β / γ	10^{-3}	10^{-1}	10	10^{3}
-1	$J_{uc} = 0.0041$ $J_c = 0.0002$ Iter. $= 607$	$J_{uc} = 0.0041$ $J_c = 0.0033$ Iter. $= 637$	$J_{uc} = 0.0041$ $J_c = 0.0040$ Iter. $= 311$	$J_{uc} = 0.0041$ $J_c = 0.0041$ Iter. $= 1$
0	$J_{uc} = 0.0104$ $J_c = 0.0005$ Iter. $= 635$	$J_{uc} = 0.0104$ $J_c = 0.0086$ Iter. $= 671$	$J_{uc} = 0.0104$ $J_c = 0.0104$ Iter. $= 340$	$J_{uc} = 0.0104$ $J_c = 0.0104$ Iter. $= 1$
1	$J_{uc} = 0.0195$ $J_c = 0.0011$ Iter. $= 656$	$J_{uc} = 0.0195$ $J_c = 0.0164$ Iter. $= 696$	$J_{uc} = 0.0195$ $J_c = 0.0195$ Iter. $= 356$	$J_{uc} = 0.0195$ $J_c = 0.0195$ Iter. $= 1$

Table 1

1 Some bits and pieces that are not part of the paper.

+++ Two additional nonlinear control problems below, may be deleted? +++

2 Neumann boundary conditions, Symmetric Example 1

Consider the following symmetric setup:

$$
\begin{aligned}
\widehat{\rho} &= \frac{1}{2}(1-t) + t\frac{1}{4}(\cos(\pi y) + 2) \\
\rho_0 &= \frac{1}{2} \\
q_T &= 0 \\
\vec{w} &= 0 \\
f &= 0 \\
V_{ext} &= 0
\end{aligned}
$$

Table 1 summarizes the results for this example.The attractive interaction term causes ρ to move towards the centre of the domain. Since $\widehat{\rho}$ is also centred in the domain, J_{uc} is small for $\gamma = -1$ in comparison to the problems with $\gamma = 0$ and $\gamma = 1$. This example illustrates that the particle interaction term can have a significant impact on the optimization problem considered.

β / γ	10^{-3}	10^{-1}	10	10^3
-1	$J_{uc} = 0.0209$ $J_c = 0.0009$ Iter. $= 646$	$J_{uc} = 0.0209$ $J_c = 0.0168$ Iter. $= 691$	$J_{uc} = 0.0209$ $J_c = 0.0209$ Iter. $= 379$	$J_{uc} = 0.0209$ $J_c = 0.0209$ Iter. $= 1$
0	$J_{uc} = 0.0104$ $J_c = 0.0005$ Iter. $= 635$	$J_{uc} = 0.0104$ $J_c = 0.0086$ Iter. $= 671$	$J_{uc} = 0.0104$ $J_c = 0.0104$ Iter. $= 340$	$J_{uc} = 0.0104$ $J_c = 0.0104$ Iter. $= 1$
1	$J_{uc} = 0.0047$ $J_c = 0.00034$ Iter. $= 623$	$J_{uc} = 0.0047$ $J_c = 0.0040$ Iter. $= 651$	$J_{uc} = 0.0047$ $J_c = 0.0047$ Iter. $= 297$	$J_{uc} = 0.0047$ $J_c = 0.0047$ Iter. $= 1$

Table 2

3 Neumann boundary conditions, Symmetric Example 2

Consider the following symmetric setup, which is the opposite of the first symmetric example:

$$\begin{aligned}
\widehat{\rho} &= \frac{1}{2}(1-t) + t\frac{1}{4}(-\cos(\pi y) + 2) \\
\rho_0 &= \frac{1}{2} \\
q_T &= 0 \\
\vec{w} &= 0 \\
f &= 0 \\
V_{ext} &= 0
\end{aligned}$$

This example can be compared to the Symmetric Example 1. Here, the desired state is having ρ clustered at both boundaries, which is similar to the effect of the repulsive interaction term $\gamma = 1$. Therefore, for this choice of interaction term, the value of the cost functional J_{uc} is smaller than the one for $\gamma = 0$ and $\gamma = -1$. This is the opposite to the observation made in the Symmetric Example 1, which is to be expected, given the two choices of desired state.