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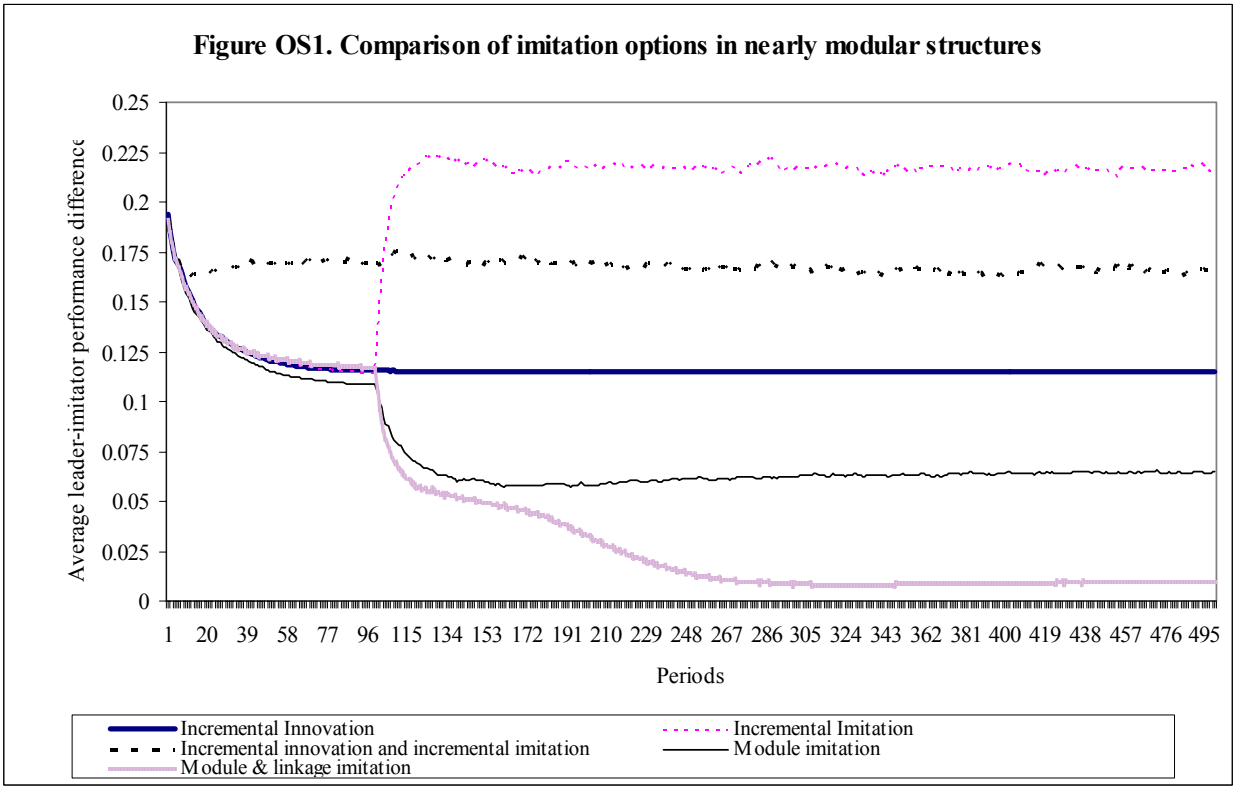
Electronic Companion—"The Dual Role of Modularity: Innovation and Imitation" by Sendil K. Ethiraj, Daniel Levinthal, and Rishi R. Roy, *Management Science*, DOI 10.1287/mnsc.1070.0775.

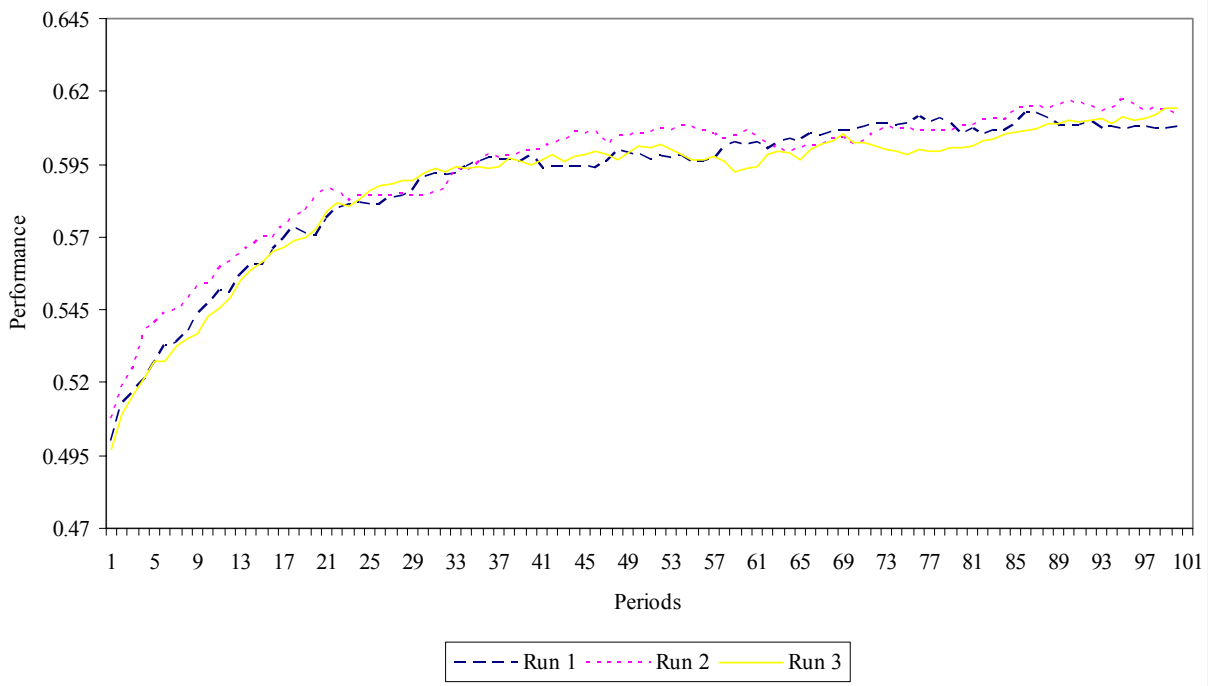
Online Supplement

Figure OS1. Comparison of imitation options in nearly modular structures



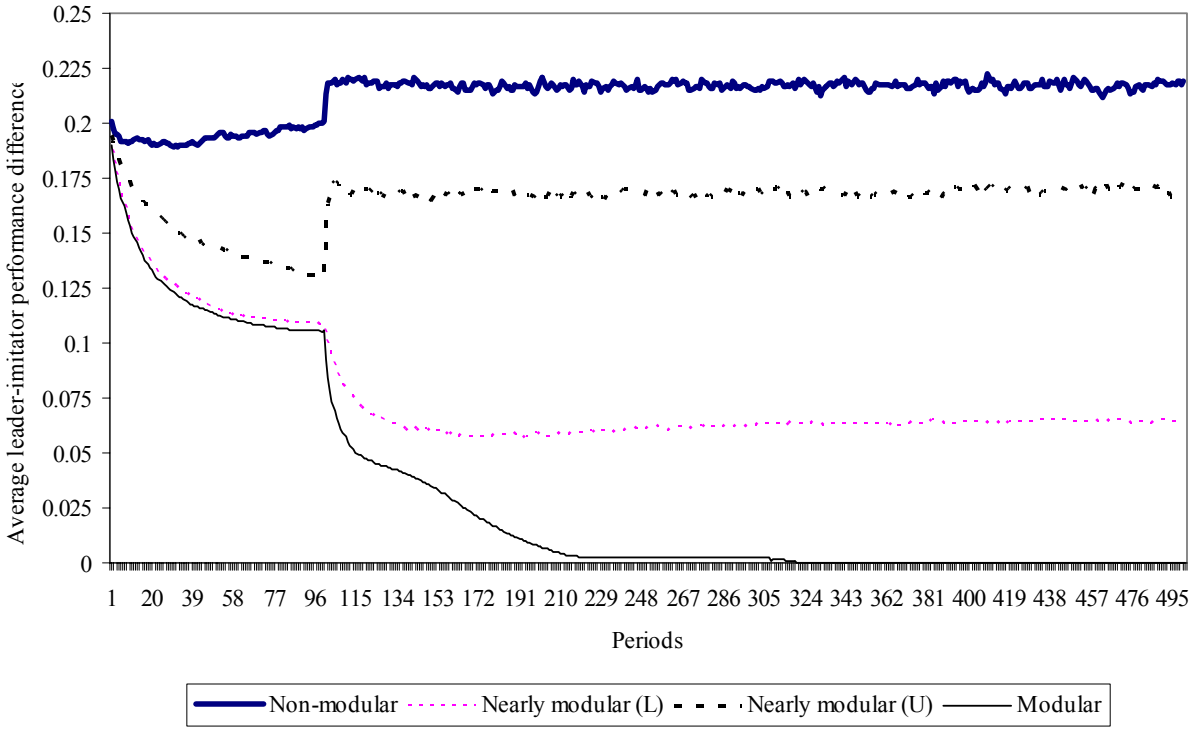
Notes: Figure OS1 evaluates the impact of alternative units of imitation including: (1) incremental innovation (single decision choices) only and no imitation; (2) Incremental imitation (single decision choices) only; (3) Incremental innovation and incremental imitation; (4) Module imitation; (5) module imitation and inter-module linkage imitation. The plot shows the average leader-imitator performance difference as the experiment progresses in each of the imitation regimes. The figure shows that in interdependent settings firms are better off not imitating at all (alternative 1) to engaging in incremental imitation (alternative 2) or incremental imitation in conjunction with incremental innovation (alternative 3). This is because imitation in interdependent systems destroys the value of incremental innovation and increases the average leader-imitator performance difference. In contrast, imitation alternatives (4) and (5) at the module level are superior to the status quo of no imitation. Thus, firms in interdependent settings, if they choose to engage in imitation, have a greater incentive to imitate modules and their linkages rather than single decision choices.

Figure OS2. Individual runs of incremental innovation for the non-modular structure



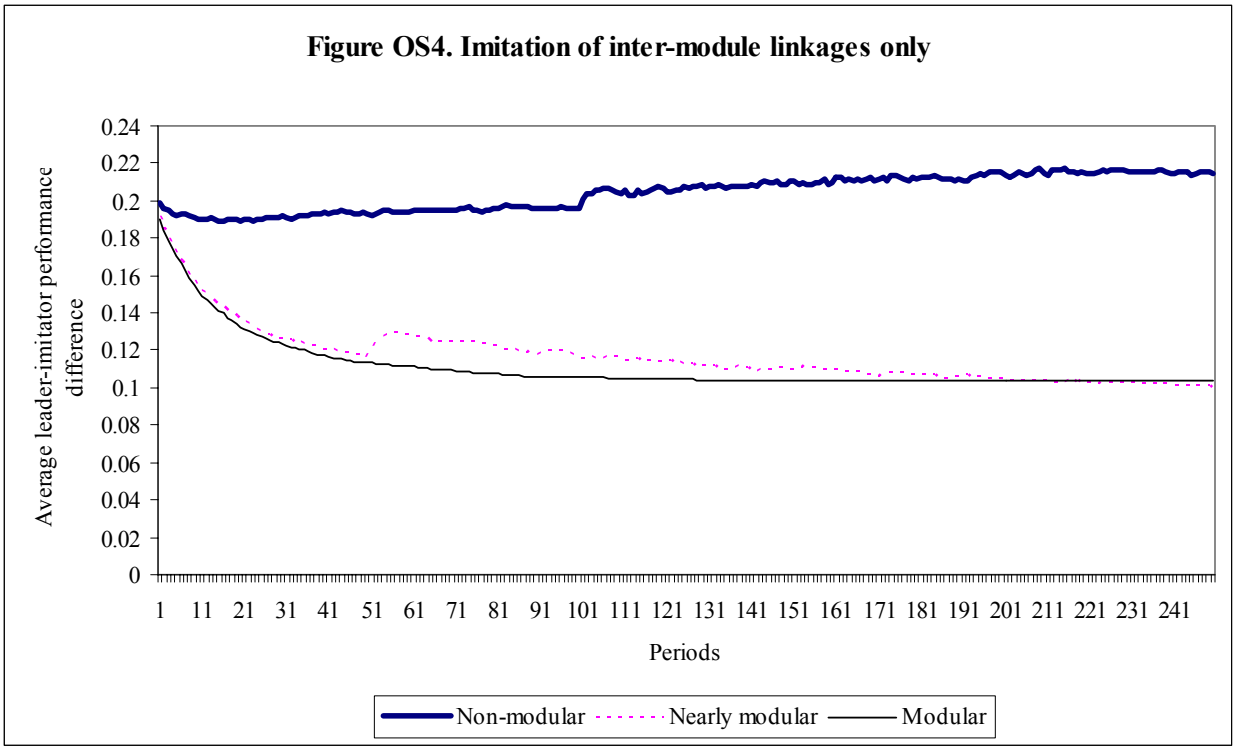
Notes: Figure OS2 shows three individual runs of incremental innovation in the non-modular structure. The single runs reveal the non-monotonicity of performance improvement that is a function of the inter-module interdependencies. As a result the non-modular structure does not reach a stable asymptote by the end of 100 periods.

Figure OS3. Perfect Imitation of module decisions and intra-module linkages

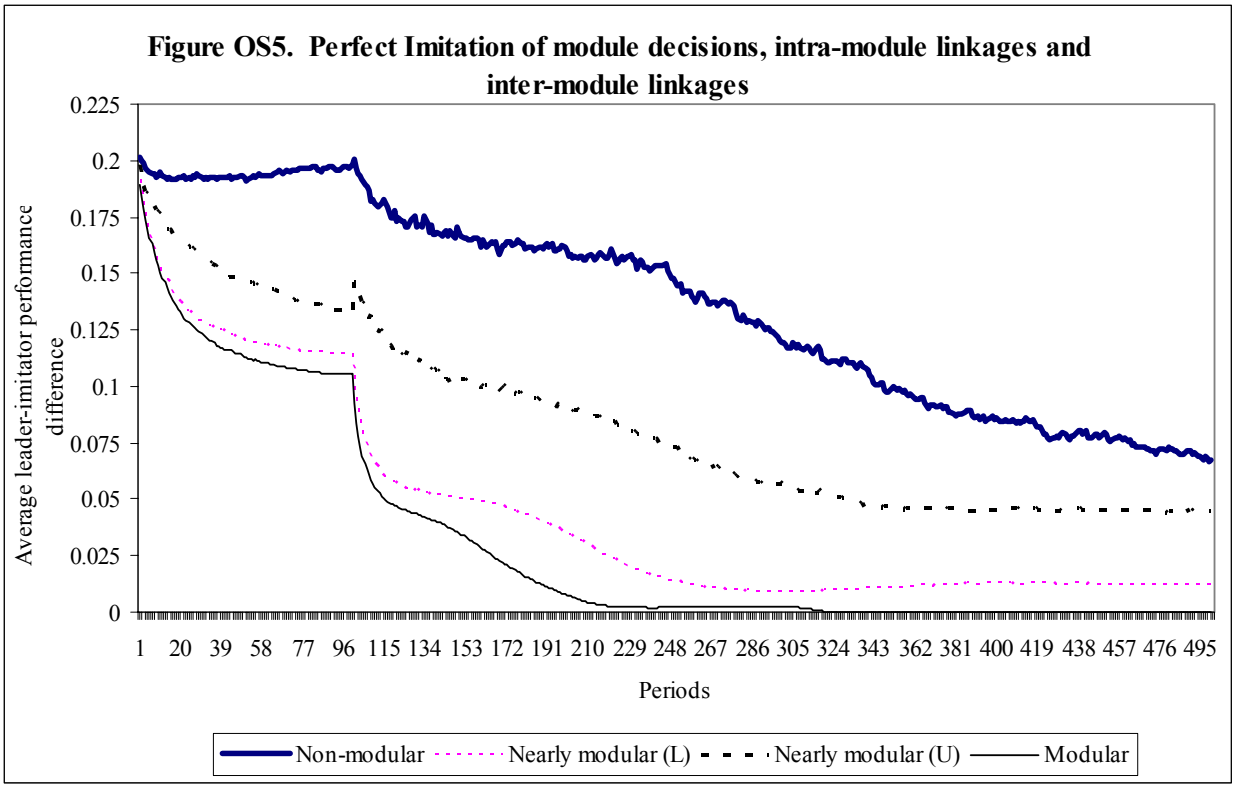


Notes: Figure OS3 is an augmented version of Figure 3 in the paper. We sought to parameterize nearly modular structures to capture the implications for the full range of such structures. We parameterized nearly modular structures by increasing the density of inter-module linkages and correspondingly reducing the density of intra-module linkages. We adopted a definition of nearly modular structures as those where the density of intra-module linkages are greater than the density of inter-module linkages. Thus, we added an upper bound on nearly modular structures and called it nearly modular (U) and re-labeled the nearly modular structure reported in the paper as nearly modular (L). From the figure above, we see that the benefits of imitation deterrence are increasing gradually in the extent of inter-module linkages and reach their maximum in the case of non-modular structures.

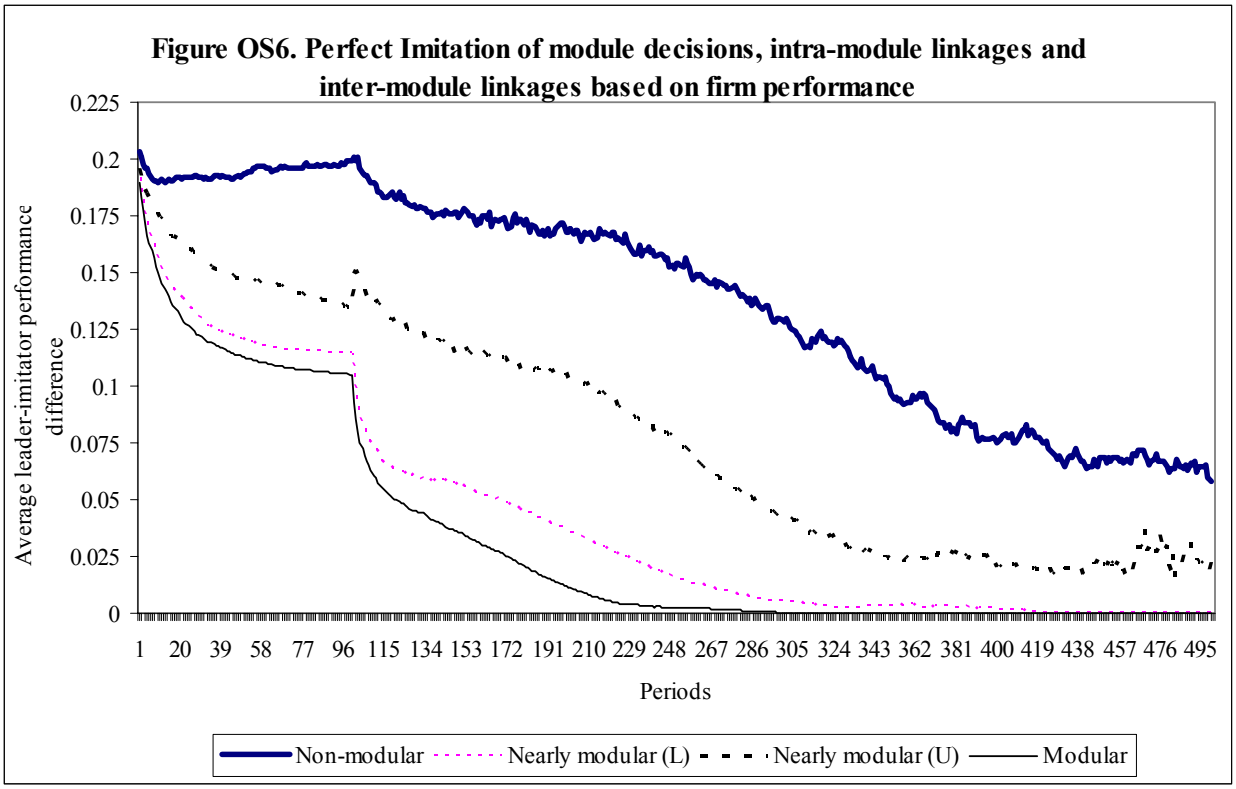
Figure OS4. Imitation of inter-module linkages only



Notes: Figure OS4 shows the effects of imitation of inter-module linkages only. In the modular structure no imitation occurs since there are no inter-module linkages and thus the status quo of the leader-imitator performance difference is preserved. In the nearly modular structure, imitation of linkages initially worsens the performance of imitators before improving. Overall, linkage copying does little to bridge the gap between leaders and imitators.

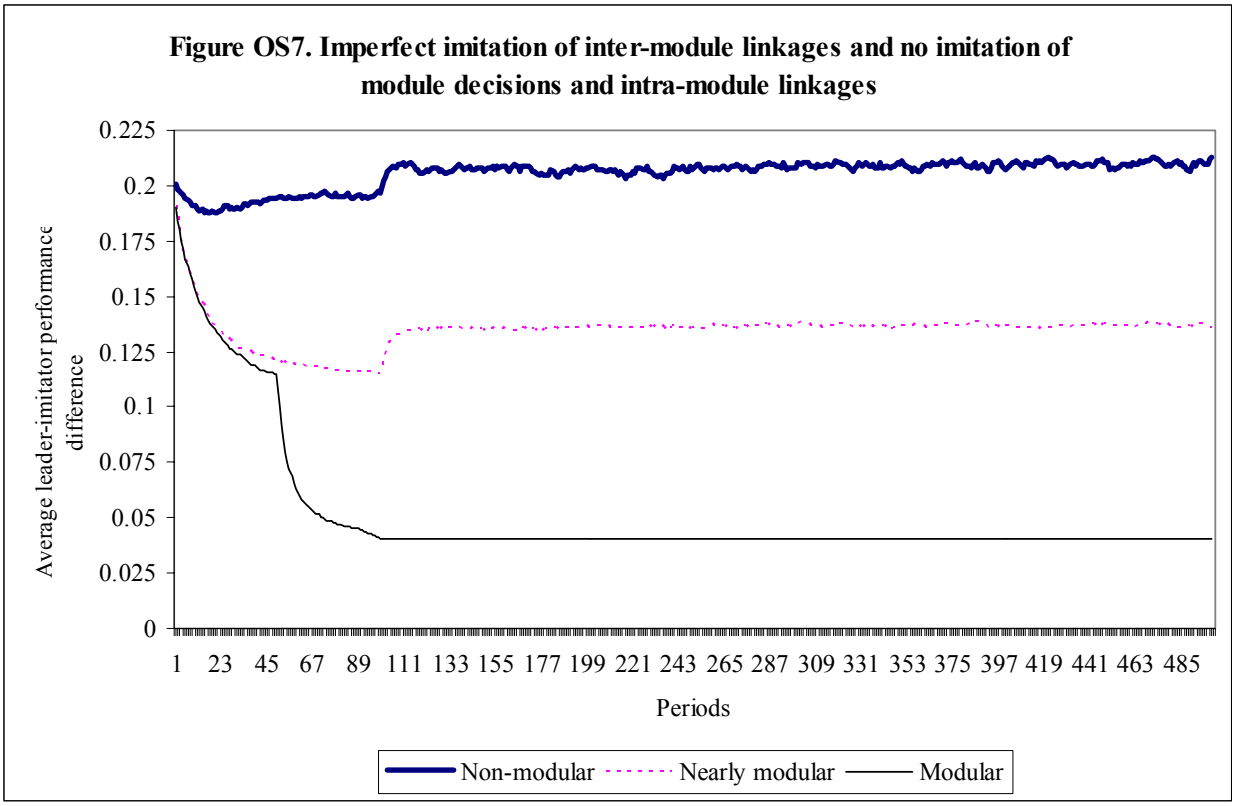


Notes: Figure OS5 is the augmented version of Figure 4 in the paper. We again parameterized the extent of nearly modular structures and added the results for nearly modular (U) structures (see description for Figure OS3). Once again the results show that the imitation deterrence potential of nearly modular structures is increasing in the extent of inter-module linkages and reaches its maximum in the case of the non-modular structures. Furthermore, the imitation deterrence potential remains substantial even in the extreme case of imitators being able to copy module decisions, intra-module linkages, and inter-module linkages.



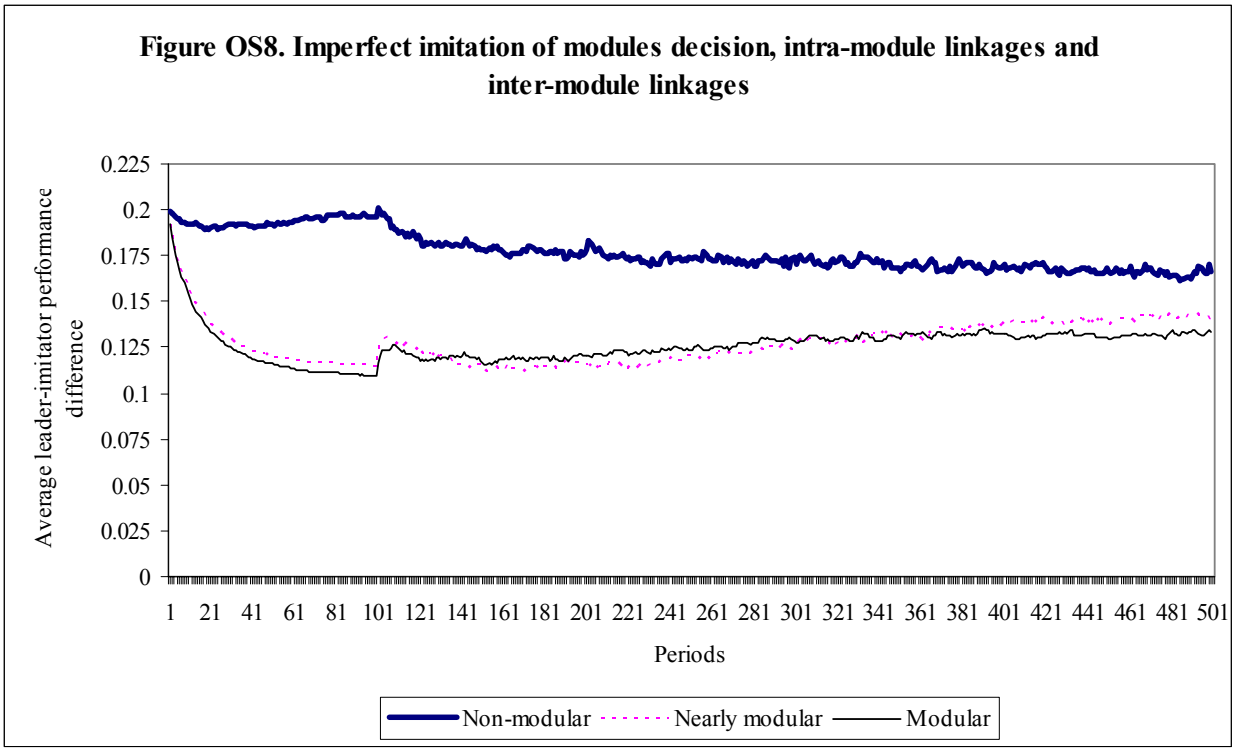
Notes: Figure OS6 implements the perfect imitation of module decisions, intra-module linkages and inter-module linkages based on superior firm performance rather than superior module performance. This is akin to imitating randomly chosen modules of high-performing firms. As seen from the figure, this regime diminishes much of the performance differences between leaders and imitators. In the nearly modular (L) structures the average leader-imitator performance difference goes to zero by period 431 in contrast to period 323 in the case of modular structure. The performance difference in the nearly modular (U) and non-modular structures do not go to zero by the 500th period but is likely if we run the model for a longer duration. Nonetheless, the relative ordering of the three structures in terms of its imitation deterrence potential remains robust.

Figure OS7. Imperfect imitation of inter-module linkages and no imitation of module decisions and intra-module linkages



Notes: Figure OS7 shows the effect of imperfect imitation of only the inter-module linkages but not the module decisions and intra-module linkages. The modular structure maintains the status quo in the performance difference between leaders and imitators since no imitation occurs because there are no inter-module linkages. In the nearly modular and non-modular structures imperfect imitation of linkages alone hurts the performance of imitators suggesting that they may be better off not imitating at all. This again confirms the relative ordering of the three structures in terms of their imitation deterrence potential.

Figure OS8. Imperfect imitation of modules decision, intra-module linkages and inter-module linkages



Notes: Figure OS8 shows the imperfect imitation of module decision, intra-module linkages, and inter-module linkages. These results show that the imitation deterrence of the three structures is largely similar when imitation is imperfect. Thus, the extent of imperfections in imitation acts as a substitute for design complexity. In other words, if imitation is expected to be highly imperfect, design complexity is not a discriminating instrument for imitation deterrence.