Population Dynamics, Economic Growth and Energy Consumption in Kenya

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Introduction

- Energy Consumption is positively related with economic growth
- Energy fuels systems enhance the efficiency of production
- Energy improves the quality & delivery of goods and shelter

Electricity Production in Kenya

Motivation

- The last three decades were characterized by large rural to urban migration
- As urbanization gathers pace, the demand for modern forms of energy will further increase
- Economic reforms are also likely to contribute to increased energy demand in rural and urban areas

Evolution of Population, GDP and Energy Indexes in Kenya

Parameter	1971	2009	Ratio (%)
Urban Population	1261322	8642219	585.17
Rural Population	10395999	30819969	196.46
Total Population	11657321	39462188	238.52
GDP (Constant 2000 US$)	4002858709	1.799E+10	349.42
Income (GDP per Capita)	343.37	455.86	32.76
Energy Use (kt of oil equivalent)	5416	18723	245.71
Energy Intensity (Energy use per Capita)	0.00045	0.00047	2.12
Electric Power Consumption (Kwh)	909000000	5818000000	540.04

Objectives

In this study, the relationship between urban and rural populations, economic development, and energy use is studied within a Vector autoregression framework

Methodological Approach

To analyze this relationship we specified a VAR model as follows:

$$\begin{bmatrix} GDP_t \\ POP_t \\ EN\_USE_t \end{bmatrix} = A_0 + A_1 \begin{bmatrix} GDP_{t-1} \\ POP_{t-1} \\ EN\_USE_{t-1} \end{bmatrix} + A_2 \begin{bmatrix} GDP_{t-2} \\ POP_{t-2} \\ EN\_USE_{t-2} \end{bmatrix} + \cdots + A_i \begin{bmatrix} GDP_{t-i} \\ POP_{t-i} \\ EN\_USE_{t-i} \end{bmatrix} + \begin{bmatrix} \varepsilon_{GDP} \\ \varepsilon_{POP} \\ \varepsilon_{EN\_USE} \end{bmatrix}$$

GDP = Real Gross Domestic Product
POP = Population
EN_USE = Energy Use

Table 1. Variance Decomposition Analysis - Urban

Variance Decomposition of LN_URBAN:				
Period	S.E.	LN_ENERGY_USE	LN_GDP	LN_URBAN
1	0.014204	0	0	100
5	0.032934	8.132967	4.738561	87.12847
10	0.04434	31.19487	8.882423	59.92271
Variance Decomposition of LN_GDP:				
Period	S.E.	LN_ENERGY_USE	LN_GDP	LN_URBAN
1	0.014991	0	96.87161	3.128392
5	0.043438	15.05122	29.8093	55.13948
10	0.058089	31.37677	24.4601	44.16314
Variance Decomposition of LN_ENERGY_USE:				
Period	S.E.	LN_ENERGY_USE	LN_GDP	LN_URBAN
1	0.003164	88.83132	6.919463	4.24922
5	0.01698	71.08788	7.081724	21.8304
10	0.032952	71.63627	9.784281	18.57944
Cholesky Ordering: LN_URBAN LN_GDP LN_ENERGY_USE				

Table 2. Variance Decomposition Analysis - Rural

Variance Decomposition of LN_RURAL:				
Period	S.E.	LN_ENERGY_USE	LN_GDP	LN_RURAL
1	0.015163	0	0	100
5	0.028411	1.041903	32.53626	66.42183
10	0.031491	1.638918	56.80944	41.55164
Variance Decomposition of LN_GDP:				
Period	S.E.	LN_ENERGY_USE	LN_GDP	LN_RURAL
1	0.017727	0	98.2554	1.744602
5	0.05328	40.33178	56.25852	3.4097
10	0.059221	39.28808	53.52254	7.189378
Variance Decomposition of LN_ENERGY_USE:				
Period	S.E.	LN_ENERGY_USE	LN_GDP	LN_RURAL
1	0.000662	72.53991	26.80352	0.656574
5	0.004549	71.82353	23.28808	4.888386
10	0.011623	59.26114	29.17722	11.56164
Cholesky Ordering: LN_RURAL LN_GDP LN_ENERGY_USE				

Discussion and Conclusion

- Urban population has a greater effect on the future variability of energy usage than the rural population
- Findings reveal that the urban population has a greater effect on economic development than the rural population