The Wikipedia.org Portal and Ukrainian Wikipedia

3rd Draft

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Executive Summary

On 16 August 2016, Discovery deployed a major design change to the Wikipedia.org Portal page. As of the deployment, the links to Wikipedia in 200+ languages have been put into a modal drop-down to make the page cleaner and less overwhelming to new visitors. Before that, Discovery added browser language preferences detection (via accept-language header) to the page so that users (who have their language preferences set in their browser) would see their language around the Wikipedia globe logo, without having to look for it in the long list of languages. Discovery received some criticism about the change, with some users hypothesizing that the change may have resulted in a decrease to Ukrainian Wikipedia's pageviews because some visitors may have Russian set as a language, but not Ukrainian.

In this analysis, we use Bayesian structural time series models to model Ukrainian Wikipedia Main Page (since that's where the Portal leads to) pageviews from Russian-but-not-Ukrainian-speaking visitors to the Wikipedia.org Portal. The effect of the deployment was estimated to be negative in some models and positive in others — including ones that looked at Russian-and-Ukrainian-speaking visitors — but the 95% credible interval included 0 in all of them, meaning the deployment did not have a statistically significant effect. In other words, we do not have sufficient evidence to say that the language-dropdown deployment had a convincingly positive or negative impact on Ukrainian Wikipedia Main Page pageviews from the Wikipedia.org Portal.

Background

For the past several months, Discovery's the Wikipedia.org Portal team has been working on redesigning the (wikipedia.org) page to have a cleaner, more welcoming, and less overwhelming design and user experience. On 16 August 2016, the team deployed the final major patch (for the foreseeable future) wherein the links to Wikipedia in 200+ languages have been put into a drop-down modal that is hidden by default and is only visible when the user intentionally clicks the "Read in your language" button (see Figures 1a and 1b).

Per some comments in a thread on mediawiki.org, there is a suspicion that the deployment of the collapsed language links has decreased the page views to the Ukrainian Wikipedia as a result of some users' browsers being configured to Russian, thereby burying the link to the Ukrainian Wikipedia (shown in Figure 1). The goal of this analysis is to test the hypothesis that the deployment has had a negative impact on visits to Ukrainian Wikipedia's main page from the Wikipedia.org Portal. That is, this analysis is not concerned with Ukrainian Wikipedia overall pageviews or pageviews from somebody searching on the Wikipedia.org Portal and going to a specific article or pageviews from search engines and other sources.

Methods

We used Bayesian structural time series (BSTS) to model Ukrainian Wikipedia main page pageviews from the Wikipedia.org Portal, using the R package "bsts" (Scott et al., 2016).

We tried multiple models, including different combinations of:

- seasonality (weekly and monthly) components,
- a one-back autoregressive (AR1) component,
- specific pageview time series as control time series (e.g. Russian Wikipedia Main Page pageviews from the Wikipedia.org Portal, Ukrainian Wikipedia Main Page pageviews *not* from the Wikipedia.org Portal),
- dynamic time warping-matched pageview time series ("markets") as control time series, such as Ukrainian Wikitionary (Main Page) pageviews from a Wikimedia project/tool/bot (which had the 2nd highest similarity).
- a "mix of markets" that included similar markets and markets with the highest posterior inclusion probability via Bayesian variable selection.

When including control time series (e.g. Ukrainian Wikipedia pageviews from a Wikimedia site but not the Wikipedia.org Portal), we used static regression (the coefficients were assumed to not vary over time). Specifically, we set $Z_t = \beta^T X_t$ and $\alpha_t = 1$, so that each p-th covariate had a coefficient β_p. All models included an indicator variable $x_{\text{deployment},t}$ of the Wikipedia.org Portal secondary link collapse patch deployment as a covariate, meaning that $x_{\text{deployment},t} = 0$ when t is before 16 August 2016, and $x_{\text{deployment},t} = 1$ when t is 16 August 2016 or after, so that $\beta_{\text{deployment}}$ is the effect of the deployment on Ukrainian Wikipedia main page pageviews from the Wikipedia.org Portal after accounting for variance in pageviews using various control time series.

Twenty-eight different models (but only twelve dealt with Russian-but-not-Ukrainian-speaking populations) were considered (see Figure 3) and nine were chosen according to the models' R^2 (proportion by which the residual variance is less than the variance of the original observations).

Results

The models in Table 2 had the following control time series:

1. Russian Wikipedia Main Page pageviews from the Wikipedia.org Portal
2. No control time series
3. DTW-matched time series
4. Ukrainian Wikipedia non-Main pageviews from the Wikipedia.org Portal
5. 1 and 4
6. The following control time series:
    - Russian Wikipedia Main Page pageviews from the Wikipedia.org Portal
    - German Wikipedia Main Page pageviews from the Wikipedia.org Portal
    - Ukrainian Wikipedia non-Main Page pageviews from the Wikipedia.org Portal
    - Ukrainian Wikipedia Main Page pageviews not from the Wikipedia.org Portal
    - Ukrainian Wikipedia Main Page pageviews from a Wikimedia project/tool/bot

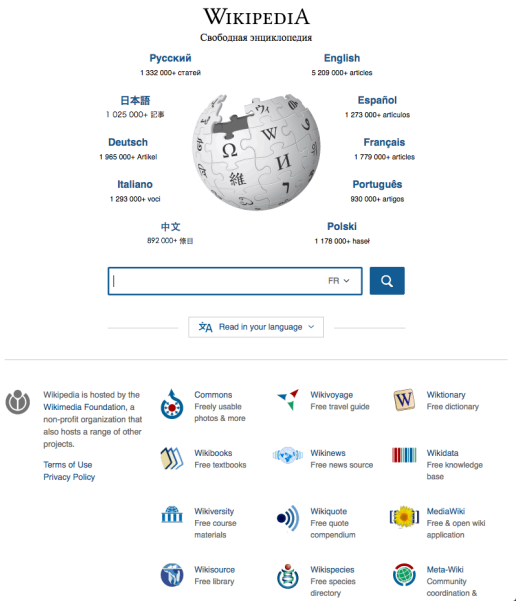
7. Top two DTW-matched time series as controls, along with the selection listed in 6
8. Russian Wikipedia Main Page pageviews from the Wikipedia.org Portal visitors from Ukraine

The models in Table 3 include those dealing with pageviews not just from Russian-but-not-Ukrainian-speaking (RuBNUkS) Portal visitors (these are users who had Russian but not Ukrainian in their accept-language header, and are of primary interest in this analysis), but also Ukrainian-but-not-Russian-speaking (UkBNRuS) visitors, Ukrainian-AND-Russian-speaking (UkARuS) visitors, and all visitors ("All Speakers", where we did not filter the pageviews by presence of Ukrainian or Russian in the accept-language header). Some of the models also looked at those populations specifically with Ukrainian IP addresses. The models had the following combinations of control time series:

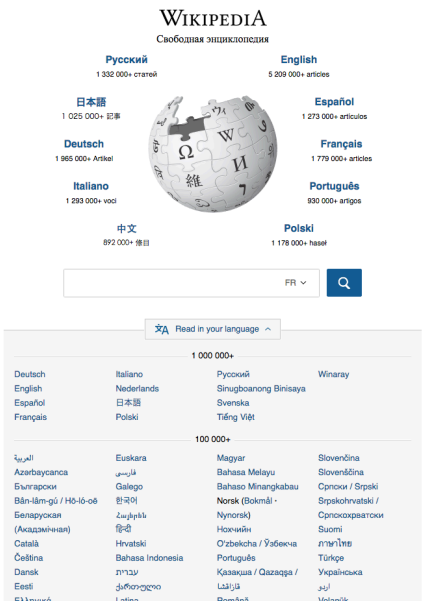
- Ukrainian Wikipedia non-Main Page pageviews from the Wikipedia.org Portal
- Russian Wikipedia Main Page pageviews from Portal and Ukrainian Wikipedia non-Main Page pageviews from the Wikipedia.org Portal
- Selected control time series:
  - Russian Wikipedia Main Page pageviews from the Wikipedia.org Portal
  - German Wikipedia Main Page pageviews from the Wikipedia.org Portal
  - Ukrainian Wikipedia non-Main Page pageviews from the Wikipedia.org Portal
  - Ukrainian Wikipedia Main Page pageviews not from the Wikipedia.org Portal
  - Ukrainian Wikipedia Main Page pageviews from a Wikimedia project/tool/bot
- Top 2 DTW-matched time series and selected control time series (see list above)
- No control time series

In Tables 2 and 3, we list several well-fitting models (high R^2) and show the estimated effect of the deployment. Also included are the 95% credible intervals, which can be interpreted as "there is a 95% probability that the true value of the effect is inside this interval". Whether looking at models of Ukranian Wikipedia Main Page pageviews from Russian-but-not-Ukrainian-speaking visitors to the Wikipedia.org Portal or the other models, the effect of the deployment was estimated to be positive in some models and negative in others, and not statistically significant (95% credible interval included 0) in all of them, meaning that we do not have evidence to say that the deployment had a reliably positive or a negative impact.

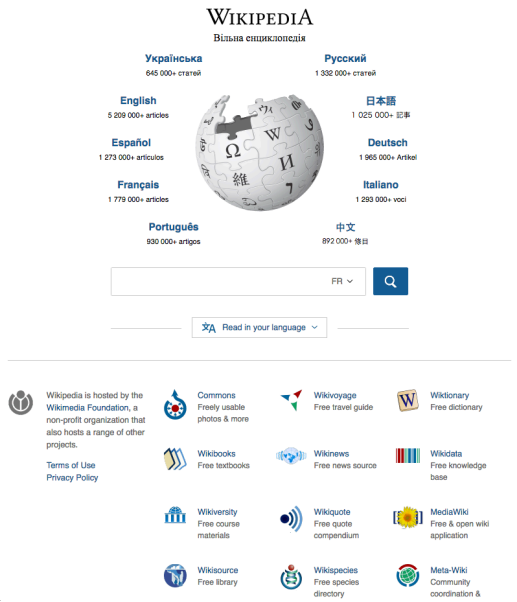
Figure 1: Screenshots of Wikipedia Portal (wikipedia.org) showing the current (baseline) experience and the redesign we tested.



(a) Default experience when visiting the Wikipedia.org Portal with Russian as the preferred language. Our deployment on August 16th, 2016, collapsed the language links into a hidden-by-default modal in an effort to make the page's design cleaner and less overwhelming to new visitors.



(b) Link to Ukrainian Wikipedia is only visible by clicking the "Read in your language" button to reveal the modal containing links to Wikipedia in various languages.



(c) How the Wikipedia.org Portal looks to a user who has set their language preferences to Ukrainian (first) and Russian (second). The links to Ukrainian and Russian Wikipedias are now the first links around the globe.

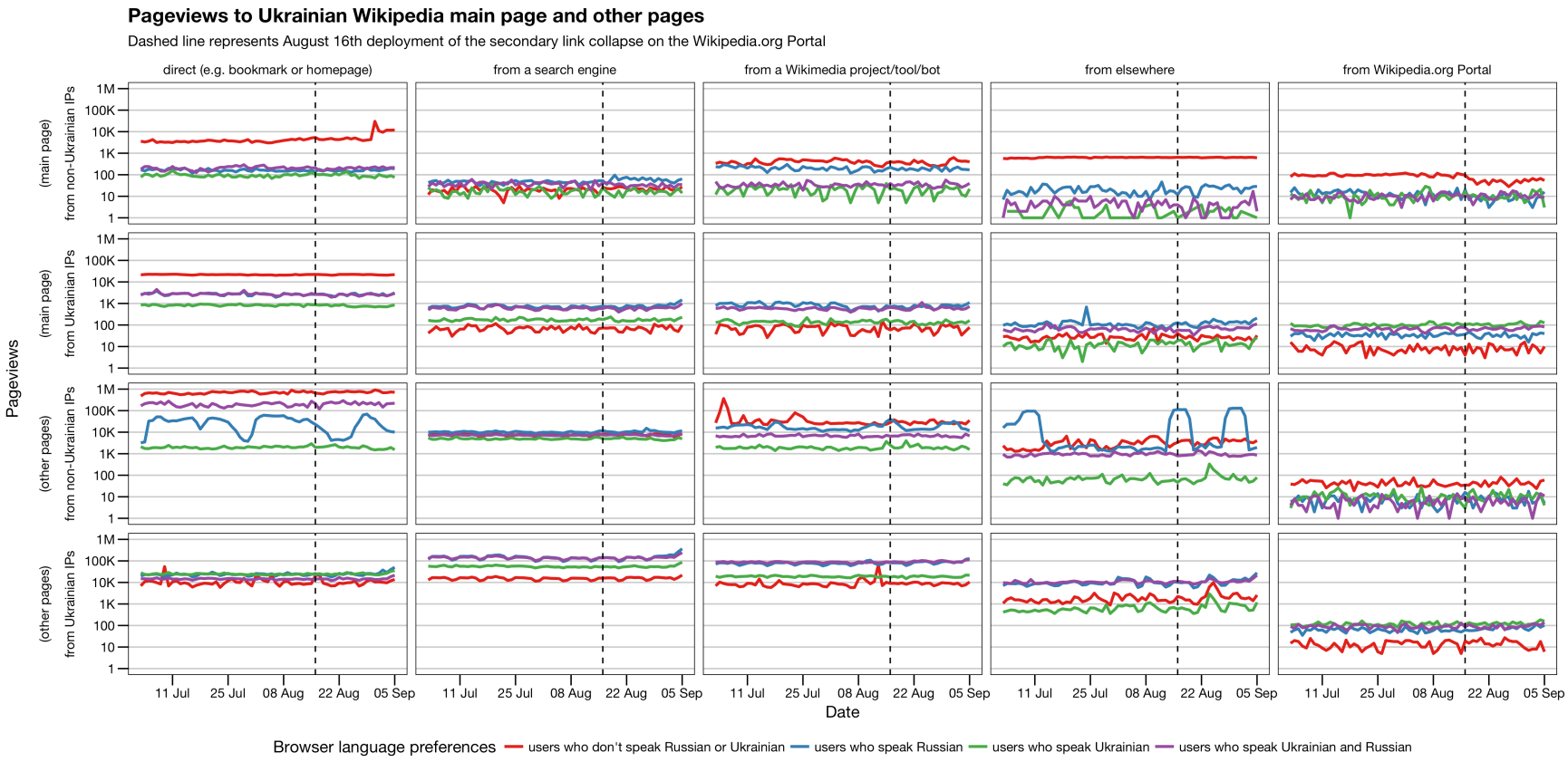


Figure 2: Pageviews (on a log scale) to Ukrainian Wikipedia main page and other pages from users with Ukrainian IP addresses and users with non-Ukrainian IP addresses.

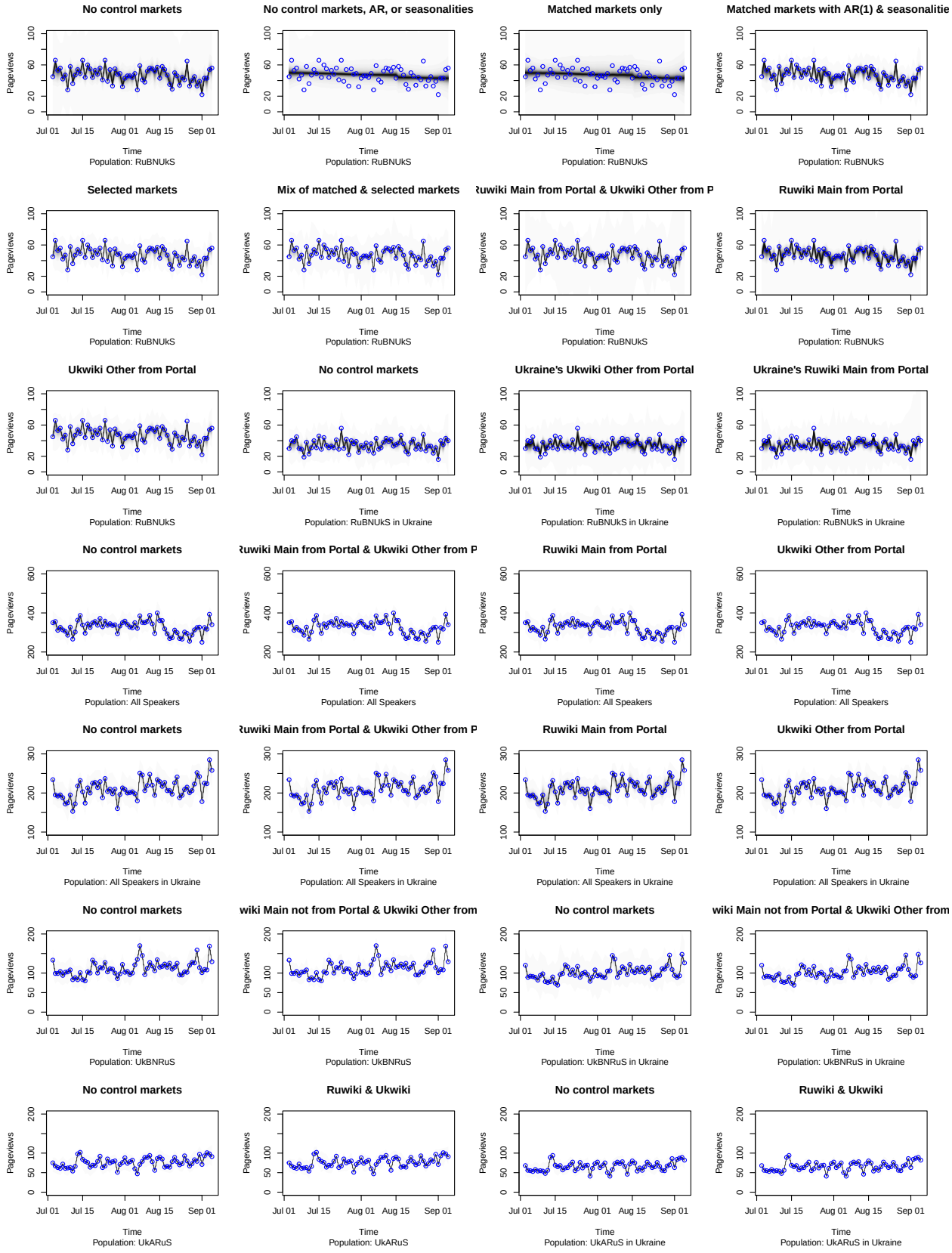


Figure 3: Plots of the 28 BSTS models' predictions (in black and gray) with actual pageviews (blue circles) for comparison.

Table 1: Top 20 most similar pageviews to Ukrainian Wikipedia main page pageviews from the Wikipedia.org Portal. These are the time series used as controls in models that use "matched markets".

Control	Distance	Correlation

Table 2: Summary metrics (R squared, Akaike information criterion, Schwarz criterion) of models and point estimate (and credible interval, both in pageviews) of the effect of the Wikipedia.org Portal's secondary link collapse patch deployment from the top BSTS models of Ukrainian Wikipedia Main Page pageviews from Russian-but-not-Ukrainian-speaking users (RuBNUkS) – in genderal and specifically pageviews from users with IP addresses in Ukraine. All of the models included weekly and monthly seasonalities and AR(1) components.

	Population	Model Nickname	R^2	AIC	BIC	Estimate (PVs)	95% CI (PVs)
1	RuBNUkS	Ruwiki Main from Portal	0.720	551.963	601.974	-2.734	(-78.56, 12.95)
2	RuBNUkS	No control markets	0.769	551.571	599.407	1.797	(-15.33, 34.68)
3	RuBNUkS	Matched markets with AR(1) & seasonalities	0.813	589.991	681.316	-0.695	(-20.78, 20.39)
4	RuBNUkS	Ukwiki Other from Portal	0.913	556.998	607.009	0.158	(-15.72, 19.75)
5	RuBNUkS	Ruwiki Main from Portal & Ukwiki Other from Portal	0.921	556.006	608.191	-2.489	(-14.07, 12.41)
6	RuBNUkS	Selected markets	0.940	557.370	613.904	-1.437	(-11.42, 9.93)
7	RuBNUkS	Mix of matched & selected markets	0.955	564.273	625.156	-1.740	(-11.64, 11.33)
8	RuBNUkS in Ukraine	Ukraine's Ruwiki Main from Portal	0.712	522.535	572.546	-1.065	(-10.19, 8.69)
9	RuBNUkS in Ukraine	No control markets	0.835	528.735	576.571	2.044	(-19.44, 18.86)

Table 3: Summary metrics (R squared, Akaike information criterion, Schwarz criterion) of models and point estimate (and credible interval, both in pageviews) of the effect of the Wikipedia.org Portal's secondary link collapse patch deployment.

	Population	Model Nickname	R^2	AIC	BIC	Estimate (PVs)	95% CI (P
1	RuBNUkS	Ukwiki Other from Portal	0.913	556.998	607.009	0.158	(-15.72, 19.
2	RuBNUkS	Ruwiki Main from Portal & Ukwiki Other from Portal	0.921	556.006	608.191	-2.489	(-14.07, 12.
3	RuBNUkS	Selected markets	0.940	557.370	613.904	-1.437	(-11.42, 9.9
4	RuBNUkS	Mix of matched & selected markets	0.955	564.273	625.156	-1.740	(-11.64, 11.
5	UkBNRuS	No control markets	0.977	620.017	667.854	1.707	(-23.63, 44.
6	UkBNRuS	Ukwiki Main not from Portal & Ukwiki Other from Portal	0.989	623.273	673.284	1.594	(-16.86, 23.
7	UkBNRuS in Ukraine	No control markets	0.966	608.024	655.860	-1.345	(-24.30, 21.
8	UkBNRuS in Ukraine	Ukwiki Main not from Portal & Ukwiki Other from Portal	0.983	609.551	659.562	-0.409	(-30.85, 15.
9	UkARuS	No control markets	0.978	580.570	628.406	-1.365	(-18.47, 18.
10	UkARuS	Ruwiki & Ukwiki	0.986	586.019	640.379	0.901	(-15.82, 21.
11	UkARuS in Ukraine	No control markets	0.979	569.233	617.070	2.122	(-13.08, 17.
12	UkARuS in Ukraine	Ruwiki & Ukwiki	0.986	575.922	630.282	-4.231	(-18.03, 11.
13	All Speakers	No control markets	0.957	694.194	742.030	-43.092	(-87.62, 14.
14	All Speakers	Ruwiki Main from Portal	0.969	694.965	744.976	-33.263	(-86.00, 16.
15	All Speakers	Ruwiki Main from Portal & Ukwiki Other from Portal	0.980	697.172	749.358	-29.345	(-84.60, 39.
16	All Speakers	Ukwiki Other from Portal	0.983	696.811	746.822	-16.427	(-71.52, 36.
17	All Speakers in Ukraine	Ruwiki Main from Portal	0.942	662.374	712.385	-2.224	(-43.47, 45.
18	All Speakers in Ukraine	Ukwiki Other from Portal	0.966	663.672	713.683	-8.058	(-64.75, 71.
19	All Speakers in Ukraine	No control markets	0.973	664.458	712.295	-0.306	(-43.46, 27.
20	All Speakers in Ukraine	Ruwiki Main from Portal & Ukwiki Other from Portal	0.979	664.830	717.015	-2.787	(-32.64, 16.

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