American Economic Review: Papers & Proceedings 2016, 106(5): 230–235
http://dx.doi.org/10.1257/aer.p20161067

War, Inflation, and Social Capital†

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In recent decades, many studies in sociology, political science, and economics have argued that social capital matters for the effectiveness of political and legal institutions, for the production of human capital and public goods, and for the 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 the free-rider problem (Guiso, Sapienza, and Zingales 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, Leonardi, and Nanetti 1994, who argued that social capital is highly persistent) and "Putnam II" (after Putnam 2001, who showed that social capital can change). Ananyev and Guriev (2015) show that Putnam I and Putnam II are not mutually exclusive: short-term changes in trust during the Great Recession may have persistent effects. In particular, trust in Russian regions that suffered the most during the 2009 recession was still 10 percentage points lower in early 2014 than before the crisis (even though the Russian economy had 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 tracking social capital "in real time." Following the insights from recent studies using Google data in social science (Varian 2016, 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 prosocial behavior such as "blood donations," "adopt a child," "charity." The search data have three advantages. First, searches are based on revealed preferences rather than self-reported. Second, they are carried out in real life rather than in an artificial lab environment. Third, they can be collected at high frequency.

Using this methodology, we construct weekly data on prosocial behavior for 79 Russian regions in 2014. Given the political and economic turbulence in Russia during that year, this high-frequency measure allows us to study 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 social capital, and inflation decreases social capital.

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†Go to http://dx.doi.org/10.1257/aer.p20161067 to visit the article page for additional materials and author disclosure statement(s).

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 banning food imports from the West. In addition, the global price of oil, Russia's main 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 8,000 killed and about two million displaced (according to the United Nations).

These dramatic events brought about a severe economic shock. Inflation started to increase from the annexation of Crimea in March 2014 (normally, inflation in Russia slows down in the second quarter). The seasonal deflation 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 decreased from \$100/barrel to \$55/barrel. The oil price decline combined with the sanctions resulted in further ruble depreciation (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 percent of its value within two days. The intraday volatility was even higher: during the trading day of December 16, the ruble was trading 30 percent below the December 15 opening level. This fall was reversed by the Central Bank's overnight increase in interest rates from 10.5 percent to 17 percent per year.

The intensity of the conflict in Ukraine 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 (the latter are not reliable and not available at a weekly frequency). Figure 1 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 these developments were largely unexpected as they were triggered by erratic moves and the sudden departure of Ukrainian President

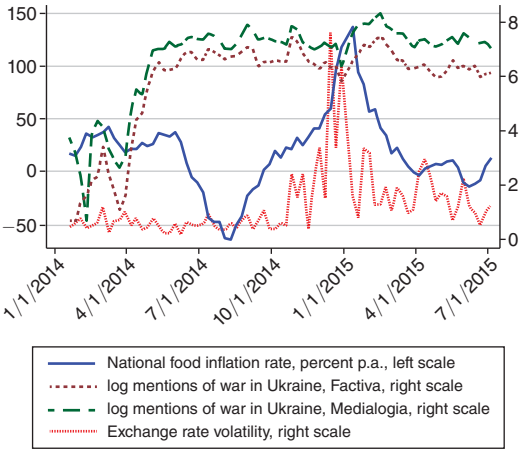

FIGURE 1. EVOLUTION OF INTENSITY OF CONFLICT AND OF INFLATION OVER TIME IN JANUARY 2014–JULY 2015

Victor Yanukovich in February 2014. For example, in October 2013, the IMF's World Economic Outlook predicted 2014 consumer price inflation to be 5.3 percent. IMF maintained the same forecast in the April 2014 issue of the World Economic Outlook. The actual outcome was 11.4 percent. Futures markets in the end of 2013 predicted the ruble exchange rate to depreciate by about 5 percent during 2014; currency options also did not price in any significant change. The actual depreciation in 2014 was 40 percent. The conflict in Ukraine and the 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 different regions are differentially affected by either of these macro shocks, we can apply the difference-in-differences methodology. We use a panel of 79 Russian regions (indexed by i) for 50 weeks in 2014 (indexed by t) to estimate the following specification:

$$Y_{it} = \alpha\, Inflation_{it} + \beta\, War_t Distance_i + \gamma Volatility_t\, Vulnerability_i + \lambda X_{it} + u_i + \delta_t + \varepsilon_{it}.$$

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 ruble/dollar exchange rate volatility, $Vulnerability_i$ is region i's vulnerability to the 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 the 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, the coefficient β represents the effect of war on social capital (if $\beta > 0$, war has a negative impact on social capital). In turn, the coefficient γ represents the effect of ruble volatility as the latter is more likely to affect regions whose economies are more vulnerable to currency shocks. Finally, the 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 prosocial 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 Russia's leading Internet search engine, Yandex.[1] The data on the composition of searches by week and region are available at *wordstat.yandex.ru*. 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: (i) Social protection: 0.864; (ii) Blood donations: 0.003; (iii) Adopt a child: 0.029; (iv) Orphanage: 0.470; (v) Charitable foundation: 0.023; (vi) Help children: 0.178.[3]

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 question on

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

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

[3] The fact that the weights are so different is explained by large variation in the magnitudes of the six variables. When those are normalized by their means in April 2014, the weights are 0.60, 0.19, 0.31, 0.36, 0.15, 0.60, respectively. In the regressions below, we have used the principal component with normalized search data as well; the results did not change.

generalized social trust in its regionally representative GeoRating survey.[4]

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 find that 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, the urbanization rate, and the percentage of households with Internet connection, the cross-sectional correlation between the survey-based measure of trust and the principal component of searches related to social capital in April 2014 is positive and significant at the 5 percent level.

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 percent of its standard deviation).

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

We measure the intensity of the conflict in Eastern Ukraine by the popularity of the theme "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 the ruble 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 the share of imports in gross regional product, the 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 2014, the price of this basket was 15 percent higher than the year before.

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 percent of its standard deviation. The coefficient of the conflict intensity interacted with distance to conflict is *negative* and significant—and much larger in magnitude. Being closer to the conflict during more intense fighting by one standard deviation results in an increase in our measure of social capital by about half of the standard deviation. The fact that the coefficient is negative implies *more* prosocial behavior in areas closer to the conflict. This is consistent with the willingness to engage in more civic behavior as the conflict is near—due to empathy toward the victims.[5]

As a placebo, we also add to the regression the intensity of conflict interacted with the distance to Moscow (which is located at the very same longitude as Donetsk). The coefficient at this interaction term is small and not significant, while the coefficient at the interaction with the distance to the conflict still is. Thus, it is indeed the distance to the conflict rather than the distance to Moscow that matters.

The variables related to the exchange rate volatility are not statistically significant, whether controlling or not controlling for inflation. We do not report the respective specifications and coefficients at these variables. Income is also not statistically significant. This is not surprising given that income does not vary substantially during the year (74 percent of variation in income is

[4] 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.

[5] The alternative explanation is that a military success may contribute to nationalism, which in turn drives prosocial behavior. In our setting, it is unlikely to be the case given that there has been no clear "success" in the Eastern Ukraine. Also, in the cross-sectional regressions, our measure of social capital is positively correlated with homicides per capita. The latter is consistent with the "empathy" explanation above rather than the "nationalism" one.

Table 1—Panel Regression for the Principal Component of Searches Related to Social Capital in 2014

Dependent variable: Internet searches related to prosocial behavior				
Distance to conflict × conflict intensity	−1.13*** (0.43)		−1.09** (0.43)	−0.96** (0.43)
Inflation, % p.a.		−4.23*** (1.08)	−3.71*** (1.00)	−3.68*** (1.00)
Distance to Moscow × conflict intensity				−0.13 (0.23)
Observations	3,950	3,950	3,950	3,950
R^2	0.775	0.772	0.776	0.776

Notes: The table reports the results for weeks starting January 20 to December 29, 2014. Distance is in logarithms. Conflict intensity are the logarithms of mentions of "war in Ukraine" in media covered by the Factiva dataset 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 (in parentheses) are two-way clustered at week × region level.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

explained by regional dummies). This implies that we should interpret the negative correlation of social capital with inflation as a positive correlation with real income.

We have also run a number of robustness checks. We have run the regressions for the whole dataset covering January 2014—July 2015 period. The results are robust. We have used Medialogia rather than Factiva media data; the results are exactly the same. We have constructed two other measures of conflict intensity. First, we calculated the mentions of war in Ukraine in the top ten Russian media (including TV 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 remains negative and significant.

We have also checked if our results are driven by the direct effect of the war (e.g., immediate need to donate blood to the victims of the war). This is not the case: the results hold when we exclude "blood donations" searches and when we exclude regions closest to the conflict zone.

In order to measure the immediate impact of Western sanctions and Russian counter-sanctions, we have also created dummies for whether or not the specific rounds of sanctions are in place. Then we interacted these dummies with exports as a share of the gross regional product in 2013, share of agriculture in gross regional product, etc. We found no significant effects.

V. Concluding Remarks

Our analysis suggests that Internet-based measures can help in 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 the 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 that year Russia experienced a number of shocks that had an effect on the incentives for prosocial behavior.

Our analysis shows that the effect of the 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 prosocial keywords on the Internet. The impact of an unexpected outburst of inflation (which exceeded original forecasts by 6 percentage points) is negative and statistically significant but its magnitude is not very large.

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

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