Given a Galois cover of curves $X \to Y$ with Galois group $G$ which is totally ramified at a point $x$ and unramified elsewhere, restriction to the punctured formal neighborhood of $x$ induces a Galois extension of Laurent series rings $k((u))/k((t))$. If we fix a base curve $Y$, we can ask when a Galois extension of Laurent series rings comes from a global cover of $Y$ in this way. Harbater proved that over a separably closed field, this local-to-global principle holds for any base curve if $G$ is a $p$-group, and gave a condition for the uniqueness of such an extension. Using a generalization of Artin-Schreier theory to non-abelian $p$-groups, we characterize the curves $Y$ for which this lifting property holds and when it is unique, but over a more general ground field. (Received July 25, 2017)