Solution of the Prostitution & Human Trafficking case (EN)

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The Prostitution Case was inspired by one of the SD projects for the MSc SD project course (see (Kovari 2011; Kovari and Pruyt 2012)). In this staged case, students first need to build a small population model (see Figure 1a) and make a detailed causal loop diagram (see Figures 1b) as well as an aggregate causal loop diagram of this model (see Figure 1c). Most students only made a single causal loop diagram – mostly just a detailed causal loop diagram. Then students need to model the remainder of the case (see Figure 1d), using min(1,(max(0,...)) functions (*societal acceptability of prostitution*), max(0,...) functions (in light blue), 'with lookup' functions (in yellow), and smooth3I functions (in orange). While verifying, students also need to figure out that an additional real-world time-related variable (*delivery time*) is required to match the units between flow and auxiliary variables. The students are supposed to change the first order structure *births-children-from minors to adults* into a fixed delay of 18 years (in light green). Many students messed up doing this and did not find their error in spite of impossible outcomes caused by it. Then students are asked to add some variables in view of simulating the effect of a sudden illegalization of the supply of prostitution (variables in red), requiring a step function (*influence of illegalisation on the societal acceptability of prostitution*), a pulse function[1] (*reduction of supply through illegalisation*), and –because of this abrupt policy change– the use of the Euler integration method with a rather small time step (e.g. 0.0078125).

In the open questions, students need to show they can validate the model, simulate the model, draw decent graphs (see Figures 2a and 2b), and interpret the dynamics. An acceptable interpretation may sound as follows:

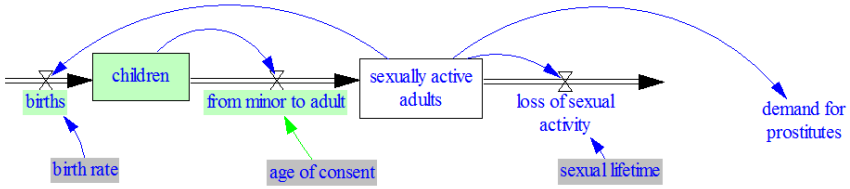
> *A sudden ban on prostitution may eliminate the supply for some time, but not the demand. Temporarily higher prices and a permanently lower societal acceptability of prostitution may strongly depress the demand for a while, after which demand will rise again and stabilize between the initial level and the depressed level at which the price mechanism balances supply and demand. Total prostitution revenues will fall dramatically before overshooting and stabilizing at a lower level. However, illegal prostitution, organized crime, and human trafficking will rise since prostitution will be illegal after the ban, and living conditions of prostitutes will most likely deteriorate.*

Students are also required to make an aggregate causal loop diagram of this model with this policy (see Figure 2c for a slightly aggregated diagram – more aggregated diagrams that respect the balancing nature of the system may be even better), and explain the relation between structure and behavior of this model with this policy using the diagram. A possible explanation would be:

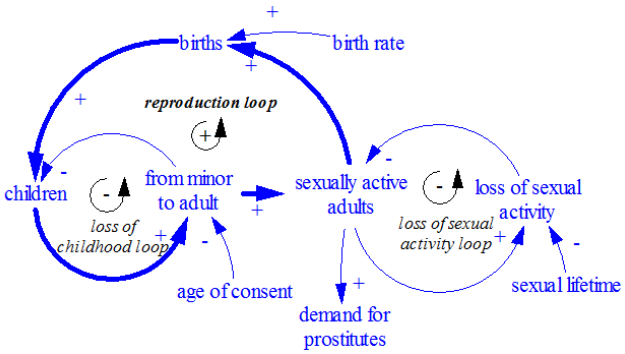
> *All feedback loops –except the* supply price demand supply loop– *are negative loops balancing supply and demand. Since demand does not fall to zero, they force the system after the initial supply shock back to a level of societally acceptable supply and demand.*

Finally students are asked to perform sensitivity analyses and propose an effective policy to address the trafficking and organized crime related to prostitution. The model could be used to illustrate that banning prostitution without fully eliminating the demand leads to highly undesirable outcomes: illegal prostitution and human trafficking by organized crime to fulfil demand. It

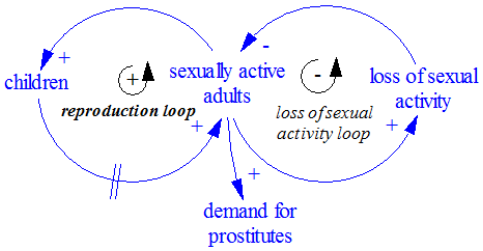
[1] More precisely, a PULSE function in Vensim and a PULSEIF function in Powersim.



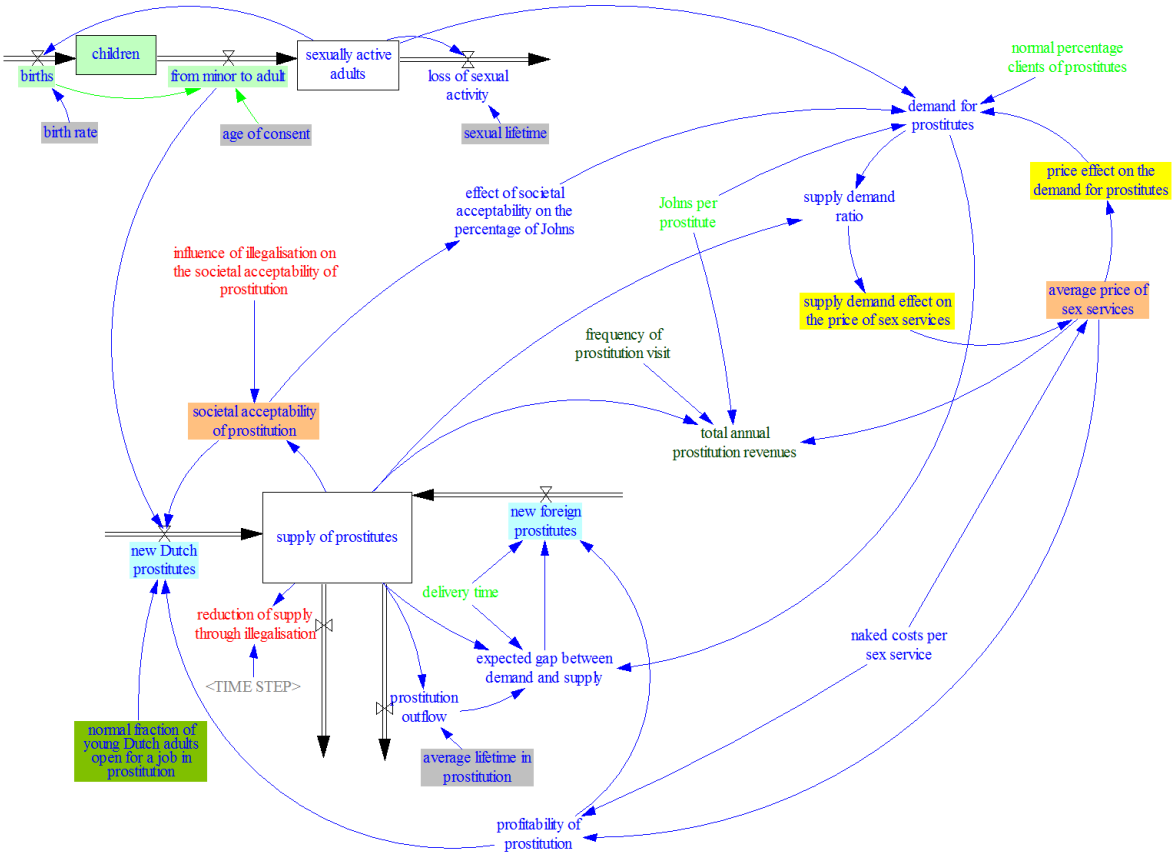
(a) Stage-one stock-flow diagram



(b) Detailed causal loop diagram

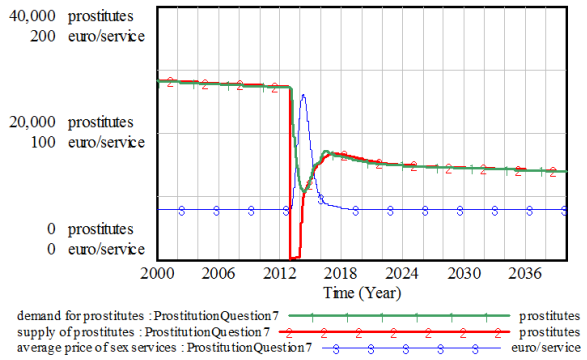


(c) Aggregate causal loop diagram

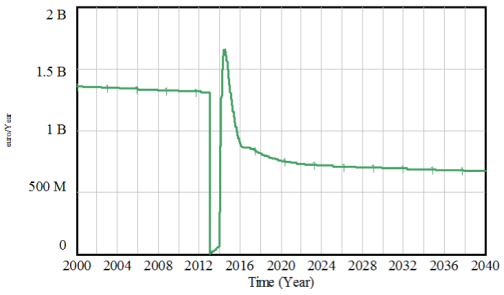


(d) Full stock-flow diagram of the prostitution and human trafficking case

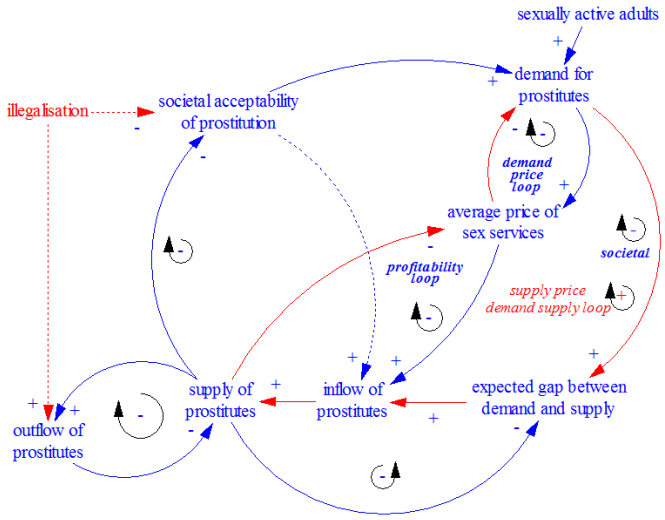
Figure 1: Stage-one stock-flow diagram and corresponding causal loop diagrams, and full stock-flow diagram of the prostitution and human trafficking case



(a) Demand for (green), and supply of prostitutes (red), with their main regulating mechanism, the price of sex services (blue)



(b) total annual prostitution revenues (green)



(c) Minimally aggregated causal loop diagram to explain the link between structure and behavior

Figure 2: Behavior of the model including the sudden illegalization of the supply side of prostitution, and causal loop diagram to explain the behavior

is rather difficult though to test other policies with this simplistic version of the model. All common sense and systemic policy proposals were considered acceptable, for example, many students suggested (*i*) fighting human trafficking by organized crime without banning prostitution, and (*ii*) providing information about the downside of prostitution in order to reduce societal acceptance, and hence, demand.

References

Kovari, A. (2011, December). Prostitution and human trafficking: A model-based exploration and policy analysis. SD Project Report. Delft University of Technology. 1

Kovari, A. and E. Pruyt (2012, July). Prostitution and human trafficking: A model-based exploration and policy analysis. In *Proceedings of the 30th International Conference of the System Dynamics Society*, St.-Gallen, CH. International System Dynamics Society. 1