5 Component Pseudo-Panel Decomposition - `xtoaxaca`

- Paper: Kim, ChangHwan. 2010. "Decomposing the Change in the Wage Gap between White and Black Men Over Time, 1980-2005: An Extension of the Blinder-Oaxaca Decomposition Method." SMR.
- Statistical Software: Kröger, Hannes and Jörg Hartman. 2021. "`xtoaxaca` - Extending the Kitagawa-Oaxaca-Blinder Decomposition Approach to Panel Data."

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\begin{aligned}
(Y_{w1} - Y_{w0}) - (Y_{m1} - Y_{m0}) = & \underbrace{[(a_{w1} - a_{w0}) - (a_{m1} - a_{m0})] + \sum \left[(\bar{b}_{w1} - \bar{b}_{w0}) - (\bar{b}_{m1} - \bar{b}_{m0})\right]}_{\text{D1. Intercept Effect}} \\
& + \underbrace{\sum\sum \left[(b^*_{w1} - b^*_{w0}) - (b^*_{m1} - b^*_{m0})\right] \left[\frac{\bar{X}_{w1} + \bar{X}_{w0} + \bar{X}_{m1} + \bar{X}_{m0}}{4}\right]}_{\text{D2. Pure Coefficient Effect}} \\
& + \underbrace{\sum\sum \left[\frac{(b^*_{w1} + b^*_{w0})}{2} - \frac{(b^*_{m1} + b^*_{m0})}{2}\right] \left[\frac{(\bar{X}_{w1} - \bar{X}_{w0}) + (\bar{X}_{m1} - \bar{X}_{m0})}{2}\right]}_{\text{D3. Coefficient Interaction Effect}} \\
& + \underbrace{\sum\sum \left[(\bar{X}_{w1} - \bar{X}_{w0}) - (\bar{X}_{m1} - \bar{X}_{m0})\right] \left[\frac{b^*_{w1} + b^*_{w0} + b^*_{m1} + b^*_{m0}}{4}\right]}_{\text{D4. Pure Endowment Effect}} \\
& + \underbrace{\sum\sum \left[\frac{(\bar{X}_{w1} + \bar{X}_{w0})}{2} - \frac{(\bar{X}_{m1} + \bar{X}_{m0})}{2}\right] \left[\frac{(b^*_{w1} - b^*_{w0}) + (b^*_{m1} - b^*_{m0})}{2}\right]}_{\text{D5. Endowment Interaction Effect}}
\end{aligned} \tag{1}
$$

1. D1 – Intercept Effect: This is purely the difference in differences between group and overall intercepts. This portion is the entirely unexplained gap between groups that is common in both periods.
2. D2 – Pure Coefficient Effect: This measures the effect of the changing coefficients over time when the distributions of X are identical between two groups and they do not change over time. E.g., what is the pure effect of growing college premium (that is, differentiated growth in the college premium between whites and blacks) as for the racial earnings gap when the % college-educated do not differ between whites and blacks, and the % don't change over time.
3. D3 – Coefficient Interaction Effect: This measures how much the gap between groups changes due to the average change in endowment combined with the difference in the averaged coefficient. E.g., when the % college-educated grows equally likely for both whites and blacks, how that affects the racial gap because of the (initial or average) difference in the college premiums between whites and blacks.

4. D4 – Pure Endowment Effect: This measures the effect of the changing distribution of X over time when the coefficients of X are identical between two groups and they do not change over time. E.g., what is the pure effect of the rising % college-educated (that is, the growth rates differ between whites and blacks) as for the racial earnings gap when the college premiums do not differ between whites and blacks, and the premium don't change over time.

5. D5 – Endowment Interaction Effect: This measures how much the gap between groups changes due to the average change in coefficients combined with the difference in the averaged endowments. E.g., when the college premium grows equally for both whites and blacks, how that affects the racial gap because the (initial or average) difference in the % college-educated between whites and blacks.