System Dynamics as a Method for Analyzing Human Trafficking

James Grimes, Robin L. Dillon[1], Catherine H. Tinsley

McDonough School of Business, Georgetown University

517 Hariri Building

202-687-5398

rld9@georgetown.edu

Abstract

This paper describes a system dynamics model designed to test policies that could potentially limit, halt, or reverse the growth of human trafficking (and more broadly female exploitation for sex) in Washington, D.C and elsewhere. Human trafficking has been deemed a "crime against humanity," yet despite prevention programs around the world – the practice has continued to flourish. We believe these policies have had limited impact because of the variety of variables and causal structures that influence the system as a whole. Through the study of the trafficking/exploitation sex market in Washington, D.C., we have identified some key drivers and limiters in the system, as well as some of the complex interactions between them. A computerized version of our model allows policy makers to virtually test how new policies are likely to influence the system before actually implementing them in the real world. System dynamics presents a new tool in the effort to combat human trafficking/exploitation around the world, and our model is the first step towards fully comprehending and eventually eliminating this modern form of slavery.

Key words: human trafficking, complex interacting markets, policy interventions

[1] Corresponding author

Introduction to Human Trafficking[2]

Humans are trafficked for sexual labor every year in the United States. Unfortunately, estimating the current scope of this problem, and projecting forward to estimate the future has proven extraordinarily difficult. This is not because we lack a common definition of the problem. Indeed over a decade ago the United Nations declared human trafficking a crime against humanity. In Article 3, paragraph (a) of the Protocol to Prevent, Suppress and Punish Trafficking in Persons (http://www.unodc.org/unodc/en/treaties/CTOC/index.html), it is defined as:

> the recruitment, transportation, transfer, harbouring or receipt of persons, by means of the threat or use of force or other forms of coercion, of abduction, of fraud, of deception, of the abuse of power or of a position of vulnerability or of the giving or receiving of payments or benefits to achieve the consent of a person having control over another person, for the purpose of exploitation. Exploitation shall include, at a minimum, the exploitation of the prostitution of others or other forms of sexual exploitation, forced labour or services, slavery or practices similar to slavery, servitude or the removal of organs.

The problem is also not for lack of institutions focused on documenting the crimes of sexual exploitation. The UN has an active office on drugs and crime (UNDOC) that monitors human trafficking conditions, putting out anti-trafficking publications and "tools".[3] Closer to home, every metropolitan police department keeps data on rape, incest, and "vice" crimes.

The problem in estimating the scope of human trafficking rests in part because of the complexity of the system and the limited resources to study the problem. The complexity of the system is a challenge that system dynamics can address with humans trafficked for sexual labor represented as a series of stocks with interacting flows across multiple markets. There are complex interrelationships between three main stocks: those who are trafficked, those who traffic

[2] In this project we are focused on trafficking for sexual labor, recognizing that other forms of trafficking also flourish

[3]See website: http://www.unodc.org/unodc/en/treaties/CTOC/index.html

in humans (referred to here as dealers), and those who use the trafficked labor (referred to here as clients). A model that examines these moving stocks and how they relate to each other across multiple markets can thus help to understand the current scope and future directions of this problem. We can also explore policy interventions which is an important contribution because of the limit resources available to study the problem.

These limited resources result in limited data on this problem. Although crime data is collected in the U.S., human trafficking for sex does not represent one of the "major" crimes in which the public is believed to be most interested (such as burglary, assault, homicide) and thus these data are harder to access. Given the limited resources of all law enforcement, naturally those crimes that the public is more interested in are more widely available, documented, circulated, and cross referenced (such as in multi-crime task forces).As well, limited resources also constrain data efforts in other countries, where anti-human trafficking institutions must rely on people "on the ground" who can go to shelters, brothels, and well-known public areas of sexual trafficking to document cases and issue reports. Thus although the U.S. Department of State issues reports every year with estimate numbers of cases of humans trafficked (for example it is estimated that between 14,000-18,000 people are trafficked into the U.S. from other countries each year for forced sexual and other labor), these estimates have wide ranges and are likely associated with large error rates.

We believe that a comprehensive system dynamics model can be used to engage a relatively uninformed public who appears almost mute about the problems. We believe this lack of engagement stems in part from lack of focus about the problem and thus clarity about any effective interventions or solutions. In order to further explore public perceptions and effective interventions, in this research we have coupled the system dynamics approach with a series of

behavioral experiments that measure the engagement of the general public. As will be detailed later, we find that when the problem of sexual trafficking is seen as more focused and solvable, people are more willing to engage, i.e., they are more willing to act themselves and are more supportive of the U.S. Government spending money to eradicate the problem. Thus, with some traction around the problem, which we hope our systems dynamic model can offer, people are likely to become more interested in the problem, which would have a positive influence on the aforementioned issue of limited resources being devoted to sexual trafficking. That is, the model, which identifies the problem, might, in and of itself, become part of a virtuous circle towards solving the problem. In this paper, we begin to detail such a model for human trafficking, based on interviews with law enforcement and not-for-profit institutions.

Human Trafficking as a System Dynamics Model

According to several sources, human trafficking is the fastest growing organized crime in the United States and only lags behind drug and arms dealing in terms of scale. Human trafficking appeals to organized crime rings because of very high profit margins, relative ease in attaining a supply of women, soft legal consequences if caught, and tremendous demand. In the United States, there are three primary markets in which dealers interact with clients in order to sell sexual acts: the Street market (i.e., the traditional prostitute on a street corner overseen by pimps), the Internet market (i.e., clients connect with prostitutes via the internet to arrange a transaction), and the Front market (i.e., a location pretending to be a legitimate business such as a massage parlor that is actually selling women for sexual acts). Dealers in these markets may interact with each other and indeed may cross markets (particularly between the Street and the Internet markets). Likewise the supply of women across Street and Internet markets may be

quite fluid. Yet the most fluid actors across all three markets will be the clients who can move between these markets with relative ease, and for whom these markets may be highly substitutable.

Although law enforcement programs and agencies specifically target these market practices, enforcement has proved difficult precisely because of the fluidity of these markets. Moreover, the high demand from clients and the relative ease of entry into the market as a dealer means that one dealer brought to justice simply offers an opportunity for other dealers to enter the market and thus has a minimal impact on the system as a whole. Furthermore, bringing these dealers to justice can be thwarted by the one-sided psychological connection that has been formed between dealers and the women they handle, such that the exploited women often protect their dealers.

Yet, this interplay between different individuals, organizations, psyches, and incentives forms an encapsulated system that seems fit to be studied through the lens of system dynamics. At the core of the human trafficking practice lies a valuable market which drives the growth of the entire system. Both economic markets and the internal structure of business institutions are commonly studied subjects in the realm of system dynamics, and the human trafficking system contains semblances of these two features. Through system dynamics it would be possible to trace how the interaction between the supply and demand for sexual acts, coupled with the current legal system in the United States has spawned the currently observed behavior of the human trafficking practice. Clearly, policy resistance has played a significant role in the growth of human trafficking since governments the world over have measures in place to stem this exploitation, yet the practice continues to grow. These policies fail to have a significant impact if policy writers are unable to comprehend the dynamic complexity of the trafficking system, partly

because information is limited, but mainly because humans find it impossible to grasp all the variables and feedback structures in a system driven by growth. Indeed much prior work in the area of systems dynamics finds that even highly educated people (such as PhD students at MIT) display fundamental weaknesses in grasping basic stock and flow concepts and the implications of these dynamic models for assessing accumulations.[4] By constructing a computerized model of the trafficking system, it is possible to account for all the different variables and feedback loops that are contained within it. Once a reliable model is constructed, policies can be tested virtually to better grasp how the system would be affected in the short and long run. Ultimately, through this system dynamics model, policies could be explored that would collapse the economic market of human trafficking and thereby free exploited women from their terrible situation.

High-Level Model of Human Trafficking

Through our discussions with the local Washington D.C. law enforcement, we have developed a preliminary computerized system dynamics model that should be largely applicable to a wide variety of human trafficking systems. Although specific assumptions should be verified for each local market, the structure of the system as a whole would be generalizable. Before delving into the details of the model, some potential weaknesses of this model must be noted. First, a lack of credible data about human trafficking makes it impossible to test this model against historical data to help determine the model's validity. For example, there is no published information regarding the number of women trafficked, the number of dealers, the number of clients, or prices paid in the past. Second, due to the rather dangerous nature of this system, direct observation was precluded so a heavy reliance was placed on interviewing those

[4] See for example: Booth Sweeney, L., &Sterman, J. D. (2000) and Sterman, J. D., & Booth Sweeney, L. (2002).

who have observed and studied trafficking firsthand. Finally, our model focuses mainly on the economic aspect of the human trafficking system and does not account for most psychological aspects that may affect some stocks or variables. However, our studies have suggested that the economic aspects of the system dominate any psychological influences.

This high-level human trafficking model is intended to be a baseline model that can be altered for the study of a system in different geological locations or type of trafficking market (Street, Internet, or Front). The model is altered by changing the initial states of several variables and stocks, which will be discussed later, and potentially incorporating additional variables that are unique to that system. Additionally, in the future, we will construct one large model that captures the client substitutability across the multiple markets. For this paper, we focus on describing the Street market. To construct our model we began with the three stocks in the system: Clients, Dealers, and "Exploited Women" (see Figure 1).

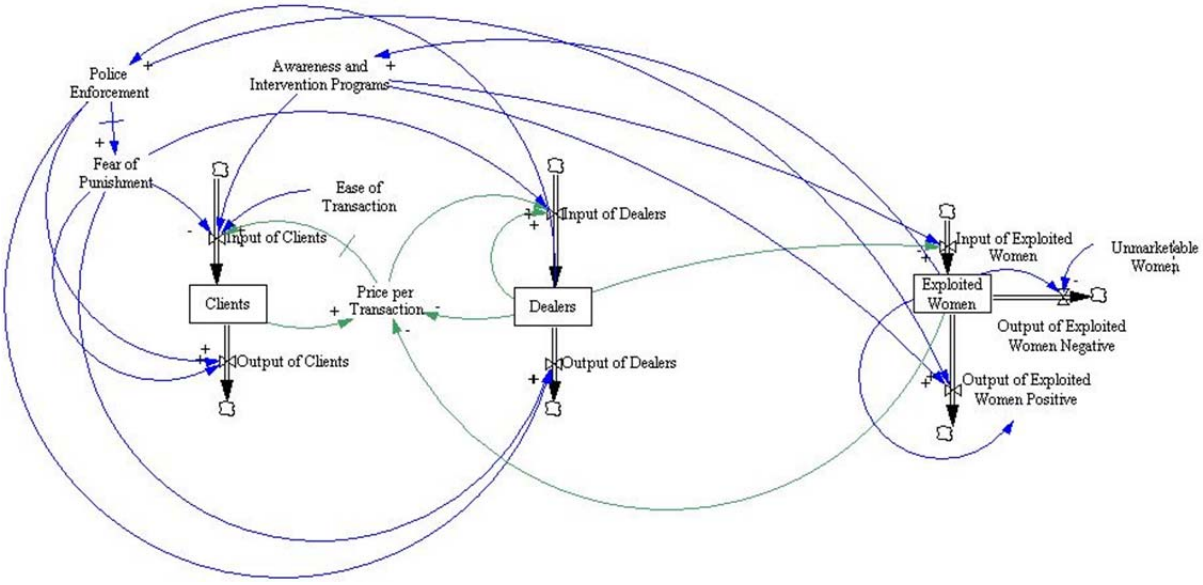


Figure 1 – High-level System Dynamics Model for Human Trafficking

From each of these stocks we attached two flows: Input and Output. The input flows each begin with individual sources from where Clients, Dealers, and "Exploited Women" have the potential to actually enter the system (i.e., although these sources theoretically could come from all of strata of society, base rate evidence suggests there are specific groups that are more probable as input sources). Though each stock has its own outflow to an individual source, these individual sources can be thought of as one source leading back to "general" society. For our purposes we did not include the possibility of relapse back to either a potential source or back into the system. "Exploited Women" has an extra output flow which is "negative" rather than "positive". This negative output flow differs from the positive Output flow (which assumes women exit the stock by being rescued or saved) with the assumption that negative output flow women are those who were not rescued and were instead abandoned by the dealers because the women were no longer valuable. Each of the three stocks begins with an initial value and for each iteration of the model, the difference between the input and output of the flows is added to the stock.

The Economic Links

The three stocks of Clients, "Exploited Women", and Dealers represent the demand, supply, and platform for the human trafficking market, respectively. To construct the economic market aspect of the model a "Price Per Transaction" variable was included. Basic supply and demand principles were used to make connections between these variables. A positive link between Clients and "Price Per Transaction" was formed, while a negative link was placed between "Price Per Transaction" and Input flow for Clients. Conversely, there is a negative link between Dealers and "Price per Transaction" and a positive link running from "Price Per Transaction" to the Input flow for Clients. These links form the most basic supply and demand

feedback loops. What they suggest is that: as demand (Clients) increases, the price (Price Per Transaction) increases and as prices rise, demand falls. As price increases, sellers (Dealers) increase and as sellers increase, price decreases due to competition. Another positive link leads from the stock of Dealers to its own Input flow. As business increases for the dealers, they may need to hire other dealers to help run their operation. Two other critical links complete the economic core of the trafficking system. A positive link connects Dealers to the Input flow for "Exploited Women" because as more dealers enter the market, more women are trafficked (or recruited). To balance this positive connection, a negative link ties Exploited Women to "Price Per Transaction" since a greater supply leads to lower prices. In our model, the growth of the system stems entirely from the demand of the clients and the dealers' ability to fulfill it.

The Societal Aspects

Clearly, the human trafficking system does not rely only on economic forces to manage the system. In order to stop human trafficking, governments have made the practice illegal and some have instituted programs designed to prevent and rescue women from this sexual slavery. Therefore we added two variables named "Police Enforcement" (which can be thought of more broadly as law enforcement) and "Awareness and Intervention Programs" into the model, which regulate how many women are rescued or prevented from entering the system, and how many clients and dealers are arrested or prevented from entering the system. "Police Enforcement" focuses on removing the stocks from the system through arrests and rescues. Therefore, positive links were created from "Police Enforcement" to the Outflow rates of all the stocks because as enforcement against human trafficking increases, more arrests and rescues are made. However, police departments tend to focus on the most pressing issues in their district at the current time, so the strength of "Police Enforcement" is directly related to the stock of Dealers. A positive link

runs from this stock to “Police Enforcement” which represents the effort devoted by police on the issue when it becomes a major problem in the area.

“Police Enforcement” has one other positive link emanating from it that leads to the variable “Fear of Punishment”. “Fear of Punishment” is a psychological variable that may halt potential clients and dealers from entering the system and cause clients and dealers already in the system to leave because they feel the risk of being arrested is too great. This fear directly relates to “Police Enforcement” because the risk becomes greater when the police presence in the system increases. Naturally, “Fear of Punishment” positively links to the output flows of Clients and Dealers and negatively links to the input flows of the same two stocks. In some communities including Boston, the threat of punishment from police has been shown to be more effective in reducing gang crime than increased enforcement (i.e., arrests). Increased enforcement would reduce crime but would also decrease trust between the community and the police officers, while increasing the “threat” of punishment from increased police attention has been shown to reduce crime without reducing trust (Kennedy, 2011).

The other major force attempting to curb human trafficking are programs designed to help victims of trafficking and prevent men from engaging in this type of behavior. Thus, we added a positive link starting from “Exploited Women” and terminating at “Awareness and Intervention Programs”. Similar to the way “Police Enforcement” gains strength from the magnitude of the problem with Dealers, “Awareness and Intervention Programs” becomes more powerful as “Exploited Women” increases since the bigger the problem, the more likely funding and volunteers are funneling into these programs. Primarily these programs focus on preventing women and clients from entering the system, so two negative links connect from “Awareness and Intervention Programs” to the Input flows of Clients and “Exploited Women”. These

programs are also supposed to be safe-houses for any women who escape from their dealers and this creates a positive link from “Awareness and Intervention Programs” to the Output flow of “Exploited Women” because the more these programs are known to the public, the more likely trafficked women will seek them out for safety.

Detailed Run-Through of the Model

The primary unit of the stocks and variables in our model is “People”. This unit is easily measurable, observable, and corresponds to the problem we are trying to solve, namely reducing the number of trafficked and exploited women to zero. The variables in the model influence the system by either adding or removing people from the three stocks. For example, the “Police Enforcement” variable is governed by the equation: Dealers/20. This equation means that for every dealer in the Washington, D.C. trafficking system, we estimated 5%are arrested by law enforcement every month, and this gives a number which can be used to influence the rest of the system. Naturally, these ratios are the specific details of the model that can and should be altered as better data becomes available in any particular geographical market. “Police Enforcement” positively links to the Output of Clients and Dealers, so for each iteration of the model, the number in the “Police Enforcement” variable is subtracted from the Clients and Dealers stocks. Conversely, there are structures in the model that add people to the stocks in the system. One such structure is the “Ease of Transaction” variable. Depending on the market, policy makers can adjust this variable to add or subtract the number of clients that enter into the system, that otherwise would not, because some methods for reaching a dealer have a low risk of an arrest (i.e., the internet). This variable had no direct influences and only affects the Input flow of the

Client stock to determine extra people entering the system. See Table 1 for a complete list of variables and equations in the model.

The Simulation

This section presents a simulation of our model based on educated assumptions made about the "Street Market" in Washington, D.C. The stocks need initial values which we estimated based on the information provided to us (by undercover metro PD vice): Clients – 1,000, Dealers – 100, and Exploited Women – 300. The maximum price per transaction in this market is roughly $80, while the average is around $40. In Table 1, we describe how several variables are based on a percentage of people taken from other variables or stocks. Depending on the market, these percentages can change and our best estimates were used for this simulation. From our interview with Dr. David Kennedy (Kennedy, 2011), we realized that police punishment and threats can be an effective form of deterrence against illegal behavior. In order to test the credibility of this claim, along with the value of our model, we performed sensitivity analysis on the variable "Police Enforcement" and then looked to see how the three stocks and variable "Price per Transaction" were affected.

With the stocks at their initial levels and "Police Enforcement" set to 5% of Dealers, we ran the simulation for 200 iterations. For Clients, the stock initially dipped from 1,000 people to 943 at iteration 31 before begin to slowly rise back up to 1,255 people at the end of the run. The Dealers stock quickly decreased from 100 people to 75 by iteration 90, but then leveled out at 71 people for the remainder of the simulation. "Exploited Women" acted in an opposite manner from Dealers by increasing quickly to 1,300 people at iteration 83, but slowly began leveling off and closed at 1,600 by iteration 200. "Price per Transaction" started the simulation a $46, and fell relatively quickly to $36 halfway through and remained steady at that level. These results

make sense on an economic basis for a number of reasons. As the number of clients increased, the number of exploited women had to increase to meet demand. Since the number of exploited women increased, the price in the trafficking market fell. With the price falling, some dealers would be forced to leave the market because the returns are not as high. Eventually, all the stocks reached an equilibrium point.

In the second simulation, we doubled the "Police Enforcement" variable to 10% of Dealers. At this new police level, the Clients stock rapidly fell and did not rebound as in the first simulation. By iteration 60, Clients had dropped to 865 people and ended up settling at 840 for more than the last half of the simulation. The Dealers stock followed the same trend as Clients but the initial drop was even more severe. The 30th iteration showed Dealers at 38 people and by the 90th iteration Dealers reached its equilibrium value of 35 people. "Exploited Women" grew logarithmically as in the first simulation, but its limiting level of 525 people was not even a third of the number of exploited women seen previously. Again, "Price per Transaction" followed the same trend as in the first simulation of slowly settling into its equilibrium value, however the price did not fall as far this time, leveling out at $42. The results of this simulation show the impact of a strong police presence in the trafficking system. The number of clients fell due primarily to fear and arrests. Demand for women still remained so exploited women increased but not nearly as much. Dealers left the system through a combination of slightly lower prices and a higher police force. The price dropped for this simulation because of a smaller demand and relatively high supply, but the increased risks the dealers had to take, along with less competition, kept the price from falling as much.

For the last simulation, the "Police Enforcement" variable was again doubled – this time 20% of Dealers are arrested each month. At this impossibly high level of police action, some

strange phenomenon in the behavior of the stocks is observed. This behavior is clearly linked to the effect "Police Enforcement" has on Dealers. At a 20% arrest rate per iteration, not to mention the high fear factor causing dealer to not enter and also leave the system, the Dealers stock is crushed. Within 20 iterations the number of dealers has fallen to 17 people where it remains. Additionally, "Police Enforcement" has a similar effect on the Clients stock. However, the Clients stock decreases in a linear fashion rather than exponential decay (which was seen in the second simulation) and only holds 630 people at the end of the simulation. This small demand, coupled with virtually no dealers causes the "Exploited Women" stock to fall to zero at iteration 180. Hence, our model appears to show that a high police presence that focuses on arresting dealers can be used to collapse the human trafficking system. Even though clients still have a demand, and there are a miniscule amount of dealers who have the potential to fulfill part of that demand, the police presence destroyed the supply and platform of the economic aspect of the system.

How to increase police presence?

So if increasing law enforcement does appear to collapse the system an interesting question becomes how to recruit the resources to do this. Simultaneous to our construction of this systems dynamic model we have been running behavioral experiments in an attempt to determine what types of information about the problem of human trafficking is most likely to provoke public engagement and support for increased resources to this issue. Most promising so far appears to be information that suggests to that the issue of sexual exploitation is indeed a solvable problem, rather than a fixed state. Specifically, we recruited participants to read through one of two scenarios. First all participants read a short introduction about the problem:

> *Domestic Human Trafficking is one of the fastest growing and most profitable criminal enterprises, often involving the prostitution of women and girls. Mid-level traffickers*

can make more than $500,000 a year marketing just four prostitutes, and therefore networks of gangs and drug dealers are increasingly entering into this enterprise.

Then half of the participants read information suggesting that this problem is a relatively fixed and immutable state of the world. Specifically:

Although prostitution is illegal, it is "the oldest profession in the world", and not likely to go away any time soon. It is present in every state in the U.S. Men are biologically pre-disposed to being more active sexuality than women, and some girls see it as a perfectly rational way to make much more money than working in a minimum wage job. It is highly lucrative job. As one girl commented, she did not feel that she was a victim, in fact she was surprised and impressed by her ability to make over $1000 a night.

The other half of the participants read information suggesting that this problem is fluid and changeable. Specifically:

Although it is present in every state in the U.S., recent sting operations highlight that this exploitation can be successfully eradicated. Working together, the FBI, IRS, and local law enforcement broke up four prostitution networks in as many weekends, resulting in over 80 indictments and identifying more than 200 victims. Ironically, because of the increasing presence of gang networks, government officials now have an easier time tracking the activity and hold gang members accountable.

We found that participants who read the second scenario (sexual trafficking as a fluid, malleable state where traction in change is possible) were significantly more likely to get engaged in this problem themselves (volunteering time and money, sending emails to representatives about stiffening penalties and enforcement). This was particularly true for the male participants as can be seen by the Average engagement levels (on a 7-point Likert scale where 1 = not at all and 7 = very much), by condition (fixed versus fluid state) shown in Figures 2 and 3. Moreover, participants reading the fluid state condition were significantly more likely to support increasing governmental resources towards this problem. Although as Figures 4 and 5 show, male and female participants different in the types of programs they wanted government to support. Figure 4 shows males preferred governmental resources flow to prosecuting dealers whereas

female respondents preferred governmental resources flow to helping exploited women. Figure 5 then shows that when participants read about the problem in the fluid condition—each gender supported giving more governmental resources to the intervention that they believed was most critical for addressing the problem (i.e.- men supported increasing prosecution resources and women supported increasing victim services resources).

Overall what these figures show is that when people believe that trafficking women for sexual labor is a fluid and malleable rather than fixed state of affairs, they are motivated to engage and support governmental programs. Tying back to our systems dynamic results, this suggests that messaging to the public illustrating the market is indeed vulnerable and about the resources needed to collapse the market should motivate the public that might be necessary to assign such resources.

Figure 2: Presenting domestic sexual exploitation as a fluid (rather than fixed) state increases participant engagement (willingness to email or take action) in the problem

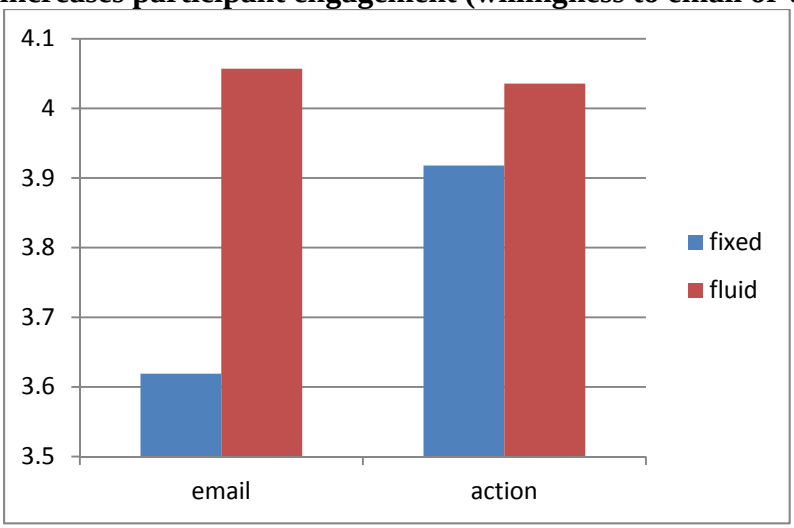


Figure 3: The effect of presenting the problem as fluid is particularly powerful in prompting engagement from male participants

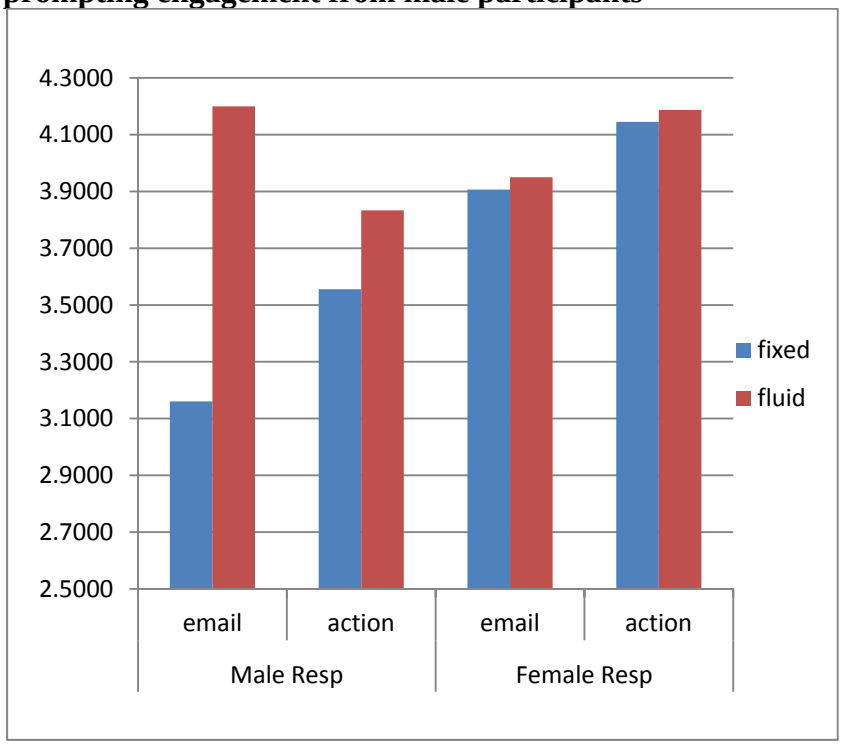


Figure 4: Males support governmental resources for prosecution of dealers; whereas Females support governmental resources for helping the exploited women (Y axis represents $ Millions)

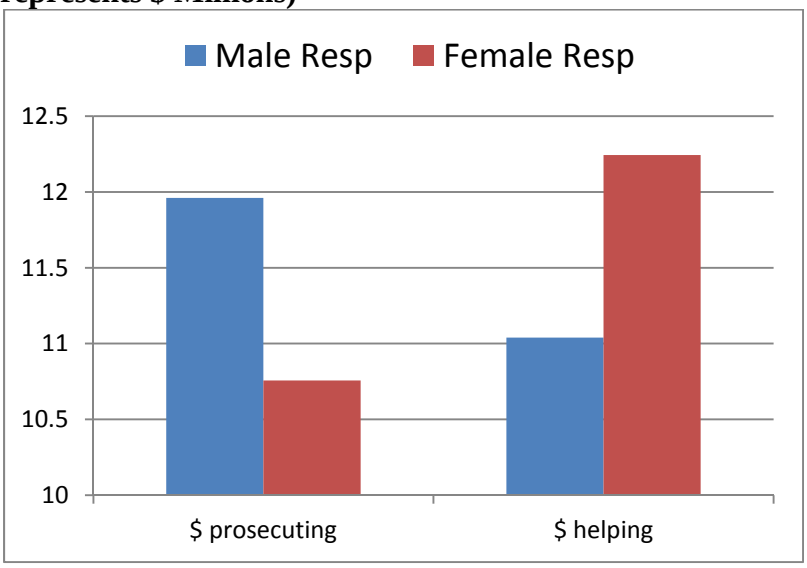
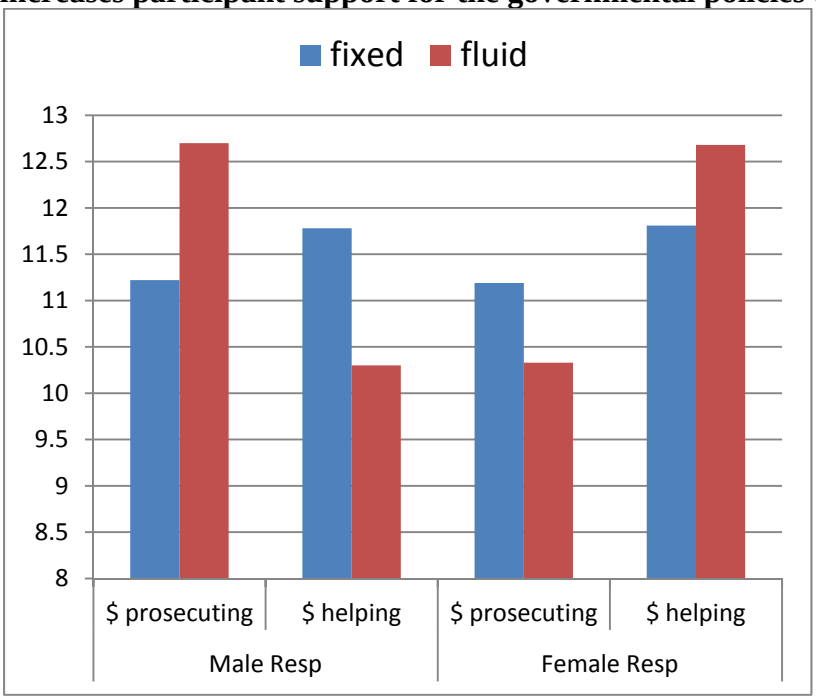


Figure 5: Presenting domestic sexual exploitation as a fluid (rather than fixed) state increases participant support for the governmental policies they find most useful



Conclusion

Human trafficking around the world is an issue that humanity cannot overlook. Numerous governments have instituted a variety of police measures and awareness programs that so far have failed to address this problem in a satisfactory manner. A multitude of economic and societal variables are present in the human trafficking system, of which various stakeholders may be aware, but which seem to be absent as a whole from anti-trafficking policies. We created a high level system dynamics model in order to better understand how the human trafficking system operates and to virtually test policies that may be instituted in the future. This model can be customized to fit the type of market or geographic location where one wishes to study and eliminate human trafficking. In our study of the human trafficking system in the Washington, D.C. area, we attempted to show how the system may be affect by various levels of police enforcement. This sensitivity analysis yielded data that showed that human trafficking could

potentially be eliminated through a high enough level of police enforcement. However, there were a number of other tests that could have been performed to see how the system would have reacted. By altering other variables, such as "Awareness and Intervention Programs" or "Ease of Transaction" either individually or in unison, other solutions to the problem may have become evident. Though incomplete, this human trafficking model is a step towards learning more about the trafficking system, discovering more effective anti-trafficking policies, and the eventual elimination of human trafficking around the world. Future work, of course, is needed to improve the specific assumptions we have used in running this simulation. As well, future work will link the three primary markets (Street, Front, and Internet) because of the high client substitutability across the markets. In our example, where police enforcement shut down the street market, in reality, it may only be displacing the clients and exploited women into a different market. These relationships among the markets will be explored in future models.

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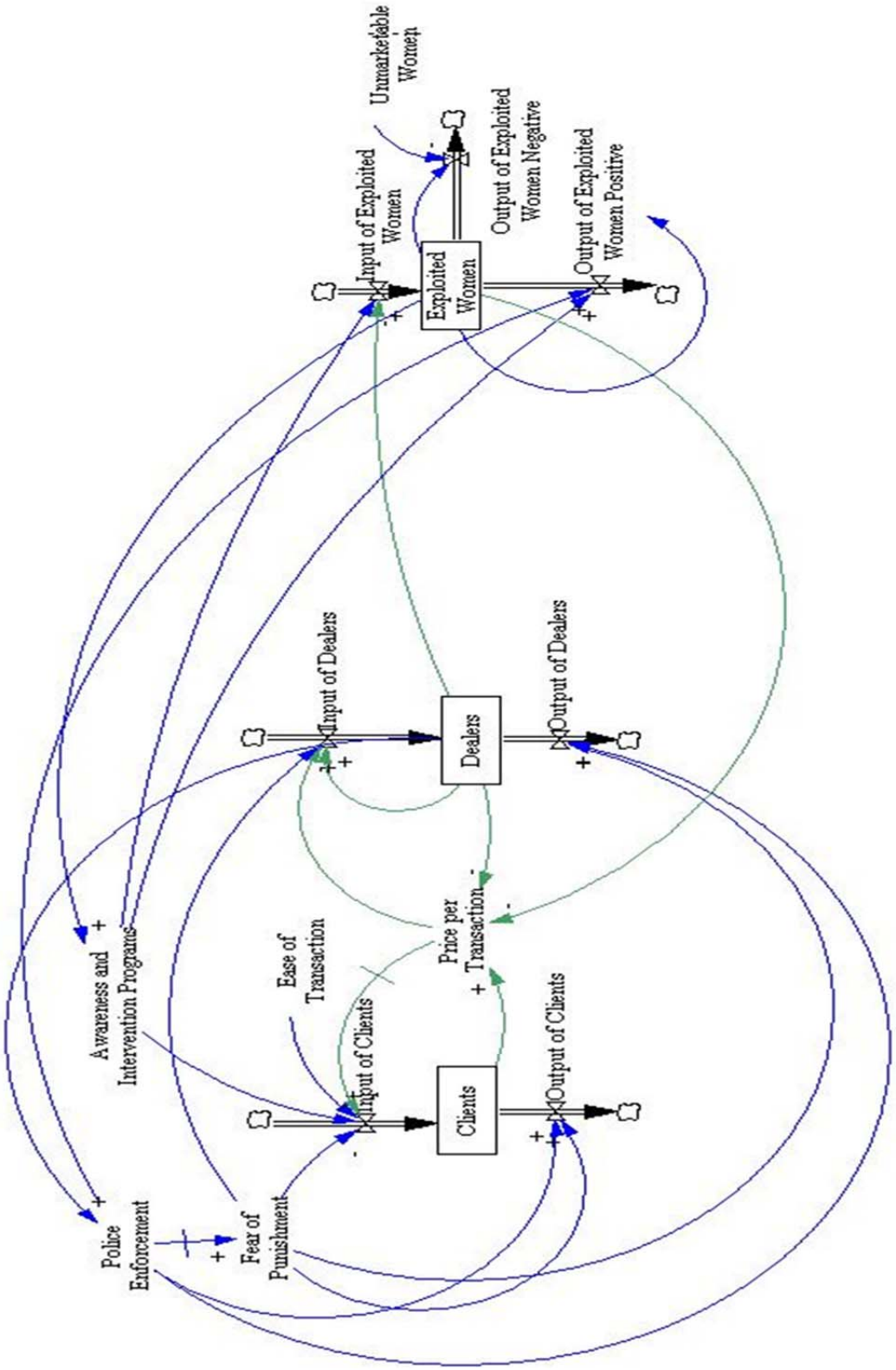
Table 1 – Model Variables

Name	Equation	Explanation
Clients	Client Input - Client Output	
Dealers	Dealer Input - Dealer Output	
Exploited Women	Exploited Input - Exploited Output (Positive) - Exploited Output (Negative)	
Input Flow of Clients	MAX(0, Ease of Transaction - Fear of Punishment - Price for Transaction - Awareness and Intervention Programs)	As ease for finding sexual acts increases, more men are willing to seek them out. This is balanced by fear, price, and going against societal norms
Output Flow of Clients	MAX(0, Police Enforcement + (Fear of Punishment/2))	Police arrest a certain number of clients every month and these arrests scare a percentage of clients into exiting the system
Input Flow of Dealers	MAX(0, (Dealers/50) + (Price per Transaction/10) - Fear of Punishment)	As the number of dealers increase, more are needed to help run the business. As the price a trafficked women brings in, the market becomes more attractive for dealers. As fear increases, less dealers would be willing to enter
Output Flow of Dealers	MAX(0, Police Enforcement + Fear of Punishment)	Police arrest a certain number of dealers every month and these arrests scare a percentage of dealers into exiting the system. The percentage that leave is larger than clients because of harsher penalties
Input Flow of Exploited Women	MAX(0, (Dealers/10) - Awareness and Intervention Programs)	More dealers bring more trafficked women into the system. Awareness programs help women learn how to avoid dealers
Output Flow of Exploited Women (Positive)	MAX(0, Police Enforcement - Awareness and Intervention Programs)	Police rescue a number of women every month and some escape into rescue homes
Output Flow of Exploited Women (Negative)	Unmarketable Women	Dealers cast off a certain number of women that can no longer command a high enough price for sexual acts
Price per Transaction	MIN(80, 40 + (Clients/100) - (Dealers/100) - (Exploited Women/100)	Maximum price is around $80 (can vary). The price is dicated by the number of clients, dealers, and women in the system. Increases in these stocks affect the price by a small percentage
Police Enforcement	Dealers/20	As dealers increase, police respond with more enforcement
Fear of Punishment	Police Enforcement/5	Participants or potential entrants in the system leave the system because of fear of consequences
Awareness and Intervention Programs	Exploited Women/200	A very small percentage of exploited women escape to rescue homes
Ease of Transaction	Constant	Number of clients brought into the system fluctuates based on the market
Unmarketable Women	Constant	Number of women that are cast off by dealers fluctuates based on the market

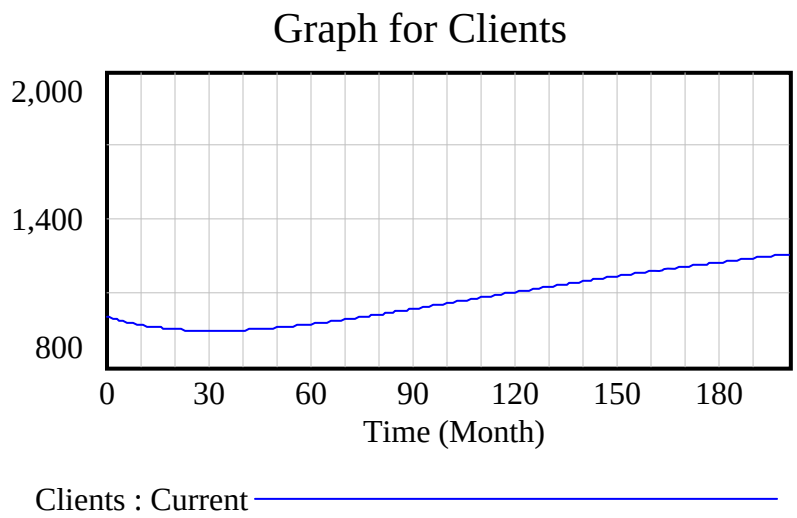
APPENDIX

Figure 1 (Larger size)

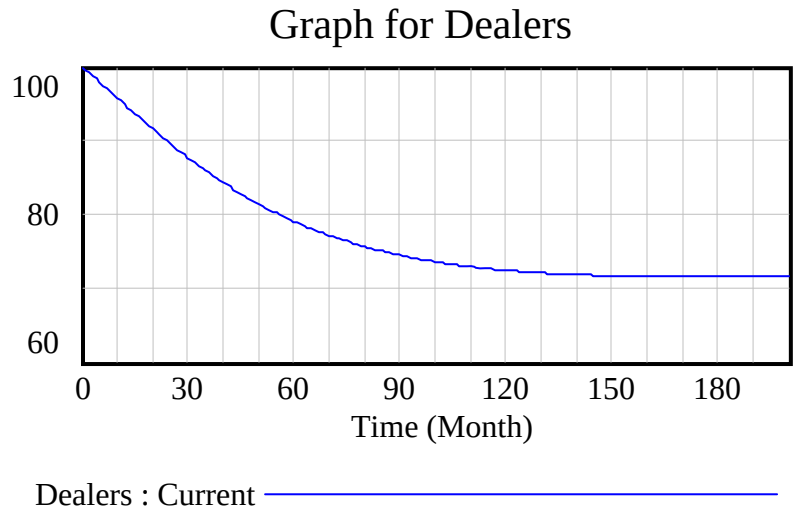


Simulation Graphs – 5% Police Enforcement

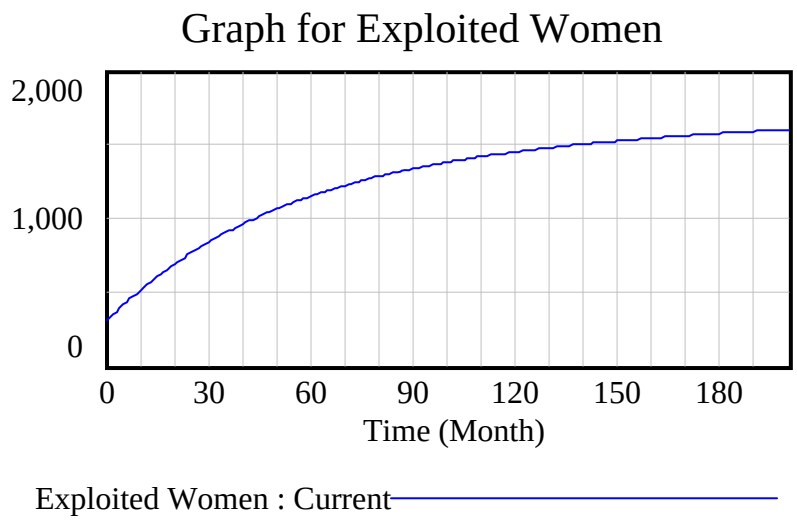
Clients



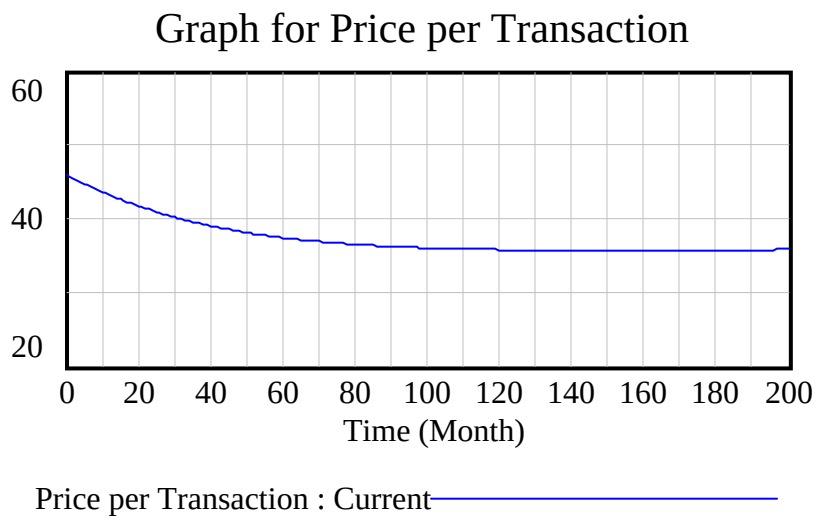
Dealers



Exploited Women

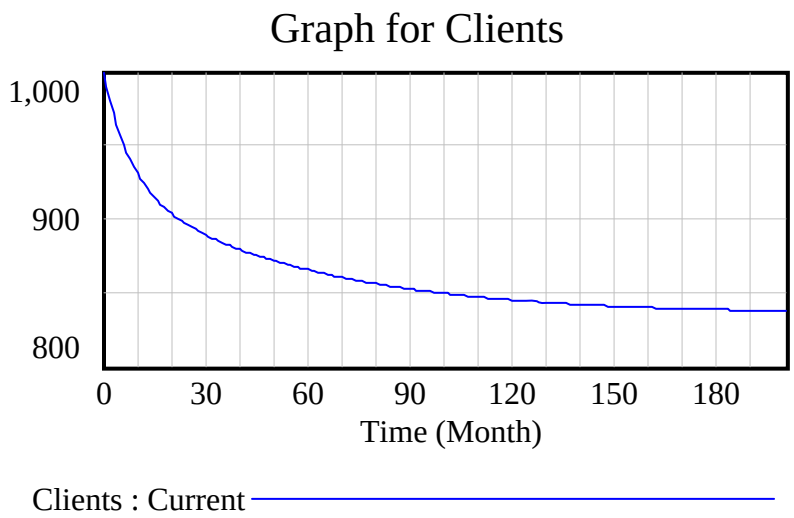


Price Per Transaction

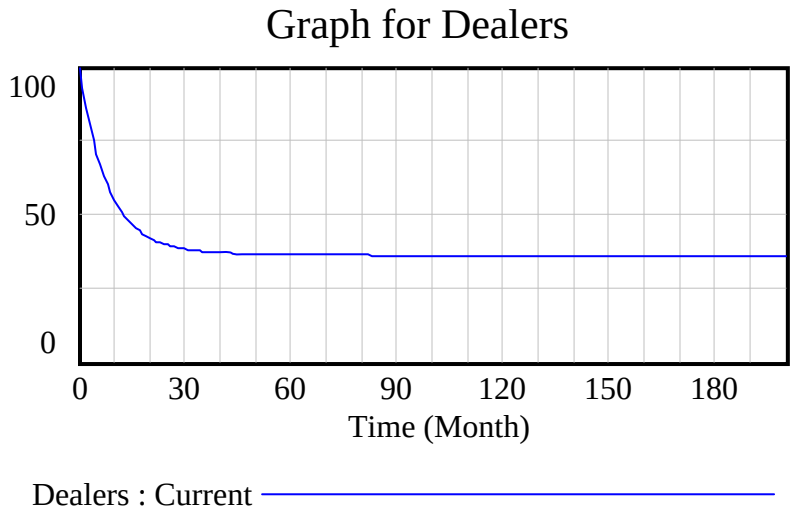


Simulation Graphs – 10% Police Enforcement

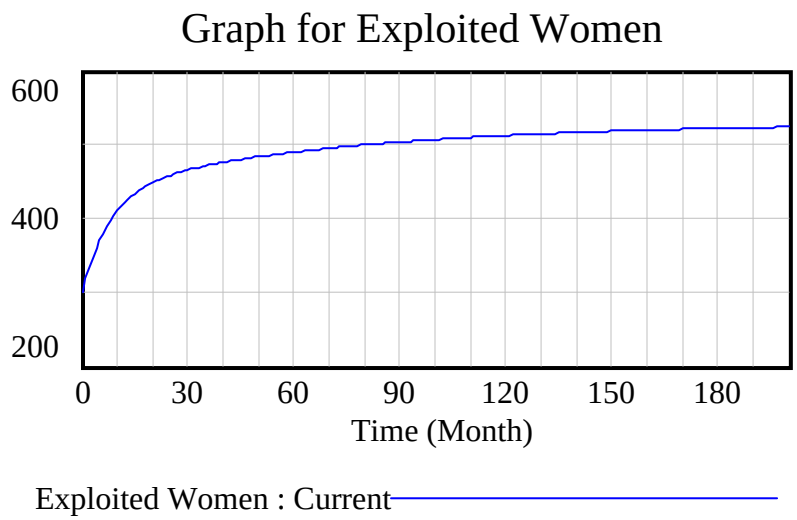
Clients



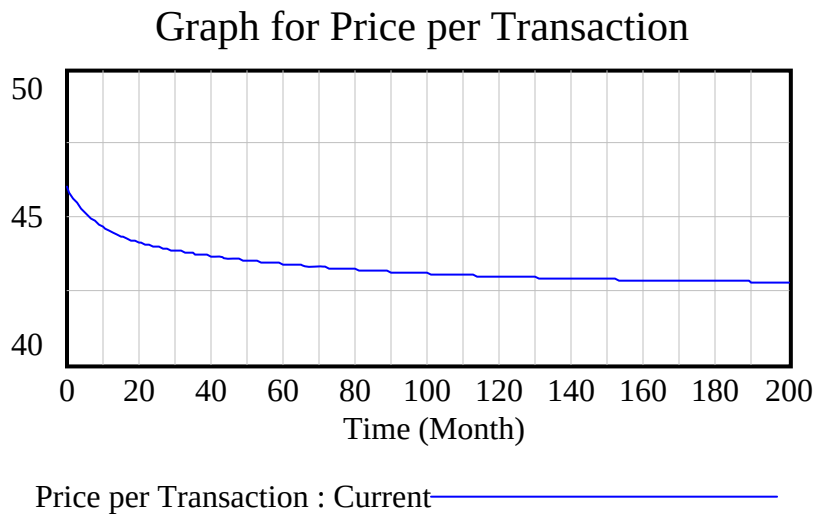
Dealers



Exploited Women

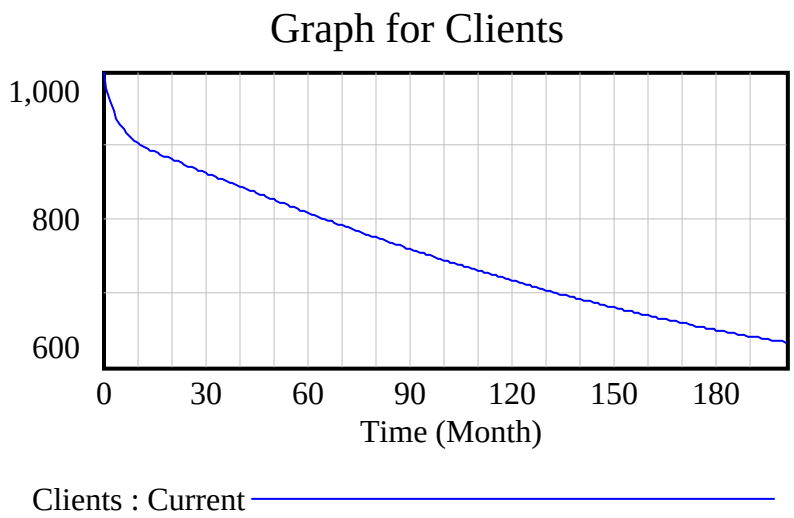


Price Per Transaction

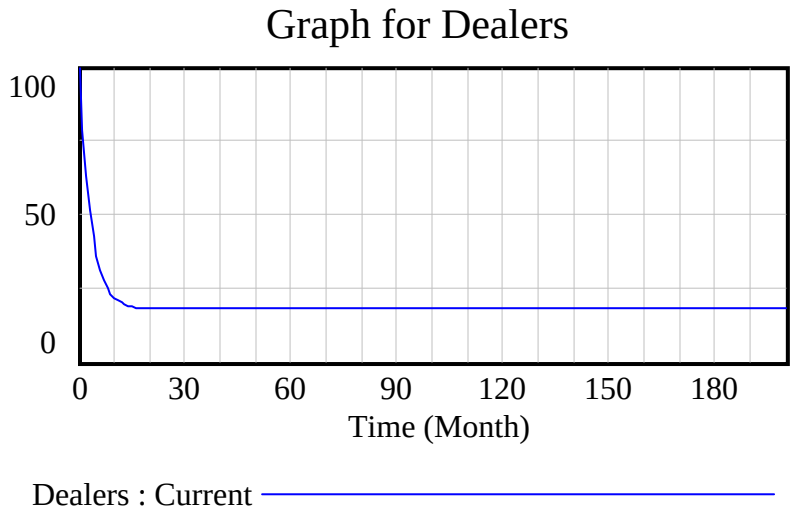


Simulation Graphs – 20% Police Enforcement

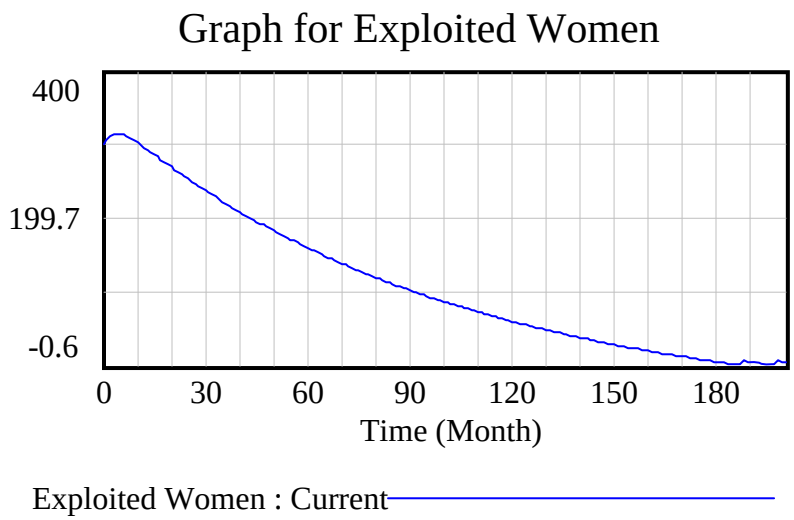
Clients



Dealers



Exploited Women



Price Per Transaction