

Industrialization and the Demand for Mineral Commodities

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April 25, 2016

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Paper on one page

Question: How does industrialization affect the derived demand for mineral commodities in the long run?

New dataset: Al, Co, Le, Ti, Zi, 12 countries, 1840-2010.

Methodology: Heterogeneous dynamic panel model.

Results:

- ▶ Manufacturing output affects demand very differently across minerals.
- ▶ Price elasticities are relatively small.
- ▶ Adjustment to equilibrium takes 7 to 15 years.

Motivation

- ▶ China's boom and recent slowdown key driver of commodity prices.
- ▶ “Income elasticities of demand” versus “intensity of use.”
- ▶ Potential demand drivers:
 - ▶ Sectoral shifts.
 - ▶ Intra-sectoral shifts due to development-specific consumer preferences and/or production technology.
 - ▶ Time depending technological change.
 - ▶ Price.
 - ▶ Population growth.

A new dataset

- ▶ 12 major industrialized countries.
- ▶ 1840-2010, annual.
- ▶ Per capita consumption of aluminum, copper, lead, tin, and zinc (in metric tons).
- ▶ Per capita real value added of the manufacturing sector (IGK-\$).
- ▶ Real prices (Inflation adjusted by PPIs)

Econometric model

- ▶ Heterogeneous dynamic panel model.

$$c_{i,t} = \sum_{j=1}^p \lambda_{i,j} c_{i,t-j} + \sum_{l=0}^q \delta_{i,l} y_{i,t-l} + \sum_{m=0}^r \gamma_{i,m} p_{i,t-m} + \mu_i + \epsilon_{it} .$$

▶ Error Correction Form

- ▶ Different extensions to account for technological change.
 - ▶ Linear time trend
 - ▶ Time fixed effects
- ▶ Pooled mean group estimator (Pesaran et al 1999).

Identification

- ▶ Reverse causality from the demand variable to price.
- ▶ Assumptions:
 - ▶ National prices follow international price in the long-run.
 - ▶ Long-run supply elastic, no single country causes long-term price changes.

Regression Results: Benchmark

	Al	Co	Le	Ti	Zi
Manufact. (log)	1.551*** (0.092)	0.914*** (0.061)	0.435*** (0.057)	0.616*** (0.035)	0.734*** (0.033)
Price (log)	-0.706*** (0.184)	-0.400*** (0.093)	-0.220** (0.093)	0.169** (0.085)	-0.064 (0.088)
Adj. Coeff.	-0.117*** (0.023)	-0.132*** (0.028)	-0.094*** (0.021)	-0.095** (0.040)	-0.113*** (0.055)
No. obs.	973	1,206	1,059	1,142	1,216

Notes: Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Regression Results: Time Fixed Effects

	Al	Co	Le	Ti	Zi
Manufact. (log)	1.581*** (0.073)	1.128*** (0.067)	0.745*** (0.112)	0.295** (0.141)	0.834*** (0.132)
Price (log)	-0.836*** (0.236)	-0.009 (0.049)	-0.014 (0.204)	-0.384*** (0.046)	0.207** (0.083)
Adj. coeff.	-0.142*** (0.031)	-0.180*** (0.057)	-0.148*** (0.033)	-0.096*** (0.030)	-0.085*** (0.022)
No. obs.	973	1,206	1,059	1,142	1,216

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

Conclusion

- ▶ Industrialization affects demand very differently across minerals in the long run.
- ▶ China's slowdown: strong effect on aluminum and copper demand, less so on lead, tin, and zinc.
- ▶ But intensity of aluminum use will continue to increase; copper: stable; lead, tin and zinc: down.
- ▶ Prices have a small effect on long-run demand.
- ▶ Adjustment to equilibrium : 7-12 years.

Thank for your attention and your comments!

Error Correction Form

$$\begin{aligned}\Delta c_{i,t} = & \Phi_i(c_{i,t-1} - \theta_{0,i} - \theta_{1,i}y_{i,t} - \theta_{2,i}p_{i,t}) \\ & + \sum_{j=1}^{p-1} \lambda_{i,j}^* \Delta c_{i,t-j} + \sum_{l=0}^{q-1} \delta_{i,l}^* \Delta y_{i,t-l} + \sum_{m=0}^{r-1} \gamma_{i,m}^* \Delta p_{i,t-m} + \epsilon_{it} .\end{aligned}$$

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