Good mine, bad mine: Natural resource heterogeneity and Dutch disease in Indonesia

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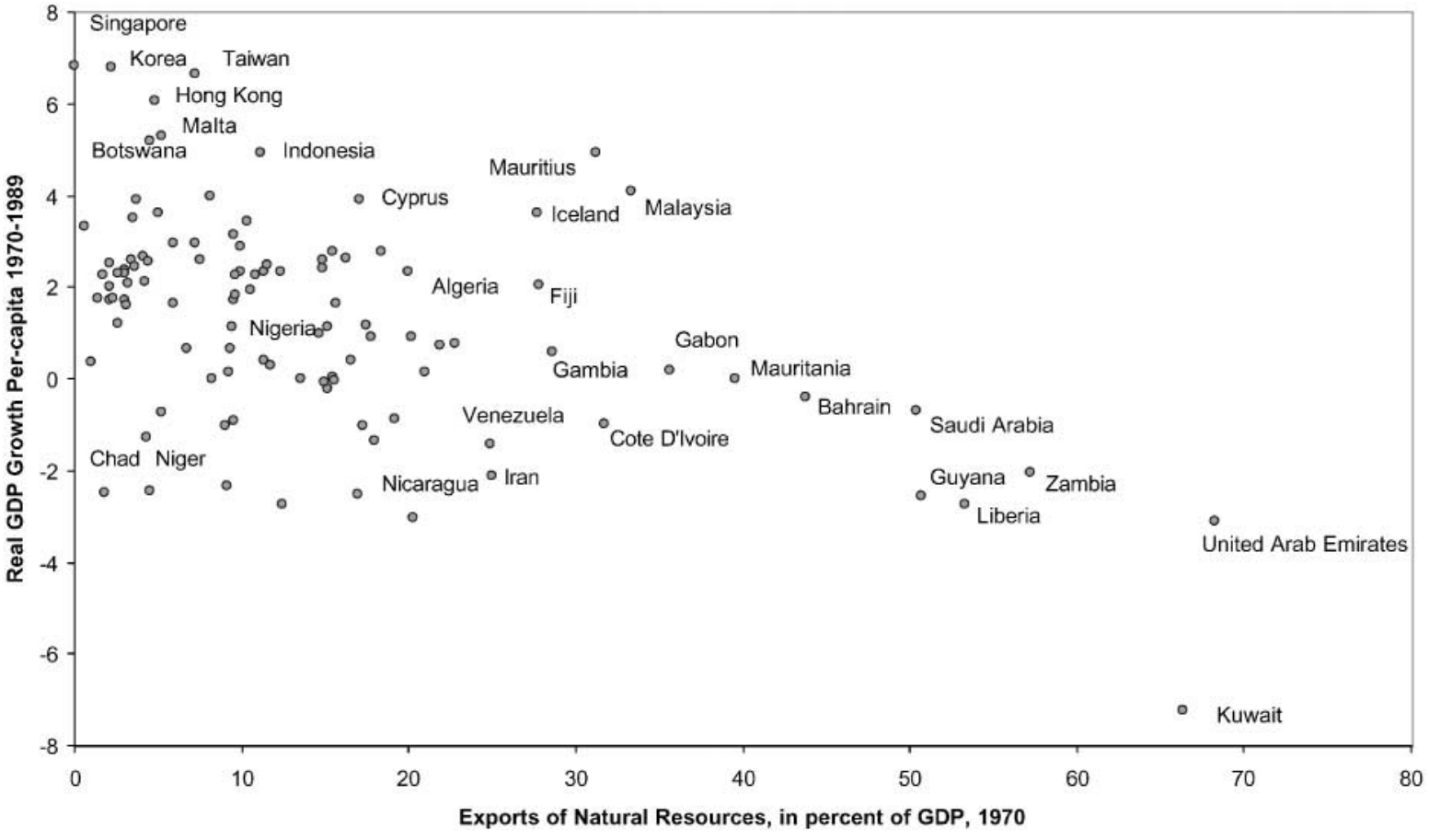
The natural resource curse



- Sachs and Warner (2001): Negative Correlation between Natural Resource Dependence and Economic Growth, also after inclusion of controls. The Resource curse is a "reasonably solid fact".

Why? Dutch Disease?

- Natural Resource boom $\rightarrow$ Currency appreciates
- Manufacturing sector becomes less competitive
- If manufacturing is crucial & Market Failures occur
  $\rightarrow$ Economic growth decreases (Long run; "Dutch Disease")
- Cross-country studies largely confirm negative effect on MF
  (Sachs and Warner 2001, Harding and Venables 2016)

Why? Dutch Disease?

- Natural Resource boom $\rightarrow$ Currency appreciates
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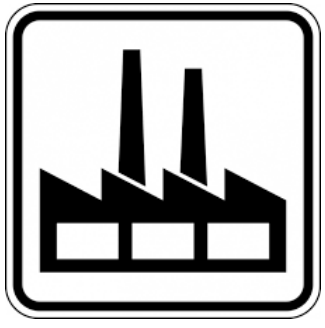
  $\rightarrow$ Economic growth decreases (Long run; "Dutch Disease")
- Cross-country studies largely confirm negative effect on MF
  (Sachs and Warner 2001, Harding and Venables 2016)
- Identification concerns $\rightarrow$ Move to within-country studies
- Local resource boom $\rightarrow$ Wages $\uparrow$ $\rightarrow$ MF $\downarrow$ (RER $= eP^*/P$)
- Mostly US data and oil&gas
  (Allcott & Keniston 2017, Michaels 2011)
- Find positive results on manufacturing!

Good Mine, Bad Mine

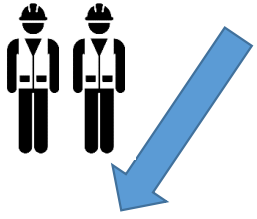
- Labour intensity of extraction may reconcile previous findings

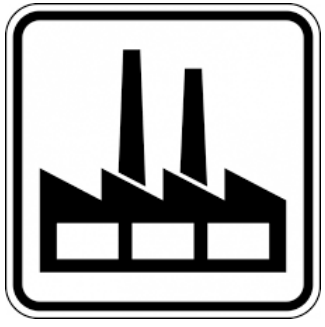
Region A



Gold Price Doubles

Region B





Roadmap

- First to address heterogeneity in natural resource extraction
- Set up a GE model: One country, multiple regions, 3 sectors
- Collect data on Indonesia
  - Mining and Oil&Gas intensity by district
  - Labor intensity of resource extraction by district
  - Census of manufacturing plants with 20+ employees

  - Mining = 4.54% of GDP and Oil&Gas = 4.55% in 2009
  - MF = 23% of GDP 1990-2009, 14% of output exported
  - Government tries to promote MF exports to stimulate growth
- Collect data on global commodity prices over time
  (Price Increase + Local Resources = "Local Res. Boom")

Research Questions

- *What is the effect of a natural resource boom on local manufacturing?*
  - Local goods producers
  - Traded goods producers
- *Does the local extraction technique (capital-intensive vs. labor-intensive) matter for this?*

Main Findings

Mining boom in capital-intensive mining district:

- MF wages unaffected
- MF employment rises

Mining boom in labour-intensive mining district:

- MF wages rise
- MF employment falls, if traded goods producer

- Can put previous and future findings into perspective
- No Long-term TFP effects on traded MF

Theory I: Within-country Model

Based on Matsuyama (1992) and Allcott and Keniston (2017):

- Single country, common currency
- Take a specific district:
  - Natural resource sector (NR) = tradable
  - Manufacturing sector (MF) = tradable
  - Service sector (S) = non-tradable
- p_{NR} and p_{MF} exogenous, p_S endogenous
- Labor is the only input and is (imperfectly) mobile across sectors and districts
- All sectors in the district pay the same wage

Theory II: Results

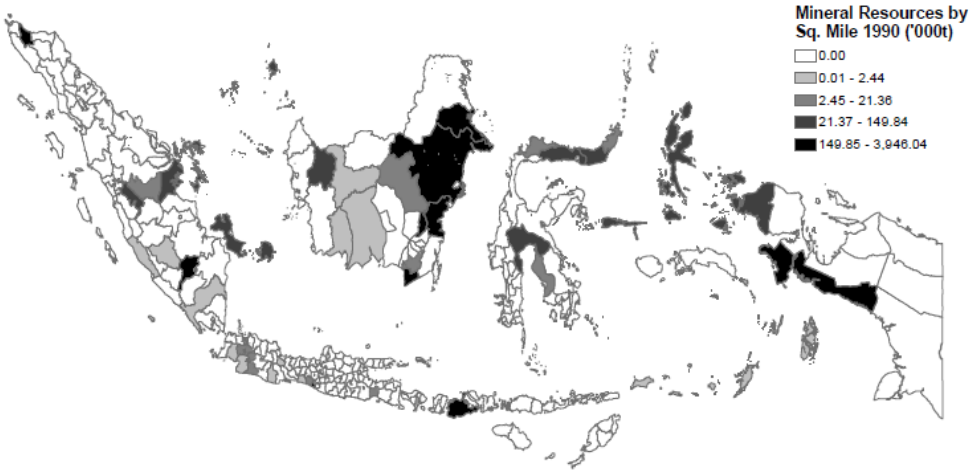
- $p_{NR} \uparrow \rightarrow$ NR increases wage to hire more workers ("Resource Movement Effect")
- Magnitude depends on Labour Intensity of NR-sector and Labour Mobility across districts
- As long as workers participate in larger NR-profits or population increases:
  - Demand for services and MF-good $\uparrow$
  - $\rightarrow$ Production & price of Service Sector $\uparrow$ ("Spending Effect")
- MF cannot benefit and reduces employment
- In practice: The less traded a MF plant's products are, the less it suffers / the more it benefits

Data

- Sample period: 1990-2009
- 282 districts in 26 provinces in 1990
- Unit of observation: Manufacturing plants with 20+ employees over time
- $\sim$ 400,000 plant-years, i.e. $\sim$ 20,000 plants per year
- Mining data from *Raw Materials Data* and *MinEx consulting*
- Oil and Gas Data from *Indonesia Oil and Gas Atlas*
- Natural Resource Price data from various sources
- Population data from *Minnesota Population Center* (MPC)
- Labor Force Survey Data from Statistics Indonesia

Data & Key Variables II

- District's mining intensity = 1990 Mineral Resources / Area
- At least 1 underground mine in district $\rightarrow$ Relatively Labor-intensive mining
- 40 mining districts in 21 provinces, of which 9 underground mining districts in 6 provinces
- Oil and Gas: no resources data $\rightarrow$ use district-specific production $\sim$ 1990 (37 O&G districts in 14 provinces)
- Focus on mining due to revenue sharing scheme & Labor-Intensity
  - $\sim$ 50% of mining revenues shared with producing district
  - $<$10% of oil and gas revenues shared with producing district

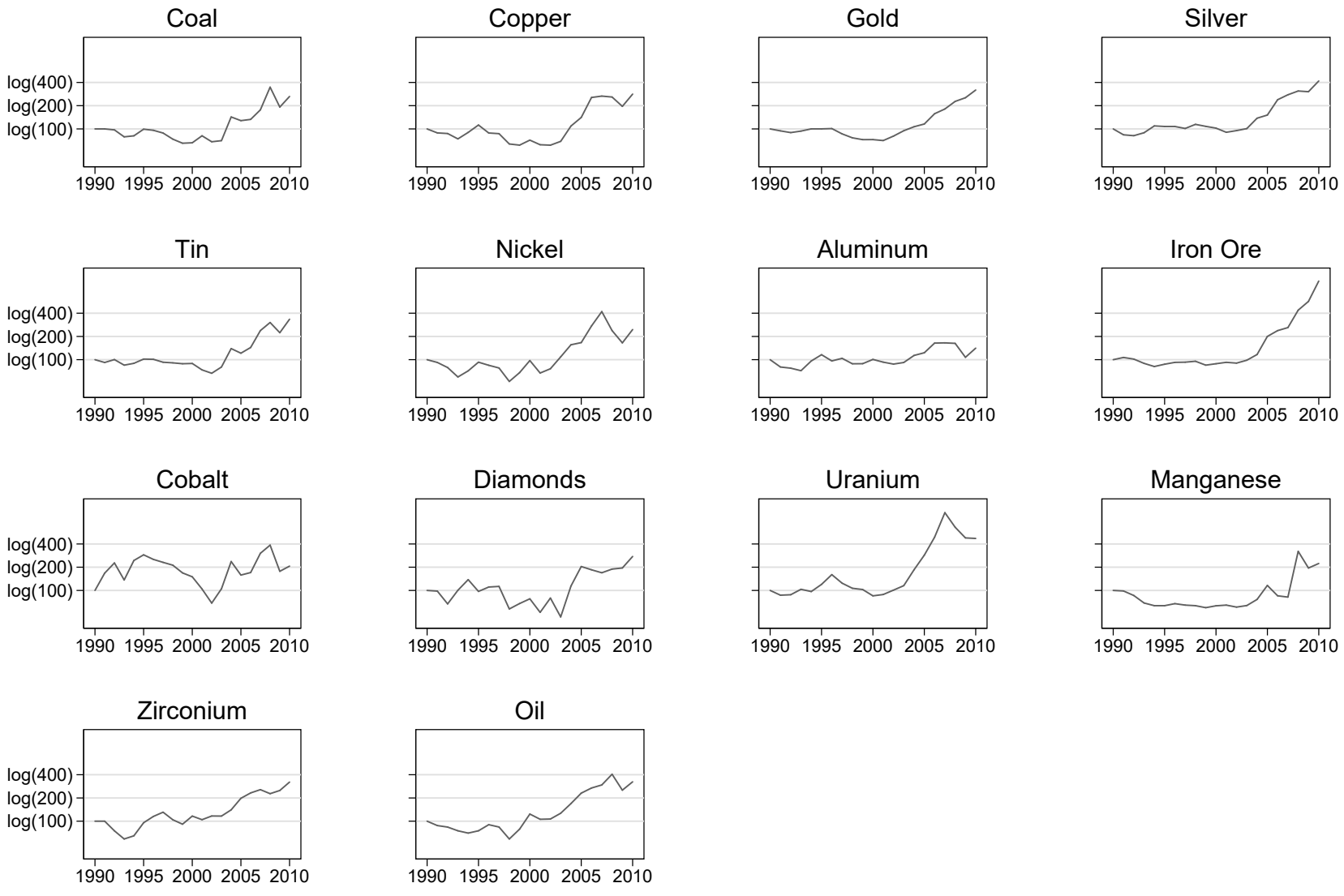

Mineral Resources by Sq. Mile 1990 ('000t)
0.00
0.01 - 2.44
2.45 - 21.36
21.37 - 149.84
149.85 - 3,946.04


Barrels of Oil Equiv. Production per Sq. Mile ~1990
0.00
0.01 - 1.17
1.18 - 5.04
5.05 - 58.14
58.15 - 2,301.35


Number of Plants per Square Mile 1990-2009
0.000 - 0.003
0.004 - 0.012
0.013 - 0.104
0.105 - 0.492
0.493 - 15.737

Minerals prices and Oil Price 1990-2010

Log Prices 1990-2010



Data & Key variables III

- District-specific Minerals Price
  - Example: 1990 mineral resources are 80% gold and 20% coal
  - $\rightarrow$ Weight of $p_{GOLD} = 0.8$
  - $\rightarrow$ Weight of $p_{COAL} = 0.2$
- Tradedness of manufacturing goods at plant-level:
  - 1. Exporters vs. Non-exporters
  - 2. Refine by industry-specific distance elasticity of trade, proxied by avg. shipment distance (Holmes and Stevens, 2014)
    - If non-exporter & industry average shipment distance below median $\rightarrow$ "Local Goods" Producer
    - If exporter or industry average shipment distance above median $\rightarrow$ "Traded Goods" Producer

Empirical specification

$$\begin{aligned}\Delta Y_{ijkt} = &\beta_1[\textit{Mineral resources}_k \times \Delta \textit{MPrice}_{kt}] \\ &+ \beta_2[\textit{Mineral resources}_k \times \Delta \textit{MPrice}_{kt} \times \textit{UGMining}_k] \\ &+ \beta_3[\textit{OilGas}_k \times \Delta \textit{OilPrice}_t] \\ &+ \beta_4\ \textit{Mineral resources}_k + \beta_5 \textit{UGMining}_k + \beta_6 \textit{OilGas}_k \\ &+ \mu_j \times \alpha_t + \epsilon_{ijkt}\end{aligned}$$

- $\mu_j \times \alpha_t =$ Industry $\times$ Year Fixed Effects
- $=$ difference - in difference specification with time-varying treatment of different intensity
- β_1 measures the *relative* effect of a price shock in the district with average mineral resources

Results

Labor intensity by type of resource extraction

Dependent variable	log(# Mining and Oil&Gas Workers)			
	(1)	(2)	(3)	(4)
Total Mineral Resources 1990	0.39***	0.30***	0.40***	0.18*
	(0.086)	(0.107)	(0.098)	(0.092)
Total BOE Production ∼1990	0.07***	0.05**	0.07***	-0.01
	(0.018)	(0.023)	(0.021)	(0.023)
Underground Mining		1.07**		
		(0.505)		
100% Underground Mining			2.45***	1.96***
			(0.185)	(0.236)
Underground & Open Pit Mining			-0.05	1.17*
			(0.566)	(0.691)
Year FE	Yes	Yes	Yes	Yes
Province FE	No	No	No	Yes
Observations	1484	1484	1484	1484
adj. R^2	0.119	0.137	0.163	0.416

- Underground mining > Open-pit mining
- Mining > Oíl&G Extraction

Migration

Dependent variable	Δ_5 ln(Population$_t$)			
	(1)	(2)	(3)	(4)
Mineral Resources 1990 × $\mathbf{W_1}$ Δ ln(Minerals Price)	0.044**	0.000		
	(0.021)	(0.035)		
Mineral Resources 1990 × $\mathbf{W_1}$ Δ ln(Minerals Price) × Underground Mining		0.060*		
		(0.035)		
BOE Production ∼1990 × $\mathbf{W_1}$ Δ ln(Oil Price)	-0.019	-0.019		
	(0.037)	(0.037)		
Mineral Resources 1990 × $\mathbf{W_2}$ Δ ln(Minerals Price)			-0.030	
			(0.018)	
Mineral Resources 1990 × $\mathbf{W_2}$ Δ ln(Minerals Price) × Underground Mining			0.082***	
			(0.027)	
BOE Production ∼1990 × $\mathbf{W_2}$ Δ ln(Oil Price)			-0.018	
			(0.028)	
Mineral Resources 1990 × Δ_5 Minerals Price				0.000
				(0.007)
Mineral Resources 1990 × Δ_5 Minerals Price × Underground Mining				0.012*
				(0.007)
BOE Production ∼1990 × Δ_5 ln(Oil Price)				-0.004
				(0.007)
Controls	Yes	Yes	Yes	Yes
Observations	939	939	939	939
adj. R^2	0.040	0.040	0.040	0.040
Marginal Effect of Mining Boom for Underground Mining=1		0.061***	0.052**	0.012***
		(0.018)	(0.025)	(0.003)

Manufacturing Wages

Dependent variable	Δ ln(Average earnings per worker)					
	All Plants	All Plants	Non-Exporters	Exporters	Producers of Local Goods	Producers of Traded Goods
	(1)	(2)	(3)	(4)	(5)	(6)
Mineral Resources 1990 × Δ ln(Minerals Price)	0.022	-0.012	0.019*	-0.043	0.018*	-0.042
	(0.020)	(0.021)	(0.010)	(0.028)	(0.011)	(0.026)
Mineral Resources 1990 × Δ ln(Minerals Price) × Underground Mining		0.071***	0.093***	0.049*	0.094***	0.047*
		(0.021)	(0.011)	(0.028)	(0.011)	(0.026)
BOE Production ∼1990 × Δ ln(Oil Price)	-0.002	-0.002	-0.001	-0.004	-0.005	-0.001
	(0.003)	(0.003)	(0.002)	(0.005)	(0.005)	(0.003)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	343466	343466	224078	119250	140167	203249
adj. R^2	0.034	0.034	0.035	0.037	0.032	0.036
Marginal Effect of Mining Boom for Underground Mining=1		0.059***	0.112***	0.006	0.112***	0.005
		(0.003)	(0.004)	(0.005)	(0.004)	(0.005)

- Wages significantly increase during a labor-intensive mining boom
  → Evidence of Resource Movement effect

Manufacturing Employment

Dependent variable	Δ ln(# Employees)					
	All Plants	All Plants	Non-Exporters	Exporters	Producers of Local Goods	Producers of Traded Goods
	(1)	(2)	(3)	(4)	(5)	(6)
Mineral Resources 1990 × Δ ln(Minerals Price)	0.020*	0.035***	0.021***	0.048**	0.021***	0.048**
	(0.010)	(0.010)	(0.007)	(0.022)	(0.007)	(0.022)
Mineral Resources 1990 × Δ ln(Minerals Price) × Underground Mining		-0.033***	-0.006	-0.057**	-0.006	-0.056***
		(0.010)	(0.007)	(0.022)	(0.007)	(0.022)
BOE Production ∼1990 × Δ ln(Oil Price)	-0.001	-0.001	0.000	-0.001	0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	343751	343751	224235	119378	140261	203440
adj. R^2	0.016	0.016	0.016	0.017	0.015	0.017
Marginal Effect of Mining Boom for Underground Mining=1		0.003*	0.015***	-0.009***	0.015***	-0.009***
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)

- Employment sign. increases during capital-intensive mining boom
- Traded MF employment sign. decreases during labor-intensive boom

Manufacturing Revenues, Sales & Prices

	All Plants	Producers of Local Goods	Producers of Traded Goods
	(1)	(2)	(3)
Δ ln(Revenues)			
Mineral Resources 1990 × Δ ln(Minerals Price)	0.019	0.041	0.001
	(0.018)	(0.037)	(0.024)
Mineral Resources 1990 × Δ ln(Minerals Price) × Underground Mining	0.067***	0.112***	0.010
	(0.018)	(0.037)	(0.025)
BOE Production ∼1990 × Δ ln(Oil Price)	0.003**	0.004	0.002
	(0.002)	(0.002)	(0.003)
Δ ln(Number of Product Units sold)			
Mineral Resources 1990 × Δ ln(Minerals Price)	0.049	0.032	0.063
	(0.045)	(0.036)	(0.053)
Mineral Resources 1990 × Δ ln(Minerals Price) × Underground Mining	-0.024	-0.025	-0.024
	(0.047)	(0.036)	(0.058)
BOE Production ∼1990 × Δ ln(Oil Price)	0.011	0.010	0.008
	(0.016)	(0.008)	(0.026)
Δ ln(Revenues / Number of Product Units sold = Unit Price)			
Mineral Resources 1990 × Δ ln(Minerals Price)	-0.006	0.032	-0.039
	(0.043)	(0.047)	(0.041)
Mineral Resources 1990 × Δ ln(Minerals Price) × Underground Mining	0.072	0.121**	0.012
	(0.045)	(0.047)	(0.048)
BOE Production ∼1990 × Δ ln(Oil Price)	-0.016*	-0.011	-0.018
	(0.010)	(0.009)	(0.020)

- Local Goods Producers can raise prices during labor-intensive boom

TFP

Dependent variable	Δ ln(TFP)			Δ_5 ln(TFP)
	All Plants	Producers of Local Goods	Producers of Traded Goods	Producers of Traded Goods
	(1)	(2)	(3)	(4)
Mineral Resources 1990 $\times$ Δ ln(Minerals Price)	-0.001	0.001	-0.004*	
	(0.001)	(0.002)	(0.002)	
Mineral Resources 1990 $\times$ Δ ln(Minerals Price) $\times$ Underground Mining	0.006***	0.006**	0.005**	
	(0.001)	(0.002)	(0.002)	
BOE Production $\sim$1990 $\times$ Δ ln(Oil Price)	-0.000	0.001**	-0.001	
	(0.000)	(0.000)	(0.001)	
Mineral Resources 1990 $\times$ $\mathbf{W_1}$ Δ ln(Minerals Price)				-0.001
				(0.017)
Mineral Resources 1990 $\times$ $\mathbf{W_1}$ Δ ln(Minerals Price) $\times$ Underground Mining				0.021
				(0.023)
BOE Production $\sim$1990 $\times$ $\mathbf{W_1}$ Δ ln(Oil Price)				0.001
				(0.004)
Observations	214787	90126	124605	62430
adj. R^2	0.088	0.104	0.087	0.101
Marginal Effect of Mining Boom for Underground Mining=1	0.004***	0.007***	0.001	0.021
	(0.000)	(0.000)	(0.001)	(0.015)

- No long-term negative TFP effect on traded goods producers

Robustness checks

Results are robust to...

- Excluding one labor intensive district at a time
- Redefining Underground districts
- Redefining Mining Intensity
- Studying Coal only
- Foreign and Government Ownership of plants
- Mining booms of neighboring districts
- Mining booms of other districts in the same province
- Upstream linkage of plants

Conclusion I

- Do resource booms hurt the manufacturing sector?
  $\rightarrow$ Depends on labor intensity of extraction method and tradedness of manufacturing!
- "Good mine": Positive effect on all plants
- "Bad mine": Negative effect on traded goods producers
- Oil and gas extraction: capital-intensive and limited revenue sharing $\rightarrow$ no effect
- Can reconcile findings in existing literature
- On aggregate positive effects
  & no negative long-run TFP effects on Traded MF

Conclusion II

- Results are large in magnitude
- AK find that a doubling of oil price raises MF employment by 0.3%
- We find that a doubling of mineral prices raises MF employment by 8.8% if capital-intensive mining!
- e.g. Coal price has more than tripled, so MF sector appears to be hugely affected by mining booms
- $\leftrightarrow$ Less offsetting factors in developing countries!? (e.g. labor mobility across space and sectors)
- High volatility of MF over time $\rightarrow$ lower investment and entry?

The end

Thank you for your Attention!

Additional Results

Dependent variable →	Δln(# Employees)					
	Baseline	Booms nearby	Booms in same province	Booms nearby, after 1999	Booms in same province, after 1999	Two-way clustering
	(1)	(2)	(3)	(4)	(5)	(6)
Mineral Resources 1990 × Δln(Minerals Price)	0.035***	0.034***	0.033***	0.032**	0.032**	0.035***
	(0.010)	(0.011)	(0.009)	(0.014)	(0.013)	(0.003)
Mineral Resources 1990 × Δln(Minerals Price) × Underground Mining	-0.033***	-0.032***	-0.031***	-0.036***	-0.035***	-0.033***
	(0.010)	(0.011)	(0.009)	(0.014)	(0.013)	(0.002)
BOE Production ∼1990 × Δln(Oil Price)	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Neighbours' Mineral Resources 1990 × Δln(Neighbours' Minerals Price)		0.005		0.003		
		(0.022)		(0.022)		
Neighbours' Mineral Resources 1990 × Δln(Neighbours' Minerals Price) × Neighbours' Underground Mining		0.001		0.006		
		(0.024)		(0.024)		
Neighbours' BOE Production ∼1990 × Δln(Oil Price)		-0.001		0.001		
		(0.001)		(0.001)		
OthersProv Mineral Resources 1990 × Δln(OthersProv Minerals Price)			0.003		0.002	
			(0.003)		(0.003)	
OthersProv BOE Production ∼1990 × Δln(Oil Price)			-0.002		-0.001	
			(0.001)		(0.002)	
Observations	343,751	342,065	343,751	196,189	196,935	343,751
adj. R^2	0.016	0.015	0.016	0.004	0.004	0.016
Marginal effect of mining boom for underground mining=1	0.003*	0.003	0.003*	-0.004*	-0.004**	0.003
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)

Robustness Checks I

Dependent variable →	Δln(# Employees)				
	Baseline	Resources 1980	No industry switchers	Ownership Controls	Upstream Controls
	(1)	(2)	(3)	(4)	(5)
Mineral Resources 1990 × Δln(Minerals Price)	0.035***		0.037***	0.025***	0.026***
	(0.010)		(0.011)	(0.004)	(0.010)
Mineral Resources 1990 × Δln(Minerals Price) × Underground Mining	-0.033***		-0.030***	-0.024***	-0.019**
	(0.010)		(0.011)	(0.004)	(0.010)
BOE Production ∼1990 × Δln(Oil Price)	-0.001	-0.001	-0.002	-0.001	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Mineral Resources 1980 × Δln(Minerals Price)		0.066***			
		(0.009)			
Mineral Resources 1980 × Δln(Minerals Price) × Underground Mining		-0.064***			
		(0.009)			
Mineral Resources 1990 × Δln(Minerals Price) × Foreign Ownership (t-1)				0.123**	
				(0.056)	
Mineral Resources 1990 × Δln(Minerals Price) × Foreign Ownership (t-1) × Underground Mining				-0.015	
				(0.058)	
Mineral Resources 1990 × Δln(Minerals Price) × Government Ownership (t-1)				-0.033	
				(0.027)	
Mineral Resources 1990 × Δln(Minerals Price) × Government Ownership (t-1) × Underground Mining				-0.052*	
				(0.029)	
Mineral Resources 1990 × Δln(Minerals Price) × Upstream share > 50pctl					0.019
					(0.039)
Mineral Resources 1990 × Δln(Minerals Price) × Upstream share > 50pctl × Underground Mining					-0.021
					(0.038)
Observations	343,751	343,751	230,353	343,751	343,826
adj. R^2	0.016	0.016	0.014	0.016	0.009
Marginal effect of mining boom for underground mining=1	0.003*	0.003*	0.007***	see	0.007***
	(0.002)	(0.001)	(0.002)	below	(0.001)
Marginal effect of a capital-intensive boom on: Domestic private plant: 0.025*** (0.004) ; Foreign-owned plant: 0.148** (0.059) ; Government-owned plant: -0.008 (0.024)					
Marginal effect of a labour-intensive boom on: Domestic private plant: 0.001 (0.002) ; Foreign-owned plant: 0.109** (0.015) ; Government-owned plant: -0.084*** (0.014)					

Robustness Checks II

Dependent variable →	Δln(# Employees)					Δln(Earnings per worker)
	Baseline	Excluding Tin & Nickel	Same Mineral	After 1999 FE	AK2017 scaling	AK2017 scaling
	(1)	(2)	(3)	(4)	(5)	(6)
Mineral Resources 1990 × Δln(Minerals Price)	0.035***	0.035***	0.034***	0.036***		
	(0.010)	(0.010)	(0.010)	(0.010)		
Mineral Resources 1990 × Δln(Minerals Price) × Underground Mining	-0.033***	-0.033***	-0.031***	-0.033***		
	(0.010)	(0.010)	(0.010)	(0.010)		
BOE Production ∼1990 × Δln(Oil Price)	-0.001	-0.001	-0.001	-0.001		
	(0.001)	(0.001)	(0.001)	(0.001)		
Mineral Resources 1990 (AK2017) × Δln(Minerals Price)					0.088***	-0.029
					(0.024)	(0.052)
Mineral Resources 1990 (AK2017) × Δln(Minerals Price) × Underground Mining					-0.082***	0.177***
					(0.024)	(0.052)
BOE Production ∼1990 (AK2017) × Δln(Oil Price)					-0.002	-0.006
					(0.003)	(0.009)
Industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
District × After 1999 FE	No	No	No	Yes	No	No
Observations	343,751	342,274	319,591	343,750	343,751	343,466
adj. R^2	0.016	0.016	0.015	0.017	0.016	0.034
Marginal effect of mining boom for underground mining=1	0.003*	0.003	0.003*	0.003*	0.006*	0.148***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)	(0.008)

Robustness Check III.1

Sample →	All Plants	Non-Exporters	Exporters	Local Goods Producers	Traded Goods Producers
Dependent Variable	**Δln(Average earnings per worker)**				
	(1)	(2)	(3)	(4)	(5)
Mineral Resources 1990 × Δln(Minerals Price)	-0.012	0.019*	-0.043	0.018*	-0.042
	(0.021)	(0.010)	(0.028)	(0.011)	(0.026)
Mineral Resources 1990 × Δln(Minerals Price) × 100% Underground Mining	1.329***	2.846***	0.475	3.313***	0.357
	(0.458)	(0.537)	(0.631)	(0.515)	(0.586)
Mineral Resources 1990 × Δln(Minerals Price) × Underground & Open-Pit Mining	0.070***	0.092***	0.048*	0.093***	0.047*
	(0.021)	(0.011)	(0.028)	(0.011)	(0.026)
BOE Production ∼1990 × Δln(Oil Price)	-0.002	-0.001	-0.004	-0.005	-0.001
	(0.003)	(0.002)	(0.005)	(0.005)	(0.003)
Observations	343,466	224,078	119,250	140,167	203,249
adj. R^2	0.034	0.035	0.037	0.032	0.037
Marginal effect of mining boom in the average 100% underground mining district	0.023***	0.051***	0.008	0.059***	0.006
Marginal effect of mining boom in the average underground & open-pit mining district	0.108***	0.205***	0.010	0.206***	0.009

Robustness Check III.2

Sample →	All Plants	Non-Exporters	Exporters	Local Goods Producers	Traded Goods Producers
Dependent Variable	**Δln(# Employees)**				
	(6)	(7)	(8)	(9)	(10)
Mineral Resources 1990 × Δln(Minerals Price)	0.035***	0.021***	0.048**	0.021***	0.048**
	(0.010)	(0.007)	(0.022)	(0.007)	(0.022)
Mineral Resources 1990 × Δln(Minerals Price) × 100% Underground Mining	-0.623***	0.241	-1.262***	0.472**	-1.236***
	(0.169)	(0.204)	(0.309)	(0.225)	(0.223)
Mineral Resources 1990 × Δln(Minerals Price) × Underground & open-pit Mining	-0.032***	-0.006	-0.057**	-0.007	-0.056**
	(0.010)	(0.007)	(0.022)	(0.007)	(0.022)
BOE Production ∼1990 × Δln(Oil Price)	-0.001	0.000	-0.001	0.002	-0.002
	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Observations	343,751	224,235	119,378	140,261	203,440
adj. R^2	0.016	0.016	0.017	0.015	0.017
Marginal effect of mining boom in the average 100% underground mining district	-0.010***	0.005	-0.022***	0.009**	-0.021***
Marginal effect of mining boom in the average underground & open-pit mining district	0.005*	0.028***	-0.015***	0.027***	-0.015***

Robustness check: Exclude UG districts one by one

Dependent variable	Δ ln(# Employees)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Mineral Resources 1990 × Δ ln(Minerals Price)	0.035***	0.035***	0.035***	0.035***	0.035***	0.035***	0.035***	0.035***	0.035***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)	(0.009)	(0.009)
Mineral Resources 1990 × Δ ln(Minerals Price) × Underground Mining	-0.033***	-0.033***	-0.033***	-0.032***	-0.033***	-0.033***	-0.095**	-0.032***	-0.033***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.047)	(0.009)	(0.009)
Controls & Industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	343684	332996	343735	343411	343306	343571	343663	343509	343727
adj. R^2	0.016	0.015	0.016	0.016	0.016	0.016	0.016	0.016	0.016

- Results not purely driven by one labor-intensive district