P-categorical equivalence of algebras

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A variety of algebras is considered as a category: the objects are the algebras in the variety and the morphisms are the homomorphisms between them.

Two algebras $A$ and $B$ are called categorically equivalent, if there is a categorical equivalence between the varieties they generate that maps $A$ to $B$.

We denote by $A^+$ the algebra obtained from an algebra $A$ by adding to its fundamental operations all nullary operations on $A$. We will call algebras $A$ and $B$ p-categorically equivalent if $A^+$ and $B^+$ are categorically equivalent.

It appears that categorically equivalent algebras are also p-categorically equivalent. The converse is however generally not true. One of the simplest examples are finite simple nonabelian groups: while any two simple nonabelian groups are p-categorically equivalent, they are categorically equivalent iff they are isomorphic.

We have shown that also the extensions with trivial center of finite simple nonabelian groups by some finite abelian group are p-categorically equivalent. In particular, symmetric groups of order at least five are p-categorically equivalent.