The well-known Skitovich-Darmois theorem states: If \( \xi_j, \ j = 1, 2, \ldots, n, \ n \geq 2, \) are independent random variables, and \( \alpha_j, \beta_j \) are nonzero constants, then the independence of linear statistics \( L_1 = \alpha_1 \xi_1 + \cdots + \alpha_n \xi_n \) and \( L_2 = \beta_1 \xi_1 + \cdots + \beta_n \xi_n \) implies that all random variables \( \xi_j \) are Gaussian. This theorem was generalized by Ghurye and Olkin for case where \( \xi_j \) are independent random vectors in the space \( \mathbb{R}^m, \) and \( \alpha_j, \beta_j \) are non-singular matrices. They proved that the independence of \( L_1 \) and \( L_2 \) implies that the random vectors \( \xi_j \) are Gaussian.

We will discuss generalizations of the Skitovich-Darmois theorem to the case where independent random variables take values in a locally compact Abelian group \( X \) and coefficients of linear statistics are topological automorphisms of \( X. \)