PERUVIAN ECONOMIC ASSOCIATION

The Determinants of Social Conflicts in Mining Production Areas

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Working Paper No. 100, June 2017

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May 16, 2017

Abstract

This paper evaluates the determinants of social conflicts in areas with mining production in Peru, using information at the district level of each social conflict and mining company between 2008 and 2015. We find that both socio-demographic and economic factors, which have not been used in the previous literature and which are distinctive to each district and mining company, impact significantly on the probability for a socio-environmental conflict to occur. Unlike previous works, we find that an increase in the international price of major minerals extracted in each mine does not have a significant effect in the probability of occurrence of social conflict in areas with mining production.

Codes JEL: C23, D74, Q34

Key words Conflict, mining, Peru, district

*Preliminary version. We are grateful for the comments received during the 34th Economist Meeting of the Central Reserve Bank of Peru. We value the collaboration of Marcia Murillo and Leslie Guzmán in the creation of this document. .

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1 Introduction

Social conflicts have been one of the most commented topics in Peru over the last few years, partly because they caused both human and economic losses to the country. According to data from *Defensoría del Pueblo*, social conflicts originated around 63 deaths and left close to 1935 injured people between August of 2011 and May of 2015.[1] On the other hand, social conflicts associated with mining projects paralyzed $18billion worth of investments (10% of the GDP) over the last few years.[2]

Mining has played an important role in the Peruvian economy. More particularly, over the last 20 years the share of mining exports in total exports rose from 40% to 55% in 2015 (see figure 1). This share increased in the early 2000s and reached a maximum in 2007. According to figure 2, this growth was mainly linked to superior exports of copper and gold, which volumes increased between 2004 and 2012, and represented 80% of total mining shipments. The growth in export value followed in major part, with the exception of zinc, the increase of mineral prices more than the increase in volumes exported.

Given those characteristics of the Peruvian economy, the objective of this work is to evaluate the determinants of social conflicts related to mining activity. To do so, we use detailed monthly information on each social conflict, which includes the motive, the district, the company and the rest of the actors involved in the conflict. Additionally, we combine this information with characteristics and data on production for each mineral extracted by mining companies. Finally, we include in this analysis socio-demographic and economic information on each district, complemented by specific information on mining companies in each district.

The structure of this document is the following: in the second section, we present the literature on the topic; the third section analyses the determinants and gives a brief description of the data available on mining social conflicts. Section 4 shows the empirical strategy we use, while sections 5 and 6 present the main results and a few robustness checks. Section 7 discusses

[1] http://elcomercio.pe/politica/actualidad/conflictos-sociales-peru-han-dejado-63-muertos-desde-2011-noticia-1814758

[2] Those projects are: Minas Conga (Newmont, US$ 4.8 billion), Haquira (First Quantum Minerals, US$ 2.5 billion), El Galeno (China Minmetals, US$ 2.5 billion), Hierro Apurímac (Strike Resources Peru, US$ 2.3 billion), Los Chancas (Southern Peru Copper, US$ 1.6 billion), Río Blanco (Zijing Mining Group, US$ 1.5 billion), Tía María (Southern Peru Copper, US$ 1.4 billion) y Río Tinto (La Granja, US$ 1 billion)

the results and section 8 concludes.

2 Literature

Oberschall (1978) defines social conflict as resulting "from purposeful interaction among two or more parties in a competitive setting."[3] In particular, sustains the author, social conflict is a form of interaction in which the means used by one of the parties involved is likely to affect or harm the other, although in a non-systematic way.

For Oberschall, any theory of conflict has three dimensions: the domination structures that increase the probability of conflict for scarce resources; the formation of the groups involved in the conflict and the means of collective action used; and, finally, the dynamics of the conflict, meaning the interaction between groups, the forms of conflict, its duration, resolution, etc. Based on this, in this research we classify mining conflicts as a sub-category of social conflicts, with three major actors involved: mining companies (domestic and international, formal and informal); the State, at the national, provincial and district levels, through ministries and public agencies; and a third group composed of populations living in mining areas, i.e farmer unions, etc.

The literature traditionally highlights a direct relationship between the extraction and exploitation of natural resources and the emergence of conflicts with local populations in areas with mining activity. A first part of the literature focuses on the issues relative to the distribution of the rent generated from natural resources. Those works sustain that natural resources generate a significant income that can be grabbed by an interest group, which further captures the State at the expense of other groups. Hodler (2006) analyses the reason why natural resources (oil and diamonds) constitute an asset in Norway and Botswana but a curse in Angola. The author concludes that highly-fragmented countries in terms ethnic affiliation or property rights, experience more conflicts because different ethnic groups try to grab the income generated by natural resources, especially when the latter are concentrated in a geographical area. Van der Ploeg & Rohner (2012) finds that, in a country with weak institutions and which does not protect property rights, there is an incentive to grab "voraciously" natural resources to re-

[3]Oberschall's concept of competition is based on Deutsch's definition (1973): "Competition implies an opposition in the goals of interdependent parties such that the probability of goal attainment for one decreases as the probability for the other increases".

duce opportunities for other groups to get some part of the rent. Similarly, Caselli et al. (2013) conclude that the presence of oil, as well as its localization (especially when it is located close to the border, like between Chad and Sudan), have constituted significant predicting factors of conflict between states since the second world war.

A second group of works finds evidence that the exploitation of natural resources generates distributive problems between territories and ethnic groups or communities. As a consequence, the presence of natural resources facilitates rebellion and the activation of civil wars, since the appropriation of natural resources constitutes an easy form of income for rebel groups, which can thus finance a civil conflict (Fearon, 2004; Collier et al., 2009). Respectively, Berman et al. (2015) analyze data on conflicts and mineral extraction of 27 minerals between 1997 and 2010 in Africa, and they find that the access to the rent by a rebel group increases the duration and the scope of conflicts. More specifically, they find that the increase in the price of minerals between 1997 and 2010 contributed, on average, to 21% of violence observed in African countries during that period. Similarly, Caselli et al. (2013) indicate that the presence of natural resources is an incentive for separatism between groups, when these resources are unequally distributed in a given country. Further, Dube & Rud (2013), using information on more than 21,000 episodes of violence reported in 974 Colombian municipalities between 1988 and 2005, find that a growth in the price of oil (a capital-intensive good) increases the number of armed civil conflicts reported, while an increase in price of coffee (a labour-intensive good) reduces the number of conflicts reported [4]

Finally, an important branch of the literature focuses on the analysis of socio-environmental conflicts, i.e conflicts resulting from the impact of mining activity on living conditions of populations living in areas with extraction of natural resources. This type of conflicts refers to social movements caused by the deterioration of the livelihood of a given zone. The concept of "livelihood", as Bebbington (1999) indicates, is a "function of assets and structures, and a source of subsistence, income, identity and meaning". The feeling of deterioration of this livelihood can be caused by two factors: the "accumulation by exploitation" and the "accumulation from dispossession" (Harvey, 2003). The first factor refers to labour exploitation and, therefore, constitutes

[4] Following the rise in the price of coffee, the salary of farmers increases, thus it becomes less attractive to participate to violent groups' activities, which diminishes episodes of violence. On the other hand, when the price of oil increases, municipalities' income grows through the rent, and this new income incentivises violent groups to grab this income through violence and extortion.

an activation point of conflicts for unions, labour movements and political organizations. On the other hand, the resistance to dispossession refers to conflicts over the expropriation and the deterioration of properties (land) as well as the defense of human rights and communities. In this perspective, Arellano-Yanguas (2008) finds that protests against mining activities happen mainly when local populations see mining as incompatible with their local and traditional way of living.

Bebbington & Bury (2013) indicate that conflicts arise principally from a higher competition between farming and mining activities. In this context, the competition includes the attribution of land, the access to – and deterioration of – fundamental resources such as water. Generally, socio-environmental conflicts can originate from various motives, including environmental complaints or relative to human rights, particularly when indigenous or native communities are involved. In these cases, the motives of conflicts include the expropriation and the deterioration of land and protected areas for the extraction of natural resources, and the lack or absence of compliance from mining companies to their commitments included in the contracts (labor, environmental or social). In this perspective, Álvares et al. (2011) show that a strong presence of indigenous communities in the surroundings of mineral extraction areas is correlated with a higher probability of conflicts.

Mining conflicts in Latin America, and specifically in Peru, have been studied through case studied and the description of the conflict's characteristics, as well as through the estimation of the impact of mining activity on the probability to cause a conflict. According to De Echave et al. (2009), in Peru the major part of the increase in mining conflicts has been generated by claims from indigenous communities over the deterioration of their livelihood, that is, following the expropriation of their land by mining companies and the deterioration of soils and water resources.[5]

Among the works that study the impact of mining activity on the probability of conflict, the paper by Haslam & Tanimoune (2016) stands out, in which the authors analyze 783 mining properties in 23 Latin American countries, and they find that the poverty level, the proximity to a protected area, the scarcity of agricultural resources and the proportion of indigenous pop-

[5] De Echave et al. (2009) present a study of six emblematic conflicts between indigenous communities and mining companies.

ulations near the areas with mining activities, are related to a higher level of conflicts against mining companies. In the case of Peru, Orihuela et al. (2014) find that mining is associated with a higher percentage of farmers who signal a high risk of water contamination and that, consequently, the presence of mining activity, whatever the duration of the exploitation of the mine, increases by 4 to 5 times the probability for a socio-environmental conflict to occur. Additionally, the authors find that old, current and future/expected mining activity increase social unrest.[6]

This research focuses on socio-environmental conflicts, which refer to the third branch of literature above mentioned. In opposition to other previous works such as the one by Haslam & Tanimoune (2016), our study uses annual data of each conflict at the district level between 2008 and 2015. The advantage of using this data is that it allows us to control for unobserved heterogeneities at the company and district levels, due to which the identification of the impact of determinants of social conflicts is less sensitive to the issue of omitted variables. Additionally, we evaluate determinants previously ignored in the literature and which statistical significance is uncertain.

Similar, it is worth mentioning that a usual phenomenon in the analysis of social conflicts in the exclusive focus on the communities or areas directly affected by mining activities. Nevertheless, mining can also generate indirect effects on neighbouring areas. Therefore, it is necessary to include all the groups affected in the negotiation process to guarantee the strength, sustainability and trust in the relationships between local communities and mining companies. In this perspective, ignoring these neighboring communities increases the risk of occurrence of a conflict in the long term.[7]

[6] The authors use a different definition of unrest: presence of at least a socio-environmental conflict linked to mining, number of socio-environmental conflicts.

[7] For exemple, according to De Echave et al. (2009), in the case of the Tintaya mine (province of Espinar, Cusco-Peru) neighbouring farmers' communities complained that the mining company had expropriated communal land previously reserved for agricultural use and for the management of water resources. In fact, the development of mining activity in the area increased the bidding for scarce resources such as water. Similarly, in the case of the Las Bambas project (province of Apurimac- Peru), the company negotiated only with a few close neighboring communities, leaving other populations of the area aside. In this case, the closest population received a higher share of benefits coming out of the negotiations with the mining company, whereas the benefits allocated to further and more isolated communities remained highly uncertain. Taking this into consideration, part of the empirical strategy is based on the possibility to generate conflicts in neighboring districts from areas with mining activities.

3 Social conflicts and determinants

In this section, we describe the data that we use in the estimation of the determinants of conflicts related to mining activities. The first subsection describes the information on social conflicts extracted from reports by the *Defensoría del Pueblo*, while the second section presents the determinants chosen and the rationale for choosing such determinants.

3.1 Social conflicts

We use monthly information on social conflicts reported by *Defensoría del Pueblo* between 2008 and 2015.[8] Each report contains information on each social conflict at the district level and the typology of the conflict, i.e if it is socio-environmental, labor-related, or linked to local, provincial or departmental affairs. Moreover, the reports indicate whether the conflict is latent, active or solved.[9]

Moreover, the reports contain information on the mining company and the actors involved in each conflict. Based on this, we match this information with data on mining production at the district level, by company and mineral type, provided by the Ministry of Energy and Mines (MINEM). According to these databases, among a total of 1834 districts existing in Peru as of 2014, 70 of these reported at least on environmental conflict, whereas 146 districts had at least one mining company operating in their jurisdictions. The matching of these databases allows us to differentiate between conflicts related to mining projects and conflicts related to mining companies that have already reached the production phase. Figure 3 shows the total number of conflicts and the total extracted value of minerals by province between 2008 and 2015.[10] According to the figure, there is a direct relationship between areas that report active mining conflicts and mining production.[11]

Figure 4 shows the evolution of conflicts by their state, i.e either active or latent. Con-

[8]http://www.defensoria.gob.pe/conflictos-sociales/home.php

[9]The *Defensoría del Pueblo* classifies as active "any conflict expressed by any of the parties involved in the conflict through a formal or informal protest". It classified as latent "any social conflict not expressed publicly. It remains hidden, quiet or inactive, in that one can observe the existence of factors of conflict but which don't manifest themselves or have not manifested themselves in a long time". Finally, it defines as a solved conflict any social conflict which solution has been accepted by the parties through agreements, norms and resolutions, etc.

[10]For the calculation of the produced value, we used the price for each mineral in 2007.

[11]Orihuela et al. (2014) find that in mining exploitation areas, the probability of occurrence of a socio-environmental conflict is higher.

sidering active conflicts, conflicts related to mining projects as well as those linked to mining production show a relatively similar evolution, a significant increase in 2009, a decline in 2010 and 2011, and another increase until 2013. Conflicts classified as latent reveal an evolution similar to active conflicts until 2013, year in which they keep on following a growing trend, in opposition to active conflicts.

Table 1 summarizes the causes of socio-environmental mining conflicts based on the reports by *Defensoría del Pueblo*. In the case of conflicts related to the production phase of the mine, 71% are related to environmental contamination or harm to agricultural activity, whereas 23% of these conflicts are associated with the incompliance of commitment previously agreed by the mining company. Additionally, 18% of conflicts are related to the demand for additional resources for the district, whereas 14% are linked to labor-related claims.[12] Finally, 9% of conflicts are related to the dispute over land or the presence of protected areas, while 3% of complaints relate to the existence of illegal mining. In the case of mining projects, motives and complaints/claims are similar, although the motives of environmental contamination and harm to agricultural activity stand out, whereas conflicts for labour-related motives are minor.

Similarly, table 1 shows the main actors of socio-environmental conflicts. Thus, during the mining production phase, farmers appear in 38% of conflicts. Moreover, non-farmers community members and mayors appear in 37% and 20% of conflicts respectively. Non-governmental organizations (NGOs) participate in 10% of conflicts, while other local organizations do so in 12 of cases. Finally, artisanal and illegal miners participate in 2.8 and 2.4% of the conflicts respectively.

Depending on the origin of mining companies, i.e Peruvian or foreign, respectively, figure 5 indicates that the share of socio-environmental conflicts linked to foreign companies during the production phase exceeds, in almost the entire sample, the share of conflicts linked to Peruvian companies.[13]

[12] According to De Echave et al. (2009), based on the study of six emblematic mining conflicts, populations' usual economic claims are related to the creation of jobs and infrastructures (electrification, construction of road), as well as the purchase of local products by mining companies.

[13] For this calculation we consider the total number of company-district pairs, since there are companies that operate in more than one district.

3.2 Determinants

3.2.1 Determinants at the district level

In this group, we consider the determinants linked to socio-demographic characteristics of each district. Thus, for example, a first sub-group of determinants includes the Gini coefficient, as a measure of inequalities, and the poverty rate, which are taken from the *Mapa Distrital de Pobreza 2007*. Respectively, Haslam & Tanimoune (2016) find that areas with a high share of ceramic-roof houses (higher-income households) have a lower probability of mining conflict. In relation to inequality, Loayza & Rigolini (2016) suggest that a cause for social discontent with mining could be the inequality generated from this activity.[14]

On the other hand, works such as the one by De Echave et al. (2009) indicate that the absence or weakness of the organization that canalize the demands of actors affected by mining activity can cause the dispersion of claims and complaints. This reduces the possibility to create or organize solid movements that can discuss and negotiate orderly with mining companies.[15] To capture this characteristic, and based on the fact that 38% of actors involved in social conflicts are farmers (table 1), we use the share of lots smaller than 5 hectares in total farming hectares in the district. Implicitly, we assume that the more atomized is the distribution of land, and the higher the share of this dispersed group in agricultural production, the lower the probability for farmers to organize. Additionally, following studies such as the one by Haslam & Tanimoune (2016), we include the altitude of each district as a relevant determinant of conflicts. This variable considers the fact that agricultural conditions are more difficult as altitude increases, which leads to higher competition for scarce resources between mining and agriculture.

Finally, in the group of district-level determinants, we include a variable that is usually ignored in the literature on social conflicts, and which considers the citizens' preferences regarding mining activities. Thus, we use the share of votes obtained at the district level in regional elections in 2006 by political groups which governing plans are rather against mining activity.[16]

[14] The authors find that cities where there is mining activity have on average a level of inequality that is 6 percentage points higher than in non-mining areas.

[15] De Echave et al. (2009) signal as an example the case of the mining company Antamina in San Marcos. The high level of social fragmentation, in San Marcos as well as in neighboring communities, prevented the company from finding credible interlocutors to negotiate and reach a final agreement. In fact, the mining company contracted an NGO for a project of institutional strengthening with communities, but the five-year project was abandoned by the NGO after one year because, among other things, it was very difficult to organize farmers' families and to create solid and unified organizations to negotiate.

[16] We classified governing plans as against mining activity if they shows at least one of the following propositions:

It is worth mentioning that this variable considers, partly, the historical relationship between mining activity and locality, which, being negative, should be reflected in a higher share of votes for political groups with political propositions against mining.[17]

3.2.2 Determinants related to mining companies

The characteristics of mining companies can also influence the probability of occurrence of a social conflict. Based on information from table 1, one of the main motives of social conflicts is the lack of compliance by mining companies to the agreements initially signed. In order to consider this aspect, we include the accumulated number of penalties and fines imposed on companies at the provincial level, which is reported by the Agency of Environmental Evaluation and Supervision (OEFA). The level of engagement, responsibility and seriousness of the companies is directly correlated to their commitment to and respect of agreement previously accepted. We use the lagged value of this variable to reduce causality problems, because potential sanctions could also be a consequence of conflicts. Moreover, we aggregate this information at the provincial level so as to consider the effect of the company's reputation instead of just a specific event in one particular district. Additionally, the group of company-related determinants includes the price index of the minerals relevant to each company in each district.[18]

Taking into account the information contained in figure 5 which shows that the share of conflicts associated to foreign companies is higher than the share of foreign companies in operation, we include in the group of company-related variables the origin of the mining company. Works such as the one by Haslam & Tanimoune (2016) reveal a direct relationship between the origin of the company and the probability of conflict. Indeed, the authors find that 62.41% of the 133 companies involved in conflicts were operated majorly with foreign capital, whereas 58.38% of companies that were involved in conflicts were operated mainly with foreign capital. This observation indirectly refers to the concept of "liability of foreignness" introduced by Zaheer

revision and/or renegotiations of contract, expropriation of private property, explicitly negative attitude towards mining.

[17] De Echave et al. (2009) indicate that, for example, the case of operations by the company Yanacocha in Cajarmarca. In the 20th century, mining was characterized by artisanal and informal practices, without taking into account measures that avoid the issues of environmental contamination that arose in the province of Hualgayoc. The water coming from these rivers resulted almost unusable. According to De Echave et al. (2009), this is a direct consequence of the fact that companies that operated in the area until the 1970s did not realize the process of mine sealing. Thus, the contamination resulting from mining activity in Hualgayoc constituted a negative precedent for the community and an argument for its opposition to mining activity.

[18] We use as weighting factors the average share of metals and minerals in the company's total production at 2007 prices.

(1995), who indicates that foreign companies in competitive industries (the author uses the banking sector) can observe face higher difficulties to profitability because of their origin and their different corporate practices. In the specific case of social conflicts, the fact of being a foreign company can constitute a strong factor of opposition from local communities, even more is one of the reason of the conflict is an unfair rent distribution.

3.2.3 Environment and protection of the communities

This group of determinants focuses on the socio-environmental characteristics of conflicts, that is the dimension related to the protection of the environment and of the rights of local communities. In this group of determinants we include the share of expenses on environmental protection in each district. To do so, we use public information reported by the Ministry of Economy and Finance (MEF).[19] Additionally, in this group of variables we include the accumulated number of social conflicts unrelated to mining in each district. According to table 1, one main actor of social conflicts is the group of social organizations. De Echave et al. (2009) indicate that most organized localities are more familiar with conflicts and more successful at reaching the fulfilment of their demands. As a first example, the authors mention the case of the Tambogrande project, in which the community organized through defense fronts and avoided the execution of the project.[20] Another example is the case of the Tintaya mine, in the Espinar province, where the creation of social organizations and the proximity among their leaders and municipal authorities permitted the formation of a strong and coordinated position against mining activity.[21] Similarly, in the Majaz project, various actors such as mayors, communities and farmers' groups, defense fronts and the *Coordinadora Nacional de Comunidades Afectadas por la Minería* (CONACAMI) gathered with the *Frente por el Desarrollo Sostenible de la Frontera Norte* (FDSFN). Although we dispose of a database that indicates the number of social organizations by district, we use the accumulated number of social conflicts unrelated to

[19] We consider as expense on environmental protection and expenditure on: strategic development, conservation and and enhancement of natural assets and heritage, strengthening of the environmental management and the strategic development of natural resources, total management of environmental quality, environment, and protection of the environment. This information is available at: https://www.mef.gob.pe/es/seguimiento-de-la-ejecucion-presupuestal-consulta-amigable.

[20] The social organizations such as *Frente Cívico de Defensa y Desarrollo de Tambogrande* (FRECIDET), reated in (1981), and the *Frente de Lucha por los Intereses de Tambogrande* (FRELIT), created in (1990), preceded the *Frente de Defensa del Valle de San Lorenzo y Tambogrande* (FDVSLT), founded in (1999). The latter later signed an agreement with the *Mesa Técnica de Apoyo a Tambogrande*.

[21] The group of farmers' communities in Espinar created the Federación Unificada de Campesinos de Espinar (FUCAE), in the late 1970s. This federation served as a base for the creation ot the *Federación Departamental de Campesinos del Cusco*, which further allied with municipal authorities.

mining in each district to capture the district's capacity to generate claims and protests, and to translate its level of dissatisfaction. Finally, as an additional control, we include the population in each district.

4 Empirical strategy

To evaluate the determinants of mining conflicts we estimate the following equation, using a linear probability model (LPM):

$$\begin{aligned} Conflict_{d(p)mt} = {} & \beta_1\Theta_{d(p)mt} + \beta_2\Psi_{d(p)t} + \beta_3\Omega_{mt} + \alpha_1 Locality_{d(p)mt} \\ & + \alpha_2 Locality_{d(p)mt} \times [\Upsilon_{d,2007} + \Theta_{d(p)mt} + \Psi_{d(p)t} + \Omega_{mt} + \Lambda_m] \\ & + \gamma_d + \gamma_m + \gamma_t + \varepsilon_{dmt}, \end{aligned} \tag{1}$$

where the dependent variable, $Conflict_{d(p)mt}$, takes the value of 1 if in district d, belonging to province p, appears a social-environmental conflict with the mining company m in year t.[22][23] As determinants of the conflicts we consider a first group of variables that are distinct to each district and belong to year 2007, $\Upsilon_{d,2007}$. The second group of determinants considers the variability by district, company and year, Θ_{dmt}. The third group of determinants includes variables that change by district and year, Ψ_{dt}. A fourth group, Ω_{mt}, contains determinants that vary by company and year. A fifth group, Λ_m, includes characteristics of the mining company which do not vary in time. Finally, we include the binary variable *Locality*, which takes the value of 1 if the activity of company m is generated in the same district, and 0 if the activity is realized in another district belonging to the same province at the other district.

The fact that some districts register conflicts with mining companies, even when the company does not operate in the given district, allows us identify the parameters of $\Upsilon_{d,2007}$ and Λ_m based on their interaction with the variable *Locality*. Similarly, to control for the presence of non-observable heterogeneity, we include the fixed effects at the district level, per year and per district: γ_d, γ_m, and γ_t, respectively.

[22] We don't use a logit or probit model because of a large number of fixed effects.

[23] We do not consider labour conflicts as part of social-environmental conflicts.

5 Results

The results reported in table 2 consider three different groups of fixed effects specifications for the estimation of the equation 1. Columns 1, 4 and 7 contain only fixed effects by mining company. Columns 2, 5 and 8 maintain the group of fixed effects suggested in equation 1, whereas columns 3, 6 and 9 includes fixed effects at the district and company levels. This allows us to control for characteristics that are proper to the relationship to the firm and district considered, such as the type of mining exploitation, whether the mine is an open pit or not.[24] On the other hand, the first three columns include district within the same province which capital cities are located less than 50kms away from mineral-producing districts, whereas columns 4-6 and 7-9 increase this range to 75kms and 100 kms, respectively.

The estimates reported in table 2, with the exception of columns 2 and 3, indicate that poorest districts, or district with a more unequal distribution of income, and which cohabit with mining activity, have a larger probability to develop a social conflict. Moreover, districts located at a higher altitude have a larger probability to develop a conflict. This result is similar to the one reported by Haslam & Tanimoune (2016) and may be related to the competition for scarce agricultural resources in higher altitude areas. Similarly, the larger share of small agriculture in total agricultural land available increases the probability of a social conflict. This could be explained by, in addition to the number of small farmers, the difficulty for coordination with an atomized number of farmers.

Columns (2-9) show a positive and statistically significant relationship between metal prices and the probability of conflict, when the mining company operates in the same district. However, the total effect of an increase in metal prices is undetermined if we consider the direct effect of this variable on the probability of conflict. Thus, the following section discusses the marginal effects of this variable as well as each of the other determinants on the probability of conflict.

On the other hand, a larger accumulated number of fines for a company - lagged one period - is associated with an increase in the probability of an environmental conflict to appear. Similarly, a higher (lagged) level of expenditure on environmental protection reduces the probability

[24] For example, Haslam & Tanimoune (2016) show that subterranean or tunnel mining have a larger probability of generating conflict than open pit mines.

of conflict, whereas an increase in the accumulated number of other types of social conflicts unrelated to mining increases it. Finally, districts where the share of votes obtained by political groups relatively opposed to mining activities present a higher probability to experience social conflicts.

5.1 Impact

This investigation, compared to previous works on mining conflicts, not only analyzes the determinants that impact on the probability of social conflict, but also estimates the relevance of each determinant on the probability of conflict.

Works like the one by Haslam & Tanimoune (2016) define the determinants of social conflicts, however they don't estimate the different levels of relevance of each of the determinants in generating a conflict. Table 4 reports the changes in probability of conflict following a change in the levels of determinants. To do so, we use the differential between the 25th and 75th, and between the 10th and 90th percentiles of the observed values for each determinant in producing districts, and the estimates of columns 5 and 6 of table 2 (districts located at a maximum distance of 75kms from mining districts). It is worth mentioning that for variables that change in time, we used the information for year 2010.

According to the results in table 4, the probability of conflict is higher by 4% when the poverty and inequality levels increase by 0.42 and 0.5 respectively. In the case of districts with preferences weakly favorable to mining activity, the probability of conflict increases by 2% for a district located in the 75th percentile, compared to a district located in the 25th percentile, and by 4% when we consider the difference between the 10th and 9th percentiles. In the case of the share of small farmers in total agricultural activity, the probability of conflict increases by 4% when we compare districts in the 75th percentile with districts in the 25th percentile.

Regarding penalties imposed on mining companies, the presence of fined companies which penalties are located in the 75th percentile increases the probability of conflict by 2% compared to companies which penalties are located in the 25th percentile. Similarly, when we compare a district which accumulated number of other conflicts is located in the 90th percentile compared to the 10th percentile, the probability of conflict increases by 5%.

On the other hand, the total effect of an increase in the prices of minerals ends up positive but not significant in the probability of conflict in mineral-producing districts. In the neighboring districts, an increase in the probability of conflict decreases when the price of minerals increases. Finally, in opposition to what is found by Bebbington (2012), when the mining company is of foreign capital, the probability of conflict increases by 5%.[25]

6 Robustness

As a robustness exercise we use as districts in the zone of influence the districts that are neighbors to mineral-producing districts. Similarly to Loayza & Rigolini (2016), we add direct neighboring districts (these districts that share a border) and neighboring districts of neighboring districts, etc. We always process so that the distance between districts' capital cities does not exceed 50kms. As an additional measure we include districts up to a distance of 100kms.

The results of table 3 are similar to those in table 2, even for different groups of fixed effects and distances between neighboring districts and mining districts. Nevertheless, the estimated coefficients of the share of small farmer in total agricultural activity and the origin of the mining company's capital differ significantly between each table.

7 Discussion

Certain determinants of social conflicts such as poverty, inequality, population, among others vary slowly, and others such altitude, remained unchanged in time. In this perspective, these determinants can hardly explain the repeated emergence of social conflicts. Further, we would expect that the incompliance of the initially agreed commitments, and to a lower extent the change in mineral prices, explain the unplanned development of socio-environmental conflicts. Based on the latter point, short-term policy actions should aim to mitigate or reduce the possibility to change or reduce the commitment of mining companies ex-post, or otherwise, to foster the signature of agreements that are beneficial for all the parties involved.

Therefore, the institutionalization is a key determinant of the generation of conflict. The level of institutionalisation can be observed at two levels. First, at the mining company's level,

[25] Bebbington (2012) indicates that the presence of foreign mining companies allows an easier intermediation and negotiation, thus reducing the probability of mining conflicts.

since the lack of transparency in exploration and exploitation projects, and the unilateral modification of initially agreed commitments, reduce trust in mining activities and increases the probability of conflict. This effect is even higher when local or national institutions do no guarantee the respect of the initial contract.[26]

Secondly, the lack of institutionalization can be observed at the level of local political institutions, especially when these fail to defend the rights of the citizens and communities that are against the interests of mining companies. For example, De Echave et al. (2009) report that in the case of the mine Yanacocha (Cajamarca), environmental impact studies as well as permits to develop operations were presented and obtained formally, although without the effective supervision or strict control from local authorities. Consequently, the conflict between the company and local communities was caused by the weakness and incapacity of the State, and its lack of willingness to verify the information provided and to enforce the completion of initially agreed commitments.

Finally, another element that fosters conflicts is the absence of institutionalisation in the relationships between the mining company and affected communities, and the lack of effective resolution mechanisms. Indeed, institutions can directly contribute to increasing the intensity of the conflict, y failing to create an adequate space for negotiations and discussions to take place between the different parties involved.[27]

8 Conclusion

In this paper we evaluate the determinants of social mining conflicts in Peru, using detailed information of each conflict between 2008 and 2015. The results indicate that higher levels of poverty and inequality increase the probability of conflict in districts where mining activity is in place. Compared to other works, we show that an increase in mineral prices does not increase the probability of conflict in producing districts. Even more, in neighboring districts to producer districts, the probability of registering a social conflict is lower when the price of metals increases. Regarding the origin of the company, we find that the presence of foreign companies

[26] For example, according to De Echave et al. (2009), in 1999 the mining company Antamina implemented the Accelerated Relocation Programme (PARU), and decided to reduce from one year to 90 days the time period given to its staff to relocate 53 families in the area.

[27] For De Echave et al. (2009) the Majaz project (Piura, Peru) constitutes a pertinent example of such issue.

is a boosting factor to conflicts.

Among the socio-demographic and economic factors, we find that a lower level of expenditures on environmental protection, higher altitude of the district, and a rejection of mining activity by local population also increase the probability of conflict. Finally, in districts that experience a higher share of social conflicts unrelated to mining, and in which mining companies that have faced a higher number of penalties operate, there is a higher probability for a social conflict to develop.

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Table 1: Characteristics of mining conflicts

Major causes of mining conflicts (As a percentage of mining conflicts)			**Major actors of mining conflicts** (As a percentage of mining conflicts)		
	Production	**Projects**		**Production**	**Projects**
Environmental contamination /Agriculture	71%	82%	Farmers	38%	48%
Non-compliance to agreements	23%	11%	Community (non-farmers)	36%	28%
Additional economic resources	18%	6%	Mayors	21%	36%
Labour-related benefits	14%	3%	Workers	15%	2%
Land / Protected areas	9%	11%	NGOs	12%	3%
Illegal mining	3%	1%	Other organizations	9%	26%
Others	6%	7%	Artisanal miners	3%	10%
			Illegal miners	3%	1%

Table 2: Base regression

Dependent variable: 1 if registers a conflict, 0 if not.	[Dist. of 50 kms.]			[Dist. de 75 km.]			[Dist. de 100 km.]		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\text{Local}_{dmt} \times \text{Poverty}_{d,2007}$	0.228***	0.024	0.031	0.230***	0.067***	0.074***	0.231***	0.075***	0.081***
	(0.022)	(0.027)	(0.028)	(0.020)	(0.024)	(0.024)	(0.019)	(0.023)	(0.023)
$\text{Local}_{dmt} \times \text{Gini}_{d,2007}$	0.734***	1.253***	1.248***	0.750***	0.957***	0.939***	0.756***	0.940***	0.914***
	(0.129)	(0.174)	(0.175)	(0.115)	(0.147)	(0.148)	(0.111)	(0.141)	(0.142)
$\text{Local}_{dmt} \times \text{Foreign company}_{m}$	0.097***	0.047***	0.049***	0.098***	0.042***	0.043***	0.098***	0.042***	0.043***
	(0.010)	(0.013)	(0.013)	(0.009)	(0.011)	(0.011)	(0.009)	(0.010)	(0.010)
$\text{Local}_{dmt} \times \text{Price index of extracted minerals}_{dmt}$ (logs)	0.020	0.061***	0.059***	0.020*	0.052***	0.051***	0.020*	0.050***	0.049***
	(0.013)	(0.014)	(0.014)	(0.011)	(0.012)	(0.012)	(0.011)	(0.012)	(0.012)
$\text{Local}_{dmt} \times \text{Accumulated sanctions of the company}_{dmt-1}$(logs)	0.048***	0.028***	0.028***	0.047***	0.032***	0.032***	0.047***	0.032***	0.032***
	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
$\text{Local}_{dmt} \times \text{Altitude}_{d}$ (m.s.n.m.)-(logs)	0.017***	0.017***	0.016***	0.016***	0.017***	0.017***	0.016***	0.018***	0.017***
	(0.005)	(0.006)	(0.006)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)
$\text{Local}_{dmt} \times \text{Population}_{dt}$ (logs)	1.136***	2.494***	2.267***	1.104***	2.466***	2.299***	1.086***	2.570***	2.421***
	(0.426)	(0.655)	(0.670)	(0.380)	(0.533)	(0.540)	(0.369)	(0.511)	(0.518)
$\text{Local}_{dmt} \times \text{Share of small farmers in production}_{d}$	0.023	0.171***	0.166***	0.024	0.128***	0.123***	0.025	0.136***	0.130***
	(0.019)	(0.025)	(0.026)	(0.017)	(0.021)	(0.022)	(0.016)	(0.021)	(0.021)
$\text{Local}_{dmt} \times \text{Share of expenditures in protection of the environment}_{dt}$	-0.174**	-0.447***	-0.446***	-0.178**	-0.403***	-0.404***	-0.175**	-0.378***	-0.378***
	(0.084)	(0.088)	(0.089)	(0.075)	(0.077)	(0.078)	(0.072)	(0.074)	(0.074)
$\text{Local}_{dmt} \times \text{Share of votes to parties against mining activity}_{d,2006}$	0.138***	0.072**	0.077**	0.139***	0.072***	0.076***	0.137***	0.061**	0.066***
	(0.024)	(0.030)	(0.030)	(0.022)	(0.026)	(0.026)	(0.021)	(0.025)	(0.025)
$\text{Local}_{dmt} \times \text{Accumulated non-mining social conflicts}_{dt}$ (per capita)	0.182***	0.448***	0.454***	0.181***	0.392***	0.400***	0.175***	0.355***	0.364***
	(0.052)	(0.067)	(0.068)	(0.047)	(0.060)	(0.060)	(0.045)	(0.056)	(0.056)
Local_{dmt}	0.096***	0.066***	0.066***	0.096***	0.071***	0.072***	0.093***	0.066***	0.067***
	(0.006)	(0.007)	(0.007)	(0.005)	(0.007)	(0.007)	(0.005)	(0.006)	(0.006)
Population_{dt} (logs)	-0.051	-1.439	-1.280	-0.016	-1.329	-1.359	0.003	-1.342	-1.365
	(0.137)	(2.743)	(2.750)	(0.110)	(2.179)	(2.183)	(0.104)	(2.068)	(2.072)
$\text{Price index of extracted minerals}_{dmt}$ (logs)	-0.008	-0.029	-0.029	-0.009	-0.025	-0.023	-0.010	-0.026	-0.024
	(0.009)	(0.023)	(0.024)	(0.007)	(0.018)	(0.020)	(0.007)	(0.017)	(0.019)
$\text{Accumulated sanctions of the company}_{dmt-1}$ (logs)	-0.001	-0.011***	-0.011***	-0.001	-0.009***	-0.009***	-0.001	-0.009***	-0.009***
	(0.002)	(0.004)	(0.004)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)
$\text{Share of expenditures in protection of the environment}_{dt}$	-0.010	0.022	0.021	-0.007	0.016	0.015	-0.007	0.013	0.013
	(0.028)	(0.029)	(0.029)	(0.022)	(0.023)	(0.023)	(0.021)	(0.022)	(0.022)
$\text{Accumulated non-mining social conflicts}_{dt}$ (per capita)	-0.002	-0.010	-0.012	-0.002	-0.002	-0.003	-0.002	-0.001	-0.002
	(0.007)	(0.027)	(0.027)	(0.006)	(0.019)	(0.019)	(0.006)	(0.018)	(0.018)
Observations	8,155	8,153	8,153	10,032	10,032	10,032	10,723	10,723	10,723
R-squared	0.150	0.431	0.434	0.152	0.418	0.420	0.152	0.416	0.418
EF Districts	NO	SI	NO	NO	SI	NO	NO	SI	NO
EF Company	NO	SI	NO	NO	SI	NO	NO	SI	NO
EF District-Company	NO	NO	SI	NO	NO	SI	NO	NO	SI

Robust standard errors in parenthesis. ***,**, * indicate significance levels at 1 %,5 % y 10 %, respectively. All the regressions include fixed effects per year and type of mineral extracted by the mining company

Table 3: Robustness regression

Dependent variable: 1 if registers conflict, 0 if not.	[Dist. of 50 kms.]			[Dist. of 75 kms.]			[Dist. of 100 kms.]		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$Local_{dmt}$ × $Poverty_{d,2007}$	0.233***	0.074***	0.079***	0.234***	0.112***	0.118***	0.236***	0.120***	0.128***
	(0.020)	(0.022)	(0.022)	(0.017)	(0.019)	(0.019)	(0.016)	(0.017)	(0.017)
$Local_{dmt}$ × $Gini_{d,2007}$	0.742***	0.743***	0.739***	0.741***	0.700***	0.699***	0.748***	0.710***	0.698***
	(0.112)	(0.127)	(0.128)	(0.098)	(0.106)	(0.107)	(0.092)	(0.098)	(0.099)
$Local_{dmt}$ × EForeign $company_m$	0.102***	0.075***	0.078***	0.102***	0.099***	0.098***	0.102***	0.101***	0.101***
	(0.009)	(0.010)	(0.010)	(0.008)	(0.008)	(0.008)	(0.007)	(0.008)	(0.008)
$Local_{dmt}$ × Price index of extracted $minerals_{dmt}$ (logs)	0.022**	0.049***	0.047***	0.022**	0.023**	0.021**	0.022**	0.017*	0.014
	(0.011)	(0.012)	(0.012)	(0.010)	(0.010)	(0.010)	(0.009)	(0.009)	(0.009)
$Local_{dmt}$ × Accumulated sanctions of the $company_{dmt-1}$(logs)	0.046***	0.039***	0.038***	0.045***	0.038***	0.037***	0.045***	0.038***	0.038***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
$Local_{dmt}$ × $Altitude_d$ (m.s.n.m.)-(logs)	0.014***	0.021***	0.021***	0.015***	0.023***	0.023***	0.015***	0.022***	0.020***
	(0.004)	(0.005)	(0.005)	(0.003)	(0.004)	(0.004)	(0.003)	(0.004)	(0.004)
$Local_{dmt}$ × $Population_{dt}$ (logs)	0.896**	3.329***	3.254***	0.885***	2.424***	2.437***	0.880***	2.312***	2.290***
	(0.375)	(0.484)	(0.490)	(0.328)	(0.398)	(0.401)	(0.308)	(0.367)	(0.369)
$Local_{dmt}$ × Share of small farmers in $production_{d,2007}$	0.037**	0.076***	0.069***	0.034**	0.000	-0.001	0.034**	0.001	-0.002
	(0.017)	(0.019)	(0.019)	(0.014)	(0.016)	(0.016)	(0.014)	(0.015)	(0.015)
$Local_{dmt}$ × Share of expenditures in protection of the $environment_{dt}$	-0.195***	-0.315***	-0.318***	-0.187***	-0.287***	-0.290***	-0.188***	-0.263***	-0.253***
	(0.074)	(0.076)	(0.076)	(0.064)	(0.068)	(0.068)	(0.060)	(0.060)	(0.060)
$Local_{dmt}$ × Share of votes to parties against mining $activity_{d,2006}$	0.146***	0.044*	0.041*	0.146***	0.056***	0.045**	0.146***	0.057***	0.047**
	(0.021)	(0.024)	(0.024)	(0.018)	(0.020)	(0.020)	(0.017)	(0.019)	(0.019)
$Local_{dmt}$ × Accumulated non-mining social $conflicts_{dt}$ (per capita)	0.140***	0.255***	0.264***	0.141***	0.145***	0.162***	0.142***	0.115***	0.136***
	(0.045)	(0.052)	(0.053)	(0.040)	(0.046)	(0.046)	(0.038)	(0.041)	(0.041)
$Local_{dmt}$	0.097***	0.055***	0.055***	0.093***	0.066***	0.067***	0.091***	0.066***	0.067***
	(0.005)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)
$Population_{dt}$ (logs)	0.112	-1.661	-1.323	0.135*	-0.667	-0.644	0.140**	-0.578	-0.542
	(0.094)	(2.057)	(2.057)	(0.070)	(1.633)	(1.632)	(0.062)	(1.457)	(1.456)
Price index of extracted $minerals_{dmt}$ (logs)	-0.003	-0.023*	-0.023	-0.002	-0.028***	-0.015	-0.002	-0.026***	-0.013
	(0.006)	(0.013)	(0.016)	(0.005)	(0.010)	(0.013)	(0.004)	(0.009)	(0.011)
Accumulated sanctions of the $company_{dmt-1}$(logs)	-0.001	-0.006***	-0.006***	-0.000	-0.002	-0.002	0.000	-0.002	-0.002
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)
Share of expenditures in protection of the $environment_{dt}$	0.012	0.009	0.009	-0.001	0.008	0.008	-0.000	0.007	0.006
	(0.021)	(0.022)	(0.021)	(0.016)	(0.017)	(0.017)	(0.014)	(0.015)	(0.015)
Accumulated non-mining social $conflicts_{dt}$ (per capita)	0.006	0.009	0.007	0.004	0.012	0.011	0.004	0.011	0.010
	(0.006)	(0.017)	(0.017)	(0.004)	(0.012)	(0.012)	(0.004)	(0.010)	(0.010)
Observations	13,696	13,696	13,696	18,894	18,894	18,894	21,442	21,442	21,442
R-squared	0.118	0.402	0.407	0.113	0.305	0.311	0.113	0.285	0.291
EF District	NO	SI	NO	NO	SI	NO	NO	SI	NO
EF Company	NO	SI	NO	NO	SI	NO	NO	SI	NO
EF District-Company	NO	NO	SI	NO	NO	SI	NO	NO	SI

Robust standard errors in parenthesis. ***,**, * indicate significance levels at 1 %,5 % y 10 %, respectively. All the regressions include fixed effects per year and type of mineral extracted by the mining company

Table 4: Marginal effects

Determinant	**Data**		**Base estimates**		**Alternative estimates**	
	Δ(75-25)	**Δ(90-10)**	**Δ(75-25)**	**Δ(90-10)**	**Δ(75-25)**	**Δ(90-10)**
Foreign company	1	1	0.04***	0.04***	0.1***	0.1***
Gini (2007)	0,05	0,11	0.04***	0.1***	0.03***	0.08***
Share of small farmers in production	0,33	0,67	0.04***	0.08***	0	0
Poverty (2007)	0,42	0,68	0.03***	0.05***	0.05***	0.08***
Altitude (m.s.n.m.)-(logs)	0,96	2,86	0.02***	0.05***	0.02***	0.06***
Accumulated sanctions of the company (logs)	0,69	1,10	0.02***	0.02***	0.02***	0.04***
Share of votes to parties against mining activity (2006)	0,32	0,48	0.02***	0.04***	0.01**	0.02**
Share of expenditures in protection of the environment	0,05	0,12	-0.02***	-0.05***	-0.01***	-0.03***
Accumulated non-mining social conflicts per capita (logs)	0,00	0,14	0***	0.05***	0***	0.02***
Price index of extracted minerals (log)	0,65	1,04	0.02	0.03	0	0.01
Population (logs)	0,01	0,03	0.01	0.03	0.02	0.05

Figure 1: Mining exports (1996-2015)

(a) Share of mining exports in total exports

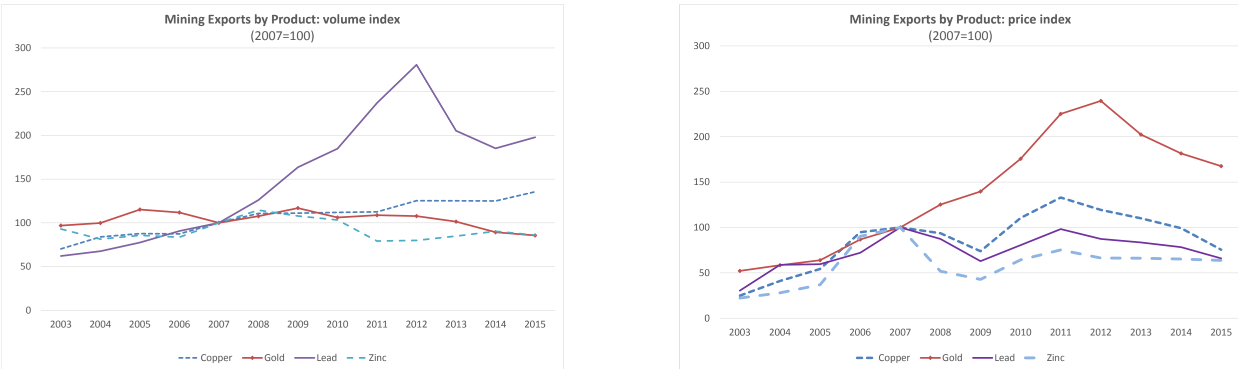
(b) Mining exports

Source: BCRP.

Figure 2: Volumes and prices of mining exports (2003-2015)

(a) Volume Index

(b) Prices



Source: BCRP.

Figure 3: Mining conflicts and value of mining production by province

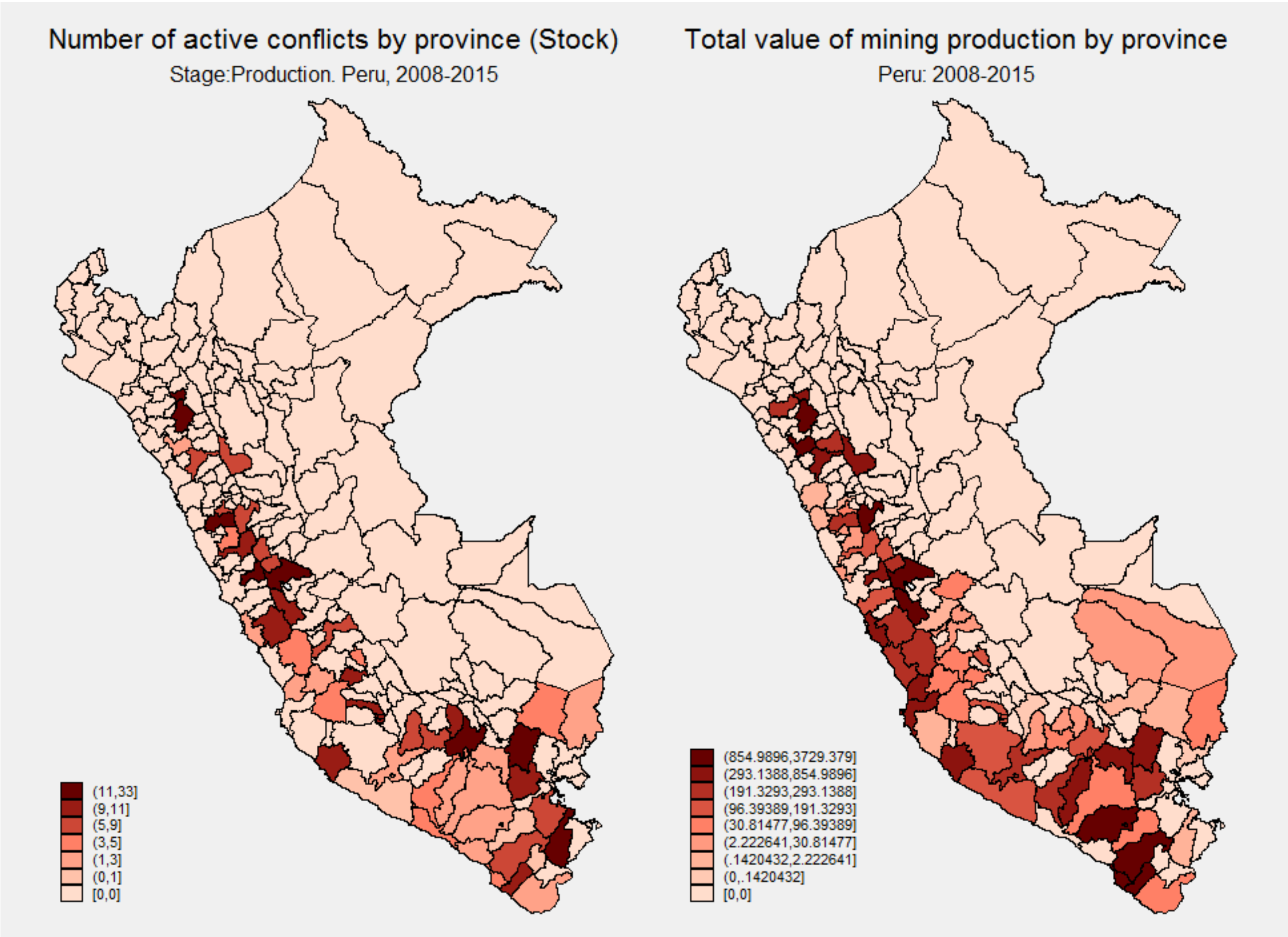


Figure 4: Mining conflicts by type

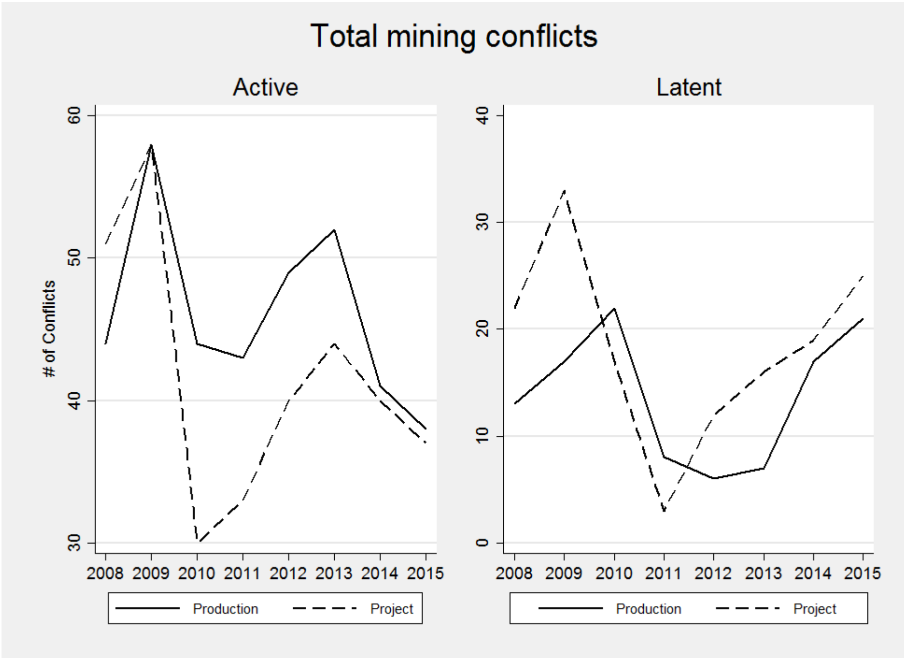


Figure 5: Share of foreign owned firms in conflicts and mining production