Global Journal of HUMAN-SOCIAL SCIENCE: E
Economics
Volume 19 Issue 3 Version 1.0 Year 2019
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-460x & Print ISSN: 0975-587X

Globalization in Reverse: The Missing Link in Energy Consumption

By Tarana Azimova
Nisantasi University

Abstract- We present a theoretical framework that demonstrates the globalization as a beneficial trend which fosters the movement of advanced technology from developed nations to developing countries leading to the deployment of large scale energy projects on renewable technologies. We explore the implications of this framework with panel data and vector autoregressive (VAR) analyses. These suggest that an increase in social globalization which accounts for the spread of know-how, skilled workers and technology by 1 percent reduces the energy consumption by roughly 21 percent. This lead to increasing the employment of clean and renewable energy sources through the attainment of technological efficiency. However, substantial increase in traditional energy demand from developing countries suggests the trend of anti-globalization.

Keywords: energy consumption, panel data analysis, globalization, renewable technologies.

GJHSS-E Classification: FOR Code: 340299

GLOBALIZATIONINREVERSETHEMISSINGLINKINENERGYCONSUMPTION

Strictly as per the compliance and regulations of:

Globalization in Reverse: The Missing Link in Energy Consumption

Tarana Azimova

Abstract- **We present a theoretical framework that demonstrates the globalization as a beneficial trend which fosters the movement of advanced technology from developed nations to developing countries leading to the deployment of large scale energy projects on renewable technologies. We explore the implications of this framework with panel data and vector autoregressive (VAR) analyses. These suggest that an increase in social globalization which accounts for the spread of know-how, skilled workers and technology by 1 percent reduces the energy consumption by roughly 21 percent. This lead to increasing the employment of clean and renewable energy sources through the attainment of technological efficiency. However, substantial increase in traditional energy demand from developing countries suggests the trend of anti-globalization.**

Keywords: energy consumption, panel data analysis, globalization, renewable technologies.

I. Introduction

There is substantial amount of academic literature on the energy consumption. However, much of academic research seems to be narrowly focused, covering only a few economies and factors. Moreover, the academic literature is obscure and scarce on whether globalization has amplified or reduced the consumption of traditional fossil fuels to satisfy expansion in energy demand. Therefore, here we venture to bridge the gaps available in the academic literature, by providing an empirical framework that encompasses the change in fossil fuels consumption for 66 developing countries that result from globalization.

In this paper, globalization comes in many flavors, including economic, political and social elements. Because globalization is a multidimensional phenomenon, we focus on different aspects of globalization to provide the empirical modeling that captures volatility in energy need that arise from globalization effect.

Some academic literature suggests that globalization has made the world into a single system and connected countries through the exchange of information, trans border maintenance of produced technology and international technological partnership. Some argue that this flow leads to technological innovation which in turn leads to efficiency and cost-cutting. Thus this paper focuses on whether globalization has amplified the consumption of traditional energy or if there is a successive switching towards clean and renewable energy sources through the attainment of technological efficiency.

We organize the remainder of the paper as follows. Section 1 gives information of how energy consumption has evolved recently in developing economies. It also provides a brief methodology on globalization. Section 2 delivers the academic literature related to globalization and its impact on energy demand. In section 3 we give a brief description of the dataset, and present the results of various statistical specifications and findings. The last section provides findings and discussions.

II. Theoretical Framework

The emerging economies are increasingly becoming substantial actors in international commercial energy demand. Their share of the total energy use has magnified abruptly in the last decades, from 12 percent of worldwide energy use in 1970 to 57 percent in 2014. Notwithstanding that their per-capita is much lower than that of the industrialized countries; developing countries accounted for more than one-half of the total growth in global energy use since 1970 (see Table 1).

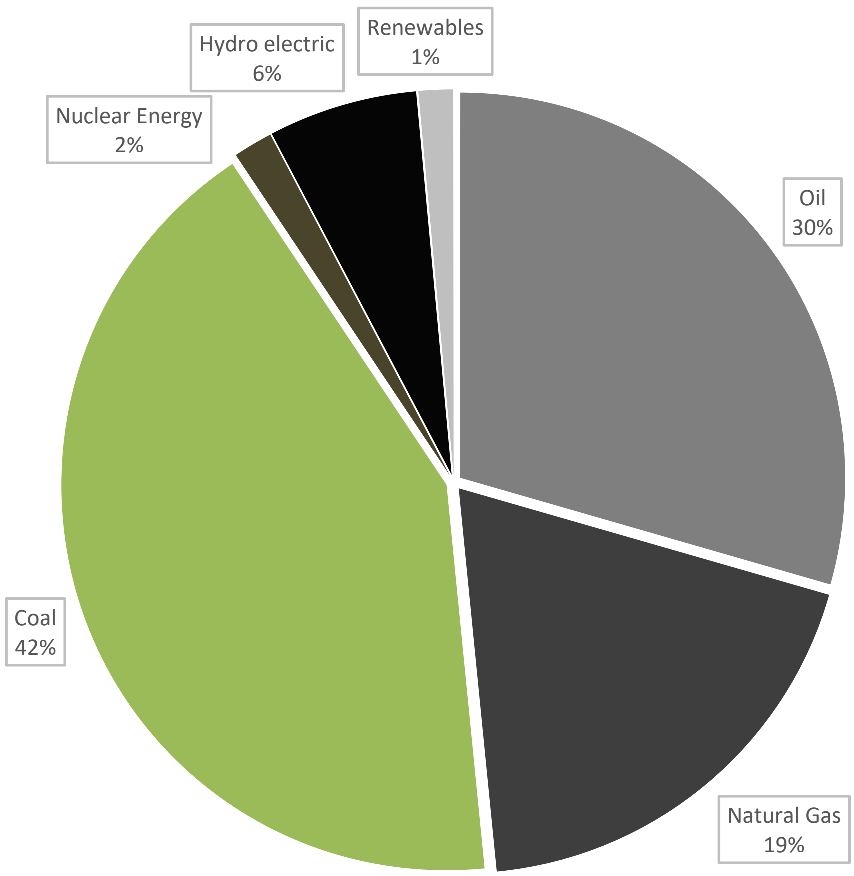
Author: Teaching Assistant in Business Administration Department of Nisantasi University Maslak Istanbul, Turkey.
e-mail: tarana.azimova@nisantasi.edu.tr

Table 1: Energy Consumption, million tones oil equivalent

	1970	1980	1990	2000	2010	2011	2012	2013	2014
World	4911.66	6642.30	8141.85	9390.45	12169.98	12455.29	12633.84	12866.01	12988.85
Developing countries	610.52	1201.01	3265.47	3867.34	6490.15	6847.59	7083.04	7253.52	7421.52
Share of Developing countries	12%	18%	40%	41%	53%	55%	56%	56%	57%

Source: BP statistical review of world energy, 2017

Figure1 displays the sources of energy for the developing group of countries. The developing group mostly uses coal and oil to meet their energy demand. Its worth to note that, much of the coal is used in China and India only. Most of the developing countries use oil as a primary source of energy supplies.



Source: BP statistical review of world energy, 2014

Figure 1: Energy Consumption by Fuel, share of total, 2014

China, Russia, India, and Brazil are among the largest consumers of commercial energy in the world. (see Table 2). China alone accounts for more than 22 percent of the global l energy consumption and 40 percent of commercial energy use among developing countries. China's future energy course will potentially change the energy flows in the region and globally.

At the other end of the scale there is a number of the emerging group that together, that justify only a moderate portion of worldwide energy use. For example, countries of South Africa, consume less than 1 percent of overall fossil fuels (see Table 2).

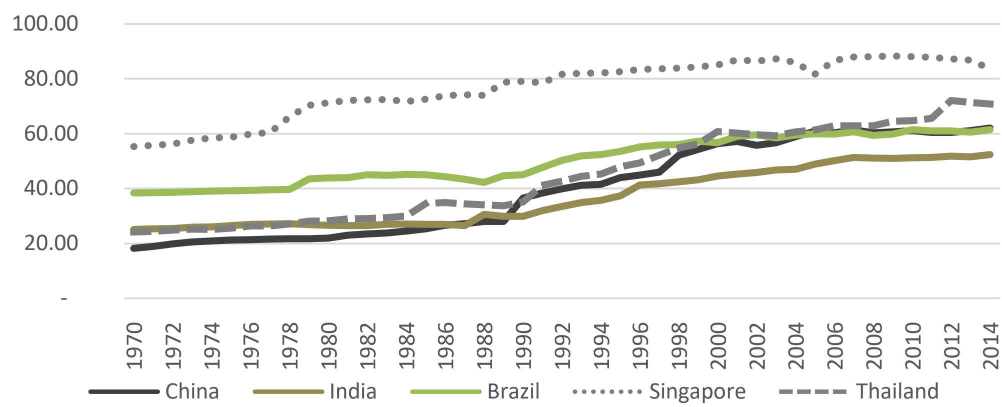
Table 2: Energy Consumption by Country, 2014

Country	Energy Use, million tones oil equivalent	Share in developing countries' energy usage	Share in total usage
China	2970,6	40.17%	22.8%
Russia	689.2	9.3%	5.3%
India	663.6	8.9%	5.1%
Brazil	304.9	4.1%	2.3%
South Africa	125,2	1.7%	0.9%

Source: BP statistical review of world energy, 2014

To analyze in more details how the energy intensity in developing countries changed as a result of the globalization, we focus on different aspects of globalization. Accordingly, to capture the globalization power of developing countries, we use the globalization index Konjunktur for schungs stelle (KOF) developed by the Swiss Economic Institute (Dreher 2006, 2008). The KOF index displays the power of globalization in three dimensions: economic globalization, which estimates business flows with an assumption for confinements to capital and trade; social globalization, which accumulates the dissemination of information, population, ideas, and images and; political globalization, which shows the diffusion of government policies. These three indices are weighted by the weights of variables making up these indices. The weights such as 36%, 37% and 27% are allocated between economic, social and political dimensions of globalization, respectively. These weights are computed based on the values of sub-indices composing the indexes. The three indices are always between 1 and 100, with a greater index indicating on a higher degree of globalization.

Figure 2 illustrates the trend of globalization index for some developing countries. For these, the overall globalization score together with its sub-variables has considerably ameliorated between 1971 and 2014-time span.



Source: World Bank Data Extract

Figure 2: Total Globalization Index, Country Case

By shifting from central economic planning to market reforms, China has made a progress and displayed an increase in globalization index from 18.13 in 1970 to 62.02 in 2014 among developing countries. The data suggests that the overall globalization index of 83.64 for Singapore is the highest among developing countries. For Thailand, the overall globalization index has also been significantly improved reaching 70.76 in 2014.

III. Literature Review

There is surprisingly very scarce literature record connecting globalization and energy demand. To my best knowledge, only one empirical study on energy consumption and globalization exist in the literature. The research conducted by Khalid Ahmed (2015) and others, show that globalization in China diminishes energy demand in the short period. Numerous papers have reviewed the impact of factors such as GDP, financial development, trade openness and energy demand in both developed and developing economies such as Kraf (1978), Al-Iriani M. A. (2006), Ozturk I., Kaplan, M., & Kalyoncu H. (2013), Stern D. I. (1993), Lee, C. C. (2005),Apergis, N. (2009), Asafu-Adjaye J. (2000), Lee C. (2008), Mahadevan R., & Asafu-Adjaye, J. (2007),Yu E. S. (1985), Cheng B. S. (1995), and others.

Moreover, Sari and Soytas (2009), Glasure Y.U. (2002) and others found a long-run relationship between income and energy use in Saudi Arabia. Shu-Chen

Chang (2014) reports that energy demand grow with income in developing markets, whereas in industrial markets energy demand grow with income beyond a point at which the market attains a threshold level of income. This paper uses the most widely referenced, and more recent contributions works of Dreher, A. (2006) and Dreher, A., Gaston, N., & Martens, P. (2008). The studies of Zobaa, A. F., & Lee, W. J. (2006), Harris, M. C. (2001), Stiglitz, J. E. (2004), Guthrie, D. (2012) and others on globalization and its effect on different macroeconomic frames have been used in this paper. We do not venture to present such a review here, but do use these studies to avoid overlapping and place my analysis within the literature.

IV. Empirical Analysis

The empirical investigation covers annual time series for the 66 developing economies.. Annual data on energy consumption and income are extracted from World Development Indicators. The income time series considered in the model as a control variable connecting energy use and globalization. I extract the data on the three globalization indices from KOF Globalization Index (2013). The time length of an analysis depends on the availability of data; therefore, the empirical period is between 1998–2014. In the statistical analysis, we use natural logarithms of all variables.

a) *The stationarity testing*

The first estimation of stationarity was conducted with Levine, Lin and Chu (2002) test. According to if the first order serial correlation coefficient is ρ, then the null hypothesis is that $H_{0:}$ $\rho_i=1$ for i=1…. N, in contrast to homogeneous assumption H_1^1:$-1< \rho_i= \rho<1$ for i=1…. N. Therefore, according to the second hypothesis the ρ is expected to be equal in all terms, by keeping them uniform throughout cross-sectional units as follows: $\Delta y_{it} = (p_i - 1)y_{it-1} + \sum_{j=1}^{p_i} O_{ij}\, \Delta y_{it-j} + \sigma_{mi}\, d_{mt} + v_{it,}\;\; m = 1,2,3$, where $v_{it,}$ represents the residual term of the autoregressive model $\sigma_{ui,LR}^2 = \frac{1}{T}\sum_{t=1}^{T} u_{it}^2 + \frac{2}{T}\sum_{j=1}^{L} w(j,L) \sum_{t=j+1}^{T} u_{it}\, u_{i,t-j}$,where u_{it} is the unobserved noise if there is a coefficient $\varphi_{i=}(\rho_i - 1) = 0\; for\; i = 1 \ldots\ldots N$, then $\varphi = \frac{\sum_{i=1}^{N}\sum_{t=p_{i+2}}^{T} e_{it} f_{it-1}}{\sum_{i=1}^{N}\sum_{t=p_{i+2}}^{T} f_{it-1}^2}$. Im, Pesaran and Shin (1997) unbrace the hypothesis of the LLC test and allow first-order serial correlation coefficients to change across regions as follows: $\bar{Z} = \frac{\sqrt{N}(\bar{t}-E(\bar{t}))}{\sqrt{Var\,(\bar{t})}}$, where $\bar{t} = \frac{1}{N}\sum_{i=1}^{N} t_{y,}$ the terms $Var(\bar{t})$ and $E(\bar{t})$ are the variance and mean of individual t_y statistic, and $\bar{Z}$ statistic approximate to a standard normal distribution. Hadri (2000) estimates a Lagrange ratio with the residuals obtained from the following equation $y_{it} = \delta_{mi}\, d_{mt} + \varepsilon_{it}\;\; with\;\; m = 2,3$ for i=1,……, N. $LM = \frac{1}{N}\sum_{i=1}^{N} \frac{\frac{1}{T^2}\sum_{t=1}^{T} S_{it}^2}{\bar{\delta}_{\varepsilon}^2}$, where $S_{it} = \sum_{j=1}^{t} \varepsilon_{ij}$ and $\bar{\delta}_{\varepsilon}^2$ is the long-run variance estimate of disturbance terms. Table 3 exhibits the panel unit root estimators. At a 5% significance level, except for the IPS statistic for income and energy use variables with individual intercept and individual intercept and trend, other estimators significantly support that five series are stationary. Using these results, I test the time series with the error components model for evidence of the relationship.

Table 3: Unit root test results

	LL		IPS		Hadri	
Variables	Individual Intercept	Individual Intercept and Trend	Individual Intercept	Individual Intercept and Trend	Individual Intercept	Individual Intercept and Trend
Energy Use	-2.85335 (0.0022)	-3.25674 (0.0006)	2.58404 (0.09951)	-0.68804 (0.2455)	18.5366 (0.0000)	12.0678 (0.0000)
Income	-4.64737 (0.0000)	-0.34169 (0.3663)	5.00188 (1.0000)	1.00225 (0.8419)	19.0378 (0.0000)	12.2460 (0.0000)
Economic Globalization	-5.83036 (0.0000)	-5.13200 (0.0000)	-2.26803 (0.0117)	-1.67088 (0.0474)	17.5286 (0.0000)	13.6618 (0.0000)
Political Globalization	-10.1218 (0.0000)	-11.1036 (0.0000)	-6.58672 (0.0000)	-2.97939 (0.0014)	18.0160 (0.0000)	15.6824 (0.0000)
Social Globalization	-16.1049 (0.0000)	-30.1781 (0.0000)	-7.54469 (0.0000)	-6.94836 (0.0000)	17.3266 (0.0000)	13.3718 (0.0000)

b) *The Error Components Model*

In this paper, we use the error components model because there is no correlation between the individual effects and the other regressors. This model allows the intercepts for each cross-sectional unit to arise from a common intercept α . Moreover, it is assumed that the global intercept is the same for all cross-sectional units and over time as follows: $EU_{it} = \alpha + \beta Inc_{it} + cEG_{it} + \gamma PG_{it} + \rho SG_{it} + w_{it},\;\; w_{it} = \epsilon_i + u_{it}$, where ϵ_i is a random variable with zero mean and constant over time but varies cross-sectionally. A random variable determines the arbitrary deviation of individual unit's intercept terms from the common intercept term α and is independent of each observation

Global Journal of Human-Social Science (E) Volume XIX Issue III Version I Year 2019

error term u_{it} and independent explanatory variables Inc_{it}, EG_{it}, PG_{it} and SG_{it} with $1 \times k$ vector of explanatory determinants (Muthen B. 2000). I estimate the common intercept and β vector using a generalized least squares procedure. This procedure involves demeaning data as $EU_{it}^* = EU_{it} - \theta\overline{EU}_i$, $Inc_{it}^* = Inc_{it} - \theta\overline{Inc}$, $EG_{it}^* = EG_{it} - \theta\overline{EG}$, $PG_{it}^* = PG_{it} - \theta\overline{PG}$, $SG_{it}^* = SG_{it} - \theta\overline{SG}$. (Hox J.2002 and Laird N. 1982). Where θ is defined as the variance of the country-specific error term and δ_e^2 is the observation error term, as follows $\delta_u^2 = 1 - \frac{\delta_u}{\sqrt{T\delta_e^2+\delta_u^2}}$. Estimating the data with the panel analysis requires condition on individual and time effects. According to the Likelihood Ratio (LR) test result, there are individual or time effects in the model. The LR also retests the time and individual effects separately; the test result shows the persistence of individual effect in the model (see Table 4).

Table 4: Individual and Time Effects Test Results

Tests	LR Test for Indv. And Time Effects	LR for Ind.	LR for Time.
chi2(2)	2568.00	-	-
Prob.	(0.0000)	(0.0000)	(1.000)
Individual Effect	Yes	Yes	-
Time Effect	Yes	-	No

We use the Hausman Test $H = (\hat{\beta}_{FE} - \hat{\beta}_{RE})'\left[Avar(\hat{\beta}_{FE}) - Avar(\hat{\beta}_{RE})\right]^{-1}(\hat{\beta}_{FE} - \hat{\beta}_{RE})$ to estimate the distance between the random and fixed effects and to test the individual effect of the model. Where FE and RE are fixed and random estimators, and $Avar$ is asymptotic variance-covariance matrices obtained from fixed and random estimations. This test is used in this study to decide which model is statistically appropriate. According to the test results at 5 % significance level, the null hypothesis can be accepted (see Table 5). We conclude that the error component is an appropriate model for the small distance.

Table 5: Hausman Test for Random and Fixed Effects models

Ho: difference in coefficients not systematic
Model Results
chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 8.20
Prob>chi2 = 0.0844

With this information, we move further to test the assumptions of the panel data. The first assumption is related to the stability of variance of the error terms. To test this assumption, I use Levene, Brown and Forsythe (1960) test as follows: $W_0 = \frac{\sum_i n_i(\bar{Z}_i - \bar{Z})^2/(g-1)}{\sum_i \sum_j (Z_{ij} - \bar{Z})^2 / \sum_i (n_i - 1)}$, where $Z_{ij} = \left|X_{ij} - \bar{X}_i\right|$, in this equation X_{ij} is j observation of X variable in group i and n is the number of observations and g is a number of units. From the probability estimators, at 5% significance level I concluded that the error terms are heteroscedastic (see Table 6). If the errors don't have a constant variance their mean value is roughly constant however their variance is rising systematically with the values of dependent variables.

Table 6: Test for Heteroscedasticity

Mean 5.011e-12 and Std. Dev.05232958
Model Results
W_0=23.811554 df(65, 1056) Pr > F = 0.0000000
W_{50} =13.88157 df(65, 1056) Pr > F = 0.00000000
W_{50} =22.88434 df(65, 1056) Pr > F = 0.00000000

I test serial correlation using two alternative techniques: Durbin-Watson $d = \frac{\sum_{i=1}^{N}\sum_{j=1}^{n_i}\left[\tilde{z}_{i,t_{i,j}} - \tilde{z}_{i,t_{i,j-1}} I\,(t_{i,j} - t_{i,j-1} = 1/0)\right]^2}{\sum_{i=1}^{N}\sum_{j=1}^{n_i} \tilde{z}_{i,t_{i,j}}}$ as proposed by Bhargava, Franzini and Narendranathan (1982), where $\tilde{z} = diag(B_i B_i')(Y - X\tilde{\beta})$, $\tilde{\beta}$ is obtained from the estimation by the pooled least squares model $\tilde{Y} = \tilde{X}\beta + u$ .The estimators are indicating on the availability of positive, consistent correlation in the residuals (see Table 7). This condition shows that the standard error terms can inflate the model as they will be biased downwards relative to the true standard errors. Therefore, the test will belittle its true value with underestimating of the true error variance.

Table 7: Test for Serial Correlation

H_0: No AR(1)) in the following specification for the error terms AR(1) disturbances
Model Results
F test that all u_i=0: F(65,986) = 15.42 Prob > F = 0.0000
Modified Bhargava et al. Durbin-Watson = .2864477
Baltagi-Wu LBI = .49502233

We diagnose that the error component model with time effects has heteroscedasticity and serial correlation. Therefore, to eliminate the deviations from assumptions, I use Arellano (1987, 1993) standard errors technique $Var(\hat{\beta}) = \frac{N-1}{N-k}\frac{M}{M-1}(X'X)^{-1}(\sum_{t=1}^{N} X_i'\ \hat{u}_i\hat{u}_i' X_i)(X'X)^{-1}$ where M and N are a number of groups, $\hat{u}_i$ is i residual in group j. The Table 8 shows the test results. The results show that the model and some coefficients are statistically significant. Moreover, the test displays 36% explanatory power, indicating that dependent variables can explain 36% of the variation in energy use.

Table 8: Error Components Model with Arellano standard errors

Model Results	
Energy Consumption	
Income	-0.1116105** (0.002)
Economic Globalization	0.128989 (0.304)
Political Globalization	-0.156562 (0.199)
Social Globalization	-0.2172409 (0.005)
FTest (4,65)	10.62 (0.0000)**
Number of Obs / Groups	1122/66
R-squared	0.3601

*** significant at 5%; * significant at 10%, and *** significant at 1% level*

c) Vector autoregressive model

We present a VAR model for energy use for a group of n time series $y_t = y_{1t}, y_{2t}, .., y_{nt}$, as follows (Ciccarelli and Canova, 2004,2007, 2009, 2013):

$$y_{it} = A_{0i}(t) + A_1(l)y_{t-1} + A_2(l)y_{t-2} + \cdots + A_i(l)y_{i,t-1} + F_i(l)W_{t-1} + u_t$$

where y_{it} is the vector of dependent variable. The advantage of VAR analysis is that it can be extended to over two and more variables. W_{t-1} is the vector of exogenous variables (if present). $A_{0i}(t)$ are the deterministic components of the time series (constant terms, deterministic polynomial in time and seasonal dummies). Under the assumption of heterogeneity across units $F_i(l)$ and $A_i(l)$ are polynomials in the lag operators. We estimate operators under homogeneous panel VAR model (Gnimassoun and Mignon 2013, 2015). u_t is evenly and independently disseminated white noise with zero mean. VAR panel analysis includes only the variables that proved to be statistically significant in panel data analysis.

Before conducting impulse response analysis, we tested the stationarity of the VAR model. From the figure, we found that all roots reside within the integer circle and are lower than one (see Figure 3). This result indicates on the stationarity of the VAR model.

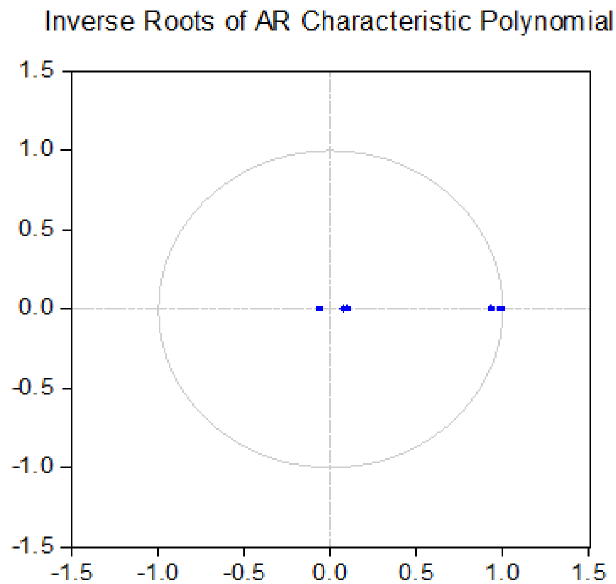


Figure 3: VAR consistency condition verification

We intend to record the time track of the impact of structural shocks on the dependent variables in the model. To estimate the impact of variations in the value of globalization on the structure and the time it will take for the impact to continue across the system, we use impulse response analysis as follows: $\begin{matrix} y_t \\ z_t \end{matrix} = \bar{X} + \sum_{i=0}^{\infty} \Phi_i \, \mathcal{E}_{t-i}$, where Φ_i are impact factors which follow the impact of a single unit variation in a structural innovation as follows: $\Phi_i = \frac{dy_t}{d\mathcal{E}_{z,t}}$(Lutz Kilian 1998). Based on the VAR model impulse response analysis shows the destabilization experienced by the variables in response to shocks that arise within other variables. The results from impulse response analysis show that the impact of social globalization on energy use will work till seven lags lengths after which the shocks will die away (see Figure 4).

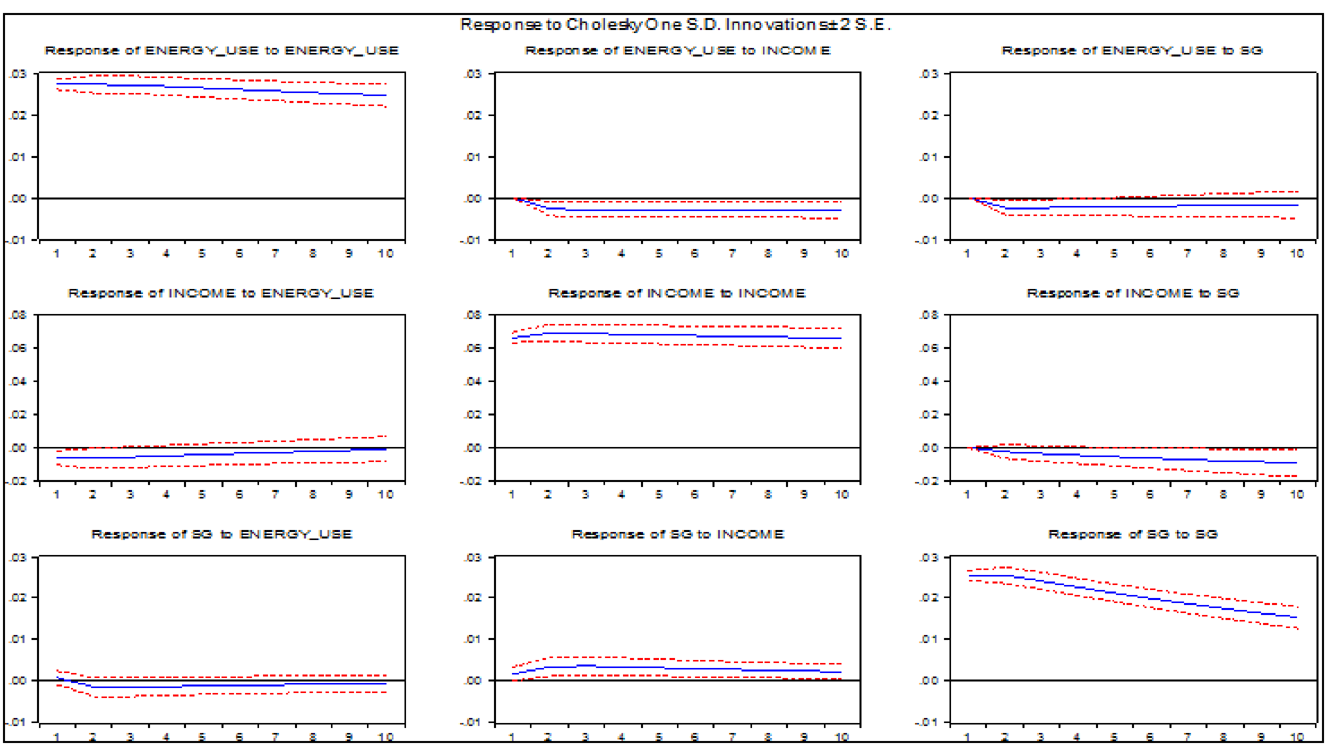


Figure 4: The impulse response of energy consumption, globalization, and income, with panel VAR

V. Findings and Discussions

The key question we are interested in is whether the change in globalization can explain the energy demand in developing countries. With this question in mind, we constructed error components estimators and carried out an impulse response analysis. As a result of these analyses, we found that economic and political globalization processes don't have an impact on energy demand in developing countries. On the other hand, the error components estimators indicate on the fact that among three broad globalization dimensions only social globalization has a statistically significant impact on traditional energy consumption. Social globalization reveals 21.7 % of the change in energy consumption. The coefficient of social globalization is statistically significant, and its effect is negative. That is a 1% increase in globalization diminishes conventional energy use by 21.7 %. This result is very important, because the literature is still ambiguous on the effect of globalization on conventional energy demand. The coefficient of the income variable is also significant, and its effect is negative. This suggests that the increase in income by 1 % decreases traditional energy demand by 11 %. Indeed, the affluent industrialized countries with the highest income per capita decrease the share of traditional energy and increasingly implement the large scale and costly energy projects on renewable energy technology.

A similar pattern emerges from impulse response analysis. The impulse response functions show that energy consumption responds negatively to the increase in social globalization. The functions also show that the energy use responds negatively to the increase in demand.

Although it is an indisputable fact that there are a lot of debates and opinions on globalization across the world, it is widely accepted that globalization fosters trading and business performance by means of rise in foreign direct investment and the transfer of progressive technology from developed nations to developing countries. In particular, social globalization which accounts for the proliferation of ideas, skilled employees and know-how is expected to have a tremendous benefit to developing countries and increase use of clean and renewable energy sources through the attainment of technological efficiency.

The estimations show that a 1% increase in globalization diminishes energy use by 21.7 %. If globalization increased globally, then the traditional energy use in developing economies should have been decreased. However, the use of traditional energy in developing countries has risen steadily from 4911.66 million tons in 1970 to 12988.85 million tons in 2014. Their share of the entire energy demand in 2014 accounted for more than half of the total increase in worldwide commercial energy use. This controversial result can be explained by two phenomena. Firstly, globalization together with income accounts for 36% and globalization alone accounts for 21.7% change in energy demand. However, there are other factors that affect the energy demand and the pace of change of these factors may have been greater than increase in globalization. In other words, the negative impact from the change in other factors may outweigh the benefits from the increase in globalization causing traditional energy demand to increase.

Secondly, this contradictory result may indicate the trend of globalization in reverse. Some countries benefit from globalization process, but probably there is an uneven development of globalization in clean energy consumption around the world. With normal functioning of social globalization, the ideas, skilled people, information and technology transfer very quickly from advanced economies to developing world leading to deployment of large scale energy projects on renewable technologies and thus decreasing the demand for fossil fuels. However recent trends indicate the trend of de-globalization. While the influence of developing group such as China, India, Mexico, Turkey, Singapore, etc. has grown significantly in recent years, it seems that they couldn't change the process of anti-globalization in energy consumption and benefit from social globalization.

References Références Referencias

1. Dreher, A. (2006) Does globalization affect growth? Evidence from a new index of globalization. Applied Economics, 38(10), 1091-1110.
2. Dreher, A., Gaston, N., & Martens, P. (2008) Measuring globalisation: Gauging its consequences. Springer Science & Business Media.
3. Khalid Ahmed , Mita Bhattacharya, Ahmer Qasim Qazi and Wei Long (2015) Energy Consumption in China and Underlying Factors in a Changing Landscape: Empirical Evidence since the Reform Period Monash Business School, ISSN 1441-5429, 43/15.
4. Kraft, J., & Kraft, A. (1978). On the Relationship between Energy and GNP. Journal of Energy and Development 3, 401-403.
5. Al-Iriani, M. A. (2006) Energy–GDP relationship revisited: an example from GCC countries using panel causality. Energy policy, 34(17), 3342-3350.
6. Ozturk, I., Kaplan, M., & Kalyoncu, H. (2013) The causal relationship between energy consumption and GDP in Turkey. Energy & Environment, 24(5), 727-734.
7. Stern, D. I. (1993) Energy and economic growth in the USA: a multivariate approach. Energy Economics, 15(2), 137-150.

8. Lee, C. C. (2005) Energy consumption and GDP in developing countries: a cointegrated panel analysis. Energy economics, 27(3), 415-427.
9. Apergis, N., & Payne, J. E. (2009) CO_2 emissions, energy usage, and output in Central America. Energy Policy, 37(8), 3282-3286.
10. Asafu-Adjaye, J. (2000) The relationship between energy consumption, energy prices and economic growth: time series evidence from Asian developing countries. Energy economics, 22(6), 615-625.
11. Lee, C. C., & Chang, C. P. (2008). Energy consumption and economic growth in Asian economies: a more comprehensive analysis using panel data. Resource and energy Economics, 30(1), 50-65.
12. Mahadevan, R., & Asafu-Adjaye, J. (2007). Energy consumption, economic growth and prices: A reassessment using panel VECM for developed and developing countries. Energy Policy, 35(4), 2481-2490.
13. Yu, E.S.H., Choi, J.Y., (1985) The causal relationship between energy and GNP: An International Comparison. Journal of Energy Development 10, 249-272.
14. Cheng, B. S. (1995) An investigation of cointegration and causality between energy consumption and economic growth. Journal of Energy and Development, 21(1).
15. Soytas, U., Sari, R., Ewing, B., (2009) Energy consumption, income, and carbon emissions in the United States. Ecol. Econ. 62, 482–489.
16. Glasure, Y.U., (2002) Energy and national income in Korea: further evidence on the role of omitted variables. Energy Econ. 24 (4), 355–365.
17. Scu-Chen Chang (2014) Effects of Financial Developments and Income on Energy Consumption. International Review of Economics and Finance 35,28-44.
18. Zobaa, A. F., & Lee, W. J. (2006) The globalization of energy markets in Asia. In Power Engineering Society General Meeting, 2006. IEEE (pp. 6-pp). IEEE.
19. Harris, M. C. (2001) The Globalization of Energy Markets. Challenges of the Global Century, Washington, DC: National Defense University.
20. Stiglitz, J. E. (2004) Capital-market liberalization, globalization, and the IMF. Oxford Review of Economic Policy, 20(1), 57-71.
21. Guthrie, D. (2012) Guthrie, D. (2012) China and globalization: the social, economic and political transformation of Chinese society. Routledge.
22. Levine, A., Lin, C.F., Chu, C.S., 2002. Unit root tests in panel data: asymptotic and finite sample properties. Journal of Econometrics 46 (1), 31-77.
23. Im, K.S., Pesaran, M.H., Shin, Y., (1997) Testing for unit roots in heterogeneous panels. Working paper. University of Cambridge.
24. Hadri, K., (2000) Testing for stationarity in heterogeneous panel data. Econometrics Journal 3, 148 – 161
25. Muthén, B. O. (2000) Methodological issues in random coefficient growth modeling using a latent variable framework: Applications to the development of heavy drinking. In Multivariate 56 Applications in Substance Use Research, edited by L. C. J. Rose, C. Presson & J. Sherman. Hillsdale, N.J.: Erlbaum.
26. Hox, J. (2002) Multilevel Analysis. Techniques and applications. Mahwah, NJ: Lawrence Erlbaum Associates.
27. Laird, Nan M.; Ware, James H. (1982) Random-Effects Models for Longitudinal Data. Biometrics. 38 (4): 963974. JSTOR 2529876.
28. Levene H., (1960) Robust Tests for Equality of Variances, Contributions to Probability and Statistics: Stanford, California: Stanfords University Press, 278-292.
29. Bhargava A., Franni L. and Narendranathan W., (1982) Serial Correlation and Fixed Effect Models. the Review of Economic Studies, 49, 33-549.
30. Arellano M., (1987) Computing Robust Standard Errors for Within-Groups Estimators. Oxford Bulletin of Economics and Statistics, 49(4), 431-434.
31. Arellano M, (1993) On the Testing of Correlated Effects with Panel Data. Journal of Econometrics, 59, 87-97.
32. Canova, F. and Ciccarelli, M., (2004) Forecasting and Turning Point Predictions in a Bayesian Panel VAR Model. Journal of Econometrics, 120, 2004, 327-359.
33. Canova, F. (2007) Methods for applied macroeconomic research. (Vol. 13). Princeton University Press.
34. Canova, F., and Ciccarelli, M., (2009) Estimating Multi-country VAR models. International Economic Review, 50, 929-961.
35. Canova, F.and Ciccarelli, M. (2013) Panel Vector Autoregressive Models: A Survey. ECB Working Paper No. 1507
36. Gnimassoun B.& Mignon V., (2013) How Macroeconomic Imbalances Interact? Evidence from a Panel VAR Analysis, Working Papers 2013-42, CEPII research center
37. Gnimassoun, B. & Mignon, V. (2015) Persistence of Current-account Disequilibria and Real Exchange-rate Misalignments. Review of International Economics, 2023- 137.
38. Kilian L (1998) Small sample confidence intervals for impulse response functions. Review of Economics and Statistics 80: 218-230.