

## Characterizing the Typewise Top-Trading-Cycles Mechanism for Multiple-Type Housing Markets

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We consider the generalization of the classical Shapley and Scarf housing market model (Shapley and Scarf, 1974) to so-called multiple-type housing markets (Moulin, 1995). Throughout the paper, we focus on strict preferences. When preferences are separable, the prominent solution for these markets is the typewise top-trading-cycles (tTTC) mechanism.

We first show that for lexicographic preferences, a mechanism is unanimous (or onto), individually rational, strategy-proof, and non-bossy if and only if it is the tTTC mechanism. Second, we obtain a corresponding characterization for separable preferences. We obtain additional characterizations when replacing [strategy-proofness and non-bossiness] with self-enforcing group (or pairwise) strategy-proofness. Finally, we show that for strict preferences, there is no mechanism satisfying unanimity, individual rationality, and strategy-proofness. We obtain further impossibility results for strict preferences based on weakening unanimity to ontoneess and on extending the tTTC solution.

Our characterizations of the tTTC mechanism constitute the first characterizations of an extension of the prominent top-trading-cycles (TTC) mechanism to multiple-type housing markets.

**Co-authors:** KLAUS, Bettina; FENG, Di (Dongbei University of Finance and Economics)

**Presenter:** KLIJN, Flip

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