**Performance Comparison of Major European Countries in the Meat Manufacturing Industry: A Machine Learning-based Approach**

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**MATHEMATICAL MODELS**

**Directional distance function (DDF) based on regression splines**



**The spline-based Camanho-Dyson Luenberger indicator (SBCDLI):**



**Decomposition of SBCDLI into an efficiency gap between groups (SBEG) (first square brackets), and technical gap between the production frontier of the technologies of A and B (SBTG) (second square brackets):**



**The spline-based pseudo-panel Luenberger indicator (SBPPLI):**



**Decomposition of SBPPLI into efficiency gap change (SBEGC) and technical gap change (SBTGC):**

