The (non-)uniqueness of the non-diagonal tile in a generalized triangular matrix ring

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In this talk we first provide an example regarding the impossibility of the recovery up to isomorphism of one of the algebraic structures involved in generalized triangular matrix rings. To be more precise: we show that the tile in the non-diagonal position of a $2 \times 2$ upper triangular tiled matrix ring can in general not be recovered up to isomorphism even if the base ring is finite. This ties in with recent work on the recovery/non-recovery of some of the algebraic structures involved in various classes of matrix rings.

In contrast to the negative result above, we discuss an “isomorphism” for generalized triangular matrix rings over rings having only the trivial idempotents (namely 0 and 1), in particular over indecomposable commutative rings or over local rings (not necessarily commutative). This “isomorphism” is not exactly an isomorphism, but an isomorphism relative to some automorphisms of the underlying ring. As a consequence we obtain a recovery result for the non-diagonal tile in a tiled matrix ring.