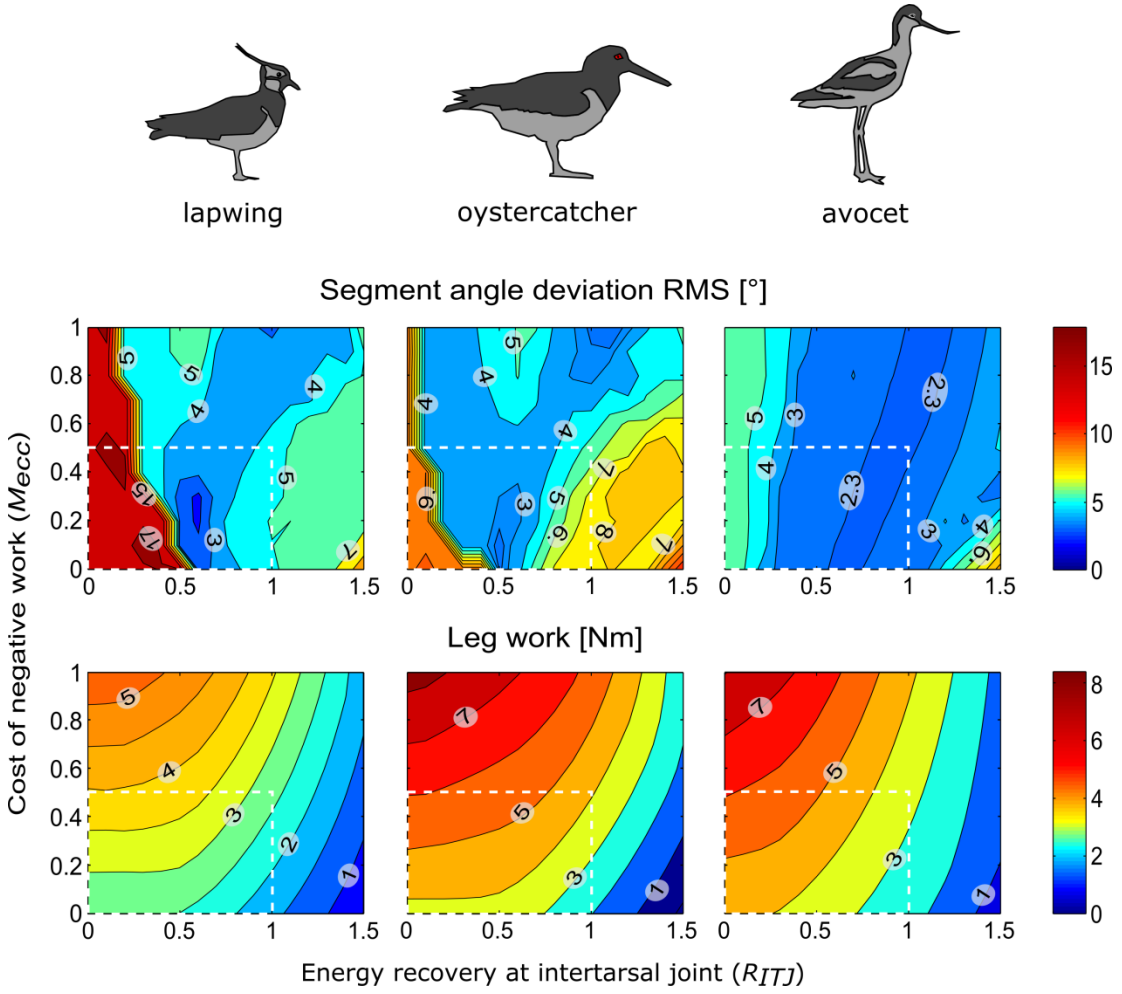


**Fig. S1. Deviations of predicted and experimental segment angles and associated modified leg work for extended domains of energy recovery and cost of negative work.** Contour graphs show the root mean square (RMS) deviations between predicted and experimental segment kinematics (top row) and the associated modified leg work (bottom row) both depending on the level of energy recovery at the intertarsal joint ($R_{ITJ}$) and on the relative metabolic cost of negative work ($M_{ecc}$). The physiologically relevant area (cf. discussion) is within the boxed area at the bottom left of each graph. For values of $M_{ecc}$ exceeding 0.5, the valley of low deviations splits into two separate valleys for lapwing and oystercatcher and one of these branches moves towards unrealistic values of energy recovery in the same way like the minimum in deviations for avocet. Ignoring the effect of metabolically cheap negative work leads to erroneous predictions which are hard to interpret. The contour graphs of minimized modified leg work are smooth (suggesting that the minima were found) and behave as expected, i.e. modified work decreases with decreasing cost of negative work and with increasing levels of energy recovery. Within the range corresponding to the plateau in deviations (lower left corner of lapwing and oystercatcher graphs) contour lines are parallel and horizontal because of the straight leg configuration; no work is done at the ITJ, and consequently the increasing recovery factor cannot decrease the modified work.

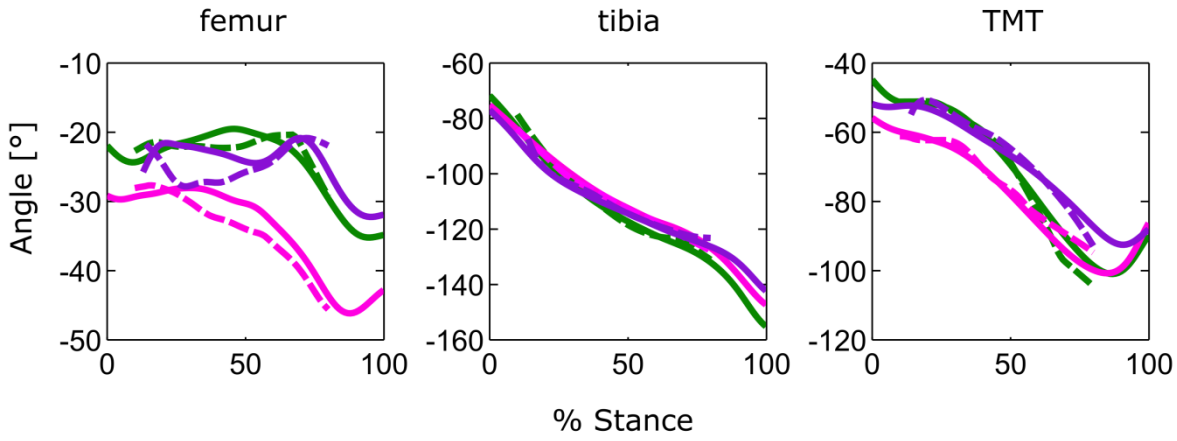


**Fig. S2**. **Segmental comparison of angle-time curves.** Experimental segment angles (solid lines) during locomotion of lapwing (green), oystercatcher (magenta), and avocet (purple) are distinct from one another. Results from the optimization (dashed lines) corresponding to the crosses in the contour graphs in Fig. 2 with low RMS values of segment angle deviations approximate the corresponding data.