Title:	Friction due to inhomogeneous driving of coupled spins in a quantum heat engine
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Abstract:	We consider two spin-1/2 particles with isotropic Heisenberg interaction, as the working substance of a quantum heat engine. We observe a frictional effect on the adiabatic branches of the heat cycle, which arises due to an inhomogeneous driving at a finite rate of the external magnetic field. The frictional effect is characterized by entropy production in the system and reduction in the work extracted. Corresponding to a sudden and a very slow driving, we find expressions for the lower and upper bounds of work that can be extracted on the adiabatic branches. These bounds are also confirmed with numerical simulations of the corresponding Liouville-von Neumann equation.
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