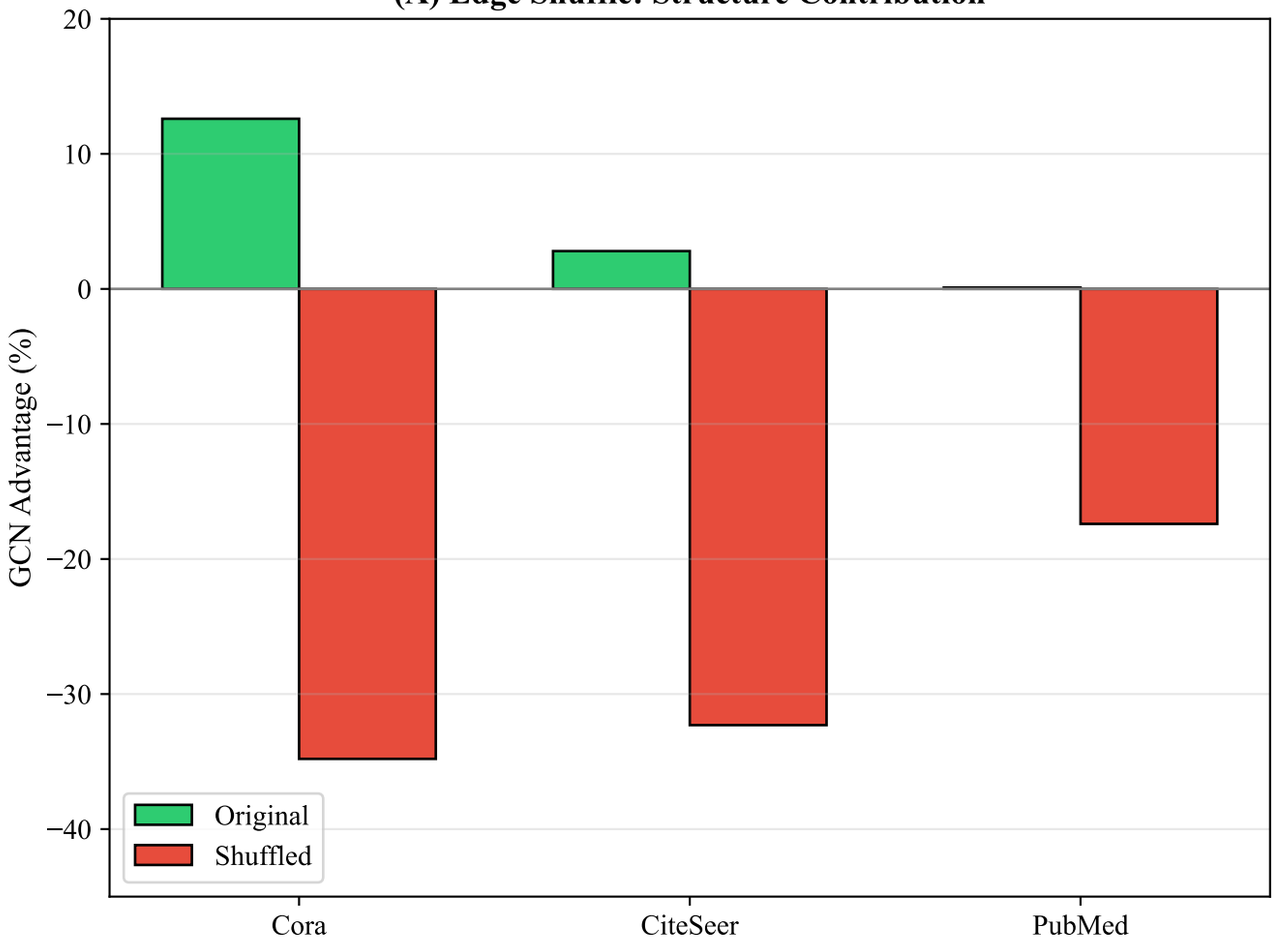

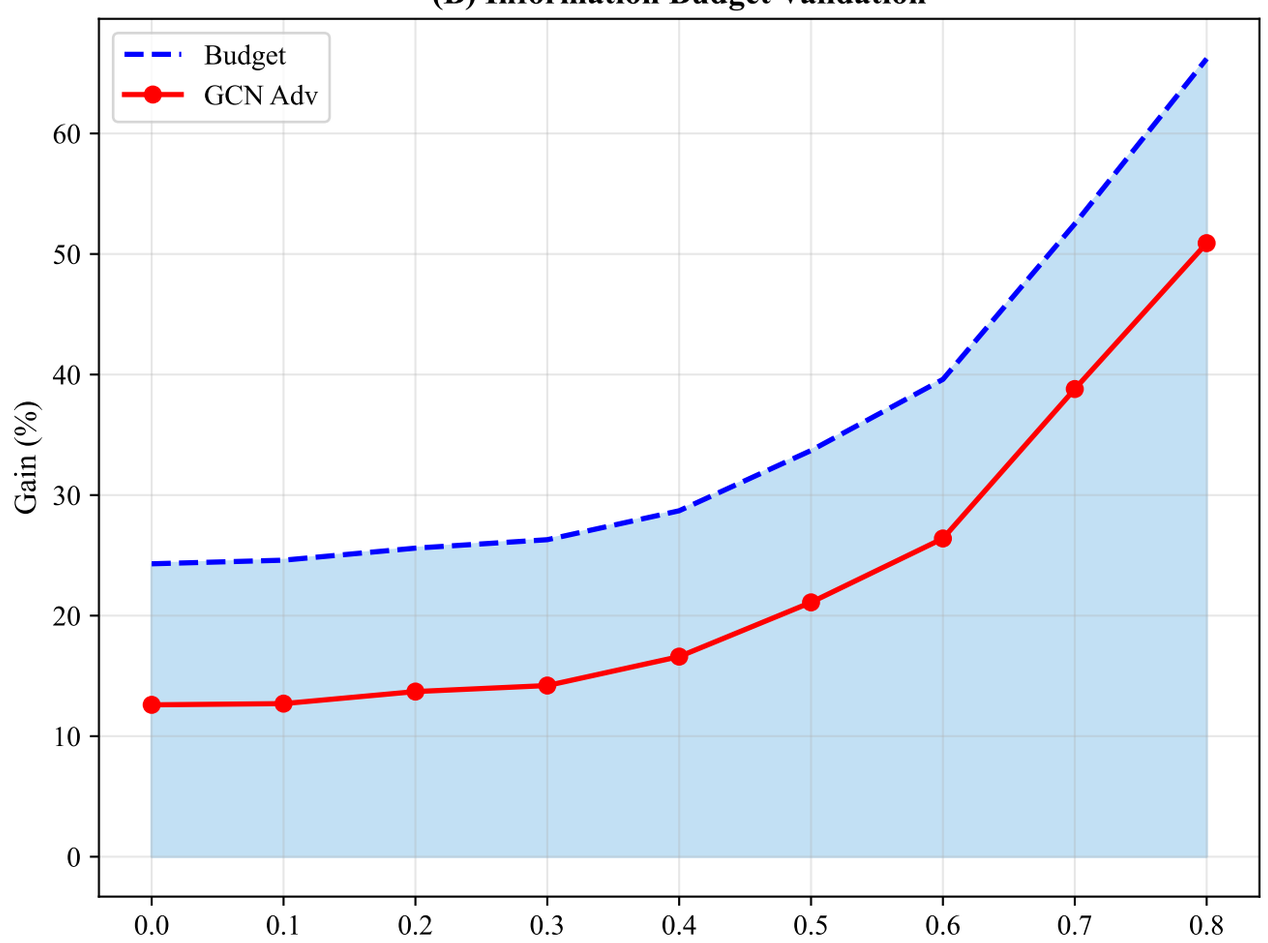

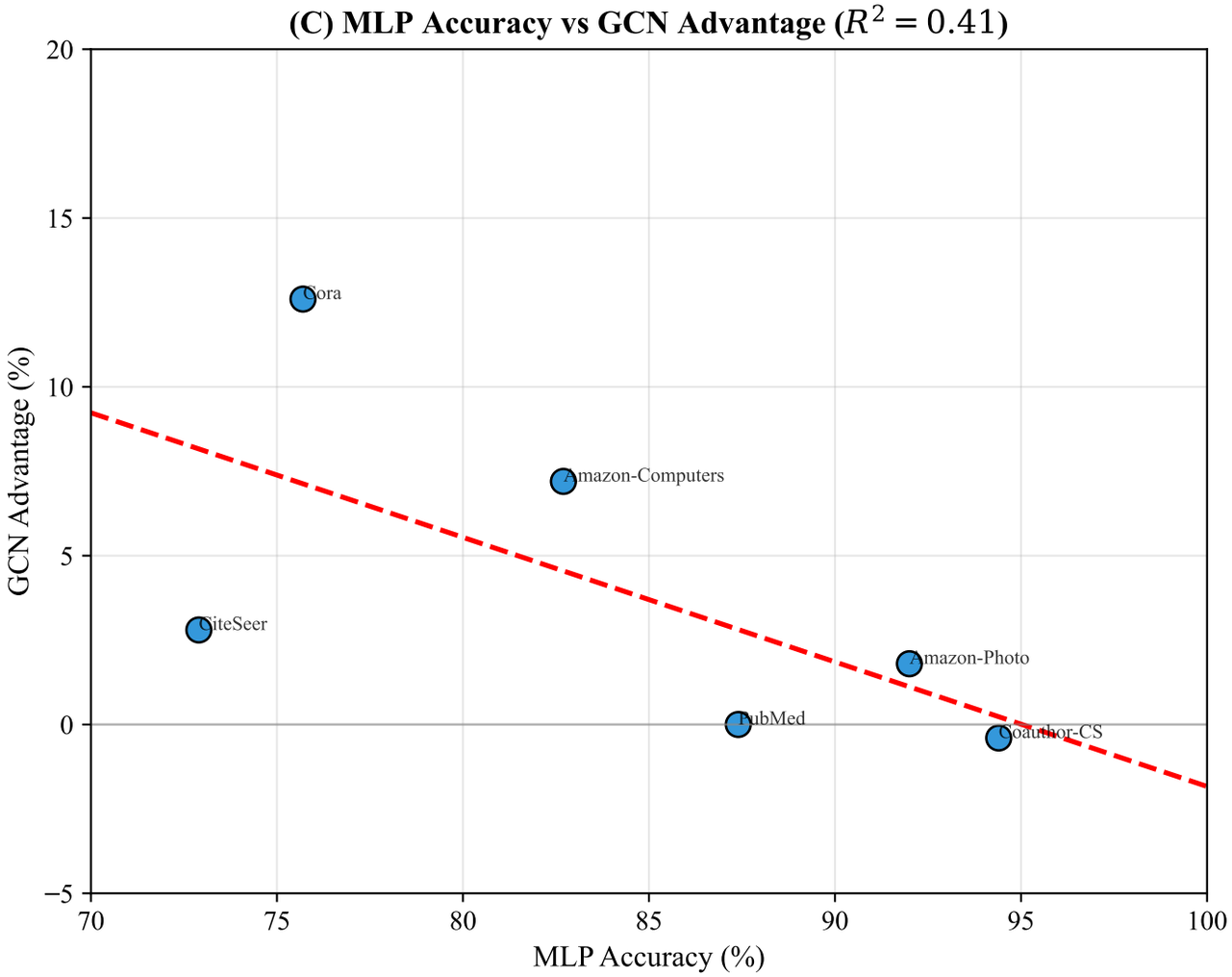


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INFORMATION BUDGET THEORY
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Core Principle:
  GNN_max_gain ≤ (1 - MLP_accuracy)

Key Evidence:
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1. EDGE SHUFFLE (Panel A)
   • Shuffling edges destroys GNN advantage
   • Cora: +12.6% → -34.8%
   • Proves: Structure is essential

2. BUDGET VALIDATION (Panel B)
   • All 9 noise levels within budget
   • Violations: 0/9 (100% compliance)
   • Proves: GNN gain is bounded

3. SAME-h DIFFERENT-MLP (Panel C)
   • Cora vs Coauthor-CS: h≈0.81
   • MLP: 75.7% vs 94.4%
   • GCN_adv: +12.6% vs -0.4%
   • Proves: MLP (not h) determines utility

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Conclusion:
GNN can only improve upon what MLP
cannot explain. High feature quality
leaves little room for structural gain.
```