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# Mapping social conflicts in natural resources. A text-mining study in mining activities

**Ramiro Albrieu[1] and Gabriel Palazzo[2]**

**Abstract**

Applying text-mining techniques we have developed a methodology that measures the number of social conflicts related to the exploitation of nonrenewable natural resources. We focused on conflicts in four mining countries (Australia, Canada, Chile, and Peru) from 2003 to 2016 considering more than 20,000 articles from the major newspaper of each country. From our data we detected cross-country and cross-regional differences and changes in time patterns. We found a statically significant correlation between our main index and mineral rents in % in GDP. However, our results should be interpreted with caution since we have not taken into account endogeneity issues and our indexes could be biased by different level of lobby powers among our country sample. Our main contribution is the generation of novel database with different indexes of soft conflicts related to the exploitation of non-renewables natural resources and its media coverage in Australia, Canada, Chile and Peru.

JEL: Q32, Q34, O13.

## 1. Introduction

The exploitation of underground assets is a controversial issue. On the one hand, it can increase government revenues and feed the economy with the necessary income for growth - what Albert O. Hirschman (1977) called indirect linkages. On the other hand, there is a perception both in the literature and in public opinion that the social costs of these activities are not fully taken into account when governments (or firms) decide to deplete a given nonrenewable natural resource. This is particularly true when it comes to a future generation's welfare effects from current actions, but also to the contemporary local effects of its depletion.

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The climate change agenda, and, more specifically, the green accounting literature and its main applications (such as the United Nation's System of Environmental-Economic Accounting) are currently addressing the intergenerational equity issue. In particular, the World Bank's (World Bank, 2005 & 2010) estimates of adjusting savings tackled the intergenerational problem by correcting standard accounting savings (this period's addition to future generations' assets) with human and physical capital investment, natural resources depletion, and environmental damages caused by carbon dioxide and other emissions. The issue of intra-generational equity, in turn, has been harder to address.

This paper seeks to contribute to this in-progress literature by finding proxy measures for social conflicts at national and local (or regional) levels. To that end, we try to find patterns that can account for social conflicts in millions of words inside articles about the mining sector appearing in the major newspapers of four large mining producers: Australia, Canada, Chile, and Peru. The major contribution is to provide a novel database in order to explore in the future causal effects and correlation for the understanding of a better management of conflicts.

The indexes that we build have the strength of being able to capture soft conflicts as well as measure different intensities of conflicts. Yet their major weaknesses is that they might be biased by different level of lobby powers of mining industries, government or others agents on the media coverage. However, if the levels of lobby power do not change among time, the indexes in our country sample only will be biased on level but the changes through time or changes caused by shocks might reflect ups and downs of conflict levels. In any case, if different lobby power levels do change or impact different among time and different shocks, it is still interesting to measure the media coverage of social conflicts related to natural resources.

The paper is organized as follows. Section 2 reviews briefly the literature of text mining in economics and explains the methodology to be applied to measure social conflict. Section 3 shows our main descriptive results at country levels, addresses regional disparities within countries, and characterizes different levels of violence in conflicts between countries in our sample. In section 5 we perform some regression models in order to evaluate the relationship between conflicts and mineral rents and overall economic performance, while section 6 6 concludes.

## 2. Quantifying social conflicts in extractive industries

### 2.1. Literature review

The methodology that we employ in this paper belongs to the family of the text mining techniques. These techniques reach conclusions, promote computationally-based research and detect statistical patterns by studying the words present in the text.

Online newspapers contain vast amounts of qualitative information that can be processed using new software technologies in order to obtain quantitative assessments for hard-to-quantify economic variables. Gupta and Lehal (2009) describe these text mining techniques as "the discovery by computer of new, previously unknown information, by automatically extracting information from different written resources".

The amount of work using this family of techniques in economics has grown over time. Tetlock (2007) is one of the pioneering works in the profession to build an index of market pessimism by mining into the contents of the "Abreast of the Market" column in the Wall Street Journal. Using basic vector auto regressions (VARs), he finds that high media pessimism predicts downward pressure on market prices followed by a reversion to fundamentals. His findings suggest that measures of media content are useful as proxies for investor sentiment. By the same token, Garcia (2013) constructed an index of market sentiment counting the number of positive and negative words of two financial columns ("Financial Markets" and "Topics in Wall Street") of the New York Times, with daily data from this newspaper from 1905 to 2005. The author reinforces a finding of Tetlock (2007) concluding that media content can predict trading volume. Using a time-series parsimonious model, he also finds that new content helps to predict daily stock returns during recessions. Likewise, Aromí (2013) applied a similar methodology evaluating how information flows from newspapers can influence the performance of the financial market in Argentina from October 1996 to December 2012. The author implements time-series regression models on stock returns. The determinants are media sentiment measures that he has built, the lags of these variables and the stock returns lags, among other control variables. He finds evidence compatible with the presence of market participants that overreact to information flows. To obtain a quantitative index all these studies used a dictionary approach, counting positive and negative words to generate a numerical index.

Baker, Bloom and Davis (2013) use text-mining techniques to derive an index that quantifies the uncertainty of current economic policy and its impact on investment demand in the context of the economic recession of the United States 2007-2009. They built an "economic policy uncertainty" (EPU) index which attempts to capture the prevailing uncertainty about taxes, spending, regulation and

monetary policy. The EPU index is based on an automated text search in ten American newspapers and explores terms related to political uncertainty.

Turning to the topic of the paper, social conflicts in natural resources have a far longer history than our methodology. From the 1980s the conventional view that natural resources endowments are conducive to economic development is being contested by a more pessimistic view where these very endowments are the source of underdevelopment. Sachs and Warner (1995) drew attention to the "curse of natural resources", accounting for the lower growth exhibited by countries with a high share of exports based on natural resources for the period 1970-1989. More recently, Brunnschweiler and Bulte (2009) stated that there are at least three dimensions of the curse of natural resources: (i) lower economic growth, (ii) violent civil conflicts, and (iii) authoritarian political regimes.

Several reasons may link the exploitation of natural resources to social unrest and political conflicts. As possible hypotheses Sachs and Warner (1995) and Leite and Weidmann (1999) argue that natural resources-rich countries exhibit higher inequality and social polarization as the upper classes take advantage of their political power to lobby for resources, assuming a rent- seeking behavior. Collier and Hoeffler (1998, 2000, 2005) stated that as natural resources are homogeneous goods, they do not require complex skills for exploitation, thus making it easier to appropriate their income.

Along a similar line, Nafziger and Auvien (2002) and Sinnott et al. (2010) argue that the conflict could be generated as the poorest strata would not receive what they consider fair, implying a predator state, weak regulations and elites that leverage to extract rents rather than promote economic growth. Sinnott et al. (2010) marked the mining and oil exploitation in social terms, often producing social reprobation for these activities because their environmental impact and its poor working conditions. In turn, concepts such as "Dutch Disease" or the Prebisch-Singer thesis explain why the exploitation of natural resources can generate social unrest among a certain segment of the population in terms of economic performance (Singer, 1950 and Prebisch, 1950). This could weaken governance and democratic structures, given the high poverty rates that would result in vulnerable populations and then be reflected in conflict (Mehlum, Moene and Torvik, 2006); Robinson, Torvik and Verdier, 2006).

Brunnschweiler and Bulte (2009) argue that it is necessary to instrument the variables involved. The authors find that there is endogeneity between these variables and reverse causality situations, where peace reduces the dependence on natural resources and that it is not the dependency on exports that

promotes social conflict. Note that these results support the opposite effect of the resources curse thesis; in fact, they found that the abundance could impact positively on economic growth. Mehlum, Moene, and Torvik (2006), like Brunnschweiler and Bulte (2009), Arezki and van der Ploeg (2007), Haber and Menaldo (2011) and Leite and Wiedmann (1999) stated that taking into account the role of institutions, the abundance of natural resources could become a blessing. According to Giordano, Giordano and Wolf (2005) and Evans (2010) would be due to shortages of resources that can be found links between the exploitation of natural resources and the generation of sociopolitical conflicts.

Few studies examine this relationship with text-mining technology. To our knowledge Calderon Gutierrez et al. (2013) is the closest to ours. They conducted a study of social conflict in Latin America collecting data from major newspapers from seventeen countries from October 2009 to September 2010. The study addresses a general analysis of social conflict, identifying three different types: i) social reproduction (which is the largest type in the period and includes conflicts related to labor, wages, land and incomes); ii) institutional conflict (public goods provision, administrative management and authority questioning); and iii) cultural conflict (ideological-political issues, public safety, environment, etc.). Dube and Vargas (2013) is another example in this field since they use newspapers articles to characterize violent civil conflicts in Colombia. They found evidence that a rise (fall) in oil prices increase (decrease) violent conflicts, while rise (fall) coffee price shocks decrease (increase) them. The key difference between these activities is the labor intensity gap. On one hand, a rise in coffee prices increase labor wages of rural workers, which may lower conflicts by reducing labor supplied to appropriation (lower labor supplied to left-wing *guerrillas* or right-wing paramilitaries). This effect is called opportunity cost effect. On the other hand, a rise in oil prices may increase violence by raising gains of the elites/government from appropriation of its rents. This is called the rapacity effect. However, their empirical strategy does not relay in their own generation of a dabase using text-mining technique but in newspapers articles qualitative analyses recollected by Conflict Analysis Resource Center (CERAC).

Finally, we borrow from Palazzo (2017) our empirical strategy. He has created social conflict indexes related to the exploitation of a broad set of natural resources from 1996 to 2014 in Argentina. His main contribution is the building of the methodology and verification that those indexes show reliably some stylized facts of civil conflicts related to agriculture, mining, oil, fishing and forestry activities in Argentina.

### 2.2. Our empirical strategy

We have created a methodology that measures the quantity of sociopolitical conflicts related to the exploitation of mineral resources for an application to others natural resources (see Palazzo (2017).

The program routine that we applied belongs to the bag-of-words family models of text mining. It consists of counting the number of hostile words in each article which refers to the mining industry in a particular location and time. The number of conflict articles gives us a proxy of the level of conflict in a particular point in time and place. In addition, with this information we created a set of indexes (e.g., the ratio of hostile words and total words per article) to capture the intensity of conflicts.

The literature on social conflicts has been dealing with civil wars where the number of dead people is the measure. Our index differs from those kinds of indexes, offering a soft measure of conflict that involves strikes, lockouts, protest marches and political conflicts. Additionally, the conflicts are unequivocally related to the mining industry because of the methodology itself.

To obtain the data we accessed Global Factiva - Dow Jones, a website which collects and stores a large number of newspapers from around the world and classifies the pieces of news by industry and sector. We have chosen the Mining/Quarrying and Primary Metals Industries, which guarantees that every piece of news concerns the sector of our interest.

Ideally we would have like to download more than one newspaper per country in order to avoid or smooth media biases. But, despite the fact that Global Factiva has a broad coverage of newspapers, the coverage length varies by media and the number of newspapers covered is not the same in all the countries. This data restriction forced us to make decision about the length and the number of newspapers that we have used to build our indexes. If we would have wanted to use more than one newspapers, time coverage will be reduce to less than 3 years of data. This is the reason why we decided to use only one newspaper per country and extend our database from 2003 to 2016. As we have noted before, this is the major weaknesses of our database since our indexes might be biased by different level of lobby powers of mining industries, government or others agents on the media coverage of conflicts in each country. However, if the levels of lobby power do not change among time, the indexes in each country only will be biased on level but the changes through time or changes caused by shocks might reflect ups and downs of conflict levels. This will only limit the cross country analysis but can be easily solved in any kind of regression strategy after including a fixed effect constant. However, more effort is needed in the future in order to reduce this potential pitfall.

We were able to download each country's largest paper in circulation. We downloaded *El Mercurio* for Chile, *Comercio* for Peru, Herald Sun for Australia and The Globe and Mail for Canada. We have information from November 2002 for *Mercurio*, October 2002 for *Comercio*, July 1997 for Herald Sun and December 1986 for The Globe and Mail. Since most newspapers have articles referring to other countries, we deleted those articles that contain the name of other countries as long as the name of the country of interest was not mentioned in the same news item. We decided to do our analysis from 2003 to the first semester of 2016 in order to have a balanced panel of data.

The way in which we identified conflicts is crucial. Like Calderon Gutierrez et al., (2013) we adopt a classic definition of social conflict as *"a process of contentious interaction between social actors and institutions, mobilized with varying degrees of organization and act collectively according to expectations of improvement, defense of the status quo or proposing a social counterproposal. A social conflict arises when a social group, actor or social movement (workers, entrepreneurs, farmers, indigenous people, teachers, civic movement, students, unions, academics, etc.) expresses a collective malaise situation so demands hostile through and violent measures pressure (strikes, marches, riots, demonstrations, making facilities, riots, etc.) against any public or private body"* (Calderon Gutierrez et al. (2013) p. 283).

Taking this definition, we chose a dictionary approach to detect these patterns in the news. We used the hostile words category of the Harvard IV-4 dictionary which includes 687 entries in English. We then translated them into Spanish and expanded the database by using synonyms for 1,325 words (see the appendix for more details).

Some comments are necessary. First, using the R program we remove the common termination of words by language, avoiding any possible complication derived from the conjugation of verbs, plurals and genders. Second, all words are rewritten in the lowercase; we excluded punctuation, accents and deleted common words in each language (like connectors) to avoid counting extra words that add no special meaning and may be used in different amounts in each idiom.

Finally, the statistical program R allowed us to systematize the routine to generate both indexes at a national level. However, we went further and divided the indexes of each country by state/region. To that end we again used text mining techniques. We categorized each article in terms of regions by

checking if it contained the name of the state, the name of the principal cities and/or the name of the mining sites in that state.

We created three alternative indexes that serve as proxy variables for the number of social conflicts related to natural resources. These indexes could be used for different purposes.

- **Conflictive news.** Let $CN_{i,t}$ be some news with conflict words about the country or region i at time t, then the conflict news index for each country/region is $CN_i = \sum_t CN_{i,t}$ and the total conflict news index for each period $CN_t = \sum_i CN_{i,t}$. This index can have numerous biases because, for example, it does not control whether conflict increases are due solely to an increasing trend in the number of published reports.
- **Standardized Conflictive news.** As in Baker, Bloom and Davis (2013), let $TN_{i,t}$ be some news items about mining in country/region i published in period t, the standardized conflict news index is $SCN_{i,t} = CN_{i,t} / TN_{i,t}$.
- **Conflict intensity**. Based on Garcia (2013) and Aromí (2013), we propose measuring the intensity of a conflict in a specific point in time and space as the ratio of the number of hostile words to the total number of words inside the subset of conflict news. Let $CW_{i,t}$ be the number of conflict words found in the conflict news and $TW_{i,t}$ the total number of words of these articles, we measure conflict intensity in country/region i during the period t as $CI_{i,t} = CW_{i,t}/TW_{i,t}$.

## 3. Social conflicts in mining

### 3.1. Cross-country comparisons

Table 1 below shows our basis data[3]. We collected 20.119 pieces of news about mining in the four newspapers between Q1 2003 and Q2 2016. The 78% of those pieces of news were conflictive news, showing that there is a pessimistic public sentiment about the mining activities. It is somewhat an expected outcome given that our unit of analysis if newspapers' news.

When we split the data in countries, some differences arise. First, $SCN_{i,t}$ is higher among developed countries: around 92% for both Australia and Canada. In Chile and Peru, in turn, the share of conflictive

[3] Our main indexes are free-available in monthly and annual frequency on https://sites.google.com/view/gabrielmpalazzo/original-databases. Our codes in R format are available upon request.

news is some 63%-66%. Regarding to conflict intensity, again we find higher values in developed countries, but in Canada the intensity seems somewhat higher than in Australia.

These results are just descriptive of our general findings and the database that we are building. However, they should not be interpreted as Australia and Canada having a higher conflict levels than Chile and Peru. First of all, since we are comparing indexes created from different newspapers, a higher proportion of $SCN_{i,t}$ or $CI_{i,t}$ could be explain by different consumers' preferences or interests as well as different writing styles from newspapers' journalists. Additionally, our difference in levels coincides with languages differences. We cannot discard that expressions in one or other languages differ in the way the native speakers express facts and their opinions. Finally, as we highlighted before, different levels might arise from different biases in the media. Then, we should interpret these results as indexes composed by different constants and focus on different behavior through time and their responses after relevant shocks from exogenous variables.

**Table 1**

Cross-country patterns in social conflicts in mining,

Q1 2003- Q2 2016

| **Country** | $\boldsymbol{TN_{i,t}}$ | $\boldsymbol{CN_{i,t}}$ | $\boldsymbol{SCN_{i,t}}$ | $\boldsymbol{CI_{i,t}}$ |
|---|---|---|---|---|
| Australia | 2,709 | 2,502 | 92,36% | 3,70% |
| Canada | 6,871 | 6,349 | 92,40% | 4,53% |
| Chile | 8,095 | 5,375 | 66,40% | 2,76% |
| Peru | 2,444 | 1,543 | 63,13% | 2,89% |
| **Total** | **20,119** | **15,769** | **78,37%** | **3,81%** |

Now we move to time patterns (see Table 2). Regarding the conflictive news index, $CN_{i,t}$, we detected three different sub-periods. One where social conflict shows an increasing trend (roughly from 2003 to 2006); other where it consistently drops (2007-2009) and the final one where it remains stable (although with two peaks: 2010 and 2014). The standardized index $SCN_{i,t}$, in turn, exhibits a different picture. During the period 2003-7 it shows a stable trend at relatively low levels, reflecting that conflictive news

grew *pari passu* total news; then, it jumps and stabilized at higher levels through the period 2008-2013; finally, it swings over the last years, peaking in 2015.

When we focus on conflict intensity, our index $CI_{i,t}$ detects a continuous increase in the intensity of social conflicts around mining from 2003 to 2010; then it diminishes, but slowly.

**Table 2**

Time patterns in social conflicts in mining,
all countries

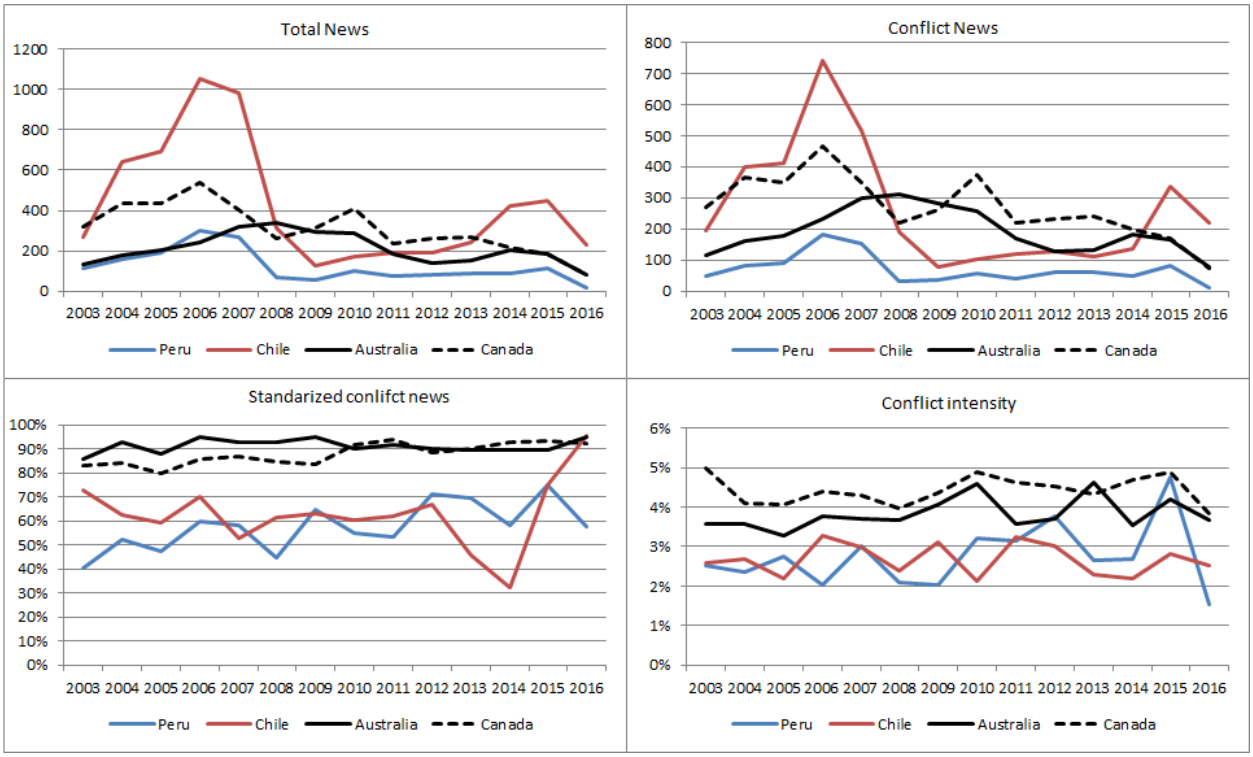
| **Period t** | $\boldsymbol{TN_{i,t}}$ | $\boldsymbol{CN_{i,t}}$ | $\boldsymbol{SCN_{i,t}}$ | $\boldsymbol{CI_{i,t}}$ |
|---|---|---|---|---|
| **2003** | 822 | 695 | 84.55% | 4.02% |
| **2004** | 1,394 | 1,049 | 75.25% | 3.42% |
| **2005** | 1,497 | 1,091 | 72.88% | 3.20% |
| **2006** | 2,128 | 1,637 | 76.93% | 3.62% |
| **2007** | 1,952 | 1,270 | 65.06% | 3.63% |
| **2008** | 953 | 664 | 69.67% | 3.47% |
| **2009** | 774 | 529 | 68.35% | 4.02% |
| **2010** | 938 | 755 | 80.49% | 4.42% |
| **2011** | 670 | 495 | 73.88% | 4.03% |
| **2012** | 669 | 541 | 80.87% | 4.03% |
| **2013** | 732 | 535 | 73.09% | 3.98% |
| **2014** | 908 | 502 | 55.29% | 3.75% |
| **2015** | 908 | 697 | 76.76% | 3.91% |
| **2016** | 406 | 373 | 91.87% | 2.99% |

Finally, Figure 1 exhibits the country-specific evolution of social conflict through time. Regarding both the total news index $TN_{i,t}$ and the conflictive news index $CN_{i,t}$, it is clear that they peaked somewhere during 2004-2008. The standardized index, in turn, reveals that the cross-country differences we mentioned before are present all the period under analysis. The index for Chile and Peru are more volatile than those of Australia and Canada, and Chile's social conflict grew heavily during the last two

years. Regarding conflict intensity, we highlight two things. First, that the Peruvian index in more volatile than the others; it means that Peru is subject to "explosions" of intensive conflicts that are not present in the other countries. The second is the ability of Chile to maintain its low intensity during the whole period.[4]

**Figure 1**

Time-variant, country-specific social conflicts in mining




Source: own elaboration

The main advantage of text-mining technique is that it allows us to process a huge amount of non-structured data without qualitative analysis. However, it could be informative to match some peaks with some important events. For example, in November 2010 there was peak on mining conflictive news in

[4] The lector should keep on mind that conflicts can arise in a specific territory but companies from different countries might be involved. These could be the case of companies from, for example, Canada had involved in conflicts in Africa or Chile. We have not been able to address these data challenges with our methodology and if the country´s newspaper is from Canada, it will be allocated as conflictive news of that country.

Canada due the controversial attempt of foreign takeover of Australia-based BHP Billiton of Potash Corp. The Canadian Prime Minister Stephen Harper blocked this attempt. In figure 1, this is reflected by a rise on conflictive news during 2010 in Canada. Another example is a strike occurred in December 2005 in Chile. Workers of "*El Ferrocarril de Antofagasta a Bolivia" (FCAB)*, a mining railroad from Antofagasta to Bolivia, went to a strike asking for higher wages. Also there was some controversy during those times since the exchange rate suffered an appreciation and mining firms were complaining about their profits. Finally, during the first months of 2006, some members of the opposition party questioned in the parliament the hiring processes of consultancies and services carried out by Codelco, the Chilean state owned copper mining company.

Those conflicts are some examples about what is capturing our indexes. However, we do not have an objective measure of conflicts to check the accuracy of our index. Then, it is not conclusive to try to check the accuracy of our indexes with newspapers articles, since they are our primary source of information for building the indexes. Our indexes are a first step in order to future documentation of civil conflicts related to mining activities.

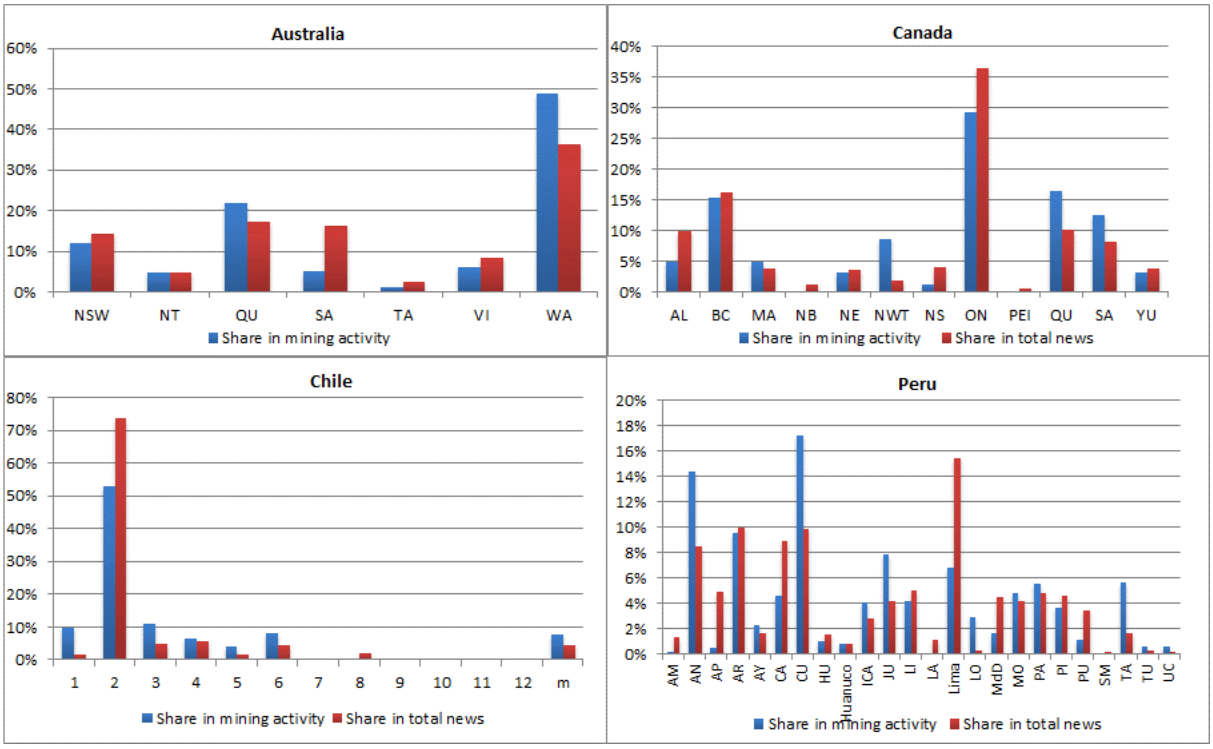
### 3.2. Social conflicts in mining (ii): cross-regional comparisons

Let us now focus on the regional level. We applied text mining to categorize each article by state to see whether it contained the name of the state, the principal cities or the name of the mining sites in that state.

**Figure 2**

Regional mapping of mining activities and mining news

Q1 2003- Q2 2016




Source: own elaboration

As was expected, the states with a higher level of total news are those where the mining sector is present. Figure 2 shows the relationship between shares in the national mining GDP (c. 2013-4) and the share in total news of each state in each country.

We found a clear correlation between both indexes. This correlation is particularly high in Canada (Ontario), Australia (Western Australia) and Chile (Region II), where the main state producer has the highest level of news about mining. The level of news drops as the mining sector becomes less important.

In Peru the correlation is weaker but remains high. The peak of total news is in Lima, the country´s capital, which ranks 5th in mining and exhibits 7% of the share. Although it is not the main producer (Ancash and Cusco are more important), it is not uncommon to find mining news in the capital city, where the congress and national politicians are located. Similar results are found in Argentina (Palazzo, 2017).

Now let us examine the regional mapping of social conflicts in mining (that is, obtain regional values for our standardized conflict index and our conflict intensity index). To analyze regional differences within

each country we will consider four distinct sub-groups; two of them are "exceptional" and refer to cases where the index reaches higher (lower) values than the average value plus (minus) one standard deviation. The members of the other two subgroups exhibit values above or below the average but within normal standards.

We start with the standardized conflict index. In Australia, Queensland is a region that can be characterized for its particularly high level of conflict. For one thing, the proportion of negative news surpasses 95% (92.3% is the average for the country as a whole). Western Australia and the Northern Territory, in turn, are characterized for their relatively low levels of conflict (about 90% of the news registers conflicts). The total variability, however, is relatively low (the coefficient of variation is 0.023).

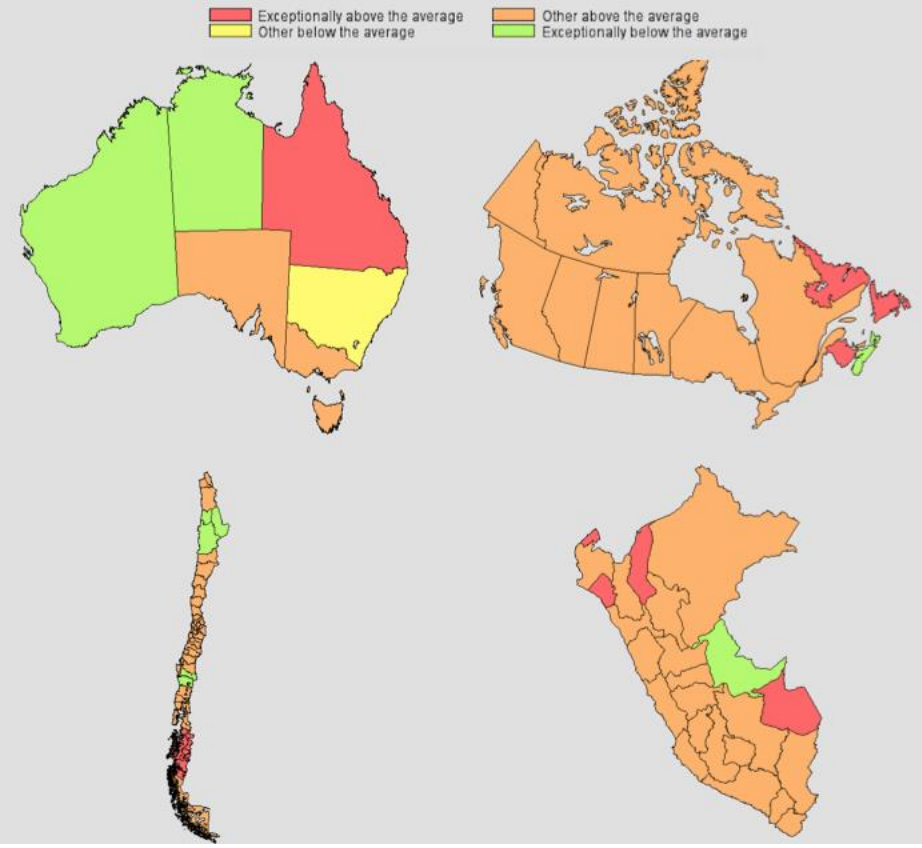
In Canada, the conflict index is also close to 92%. New Brunswick and Newfoundland, two eastern regions, are conspicuous for the wrong reasons; their share of negative news exceeds 95%. Across the ranking, Nova Scotia stands out for having the lowest level of conflict (84.5% of the news involves conflicts). It is only because of this case that the total variability index for Canada is higher than Australia's.

Chile has a lower level of conflict -an index close to 80%. The differences between regions are more marked than in the previous cases (and consequently the coefficient of variation is higher: 0:12). In some regions the index exceeds 85%; in others it is less than 70%. In the first case we can find three regions that are not traditionally related to mining: Region 11 (also known as Aysn), region 10 (Los Lagos) and region 12 (Magallanes). It is interesting to note that one of Chile's major mining areas, region 2, also known as Antofagasta, is -along with region 9 Araucana- the stratum of the regions with the lowest levels of conflict (where just 61% of the news is negative).

**Figure 3**

Regional mapping of the standardized conflict index

Q1 2003- Q2 2016



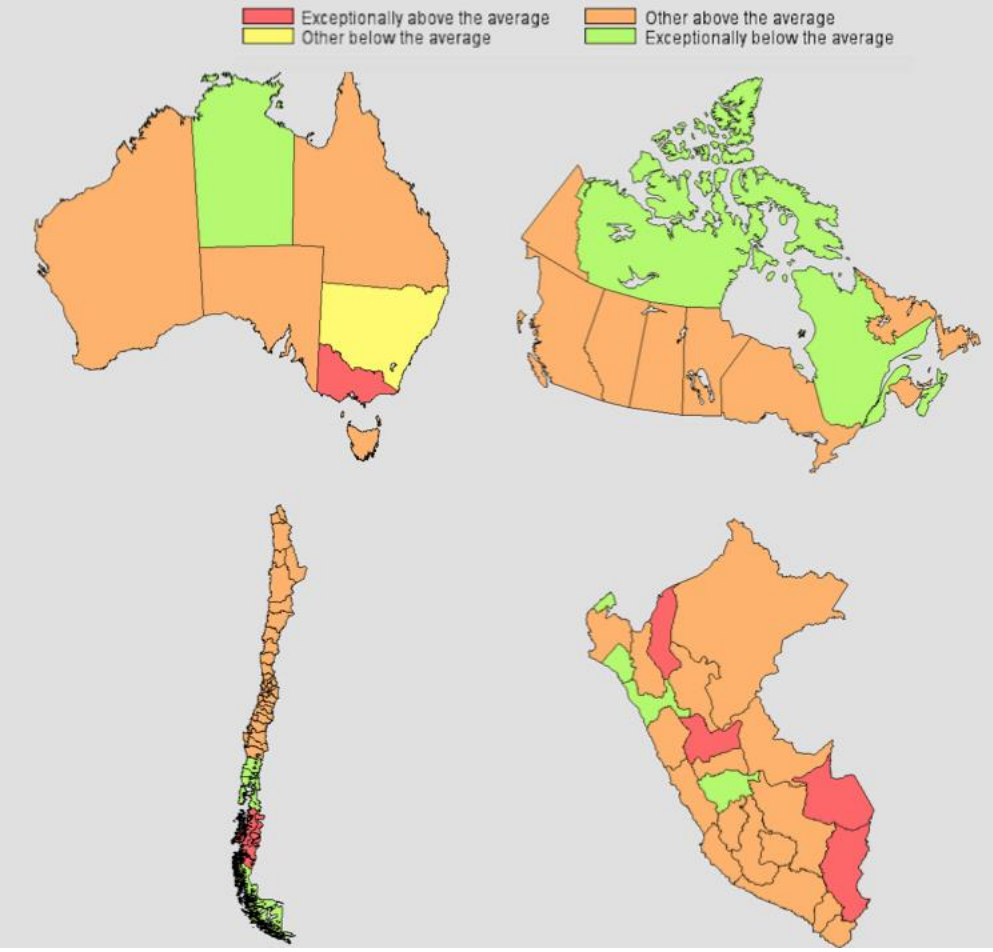

Source: own elaboration

Finally, in Peru the contrast between different regions is even starker: in some regions the conflict index is less than 50% while others approach 90% (the coefficient of variation rises to 0:23). Three regions are particularly controversial: Amazonas, Madre de Dios and Tumbes, while the Ucayali region stands out for having the lowest level of conflict associated with mining.

**Figure 4**

Regional mapping of the standardized intensity index

Q1 2003- Q2 2016




Source: own elaboration

Let us now consider the indicator intensity conflict (Figure 4). In the case of Australia, Victoria is the region with the greatest intensity conflict; almost one in twenty words is conflictive. Queensland, which has the highest level of conflict according to our index, recorded a not-so-high intensity, as was expected. At the other end, the Northern Territory, registering the lowest level of conflict, also recorded the lowest rate of intensity (one in every thirty words is adverse).

Canada's intensity of the conflict is much more homogeneous across regions: the variation coefficient is 0.045 and the percentage of negative words varies between 4.0% and 4.7%. Two regions stand out positively for their low intensity conflict: the North West Territories and Nova Scotia.

Regional disparities in the intensity of social conflicts are more pronounced in developing countries. In Chile, for example, regions such as Aysen (region 11), Maule (7) and O'Higgins (6) recorded high levels of

intensity conflicts, while Magallanes (12) and lakes (10) recorded the lowest levels. As a result of these differences, the variation coefficient reaches 0.20.

Peru's disparities are even greater. In four regions (Madre de Dios, Huanuco, Puno and Amazonas) the intensity of conflict is high: at least one in every thirty words refers to conflict. Four others, meanwhile, recorded low intensity conflict: Junin, La Libertad, Lambayeque and Tumbes). Variability recorded in Peru is the highest of the four countries under study with a variation coefficient reaching 0.25.

### 3.3. Social conflicts in mining (iii): intensity of conflict violence

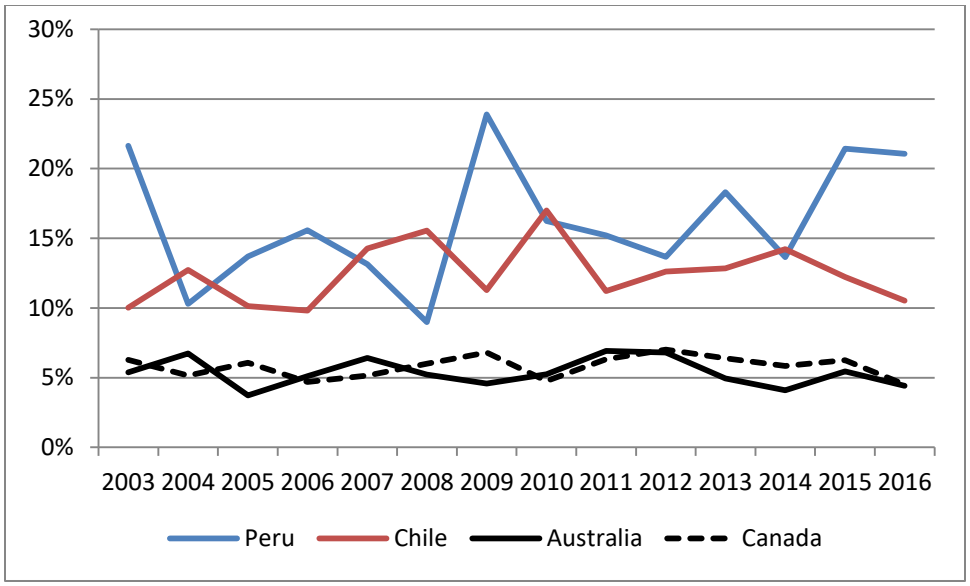
It may sound counterintuitive that our indexes of social conflicts concerning mining activities are higher in advanced countries than in emerging ones. Although we have already clarified possible methodological reasons and we have explained the way to use the indices that we think most appropriate, we will try to figure out some possible difference between the types of conflicts that our indexes are capturing in our country sample. One testable hypothesis is that our indexes in advanced countries are capturing softer conflicts than in developing countries. For example, in the way that we build our indexes, "death" has the same sense of conflict as "disagreement". Thus, we should redefine conflict intensity in a way that would allow us to discriminate between violent and non-violent conflicts.

Our strategy is as follows. We developed an index of violent conflict based on the share of conflict words in a given period/country that can be classified as violent, that is $VC_{i,t} = VW_{i,t}/CW_{i,t}$, where $VC_{i,t}$ is the index and $VW_{i,t}$ is the sum of violent words (the subgroup of hostile words that are violent can be found in the appendix). $CW_{i,t}$ is the sum of conflict words defined above. The Figure below presents the results.

**Figure 5**

Violent conflicts in Mining

2003- 2016




Source: own elaboration

Note there that, as was expected, violent conflicts in mining activities are more common in developing countries. In Australia and Canada the share of violent conflicts in total hostile conflicts is consistently around 5%. In Chile it yields a U-shaped curve through the period 2002-2016, averaging some 11%. In Peru it shows an increasing trend with high volatility and an average value of 15%. Our main hypothesis is that these findings might be related to weaker governance or less number of mechanisms available to solve and process social demands in developing countries which cause surges of violent conflicts. This strengthened because in developing countries suffer higher inequality and a more pronounced polarization, causing civil conflicts to be more violent than in developed countries.

On the other hand, some soft conflicts in developing countries might have less media coverage due higher power of the elites (owners of mining deposits) to soften unwanted news (in all this argumentation line see Nafziger and Auvien, 2002 and Sinnott et al., 2010). However, a deeper analysis is needed to understand this difference between developed and developing countries as well as a bigger sample of countries.

## 4. Some stylized facts from our database

### 4.1. Common drivers or country specific dynamics?

It is interesting to perform a deeper analysis about the correlation between our conflict indexes in our sample. In table 3 we show the correlation matrix using annual frequency of our different conflict indexes.

Correlation Matrix

| | **Conflict News** | | | | **Standardized Conflictive news** | | | |
|---|---|---|---|---|---|---|---|---|
| Country | Chile | Peru | Canada | Australia | Chile | Peru | Canada | Australia |
| Chile | 1 | | | | 1 | | | |
| Peru | 0.9337 | 1 | | | -0.023 | 1 | | |
| Canada | 0.6876 | 0.6976 | 1 | | -0.2708 | 0.514 | 1 | |
| Australia | 0.1821 | 0.1894 | 0.2793 | 1 | 0.0544 | 0.1963 | -0.056 | 1 |

| | **Conflicts intensity** | | | | **Violent conflicts intensity** | | | |
|---|---|---|---|---|---|---|---|---|
| Country | Chile | Peru | Canada | Australia | Chile | Peru | Canada | Australia |
| Chile | 1 | | | | 1 | | | |
| Peru | 0.0559 | 1 | | | -0.4069 | 1 | | |
| Canada | 0.0165 | 0.5365 | 1 | | -0.3009 | 0.3782 | 1 | |
| Australia | -0.1647 | 0.2451 | 0.3076 | 1 | 0.0878 | -0.2599 | -0.024 | 1 |

Source: own elaboration

Our correlation analysis using annual data shows that without any control, conflicts in mining industries countries do not covariate together. Only the number of conflict news between Chile, Peru and Canada show some positive and significant correlation. Australia does not correlate in a positive and statistically significant way with any of them. These results are confirmed using quarterly data and performing a factor analysis[5].

Factor loadings[6] and unique variances

[5] We exclude 8 monthly observations of our conflict intensity index from Chile because their values were five times the standard deviation above the mean. These extreme values were only present in Chile and it might bias our correlation matrix analysis.

[6] The factor loadings represent both how the variables are weighted for each factor but also the correlation between the variables and the factor.

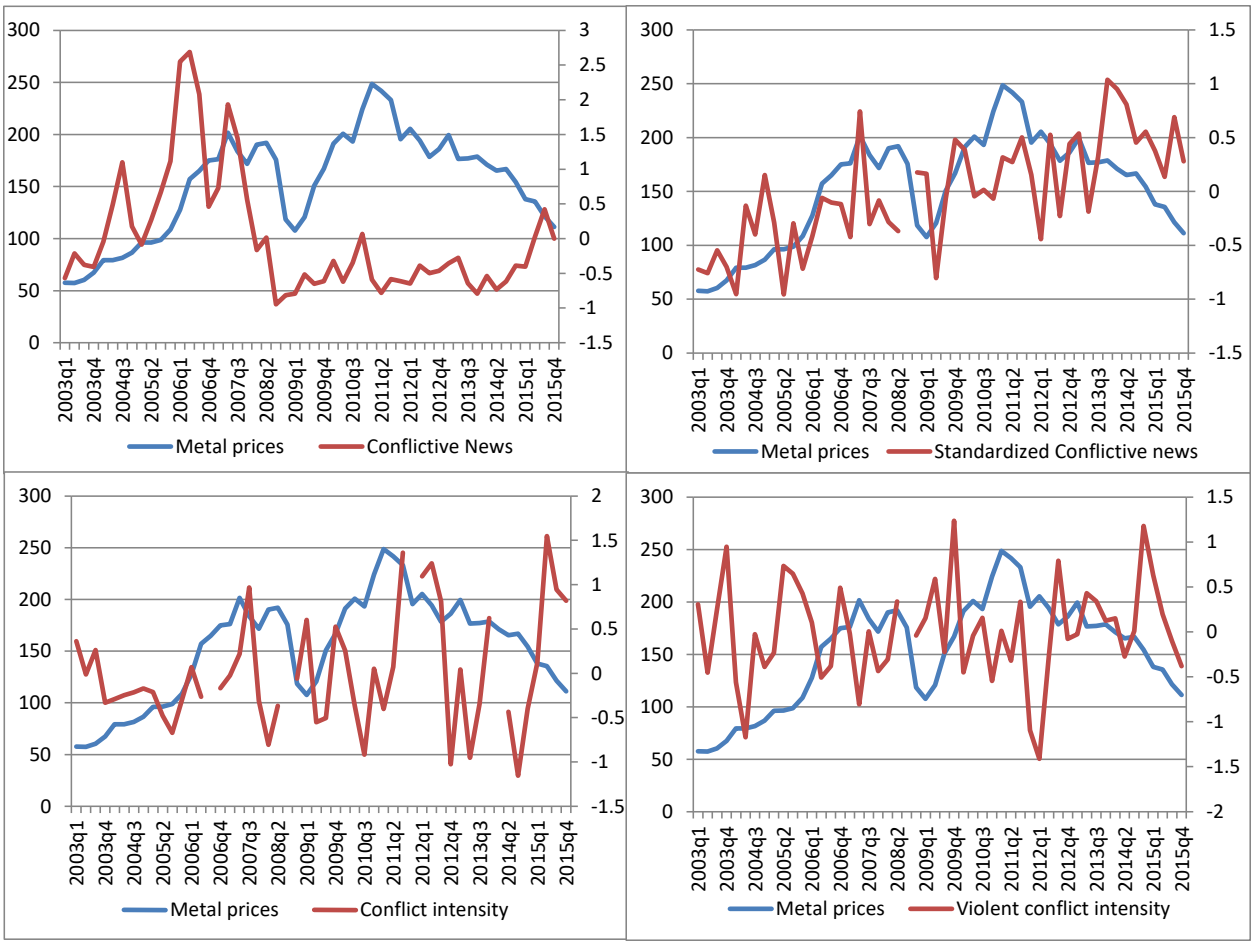
| | Conflict News | | | Standardized Conflictive news | | |
|---|---|---|---|---|---|---|
| Country | Factor 1 | Factor 2 | Uniqueness | Factor 1 | Factor 2 | Uniqueness |
| Chile | 0.8047 | -0.0213 | 0.352 | -0.2342 | 0.3098 | 0.8491 |
| Peru | 0.7634 | 0.0028 | 0.4172 | 0.2368 | 0.3054 | 0.8506 |
| Canada | 0.565 | 0.0043 | 0.6807 | 0.4341 | -0.0043 | 0.8115 |
| Australia | 0.1375 | 0.0916 | 0.9727 | 0.0658 | 0.0323 | 0.9946 |

| | Conflicts intensity | | | Violent conflicts intensity | | |
|---|---|---|---|---|---|---|
| Country | Factor 1 | Factor 2 | Uniqueness | Factor 1 | Factor 2 | Uniqueness |
| Chile | 0.5141 | -0.096 | 0.7265 | -0.098 | 0.1821 | 0.9572 |
| Peru | 0.505 | 0.0926 | 0.7364 | 0.28 | -0.1119 | 0.9091 |
| Canada | 0.2574 | 0.0478 | 0.9315 | 0.3582 | 0.1113 | 0.8593 |
| Australia | -0.0343 | 0.2837 | 0.9183 | -0.4298 | -0.0217 | 0.8148 |

Source: own elaboration

Uniqueness shows the proportion of the common variance of the variable not associated with the factors. Conflict news uniqueness is high in all countries but particularly in Australia. Additionally, $SCN_{i,t}$, $CI_{i,t}$, $VC_{i,t}$ uniqueness are very high in all the countries. The uniqueness averages are 0.876, 0.828 and 0.885 respectively for each one of the indexes mentioned before. These results may indicate that conflicts in mining industries emerge as local political and economic reasons and that different countries can manage common shocks in very different ways depending their institutional framework, industry and general social structure. Figure 6 show a visual exploration of the main factor of our conflict indexes and a metal price index provided by the International Financial Statistics (IFS) database. [7]Metal prices and main factor loading

[7] Metals Price Index, 2005 = 100, includes Copper, Aluminum, Iron Ore, Tin, Nickel, Zinc, Lead, and Uranium Price Indices




Source: own elaboration

There are not evident conclusions to sum up from figure 6 and we have to keep on mind that the uniqueness of each series is very high. However, it is interesting to summarize some facts from common factor performance of each series and their relationship to metal prices evolution. Starting for the bottom, both series related to conflict and violent intensity do not seem related to metal price index trend. So, we do not run any econometric analysis in this subsection.

Regarding to the evolution of conflictive news (top left plot), there is an upward common trend until 2007 that disappeared after 2008. That trend was accompanied by a strong increase of metal prices seems broken since 2008. One possible explanation might be that the international financial crisis keeps the focus of the media in other kind of news in some countries of our sample. Another reason could be that the number of total conflicts related to mining became more country specific after the crisis.

If our first explanation is right, this issue may be corrected using the standardize conflictive news indexes, which is built in order to correct the total number of conflictive news dividing them by the total number of news related to mining activities. The main factor of standardize conflictive news index (top right plot) shows an upward trend which last until the end of the sample. The positive relationship between both series could be guided by a spurious correlation if both series are I(1).

We perform the augmented Dickey-Fuller test. The null hypothesis is that the variable contains a unit root, and the alternative is that the variable was generated by a stationary process. Since both series show a unit-root process[8],but the first difference is stationary, we test for a cointegration relationship following Engle-Granger methodology.[9]

Using different numbers of lags suggested by likelihood-ratio (1 lag), SBIC (1 lag), AIC (3 lags), FPE (3 lags) and HQIC (2 lags) tests, we cannot reject the null hypothesis of no cointegration. The only case that can reject the null hypothesis of no cointegration is when we select zero lags, but this is not suggested by any lags selection criteria. Then, we perform a VAR analysis in differences to shed some light between these variables. Since these countries are big players in metals production, common conflict trends might cause also some variation in prices due less/more production. We estimated a VAR model, using one lag (suggested by the all different tests performed) without imposing any restriction. They classical specification of a VAR(1) model is the following:

$$y_{1,t} = c_1 + a_{1,1}y_{1,t-1} + a_{1,2}y_{2,t-1} + e_{1,t}$$

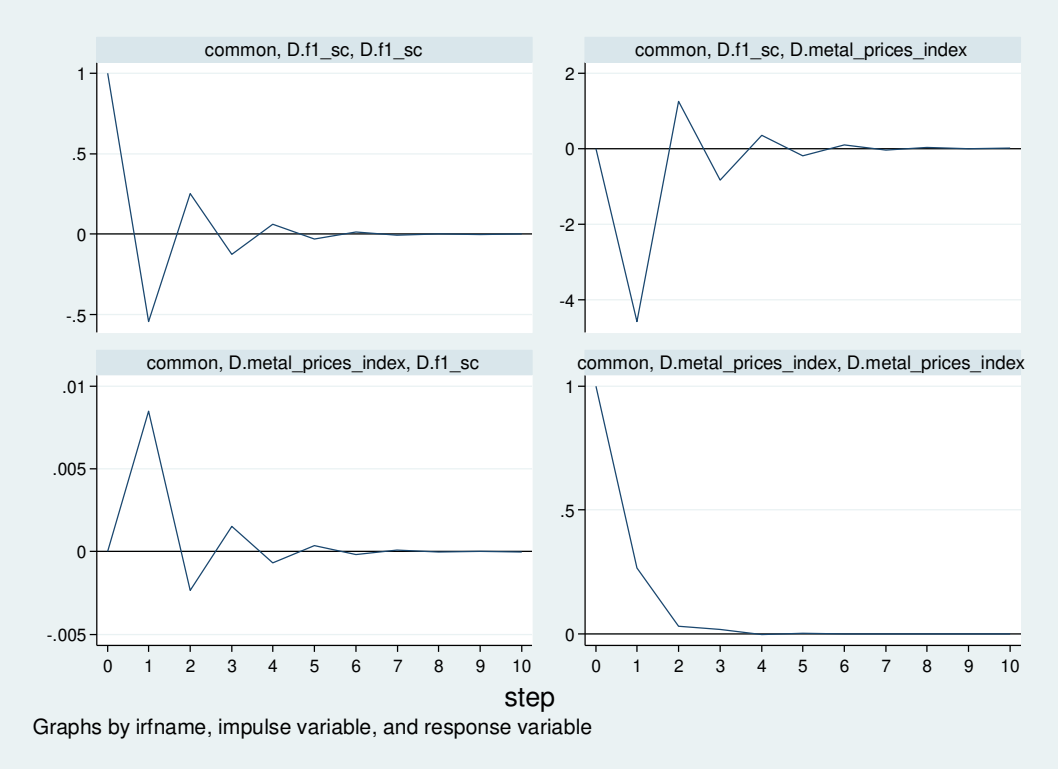
$$y_{2,t} = c_1 + a_{2,1}y_{1,t-1} + a_{2,2}y_{2,t-1} + e_{1,t}$$

Where, in our case, $y_{1,t}$ is the first difference of the metal price index provided by the IFS and $y_{2,t}$ is the first difference of the first loading factor of $SCN_{i,t}$ (which is called $F1_{SC_{i,t}}$ in table B. 2 ). Figure 7 shows the impulse–response function and in the appendix B, table B.2 we reproduce our results.

Impulse–response function: Metal prices and main factor loading

[8] We select the number of lags using AIC criteria.

[9] See table 1.B in Appendix B for Augmented Dickey-Fuller tests on variables and residuals. Performing this test on the residuals we checked for cointegration relationship. We report the correct critical value for each test.




Source: own elaboration

The analysis shows one interesting finding. The bottom left panel shows that a structural innovation in metal prices predict an increase in the standardize conflict index during the next quarter. This is not precisely estimated and if we impose a Cholesky decomposition (ordering first metal prices indexes) the coefficient is not different to 0 at normal significant levels but still keeps the sign. However, we believe that this is an interesting prediction from a simple VAR model and may be a fruitful research line for the future and it is in line with the finding of Dube and Vargas (2013) to oil price shocks in Colombia.

## 4.2. Panel regressions

In this section, we go deeper in the relationship of conflicts, prices, mineral rents and general economic performance. We will take advantage of our panel database and relate our main index to metal commodity prices, mineral rents as % of GDP and GDP per capita (constant 2010 USD). The last two variables are provided by World Bank development indicators database. We use annual data due our main possible determinants are given in annual frequency.

We perform the analysis on Standardize Conflictive News index ($SCN_{i,t}$), Conflict Intensity index ($CI_{i,t}$), Violent News in % of Conflictive News and Violent Conflict intensity ($VC_{i,t}$). All regression models use fixed country effects estimators and year fixed effects[10]. Our preferred regression model is the following:

$$\ln(SCN_{i,t}) = \beta_0 + \beta_1 \ln(MR_{i,t}) + \beta_2 \ln(GDP_{i,t}) + f_i + f_t + \epsilon_{j,t}$$

*Where* $MR_{i,t}$ is the mineral rents in percentage of GDP of country i in the year t, $GDP_{i,t}$ is the gross domestic product of each country at each year, and $f_i$ and $f_t$ are time and country fixed effects. However, we also tested replacing $MR_{i,t}$ by the metal price index and the level of GDP by the growth rate of GDP. All our regressions should be interpreted with caution since reverse causality has not been properly taken into account in our analysis. However, the type of conflict do not seems as important to cause a fall in the production that affects commodity prices. Our main results are shown in table 5.

Standardize Conflictive News index :

Fixed effects regression – Annual frequency

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| VARIABLES | ln(sc_index) | ln(sc_index) | ln(sc_index) | ln(sc_index) | ln(sc_index) | ln(sc_index) |
| ln(mineral rents % of GDP) | 0.222*** | 0.214*** | 0.226*** | | | |
| | (0.0709) | (0.0725) | (0.0751) | | | |
| ln(metal_prices_index) | | | | 0.0559 | -0.00492 | 0.0449 |
| | | | | (0.0789) | (0.0972) | (0.0814) |
| ln(GDP per capita - constant 2010 usd) | | 0.212 | | | 0.368 | |
| | | (0.317) | | | (0.346) | |
| first difference_ln(GDP per capita - constant 2010 usd) | | | -0.385 | | | 1.224 |
| | | | (1.844) | | | (1.958) |
| Constant | -0.372*** | -2.433 | -0.364*** | -0.620 | -3.946 | -0.600 |
| | (0.0668) | (3.085) | (0.0785) | (0.380) | (3.146) | (0.385) |
| Observations | 52 | 52 | 52 | 52 | 52 | 52 |
| R-squared | 0.412 | 0.420 | 0.413 | 0.248 | 0.272 | 0.256 |
| Country and year effects | YES | YES | YES | YES | YES | YES |
| Number of country_num | 4 | 4 | 4 | 4 | 4 | 4 |

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: own elaboration

[10] Visual inspection to $SCN_{i,t}$ index may allow us to conclude that those series are not I(1). However, we performed Im-Pesaran-Shin test in stata with AIC as criteria to lag selection. We reject the H0 that all the panels contain unit root with a p-value of 0.0185.

We find a positive and significant covariance between mineral rents in % of GDP and $SCN_{i,t}$. This variable is stable and keeps its sign and significance even though we include GDP per capita or the first difference of GDP per capita. This variable seems to be the relevant determinant and not metal price index, which is not significant when it is included alone or with the GDP per capita or the first difference of GDP per capita. Mineral rents in % of GDP might be more accurate since it varies through countries while metal price index is the same index for all countries.

One possible interpretation of our results is that higher mineral rents increase conflicts due to different agents trying to appropriate a higher percentage of mining rents. Those agents could be the government, domestic firms, foreign firms or workers. This is in line with the literature of resource curse mentioned before (i.e. Brunnschweiler and Bulte, 2009) but also with Dube and Vargas (2013) which finds similar evidence for oil rents in Colombia. In terms of those authors this is called the *rapacity effect*. Palazzo (2017) arrives to a similar conclusion for Argentina and agricultural goods.

When we use the number of violent news to number of conflictive news as an index, we do not find any clear relationship between this variable and metal price index, mineral rents in % of GDP and GDP per capita (see table 3.B in Appendix B). Additionally, our attempts to find determinants for conflict intensity and violent conflict intensity are not successful. Finally, we have run the same regression model adding and changing some independent variable but any of our determinant candidates were statistically significant[11].

To sum up, all results should be taken with caution since our sample is small and we do not take care about endogeneity issues properly. However, it is interesting to find correlation between the standardize conflict index and mineral rents since it is in line with the literature of resource curse. These results reinforce our previous section findings, in which we found that the common factor of $SCN_{i,t}$ seems to be predicted by a rise of metal prices.

## 5. **Conclusions**

[11] For example, we tested if political cycle is related to civil conflicts in mining activities. The political cycle variable was created defining a dummy equal to 1 if the country was having running in presidential of federal government elections during that period. If the elections have been taken place before the first quarter, we define the previous year as the election year. In other case, it is the same year. Results are available under request.

In this paper we study the social conflicts concerning mining activities in four mining countries applying text mining techniques to the leading newspapers in each country for the period 2003-2016. Our main achievement is different measures of conflicts and conflict intensity that are available for further research.

It is important to keep on mind that the cross-country difference could surge because media biases, differences in languages expressions and ways to communicate news, different interests or preferences of the newspapers readers which bias the way journalist to write news, among others. We think that this is a first step trying to understand and measure civil conflicts related to mining activities. However, the major findings are as follows.

First, we characterize cross country difference between Canada, Australia, Chile and Peru as well as time series partner in each country. In advanced countries the level of conflict news is stable and consistently higher than that recorded in developing countries. In these, however, there is a more favorable perception of mining activities by media coverage, but some conflicts arise throughout the period.

Second, we computed differences between the two groups of countries. Of the developed countries, Canada shows an increasing trend (starting in lower values) in the level of conflicts, while the intensity of conflict in Canada is higher than in Australia. In developing countries, in turn, while Peru exhibits a growing trend for both the level and the intensity of social conflict, Chile reveals volatility but not a definite trend. In particular, the intensity of conflict in Chile stands out as low and stable. On splitting social conflicts into violent and non-violent, we found a bias in emerging countries towards the former, particularly in the case of conflict intensity.

Third, some interesting results emerge if we measure social conflict at the subnational level. We detect that the amount of news obtained from our mining technique matches the economic importance of this activity. In addition, the average level of conflict in developed countries for the period as a whole is fairly homogeneous across regions, while the disparities are profound in developing countries. Finally, the intensity of conflict is also quite homogeneous in advanced countries and heterogeneous in developing countries (especially in Peru).

Fourth, we explore how much are related those conflicts between countries. We perform a common factors analysis and we conclude that the idiosyncratic component of each country excels when

determining levels of conflicts. Though, the common factor that is left is positive related to general index of metal prices. A higher level of metal prices might predict a higher level of conflicts.

Finally, we reinforce this conclusion performing a panel data regression model. We have found a positive relationship between the Standardize Conflictive News index and mineral rents in percentage of GDP. This result is line with the rapacity effect reported by Dube and Vargas (2013) and the literature of resource curse. However, we should take our results with caution since our sample is small and we do not take care properly of endogeneity issues.

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**Appendix: Hostile and violent words in the text mining exercise**

**Hostile words in English:** abhor, abolish, abrasive, abscond, absentee, abuse, accost, accursed, accusation, accuse, acrimonious, acrimony, admonish, adversary, afflict, aggravate, aggravation, aggression, aggressive, aggressiveness, aggressor, aggrieve, agitator, alienate, allegation, altercation, ambush, anarchist, anarchy, anger, angry, anguish, animosity, annihilate, annihilation, annoy, annoyance, antagonism, antagonist, antagonistic, antagonize, argue, argument, arm, armed, arrest, arrow, assail, assailant, assassin, assassinate, assault, attack, attacker, austere, avenge, aversion, avert, avoid, avoidance, bandit, banish, barbarian, barbarous, bastard, battle, battlefield, beastly, beat, behead, belie, belittle, belligerent, belt, bereave, berserk, besiege, betray, betrayal, beware, bit, bitchy, bite, bitter, blame, blind, block, bloodshed, bloodthirsty, blurt, bomb, bombard, bombardment, bother, bout, boycott, brandish, brawl, breach, break, bristle, broke, brusque, brutality, brute, brutish, bug, bullet, burglar, burglary, butchery, callous, cannibal, cannon, capture, cataclysm, caught, censure, challenge, charge, chase, chastise, cheat, chide, chip, choke, clash, collide, collision, combat, combatant, compel, compete, competition, competitive, competitor, complain, complaint, compulsion, conceal, conceit, condemn, condemnation, condescending, condescension, conflict, confront, confrontation, conspiracy, constrain, contaminate, contamination, contempt, contemptible, contemptuous, contend, contest, contradict, convict, corruption, coup, cranky, crass, criminal, cripple, critic, criticize, crooked, crop, cross, cruel, cruelty, crush, crushing, curse, curt, cut, cynical, dagger, damage, damn, damnable, damned, deadlock, deadly, deceit, deceitful, deceive, deception, deceptive, defeat, defensive, defiance, defiant, defile, defy, degrade, demean, demolish, demon, demoralize, denial, denounce, deny, deplore, depose, deprive, deride, derision, derogatory, desert, despise, destroy, destruction, destructive, deterrent, detest, devastate, devastation, devil, devilish, devious, diabolic, diabolical, disagree, disagreeable, disagreement, disapprove, disavow, disavowal, disbelief, discord, discordant, discourage, discredit, discrepant, discrimination, disgust, dislike, dismiss, disobedience, disobedient, displeasure, dispose, disputable, dispute, disrupt, disruption, dissatisfied, dissent, dissention, distort, distrust, disturb, disturbance, ditch, divorce, drag, dump, egotistical, endanger, enemy, enforce, engulf, enrage, entanglement, epithet, escape, exception, exclude, exclusion, excommunication, execute, execution, exile, expel, exploit, fail, fallout, ferocious, ferocity, feud, fiend, fierce, fight, fighter, fire, fist, fled, floor, foe, fool, force, foreboding, fought, frighten, frown, frustrate, fun, furious, fury, germ, goddamn, grab, grapple, grenade, grudge, grumble, guerrilla, gun, gunmen, hamper, hang, harass, harassment, harm, harsh, hassle, hate, hater, hatred, haunt, heartless, hedge, heinous, hidden, hide, hinder, hindrance, hit,

horrify, horror, hostile, hostility, humiliate, hunt, hunter, hurt, hustle, hustler, impair, impatience, impede, impediment, implicate, indictment, indignation, infect, infection, infiltration, inflame, infringement, infuriate, inhibit, inhibition, inhumane, injunction, injurious, injury, insolence, insolent, interfere, interference, interrupt, interruption, intrusion, irk, irritable, irritation, jagged, jail, jeer, jeopardize, jerk, kick, kidnap, kill, killer, knife, knock, laid, lawless, liar, lie, limit, liquidate, liquidation, litigant, litigation, lying, mad, malice, malicious, malignant, mangle, manslaughter, marksman, massacre, merciless, misbehave, mislead, missile, mob, molest, monster, monstrous, murder, murderous, mutter, nag, nasty, naughty, needle, negate, neglect, nigger, nightmare, obliterate, obnoxious, obstinate, obstruct, offend, offender, offensive, ominous, opponent, oppose, opposition, oppress, oppression, ostracize, oust, outlaw, outrage, pan, parasite, pass, penalty, penetrate, penetration, persecute, persecution, pinch, pistol, plague, plight, poisonous, pollute, posse, prejudice, pretend, pretense, prosecution, protest, provocation, provoke, prowl, punch, punish, push, quarrel, quarrelsome, quibble, rage, raid, raise, ravage, reactive, rebel, rebellion, rebellious, rebuff, rebuke, rebut, recalcitrant, refusal, refuse, reject, rejection, renounce, renunciation, repel, reproach, repulse, resent, resentful, resentment, resist, resistance, restrain, restrict, retaliate, retard, revenge, revolt, revolution, revolutionary, rid, ridicule, rifle, rip, rival, rivalry, robber, robbery, rogue, ruffian, ruinous, rumple, rupture, ruthless, ruthlessness, sabotage, sarcasm, sarcastic, savage, scandalous, scare, scared, scold, scorch, scorn, scornful, scoundrel, scowl, scuffle, seethe, segregation, sever, shadow, shaft, shatter, shock, shoot, shot, shove, shred, shrew, shrug, shudder, shun, shut, sick, siege, sinister, skirmish, slam, slander, slanderer, slanderous, slap, slash, slaughter, slayer, sleazy, slight, sly, smack, smash, smear, snarl, snatch, spank, spear, spite, spiteful, split, spoil, stab, stall, stamp, startle, steal, stern, stifle, sting, stole, stolen, stone, stop, storm, stormy, strangle, strife, strike, stringent, strip, struck, struggle, stubborn, stubbornly, stubbornness, stun, subdue, subversion, subvert, sunder, suppress, suppression, suspect, suspicion, suspicious, sword, taboo, taint, tamper, tantrum, taunt, tear, tease, temper, tempest, tense, terrorism, terrorize, theft, thief, thorny, thrash, threat, threaten, thwart, tire, tired, tnt, torment, tough, traitor, trample, trap, treacherous, treachery, treason, treasonous, trick, trigger, turbulent, ultimatum, undermine, unfair, unjust, unjustified, unleash, unruly, unsafe, untruth, unwilling, unwillingness, uprising, upset, usurp, vengeance, venom, venomous, vicious, victim, vie, villain, violate, violation, violence, violent, wait, walk, war, warlike, warrior, weapon, weed, wench, whack, whine, whip, wicked, wickedness, wily, witch, witchcraft, withheld, withhold, withstand, worry, wound, wrath, wreck, wrestle, wrong.

**Violent words in English:** aggressive, aggressiveness, ambush, arm, armed, assault, attack, beat, belt, bloodthirsty, bomb, brutality, bullet, butchery, crush, crushing, deadly, fire, guerrilla, gun, gunmen, kill, killer, monster, monstrous, murder, rebel, rebellion, slash, slayer, violence, violent, warrior, whip.

**Hostile words in Spanish:** abatir, abdicación, abdicar, abofetear, abolición, abolir, abominación, abominado, abominar, aborrecer, aborrecido, aborrecimiento, aborrezco, abrumar, abuchear, abucheo, abusar, abusivo, abuso, abyecto, acéfalo, acérrimamente, acérrimo, aciago, acobardar, acogotar, acorralamiento, acorralar, acosamiento, acribillar, acritud, acuchillar, acusación, adulterino, aflicción, afligido, afligir, agitación, agitador, agobiar, agobio, agolpamiento, agraviante, agraviar, agravio, agredir, agresión, agresividad, agresivo, agresor, ahogamiento, ahogar, ahogo, ahorcamiento, ahorcar, ahuyentar, ajusticiar, ajusticiamiento, alabarda, alboroto, alegación, alegato, alevosía, alienar, altercado, alzamiento, alzarse, embaucador, amedrentar, amenaza, amenazador, amenazar, ametralladora, ametrallar, amilanar, amohinado, amonestar, amotinador, amotinarse, amputar, anarquía, anárquico, anarquista, anatema, angustia, angustiado, animadversión, animosidad, aniquilación, aniquilamiento, aniquilar, anormalidad, antagónica, antagonismo, antagonista, antihigiénico, anticristo, apedrear, apercibir, apesadumbrado, apesumbrar, aporrear, aprehender, apremio, apresamiento, apresar, aprieto, aprisionamiento, aprisionar, apuntar, apuñalar, arma, armamento, armas, arpía, arrebatar, arredrar, arremeter, arremetida, arrestar, arresto, arrinconar, arrogancia, arrogante, artero, artimaña, asaltado, asaltador, asaltante, asaltar, asalto, asco, asechada, asechanza, asechar, asediar, asesinar, asesinato, asesino, asfixia, asfixiar, asolación, asolar, asustar, atacante, atacar, ataque, atemorizar, atentado, atentar, aterrador, aterrar, aterrarse, aterrorizar, atizo, atormentado, atormentar, atosigamiento, atosigar, atracador, atracando, atracar, atraco, atraco, atrocidad, atroz, austero, avasallamiento, avasallar, bandolero, bastardo, batalla, batallador, batallando, batallar, bayoneta, belcebú, bélico, belicosidad, belicoso, beligerante, bellaco, bestialidad, blasfemar, blasfemia, boicot, boicotear, boicoteo, bomba, bombardear, bombardeo, bravucón, bribón, bronca, cacheteada, cachetear, cachiporra, calamidad, calumnia, calumniador, calumniando, calumniar, calumnioso, calvario, camorrista, canalla, carabina, castigar, castigo, cataclismo, catástrofe, caustico, celada, censura, censurar, cercenar, chantaje, chantajista, chiflado, chiflarse, cicatero, cínica, claudicar, cleptómano, coacción, coercer, cohecho, cohibir, cólera, colérico, coletazo, combate, combatiendo, combatiente, combatir, combatividad, combativo, complot, complotar, compulsión, condena, condenado, condenar, confabulación, confabular, confiscación, confiscar, conflagración, conflagración, conflicto, confrontación, confrontar, conjuración, conjurar, conminación, conspiración, conspirador, conspirar, constreñir,

consternar, constreñir, contaminación, contaminado, contaminar, contender, contendiente, contestatario, contienda, contradecir, contradictorio, contraponer, contraproducente, contrincante, controversia, controvertir, contumacia, convicto, convulsión, convulsionar, corrompido, corrupción, corruptela, crimen, criminal, crispar, cruel, crueldad, cuartelazo, cuatrero, cuchillo, cuestionar, culpa, culpable, culpar, daga, damnificación, damnificado, damnificar, dañino, decapitar, defensivo, defraudado, defraudando, defraudar, defraudo, degollar, degollina, degradar, degradarse, dejadez, delincuente, demonio, denegar, denigración, denigrante, denigrar, denigrativo, denuncia, denunciar, deponer, deportación, deportar, depravado, depredar, derogación, derribar, derrotar, derruir, desacato, desacreditar, desacuerdo, desafiante, desafiar, desafuero, desagradable, desagraviar, desalentar, desalmado, desalojar, desalojo, desanimar, desaparecer, desapoderamiento, desaprobación, desaprobar, desaprueba, desasosiego, desastre, desatender, desatinar, desautorización, desautorizar, desavenencia, desazón, desbaratar, descabezado, descalabrar, descalificación, descalificar, descarado, descaro, descontento, descorazonar, descuartizar, descuidar, descuidero, descuido, desdecir, desdén, desdeñoso, desdichado, desencantado, desengañar, desequilibrarse, deserción, desertar, desertor, desesperación, desesperanzar, desestimar, desfalco, desfigurar, desgana, desgarrar, desgraciado, deshacer, deshacerse, deshecho, deshilachar, deshizo, deshonesto, deshonra, deshonrar, desidia, desigualdad, desilusión, desilusionar, desistimiento, desistir, desleal, deslealtad, desmantelado, desmantelar, desmembrar, desmentir, desmoralizar, desnucar, desobediencia, desobediente, desolación, desolar, desparecer, despecho, despectivo, despedazado, despedazar, despedido, despedir, despiadado, despidos, despojado, despojar, desposeer, déspota, despotismo, despotricar, despreciable, despreciado, despreciar, desprecio, desprestigiar, desquiciado, desquiciar, desquitar, desquitarse, desquite, destacamento, desterrado, desterrar, destierro, destituido, destituir, destripar, destrozado, destrozar, destrucción, destructivo, destructor, destruir, desunión, desunir, desvergonzado, desvergüenza, detención, detestable, detestar, detesto, detonación, detonador, detonar, detractar, desunión, devastación, devastar, diablo, diabólico, dictadura, difamación, difamador, difamar, difamatorio, difunto, dimisión, dimitir, díscolo, disconformidad, discordante, discordia, discrepancia, discrepante, discrepar, discriminación, discriminar, discusión, discutiendo, discutir, disensión, disentimiento, disentir, disgustado, disgustar, disgusto, disimulo, dislocación, dislocar, disolución, disoluto, disonancia, disputa, disputable, disputar, disputarse, distorsionar, disturbio, disuasivo, disuasorio, doblegarse, dolorido, dominación, embarullar, embate, embaucar, embestida, embestir, emboscada, emboscar, embrollar, embuste, embustero, embustir, emponzoñar, enajenar, enardecer, enardecido, encarcelamiento, encarcelar, encizañar, encolerizado, encolerizar, encrespar, enemigo,

enemistad, enemistar, enemistarse, enervar, enfadado, enfadar, enfadarse, enfado, enfrentado, enfrentamiento, enfrentar, enfurecer, enfurecido, enfurecimiento, engañando, engañar, engaño, engañosa, engañoso, engatusar, engendro, engorro, engreimiento, enjuiciamiento, enjuiciar, enloquecer, enloquecido, enmascarar, enojado, enojar, enojo, ensañamiento, entorpecer, entristecer, envenenar, enviciar, envilecer, epidemia, escandalo, escaramuza, escarmentar, escarmiento, escarnio, escepticismo, escéptico, esclavitud, esclavizar, esclavo, escopeta, esfumarse, espada, espantar, espantarse, espinoso, espurio, estacazo, estafa, estafador, estafando, estafar, estafo, estallar, estallido, estigma, estigmatizar, estrago, estrangulación, estrangulamiento, estrangular, estremecer, estremecimiento, estremezco, estropeado, estropear, estuprar, evadir, evadirse, evasión, exabrupto, exasperación, exasperar, exclusión, exilio, expatriación, expatriado, expiación, explosión, explosionar, explosivo, explotar, expropiación, expulsar, expulsión, exterminar, exterminio, extinción, extirpar, extorsión, extralimitación, falsificación, falsificando, falsificar, fanfarrón, farfullar, farsa, farsante, fascismo, fastidiar, fastidio, fastidioso, fatal, fatídico, felonía, flagelar, flagelo, flecha, follón, forajido, forzado, forzar, fraccionar, fractura, fracturado, fracturar, fragmentar, francotirador, fratricida, fratricidio, fraude, frustración, frustrar, frustrarse, fuga, fugar, fugarse, funesto, furia, furioso, furtivo, fusil, fusilar, fusta, fusta, fustigar, gánster, garrocha, garrote, gatillo, golpe, golpeado, golpear, golpeo, golpismo, golpiza, granada, granuja, gresca, grilletes, grima, guerra, guerrear, guerrero, guerrilla, guerrillero, guillotinar, hastiado, hecatombe, herida, herido, herir, hipócrita, holocausto, homicida, homicidio, horrendo, horror, horrorizar, horrorizarse, hostigarían, hostigamiento, hostigar, hostil, hostilidad, hostilidades, hostilizar, huelga, huida, huir, humillante, humillar, hurtado, hurtando, hurtar, hurto, huyo, ignorado, ignorancia, ignorar, ilegal, ilegalidad, ilegitimo, ilícito, impedimento, impedir, impeler, impertinente, impiedad, implacable, implosión, impostor, improcedente, improperio, impúdico, impugnar, impurificar, imputación, imputar, inaceptable, incautación, accidentado, incinerar, incitación, incitar, incomodar, incomodidad, incompatibilidad, incompatible, inconmovible, inconsolable, incordiar, incordio, incredulidad, incrédulo, increpar, incriminación, incriminar, inculpación, inculpar, incumplimiento, indebido, indecente, indecoroso, indemnizar, indiferente, indignación, indignado, indigno, indisciplina, indocilidad, indolencia, indomable, ineptitud, inequidad, inescrupuloso, infamador, infamante, infamar, infame, infamia, infección, infectar, infecto, infestación, infestar, inficionar, ingrato, inhabilitación, inhabilitar, inhibición, inhibir, inhumano, injuria, injuriar, injurioso, injusticia, injustificado, injusto, inmerecido, inmolación, inmolado, inmolar, inmoral, inmundo, innoble, inoculación, inquina, insalubre, insano, insatisfecho, inseguro, insensible, insidia, insidioso, insolencia, insolente, instigación, instigador, instigar, insubordinación, insubordinado, insubordinarse, insultante, insultar, insulto,

insumisión, insumiso, insurgente, insurrección, insurreccionarse, insurrecto, interferencia, interferir, intimidación, intimidar, intranquilidad, intranquilo, intransigencia, intransigente, intromisión, intrusión, inutilizar, invadido, invadir, invasión, iracundo, irascible, irracional, irracionalidad, irrazonable, irrespetuosidad, irreverencia, irrisorio, irritable, irritación, irritado, irritante, irritar, irrumpir, irrupción, jactancioso, jorobar, juzgar, laceración, lacerar, ladino, ladrón, lanceta, lapidar, lastimar, litigar, latigazos, látigo, leonino, letal, levantamiento, levantarse, levantisco, libertino, linchar, liquidación, liquidar, lisiar, litigante, litigar, litigio, llanto, lloriqueo, lucha, luchado, luchando, luchar, lucifer, luzbel, machacar, machete, madame, magnicida, magnicidio, magullado, magulladura, magullar, mal, malandrín, mal comportarse, maldad, maldecir, maldición, maldijo, maldito, maleante, maledicencia, malevolencia, malévolo, malhechor, malhumorado, malicia, malicioso, malignidad, maligno, malintencionado, malquerencia, malsano, maltratado, maltratar, maltrecho, malvado, malversación, malversado, malversando, malversar, malverso, marginar, masacrar, masacre, mascullar, matanza, matar, matón, mendacidad, mendaz, menoscabar, menospreciar, mentir, mentira, mentiroso, merodeo, metralleta, mezquino, milicia, militar, mintiendo, miserable, miseria, misil, mofa, mofar, molestar, molestia, molesto, molido, monstruo, monstruosa, monstruosidad, monstruoso, montaraz, mordacidad, mordaz, morder, mordida, mordió, mortal, mortandad, mortífero, mortificación, mortificado, mortificar, mosquetón, muerte, muertes, muerto, multa, munición, marginación, mutilar, navaja, nefasto, negligencia, nigromancia, nocivas, nocivo, obcecado, obligado, obligar, obliterar, obsceno, odiado, odiar, odio, ofender, ofendido, ofensa, ofensiva, ofuscación, ofuscado, ojeriza, ominoso, oponente, oponer, oponerse, oposición, opresión, oprimir, opuesto, ostentación, ostracismo, paliza, parricida, parricidio, patrulla, pécora, pegar, pego, pelea, peleón, pellizcar, pelotón, penado, penalizar, pendencia, pendenciero, penitencia, perjudicar, perjudicial, perjuicio, pernicioso, persecución, persecución, perseguir, persuadir, perturbación, perturbar, perversidad, perverso, pervertido, pervertir, pesadilla, pesadumbre, petulante, peyorativo, pillaje, pillar, piquete, pisotear, pistola, pistolero, pistolete, pleiteante, pleito, polémica, polemizar, polución, pólvora, ponzoña, ponzoñoso, porrazo, prejuicio, prescripción, presidiario, profanación, proscribir, proscripción, proscripto, protesta, protestar, provocador, proxeneta, pugna, pugnando, pugnar, pulverizar, punzar, puñal, puñalada, puñetazo, pútrido, quebrado, quebrantamiento, quebrantar, quebranto, quebrar, queja, quejar, quejarse, quejas, quejido, quejoso, querella, querellante, querellar, quiebra, quiebre, rabia, rabiar, rabieta, rapiñar, rapto, rastrero, ratero, reaccionario, rebelarse, rebelde, rebeldía, rebelión, recaída, recalcitrante, recelo, rechazar, rechazo, reclamar, reclamo, recluir, reclusión, recluso, recriminación, recriminar, refrenar, refriega, refunfuño, refutar, regañar, regaño, regicidio, rehuir, rehusar, rémora, rencor, rencoroso,

renegar, renuncia, renunciar, repeler, reprobar, reprender, reprensión, represalia, represión, reprimenda, reprimir, reprobar, reprochar, reproche, repudiar, repudio, repugnancia, repugnante, repugnar, repulsión, repulsivo, resarcimiento, resarcir, resentido, resentimiento, resentir, resistencia, resistente, resistir, responsabilizar, resquemor, restringir, reticente, retorcido, retrogrado, revancha, reventado, reventar, revocación, revuelta, reyerta, rezongar, ridiculizar, ridículo, rifle, riñendo, rival, rivalidad, rivalizar, robado, robando, robar, robo, rufián, ruin, ruina, ruinoso, ruptura, sablista, sabotaje, sabotear, sacrificar, sacrificio, sádico, sadismo, salvajada, salvaje, sanguinario, saqueador, saqueo, satán, satanás, satánico, secuestrado, secuestrar, secuestro, sedición, sedicioso, segregación, segregar, sentencia, siniestro, sinvergüenza, soborno, socarronería, sofoco, sojuzgar, soliviantar, sollozo, someter, sopapear, soslayar, sospecha, sospechar, sospechoso, sublevación, sublevado, sublevarse, subversión, subversivo, subvertir, subyugar, sumisión, suspicacia, suspicaz, tabú, temerario, tergiversar, terrorismo, terrorista, tiranía, tiranizar, tirotear, tiroteo, tirria, torturado, torturar, tosigo, totalitarismo, toxico, tozudez, trágico, traición, traicionar, traicionero, traidor, traidores, tralla, trampa, trampear, tramposo, transgresión, transgresor, trastornado, trastornar, trastornarse, traumar, traumatismo, trifulca, triturar, trompazo, truhan, tumulto, turba, turbulento, ultimátum, ultrajar, ultraje, ultrajante, usurero, usurpado, usurpando, usurpar, usurpo, vandalismo, vapuleado, vapulear, vendetta, venganza, viciar, vicioso, victima, vil, vileza, vilipendio, villano, vindicta, violación, violar, violencia, violento, virulento, vividor, zaheridor, zaherir, zozobra, zurriago.

**Violent words in Spanish:** agresivo, combativo, provocador, violento, agresividad, belicosidad, combatividad, provocación, emboscada, celada, trampa, asechanza, artería, artimaña, emboscar, trampear, asechar, armas, armamento, armado, asaltar, atracar, robar, agredir, acometer, irrumpir, invadir, ataque, embate, irrupción, combate, lucha, agresión, golpear, golpe, sanguinario, choque, asalto, atropello, atentado, coletazo, bomba, explosivo, granada, munición, bala, brutalidad, bestialidad, ferocidad, crueldad, atrocidad, monstruosidad, irracionalidad, vandalismo, salvajada, grosería, masacre, matanza, mortandad, hecatombe, catástrofe, degollina, aplastar, triturar, reventar, destripar, moler, aplastamiento, mortal, mortífero, letal, fatídico, fatal, funesto, disparar, tirotear, ametrallar, despedir, expulsar, destituir, guerrilla, guerrillero, milicia, arma, pistola, revólver, pistolete, ametralladora, metralleta, pistolero, atracador, bandido, forajido, delincuente, gánster, terrorista, asesino, matar, asesinar, ahorcar, ahogar, decapitar, desnucar, degollar, fusilar, guillotinar, asfixiar, electrocutar, envenenar, linchar, asesinato, crimen, homicidio, delito, muerte, parricidio, fratricidio, magnicidio, regicidio, criminal, homicida, monstruo, engendro, deforme, monstruosa, rebelarse, incitar, sublevarse,

insubordinarse, levantarse, alzarse, amotinarse, insurreccionarse, rebelión, levantamiento, revuelta, alzamiento, revolución, subversión, conspiración, conjuración, sedición, insurrección, motín, acuchillar, apuñalar, lesionar, violencia, exabrupto, coacción, profanación, furia, ensañamiento, violación, implacable, furioso, guerrero, soldado, militar, látigo, azote, fusta, tralla, vergajo, flagelo, zurriago, latigazos, azotando, latigar, azotar, fustar, flagelar.

Appendix B:

Table 1.B Augmented Dickey-Fuller test for unit root:

| Variable | Number of lags | T-Statistic | 1% Critical Value | 5% Critical Value |
|---|---|---|---|---|
| Metal prices index | lags(2) | -2.106 | -3.587 | -2.933 |
| D.Metal prices index | lags(1) | -4.379 | -3.587 | -2.933 |
| Factor #1 - SC Index | lags(3) | -1.927 | -3.628 | -2.95 |
| D.Factor #1 - SC Index | lags(4) | -4.407 | -3.655 | -2.961 |
| Predicted error | lags(0) | -4.613 | -4.124 | -3.461 |
| Predicted error | lags(1) | -2.707 | -4.124 | -3.461 |
| Predicted error | lags(2) | -1.534 | -4.124 | -3.461 |
| Predicted error | lags(3) | -1.231 | -4.124 | -3.461 |

Table 2.B: VAR results: Factor #1 – SC Index and Metal prices Index

Vector autoregression

| | | | |
|---|---|---|---|
| Sample: 2003q3 - 2015q4, but with a gap | | No. of obs | = 47 |
| Log likelihood = -216.7898 | | AIC | = 9.480418 |
| FPE | = 44.92575 | HQIC | = 9.569297 |
| Det(Sigma_ml) | = 34.7905 | SBIC | = 9.716607 |

| Equation | Parms | RMSE | R-sq | chi2 | P>chi2 |
|---|---|---|---|---|---|
| D_metal_prices~x | 3 | 14.5725 | 0.0737 | 3.737807 | 0.1543 |
| D_f1_sc | 3 | .442755 | 0.2788 | 18.17191 | 0.0001 |

| | Coef. | Std. Err. | z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| D_metal_prices_i~x | | | | | | |
| metal_prices_index | | | | | | |
| LD. | .2668515 | .1454293 | 1.83 | 0.067 | -.0181847 | .5518876 |
| f1_sc | | | | | | |
| LD. | -4.570894 | 4.260941 | -1.07 | 0.283 | -12.92218 | 3.780397 |
| _cons | 2.260713 | 2.096179 | 1.08 | 0.281 | -1.847723 | 6.369148 |
| D_f1_sc | | | | | | |
| metal_prices_index | | | | | | |
| LD. | .0084835 | .0044186 | 1.92 | 0.055 | -.0001767 | .0171437 |
| f1_sc | | | | | | |
| LD. | -.5409261 | .1294596 | -4.18 | 0.000 | -.7946623 | -.2871899 |
| _cons | -.0026951 | .0636879 | -0.04 | 0.966 | -.1275211 | .1221309 |

Table 3.B:

Standardize Violent conflictive news index :

Fixed effects regression – Annual frequency

| VARIABLES | 1<br>ln(sv_index) | 2<br>ln(sv_index) | 3<br>ln(sv_index) | 4<br>ln(sv_index) | 5<br>ln(sv_index) | 6<br>ln(sv_index) |
|---|---|---|---|---|---|---|
| ln(mineral rents % of GDP) | 0.0344 | 0.0393 | 0.0866 | | | |
| | (0.104) | (0.107) | (0.106) | | | |
| ln(metal_prices_index) | | | | -0.0108 | 0.00591 | 0.0232 |
| | | | | (0.103) | (0.129) | (0.103) |
| ln(GDP per capita - constant 2010 usd) | | -0.130 | | | -0.101 | |
| | | (0.470) | | | (0.458) | |
| first difference_ln(GDP per capita - constant 2010 usd) | | | -4.425* | | | -3.809 |
| | | | (2.612) | | | (2.488) |
| Constant | -1.215*** | 0.0467 | -1.120*** | -1.173** | -0.260 | -1.235** |
| | (0.0985) | (4.572) | (0.111) | (0.496) | (4.169) | (0.489) |
| Observations | 52 | 52 | 52 | 52 | 52 | 52 |
| R-squared | 0.382 | 0.383 | 0.430 | 0.380 | 0.381 | 0.419 |
| Country and year effects | YES | YES | YES | YES | YES | YES |
| Number of country_num | 4 | 4 | 4 | 4 | 4 | 4 |

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1