Digging for Development: Mining Booms and Local Economic Development in India *

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Abstract

How does natural resource extraction affect local economic activity in poor countries? Does this industry crowd out other sectors by raising the price of fixed factors, or does it has positive externalities and make other industries more productive? Using international prices and geological deposit locations to instrument for the value of subsurface natural resources, we examine the impact of mineral resource wealth on local economic structure in India. Because Indian policy directs all taxes and royalties from mining to the state and federal governments, we are able to isolate the direct effect of natural resource wealth, and exclude any effect of increased government spending. In the cross-section, towns in resource rich areas are smaller, with larger mining sectors and smaller manufacturing and retail sectors. The causal time series results, however, suggest that these effects may be due to unobserved aspects of natural advantage. Booms in the value of subsurface natural resources result in broad-based growth in towns up to 50km from the nearest mineral deposit. Rural areas are affected at a smaller radius, with growth in agroprocessing, but a decline in service sectors, suggesting a reallocation of labor toward mineral extraction and upstream industries. We further document how the increasing capital intensity of the mining sector affects the returns to the largely unskilled local labor force.

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1 Introduction

Does natural resource wealth put regions or nations on an adverse development path? Empirical work beginning with Sachs and Warner (1995) has led to the idea that the particular characteristics of wealth from natural resources could be a detriment to long-run growth, especially in countries with poor institutions.[1]

Most of the empirical evidence supporting a negative effect of natural resource wealth on economic development has been based on cross-country comparisons.[2] Recognizing the many confounding variables inherent to cross-country work, researchers have turned to within-country studies, and have focused on changes in resource extraction over time.[3]

This literature has found mixed results on the effect of natural resources on economic development. The interpretation of these mixed results is challenging, as there are many mechanisms by which natural resource wealth can affect local development, which include: (i) changes in local factor prices (Corden, 2012); (ii) local agglomeration spillovers (Ellison and Glaeser, 1997); (iii) increased public spending from mineral royalties; and (iv) deterioration in political outcomes (Robinson et al., 2006). This paper focuses on the first and second categories: the direct local economic consequences of mining booms. The context is India, a nation which as a whole is not highly dependent on point-source natural resources, but has many regions which produce coal, iron, gold and a range of other valuable minerals.

By using subnational and subregional variation, we are able to compare outcomes across regions that share basic political and economic institutions. We identify exogenous variation from changes in global prices of mineral resources found in India. We are also able to rule

[1]See van der Ploeg (2011) for a survey of the literature.

[2]Sachs and Warner (1995) begins this literature. Mehlum et al. (2006) is a recent example, finding that natural resources a detrimental in the presence of bad institutions, but beneficial otherwise. Alexeev and Conrad (2009) is a dissenting voice in the cross-country literature, arguing that natural resources do not have adverse effects, but rather raise income without raising other indicators of development normally correlated with income.

[3]Some recent examples include Carrington (1996), Aragon and Rud (2013), Caselli and Michaels (2013), and Domenech (2008).

out the channel of fiscal surplus, because royalties are collected and spend at the state level in India, and we rely on within state variation.[4]

The cross sectional relationship between mineral deposits and economic structure are consistent with views that natural resource wealth can inhibit economic development, or set it onto a suboptimal growth path. Towns nearest mineral deposits are smaller, and controlling for their population, have higher employment in the mining sector, but significantly smaller manufacturing and retail trade sectors. They are also at higher altitude and further from political centers.

However, the geographic differences between mineral and non-mineral areas point to the risk of identifying the effects of natural resource wealth by comparing these types of locations. The locational choice of resource extraction industries is constrained by the location of resources; towns with a high degree of natural resource extraction are likely to lack other natural advantages of resource-scarce locations, which could also produce a specialization pattern similar to that observed.

Exploiting time series variation in the value of mineral resources helps us understand the extent to which cross-sectional estimates are biased by unobserved characteristics of resource-rich regions. Contrary to the cross-sectional results, we find that exogenous increases in mineral resource wealth result in broad-based economic growth in nearby towns, across a range of manufacturing and service sectors. We find no evidence that growth in natural resource wealth results in a decline in sectors that compete for local factors of production.

Towns nearest mineral deposits experience the largest employment growth, which is composed both of tradable and non-tradable sector growth. A 100% price shock to the value of a single nearby mineral deposit raises non-farm employment in the nearest towns by 17%, and manufacturing employment by 20%. The shock raises employment in the nearest villages by

[4] A lack of formal rule does not imply that royalties are not spent locally. However, neither public officials nor mining executives that we spoke with believed that public spending was being redirected toward communities affected by mining. This said, mining firms may make social investments in affected communities.

9%, with larger increases in manufacturing and a decline in the regional rural service sector.

The difference between the long run characteristics of resource rich areas and the short term effects of mining booms suggests that some of the cross-sectional characteristics of mining areas are driven by characteristics of places other than their natural resources. In the short to medium run, our results contradict the class of theories that predict crowdout, and support a model of positive externalities from the natural resource extraction sector to nearby firms in other sectors.

Finally, we examine the impact of mining sector development on the distribution of asset holding in both urban and rural households. We exploit the fact that different minerals are extracted with different technology, leading to variation in the capital intensity and use of skilled labor across different types of mines. We document the very local impacts of the increasing replacement of labor with capital in the Indian mining sector.

Section 2 gives background information on the mining sector in India. Section 3 describes the key theoretical ways we should expect mining sector development to affect regional economies. Section 4 describes data sources, Section 5 describes the empirical strategy, and Section 6 presents results. Section 7 discusses interpretation of the results in the context of the theory, and concludes.

2 The mineral resource industry in India

Although modern India is not considered a mineral-rich country, it has a large and varied natural resource sector. In 2010, the mining sector employed 521,000 workers and accounted for 2.5% of national GDP (Indian Bureau of Mines, 2011). Mineral resources are unevenly distributed across India, and often make up a significant share of economic output in the places where they are concentrated. Over sixty different major minerals were mined in 2999 documented mines in 2010 (Indian Bureau of Mines, 2011).

Historically, Indian mines were predominantly state owned until significant privatization in the 1990s. By 2010, 2229 of 2999 mines were privately owned, representing 36% of total production value (Indian Bureau of Mines, 2011). Mineral deposits are found in nearly every state of India. The major exceptions are the Deccan Traps in west-central India and the highly populated states of Uttar Pradesh and Bihar in the lower Gangetic plain.

Major minerals such as iron ore are jointly regulated by the national and state governments, while minor minerals such as granite are regulated entirely by state governments. Notably, royalties and taxes paid by mining corporations are paid directly to state and federal governments. Importantly for this study, there is no requirement for fiscal proceeds from mining to be spent in communities close to mines. Further, our discussions with mining executives and public officials have not given any suggestion that these communities are likely to benefit disproportionately from spending of royalties or other public funds. However, mining companies often provide social goods, such as schools and libraries, to affected communities.

3 Conceptual Framework

This section considers possible channels by which mineral resource wealth could affect local industrial structure.

The first channel we consider is the Dutch Disease: in the presence of factor immobility, significant growth in one sector of the economy can increase the input factor prices faced by other sectors, making them less competitive (Corden, 2012). However, the new wealth associated with the booming sector increases the demand for locally produced goods. The factor cost effect will decrease the production of all sectors, while the demand effect increases the production of locally produced non-tradable goods. The Dutch Disease channel thus drives down the production of tradable goods, and could either increase or decrease the production of non-tradable goods.

A second channel is the agglomeration channel: growth in mineral extraction may have positive spillovers into other sectors (Ellison and Glaeser, 1997). The most widely discussed mechanisms originate in Marshall (1920): (i) input/output channels; (ii) thick labor markets; and (iii) knowledge spillovers. The first mechanism suggests that industries which have input/output linkages with the mining sector will benefit from mining booms. The second channel suggests that firms with similar labor forces to the mining sector will benefit.[5] We expect the last mechanism to be less important in the context of mining: mining sector knowledge is more likely produced in headquarter locations than at extraction sites. We also consider a fourth agglomeration channel: in a resource-poor country, many firms are constrained by a lack of basic infrastructure, such as roads and electricity, which market failures may prevent the private sector from providing. A local boom may increase the supply of government inputs, which other firms may then benefit from.[6]

Natural resource wealth could affect a local economy through a royalty channel, if local governments receive a share of profits from natural resource extraction, or if higher governments are required or choose to spend royalties in areas where mining takes place. We are able to largely exclude this channel, as there is no evidence that local communities or governments receive a disproportion share of royalties from mining.[7] The absence of locally-spent royalties allows us to focus on the direct economic channels of mineral extraction, without the confounder of increased local government spending.

[5]The short- and long-term mobility of labor are important here. If labor is immobile in the short-term, we would expect a mining boom to hurt sectors with similar labor demand to the mining sector, as wages are bid up. In the medium to long term, however, these firms would benefit from a thicker labor market, as labor moves into the area to work in the mining sector. It is worth noting that labor mobility in India tends to be very low (Foster and Rosenzweig, 2004).

[6]Two mechanisms for an increase in government inputs are possible. A mining boom may increase the value of local infrastructure, attracting efficiently allocated government inputs. Alternately, a booming industry may have increased lobbying power, and can thus be more effective at attracting government inputs to the area. Either way, we expect to see the largest growth in government inputs that are complementary to mining sector production.

[7]Mining companies do support local commnunity projects, such as schools and libraries. However, the scale of spending on these projects is much lower than royalties typically collected from mining projects.

An additional widely discussed potential consequence of natural resource wealth is the behavior of political actors. As natural resource sectors are rent-rich, politicians may put more effort into appropriating some of that wealth. Corruption may increase, and potential entrepreneurs may move from organizing production to rent-seeking (Murphy et al., 1991)[8]. The economic effects of a political resource curse could include a fall in entrepreneurship (from the reallocation of entrepreneurial talent), and a deterioration in the quality of public goods (from the reallocation of politician effort). However, the lack of sector-specific predictions of a political channel make it difficult to test directly in our context.

Finally, natural advantage plays a major role in the economic characteristics of mineral rich regions. Economic centers arise in places with certain natural advantages, for example, in places well-suited for trade, such as ports or at the confluence of rivers. Mineral deposits are a kind of natural advantage that tends to be inversely correlated with other kinds of natural advantage: deposits are most often founded in highland areas that tend to be ill-suited for both trade and agriculture.[9] Unless mineral resources are positively correlated with other kinds of natural advantage, we should expect mineral-based economies to have fewer of the natural advantages of non-mineral economic centers. Cross-sectional correlations between natural resources and local economic structure are therefore importantly confounded by natural advantage. We eliminate confounding due to natural advantage by focusing on time series changes in the value of local mineral wealth. Natural advantages other than those captured by the value of subsurface resources, are unlikely to significantly change over our sample period.

[8]We explore some of these effects in parallel work, finding that elections are less competitive and criminal accusations against politicians are more likely when the local mining sector is booming (Asher and Novosad, 2013).

[9]Many valuable minerals are formed under pressure, deep in the Earth's crust. These minerals tend to be most accessible in mountainous areas, where geological activity has exposed these deeper layers.

4 Data

The Indian Ministry of Statistics and Programme Implementation (MoSPI) conducted the 3rd, 4th and 5th Economic Censuses respectively in 1990, 1998 and 2005. The Economic Census is a complete enumeration of all economic establishments except those engaged in crop production and plantation; there is no minimum firm size, and both formal and informal establishments are included.

The Economic Census records information on the town or village of each establishment, whether ownership is public or private, the number and demographic characteristics of employees, the sources of electricity and finance, and the caste group of the owner. The main product of the firm is also coded using the 4-digit National Industrial Classification (NIC), which corresponds roughly to a 4-digit ISIC code. More detailed information on income or capital is not included. The main strengths of the data are its comprehensiveness, and rich detail on spatial location and industrial classification of firms.

We obtained location directories for the Economic Censuses, and then used a series of fuzzy matching algorithms to match villages and towns by name to the population censuses of 1991 and 2001.[10] We were able to match approximately 93% of villages between 1998 and 2005, and 81% from 1990 to 1998. The match rates for towns are respectively 78% and 55%. We also use data from the Population Census of India in 1991 and 2001, which includes village population and other demographic data, as well as information on local public infrastructure (roads, electricity, schools and hospitals).

Data on the location, type and size of mineral deposits come from the Mineral Atlas of India (Geological Survey of India, 2001), which provides the following characteristics of major mineral deposits in India: centroid latitude and longitude, mineral type, and estimated reserves (in one of three size categories). Figure 1 shows a map of mineral deposit locations.

[10] The Economic Census of 1998 was conducted with the house listing for the 1991 population census, while the 2005 Economic Census used codes from the 2001 population census.

Commodity prices come from the United States Geological Survey (Kelly and Matos, 2013). All prices are annual averages in the United States. Where available, we use the price for the ore as it is listed in the Indian deposit data. Where the ore price is unavailable, we match deposits to the price of the processed output of the mineral deposit (e.g. we use the price of aluminum for bauxite deposits).[11] We match deposits to villages and towns based on the geographic coordinates provided in the 2001 Population Census of India.

The unit of observation is the village or town. For each location, we desire a measure that indicates the extent to which the price of nearby mineral deposits has increased or decreased. There are two parts to this process: (i) creating a scalar measure that captures the recent price movement in a given commodity; and (ii) combining these price measures when locations are close to multiple deposits.

To capture recent changes in the value of a commodity, we use the mean price over the economic measurement period, and normalize it by the baseline price, measured at the beginning of the period. This measure is desirable in that a sustained increase in price results in a larger measured shock than a transitory increase in price. Further, a level shift in price at the beginning of the period results in a larger measured shock than a level shift in price at the end of the period, which is desirable if mineral price changes have lagged effects.

We use a 10-year trailing average for the baseline price, in order to prevent transitory shocks at the beginning of the measurement period from having too strong an effect on the price shock. The measure for a period of T years, ending in year t is given by Equation 1.

$$PriceShock_{c,t-T\to t} = \frac{\frac{1}{T}\sum_{\tau=t-T}^{t-1} p_{c,\tau}}{\frac{1}{10}\sum_{\tau=t-T-11}^{t-T-1} p_{c,\tau}}$$

Figure 2 presents mineral-wise price shocks for the period 1998-2005, the second of two periods in our sample.

[11] Because we rely mainly on changes in prices over time, this imputation is reasonable as long as unprocessed and processed ore comove.

For each location, we identify deposits within one of three concentric rings, with radii of 10km, 25km, and 50km. When multiple deposits fall within a zone, we take the sum of the price shocks.[12] Since commodity prices are increasing on average in the period, locations with more deposits will on average experience larger price shocks; we include a flexible function in the number of deposits near a location to control for this bias.

From a list of 45 minerals for which we have both deposit and price data, we discard economically unimportant minerals, defined as those for which the Indian Bureau of Mines does not publish production statistics or those whose average output per deposit is valued at less than $20,000 in 2005, the most recent year for which we have Economic Census data. We end up with 1325 deposits of 27 distinct minerals spread across 25 states in India. We use the presence of deposits rather than the presence of mines, as deposit existence is more likely to be exogenous than mine presence.[13] More common measures of resource abundance, such as share of GDP from primary commodities or mineral production value, are correlated with institutional factors and are better described as measures of resource dependence. Our use of mineral deposits avoids this endogeneity.

Table 1 shows key summary statistics separately for towns and villages.

[12] Our reasoning is that multiple deposits that are increasing in value create a larger shock to a local economy than a single deposit increasing in value. Results are largely robust to using a mean price shock. Future work will impute the total change in dollar value of reserves near a given location.

[13] Known deposits are endogenous to the extent that their existence depends on some exploration having taken place. Future work will test robustness using a set of deposits that were known at the beginning of the sample period.

5 Empirical strategy

The most common approach in the natural resource literature has been to regress the outcome variable on a measure of natural resource wealth, as in equation 1:[14]

$$Y_i = \beta_0 + \beta_1 * \text{RES}_i + \zeta * \mathbf{X_i'} + \epsilon_i, \tag{1}$$

where i indexes locations, RES_i is a measure of natural resource wealth, $\mathbf{X_i'}$ is a vector of location-specific controls and ϵ_i is an orthogonal error term.

This approach has had two major weaknesses. The first is with the measures of resource dependence used. Any measure with GDP in the denominator (for example, the often used primary export share of GDP) is subject to reverse causality: place that have failed to develop advanced sectors will necessarily have a high resource share of their economies. Measures of natural resource production are also endogenous: the extraction of natural resources may not take place if the background infrastructure and institutions are inadequate.

To escape the endogeneity of both mineral production and GDP, we proxy mineral resource wealth with the value of known mineral deposits, based on international prices. Geography is clearly exogenous to other factors.[15]

Estimating Equation 1 to compare resource-rich and resource-poor areas suffers from an additional omitted variable bias. Natural resources are not distributed at random; they are more likely to appear in regions that are mountainous and inaccessible, and as discussed in Section 3, resource-driven agglomerations are less likely to have other natural advantages due to compensating differentials. Control variables can mitigate this to some extent, but the high degree of selection on observables suggests that selection on unobservables may be

[14] This is the approach used, among others, by Alexeev and Conrad (2009), Sachs and Warner (2001), Michaels (2010), Black et al. (2005) and Mehlum et al. (2006).

[15] Knowledge of mineral deposits remains endogenous, which may bias our OLS results. But this will not affect our time series results, which are limited to locations with known deposits, and locations with unknown deposits will not have mining sectors.

significant as well (Altonji et al., 2005).

To better relate our work to the literature on cross-sectional estimation of the characteristics of resource rich places, we run the standard OLS tests. We use Equation 2:

$$Y_i = \beta_0 + \beta_1 * \text{RES}_{10km,i} + \beta_2 * \text{RES}_{25km,i} + \beta_3 * \text{RES}_{50km,i} + \zeta * \mathbf{X_i'} + \epsilon_i, \tag{2}$$

where the multiple β coefficients capture the relationship between the economic outcome and the distance from the mineral deposit.

To eliminate omitted variable bias due to differences between mineral and non-mineral producing areas, we limit our study to mineral-rich areas, and rely on time series variation in the value of subsurface wealth, exogenously driven by international prices. We estimate Equation 3 to identify the effect of *changes* in mineral wealth on growth in the following years:

$$Y_{i,t+1} - Y_{i,t} = \beta_0 + \beta_1 * pshock_{i,t} + \zeta * \mathbf{X_{i,t}} + \gamma_{\mathbf{s,t}} + \epsilon_{i,t}, \tag{3}$$

where $pshock_{i,t}$ is the change in value of nearby geological deposits as described above, $\mathbf{X_{i,t}}$ is a vector of location controls, $\gamma_{\mathbf{s,t}}$ is a state-year fixed effect and $\epsilon_{i,t}$ is an orthogonal error term. The coefficient β_1 identifies the effect of a change in mineral wealth on the economic outcome. As we are using interacted state-year fixed effects, our estimates are driven by variation in commodity price changes within a given state and time period. Standard errors are clustered at the district-level, which roughly corresponds to a shock radius of about 40km.

6 Results

6.1 Cross-section analysis

We begin by examining the cross-sectional relationship between subsurface mineral wealth and the economic characteristics of villages and towns. Equation 2 is the estimating equation. This method compares mineral rich to mineral poor regions within states, and estimates separate coefficients for places within 10km, 25km and 50km of mineral deposits. The reference group is composed of locations more than 50km from an economically valuable mineral deposit. The results should be interpreted as correlations between mineral wealth and economic outcomes, which are not necessarily causal.

Table 2 presents the cross-sectional relationship between mineral wealth, population and non-farm employment. Column 1 regresses village population on proximity to a mineral deposit, controlling for state fixed effects. In column 2, the dependent variable is non-farm employment, and population is an additional control. Villages are smaller in mineral rich regions, though this effect is muted in the villages closest to deposits. This is likely because deposits are located in remote regions of low population density, with agglomerations near the mines themselves.

Column 3 and 4 show the equivalent regressions for towns. Towns in mineral rich regions are 5-6% smaller than towns in non-mineral regions; conditional on being within 50km of a mine, distance to the deposit has little additional effect. Controlling for population, employment is lower in towns nearest deposits, but 8% higher in towns that are 25-50km from a deposit. Mining operations are often headquartered in district capitals, which could explain these distance effects.

Table 3 presents estimates of Equation 2 on other characteristics of villages, controlling for population, non-farm employment and state fixed effects. Column 1 shows that villages nearest mines are likely to have higher employment in establishments with more than 50 employees.[16] Column 2 shows that villages nearest deposits have marginally more diverse non-farm economies, while villages in deposit regions but not directly on a deposit have less diverse economies. Columns 3 through 5 regress the existence of local public goods on the presence of mineral deposits. Villages in mining regions are 5-10% more likely to have primary schools, but equally likely to have a paved approach road or access to electricity. Column 6 shows that villages near mineral deposits are on average further from towns.[17]

Table 4 disaggregates rural employment effects by sector. The lack of relationship between mineral deposits and total employment masks significant differences in economic structure between mineral and non-mineral areas. Mining employment is higher. Villages nearest mines have smaller retail sectors, and higher employment in schools, health clinics and public administration. In addition to these larger sectors, villages in mining regions but further from actual deposits also have larger non-farm employment in agroprocessing and hotels and restaurants. These positive results are balanced in the total employment regressions by the retail sector, which makes up a large share of rural non-farm employment. Non-agricultural manufacturing employment is largely unaffected by mining, but is a small part of many village economies. In summary, in the rural economy, mineral deposits are associated with increased employment in the mining and social sectors, and reduced employment in retail trade.

Table 5 shows the relationship between town characteristics and mineral deposits. Like villages, towns very close to mineral deposits have weakly higher employment in establishments with more than 50 employees. Industrial diversity is not affected by mineral deposits, nor are the number of primary schools, paved roads or electrical connections. However, towns in mining areas are considerably more remote; on average, they are 25-40% further

[16] We do not find a statistically significant relationship between deposits and average firm size. The vast majority of economic census firms are very small, so an unreasonably large increase in large firms would be required to substantially shift the mean size.

[17] The relationship is not significant at the shortest distance, perhaps because a high density of mineral deposits may motivate a mining town.

from state capitals.

Table 6 describes the relationship between mineral deposits and the sectoral composition of non-farm employment in towns. As with villages, the similarities in overall employment numbers mask sectoral differences. Towns nearest to mineral deposits have 30% higher employment in the mining sector, but significantly lower employment in manufacturing and retail (respectively 16% and 12%). These effects decay as distance grows, and towns located 25-50km from mines have higher employment, controlling for population, in a broad spectrum of industries - these are likely district capitals.

Towns nearest mineral deposits exhibit some classic characteristics of Dutch Disease: enlarged resource sectors and diminished manufacturing sectors. The next section exploits time series variation in the value of mineral resources to shed light on whether this result is causal or driven by unobserved characteristics of resource-rich regions.

6.2 Time series analysis

Table 7 shows estimates from Equation 3, which identify the effect of exogenous changes in mineral resource wealth on non-farm employment growth in nearby towns and villages. The independent variable (Price Shock) is the average price of local minerals over the period between census measurements, normalized by the 10-year moving average of the price at the beginning of the period. Interacted time / state fixed effects are included, and standard errors are clustered at the district level, which corresponds to the approximate range we believe price shocks have a direct effect on the local economy.

Columns 1 and 2 show estimates on employment growth in villages. Increases in the value of local mineral resources have positive and significant effects on non-farm employment in the nearest villages. Limiting the sample to villages within 10km of a mineral deposit (column 1), a doubling in the value of a single mineral deposit results in a 9% increase in total employment. To examine the spatial dimension of this effect, we widen the sample to locations within 50km of a mineral deposit, and allow separate coefficients for price changes in minerals at different distances from the deposit. Column 2 indicates that the effect is highly local: the effect is concentrated in villages nearest the mineral deposit; villages 10-50km from deposits show only a statistically insignificant estimate of 2%.

Columns 3 and 4 show estimates in towns. Limiting the sample to the on average 225 towns per period within 10km of a mineral deposit (Column 3), we find that a doubling in the value of a single nearby deposit results in a 17% increase in non-farm employment. When we estimate the distance gradient (column 4), the effect is more dispersed: the point estimate remains largest for towns nearest the deposit, but towns from 25-50km of a mineral deposit also show a 5% increase in employment.

We next separate these employment effects into manufacturing and service sector employment. Table 8 shows estimates for villages. Columns 1 and 3 show that the overall employment increase in nearby villages can be decomposed into a loss in service sector employment and an increase in manufacturing, the reverse prediction of a Dutch Disease model. Columns 2 and 4 investigate the distance gradient. The increase in manufacturing jobs is located nearest the mineral deposits, while the loss in service sector jobs affects a wider region, extending up to 50km from the mineral deposit.[18] We speculate that the villages nearest mineral deposits are supplying inputs to the mine. The loss in service sector jobs can be explained if rural retail employment is a low productivity diversification strategy. If employment in a mine is preferable to retail sector employment, we would see people move away from the retail sector when mine hiring increases.

Table 9 decomposes sectors further, roughly following 2-digit ISIC codes. The decomposition of manufacturing into food- and non-food manufacturing shows that manufacturing

[18] The zero coefficient on the 0-10km price shock variable does not necessarily imply no loss in service sector jobs in the villages nearest to the deposit. Villages nearest the deposits are also likely to be in the 25-50km range of other similar deposits. A zero coefficient therefore indicates no additional effect of being within 10km of a deposit, conditional on being 25-50km from a deposit.

growth is mainly in agro-processing, with little effect in other manufacturing sectors. This is not surprising, if villages have a comparative advantage in processed agricultural goods relative to other manufactured goods. The decline in services is relatively broad, affecting retail trade, education and health and public administration. Retail trade is the most important of these as a share of rural employment; however, the decline in government and social services may have important welfare effects. An exception to the decline in village service employment is an increase in employment in community services, which include libraries, museums and religious and community organizations. These are likely services funded directly by the mining sector for purposes of corporate social responsibility; baseline employment in community services is very small, so the growth in this sector is not economically substantive.

Table 10 decomposes resource-driven urban growth into manufacturing and service sectors. Effects are largest in the manufacturing sector, which grows 19-21% in response to a doubling in price of a single nearby deposit. Point estimates suggest service sector growth in the range of 10-16%, though it is not statistically significant. While estimates for service and manufacturing growth are not statistically different from each other, we can rule out the notion that non-tradable growth is crowding out the tradable sector. As above, the distance gradient shows an effect weakly declining in distance.

Table 11 further decomposes the sectoral effects of natural resource wealth. As with the rural sector, the positive effect on manufacturing is concentrated in the processing of agricultural commodities. The effect on non-agricultural tradable products is positive but insignificant. Service sector growth is broad-based, with growth in employment in construction, retail trade, education, health and public administration. In short, resource booms appear to result in broad based growth across all urban sectors. Non-agricultural manufacturing growth is somewhat lagging, with the smallest point estimate of all sectors, but is nevertheless consistently positive and close to 10% across all specifications.

7 Conclusion

We provide new evidence on the relationship between local natural resource wealth and economic development. We improve upon previous studies of local resource effects by concentrating on highly local effects within a large, poor country. Our economic estimates are most significant in places within 10km of mineral deposits, suggesting that much of the work on natural resources may be overlooking the highly localized impact of natural resource extraction. We compare causal estimates of resource wealth to the cross-sectional relationship between mineral wealth and development that has been most commonly studied, allowing us to demonstrate the bias in the latter studies.

The cross sectional relationship between mineral deposits and economic structure are consistent with views that natural resource wealth can inhibit economic development, or set it onto a suboptimal growth path. Towns nearest mineral deposits are smaller, and controlling for their population, have higher employment in the mining sector, but significantly smaller manufacturing and retail trade sectors.

Exploiting exogenous variation in the value of mineral resources helps us understand the extent to which cross-sectional estimates are biased by unobserved characteristics of resource-rich regions. Contrary to the cross-sectional results, we find that exogenous increases in mineral resource wealth result in broad-based economic growth in nearby towns, across all manufacturing and service sectors. We find no evidence that growth in natural resource wealth results in a decline in sectors that compete for local factors of production.

Our results are measured at a 7- or 8-year time horizon, and thus identify medium term effects of resource wealth on local employment growth. It remains possible, but in our view, unlikely, that natural resource wealth has an impact on the manufacturing sector that is positive in the short term, but negative in the long term. Future work will attempt to identify the longer-term effects of natural resource wealth in India.

The fixed geographic characteristics of local natural resources make it challenging to identify a causal effect of resource wealth. Our results point to the importance of focusing on evidence that is plausibly causal, as our cross-sectional results point to a very different story from our causal time series results. In future work, we plan to investigate further dimensions of the relationship between resource wealth and economic development that have been widely discussed. In particular, several studies have found that natural resource are beneficial in democratic and well-governed economies like Norway, but detrimental in autocratic and poorly-governed economies like those of many sub-Saharan countries.

India is country with a consolidated democracy, but a wide range of governance quality across its many states and territories. The very high quality of India's democracy, controlling for its level of wealth, may explain the positive effects of natural resource wealth that we have found. Exploiting variation in the quality of governance across India allows us to test whether the quality of governance has an important impact on the role of natural resource in economic development.

Table 1

Summary Statistics

Variable	Mean	StDev	N
Urban			
Non-farm employment (1990)	7872	19809	2678
Non-farm employment (1998)	10664	57544	4071
Non-farm employment (2005)	11142	41376	4063
Number of industries (2005)	82	33	4063
Mean firm size (2005)	2.75	2.93	4063
Paved road (km, 2001)	36.7	59.8	3705
Electrical connections (2001)	253	506	3739
Number deposits (10km)	0.3	1.1	3322
Number deposits (25km)	1.2	3.5	3322
Number deposits (50km)	3.8	6.8	3322
Number deposits (100km)	14.5	15.2	3322
Rural			
Non-farm employment (1990)	77	368	556939
Non-farm employment (1998)	87	287	588897
Non-farm employment (2005)	112	312	623289
Number of industries (2005)	10	10	622858
Mean firm size (2005)	2.01	7.69	623289
Paved approach (2001)	0.72	0.45	514606
Electricity (2001)	0.73	0.44	446655
Number deposits (10km)	0.2	0.9	510178
Number deposits (25km)	1.2	2.8	510178
Number deposits (50km)	4.4	6.9	510178
Number deposits (100km)	17.1	17.9	510178

Table 2

Employment and demographic characteristics of mineral-rich regions

	Pop (R)	Emp (R)	Pop (U)	Emp (U)
Deposit (10km)	-0.021	0.014	-0.062	-0.057
	(0.018)	(0.022)	(0.067)	(0.039)
Deposit (25km)	-0.045	-0.008	-0.069	0.003
	(0.018)**	(0.025)	(0.046)	(0.028)
Deposit (50km)	-0.116	0.028	-0.051	0.079
	(0.026)***	(0.027)	(0.048)	(0.028)***
Population (2001)		0.905		0.991
		(0.012)***		(0.014)***
Constant	5.914	-2.172	8.720	-1.036
	(0.078)***	(0.087)***	(0.127)***	(0.154)***
N	284744	284744	2798	2798
r2	0.16	0.52	0.15	0.83

$^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$

The table show estimates from Equation 2. The model estimates a regression of log population or non-farm employment on a set of dummy variables indicating whether there is a major mineral deposit within 10km, 25km or 50km from the location. Columns 1 and 2 are at the village level, and columns 3 and 4 are at the town level. The dependent variable is log population (2001) in columns 1 and 3, and log non-farm employment (2005) in columns 2 and 4. All regressions include state fixed effects and standard errors are clustered at the district level.

Table 3
Other characteristics of mineral-rich villages

	Emp (large)	Diversity	School	Paved road	Elect.	Dist. to town
Deposit (10km)	0.027	0.135	0.016	0.002	0.001	0.005
	(0.011)**	(0.080)*	(0.014)	(0.007)	(0.007)	(0.023)
Deposit (25km)	0.007	-0.039	0.047	0.000	-0.004	0.055
	(0.011)	(0.096)	(0.014)***	(0.006)	(0.006)	(0.020)***
Deposit (50km)	-0.024	-0.450	0.097	-0.009	-0.008	0.025
	(0.019)	(0.116)***	(0.023)***	(0.010)	(0.008)	(0.025)
Log employment (2005)	0.407	4.735	0.062	0.050	0.011	-0.055
	(0.018)***	(0.110)***	(0.007)***	(0.004)***	(0.002)***	(0.007)***
Population (2001)	-0.090	2.079	0.507	0.048	0.021	-0.033
	(0.011)***	(0.108)***	(0.016)***	(0.005)***	(0.004)***	(0.012)***
Constant	-0.448	-17.914	-2.289	0.139	0.847	3.162
	(0.052)***	(0.566)***	(0.110)***	(0.081)*	(0.024)***	(0.112)***
N	284744	284744	273281	232461	206993	278980
r2	0.19	0.69	0.32	0.33	0.70	0.13

$^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$

The table shows estimates from Equation 2. The model estimates a regression of a village-level outcome variable on a set of dummy variables indicating whether there is a major mineral deposit within 10km, 25km or 50km from the village. The dependent variable associated with each column is: (i) Total non-farm employment in establishments with 25 or more employees; (ii) the number of distinct products produced by non-farm firms in the village; (iii) a dummy variable indicating the presence of a village primary school; (iv) a dummy variable indicating the village is accessible by a paved road; (v) a dummy variable indicating that the village is connected to the power grid; and (vi) the log of the distance to the nearest town in kilometers. All regressions include state fixed effects and standard errors are clustered at the district level.

Table 4

Economic structure of mineral-rich villages

	Mining	Ag Proc	Constr.	Manuf.	Retail	Ed&Health	Hotels	Community	Gov.
Deposit (10km)	0.031	0.011	0.004	0.017	-0.053	0.030	0.053	0.006	0.030
	(0.007)***	(0.054)	(0.008)	(0.026)	(0.022)**	(0.017)*	(0.021)**	(0.026)	(0.017)*
Deposit (25km)	0.015	0.037	-0.003	-0.012	-0.053	0.036	0.026	-0.013	0.009
	(0.005)***	(0.059)	(0.009)	(0.027)	(0.020)**	(0.019)*	(0.020)	(0.028)	(0.019)
Deposit (50km)	0.034	0.187	0.017	0.014	-0.001	0.100	0.134	-0.018	0.080
	(0.005)***	(0.070)***	(0.010)	(0.042)	(0.033)	(0.029)***	(0.027)***	(0.036)	(0.031)**
Population (2001)	0.051	0.421	0.106	0.862	0.901	0.646	0.505	0.576	0.434
	(0.003)***	(0.030)***	(0.007)***	(0.022)***	(0.013)***	(0.017)***	(0.017)***	(0.017)***	(0.015)***
Constant	-0.306	-1.877	-0.586	-3.954	-3.949	-2.630	-2.840	-2.884	-2.340
	(0.020)***	(0.194)***	(0.042)***	(0.166)***	(0.096)***	(0.112)***	(0.112)***	(0.108)***	(0.092)***
N	284744	284744	284744	284744	284744	284744	284744	284744	284744
r2	0.01	0.06	0.03	0.30	0.46	0.29	0.20	0.24	0.17

$^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$

The table shows estimates from Equation 2. The model estimates a regression of village-level employment in a given non-farm sector on a set of dummy variables indicating whether there is a major mineral deposit within 10km, 25km or 50km from the village. The sectors are (1) mining; (2) agroprocessing; (3) construction; (4) non-agricultural manufacturing; (5) retail trade; (6) education and health; (7) hotels and restaurants; (8) community organizations; and (9) public administration. All regressions include state fixed effects and standard errors are clustered at the district level.

Table 5
Other characteristics of mineral-rich towns

	Emp (large)	Diversity	Schools	Km paved	Elect. Conn.	Dist. to Cap.
Deposit (10km)	0.097	-0.030	0.047	-0.027	0.021	0.076
	(0.150)	(1.080)	(0.040)	(0.050)	(0.041)	(0.053)
Deposit (25km)	0.156	0.659	0.038	-0.038	0.037	0.258
	(0.110)	(0.855)	(0.032)	(0.031)	(0.028)	(0.072)***
Deposit (50km)	-0.004	-0.697	0.001	0.012	-0.035	0.370
	(0.092)	(0.926)	(0.029)	(0.035)	(0.024)	(0.104)***
Log employment (2005)	2.243	17.663	0.113	0.143	0.280	0.047
	(0.091)***	(0.882)***	(0.029)***	(0.035)***	(0.032)***	(0.049)
Population (2001)	-0.467	8.575	0.710	0.803	0.686	-0.153
	(0.100)***	(1.057)***	(0.033)***	(0.039)***	(0.037)***	(0.059)**
Constant	-8.724	-149.208	-5.302	-6.144	-0.296	5.543
	(0.458)***	(4.200)***	(0.172)***	(0.145)***	(0.129)**	(0.359)***
N	2798	2798	2726	2569	2563	2797
r2	0.62	0.82	0.71	0.72	0.83	0.34

$^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$

The table show estimates from Equation 2. The model estimates a regression of a town-level outcome variable on a set of dummy variables indicating whether there is a major mineral deposit within 10km, 25km or 50km from the town. The dependent variable associated with each column is: (i) Total non-farm employment in establishments with 50 or more employees; (ii) the number of distinct products produced in the town; (iii) the number of primary schools in the town; (iv) the kilometers of paved road in the town; (v) the number of electricity connections in the town; and (vi) the log of the distance to the state headquarter town. All regressions include state fixed effects and standard errors are clustered at the district level.

Table 6

Economic structure of mineral-rich towns

	Mining	Constr.	Manuf.	Retail	Ed&Health	Hotels	Community	Gov.
Deposit (10km)	0.322	0.094	-0.165	-0.118	-0.102	0.017	-0.051	-0.005
	(0.130)**	(0.123)	(0.079)**	(0.051)**	(0.078)	(0.067)	(0.060)	(0.134)
Deposit (25km)	0.304	0.142	-0.084	-0.074	-0.012	0.129	-0.019	-0.017
	(0.121)**	(0.094)	(0.062)	(0.035)**	(0.053)	(0.051)**	(0.042)	(0.094)
Deposit (50km)	0.231	0.317	0.085	0.035	0.080	0.232	0.076	0.219
	(0.095)**	(0.093)***	(0.056)	(0.035)	(0.048)*	(0.053)***	(0.043)*	(0.107)**
Population (2001)	0.651	1.076	1.014	1.009	0.996	0.962	0.987	1.126
	(0.029)***	(0.032)***	(0.022)***	(0.017)***	(0.021)***	(0.023)***	(0.017)***	(0.039)***
Constant	-5.465	-8.624	-3.620	-3.273	-4.292	-4.785	-4.932	-6.163
	(0.298)***	(0.330)***	(0.242)***	(0.186)***	(0.231)***	(0.248)***	(0.184)***	(0.436)***
N	2798	2798	2798	2798	2798	2798	2798	2798
r2	0.19	0.36	0.63	0.79	0.67	0.59	0.72	0.39

$^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$

The table shows estimates from Equation 2. The model estimates a regression of town-level employment in a given non-farm sector on a set of dummy variables indicating whether there is a major mineral deposit within 10km, 25km or 50km from the village. The sectors are (1) mining; (2) agroprocessing; (3) construction; (4) non-agricultural manufacturing; (5) retail trade; (6) education and health; (7) hotels and restaurants; (8) community organizations; and (9) public administration. All regressions include state fixed effects and standard errors are clustered at the district level.

Table 7
Time series effects of mineral wealth on rural/urban non-farm employment growth

	Rural	Rural	Urban	Urban
Price shock (10km)	0.088	0.063	0.167	0.128
	(0.047)*	(0.032)*	(0.090)*	(0.097)
Price shock (25km)		0.022		0.057
		(0.022)		(0.054)
Price shock (50km)		0.020		0.046
		(0.017)		(0.026)*
Baseline	-0.441	-0.433	-0.423	-0.459
	(0.010)***	(0.007)***	(0.066)***	(0.038)***
Log population	0.421	0.409	0.440	0.464
	(0.013)***	(0.010)***	(0.076)***	(0.043)***
Constant	-0.955	-0.916	-0.383	-0.356
	(0.074)***	(0.053)***	(0.234)	(0.116)***
State*Year F.E.	Yes	Yes	No	No
N	41255	255725	451	2289
r2	0.24	0.23	0.37	0.32

$^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$

The table shows estimates from Equation 3. The dependent variable is rural employment growth in columns 1 and 2, and urban growth in columns 3 and 4. The time period is the seven or eight years between economic censuses; growth figures are not annualized. The sample in columns 1 and 3 is limited to locations within 10km of a mineral deposit. Columns 2 and 4 extend this distance to 50km and have separate coefficients for price shocks at these greater distances, to capture broader spatial effects. All regressions include state-time fixed effects and standard errors are clustered at the district-period level.

Table 8

Rural Sector Groups

	Manufacturing	Manufacturing	Service	Service
Price shock (10km)	0.037	0.073	-0.058	0.008
	(0.069)	(0.058)	(0.027)**	(0.021)
Price shock (25km)		0.010		-0.018
		(0.032)		(0.014)
Price shock (50km)		-0.025		-0.052
		(0.025)		(0.012)***
baseline	-0.453	-0.433	-0.504	-0.512
	(0.018)***	(0.013)***	(0.011)***	(0.009)***
Log population	0.282	0.269	0.458	0.460
	(0.015)***	(0.012)***	(0.016)***	(0.011)***
Constant	-0.731	-0.762	-1.124	-1.133
	(0.086)***	(0.070)***	(0.077)***	(0.051)***
N	33025	205694	40159	248642
r2	0.25	0.24	0.29	0.28

$^{*}p < 0.10,^{**} p < 0.05,^{***} p < 0.01$

The table shows estimates from Equation 3. The dependent variable is sector-level rural employment growth. Columns 1 and 2 look at manufacturing sector employment, and columns 3 and 4 look at service sector employment. The time period is the seven or eight years between economic censuses; growth figures are not annualized. The sample in columns 1 and 3 is limited to locations within 10km of a mineral deposit. Columns 2 and 4 extend this distance to 50km and have separate coefficients for price shocks at these greater distances, to capture broader spatial effects. All regressions include state-time fixed effects and standard errors are clustered at the district-period level.

Table 9

Time series effects of mineral wealth on economic structure of nearest villages

	Ag Proc	Non-ag Manuf.	Constr.	Retail	Ed&Health	Hotels	Community	Gov.
Price shock (10km)	0.142	-0.057	0.031	-0.110	-0.098	-0.008	0.113	-0.087
	(0.089)	(0.049)	(0.019)	(0.034)***	(0.043)**	(0.037)	(0.045)**	(0.049)*
Baseline sector employment	-0.419	-0.454	-0.692	-0.531	-0.553	-0.427	-0.617	-0.524
	(0.029)***	(0.013)***	(0.018)***	(0.014)***	(0.013)***	(0.013)***	(0.016)***	(0.012)***
Log population	0.123	0.395	0.100	0.499	0.388	0.264	0.357	0.274
	(0.014)***	(0.018)***	(0.008)***	(0.018)***	(0.015)***	(0.011)***	(0.015)***	(0.013)***
Constant	-0.507	-1.612	-0.496	-1.964	-1.117	-1.188	-1.735	-1.161
	(0.087)***	(0.117)***	(0.064)***	(0.109)***	(0.077)***	(0.074)***	(0.089)***	(0.074)***
N	41255	41255	41255	41255	41255	41255	41255	41255
r2	0.25	0.27	0.41	0.30	0.31	0.20	0.34	0.31

$^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$

	Ag Proc	Non-ag Manuf.	Constr.	Retail	Ed&Health	Hotels	Community	Gov.
Price shock (10km)	0.101	0.008	0.003	0.010	-0.015	0.032	0.048	-0.020
	(0.070)	(0.039)	(0.015)	(0.025)	(0.027)	(0.029)	(0.029)	(0.032)
Price shock (25km)	0.063	-0.029	0.018	-0.038	-0.029	0.010	0.045	-0.029
	(0.043)	(0.025)	(0.011)*	(0.017)**	(0.021)	(0.018)	(0.021)**	(0.020)
Price shock (50km)	-0.006	-0.037	0.019	-0.097	-0.060	-0.041	0.042	-0.040
	(0.028)	(0.021)*	(0.007)***	(0.012)***	(0.019)***	(0.016)***	(0.018)**	(0.016)**
Baseline sector employment	-0.390	-0.444	-0.720	-0.532	-0.559	-0.438	-0.623	-0.537
	(0.020)***	(0.010)***	(0.010)***	(0.009)***	(0.010)***	(0.009)***	(0.011)***	(0.011)***
Log population	0.126	0.388	0.094	0.497	0.382	0.252	0.364	0.252
	(0.013)***	(0.014)***	(0.005)***	(0.012)***	(0.010)***	(0.008)***	(0.011)***	(0.010)***
Constant	-0.595	-1.614	-0.481	-1.969	-1.047	-1.124	-1.789	-1.025
	(0.076)***	(0.088)***	(0.034)***	(0.073)***	(0.052)***	(0.054)***	(0.063)***	(0.058)***
N	255725	255725	255725	255725	255725	255725	255725	255725
r2	0.24	0.26	0.42	0.30	0.31	0.21	0.35	0.31

$^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$

The table shows estimates from Equation 3. The dependent variable is sector-level rural employment growth. The top panel limits the sample to locations within 10km of a mineral deposit, while the bottom panel includes locations up to 50km from a mineral deposit, with separate coefficients from shocks to minerals at different distances from locations. The sector used as dependent variables is: (1) agroprocessing; (2) non-ag manufacturing; (3) construction; (4) retail trade; (5) education and health; (6) hotels and restaurants; (7) community organizations; and (8) public administration. The time period is the seven or eight years between economic censuses; growth figures are not annualized. All regressions include state-time fixed effects and standard errors are clustered at the district-period level.

Table 10
Urban Sector Groups

	Manufacturing	Manufacturing	Service	Service
Price shock (10km)	0.213	0.190	0.161	0.104
	(0.083)**	(0.090)**	(0.101)	(0.109)
Price shock (25km)		0.101		0.075
		(0.076)		(0.063)
Price shock (50km)		-0.016		0.036
		(0.039)		(0.034)
baseline	-0.381	-0.383	-0.464	-0.464
	(0.022)***	(0.022)***	(0.022)***	(0.022)***
Log population	0.373	0.374	0.488	0.488
	(0.025)***	(0.025)***	(0.024)***	(0.024)***
Constant	-1.064	-1.085	-0.695	-0.694
	(0.119)***	(0.118)***	(0.091)***	(0.092)***
N	3963	3963	3962	3962
r2	0.26	0.26	0.30	0.30

$^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$

The table shows estimates from Equation 3. The dependent variable is sector-level urban employment growth. Columns 1 and 2 look at manufacturing sector employment, and columns 3 and 4 look at service sector employment. The time period is the seven or eight years between economic censuses; growth figures are not annualized. The sample in columns 1 and 3 is limited to locations within 10km of a mineral deposit. Columns 2 and 4 extend this distance to 50km and have separate coefficients for price shocks at these greater distances, to capture broader spatial effects. All regressions include state-time fixed effects and standard errors are clustered at the district-period level.

Table 11

Time series effects of mineral wealth on economic structure of nearest towns

	Ag Proc	Non-ag Manuf.	Constr.	Retail	Ed&Health	Hotels	Community	Gov.
Price shock (10km)	0.435	0.102	0.356	0.205	0.117	0.092	0.213	0.252
	(0.217)**	(0.101)	(0.185)*	(0.103)**	(0.125)	(0.137)	(0.150)	(0.118)**
Baseline sector employment	-0.511	-0.330	-0.563	-0.384	-0.470	-0.396	-0.572	-0.380
	(0.033)***	(0.042)***	(0.032)***	(0.050)***	(0.061)***	(0.049)***	(0.046)***	(0.041)***
Log population	0.519	0.357	0.642	0.427	0.563	0.416	0.592	0.540
	(0.054)***	(0.063)***	(0.051)***	(0.054)***	(0.068)***	(0.056)***	(0.056)***	(0.052)***
Constant	-3.661	-1.339	-4.254	-1.215	-2.050	-1.391	-2.625	-2.439
	(0.484)***	(0.364)***	(0.633)***	(0.248)***	(0.327)***	(0.299)***	(0.344)***	(0.316)***
N	451	451	451	451	451	451	451	451
r2	0.36	0.23	0.44	0.28	0.34	0.26	0.34	0.35

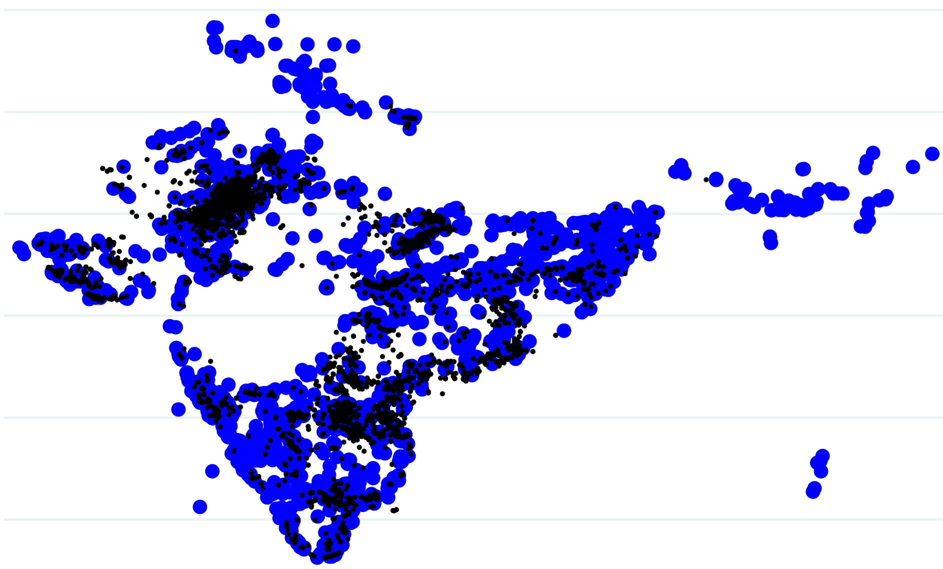
$^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$

	Ag Proc	Non-ag Manuf.	Constr.	Retail	Ed&Health	Hotels	Community	Gov.
Price shock (10km)	0.365	0.085	0.191	0.170	0.149	0.077	0.132	0.208
	(0.219)*	(0.101)	(0.170)	(0.102)*	(0.121)	(0.128)	(0.142)	(0.144)
Price shock (25km)	-0.014	0.107	0.025	0.009	0.050	0.000	0.049	-0.026
	(0.122)	(0.073)	(0.124)	(0.055)	(0.075)	(0.071)	(0.072)	(0.130)
Price shock (50km)	-0.017	-0.027	0.167	0.058	-0.055	0.053	0.086	0.087
	(0.075)	(0.040)	(0.070)**	(0.034)*	(0.043)	(0.049)	(0.046)*	(0.053)
Baseline sector employment	-0.512	-0.348	-0.574	-0.370	-0.507	-0.388	-0.570	-0.383
	(0.017)***	(0.028)***	(0.015)***	(0.030)***	(0.025)***	(0.023)***	(0.023)***	(0.016)***
Log population	0.443	0.339	0.708	0.397	0.539	0.409	0.570	0.497
	(0.030)***	(0.033)***	(0.028)***	(0.031)***	(0.030)***	(0.026)***	(0.026)***	(0.025)***
Constant	-3.004	-1.024	-5.093	-0.958	-1.597	-1.492	-2.382	-1.975
	(0.291)***	(0.170)***	(0.264)***	(0.129)***	(0.140)***	(0.143)***	(0.155)***	(0.176)***
N	2289	2289	2289	2289	2289	2289	2289	2289
r2	0.37	0.23	0.44	0.24	0.38	0.24	0.35	0.31

$^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$

The table shows estimates from Equation 3. The dependent variable is sector-level urban employment growth. The top panel limits the sample to locations within 10km of a mineral deposit, while the bottom panel includes locations up to 50km from a mineral deposit, with separate coefficients from shocks to minerals at different distances from locations. The sector used as dependent variables is: (1) agroprocessing; (2) non-ag manufacturing; (3) construction; (4) retail trade; (5) education and health; (6) hotels and restaurants; (7) community organizations; and (8) public administration. The time period is the seven or eight years between economic censuses; growth figures are not annualized. All regressions include state-time fixed effects and standard errors are clustered at the district-period level.

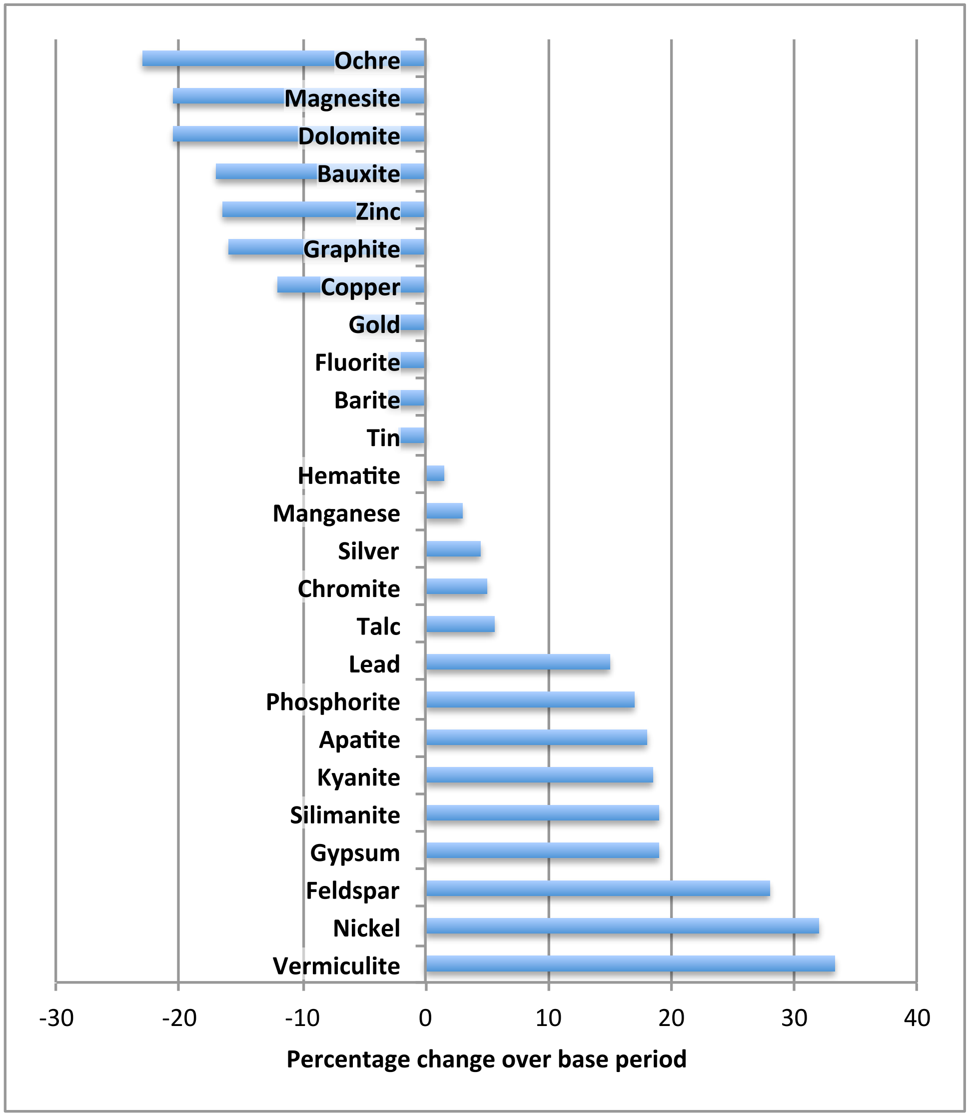
Figure 1
Map of deposit locations



The blue points describe the location of mineral deposits in India, from the Mineral Atlas of India (Geological Survey of India, 2001). The black points indicate the locations where mining licenses have been granted by the Government of India since 1990.

Figure 2

Price shocks, 1998-2005



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