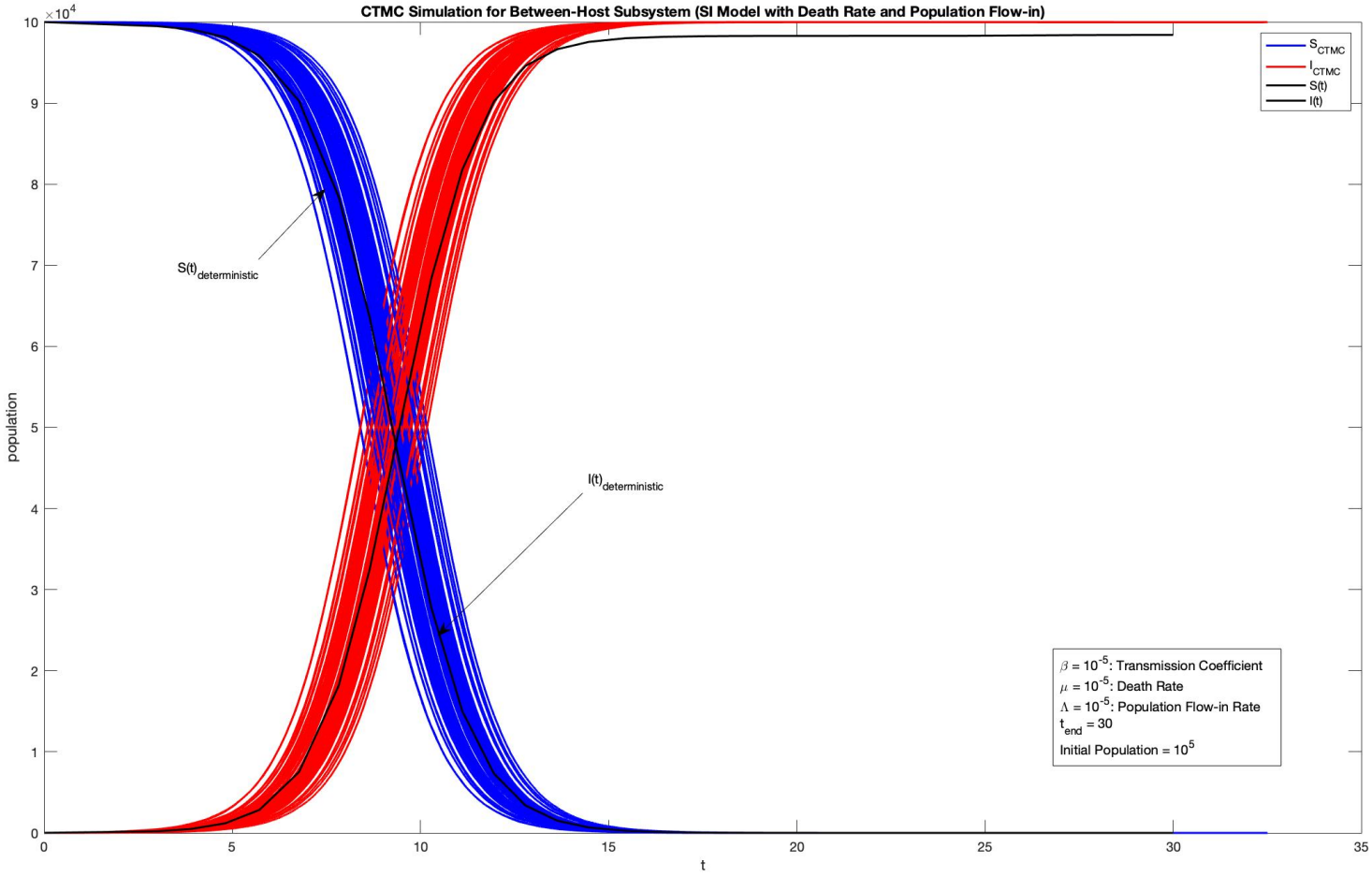
CTMC Simulation of the Between-Host System Check Point:

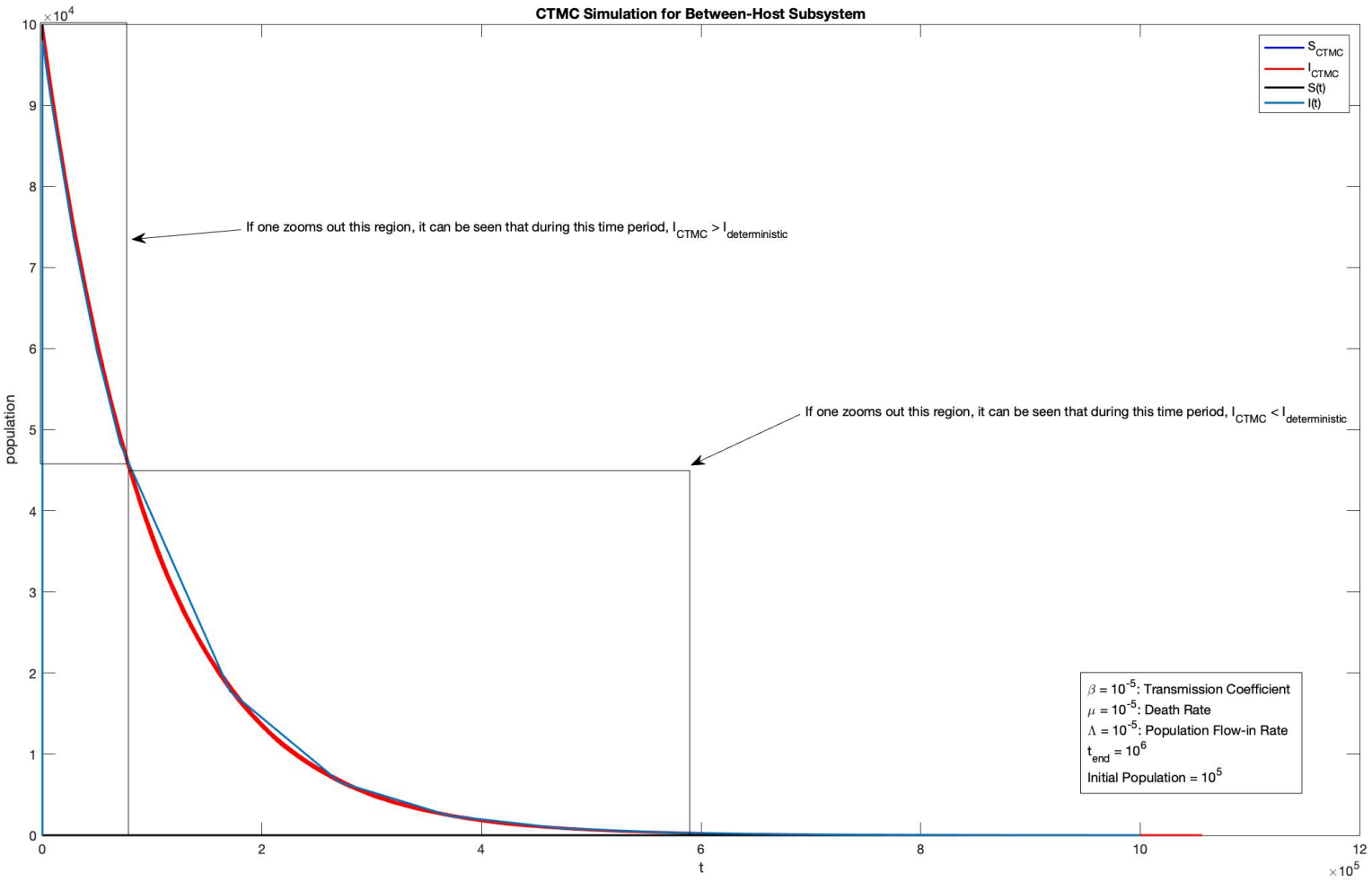
Initially What I obtained:



(Figure 1)

One might think that the CTMC simulation is not consistent with the result obtained by the deterministic simulation through ‘ode15s’ solver.

However, let's set 't' to be really large (e.g. 't = 10^6") and focus on the steady state solution:



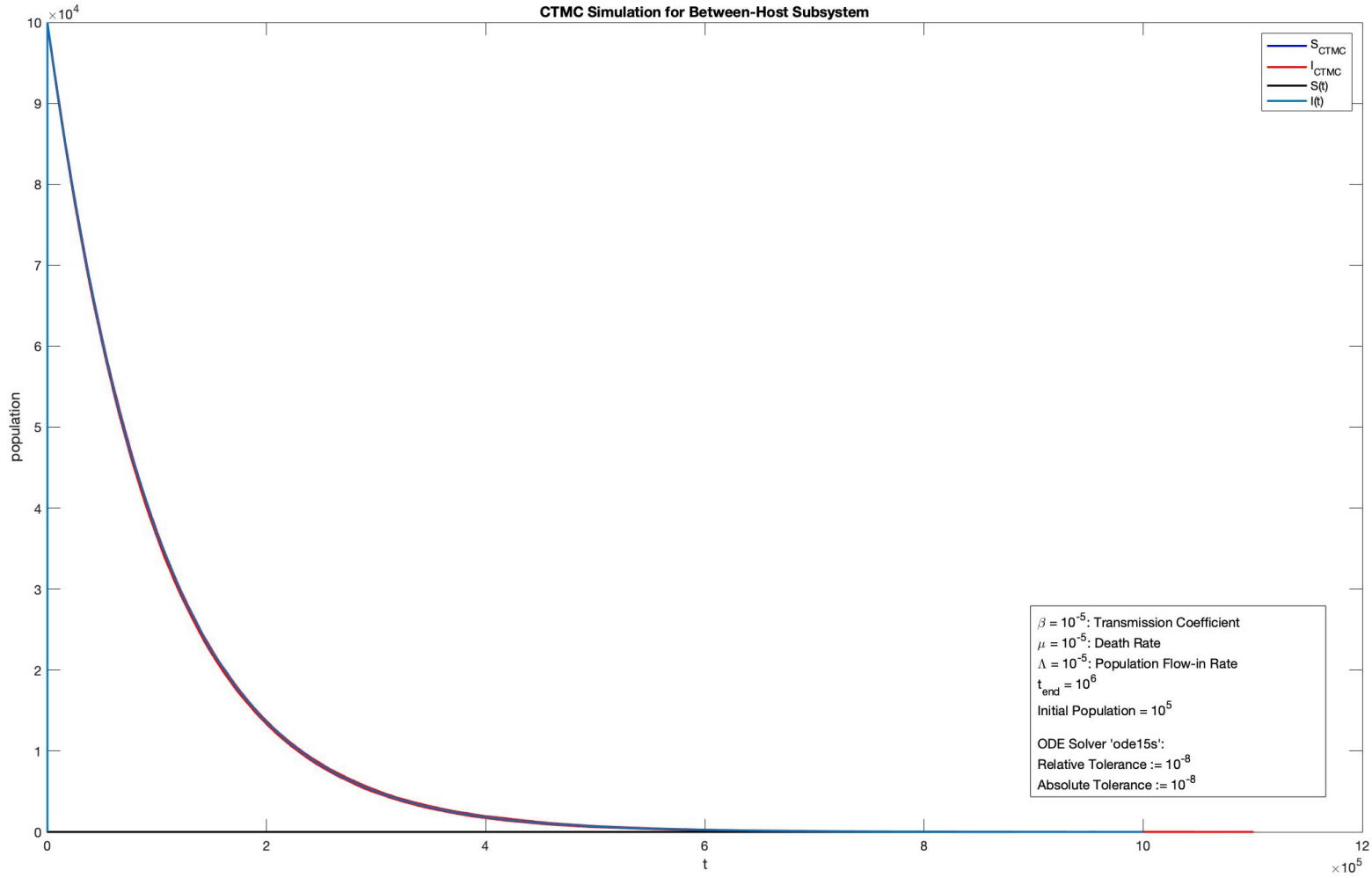
(Figure 2)

One can see from Figure 2 that the deterministic numerical solution is not smooth and the problem appeared in Figure 1 is exactly because of this!

If we impose some further conditions onto the ODE solver 'ode15s' to make sure that the numerical solution is 'smooth-enough'.

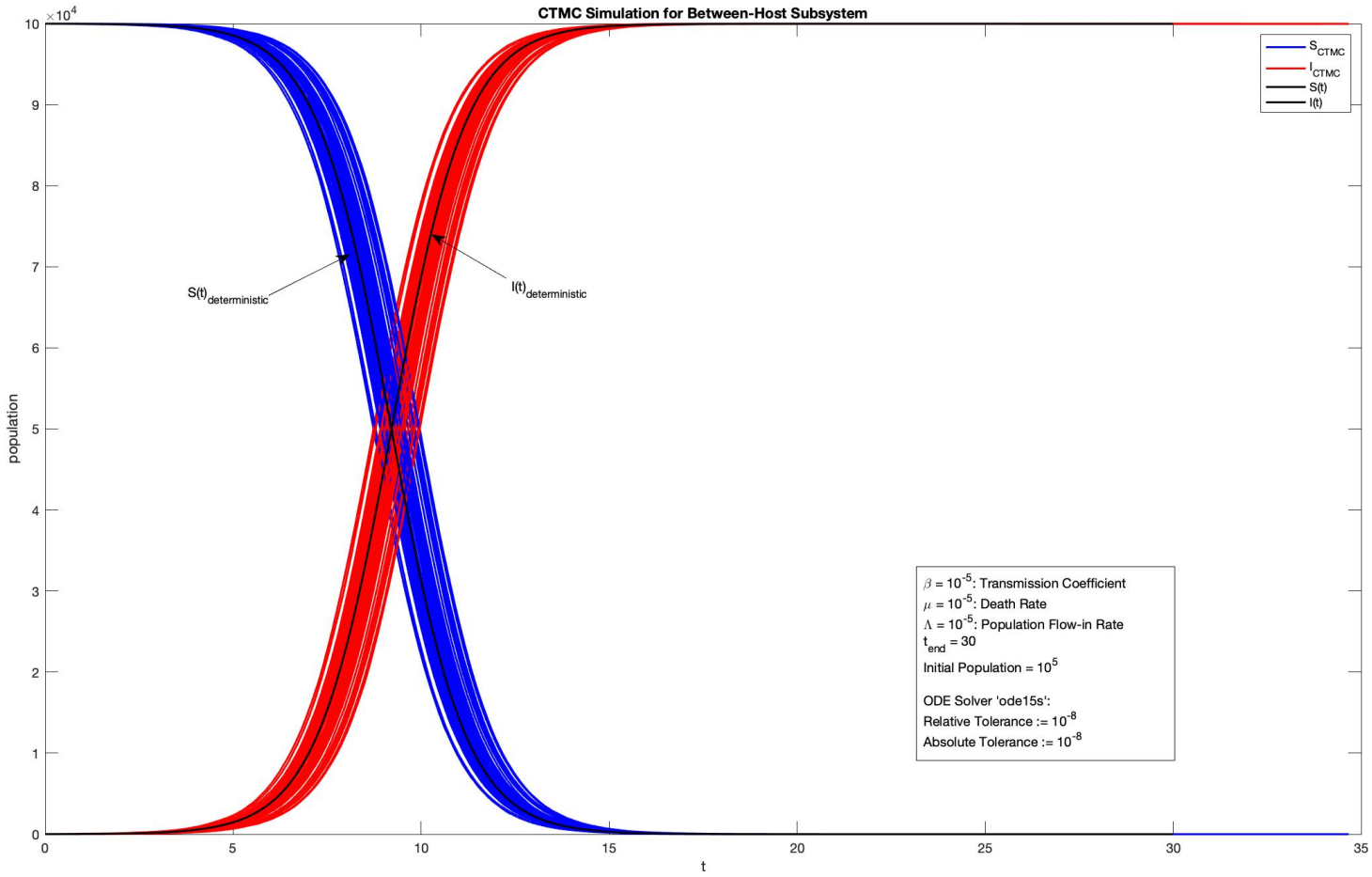
```
y0 = [log(population - 10); log(10)];
tspan = [0, t_end];
% Some extra condition to make sure that the ode solver produces
% smooth-enough solution:
opts = odeset('RelTol',1e-8,'AbsTol',1e-8);
[t, y] = ode15s(@(t,y) ode_sys(t, y, Lambda, mu, beta), tspan, y0, opts);
```

Running the same MATLAB function again gives us:



(Figure 3)

If we zoom in again and set $t_{end} = 30$ (as in Figure 1), we obtain:



(Figure 4)

ONE CAN SEE THAT THE PROBLEM IN FIGURE 1 IS SOLVED!!! (WOW)