

Evidence of bias in the Eurovision song contest: modelling the votes using Bayesian hierarchical models

Gianluca Baio

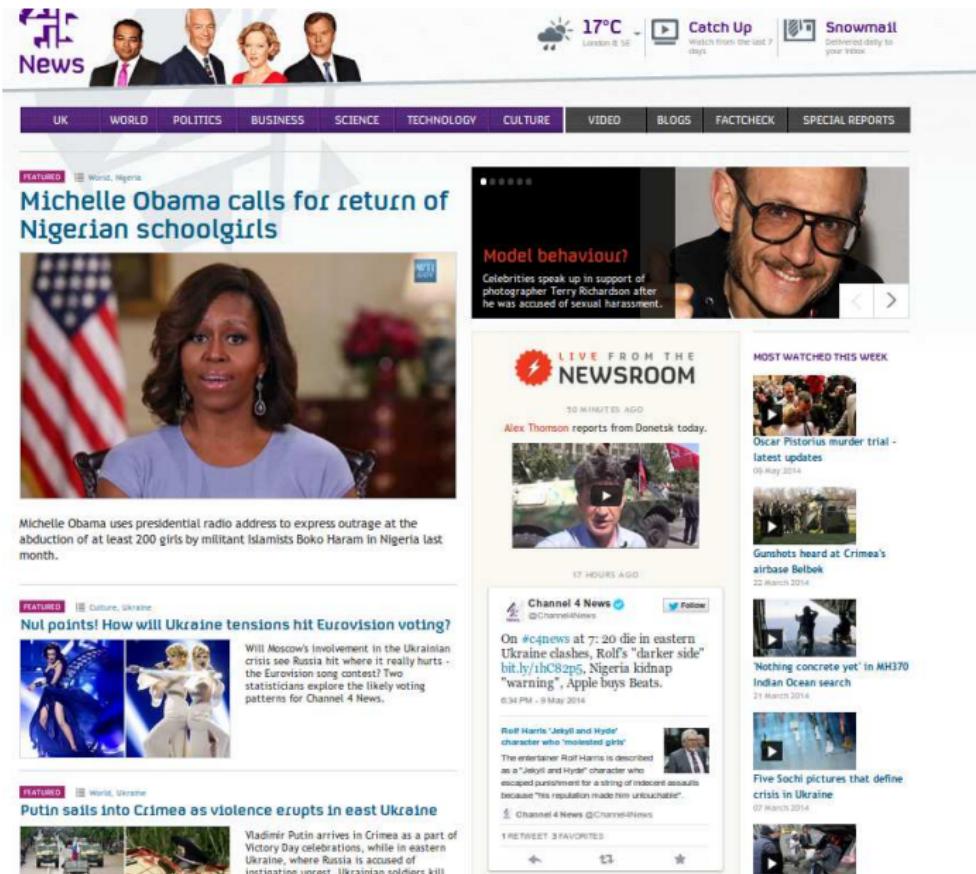
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(Joint work with Marta Blangiardo, Imperial College London)

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Sheffield, 3 September 2014

Set your priorities straight...



The screenshot shows the BBC News website homepage. At the top, there's a banner with four presenters and weather information for London (17°C). Below the banner is a navigation menu with categories: UK, WORLD, POLITICS, BUSINESS, SCIENCE, TECHNOLOGY, CULTURE, VIDEO, BLOGS, FACTCHECK, and SPECIAL REPORTS.

FEATURED (World, Nigeria)

Michelle Obama calls for return of Nigerian schoolgirls



Michelle Obama uses presidential radio address to express outrage at the abduction of at least 200 girls by militant Islamists Boko Haram in Nigeria last month.

FEATURED (Culture, Ukraine)

Nul points! How will Ukraine tensions hit Eurovision voting?



Will Moscow's involvement in the Ukrainian crisis see Russia hit where it really hurts - the Eurovision song contest? Two statisticians explore the likely voting patterns for Channel 4 News;

FEATURED (World, Ukraine)

Putin seizes into Crimea as violence erupts in east Ukraine



Vladimir Putin arrives in Crimea as part of Victory Day celebrations, while in eastern Ukraine, where Russia is accused of instigating unrest, Ukrainian soldiers kill

Evidence of bias in the Eurovision song contest

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17 HOURS AGO

Channel 4 News Follow @Channel4News On #c4news at 7:20 die in eastern Ukraine clashes. Rolf's "darker side" bit.ly/1hC82p5. Nigeria kidnap "warning". Apple buys Beats. 03:04 PM - 9 May 2014

Rolf Harris 'Jekyll and Hyde' character who 'insulted girls' The entertainer Rolf Harris is described as a "Jekyll and Hyde" character who escaped punishment for a string of indecent assaults because "his reputation made him untouchable". Channel 4 News @Channel4News 1 RETWEET 3 FAVORITES

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RSS2014, Sheffield, 3 Sep 2014 2 / 15

- The Eurovision song contest (ESC) is an annual musical competition held among active members of the European Broadcasting Union
- Since 1962, based on positional voting
 - Several iterations until current system: $\mathcal{S} = \{12, 10, 8, 7, 6, 5, 4, 3, 2, 1, 0\}$ points allocated to each act
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- Surprisingly (or not?), there is a relatively large literature on statistical modelling of the ESC voting patterns
 - Broadly speaking, clustering to detect “bloc” or “tactical” voting
 - All in all, evidence seems to suggest specific voting patterns
 - But is this **proof** of bias? Favouritism or discrimination?

- Data on tele-voting available from the ESC website (www.eurovision.tv)
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- Covariates
 - x_{1t}^* = Year of the contest (current year–1998; accounts for “external factors”)
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- **NB:** We are not particularly interested in the “effect” of these covariates on the scores
 - Our focus is **not** on predicting the actual votes for next instance of the contest, given the covariates
 - Rather, we use them to **balance** the data and account for potentially different baseline characteristics

- Model: $y_{vpt} \sim \text{Categorical}(\boldsymbol{\pi}_{vpt}) \quad [v = 1, \dots, 48, p = 1, \dots, 43, t = 1, \dots, T_{vp}]$
 - $\boldsymbol{\pi}_{vpt} = (\pi_{vpt1}, \dots, \pi_{vptS}) \quad [S = 11 = \text{number of elements of } \mathcal{S}]$
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- Model the cumulative probabilities: $\eta_{vpts} = \Pr(y_{vpt} \leq s) = \text{logit}^{-1}(\lambda_s - \mu_{vpt})$
 - $\boldsymbol{\lambda} = (\lambda_1, \dots, \lambda_S)$ set of random cut-off points: $\lambda_s \sim \text{Normal}(0, h^2)$ + ordering constraint so that $\lambda_1 \leq \lambda_2 \leq \dots \leq \lambda_S$
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- Model: $\mu_{vpt} = \beta_1 x_{1t}^* + \sum_{c=2}^{C_2} \beta_{2c} x_{2pt}^{(c)} + \sum_{c=2}^{C_3} \beta_{3c} x_{3t}^{(c)} + \alpha_{vp}$
 - $\boldsymbol{\beta} = (\beta_1, \beta_{22}, \beta_{23}, \beta_{32}, \beta_{33}) \stackrel{iid}{\sim} \text{Normal}(0, q^2)$ — flat independent prior on the covariates “effects”
 - $\alpha_{vp} \sim \text{Normal}(\theta_{vp}, \sigma_\alpha^2)$: main parameter in the analysis — represents a **structured effect**, accounting for clustering at the voter-performer level

- Model the mean of the structured effect as

$$\theta_{vp} = \gamma + \psi w_{vp} + \phi z_{vp} \mathbb{I}(z_{vp}) + \delta_{R_v p}$$

- $\gamma \sim \text{Normal}(0, q^2)$ = overall intercept
- $w_{vp} = 1$ if countries v and p share a geographic border and 0 otherwise
 $\Rightarrow \psi \sim \text{Normal}(0, q^2)$ = “geographic” effect
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- Assume that voters implicitly cluster in K (fixed number of) “regions”
 - Accounts for similarities in voters' propensity towards p , **over and above** geographic and migratory aspects
 - $R_v \sim \text{Categorical}(\zeta)$, where $\zeta = (\zeta_1, \dots, \zeta_K) \sim \text{flat Dirichlet}$ = vector of probabilities for clusters membership
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- Independent vague priors on the log standard deviation scale
 - $\log(\sigma_\alpha), \log(\sigma_\delta) \stackrel{iid}{\sim} \text{Uniform}(-3, 3)$

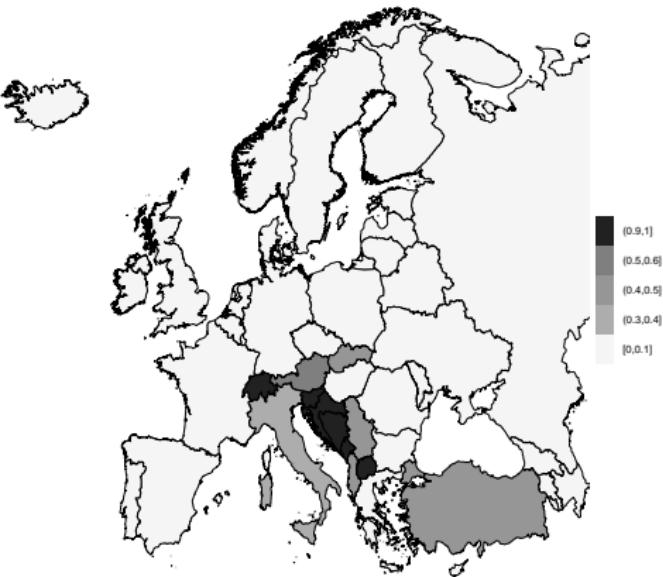
- For voters v_1 and v_2 and performer p , $\alpha_{v_1 p}$ and $\alpha_{v_2 p}$ determine $\eta_{v p t s}$, **all other covariates being equal**
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- **NB:** Difficult to give this a proper “causal” interpretation
 - Cannot establish **deliberate** intervention from the available data
 - Nevertheless, can interpret α_{vp} as at least *indicative* of the underlying voting patterns

Results — clustering

Posterior probability of membership in 'region 1'



Posterior probability of membership in 'Region 2'



Results — clustering

Posterior probability of membership in 'region 3'

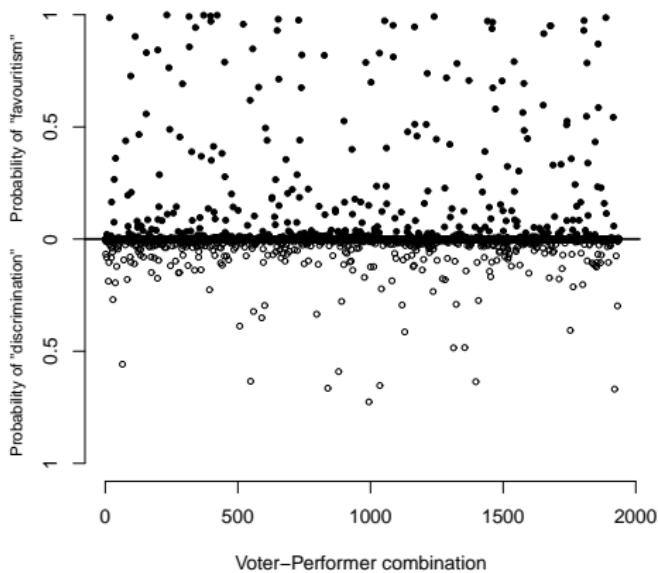


Posterior probability of membership in 'Region 4'



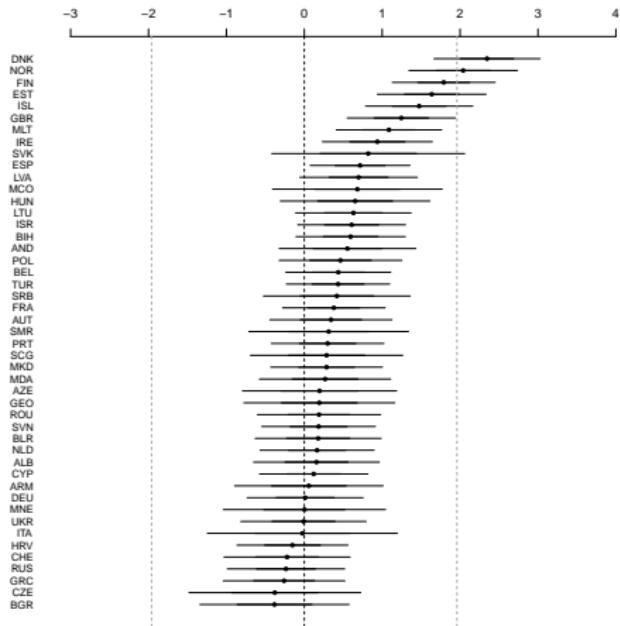
Results — structured effects

- Compute “standardised” effects: $\alpha_{vp}^* = \frac{\alpha_{vp} - \bar{\alpha}}{s_\alpha} \approx \text{Normal}(0, 1)$
 - $\alpha_{vp}^* > 1.96 \Rightarrow$ “substantial” positive bias (“favouritism”) from v to p
 - $\alpha_{vp}^* < -1.96 \Rightarrow$ “substantial” negative bias (“discrimination”) from v to p

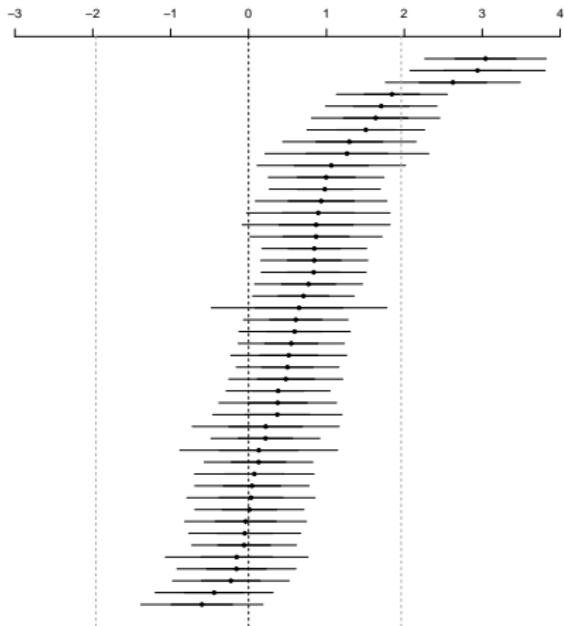


Results (selected performers)

Propensity to vote for Sweden

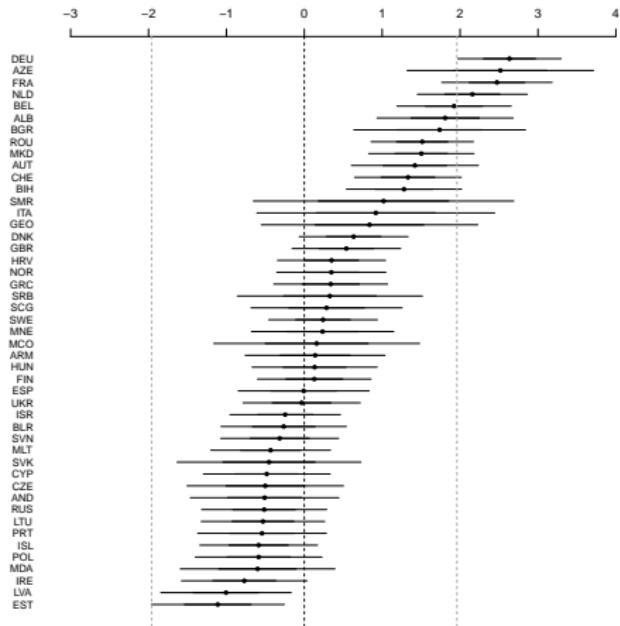


Propensity to vote for Greece

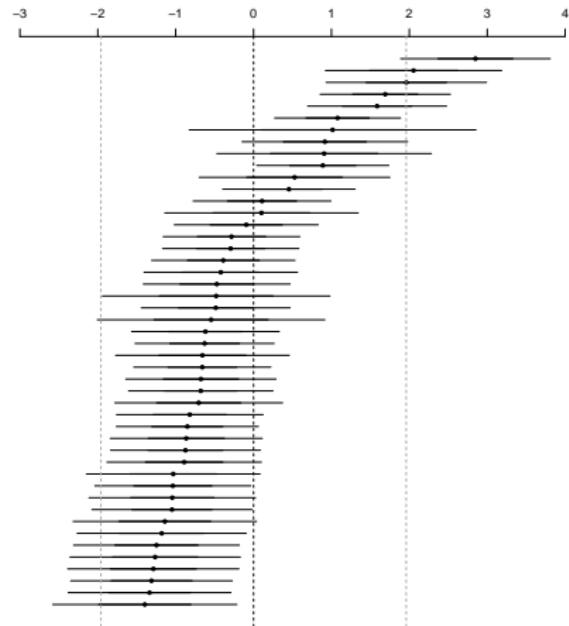


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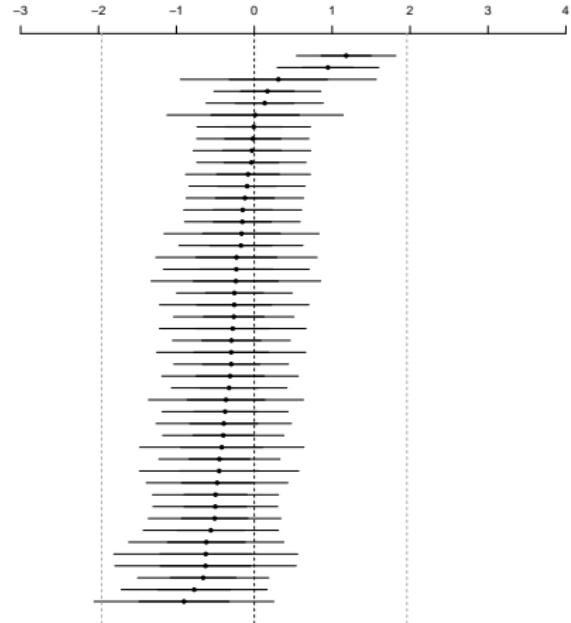
Propensity to vote for Turkey



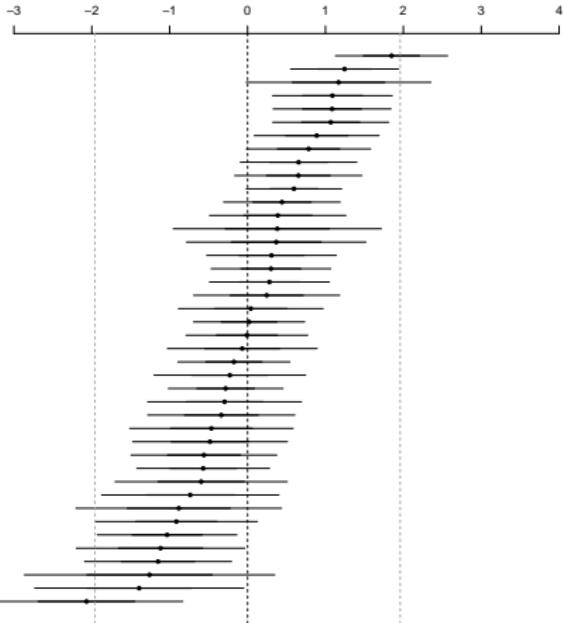
Propensity to vote for Albania



Propensity to vote **for** the UK



Propensity to vote **from** the UK



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- Migration stocks play a major role in determining the voting patterns
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- Unmeasured important factors?
 - Media coverage: in the days prior to the final, one entry is usually suggested as the strong favourite
 - May be based on objective qualities of the act, but also hangs on political reasons, eg the willingness to take up the expensive organisation of the next edition

Thank you!