q)sp_s - h - l_1 - l_2 - q\kappa_s = p_m + w \quad (7)$$

$$(1 - q)sp_s = c(n_t) + l_1. \quad (8)$$

We can conveniently rewrite (7) as $(1 - q)sp_s = p_m + w + h'$, 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 size of the prostitution market. As long as some women supply sex voluntarily (case A), criminalizing prostitutes reduces voluntary prostitution but increases trafficking. When no woman supplies sex voluntarily (case B), penalties on prostitutes that are partly borne by traffickers reduce 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. See Appendix. □

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 the burdens imposed by the ban.

As the new equilibrium price compensates for changes in *all and any* of the participation costs of prostitutes – including every occupational hazard and foregone marriage gains – it *overcompensates* traffickers who do not internalize all of those costs. Indeed, it turns out that

traffickers (Kara 2009). This does not rule out that avoiding arrest is costly for traffickers; this cost is included in the traffickers’ cost function $c(n_t)$.

¹³See, e.g., Cunningham and Shah (2018) and Nguyen (2015) for empirical evidence consistent with criminalization raising the experiential hazards – captured, in their analyses, by the number of gonorrhea and rape cases – of working as a prostitute. In the theoretical analysis of Lee and Persson (2016), criminalization also exposes prostitutes to more violence by johns and law enforcement officers.

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.

The overcompensation effect 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.¹⁴

When the burdens imposed by the ban reach a point where no woman enters prostitution voluntarily, 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, 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 once it has eliminated all 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. Suppose the police arrests johns but not prostitutes. Arrests occur after sex transactions and a john’s probability of being arrested is $q < 1$. When arrested, a john who bought x units of sex receives a criminal penalty of $x\kappa_b$.

¹⁴Without this feedback effect, l_1 and q *per se* would have no effect on n_t . Since p_s increases to compensate (the marginal) voluntary prostitutes for l_1 and q , it equally compensates traffickers for those costs.

(This proxies for the idea that the likelihood of being arrested increases with the frequency of purchases.) The revenue of prostitutes is not confiscated, but the need for secrecy may raise suppliers' administrative costs by l_1 and experiential hazards by l_2 , as in Section 3.1.¹⁵ 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 indifference conditions and the traffickers' zero-profit condition to

$$sp_s - h - l_1 - l_2 = p_m + w \quad (9)$$

$$\frac{p_s}{e - q\kappa_b - l_3} = \frac{p_m}{k} \quad (10)$$

$$sp_s = c(n_t) + l_1 \quad (11)$$

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 size of the prostitution market. As long as some women supply sex voluntarily (case A), criminalizing johns reduces voluntary prostitution but increases trafficking. When no woman supplies sex voluntarily (case B), penalties on johns reduce trafficking, and if high enough, eradicate it.*

Proof. See Appendix. □

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. So long as some women continue to supply sex voluntarily (case A), the price of prostitution adjusts to compensate voluntary prostitutes for the increases in occupational hazards and in forgone mating gains, which overcompensates traffickers who do not internalize those increases. As a result, even under the Swedish model, trafficking increases with changes in *all and any* parameters that indicate a stricter (enforcement of the) ban, i.e., in l_1 , l_2 , l_3 , q , and κ_b .

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

¹⁵Lee 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).

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.¹⁶

In essence, Propositions 3 and 4 about the effect of prostitution bans can be understood as manifestations of the comparative statics of semi-coerced markets discussed in Section 2.3: Either ban imposes costs that cause 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 the latter’s cost advantage and causes some substitution of voluntary prostitution with trafficking. Finally, that trafficking can be eradicated (once all voluntary prostitution is gone) through penalties on johns but not through penalties on prostitutes reflects the asymmetric voluntariness in semi-coerced markets. Figure 3 depicts all these effects.

3.3 Decomposition and robustness of the overcompensation effect

Since the overcompensation effect is central to the preceding analysis, we briefly discuss its nature and robustness. Recall that $sp_s^* = w + \Delta$ with $\Delta = \hat{h} + p_m^*$, where \hat{h} subsumes policy effects on occupational hazards. The overcompensation effect comprises two sub-effects that work through the components of Δ (under both the traditional and Swedish model):

First, any increase in p_s^* due to elements of \hat{h} only borne by prostitutes overcompensates traffickers. This is akin to a *discriminatory tax* levied only on voluntary suppliers. Second, any (even non-discriminatory) “tax” on prostitution that shifts male demand to the marriage market increases p_m^* , which feeds back into an increase of p_s^* (exclusive of the tax) through the women’s supply decision. This is akin to the *general equilibrium* effects, e.g., in Hotelling (1932)¹⁷ or Harberger (1962).¹⁸ In Online Appendix A, we show that this effect is robust to introducing additional consumption goods.

The overcompensation effect is weakened if, when voluntary prostitutes exit the market, the *marginal* prostitute’s outside option w in the labor market were to decrease. In Online

¹⁶The question whether there exists a level of criminal penalties that can completely eliminate trafficking is related to Posner (1985). In Posner’s theory, the goal of criminal punishment is to deter criminal offenses and push agents toward voluntary market exchanges. The problem in our setting is that transactions with both trafficked and voluntary prostitutes are penalized.

¹⁷Hotelling (1932) elucidates the Edgeworth-Hotelling taxation paradox that a tax on supply can actually lower the price of the taxed good. In Section 7 of his paper, Hotelling illustrates why such counterintuitive results can arise in an example with two goods “that compete both in production and consumption” (p.601), like prostitution and marriage in our model. He notes that, by similar arguments, import tariffs can “result in foreign sellers actually receiving more for their product” (p.608), which is analogous to the effect of a levy on demand for prostitution in our model.

¹⁸Harberger (1962) shows that a corporate income tax can increase returns to owners, i.e., capital suppliers. As Mieszkowski (1967) explains, this is due to countervailing effects on capital demand: the partial equilibrium effect that more labor is used in place of capital in the corporate sector, and a general equilibrium effect that shifts production to a more capital-intensive non-corporate sector. The linkage between the corporate and non-corporate sectors can upset the partial equilibrium intuition. In Online Appendix B, we study a model extension where an effect operating through the inelastic supply of voluntary prostitutes induced by wage heterogeneity is a partial equilibrium effect, while the effect operating through the market linkage between p_m^* and p_s^* is a countervailing general equilibrium effect.

Appendix B, we illustrate this caveat in a model extension with female wage heterogeneity, but show that the overcompensation effect can dominate even with substantial heterogeneity. It is worth noting that this caveat does not alter the ranking of policies presented in Section 5, nor the optimality of the new policy proposed in Section 6.

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.¹⁹ 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 prostitutes 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 loses 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.²⁰ 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

¹⁹The 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).

²⁰An empirical analysis of the market for sex in Nevada – a state in the U.S. with a model similar to the Dutch one, with a legal market and a parallel, illegal market – suggests that the consumption of legal sex substitutes for the consumption of illegal sex (Wakefield and Brents 2020).

lower.²¹ 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.²²

Since the law permits voluntary prostitutes to work, it does not impose (further) hazards on them. Similarly, as 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 to

$$(1 - q)sp_s = c(n_t) + l_1. \quad (12)$$

Thus, the equilibrium is determined by (1)-(3) and (12).

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. Criminal penalties κ_s 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 (12) 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.²³ Indeed, by (12), 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 prevent their prostitutes from being detected, and since total prostitution remains the same, business ceded by traffickers is reclaimed by voluntary prostitutes. Thus, moving from a decriminalized market to the Dutch

²¹We here abstract from potential stigma effects of registering per se (Ito et al. 2018).

²²Evidence of supply shifts towards prostitution market *sectors* that are less subject to criminalization is provided by, e.g., 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.

²³This effect is there, albeit weaker, even if the licensing process is imperfect but has discriminatory power.

model moves a prostitution market toward the benchmark outcome in both key dimensions: impact (on trafficking) and conflict (vis-à-vis voluntary suppliers). Put differently, 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 (i.e., (12) is independent of κ_s). Because 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.”²⁴

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 aspect 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 voluntary 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 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. \square

Corollary 4 may surprise people familiar with the debate on prostitution policy in two ways. The first twist is that the Dutch model can dominate decriminalization on 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 (case A), introducing the Dutch model has the same qualitative impact no matter whether the starting point is laissez-faire

²⁴Illegal brothels have been shown to operate in parallel to legal ones in the Netherlands (Simons 2008) and Turkey (Smith 2005). In Nevada, although 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 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).

or full prohibition. In either case, it harms 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, we find that the Dutch model is a win-win policy that grows stronger against traffickers than full criminalization with every voluntary prostitute that moves into the legal sector, as this reduces the overcompensation effect. In other words, allowing for a legal sector renders the Dutch model *stronger*, not weaker, against trafficking, *even if it camouflages part of it*.²⁵

The comparison in Corollary 4 does not cover parameter constellations under which the traditional or Swedish model eliminates voluntary prostitution (case B, which does not exist under the Dutch model unless voluntary prostitution is inexistent under decriminalization). For identical arrest probabilities q , the Dutch model dominates the traditional model even in such cases, as the price of sex 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. □

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 supply is coerced. Corollary 5 is a reflection of the asymmetric voluntariness in semi-coerced markets that we have mentioned before.

²⁵Even 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). For the Dutch model to outdo rather than be equivalent to decriminalization, however, 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 in a decriminalized market for at least some (even if not all) trafficked prostitutes.

5 Ranking Current Policies

To summarize our results so far, we will rank the four basic types of policies currently being implemented around the world along two key dimensions: their *impact* on trafficking and the *conflict* they create vis-à-vis voluntary prostitutes.

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 (Corollary 4). The Swedish model is not dominated by the Dutch model (Corollary 5) – and in fact, by none of the other existing policies – being the only one that can 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 safeguards 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).²⁶

Table 1 summarizes the comparison. Note that the (process of elimination that produces the) above policy ranking is independent of the caveats discussed in Section 3.3. Even if the overcompensation effect is attenuated or overturned, the traditional model is dominated by the Swedish model, and decriminalization is weakly dominated by the Dutch model, strictly if licensing has some discriminatory power.

6 Restoring the Benchmark Outcome: A New Policy

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,

²⁶Our analysis treats voluntary supply as socially desirable. Waltman (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.” Our results imply that, if the social planner’s objective instead is to eliminate *all* prostitution, as opposed to eliminating only trafficking, the optimal policy is the Swedish model.

in principle, restore the benchmark outcome and thus dominates all existing ones.

6.1 Dutch-Swedish model

The ranking of existing policies in Section 5 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.

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 licensed and unlicensed sex to be in demand, men must be indifferent between them. This requires unlicensed sex to be cheaper: $p_{s,u} = p_{s,l} - q\kappa_b - l_3$. Due to this discount, voluntary prostitutes prefer the licensed sector, where they are also spared additional hazards. Thus, as under the Dutch model, trafficked and voluntary prostitution, if coexistent, trade in separate sectors at different prices.

The equilibrium conditions are

$$sp_{s,l} = p_m + w \quad (13)$$

$$\frac{p_{s,l}}{e}, \frac{p_{s,u}}{e_u} = \frac{p_m}{k} \quad (14)$$

$$(n - n_t)sp_{s,l} + n_tsp_{s,u} = (1 - n)(y - p_m) + ny \quad (15)$$

$$sp_{s,u} = c(n_t) + l_1 \quad (16)$$

where (13) is the women's indifference condition, (14) the men's indifference condition (across all three markets), (15) the market clearing condition that all male income not spent on marriage is spent on the two prostitution sectors, and (16) 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.

6.2 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.

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, where 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. By contrast, under the Dutch-Swedish model, reductions in q and l_1 can be

offset by raising the penalty κ_b on johns in the unlicensed sector to maintain the deterrence by which it diverts demand to the licensed sector. In other words, even if a camouflage effect reduces the risk of arrest, punishments can 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*.”

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 be proportional to the severity of the crime itself, as per an old maxim *culpa 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 possibly be judged complicit in the act of coercion. Accordingly, it might be easier to legislate (sufficiently) severe penalties.

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.²⁷ 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.

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.

²⁷Inelastic 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 theoretical result that stricter law enforcement can increase transnational trafficking.

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.

7 On the Validity of Cross-Country Comparisons

When considering a particular prostitution law, policymakers often cite evidence on a similar policy adopted elsewhere or cross-country comparisons of trafficking flows and prostitution law.²⁸ Our theory identifies three potential caveats for the practice of designing policy using evidence from other contexts, or cross-country comparisons, as a guide.

7.1 External validity: When does (de)criminalization work

As shown in Section 3, criminalizing prostitution can increase or decrease trafficking depending on the prevalence of voluntary prostitution. This raises the question what factors make criminalization or decriminalization more likely to decrease trafficking.

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.

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

²⁸Due to a lack of data on reliable data on trafficking, there are only a few empirical studies that directly study the relationship between prostitution law and trafficking. [Cho et al. \(2013\)](#) and [Jakobsson and Kotsadam \(2013\)](#) are two rare examples, both of which conduct cross-country comparisons and find a positive association between legalization and trafficking. A similar country-by-country perspective is reflected in the U.S. State Department’s periodical *Trafficking in Persons* reports as well as in the trafficking indices used by the above studies from the United Nations Office of Drugs and Crime (UNODC) and the International Labour Office (ILO).

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 underscores that a policy that works in one context may backfire in another. 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 prostitution) involves greater occupational hazards than another segment (e.g., high-end escort services), decriminalization might increase trafficking in the former but decrease it in the latter.

7.2 Policy endogeneity: Adoption of (de)criminalization

A second important implication of our theory for the practice of designing policy based on evidence from other contexts concerns the political support for prostitution laws: The very factors that determine the impact of prostitution laws also influence the political support for these laws.

To see this, consider which individuals in our model would support what type of prostitution regulation. 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.²⁹ 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,

²⁹In our baseline model with homogeneous wages for women in the regular job market, women collectively prefer to abolish prostitution. There, existence of prostitution in competitive equilibrium is a coordination failure among women, as from an individual woman's perspective, prostitution is a means to extract higher rents (effectively, from married women). For $s > 1$, the potential for rents from prostitution can be seen in "promiscuity" (relative to "monogamy" in marriage). Women's unilateral incentives to choose prostitution leads to sex overall being cheaper for men, which is why men prefer not to abolish prostitution. With female wage heterogeneity, it is no longer true that all women prefer to abolish prostitution, since the women who earn the least in the regular job market benefit from being able to extract rents from married women. There is still coordination failure, however, since married women would prefer to pay would-be prostitutes to stay away from prostitution, which would generate aggregate gains by avoiding the occupational hazards h . In competitive equilibrium, women use prostitution and marriage as alternative strategies to compete for male expenditure on sex, which creates a conflict between married women and prostitutes.

no voluntary prostitution emerges because the regular labor market offers women sufficiently attractive alternatives.³⁰ 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 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 $\bar{w} = \frac{y}{2}$ and the average male-female wage gap is $\Gamma \equiv y - \bar{w} = \frac{y}{2}$. 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 solution:

$$sp_s = \Gamma \frac{2\sigma}{\sigma - 1} \left[-\frac{1}{2(\sigma - 1)} + \sqrt{\frac{1}{4(\sigma - 1)^2} + 1} \right]. \quad (17)$$

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.³¹ Note also that the inequality is more likely to be violated (i.e., for a larger number of voluntary prostitutes) when the average wage gap Γ 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, sparking “angry showdowns between women in favor of the law and those against it.” Similar protests have been recurrent in South Korea (e.g., [The Huffington Post 2011](#)), which exhibits high male-female income inequality. This stands in contrast to other countries that adopted the Swedish model, such as Sweden, Norway, and Iceland, where male-female income inequality is among the lowest in the world ([OECD 2018](#)) and where the law, enjoying broad support, 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. Because low levels of voluntary prostitution also make criminalization more effective against trafficking, this policy endogeneity interacts with and reinforces the concern about external

³⁰For 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.

³¹If we choose $y = 1$ and $\sigma = 2$, as for Figures 2 to 4, this is the case for all $i \leq 24$.

validity discussed in Section 7.1: countries in which a ban is likelier to decrease trafficking are likely to be ones where a ban has stronger political support.

7.3 Cross-country comparisons can favor the wrong policy

A third important factor that influences our ability to draw policy conclusions from studies in particular contexts is the presence of cross-border flows of clients and prostitutes. There is suggestive evidence that these flows respond to policy, through altered sex tourism patterns and traffickers relocating victims (e.g., [Swedish Government 2010](#)). Such spillover effects are not surprising; like environmental laws in one country may shift pollution to other countries, prostitution laws adopted in one country can have spillover effects abroad. In the case of prostitution laws, however, the spillover effects may dominate the home country effect: a law that reduces the level of trafficking at home can *raise* the total level of trafficking. Drawing conclusions from cross-country comparisons can therefore favor the wrong policy.

We illustrate this with a simple extension of our model to two countries, A and B. The wages y and w , men’s intrinsic preferences k and e , and occupational hazards h are the same in both countries. 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. However, we allow for sex tourism and transnational trafficking: men can buy sex at home and abroad, and traffickers can traffic prostitutes to both countries. We start from a setting where the sale of sex is illegal 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. □

The decriminalization in Country A causes prostitution market activity to migrate from country B to country A. In our simple model, the prostitution market in Country B collapses. Consider what country-focused empirical studies would find in this setting. A policy evaluation in Country A would find that decriminalization increased domestic trafficking. Further, a cross-country comparison would find that criminalization is negatively associated with trafficking, since there is less trafficking to Country B. The common interpretation of these empirical

findings would be that criminalization reduces trafficking, although Country A’s decriminalization is more effective in reducing (the global level of) trafficking.

In fact, while the common interpretation would lead to calls for reversing the reform in Country A, it would be socially optimal for Country B to decriminalize prostitution as well. This may be politically difficult in Country B because it would *increase* trafficking there, but so would a policy reversal by Country A. Crucially, trafficking levels in both countries would be *lower* if Country B follows suit than if Country A reverses its reform.³²

8 Concluding Remarks

Despite estimates suggesting that there are millions of forced laborers worldwide, who in many cases work alongside voluntary workers, little is known about optimal regulation of semi-coerced markets. This paper begins to fill this gap. While our analysis is cast within the context of prostitution markets – a central and policy-relevant application – the broader points are likely applicable to other markets with forced and voluntary labor.

Our theoretical analysis first shows that none of the regulatory frameworks that are common in prostitution markets today – decriminalization, criminalization of the buy or sell sides, or licensing – can eradicate trafficking *and* safeguard voluntary exchanges. However, we subsequently show that there exists an alternative, novel policy, which *can* restore the outcome that would arise in a laissez-faire regime with only voluntary market participants. This optimal policy represents a hybrid of two currently-existing, common ones – the Dutch model of licensing prostitution and the Swedish model of criminalizing johns who procure sex illegally – and thus is likely as implementable as any of its components.

Our analysis represents only one of various perspectives that can be taken on prostitution regulation. The notion of violence could be expanded from involuntary prostitution to include violence perpetrated against voluntary prostitutes, for example, by johns, pimps, and even law enforcement officers. Lee and Persson (2016) study the policy implications of such “transactional” violence. More broadly, one may question the premise that voluntary prostitution is socially desirable. Some view all prostitution as structural violence, that is, exploitation based on societal biases and inequalities (Waltman 2011); further, even when acting voluntarily, individuals may unwittingly inflict self-harm. In addition, 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. Incorporating such elements into the analysis are important avenues for future research.

³²The overcompensation effect is crucial for this insight. To see this, consider an analogy to environmental (protection) laws. The passage of an environmental law in country A may cause “dirty” firms to relocate and increase pollution in Country B. But despite this spillover effect, one would expect the law to (weakly) reduce overall pollution. In our model with semi-coerced supply, the spillover is paired with an overcompensation effect such that criminalization in one country not only shifts trafficking to the other country but also raises the *overall* level of trafficking. This is why the cross-country comparison favors the wrong policy.

Tables

Table 1: Ranking of current policies along the “impact” and “conflict” dimensions

Policy	Dominated?	Reason
Traditional model	Dominated by all other models	The Swedish model can eliminate trafficking. The Dutch model and decriminalization allow voluntary prostitution and do not subsidize trafficking.
Decriminalization	Dominated by the Dutch model	The Dutch model reduces trafficking, while also allowing for voluntary prostitution.
Swedish model	Undominated	None of the other model can eliminate trafficking.
Dutch model	Undominated	It is undominated by the Swedish and traditional models because it allows voluntary prostitution. It dominates decriminalization.

Figures

Country	Prostitution	Soliciting	Pimps/Brothels	Top Destination for Trafficking?
USA	Partly Illegal ^b			Yes
Thailand				
Japan				
Israel				
Italy				
Spain				
Belgium				
Netherlands				
Germany				
Turkey				
Sweden	Partly Illegal ^d			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

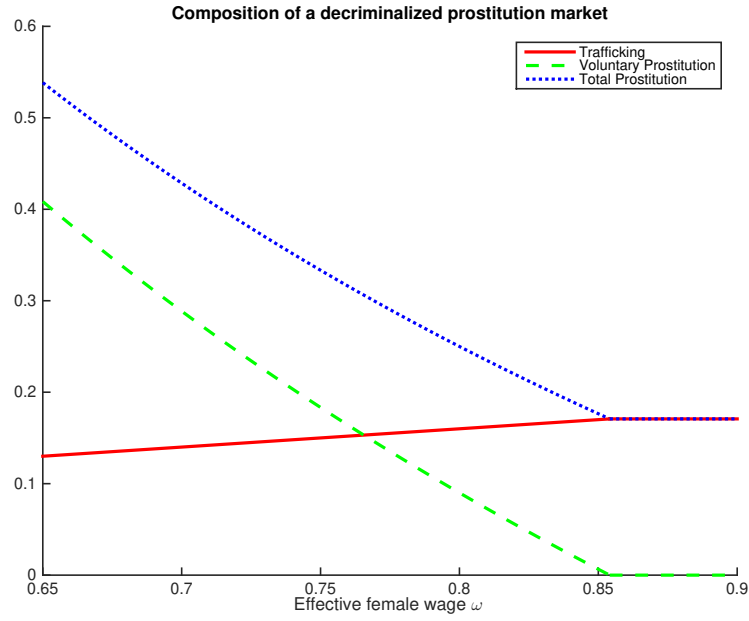


Figure 2: Contraction and substitution in a decriminalized prostitution market. The x-axis displays the female effective wage in the regular labor market ω . The y-axis displays the number of trafficked prostitutes (red solid line), the number of voluntary prostitutes (green dashed line), and the sum 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 $s = 2$.

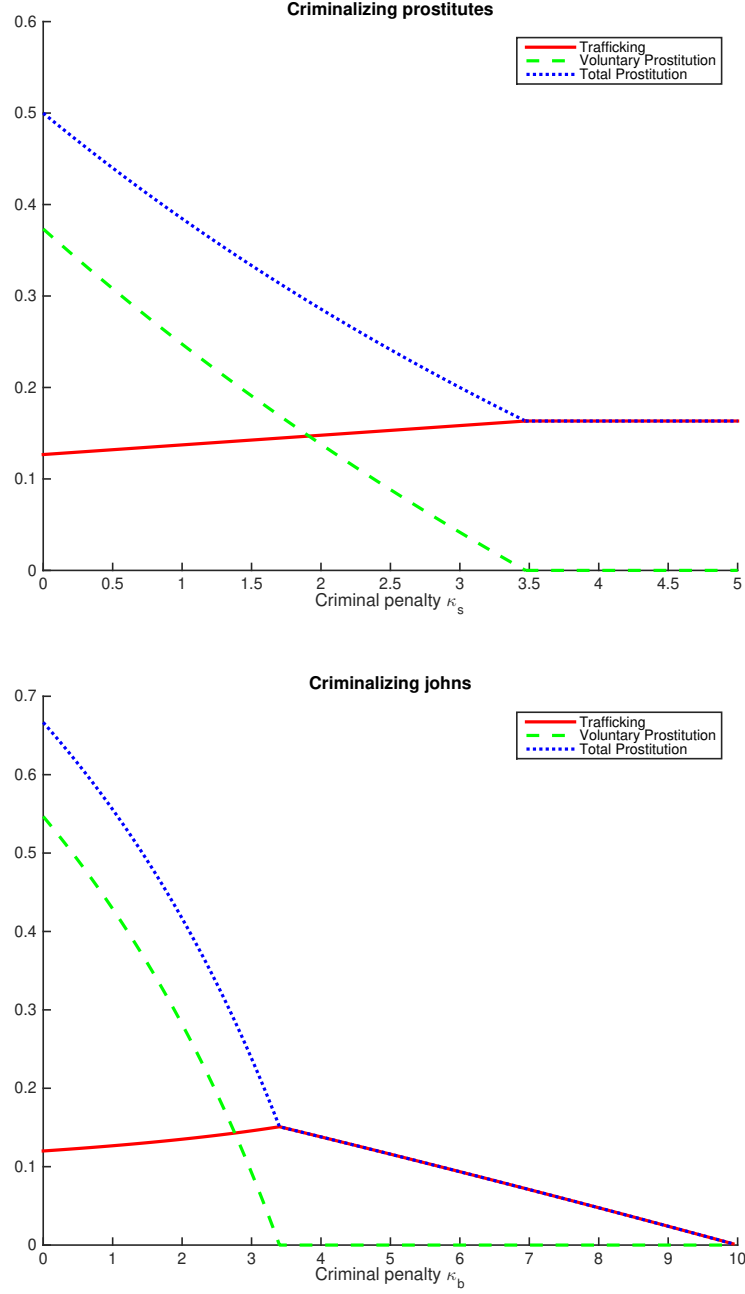


Figure 3: Sell-side versus buy-side criminalization. We compare the traditional model and the Swedish model in terms of how criminal penalties imposed on prostitutes (κ_s) or johns (κ_b) under the respective legal regimes impact the size and composition of the prostitution market, for a given arrest 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.

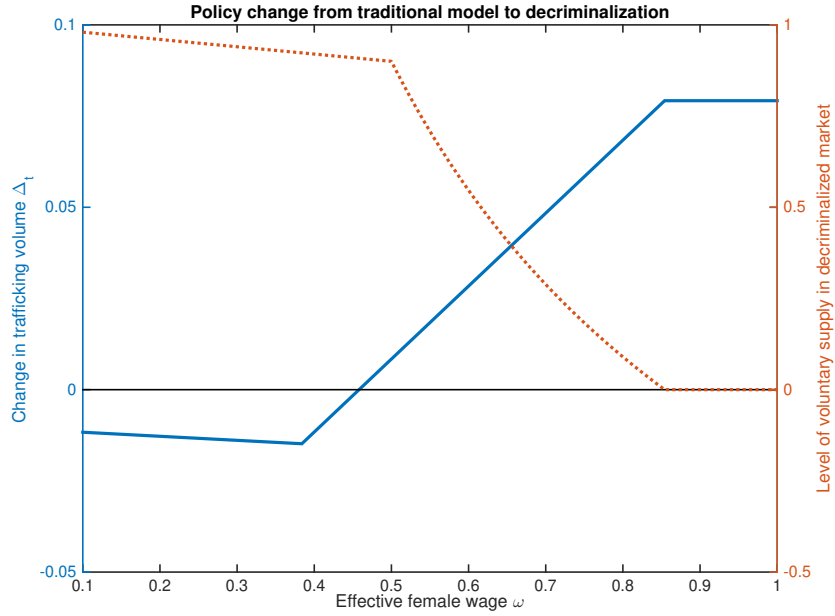


Figure 4: Ambiguous impact of decriminalization. Decriminalizing prostitution decreases trafficking when the environment is conducive to voluntary prostitution in a decriminalized market, which in this example is the case when the effective female wage is low. Conversely, decriminalization increases 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

Proposition 1

It remains to show that corner solutions are ruled out by Assumption 1. We show this for upper and lower corner solutions in turn. As an aside, note that the number of prostitutes in an interior equilibrium, n^* as defined in Proposition 1, is strictly between 0 and 1 under Assumption 1.

Upper corner: $n = 1$. Market clearing implies that each woman extracts one man's income y . Taking into account the disutility of working as a prostitute, each woman's utility is thus $y - h$. This requires $sp_s = y$, or $p_s = \frac{y}{s}$.

Furthermore, women must weakly prefer working as a prostitute, i.e., $y - h \geq p_m + w$, or $p_m \leq y - w - h$. For men, the per-util price of sex must be weakly lower than the per-util price of marriage, i.e., $\frac{p_s}{e} \leq \frac{p_m}{k}$. Substituting for p_s , this becomes $p_m \geq \frac{yk}{se}$.

The inequality conditions for men and women are only compatible if $\frac{yk}{se} \leq y - w - h$. Using $\omega \equiv w + h$, $\sigma \equiv \frac{se}{k}$, $\rho \equiv \frac{y}{\omega}$, this can be rearranged to $\rho \geq \frac{\sigma}{\sigma - 1}$, which is ruled out by Assumption 1.

Lower corner: $n = 0$. Market clearing implies that each woman extracts one man's income through marriage, that is, $p_m = y$. Taking into account the wage w she earns in the regular labor market, each woman's utility is thus $y + w$.

Women must weakly prefer marriage, i.e., $y + w \geq sp_s - h$, or $p_s \leq \frac{y + w + h}{s}$. For men, the per-util price of marriage must be weakly lower than the per-util price of sex, i.e., $\frac{p_s}{e} \geq \frac{p_m}{k}$. Substituting for p_m , this becomes $p_s \geq \frac{ey}{k}$.

The inequality conditions for men and women are only compatible if $\frac{ey}{k} \leq \frac{y + w + h}{s}$. Again using the definitions of ω , σ , ρ , this can be rearranged to $\frac{1}{\sigma - 1} \geq \rho$, which is ruled out by Assumption 1.

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 $n \in (0, 1)$, 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

$$p_s = \frac{\omega'}{s(1 - 1/\sigma')} \quad (18)$$

Here, $\omega' \equiv \frac{w+h'}{1-q}$ 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 . Note that the price in (18) 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, use (18) to replace p_s in the traffickers' zero-profit condition (8), which yields

$$\frac{\omega + l_2 + q\kappa_s}{1 - 1/\sigma'} + \frac{l_1}{\sigma' - 1} = c(n_t). \quad (19)$$

The left-hand side is strictly larger in (19) than in (5), implying a larger solution for n_t than in a decriminalized market with trafficking. The left-hand side of (19) also increases in all criminalization parameters $\{q, \kappa_s, l_1, l_2\}$, so the number of trafficking victims n_t that solves (19) increases in them, since $c(\cdot)$ 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 (10) 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 (11) 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_2 .

Proposition 4

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

Case A: Equilibrium under coexistence. Define a modified female effective wage $\omega'' \equiv w + h''$, where $h'' \equiv h + l_1 + l_2$ reflects increased occupational hazards, and a modified male preference ratio $\sigma'' \equiv \frac{s(e - q\kappa_b - l_3)}{k}$, which reflects that the hazards imposed on johns (with the consequent demand shift) are akin to a shift in male preferences toward marriage.

Next rewrite the women's and men's indifference conditions (9) and (10) 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,

$$p_s = \frac{\omega''}{s(1 - 1/\sigma'')}, \quad (20)$$

which increases in all criminalization parameters $\{q, \kappa_b, l_1, l_2, l_3\}$. Since σ'' also increases in those parameters, this implies that the total number n of prostitutes decreases in them.

Inserting (20) into the traffickers' zero-profit condition (11) yields

$$\frac{w + h + l_2}{1 - 1/\sigma''} + \frac{l_1}{\sigma'' - 1} = c(n_t). \quad (21)$$

The left-hand side of (21) increases in all criminalization parameters $\{q, \kappa_b, l_1, l_2, l_3\}$, so the number of trafficking victims n_t that solves (21) increases in them, given that $c(\cdot)$ is strictly increasing. This also implies that the number of voluntary prostitutes decreases in all criminalization parameters $\{q, \kappa_b, l_1, l_2, l_3\}$, 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 (11) 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 (13)-(14) yield unique equilibrium prices $p_{s,l} = p_s^*$, $p_m = p_m^*$, and $p_{s,u} = \frac{\sigma_u w}{s(\sigma_u - 1)}$ 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 (16) yields

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

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

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

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 increase 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 $n'_i/2$, where

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

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,

$$sp_{s,B} \leq \sigma p_{m,B}, \quad (25)$$

the price of domestic prostitution is competitive,

$$p_{s,B} \leq p_{s,A}^*. \quad (26)$$

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,

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

Thus the prostitution market in country B is active only if (25)-(27) hold simultaneously. As

it turns out, this cannot be achieved.³³ 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 hold: The women in country B must weakly prefer marriage to prostitution,

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

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

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

These two conditions can be jointly satisfied.³⁴ 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

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

A comparison of (30) with (24) shows that total trafficking decreases after decriminalization.

³³(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.)

³⁴Rewrite (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.

(This is the same comparison as between (19) and (5).)³⁵ But it need not fall below $n'_t/2$.³⁶ Thus, while the decriminalization reduces the total level of trafficking across both countries, it may raise trafficking in country A.

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³⁵Recall that this result obtains because we assume that there is voluntary prostitution. If there is initially no voluntary prostitution, decriminalization can increase trafficking.

³⁶Whether that is the case depends on the parameters and the shape of $c(\cdot)$.

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