War, Inflation, and Social Capital

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In recent decades, many studies in sociology, political science, and economists have argued that social capital matters for the effectiveness of political and legal institutions, for production of human capital and public goods, for efficiency of labor markets and corporate hierarchies (see literature surveys in Durlauf and Fafchamps, 2005, and Ananyev and Guriev, 2015). Given its ubiquity, it is hard to create a single measure or even a definition of social capital. Different studies use memberships in associations, density of social networks, survey-based and experimental-games-based measures of trust, blood donations, and newspaper subscriptions. Economists usually understand social capital as the set of beliefs that promote cooperation and help to overcome free-rider problem (Guiso et al., 2010).

The multitude of interactions between social capital and many other social, economic and political factors makes it even harder to identify social capital's determinants and its causal effects. The few contributions that develop convincing identification strategies rely on persistent effects of exogenous variation that took place many decades or centuries ago (e.g., see Algan and Cahuc, 2010, and Nunn and Wantchekon, 2011). However, even though there is a large persistent component of social capital, it can also change rather quickly. Algan and Cahuc (2014) refer to these two views as "Putnam I" (as in Putnam et al., 1994, who argued that social capital is highly persistent) and "Putnam II" (after Putnam, 2001, who showed that social capital can change). In line with Putnam II, Papaioannou (2013), Algan et al. (2015), Ananyev and Guriev (2015) show that the recent Great Recession caused a major decline in trust in Europe and in Russia. Ananyev and Guriev also show that Putnam I and Putnam II are related: short-term changes in trust during the crisis may have persistent effects. In particular, trust in regions that suffered the most during the 2009 recession was still 10 percentage points lower in early 2014 than before the crisis (even though Russian economy has already recovered from the crisis by 2013).

By definition, studying the variable component of social capital requires high-frequency measurement. In this paper, we develop a methodology for measuring social capital "in real time." Following the insights of recent work of using Google searches in social science (Varian, 2014, and Stephens-Davidowitz, 2014), we proxy social capital in a given locality in a given week by the relative popularity of internet searches for keywords for pro-social behavior such as "blood donations", "adopt a child", "charity". The search data have two advantages. First, they are based on revealed preferences rather than self-reported. Second, searches are carried out in real life rather than in an artificial lab environment.

Using this methodology, we construct weekly data on pro-social behavior for 79 Russian regions in 2014. Given the political and economic turbulence in Russia during that year, a high-frequency measure allows studying the response of social capital to the conflict intensity in Ukraine, changes in prices and exchange rate volatility. We find that controlling for region and week fixed effects conflict intensity increases and inflation decreases social capital.

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I. Russia in 2014

Russia's 2014 was a turbulent year in several dimensions. For the first time in its post-Soviet history, Russia openly annexed another country's territory which resulted in several rounds of sanctions by Western countries. Russia responded with "counter-sanctions" which banned agricultural imports from the West. In addition, the global price of oil, the main product of Russia's export and the principal source of fiscal revenues, collapsed by almost a half. Finally, Russia initiated a "hybrid war" in Donetsk and Luhansk regions of Ukraine which resulted in about eight thousand killed and about two million displaced (according to United Nations data).

The conflict in the Eastern Ukraine, sanctions, counter-sanctions, and the fall in the price of oil together resulted in a severe economic shock. Inflation started to increase from the very annexation of Crimea in March 2014 (normally, inflation in Russia slows down in the second quarter). The seasonal deflation in summer turned around when Russia introduced counter-sanctions on August 6, 2014 (see Figure 1).

In July-September, the third round of sanctions cut Russian banks and companies from global financial markets. In September-December, the oil price declined from \$100/barrel to \$55/barrel. The oil price decline combined with the sanctions resulted in further ruble devaluation (which also contributed to inflation) and a great increase in exchange rate volatility. The latter peaked in December 2014 when the ruble lost nearly 15% of its value within 2 days. The intraday volatility was even higher: during the trading day of December 16, ruble was trading 30% below December 15 opening level. This fall was reversed by the Central Bank's overnight increase in interest rates from 10.5 to 17% per year.

The intensity of conflict varied over time. As we track Russians' perceptions of the war, we use the coverage of the conflict in the media rather than actual data on casualties (that are not reliable and are not available at weekly frequency). Figure 1 also shows the number of mentions of the war in Ukraine in the media. These measures are highly volatile. Their peaks are generally consistent with the periods of intensified fighting as reported by international observers.

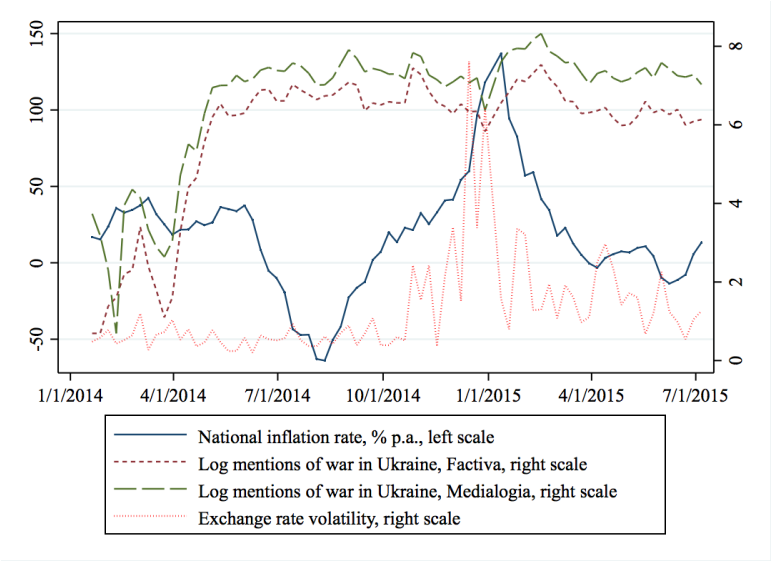
All the dramatic developments above were largely unexpected as they were triggered by erratic moves and the sudden departure of Ukrainian President Victor Yanukovich in February 2014. For example, in October 2013, IMF's World Economic Outlook predicted 2014 consumer price inflation to be 5.3%. IMF maintained the same forecast in the April 2014 issue of the World Economic Outcome. The actual outcome was 11.4%. The futures markets in the end of 2013 predicted the ruble exchange rate to depreciate by about 5 percent during 2014; it fell by 40 percent. The markets also did not price in any significant changes in the oil price. The conflict in Ukraine and confrontation with the West also do not seem to have been planned in advance. In the end of 2013, Vladimir Putin pardoned several important political prisoners; this is consistent with the theory that he was interested in restoring good relations with the West. However, once Yanukovich left Kiev, Putin sent Russian soldiers to Crimea.

II. Methodology

The high frequency nature of our measure of social capital allows tracking the impact of weekly events such as conflict intensity, inflation and exchange rate volatility.

Given the heterogeneity of Russian regions and multiple common time-specific shocks that they face, we need to control for region and week dummies. This is why we cannot estimate a specification with conflict intensity and ruble volatility (both are perfectly correlated with time dummies). However, as the different regions are differentially affected by either of these macro shocks, we can apply the difference-in-difference methodology. We use a panel of 79 Russian regions (indexed by i) for 50 weeks in 2014 (indexed by t) to estimate the

FIGURE 1. EVOLUTION OF INTENSITY OF CONFLICT AND OF INFLATION OVER TIME IN JANUARY 2014 - JULY 2015.



following specification:

$$\begin{aligned} Y_{it} &= \alpha Inflation_{it} + \\ &+ \beta War_t Distance_i + \\ &+ \gamma Volatility_t Vulnerability_i \\ &+ \lambda X_{it} + u_i + \delta_t + \varepsilon_{it} \end{aligned}$$

Here Y_{it} is our main outcome, the first principal component of internet searches related to social capital in region i in week t, $Inflation_{it}$ is the food inflation in region i in week t, War_t is the measure of conflict intensity in Ukraine in week t, $Distance_i$ is the distance to the conflict zone from region i, $Volatility_t$ is the measure of volatility of ruble exchange rate, $Vulnerability_i$ is region i's vulnerability of the to the ruble volatility (share of dollar-denominated loans, imports as percentage of gross regional product, etc. — measured in the end of 2013). Furthermore, we include time-varying control variables X_{it} (in the main specification, this is average regional monthly income). u_i and δ_t stand for region and week dummies. We use two-way clustering of standard errors by regions and weeks.

This specification allows to estimate the differential effect of conflict on regions that are closer to and those that are farther away from the conflict zone. We assume that the effect is stronger for the regions closer to the conflict during the periods of more intensive fighting. Hence coefficient β represents the effect of war on social capital. Similarly, coefficient γ represents the effect of ruble volatility as the latter is more likely to affect regions whose economy is more vulnerable to currency shocks.

Finally, coefficient α captures the impact of inflation that varies both across regions and over time.

III. Data

A. *Constructing a Measure of Social Capital*

To construct a high-frequency measure for the social capital in Russian regions, we begin with defining the categories of pro-social activities. We choose "charity and social help", "blood donations", and "child care and adoption". Then we proceed to determine the most popular internet searches that are related to each of these categories.

We use data from the Russia's leading internet search engine, Yandex.[1] The data on composition of searches by week and region are available at *wordstat.yandex.ru*.

[1] In 2014, Yandex's market share in internet search in Russia was above 60%. Also, there were no publicly available data on Google searches at the regional level.

We find that the most prominent searches connected to the categories above are "*blood donations*", "*adopt a child*", "*orphanage*", "*charitable foundation*", "*help children*", and "*social protection*". As Russian regions are vastly different in terms of population and economic development, we use the relative popularity of these keywords (number of searches for a given keyword during a particular period divided by the overall number of searches during the same period within the region) rather than the absolute number of searches.

We then construct the first principal component for these six searches using weekly data for each of 79 Russian regions.[2] We collect the data for weeks starting from January 20, 2014 to July 6, 2015.

The first principal component explains 73 percent of variation in the six variables and has the following weights:

Social protection	0.864
Blood donations	0.003
Adopt a child	0.029
Orphanage	0.470
Charitable foundation	0.023
Help children	0.178

B. Validating the Measure of Social Capital

In order to validate the measure of social capital based on internet searches, we use a survey-based measure of generalized social trust. In April 2014, Russian Public Opinion Foundation ("*Fond Obschestvennogo Mneniya*", or FOM) included a standard quesiton on generalized social trust in its regionally representative GeoRating survey.[3]

Therefore, we can check the cross-sectional correlation of our search-based measure of social capital with the survey-based measure of generalized social trust at a given moment, April 2014. We regress the survey-based measure of trust on the principal component of searches related to social capital in April 2014 controlling for the logarithm of regional per capita income, the Gini coefficient of regional income inequality, the level of education, the number of homicides per capita, child mortality, urbanization, and the percentage of households with internet connection. We find that the cross-sectional correlation between survey-based measure of trust and the search-based measure of social capital is positive and significant (see Figure 2).

The effect is quantitatively important: a change in the principal component by one standard deviation results in the change in trust by 3.3 percentage points (i.e. 30% of its standard deviation).

C. Data on War, Inflation, and Exchange Rate Volatility

To measure the impact of the dramatic events that took place in 2014 on social capital, we use the intensity of conflict in Eastern Ukraine, the ruble exchange rate volatility, and food inflation (some of which resulted from Russian counter-sanctions).

We measure the intensity of the conflict in Eastern Ukraine by considering the relative popularity of the keyword "war in Ukraine" in the media. We use both the international database Factiva and the Russian database Medialogia. As our analysis is based on the difference-in-differences approach, we interact the logarithm of the number of mentions of "war in Ukraine" with the logarithm of the distance to the conflict. The latter is the distance from the capital of the region to either Donetsk or Luhansk, whichever is closer.

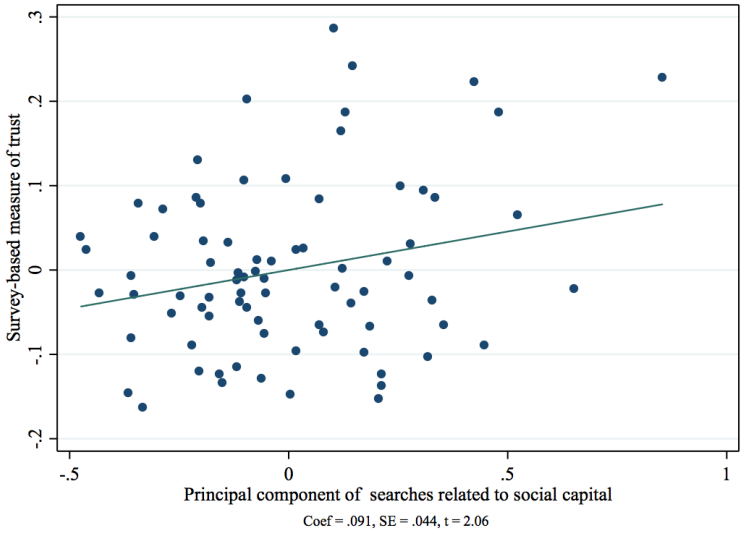
We calculate the weekly volatility of ruble to dollar exchange rate and interact it with the share of dollar-denominated debt in total debt in the region as of January 2014. We also interact the exchange rate volatility with other currency exposure variables such as share of imports in gross regional product, share of dollar-denominated deposits in total deposits, etc.

As a proxy for inflation in a given week in a given region we use the weekly change in the price of the minimal food basket defined by the official Russian Statistics Agency (Rosstat). In December of 2013, the price of this basket was 2871 rubles, in December

[2] We exclude Chechnya, Ingushetia, Chukotka, the Nenets autonomous region and Crimea because of unavailability or poor quality of data.

[3] See Ananyev and Guriev (2015) for the description of the GeoRating sample structure and the formulation of the question on trust in the April 2014 survey.

Figure 2. Correlation between survey-based generalized social trust and the principal component of internet searches related to social capital in April 2014.



The graph shows residuals from an OLS regression on 79 Russian regions controlling for logarithm of income, income inequality, homicides per capita, internet penetration, education level, and share of urban population.

2014 — 3298 rubles, or 15 percent higher.

IV. Results

Table 1 presents our main results. In all specifications, the principal component of social-capital-related searches is negatively and significantly correlated with the weekly inflation rate. The magnitude, however, is small: an increase of inflation by one standard deviation (45 percentage points in annualized terms) results in a decrease in the principal component by 7% of its standard deviation.

The coefficient at the conflict intensity interacted with distance to conflict is *negative* and significant — and much larger in magnitude. Whether we use the data from Factiva or Medialogia, being closer to the conflict during more intense fighting by one standard deviation results in an increase in our measure of social capital by 47% of standard deviation. The fact that the coefficient is negative implies *more* pro-social behavior in areas closer to the conflict. This is consistent with the willingness to engage in more civic behavior as the conflict is near.

As a placebo, we also add to the regression the intensity of conflict interacted with distance to Moscow (which is located at the very same longitude as Donetsk). The coefficient at this interaction terms is small and not significant, while the coefficient at the interaction of conflict intensity still is. Its magnitude however decreases slightly. In other words, it is indeed the distance to the conflict rather than the distance to Moscow that matters for the searches related to civic behavior.

The variables related to exchange rate volatility are not statistically significant. We do not report the respective specifications and coefficients on these variables. Income is also not statistically significant. This is not surprising given that income does not vary substantially during the year (74% of variation in income is explained by regional dummies).

We have also run a number of robustness checks. We have run the regressions for the whole dataset covering Jaunary 2014 — July 2015 period. The results are robust. We have constructed two other measures of conflict intensities. First, we calculated the mentions of war in Ukraine in the top ten Russian media (including TV

Table 1—Panel regression for the principal component of searches related to social capital in 2014.

	Dependent variable: internet searches related to pro-social behavior					
Distance to conflict X Conflict intensity (Factiva)	-0.011***			-0.011**		-0.0096**
	(0.0043)			(0.0043)		(0.0043)
Distance to conflict X Conflict intensity (Medialogia)		-0.013***			-0.012**	
		(0.0049)			(0.0049)	
Inflation, % p.a.			-0.042***	-0.037***	-0.038***	-0.037***
			(0.011)	(0.0100)	(0.010)	(0.0100)
Distance to Moscow X Conflict intensity (Factiva)						-0.0013
						(0.0023)
Observations	3950	3950	3950	3950	3950	3950
R^2	0.775	0.775	0.772	0.776	0.776	0.776

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: The table reports the results for weeks starting January 20 to December 29, 2014. Distance is in logarithms. Conflict intensity (Factiva or Medialogia) are the logarithms of mentions of "war in Ukraine" in media covered by Factiva or Medialogia datasets, respectively, in a given week. Inflation is the weekly change in the price of the minimum food basket in a given region. All regressions include 50 week dummies and 79 region dummies. The standard errors are two-way clustered at week*region level.

channels, radio, and newspapers) weighted by their audience in the end of 2013. Second, we used the total number of internet searches for "war in Ukraine" in Russia in a given week. In both cases, the coefficient at the interaction term of conflict intensity and the distance to conflict remain negative and significant.

In order to measure the impact of Western sanctions and Russian countersanctions, we have also created dummies for whether or not the first, second, and third rounds of sanctions are in place. Then we interacted these dummies with exports as a share of 2013 in the gross regional product, share of agriculture in gross regional product etc. We did not find any significant effects.

V. Conclusion

Our analysis suggests that internet-based measures can help creating meaningful 'revealed-preference' measures of attitudes and beliefs. Since these are high-frequency variables, we can analyze their correlations with quickly evolving characteristics of political and economic environment. This essentially allows to use event study methodology for studying political economy questions.

We apply this idea to the case of Russia in 2014. During this year Russia has experienced a number of shocks that had an effect on the incentives for pro-social behavior.

Our analysis shows that the effect of conflict in East Ukraine was both statistically and economically significant. The higher the intensity of the conflict, the more the Russians in regions close to the conflict zone would search for pro-social keywords on the internet. The impact of an unexpected outburst of inflation (which increased by 6 percentage points relative to original forecasts) is negative and statistically significant but its magnitude is not very large. We also find that the unprecedented ruble exchange rate volatility did not have any significant impact on Russians' social capital.

The timing of these events does not allow studying the persistence of these effects. We therefore can not yet analyze the relationship between "Putnam I" and "Putnam II" views in this case. Only after the conflict is over, we will be able to judge whether its impact on social capital has been temporary or permanent.

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