

Big Data Analysis

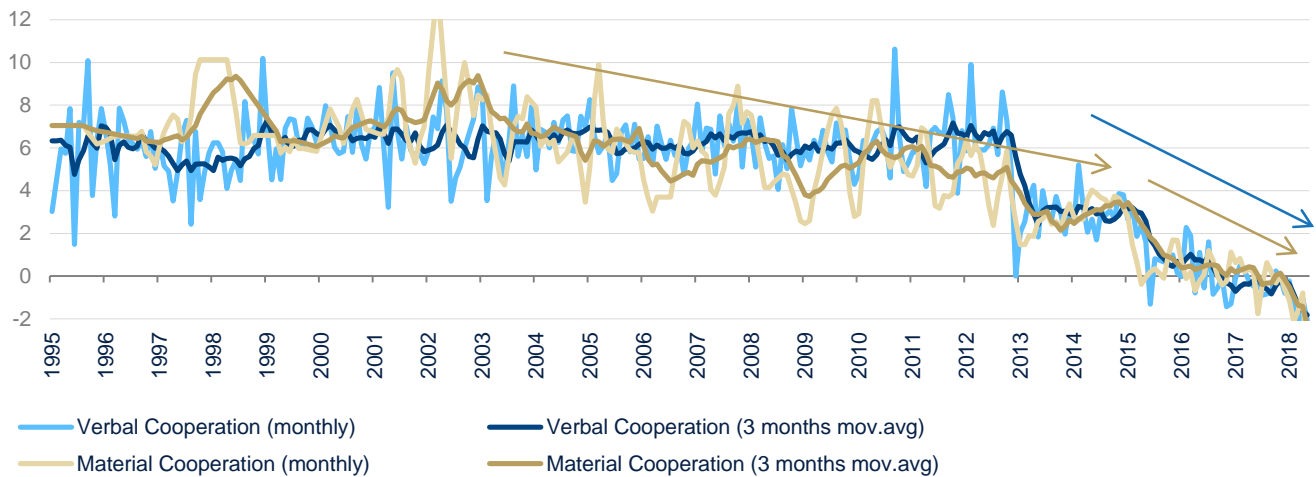
Monitoring Global Trade Support in real time using BigData

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The stagnation of global trade and the retreat of globalization have become a key issue after the Global Financial Crisis dominating the economic and political agenda across the world over the recent years. Both critics and supporters of globalization have spread their stance on it in academic and policymaking speeches. Using information from the media all over the world (GDELT) and applying Big Data techniques (natural language processing and sentiment analysis) to it, we aim to contribute to the debate measuring the “material” and “verbal” global trade support evolution in real time worldwide. Results show that while “material cooperation” for international trade was already declining since the beginning of the 00’ century (after the big support of the 70s and then 80s), the “verbal support” managed to stay alive only until the financial crisis erupted. Once the real effects of crisis became evident, the “verbal” support index suddenly collapsed converging to the material cooperation sentiment. China and the United States are among the countries where trade support has been negatively affected in a more dramatically way.

The trade material cooperation index as an early warning signal of the global trade slowdown...

Figure 1 BBVA Research Trade Support Sentiment Index



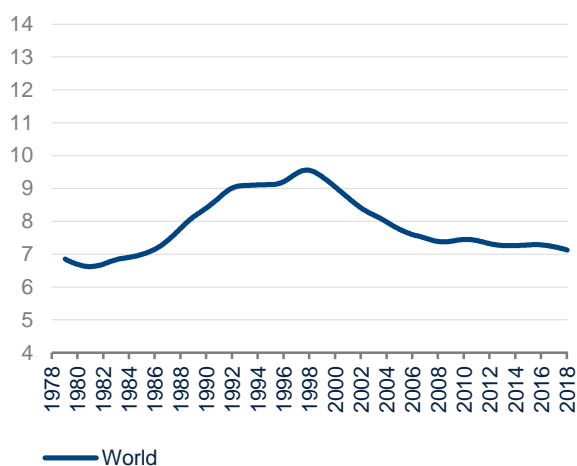
Source: BBVA Research and www.gdelt.org

The global trade slowdown and the rise of trade protectionist rhetoric, measures and policies have become one of the main concerns overshadowing the economic outlook and stand high on the economic and political agenda. A higher support worldwide for protectionist policies as austerity measures hit western economies, China's economic rebalancing bias to domestic demand and the US "America First" narrative are among factors behind a less positive momentum for trade support in the international news and social media. Concerns mount as trade has been one of the main characteristic of the post-war decades of prosperity, and its recent stagnation has raised some questions on whether the poorer momentum of growth that we are facing is a cyclical or rather a permanent trend.

To measure the extent of material and verbal support and the recent global trade slowdown, we take on an innovative approach using Big Data from the media (GDELT¹) and data science techniques for text analysis like Natural Language Processing (NLP) techniques and sentiment analysis. Media sentiment could reflect ultimately how countries, institutions, societies and Governments stand on global trade and monitoring it in high frequency allows us to have rapid responses to trade related events according to the media. We have constructed several indices to track these trends in real time, having a comprehensive and detailed view of media sentiment on global trade evolution over time.

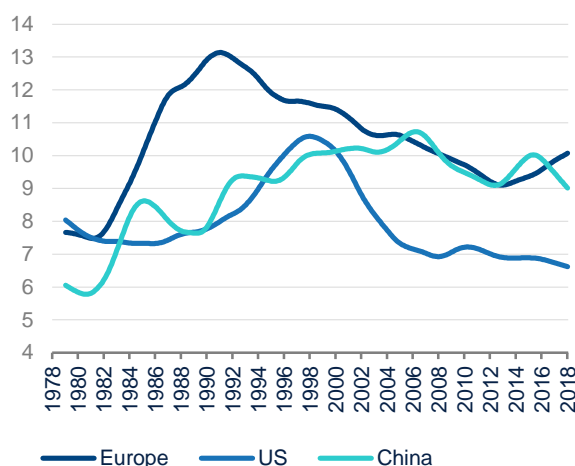
International Trade has maintained historically a positive tone² or sentiment on the media (Figure 1). However, nowadays it is close to a neutral tone. The trade support material cooperation sentiment index started to deteriorate gradually since the beginning of the century in 2003 and accelerated its drop in 2012, some time after the financial crisis erupted. It was when the trade support verbal cooperation sentiment index experienced a sharp deceleration, getting closed values to the material cooperation index and evolving similarly to it thereafter. Therefore, although protectionism woes came to the fore during last years given the global trade stagnation and its economic and political significance, the BBVA Research material cooperation index shows since 2002 some early warning signals, leading the current debate.

Figure 2 Trend of BVA Research World cooperation index (HP filtered)



Source: BBVA Research and www.gdelt.org

Figure 3 Trends of BBVA Research cooperation index by regions (HP filtered)



Source: BBVA Research and www.gdelt.org

1: More information about GDELT can be found in the annex and in www.gdelt.org

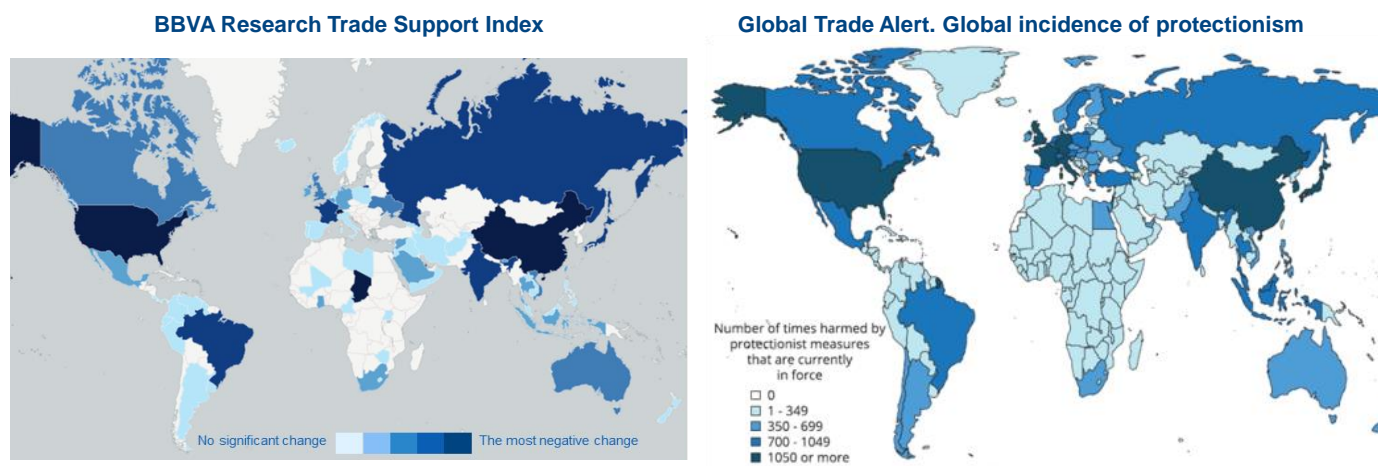
2: Sentiment score ranges from -100 (extremely negative) to +100 (extremely positive), although common values range between -10 and +10, with 0 indicating neutral. More information can be found in the annex.

Looking at the historical perspective since 1979 and getting the trend of these indices using Hodrick Prescott filter, we see that the world cooperation index (Figure 2) shows an increasing trend from the eighties to the end of the nineties, when it reversed its path with the booming growth of China and other emerging markets. The index moderated its decreasing trend since 2009, approaching nowadays to similar values to 1979.

Focusing on the big players (US, Europe and China) (Figure 3), we can appreciate different paths in their evolution. In Europe, the index showed an increasing trend during the eighties until 1993 given the expansion of the European Union (EU), the creation of the Single Market for the free flow of trade across the EU borders, which was completed in 1993 with the 'four freedoms' of movement of goods, services, people and money. This, together with the collapse of communism across central and Eastern Europe with the fall of the Berlin Wall in 1989, lead to a flourish period of expansionism for Europe as it can be seen in the index. However, since the beginning on the nineties, the index has been generally decreasing, but keeping nowadays at higher values than in 1979. On the other hand, in the case of US, the index had its higher growth during the nineties until 2000, when it started to reduce given the emerging markets expansion, reaching today lower values than in 1979. In the case of China, the index has presented an increasing path since 1979 until now.

Going to the country level, we get the index for each country all over the world and over time, identifying some interesting results. In Figure 4, we present the index in differences between values in 2008 and in 2017 in such a way that negatives values point to a reduction of the trade support index, which is illustrated in Figure 4 in darker blue.

Figure 4 BBVA Research Trade Support Index vs Global Trade Alert data on protectionism (in changes 2008-17)



Source: BBVA Research and www.gdelt.org, Global Trade Alert

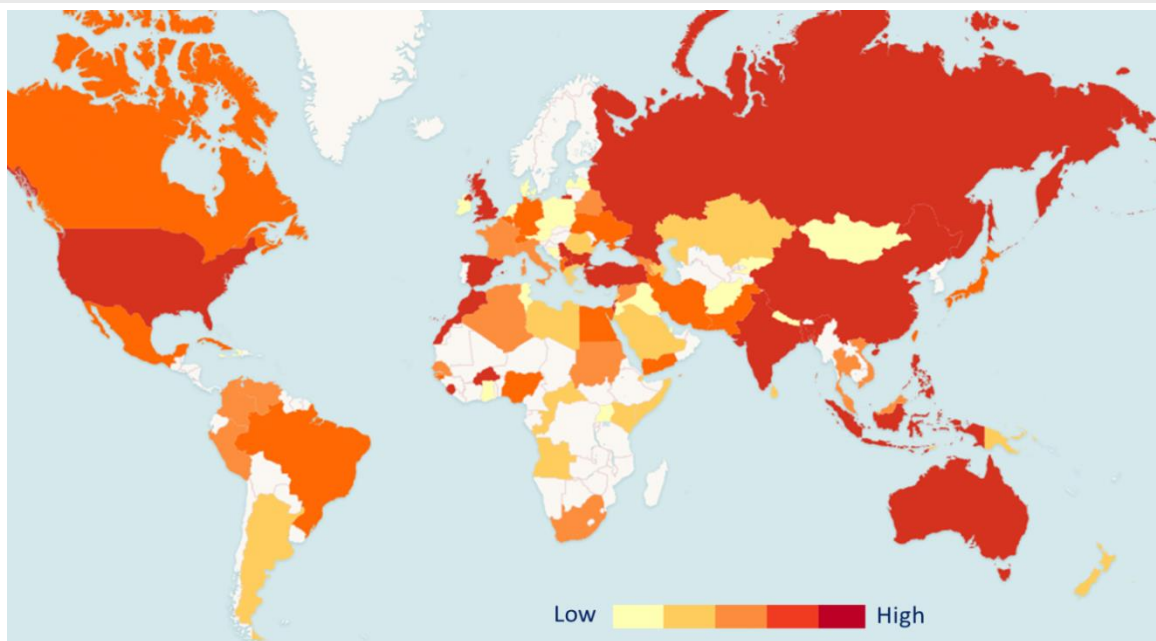
We get that the trade slowdown it's a worldwide phenomenon (Figure 4), with China, the United States and some Western European countries like France (in the darkest blue in Figure 4) as the countries hit most by protectionism, in line with the results of the 18th Global Trade Alert Report about the global incidence of protectionism (map 2 in Figure 4). Among the emerging markets, India and Russia have been the most highlighted countries by the worsening of the trade support index. On the other hand, Mexico and particularly Brazil look like the most affected Latin American countries by the rise of protectionism according to the index.

... when the trade war debate is gaining momentum

Trade concerns rose up since the beginning of March when President Trump announced the imposition of tariffs on imported solar panels, steel and aluminum, targeting also later on the month another \$60 billion in Chinese goods for duties. From this time on, a tit-for-tat tariff announcements has started heating up trade fears and uncertain. China hit back announcing retaliatory tariffs on \$50 billion of American goods. Several verbal provocations on futher tariff measures have continued feeding the spat.

All these measures, announcements and threats heaten the trade dispute between the world's two biggest economies, coming to the spotlight and making front pages in news. Using text data from the international to national media, we analyze all new articles related with trade barriers, tariff measures, protectionism and trade wars, identifying countries included in each article. Aggregate results show that this issue has captured attention worldwide, being China, United States, United Kingdom and Russia the countries with the highest media coverage³ to these topics since March to the present (Figure 5).

Figure 5 BBVA Research Trade Wars Index media coverage (Mar - Apr 2018)



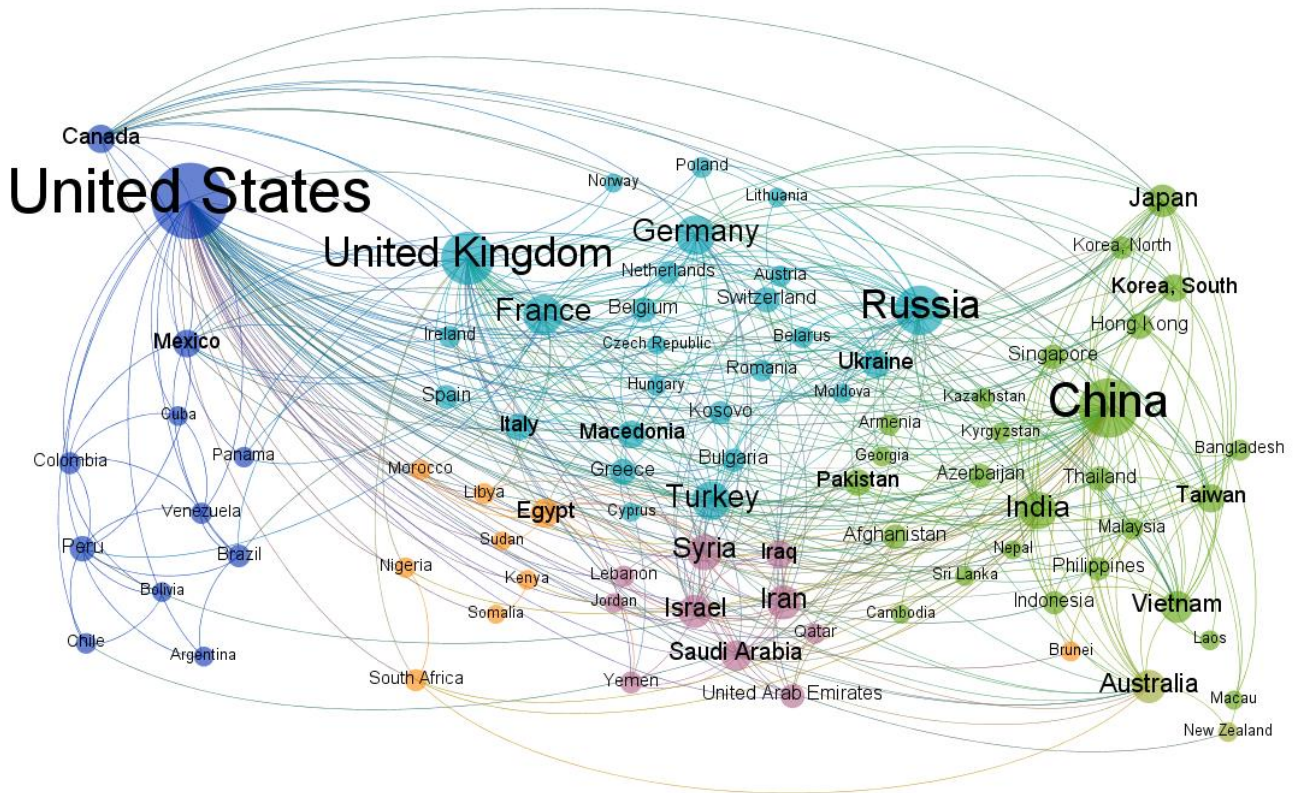
Source: BBVA Research and www.gdelt.org

Considering the co-occurrence of countries in news when trade war related issues were identified, we can measure the interrelations between countries in order to identify how countries could be affected by the imposed tariff measures, that is, the transmission mechanism of them between countries. Figure 6 show the obtained country network where the edges thickness reflects how often each pair of countries were mentioned together and the nodes size shows the interconnectedness of the country with the rest of the network. Clusters capture the potential trade corridor, reflecting how countries could be affected by trade measures. Results are shown in differences of March - April period with respect to 2017.

³: This media coverage is calculated as the ratio between news related with trade barriers, tariff measures, protectionism and trade wars in each country with respect to the total number of news in that country during the same period of time with the aim to compare observations between countries.

Identified clusters match with geographical regions, showing that the importance of the neighbourhood where relationships between countries are stronger inside each region. United States, China and the United Kingdom are the countries with the highest number of interrelations across the network, while the weaker relationships are found in the Latin American countries and African ones.

Figure 6 BBVA Research Trade Wars country network (in changes Mar/Apr 18 - 17)



Source: BBVA Research and www.gdelt.org

All in all, our built indicators to measure global trade evolution in high frequency give us timely and accurate insights both at global and national levels all over the world, which seems to be an early warning signal indicator of the global trade stagnation of the recent years. The President Trump’s “America First” policies as well as the lack of interest in the search for multilateral partnership agreements increase uncertainty and concerns on globalization in the short term.

Appendix : Material and Verbal Trade Support Indices

To investigate the evolution of global trade as well as the countries' attitude to globalization by means of Big Data Analysis, we use the dataset "Global Database of Events, Language and Tone" (GDEL⁴) created by Leetaru and Schrod⁴ (2013). GDEL is an open-source database which extracts and parses digital news in broadcast, print and web media globally in over 100 languages on a daily basis. Thus, it contains a comprehensive and high resolution catalog of geo-referenced events from 1979 to the present. Using different dictionaries, several thousands of taxonomies and themes are identified in the news pieces to classify the information. The algorithms used by GDEL also identify emotions, organizations, locations, news sources and events across the world as well as their average sentiment using Natural Language Processing (NLP) techniques and the lexicon approach.

Focusing on sentiment⁵, once each news piece is translated into English, GDEL applies more than 40 different dictionaries that classify words associated with positive and negative tone as to compute the average "tone" of all documents containing one or more mentions to the events we are looking for. The score ranges from -100 (extremely negative) to +100 (extremely positive), although common values range between -10 and +10, with 0 indicating neutral.

Every processed socio-political event in GDEL is coded using the Conflict and Mediation Event Observations (CAMEO) event coding system developed by Schrod⁴ and Yilmaz (2007). CAMEO is a broadly used coding scheme to systematize the analysis of political and social events and divide them in a scale ranging from material and verbal cooperation to verbal and material conflict.

Using the CAMEO taxonomy in GDEL, we have developed different indices to study the global trade evolution from an innovative approach. First of all, we measure the evolution over time of events related with cooperation or intentions to cooperate in the world and in the main big areas (Figure 1 and 2). For doing it, we collect news since 1979 mentioning events which go from verbal to material cooperation (1 to 6 categories in the CAMEO taxonomy, see Table 1). In order to correct for the exponential rise of the media coverage over time and the imperfect nature of computer processing of the news, we normalize the events to a reference point in time. Therefore, the indices are calculated as the ratio of the media coverage of articles related to these events each month divided by the total number of articles about any event recorded in GDEL during the same period of time.

Focusing on trade and disentangling between intentions to cooperate from actual cooperation, we have constructed a global trade support index to track the sentiment or perception of events related with verbal and material cooperation associated to the World Trade Organization (WTO) in the media at aggregate and country levels. Verbal cooperation is associated with events which go from making a public statement to engaging in diplomatic cooperation (1 to 5 categories in the CAMEO taxonomy, see Table 1) where WTO is the actor. Material cooperation refers to events in CAMEO categories that go from engaging in material cooperation to easing restrictions (6 to 8 categories in the CAMEO taxonomy, see Table 1) where WTO is the actor too.

4: Further information can be found in Leetaru, Kalev and Schrod⁴, Phillip (2013), in the project website or in BBVA Research Digital Economy Outlook Dec 15, Big Data to track geopolitical and social events.

5: Further information about the methodology and the sentiment analysis can be found in the paper of Iglesias, Ortiz and Rodrigo (2017), "[How do the EM Central Bank talk? A Big Data approach to the Central Bank of Turkey](#)".

Table 1. CAMEO categories included in verbal and material cooperation events

CAMEO Event Code	Event's Description
1 MAKE PUBLIC STATEMENT	
10	Make statement, not specified below
11	Decline comment
12	Make pessimistic comment
13	Make optimistic comment
14	Consider policy option
15	Acknowledge or claim responsibility
16	Deny responsibility
17	Engage in symbolic act
18	Make empathetic comment
19	Express accord
2 APPEAL	
20	Appeal, not specified below
21	Appeal for material cooperation, not specified below
211	Appeal for economic cooperation
212	Appeal for military cooperation
213	Appeal for judicial cooperation
214	Appeal for intelligence
22	Appeal for diplomatic cooperation, such as policy support
23	Appeal for aid, not specified below
231	Appeal for economic aid
232	Appeal for military aid
233	Appeal for humanitarian aid
234	Appeal for military protection or peacekeeping
24	Appeal for political reform, not specified below
241	Appeal for change in leadership
242	Appeal for policy change
243	Appeal for rights
244	Appeal for change in institutions, regime
25	Appeal to yield
251	Appeal for easing of administrative sanctions
252	Appeal for easing of popular dissent
253	Appeal for release of persons or property
254	Appeal for easing of economic sanctions, boycott, or embargo
255	Appeal for target to allow international involvement (non-mediation)
256	Appeal for de-escalation of military engagement
26	Appeal to others to meet or negotiate
27	Appeal to others to settle dispute
28	Appeal to others to engage in or accept mediation
3 EXPRESS INTENT TO COOPERATE	
30	Express intent to cooperate, not specified below
31	Express intent to engage in material cooperation, not specified below
311	Express intent to cooperate economically
312	Express intent to cooperate militarily
313	Express intent to cooperate on judicial matters
314	Express intent to cooperate on intelligence
32	Express intent to provide diplomatic cooperation such as policy support
33	Express intent to provide material aid, not specified below
331	Express intent to provide economic aid

Continue on next page

CAMEO Event Code Event's Description

- 332 Express intent to provide military aid
- 333 Express intent to provide humanitarian aid
- 334 Express intent to provide military protection or peacekeeping
- 34 Express intent to institute political reform, not specified below
- 341 Express intent to change leadership
- 342 Express intent to change policy
- 343 Express intent to provide rights
- 344 Express intent to change institutions, regime
- 35 Express intent to yield, not specified below
- 351 Express intent to ease administrative sanctions
- 352 Express intent to ease popular dissent
- 353 Express intent to release persons or property
- 354 Express intent to ease economic sanctions, boycott, or embargo
- 355 Express intent allow international involvement (not mediation)
- 356 Express intent to de-escalate military engagement
- 36 Express intent to meet or negotiate
- 37 Express intent to settle dispute
- 38 Express intent to accept mediation
- 39 Express intent to mediate

4 CONSULT

- 40 Consult, not specified below
- 41 Discuss by telephone
- 42 Make a visit
- 43 Host a visit
- 44 Meet at a "third" location
- 45 Mediate
- 46 Engage in negotiation

5 ENGAGE IN DIPLOMATIC COOPERATION

- 50 Engage in diplomatic cooperation, not specified below
- 51 Praise or endorse
- 52 Defend verbally
- 53 Rally support on behalf of
- 54 Grant diplomatic recognition
- 55 Apologize
- 56 Forgive
- 57 Sign formal agreement

6 ENGAGE IN MATERIAL COOPERATION

- 60 Engage in material cooperation, not specified below
- 61 Cooperate economically
- 62 Cooperate militarily
- 63 Engage in judicial cooperation
- 64 Share intelligence or information

7 PROVIDE AID

- 70 Provide aid, not specified below
- 71 Provide economic aid
- 72 Provide military aid
- 73 Provide humanitarian aid
- 74 Provide military protection or peacekeeping
- 75 Grant asylum

Continue on next page

CAMEO Event Code Event's Description

8 YIELD

- 80 Yield, not specified below
- 81 Ease administrative sanctions, not specified below
- 811 Ease restrictions on political freedoms
- 812 Ease ban on political parties or politicians
- 813 Ease curfew
- 814 Ease state of emergency or martial law
- 82 Ease political dissent
- 83 Accede to requests or demands for political reform not specified below
- 831 Accede to demands for change in leadership
- 832 Accede to demands for change in policy
- 833 Accede to demands for rights
- 834 Accede to demands for change in institutions, regime
- 84 Return, release, not specified below
- 841 Return, release person(s)
- 842 Return, release property
- 85 Ease economic sanctions, boycott, embargo
- 86 Allow international involvement not specified below
- 861 Receive deployment of peacekeepers
- 862 Receive inspectors
- 863 Allow delivery of humanitarian aid
- 87 De-escalate military engagement
- 871 Declare truce, ceasefire
- 872 Ease military blockade
- 873 Demobilize armed forces
- 874 Retreat or surrender militarily

Source: BBVA Research

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