	D_1	D_2	D_3
English	1	0	0
Welsh	0	1	0
Scottish	0	0	1

Three-category 'parent' ⇨ two dummies, since

$$D_3 = 1 - D_1 - D_2$$

estimate:

$$Y = a + b_1D_1 + b_2D_2 + \ldots\ldots$$

Effects relative to omitted category.

Pattern of effects is **not** affected by choice of omitted category.

Returned significance contrasts are (above: whether English & Welsh significantly different from Scots, not from each other)

Interpretation

For English: $D_1=1$, $D_2=0$

$Y = a + b_1 + \ldots\ldots$

For Welsh: $D_1=0$, $D_2=1$

$Y = a + + b_2 + \ldots\ldots$

For Scots: $D_1=0$, $D_2=0$

$Y = a + \ldots\ldots$

Interactions

Consider X_3
Assume its effect differs by country

Make
$Z_4 = D_1 \times X_3$
$Z_5 = D_2 \times X_3$

Estimate
$Y = a + b_1D_1 + b_2D_2 + b_3X_3$
$+ b_4Z_4 + b_5Z_5 + \ldots\ldots$

Consider

$Y = \ldots + b_3X_3 + b_4Z_4 + b_5Z_5 + \ldots$

$Y = \ldots + b_3X_3 + b_4D_1X_3 + b_5D_2X_3 + \ldots$

For English: $D_1 = 1$, $D_2 = 0$
$Y = \ldots + b_3X_3 + b_4X_3 + \ldots$

For Welsh: $D_1 = 0$, $D_2 = 1$
$Y = \ldots + b_3X_3 + b_5X_3 + \ldots$

For Scots: $D_1 = 0$, $D_2 = 0$
$Y = \ldots + b_3X_3 + \ldots$

Recap:

$Z_4 = D_1 \times X_3$

$Z_5 = D_2 \times X_3$

$Y = a + b_1D_1 + b_2D_2 + b_3X_3 + b_4Z_4 + b_5Z_5 + \ldots\ldots$

Interpretation:

For English, unit change in X_3 gives expected change in Y of $(\mathbf{b_3 + b_4})$

For Welsh, unit change in X_3 gives expected change in Y of $(\mathbf{b_3 + b_5})$

For Scots, unit change in X_3 gives expected change in Y of $(\mathbf{b_3})$

Multiplicative interactions

Consider X_1 and X_2

Make $Z_3 = X_1 \times X_2$

estimate

$Y = a + b_1X_1 + b_2X_2 + b_3Z_3 + ..$

$Y = a + b_1X_1 + b_2X_2 + b_3X_1X_2 + ..$

$Y = a + b_1X_1 + b_2X_2 + (b_3X_1)X_2$

$\partial Y/\partial X_2 = b_2 + (b_3X_1)$