

Rail Revival in Africa? The Impact of Privatization

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Macroeconomic Challenges Facing LICs, IMF

Summary

- Compile two spatial panel datasets: light density measured by satellites at night (1992-2010) and geo-coded Afrobarometer survey responses (1999-2009)
- Generalized difference-in-difference approach
- Find no effect of privatization on *objective* economic measures: lights, employment and poverty measures
- Find robust negative effect on *subjective* measures: perceived living standards and opinions on national government
- An interpretation: a disconnect between local narratives and politics vs. tangible outcomes

Background

- 13% of World Bank (IBRD-IDA) lending in 2012 to Transportation (8% to Education, 12% to Health and Other Social Services)
- Infrastructure as a whole the most important sector for IDA assistance (\$5.1 billion of \$14.8 billion in 2012)
- African Infrastructure Country Diagnostic (AICD) main findings:
 - Infrastructure responsible for more than half of African's recent growth
 - African infrastructure lags behind all other developing regions
 - Cost of addressing infrastructure needs \$93 billion/year, 1/3 for maintenance (IDA to Africa was only \$7.4 billion in 2012)
- Where should finance be directed? Where are returns high? How should *existing* infrastructure be managed?

African Rail

- Mostly comprises colonial era lines from inland mines/trading centers to coast, plus branch lines
- Poor condition, damage from civil wars and general wear, only 80% of network operational in 2009
- Mostly disconnected across countries (except Southern Africa)
- Some have proposed a trans-African system (26,000km more rail @\$40 billion minimum)
- World Bank estimates a backlog of \$3 billion investment, plus \$200 million/year needed for maintenance/rehabilitation
- Do economic arguments (big push?) justify third party finance? How about management change?

Running the Rails

- African governments initially reluctant to privatize
- Donor pressure spurred privatization since the 1990s
- 16 concessions granted since 1990 to foreign (usually) private companies, 15 to 30 years
- Some assets still under state ownership, concessionaires can set rates (plus pay fees/taxes to the state)
- With concession came donor support for investment: \$773 million from IDA since 1996

What did Privatization achieve?

- Financial flows reversed – subsidies to state company ended, taxes/fees came to government instead
- Rail management usually improved: labor and asset productivity increased (part due to layoffs, part due to concessionaires actively seeking new traffic)
- No evidence of monopoly behavior
- But still little willingness to re-invest, disappointing governments
- Little evidence on broader economic impacts

Research Question

- What were the effects (if any) of privatization on the local economy?
- Did perceptions of effects match the reality? Or did contrasting local narratives have a stronger hold?
- Answer using two complementary pan-African datasets: (i) light density and (ii) geo-coded survey responses.

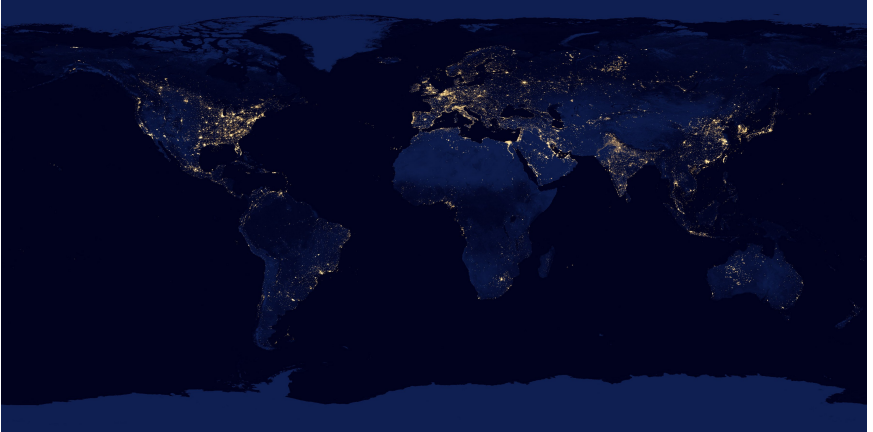
Literature

- **Using lights:** Henderson et al. (2012), Michalopoulos and Papaioannou (2013), Storeygard (2012) on effects of transport costs on African cities, Pinkovski (2013)
- M&P (2013) give support for lights as a welfare/income proxy in Africa: using DHS data they find a strong correlation (~ 0.75) between lights and wealth index
- **On infrastructure:** Donaldson (2010) on railways in India (military motives for exogeneity), Jedwab and Moradi (2012) on rail in Ghana (both find large, positive effects). Banerjee et al. (2012) and Faber (2012) on transportation infrastructure in China using IV. But what about infrastructure *management*?
- Approach to identification here exploits panel structure and assumes parallel trends
- **On privatization:** Kosec (2012) on water sector in Africa. To my knowledge, nothing on rail.

Lights Data

- Light density at night from NASA DMSP-OLS, data at pixel-level, 1 grid up. 1992-2010, 32 countries (with railways)
- Main dep. var. is $\ln(0.01 + \text{lights})$
- Cross-section GIS data on railways from Bullock (2009)/AICD
- Transform this to panel by using online sources to find privatization year
- Controls: population (from Gridded Population of the World), temperature, rainfall, natural resource deposit interacted with composite resource price index (proxy for resource wealth)
- Unit of analysis is grid-cell-year, cell is 0.3x0.3 decimal degrees (~30x30km at the equator)

The World at Night

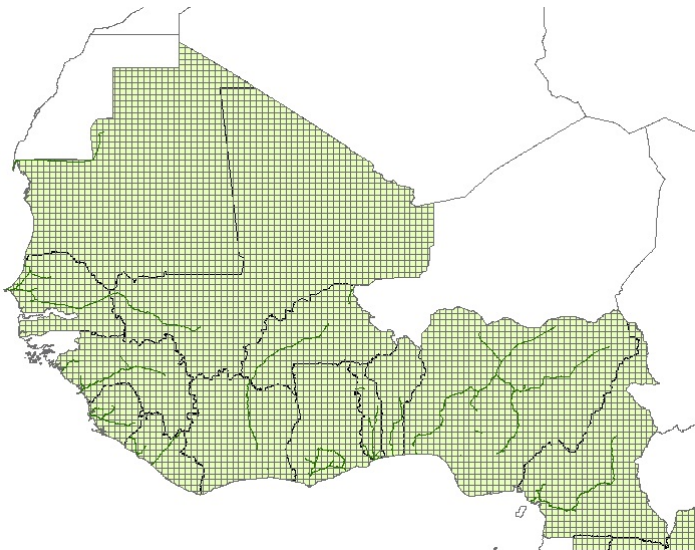


Country Sample



Note: South Africa excluded throughout.

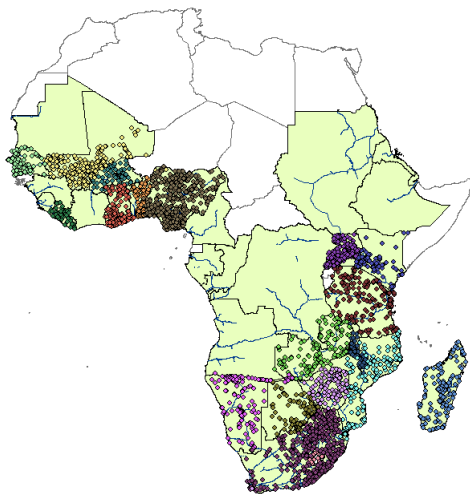
Grid Cells



Afrobarometer

- Survey data collected in five waves – I use waves 1-4 from 1999-2009, covering 11-19 countries
- 1200/2400 citizens surveyed each country-wave
- Geo-codes for ~92% of observations – district/sub-district/town/village centroid

Afrobarometer Geo-coded



Afrobarometer Variables

- Focus on 9 key outcomes (objective and subjective):
 - Employment status (=1 for employed)
 - 3 poverty measures: How often have you gone without food/cash income/water in the past 12 months? (Never = 0, Sometimes = 1, Frequently = 2, Always = 3)
 - 2 on attitudes toward government: How is government handling creating jobs/stable prices? (Very Badly = 1, Fairly Badly = 2, Fairly Well = 3, Very Well = 4)
 - 3 on living conditions: How do you rate your living conditions compared to other countrymen? How do you expect your living conditions to be in 12 months time (only waves 2-4)? How are your present living conditions compared to 12 months ago (only waves 2-4)? (Much Worse = 1, Worse = 2, Same = 3, Better = 4, Much Better = 5)
- Plus controls: Male, Age, Age Squared, Urban, Education dummies

Lights Specification

- Basic diff-in-diff specification would be (restricting to rail-cells)

$$y_{it} = \alpha_i + \alpha_t + \beta \text{priv}_{it} + \epsilon_{it}$$

- Main specification I use is

$$y_{it} = \alpha_i + \alpha_{jt} + \sum_j \beta_j (\text{rail}[j]_i \times \text{priv}_{it}) + \sum_j \gamma_j (\text{rail}[j]_i \times \text{time}_t) \\ + \varphi X_{it} + \mu (\text{res}_i \times \text{price}_t) + \epsilon_{it}$$

- $\text{rail}[j]$ are dummies for railway <10, 10-20, 20-30 and 30-40km from grid centroid (drop cells with time variation)
- β_j are coefficients of interest. Cluster standard errors at district-level throughout

Afrobarometer Specification

- Main specification is similar to that for lights:

$$y_{igwt} = \theta_s + \theta_{jw} + \sum_j \eta_j \text{rail}[j]_{gt} + \sum_j \tau_j \left(\text{rail}[j]_{gt} \times \text{priv}_{gt} \right) + \phi X_{igwt} + \nu_{igwt}$$

- $\text{rail}[j]$ dummies included because of slight panel variation; no time trends because fewer years to identify (placebo checks instead)
- τ_j are coefficients of interest, again cluster at district-level
- Try two other key specifications: restrict to <10km, restrict to sub-districts with railway station (better ‘control’ group)

Lights (I)

Table 5a: Baseline Lights Regressions

L = Lights	(1) ln(0.01+L)	(2) ln(0.01+L)	(3) ln(0.01+L)	(4) ln(0.01+L)	(5) ln(0.01+L)
Rail<10*Priv	0.133*** (0.0329)	0.124*** (0.0342)	0.121*** (0.0282)	-0.0484 (0.0416)	-0.0226 (0.0401)
10<Rail<20*Priv	0.131*** (0.0291)	0.119*** (0.0276)	0.118*** (0.0249)	-0.0504 (0.0372)	-0.0358 (0.0372)
20<Rail<30*Priv	0.0276 (0.0309)	0.0215 (0.0315)	0.0213 (0.0280)	-0.0787** (0.0381)	-0.0568 (0.0375)
30<Rail<40*Priv	0.0195 (0.0281)	0.0183 (0.0283)	-0.00164 (0.0245)	-0.0368 (0.0276)	-0.0123 (0.0264)
Observations	344,819	339,387	339,387	339,387	339,387
Year FE	YES	YES	NO	NO	NO
Grid-cell FE	YES	YES	YES	YES	YES
Country-year FE	NO	NO	YES	YES	NO
District-year FE	NO	NO	NO	NO	YES
Controls	NO	YES	YES	YES	YES
Rail Trends	NO	NO	NO	YES	YES

Lights (II) – Robustness

- Similar results with
 - Different transformations of dependent variable (Lights, $\ln(0.1+Lights)$, $\ln(0.5+Lights)$)
 - Subsample of countries: drop those with civil wars etc.
 - Drop continuously unlit grid cells
 - Restrict to 80, 60, 40, 20km from rail
 - Afrobarometer subsample (interactions insignificant, 3 out of 4 positive)
- Conclude: on average no effect on lights (though heterogeneity by country – not shown here)

Afrobarometer (I) – Objective Measures

	(1)	(2)	(3)	(4)
	Employment Status	Food Poverty	Cash Poverty	Water Poverty
Rail<10*Priv	0.0120 (0.0215)	0.0264 (0.0383)	-0.0123 (0.0408)	0.0431 (0.0457)
Observations	71,298	77,732	71,892	77,780
Country-Wave FE	YES	YES	YES	YES
<hr/> <10km from Rail <hr/>				
Priv	0.0413 (0.0342)	0.00801 (0.0486)	-0.0176 (0.0660)	0.0773 (0.0558)
Observations	23,934	27,055	23,692	27,090
Year FE	YES	YES	YES	YES
<hr/> Railway station in Sub-District <hr/>				
Priv	0.0273 (0.0278)	-0.0432 (0.0527)	-0.0558 (0.0735)	0.000477 (0.0520)
Observations	19,328	21,886	19,901	21,900
Year FE	YES	YES	YES	YES

Controls and sub-district FE included throughout.

Afrobarometer (II) – Subjective Measures

	(5) Gov. Jobs?	(6) Gov. Prices?	(7) Liv. Cond. vs Others	(8) Future Liv. Cond.	(9) Liv. Cond. vs Past
Rail<10*Priv	0.0201 (0.0431)	0.0142 (0.0377)	-0.123*** (0.0409)	-0.0467 (0.0515)	-0.122** (0.0542)
Observations	76,580	77,234	75,331	52,531	61,252
Country-Wave FE	YES	YES	YES	YES	YES
<10km from Rail					
Priv	-0.262*** (0.0746)	-0.354*** (0.0952)	-0.326*** (0.0650)	-0.523*** (0.109)	-0.395*** (0.0954)
Observations	27,038	27,176	26,253	15,850	18,395
Year FE	YES	YES	YES	YES	YES
Railway station in Sub-District					
Priv	-0.212*** (0.0802)	-0.277*** (0.0783)	-0.214*** (0.0514)	-0.371*** (0.0965)	-0.296*** (0.0847)
Observations	21,633	21,621	20,527	14,885	17,352
Year FE	YES	YES	YES	YES	YES

Controls and sub-district FE included throughout.

Placebo Checks

- Add placebo dummies to Afrobarometer regressions – = 1 if not yet privatized but will be
- Placebos are largely insignificant – supportive of common trends of privatized/non-privatized rail areas

Discussion

- Surprising result: no noticeable impact on objective outcomes, but negative effect on subjective outcomes
- One interpretation: local narratives differ from tangible outcomes. The narrative surrounding privatization in Africa is negative
- Backed up by wave 1 question: respondents asked to comment on two statements:

A: The government should retain ownership of its factories, businesses and farms.

B: It is better for the government to sell its businesses to private companies and individuals.

- 43%/16% of respondents (exc. S. Africa) strongly/somewhat agreed with A, only 23%/11% strongly/somewhat agreed with B

Conclusion

- Huge effort needed to revive African rail: World Bank estimates \$3 billion investment backlog, plus \$200 million/year on maintenance and rehabilitation
- World Bank reports on privatization generally favorable: asset and labor productivity improved, governments had fiscal gains
- Evidence here more muted: no evidence of impacts on objective measures – lights, employment and poverty measures
- *Negative* effects on perceptions toward living conditions and confidence in government creating jobs/keeping prices low
- Results show the difficulty of successful rail reform, and of privatization in Africa more generally