Stability of Damped Timoshenko systems — Cattaneo versus Fourier law

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We consider vibrating systems of hyperbolic Timoshenko type that are coupled to a heat equation modeling an expectedly dissipative effect through heat conduction. While exponential stability under the Fourier law of heat conduction holds, it turns out that the coupling via the Cattaneo law does not yield an exponentially stable system. This seems to be the first example that a removal of the paradox of infinite propagation speed inherent in Fourier's law by changing to the Cattaneo law causes a loss of the exponential stability property. Actually, for systems with history, the Fourier law keeps the exponential stability known for the pure Timoshenko system without heat conduction, but introducing the Cattaneo coupling even destroys this property.