



Energy and Economic Growth

Applied Research Programme

The Impact of Electricity of Economic Development: A Macroeconomic Perspective

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Research Questions

- Has electrification prolonged or accelerated growth in developing countries?
- How serious do electricity supply problems have to be, to be a serious constraint on growth?
- What can be learnt from countries that were historically successful in electrification?



What Does Theory Tell Us?

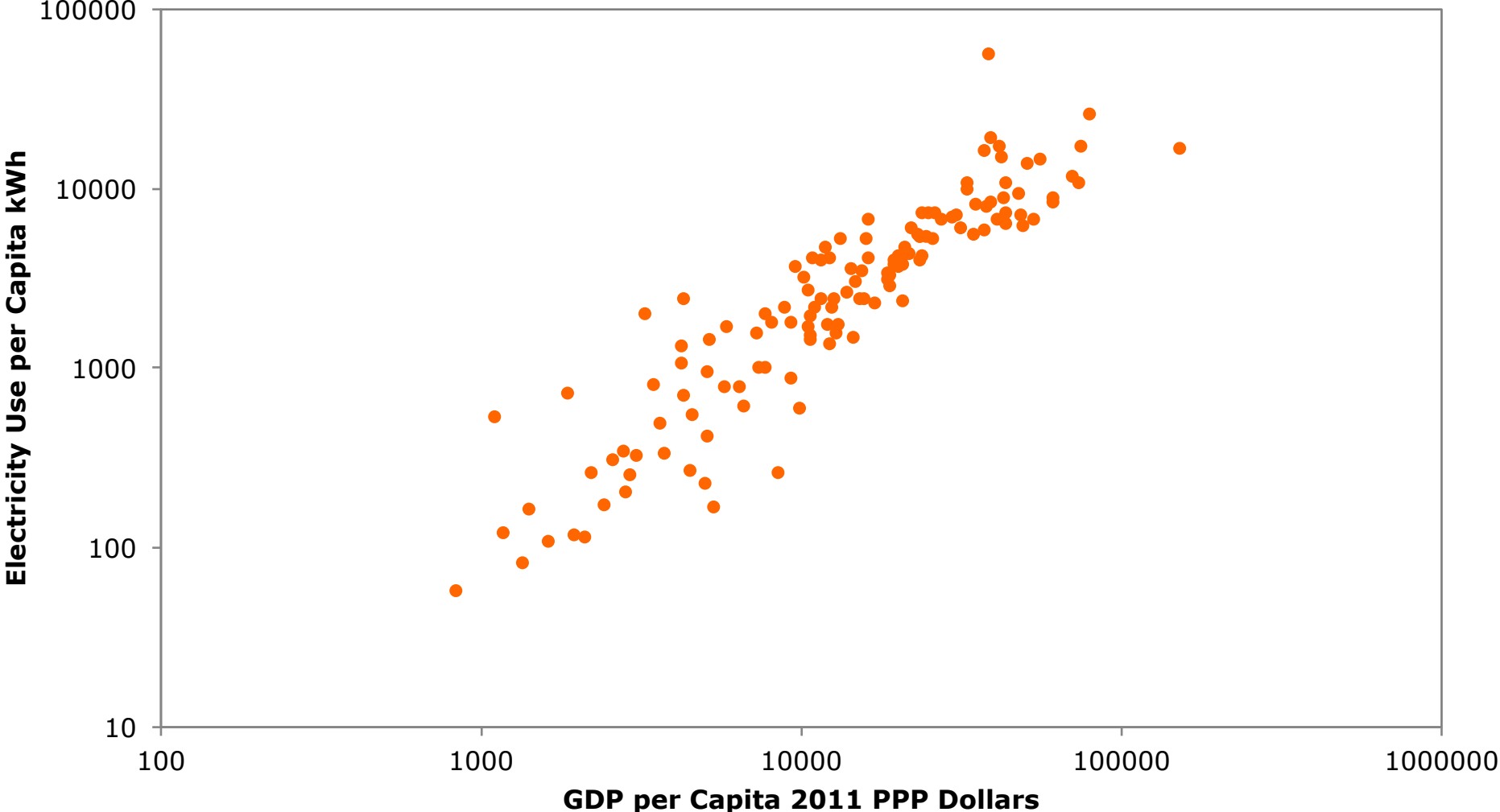
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 - Therefore, energy can be a constraint when scarce
 - Energy (use, quality, productivity) contributed more to growth in developed countries in past
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 - Energy (use, quality, productivity) contributed more to growth in developed countries in past
 - May contribute more to growth in developing than developed countries
- Electricity highest quality energy carrier
 - More productive, flexible, clean than other energy, unique applications
 - Providing reliable electricity supply challenging, requires investment in peak capacity
 - Economies of scale in generation – oil fired power in small/island countries

What Does the Data Tell Us?

Electricity Use and GDP per Capita



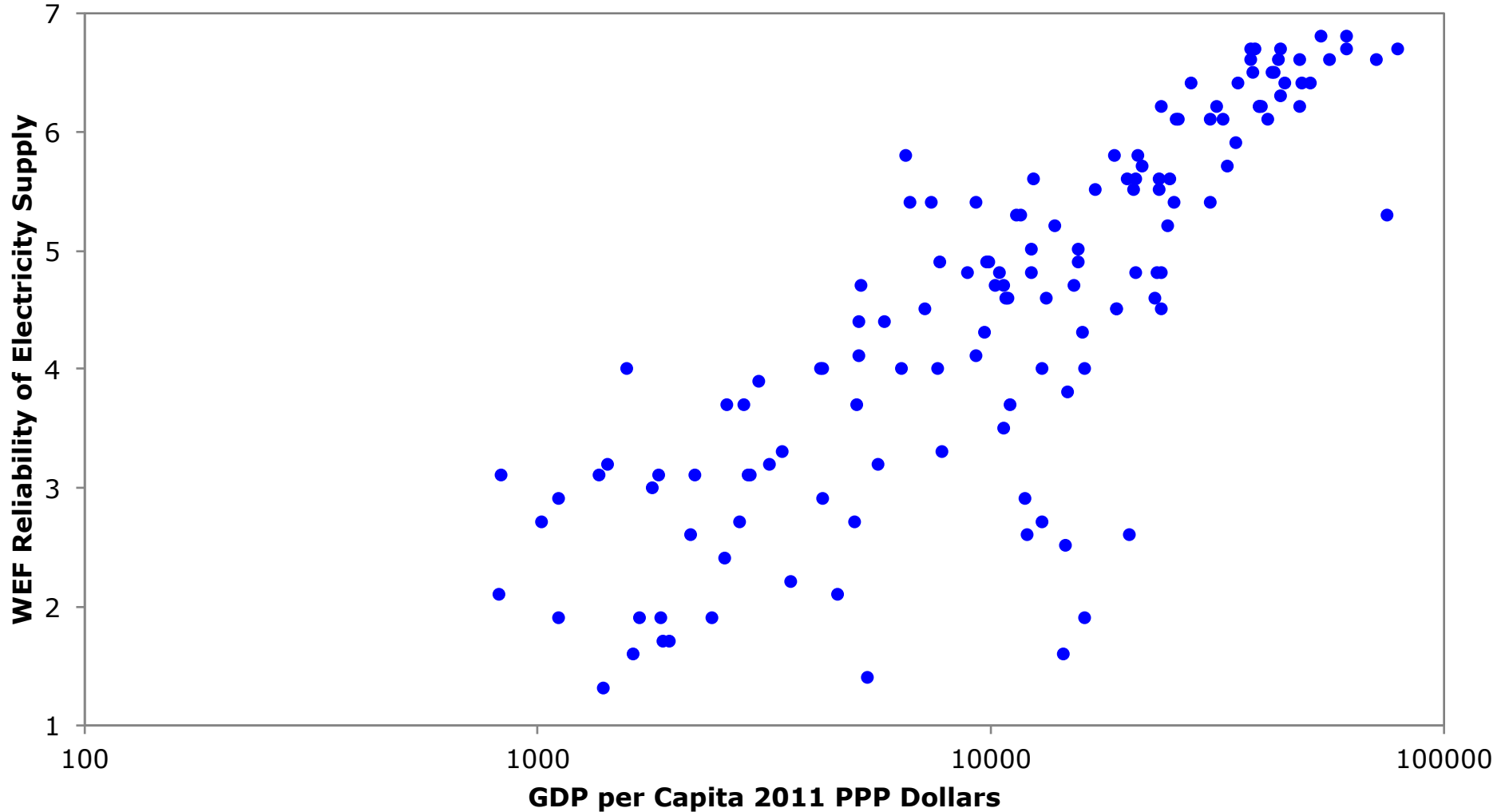
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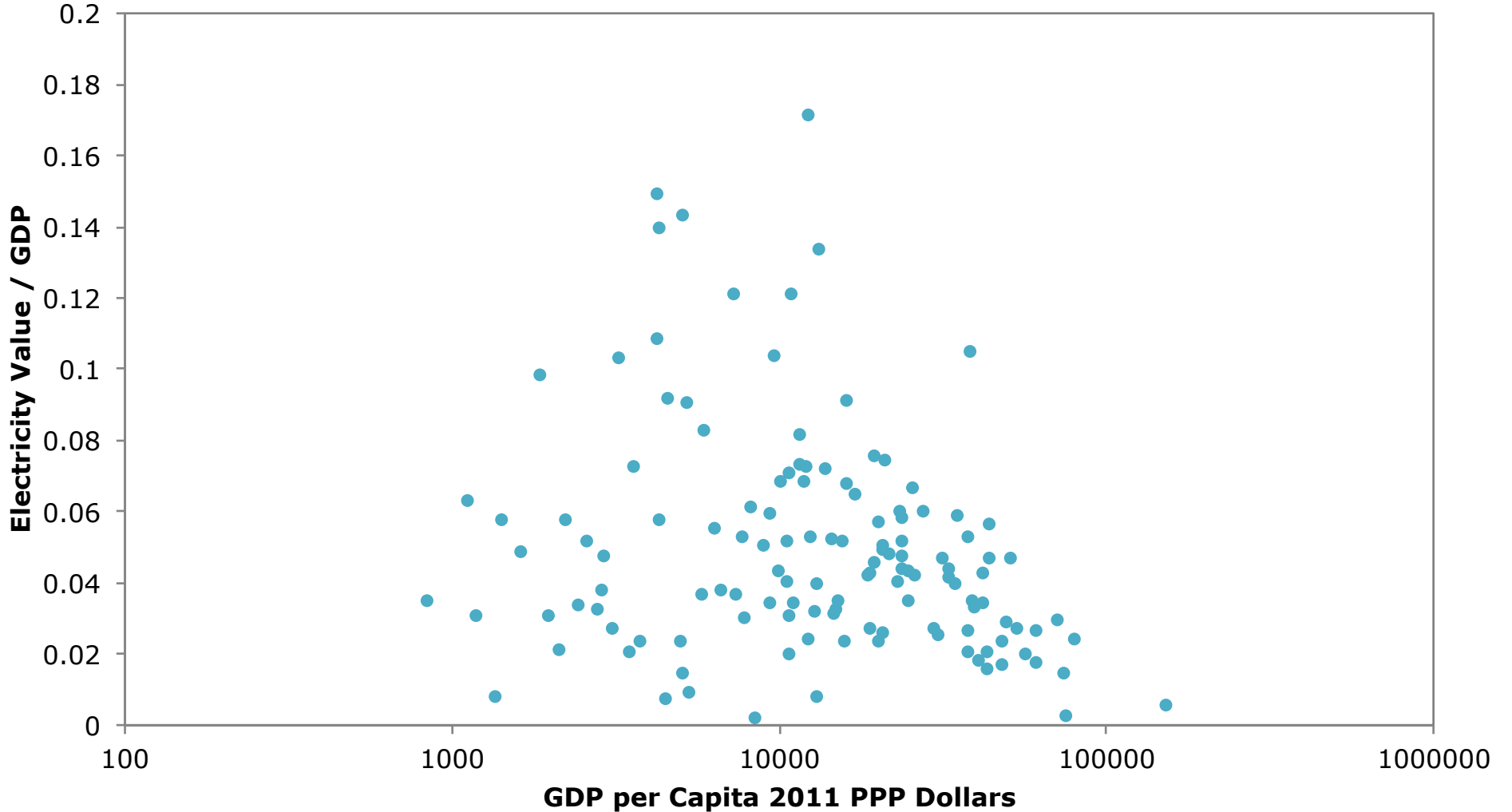
Reliability of Electricity Supply and GDP per Capita



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- Electricity costs high relative to GDP in poorer countries

Value of Electricity/GDP



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- Why?
 - Effect of energy on growth < effect of income on energy demand
 - Energy efficiency improvements reduce energy use increase GDP

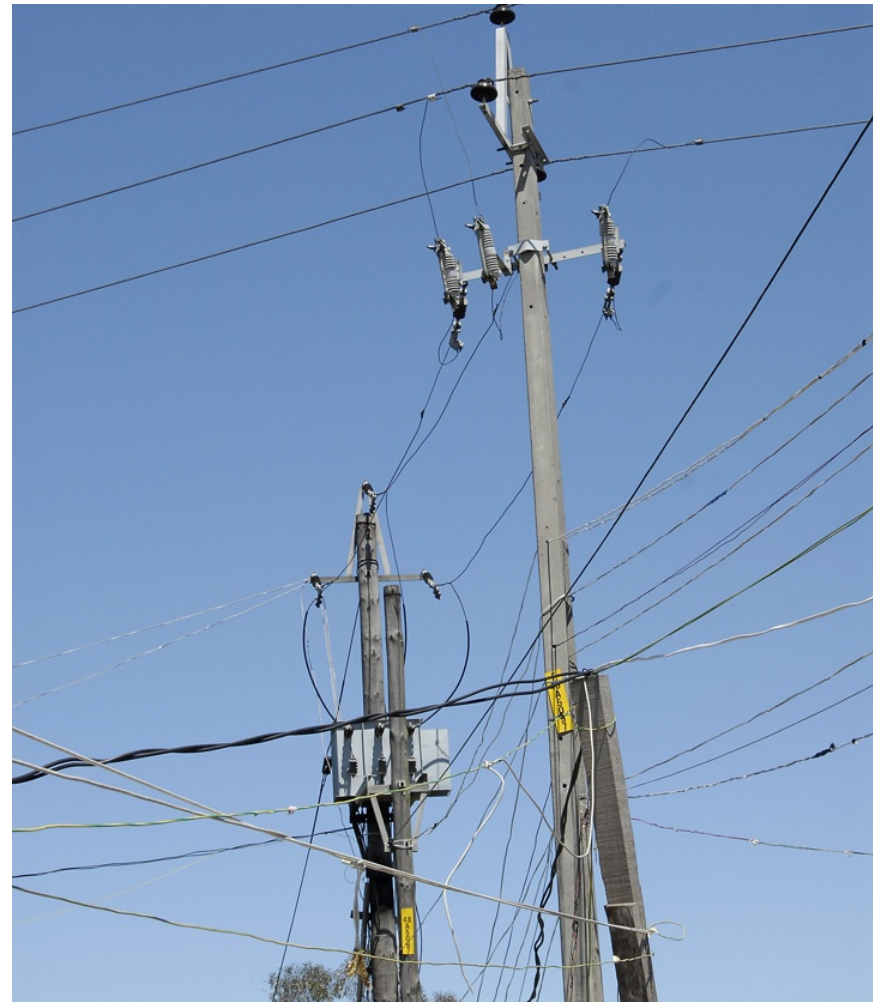
Does Electricity Infrastructure Cause Growth?

- Few methodologically sound studies
- Best studies combine electricity infrastructure with other infrastructure
- Estimated effect on GDP of 1% increase in electricity infrastructure: 0.03%-0.1%



What About Electricity Reliability?

- Again, few well-designed studies
- Andersen and Dalgaard (2013): 1% increase in outages per month → 0.018% reduction in rate of economic growth
- Calderón and Servén (2010): 1% increase in distribution & transmission losses: 0.05% reduction in GDP



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- Selection of countries:
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 - Electricity access 2013 > 95%
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- Egypt: 5.5% economic growth rate (p.c.), electricity quality 2.7



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- But rapid growth recently in Ethiopia, Kenya...

Questions for Further Research

- *What is the effect of electricity supply disruptions on economic growth?*
- *Does electricity sector success boost economic growth in country-level panel datasets?*
- *How robust is the effect of electricity infrastructure on economic growth?*
- *Are the key findings in the electricity-growth literature replicable?*
- *How can electricity be a “binding constraint” on economic growth?*
- *Can a new generation of time series models of energy and growth better identify the role of energy in growth?*



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Thank you