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The Local Impact of Mining on Poverty and Inequality: Evidence from the Commodity Boom in Peru

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Summary. — This paper studies the impact of mining activity on socioeconomic outcomes in local communities in Peru. In the 1990s and 2000s, the value of Peruvian mining exports grew by 15 times; and since the early 2000s, one-half of fiscal revenues from mining have been devolved to local governments. Has this boom benefitted people in local communities? Using the district-level "poverty map" of 2007 (the latest available with accurate data on consumption, poverty, and inequality) together with district-level data on mining production and fiscal transfers to local governments, we present some evidence to answer this question. We find that mining districts have larger average consumption per capita and lower poverty rates than otherwise similar districts. These positive impacts, however, decrease drastically with administrative and geographic distance from mining centers. Moreover, consumption inequality within mining districts is higher than in comparable nonproducing districts. This dual effect of mining is accounted for by, first, the better educated immigrants required and attracted by mining activity and, second, the jobs that some community natives obtain in industries and services related to mining. The inequalizing impact of mining, both across and within districts, may help explain the social discontent with mining in Peru, despite its enormous revenues. An area for future research highlighted in the paper regards the usefulness of fiscal transfers to local governments (the *Mining Canon*), a key component of the fiscal decentralization reform of 2002. We find neither a detrimental nor a beneficial effect from the Mining Canon in Peru. Whether this is explained by our early measurement of results (5 years into the decentralization program) or by the lack of implementation capacity of local governments remains to be answered.

Key words — natural resources, mining, poverty, inequality, commodity boom, Peru

1. INTRODUCTION

To which extent do local communities benefit from extractive natural resources and commodity booms? The question has been subject to wide but inconclusive research. This paper utilizes new data on mining activity and government transfers in Peru to investigate the effect of mining and resource windfalls on socioeconomic outcomes at the district level, the lowest administrative unit in the country. [1]

For two decades, Peru enjoyed an impressive mining boom. After decades of relative stagnation, the value of mining exports doubled in the 1990s and then rose by more than seven times in the following decade. By the early 2010s, the value of Peru's mining exports averaged nearly 25 billion US dollars, or 14% of GDP and over 50% of total exports. At the beginning of the current decade, Peru was among the five largest producers of silver, zinc, tin, lead, copper, gold, and mercury in the world. The mining boom occurred while the country experienced high and sustained economic growth, which contributed to a remarkable fall in poverty: during 2004–07 alone, national poverty rates dropped by more than 15 percentage points, dropping by a further 20 percentage points—to 22.7%—by 2014.

Local Governments in producing regions have obtained large rents derived from mining activity. The central Government transfers 50% of the taxes levied on mining companies to local governments in mining regions. This sharing scheme, called the *Mining Canon*, has been implemented to decentralize resource windfalls; it allocates funds to district, province, and regional governments according to a distribution rule that favors producing localities. The sharing agreement was developed in the context of a broader decentralization process that began in 2002. [2] The Mining Canon's distribution rule is dictated and revised by national law. [3] In 2007, the year of our analysis, the overall budget envelope of the Canon amounted to approximately 1.6 billion US dollars.

Yet, despite a substantial decline in poverty—both in urban and rural areas—and generous fiscal transfers, the expansion of mining production has been accompanied by rising social tensions. In 2009, the Office of the Ombudsman (*Defensoría del Pueblo*) reported 268 social conflicts in Peru, of which 38% were related to mining activities. Major confrontations involved violence and the use of firearms, leading to death and injuries among protesters and the police (Taylor, 2011). These social tensions are a major concern for policy makers, not least because they have halted or prevented large mining ventures: It is estimated that by 2014 mining investment lost due to social conflicts amounted to $8–12 billion (4–6% of GDP). [4] While many protesters cite environmental concerns—and limited local participation in environmental assessments may be an important factor behind conflicts (Jaskoski, 2014)—research studies suggest that the underlying reasons are often more complex, involving revenue sharing disputes between mining companies, local authorities, and local populations (Arellano-Yanguas, 2011; Haslam & Tanimoune, 2016).

In this paper we use variation in mining production across Peruvian districts to investigate the impact of mining activity on local socioeconomic outcomes. The analysis uses a unique, district-level dataset that merges administrative data (on local mining production and transfers from central to local governments) with census and survey-based data (on average consumption, poverty, and inequality). The main year of observation is 2007, when the latest national census took place.

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Our identification strategy is based on comparing socioeconomic outcomes in mining producing districts with outcomes in neighboring nonproducing districts of otherwise similar characteristics. Our premise is that, while economic and political factors may influence international patterns of mining activity, at lower administrative and geographic levels the location of mining production is primarily dictated by geological factors. By comparing neighboring or nearby districts and controlling for initial conditions, we can reduce biases related to endogenous location decisions. [5]

Figure 1 reports the location of mining districts and provinces across the Peruvian territory. It shows that mining is concentrated in the Andean region and in the Amazon basin. To reduce potential omitted variable biases, we restrict the analysis to regions that report mining activity, and we exclude the province of Lima (where the influential and populous national capital is located). Our sample consists of 104 mining producing districts and 1,260 nonproducing districts spread over 140 provinces and 17 regions in Peru.

Since we are able to identify the location where the mineral is extracted down to the lowest administrative level, we can estimate mining effects on socioeconomic outcomes with local accuracy and specificity. We can also study the extent to which local mining effects vary with the geographic and administrative distance between producing and nonproducing districts. This represents an improvement with respect to studies that have focused on the aggregate impact of oil-related windfalls over large regions. In contrast with mineral mines, oil fields and oil wells tend to be spread over several local administrations, making it necessary to conduct impact analyses at higher levels of aggregation (Michaels, 2010). This runs the risks of missing some of the specific local effects and suffering from aggregation bias (Caselli & Michaels, 2013).

Several preliminary findings emerge from our analysis. Mining activity appears to be beneficial for districts where production takes place, resulting in higher consumption per capita and lower poverty and extreme poverty rates than in comparable nonproducing districts. The benefits of mining activity, however, seem to be unevenly distributed: Consumption inequality, as captured by the Gini coefficient, is higher in districts of mining provinces and particularly in producing districts. Moreover, the benefits of mining activity are localized to producing districts, with no discernable spillovers to other districts in the same province, not even to close geographic neighbors. Therefore, mining appears to lead also to higher inequality *across* districts.

After conducting a few robustness exercises, which confirm the basic results, we turn our attention to assessing the impact of the Mining Canon itself and to understanding the mechanisms behind the dual effect of mining activity. Regarding the Mining Canon, we use an instrumental variable procedure to deal with its endogeneity and evaluate its impact. [6] We construct an instrument based on a revenue distribution rule that accounts for the district's jurisdictional location and population but abstracts from other socioeconomic characteristics. Once instrumented, the Canon does not seem to have a detrimental effect on districts' per capita consumption, poverty, or inequality. [7] However, it does not appear to have a beneficial effect either. This lack of impact is in line with some of the findings from studies focusing on oil exploitation (Caselli & Michaels, 2013). It calls into question the impact of the current revenue sharing design, in particular in the absence of strong monitoring and capacity building for subnational governments (Bardhan & Mookherjee, 2006; Loayza, Rigolini, & Calvo-Gonzalez, 2014).

In order to understand the mechanisms behind the positive (average) and negative (distributional) effects of mining activity, we consider the differences between migrant and native populations. Producing districts have a larger immigrant population than non-producing districts in the same province or in other, non-producing, provinces. Producing districts have better educational indicators than nonproducing districts, but alas, not because of differences across native populations but because of their better educated immigrants (arguably drawn by mining-related opportunities). On the positive side, native populations in producing districts do have a larger share of salaried workers than native populations in nonproducing districts. These results suggest that the better *average* outcomes enjoyed by producing districts are, in part, explained by the better educated (and presumably better paid) immigrants that mining activities require and attract and, only to some extent, explained by the jobs that some natives (presumably the more qualified) are able to get. This may not only explain the better *average* effects, but also the worse *distributional* outcomes regarding higher inequality.

Our findings add to a rich literature that investigates the impact of natural resource exploitation. Early cross-country studies based on cross-sectional analyses (Sachs & Warner, 1995, 2001) tend to find a negative association between natural resource abundance and economic growth. However, studies exploiting both cross-sectional and time-series variation find no effect or even a positive one (Manzano & Rigobon, 2006; Raddatz, 2007). Differences in institutional settings and time horizons (short *vs*. longer term) may explain in part these contrasting results (Boschini, Pettersson, & Roine, 2013; Collier & Goderis, 2008; Mehlum, Moene, & Torvik, 2006; Van der Ploeg, 2011). Notwithstanding their contribution, cross-country studies have suffered from uneven data quality and limited treatment of omitted variables that may correlate with resource abundance.

More recent studies have attempted to solve some of these pitfalls by exploiting variation of natural resource exploitation within national boundaries. These studies have mostly focused on oil extraction. Michaels (2010) studies the impact of oil abundance in Southern U.S. counties on their long-term development. It finds that oil abundance increases local employment, population growth, per capita income, and quality of infrastructure. [8] In developing countries with inferior institutional capacity, however, the picture seems to reverse. Caselli and Michaels (2013) look at the impact of backward linkages and revenue windfalls from oil production across municipalities of similar characteristics in Brazil. They find no impact on GDP; and despite higher reported municipal spending on a range of budgetary items, the paper finds little impact on social transfers, public good provision, infrastructure, and household income. Moreover, Dube and Vargas (2006) find that higher oil prices in Colombia boost conflict over the ownership of resource production. Thanks to a greater ability to determine the location of mining activity and the use of different socioeconomic outcomes, our analysis can measure local effects with more precision and make progress in understand their mechanisms.

Our cross-district analysis also complements and builds upon existing studies of the local impacts of mining on social and political outcomes. Sociological studies have found mining to play a fundamental role in shaping rural development, as a product of the interaction between communities, mining companies, and the State (Bebbington *et al.*, 2008). An active literature has described a relationship between mining exploitation and social conflict, rooted not only on environmental concerns but also on competition for land resources,

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