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The Effect of Commodity Prices on African Economic Growth

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The Effect of Commodity Prices on African Economic Growth

by

Hangnile Nathalie Olga Tiawara

A Thesis

Submitted to the Graduate Faculty of

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in Partial Fulfillment of the Requirements

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in Applied Economics

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Thesis Committee:

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Abstract

African countries export more primary commodities than anything else (Deaton, 1993). Those export are usually seen by scholars as both a hope and a curse. The purpose of this paper is to examine how commodity prices affect African economic welfare. I apply a panel modeling and construct impulse responses for the analysis using a panel data of 49 African countries from 1999 to 2014. The results will help us determine the effect of commodity price on Africa economic growth. The results are inconclusive and the estimates are statistically insignificant. Still, the impulse response functions indicate that an increase in commodity price is more likely to benefit the African economies than hurting them.

I. Introduction

The African economy has seen a tremendous economic growth over the last decade. Data for most African countries had been lacking; but nowadays research is able to progress because of the efforts of organizations such as the World Bank and the International Monetary Fund (IMF) which work to compile a tremendous database for research. Some scholars such as Angus Deaton consider the African market promising but at the same time a curse. Deaton (1993) raises the issue of the effect of the commodity prices on Africa's economic development from which he found that there is a positive effect on the economy.

African countries export more primary commodities than the rest of the world. Collier and Goderis (2008) found a strong evidence of a natural resource curse, but they also argue that there is hope since countries with sufficiently good institutions can avoid the curse. One purpose of their paper is to examine how the world commodity prices affect the economic growth for a cross-section of African countries. They found that there are important implications for non-agricultural commodity exporters with weak institutions.

Deaton (1999) also examined commodity prices and growth in Africa; he believed that the African markets are promising, but at the same time problems persist and they can also be worse. Africa is rich in natural resources such as gold, diamonds, copper, nickel, timber and oil. However, most of the production, refineries and processing of these resources are under contract to expatriates and foreign owned companies. Because the minerals are usually owned or mined by foreign investors, the pricing of the minerals are determined and controlled by these foreign interests. Thus, they may not be paying a competitive price, which may eventually hurt African countries profits. In addition, most African countries export more than one commodity, and that

may complicate the analysis. These exports are concentrated in relatively small numbers of primary commodities.

The aim of this paper is to examine the effects of commodity prices on Africa's economic growth. A panel model and an impulse response analysis are used and the result will help determine the effect of commodity price on economic growth. The results are inconclusive and the estimates are statistically insignificant. Still, the impulse response functions indicate that an increase in commodity price is more likely to benefit the African economies than hurting them

II. Literature Review

Deaton (1999) investigated the hypothesis that commodity prices affect growth in Africa. He examined data that documented who exported what, and what had happened to the world prices of the relevant commodities. His questions include: why the prices behave as they do, what determines their trends and the variability around trend; these questions, he argued, should be the central questions for policymakers in Africa. Even though he found that there had been progress in the African economies, our understanding of commodity prices and the ability to forecast them remained inadequate. Without such understanding, it is difficult to construct good policy rules. Also, there were various accounts and interpretations of African countries' political and economic responses to commodity price fluctuations. He stated that because of the severe difficulties in handling price fluctuations and dysfunctional policy-making in Africa, price booms and bust are equally feared. Nevertheless, the empirical evidence showed a close positive relationship between commodity price movements and growth. Deaton also found that additional income from commodity price booms helped the African economies, just as they were hurt by the loss of income during the economic downturns when the price fell.

A different study by Deaton and Miller (1993) examined the empirical consequences of commodity price booms in a cross section of African countries¹ and challenged the conventional understanding that commodity price booms are so mismanaged that they are harmful. Although they found that there is much heterogeneity in the individual country experience, African countries grow faster when the prices of their exports are increasing than when prices are falling. Perhaps one fifth of the decline in the rate of economic growth in Africa in 1980 to 1985 as compared with 1970 to 1975 can be attributed to the behavior of commodity price booms in the late 1970s, which increased their long-term international debt then and in the early 1980s. The same, however, was true for countries that experienced no booms or faced declining world prices for their exports. So there is no systematic evidence of an association between commodity price booms and the accumulation of debt. There is more evidence of a link between commodity prices and inflation, though the effect is modest once domestic price deflators have been removed of the automatic effects associated with the increase in world prices of exports (Deaton, 1993). In their study, they looked at the individual country experiences and made an attempt to see whether the differences can be attributed to the choice of the sample on the one hand, and to the blurring of the econometric evidence by an averaging over heterogeneous experiences on the other. They also looked at the evidence linking debt and inflation to commodity price booms. According to Deaton and Miller (1993), debt is the ultimate legacy of commodity price booms, which is part of the conventional story, and they are widespread if rarely documented. There is a strong belief that the African debt crisis of the 1980s had their ultimate roots in the commodity price booms of the late 1970s. In fact, countries that faced commodity price booms in the late 1970s increased

¹ Algeria, Benin, Botswana, Burkina Faso, Burundi, Cameroon, CAR, Congo, Egypt, Ethiopia, Gabon, Gambia, Ghana, Ivory Coast, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Sudan, Tanzania, Togo, Tunisia, Uganda, Zaire, Zambia and Zimbabwe

their long-term international debt then and in the early 1980s. That domestic prices or more precisely the prices of non-tradable should rise in response to a commodity price boom is a prediction both of Dutch disease models. More loosely, there is the perception that the ultimate consequence of a commodity price boom is to leave the country mired in debt and inflation (Devarajan, 1999). Finally, they took up the general question of the robustness of the results with respect to different assumptions and different data.

Collier and Goderis (2008) on the other hand, found that revenues generated from natural resources is better used by governments to facilitate private investment for diversifying the economy as well as exploiting opportunities for domestic value added. The strategy chosen to accomplish this can significantly affect the growth of a country's economy. They provided evidences showing that growth can be negatively affected as a result of natural resource booms. Furthermore, they alleged that revenue volatility ought to be addressed gradually and smoothly while building up domestic expenditure and investment from resource revenues. They also found that resource booms have short-term positive effects but long-term negative effects. They also established that real exchange rate appreciation, private and public consumption, and external debt, manufacturing, and services play an important role, and is a substantial part of the economic growth. Their results supported the view that such booms provided incentives for non-productive activities such as rent seeking and lobbying. Their paper helps explain some discrepancies with some evidences concerning Africa's economies.

Africa's economic growth is not as solidly founded as it seems, according to Adams and Page (2005). They cited that most African countries have been receiving allowances from developed countries. Even though, allowances have gained in importance as an effective tool promoting GDP growth and reducing poverty and inequality, they are inflows of foreign

exchange. However, any large inflow of foreign exchange can potentially cause currency appreciations in the receiving countries and hurt their exports. This Dutch-disease like side effect of allowances has received relatively little empirical attention until recently (Adams and Page, 2005). According to Ratha (2013), the Dutch-disease effect of remittances may be attributed to various channels. Remittances can lead to a spending effect leading to an increase in the consumption of both tradable and non-tradable goods. With prices of tradable goods essentially determined in world markets, the relative prices of the domestic, non-tradable goods rise and push up the overall price level in the economy (Ratha, 2013). Indeed, he found that this translates into a higher real exchange rate, both fueling and is fueled by a resource movement effect: rising non-tradable prices divert resources away from the tradable- and toward the non-tradable sector and exercise upward pressure on wages and other production costs, prices, and real exchange rate of the domestic currency. Thus, Ratha stated that an increase in remittance inflow would lead to the incidence of the Dutch Disease. In order to survive the increasingly competitive world, African countries have been relying on borrowed money from institutions like the World Bank and the IMF. Nowadays their debt-to-GDP ratio has risen tremendously.

Gyimah-Brempong (2001) used a dynamic panel model to estimate a growth equation and an income inequality equation that include corruption as an additional regressor. The dynamic panel estimator allowed him to obtain consistent estimates for the growth equation in the presence of dynamics and endogenous regressors. The objective of economic development in this case is to increase the living standards and the well being of all citizens in a country. Improvements in the quality of life include increased material well being, widening its distribution, as well as expanding the range of choices of goods and services available to all citizens. Corruption has a negative effect on economic growth and increases income inequality,

and it hampers economic development. He focused on African countries for a number of reasons. First, with a few exceptions, he found that corruption in African countries is systemic. In fact, it is possible that the impact of systemic corruption on development is different from that of other types of corruption. Focusing on African countries allowed him to study the effects of systemic corruption on economic development. African countries generally tend to have weak and fragile institutions. In fact, he said that a large number of African economies are currently undergoing economic restructuring through the Structural Adjustment Program (SAPs), including the privatization of State-Owned Enterprises (SOEs), mandated by the World Bank and the IMF. Economic restructuring with weak institutions could lead to bad outcomes if there is high level corruption, especially if corruption takes the form of state capture by high level politicians and the bureaucracy. He added that the combination of economic restructuring and weak institutions offered a second reason to why studying corruption in Africa was of interest. Thirdly, the private sector in African countries tend to be relatively small and weak as compared to economies elsewhere. Corruption is likely to exacerbate the inefficiencies imparted by large government sectors, thus, further slowing development under such circumstances. He found that corruption has a negative and statistically significant effect on the growth rate of income in African countries both directly and indirectly. Consistent with his earlier statement, a one point increase in corruption decreases the growth rates of GDP by between 0.75 and 0.9 percentage points per year and of per capita income growth rate by between 0.39 and 0.41 percentage points per year. He also found that corruption decreases the growth rate of income directly through reduced productivity of existing resources, as well as, decreased investment in physical capital. Additionally, he found that corruption is positively correlated with income inequality, as measured by the gini coefficient; a one point increase in the corruption index is associated with a

7 point increase in the gini coefficient of income inequality. As a result, while rapid economic growth may increase the incomes of the poor and hence reduces poverty, increases in corruption hurt the poor more than the rich and powerful, which do not contribute much to economic growth.

Commodity can be an important determinant of a country's growth and wealth. An account by Deaton (1999) illustrated how a plant such as cotton could bring wealth to few, and poverty to all because of bad governance. A century and a half ago, Egypt attempted to industrialize the country through cotton exports. Deaton (1999) showed the index of nominal cotton prices and the effects of the American civil war from 1820 to 1995. The price change during that period was tremendous; it went from \$9 in 1835, to \$14 in 1860 then higher in 1865 for \$33.25 and decreased to \$15.75 in 1870 after the U.S. economy was stabilized. Commodities are important products and the surpluses are exported. Deaton (1999) argued that prices of different commodities do not move in parallel. This can potentially complicate our analysis.

III. The Model and the Data

The annual data was obtained from 49 countries over a period from 1999 to 2014. In total, there are 4018 observations. The countries used are listed in Table 1. The data were collected from the World Bank and the IMF.² Our dependent variable is the annual growth rate of real GDP per capita. The mean GDP growth rate is 1.94% and the standard deviation is 15.53%.

The general form of the panel regression model is as follows:

$$\Delta \ln y_{i,t} = \sum_{i=1}^p \varphi_i \Delta \ln y_{i,t-1} + \sum_{k=1}^r \sum_{j=1}^q \theta_{jk} \Delta \ln p_{j,t-k+1} + \alpha_i + u_{it} \quad (1)$$

² <http://databank.worldbank.org>. Accessed on November 24, 2014. International Monetary Fund, World Economic Outlook Database, Accessed in October 2014.

where $y_{i,t}$ denotes the real GDP per capita of country i at time t and $p_{j,t}$ the commodity price index of good j at time t . Six regressions were ran for six groups of countries; the prices of the commodities that they export most were included in each of the regression. Tables 1 and 2 summarize the relevant information. My interest is to examine how changes in a commodity price ($p_{j,t}$) affect the dynamics of the welfare of a country measured by the real GDP per capita ($y_{i,t}$).

The six groups are respectively under commodity fuel and non-fuel (CNCF), agriculture, beverage, meat, fuel and metal. The commodity fuel and non-fuel index includes food, beverages and industrial inputs price indices, as well as energy indices, which are crude oil (petroleum), natural gas, and coal price indices. A country can be in more than one group. In other words, q for each group is equal to the number of price indexes in each group in Table 2. The CFNF group includes all countries in the sample

IV. Empirical Results

To estimate the growth regression, I settled with the fixed effects estimation method with $p=2$ and $r=1$. The estimation results are reported in Table 3. The low R^2 (from 13% to 24%) is consistent to the claims in the literature that growths in Africa are affected by many variables that are not included in the model. A Matlab program was used to derive the impulse response of the output of an average country in each group to a shock to a specific price variable. The impulse response function was constructed using our estimates and the following derivation. First, we ignore the constant term and set zero as the equilibrium level:

$$\Delta \ln y_t^* = \widehat{\varphi}_1 \Delta \ln y_{t-1}^* + \widehat{\varphi}_2 \Delta \ln y_{t-2}^* + \widehat{\theta}_{11} \Delta \ln p_{1t} + \dots + \widehat{\theta}_{q1} \Delta \ln p_{qt}$$

then we perturb the impulse response function of the level of the log real GDP per capita by

$$\ln y_t^* = (1 + \widehat{\varphi}_1) \ln y_{t-1}^* + (\widehat{\varphi}_2 - \widehat{\varphi}_1) \ln y_{t-2}^* - \varphi_2 \widehat{\ln y_{t-3}^*} + \widehat{\theta}_{s1} \ln p_{1t} - \widehat{\theta}_{s1} \ln p_{1t-1}$$

where s is the index for the commodity price of interest. $\ln y_{-1}^* = \ln y_{-2}^* = \ln y_{-3}^* = 0$ is assumed for the initiation of the impulse responses. The shock to $\ln p_0$ is set to 1, indicating a 1% positive shock to the commodity price of interest. The results are reported graphically in Figure 1.

Because the estimated standard errors are large, the impulse responses are not statistically significant at any conventional level. Nonetheless, we project the impulse response function to get a sense of the effects of a shock to the commodity price on the log of real GDP per capita. Because CNCF is a composite index, which includes many prices, and the sample is the largest, the impulse response function illustrates the overall effects. The results is consistent with the literature in which a positive effect is found: a 1% price shock leads to an immediate increase in the real GDP per capita by 0.03 or 3%. In addition, the effect is permanent. The real GDP per capita increases to 3.6% above the initial level in 3 years. Results for other price shocks are less than conclusive. Out of the 18 diagrams, 7 showed negative effects and 11 showed positive effects. More importantly, the effects are temporary and it is difficult to use them to explain the finding for CNCF. For the Agriculture, Fuel and Metal groups, positive effects dominate. Negative effects dominate in the Meat group and neither dominates in the Beverage group. The heterogeneity of the economies-commodities combinations is complex, and future research should reconcile these findings. Overall, the data seem to support that the African economies benefit from positive commodity price shocks especially when the exports, such as fuel and metal, are important intermediate goods for industrial production.

V. Conclusion

The purpose of this paper is to examine the effects of commodity price shocks on African countries economic growth. Commodity prices are thought to have a huge impact on African

economic market. I employed a fixed effects panel data model on a sample of African countries data. The results are inconclusive and the estimates are statistically insignificant. However, the impulse response functions indicated that an increase in commodity price is more likely to benefit the African economies than hurting them. One of the estimates indicated a 3.6% permanent increase in the real GDP per capita for a 1% price shock. However, there is a high degree of heterogeneity among the economies-commodity combinations; which future studies should pay attention to in order to reconcile the results here.

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Table 1: List of Countries and Regressions

Country Name	Regressions					
	CFNF	Agriculture	Beverage	Fuel	Meat	Metal
Algeria	✓			✓		
Angola	✓	✓	✓	✓		
Benin	✓	✓				
Botswana	✓				✓	✓
Burkina Faso	✓	✓			✓	✓
Burundi	✓		✓			
Cabo Verde	✓	✓		✓		
Cameron	✓	✓	✓	✓		
Central African Republic	✓		✓			✓
Chad	✓	✓		✓	✓	
Comoros	✓	✓				
Congo Democratic Republic	✓	✓	✓	✓		✓
Congo	✓		✓	✓		✓
Cote D'Ivoire	✓	✓	✓	✓		✓
Djibouti	✓	✓	✓			
Egypt	✓	✓		✓		✓
Equatorial Guinea	✓		✓	✓		
Ethiopia	✓	✓	✓		✓	✓
Gabon	✓	✓		✓		
Gambia	✓	✓				
Ghana	✓	✓	✓			✓
Guinea	✓		✓			✓
Guinea-Bissau	✓	✓				
Kenya	✓		✓	✓		
Lesotho	✓	✓			✓	

Liberia	✓		✓			✓
Madagascar	✓	✓	✓	✓		
Malawi	✓	✓	✓			
Mali	✓	✓	✓			
Mauritania	✓			✓		✓
Mauritius	✓	✓				
Morocco	✓	✓		✓		✓
Mozambique	✓	✓			✓	✓
Namibia	✓					
Niger	✓				✓	
Nigeria	✓		✓	✓		
Rwanda	✓		✓			
Senegal	✓	✓		✓		
Seychelles	✓			✓		✓
Sierra Leone	✓		✓			✓
South Africa	✓					✓
Sudan	✓	✓		✓	✓	
Swaziland	✓	✓				
Tanzania	✓	✓	✓			✓
Togo	✓	✓	✓			
Tunisia	✓	✓				
Uganda	✓	✓	✓			✓
Zambia	✓	✓				✓
Zimbabwe	✓	✓				

Table 2: Commodity Prices in Each Regression

Regression	
CFNF	Commodity fuel and non-fuel index
Agricultural	Cotton, sugar, wood
Beverage	Cocoa, Coffee Arabica, Coffee Robusta, Tea
Fuel	Coal, Coal South Africa, Crude Oil World Trade International, Natural Gas
Meat	Beef, Chicken, Sheep
Metal	Gold, Aluminum, Diamond

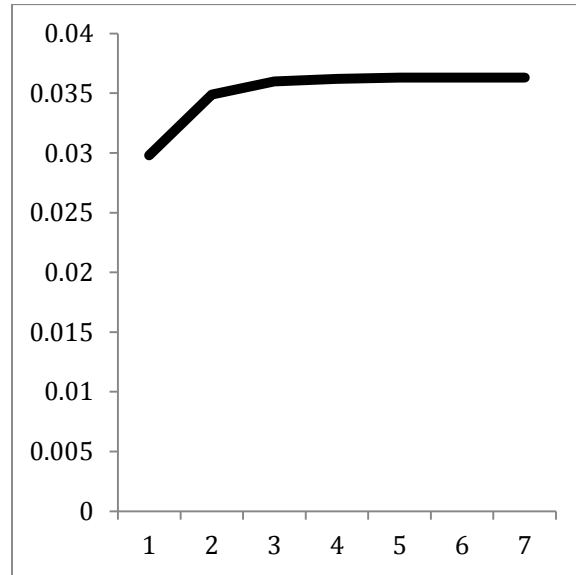
Table 3: Results from the Fixed Effects Estimation

	CFNF	Agriculture	Beverage	Fuel	Meat	Metal
Constant	0.014271 (0.001150)	-0.008631 (0.012363)	0.063158 (0.026564)	0.013131 (0.010791)	-0.013087 (0.066469)	-0.021773 (0.022582)
$\Delta \ln y_{t-1}$	0.171494 (0.015688)	0.216875 (0.039201)	0.161763 (0.046730)	0.343171 (0.054448)	0.198057 (0.082657)	0.126400 (0.056340)
$\Delta \ln y_{t-2}$	0.006806 (0.015515)	0.034447 (0.035894)	0.050747 (0.044775)	0.004252 (0.052030)	-0.199202 (0.081174)	-0.007626 (0.051583)
$\Delta P_{CFNF,t}$	0.029825 (0.006459)	--	--	--	--	--
$\Delta P_{Cotton,t}$	--	-0.003571 (0.005056)	--	--	--	--
$\Delta P_{Sugar,t}$	--	0.005114 (0.020593)	--	--	--	--
$\Delta P_{Wood,t}$	--	0.000037 (0.0000186)	--	--	--	--
$\Delta P_{Cocoa,t}$	--	--	0.002613 (0.009205)	--	--	--
$\Delta P_{coffara,t}$	--	--	0.013737 (0.006373)	--	--	--
$\Delta P_{coffrob,t}$	--	--	-0.008997 (0.009352)	--	--	--
$\Delta P_{tea,t}$	--	--	-0.027577 (0.015368)	--	--	--
$\Delta P_{coal,t}$	--	--	--	-0.000717 (0.001981)	--	--
$\Delta P_{coalsa,t}$	--	--	--	0.000264 (0.000321)	--	--
$\Delta P_{cowti,t}$	--	--	--	0.000215 (0.002458)	--	--
$\Delta P_{natgas,t}$	--	--	--	0.000162 (0.000264)	--	--
$\Delta P_{beef,t}$	--	--	--	--	-0.024419 (0.022642)	--
$\Delta P_{chicken,t}$	--	--	--	--	-0.002748 (0.054098)	--
$\Delta P_{sheep,t}$	--	--	--	--	0.026921 (0.013354)	--
$\Delta P_{alumi,t}$	--	--	--	--	--	0.0000201 (0.000011)
$\Delta P_{gold,t}$	--	--	--	--	--	0.0000055 (0.000081)
$\Delta P_{diamond,t}$	--	--	--	--	--	-0.006055 (0.021275)
R^2	0.170753	0.242530	0.221732	0.325187	0.142465	0.134768
S.E of regression	0.064094	0.038433	0.077432	0.063978	0.077003	0.060681
Sum Squared Residual	16.29250	0.870030	2.446274	1.375310	0.824185	1.307172

Standard errors in parentheses.

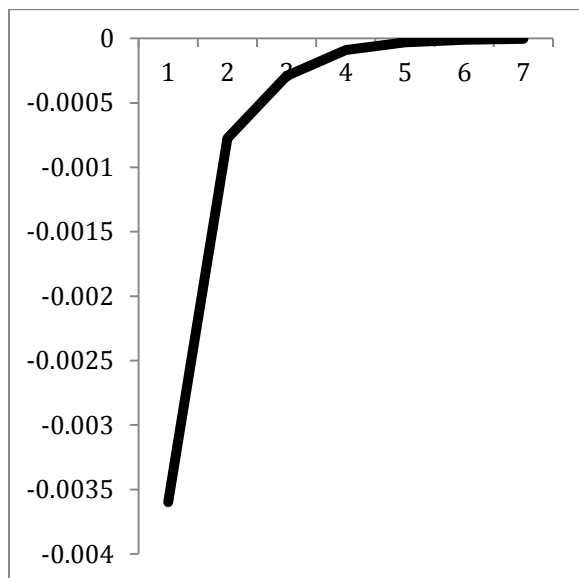
Figure 1: Impulse Response Functions

Panel (A): Commodity fuel and non-fuel

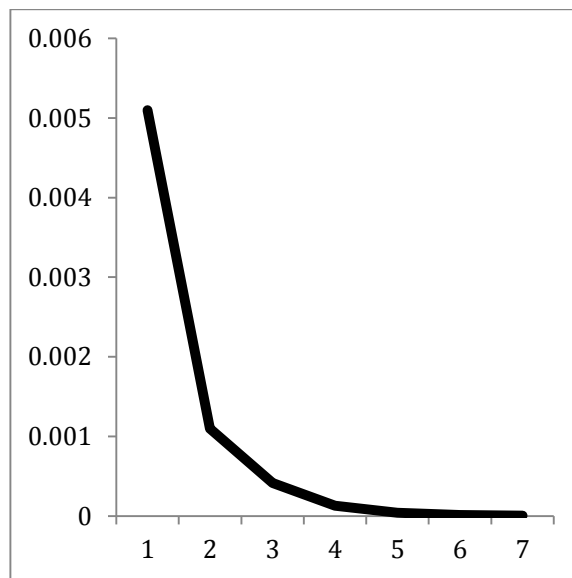


Shock to Commodity Fuel and Non-Fuel Price

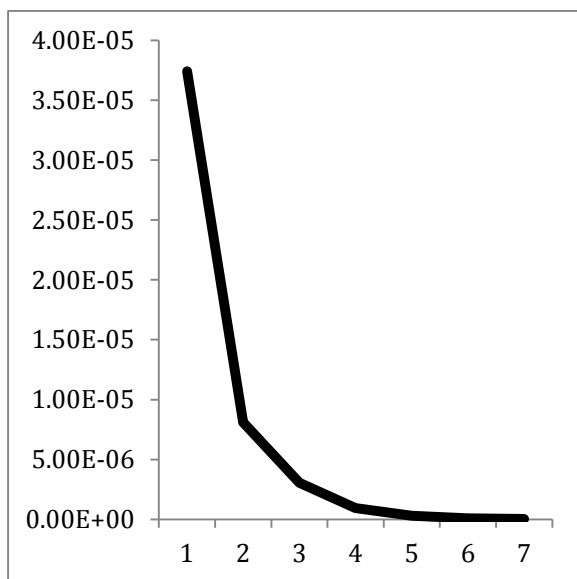
Panel (B): Agriculture



(a) Shock to cotton price

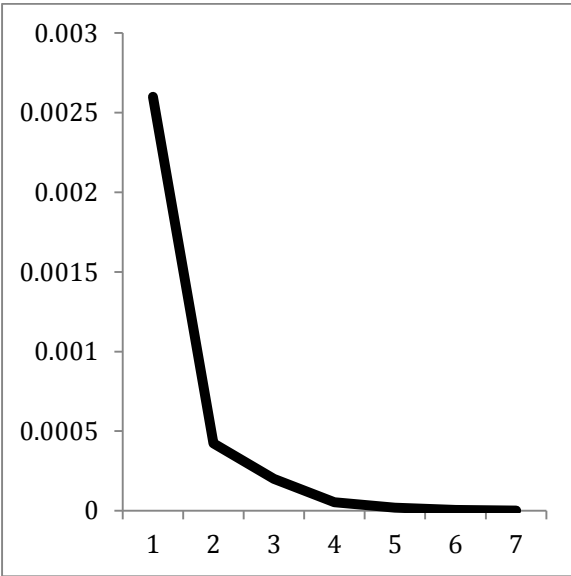


(b) Shock to sugar price

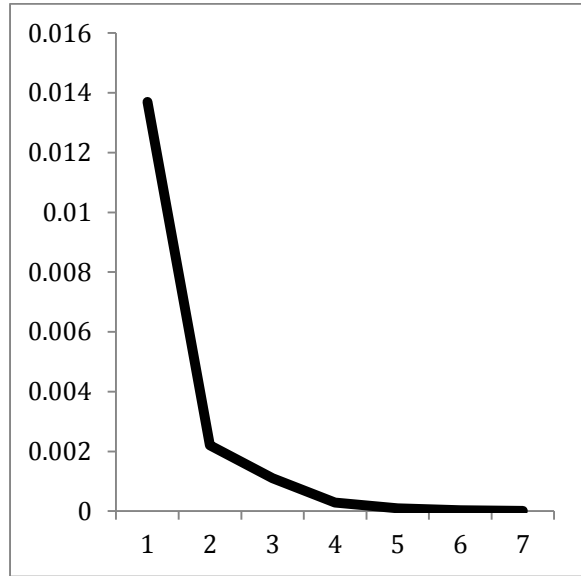


(c) Shock to wood price

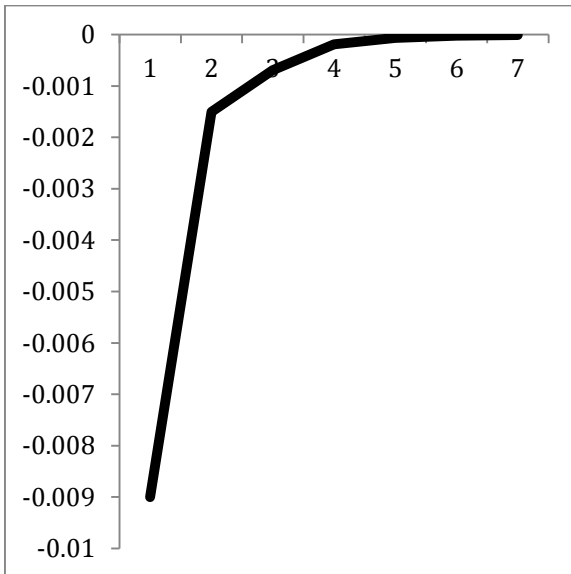
Panel (C): Beverage



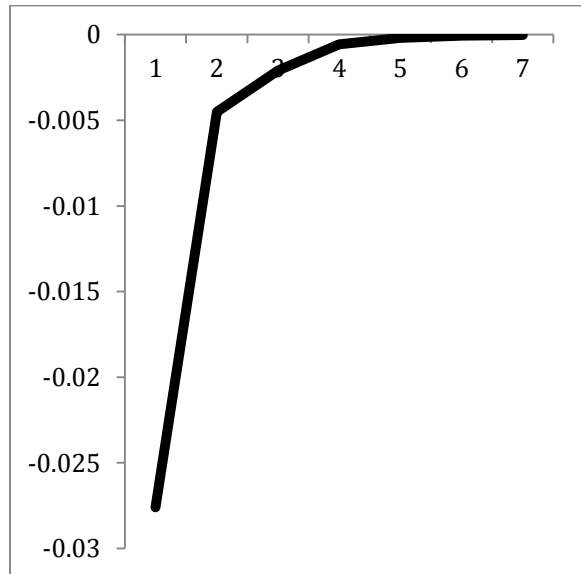
(a) Shock to cocoa price



(b) Shock to coffee Arabica price

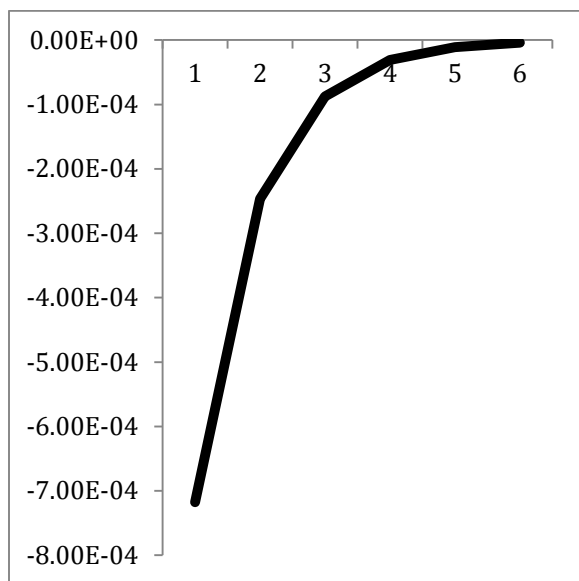


(c) Shock to coffee Robusta price

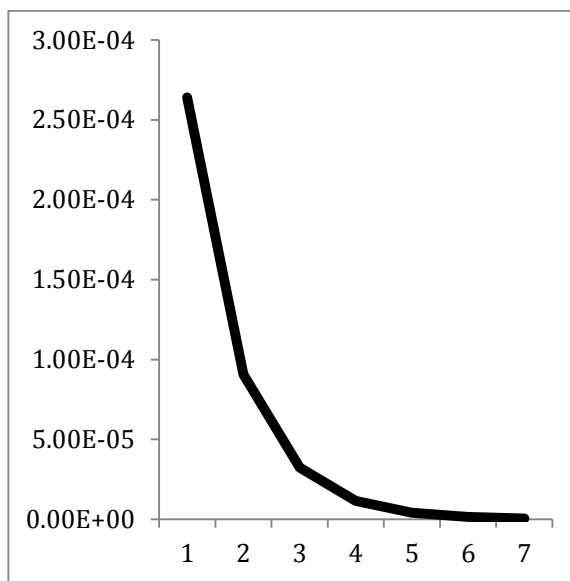


(d) Shock to tea price

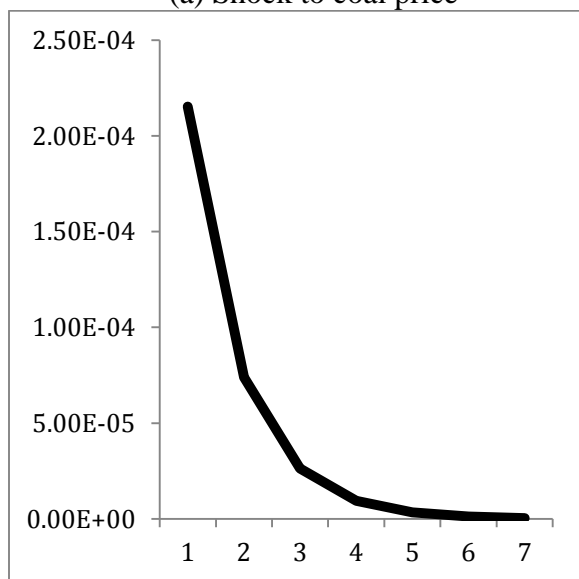
Panel (D): Fuel



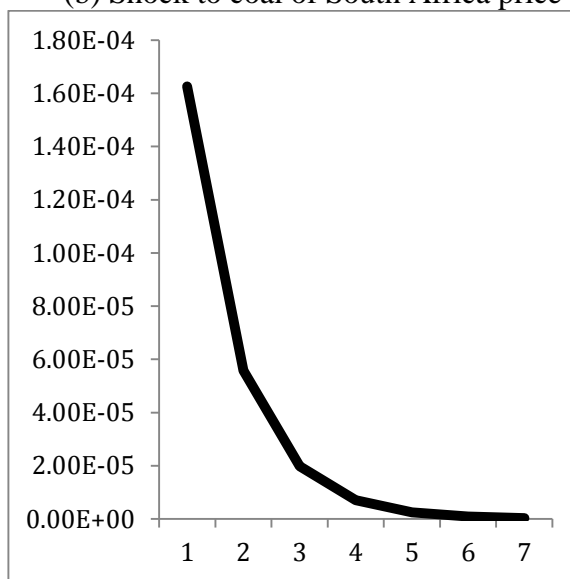
(a) Shock to coal price



(b) Shock to coal of South Africa price

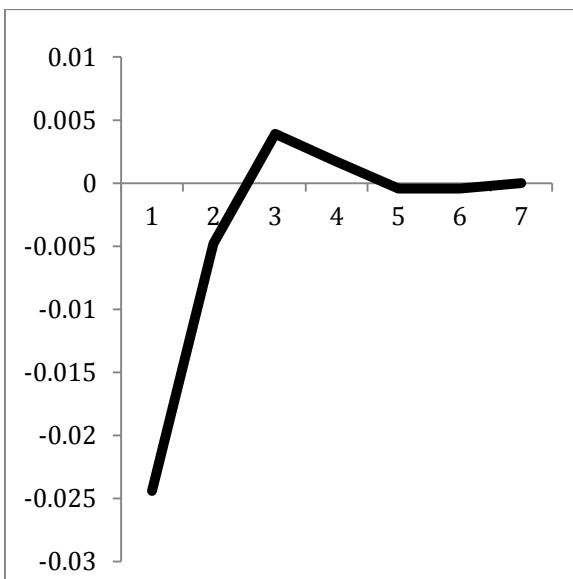


(c) Shock to crude oil world trade international price

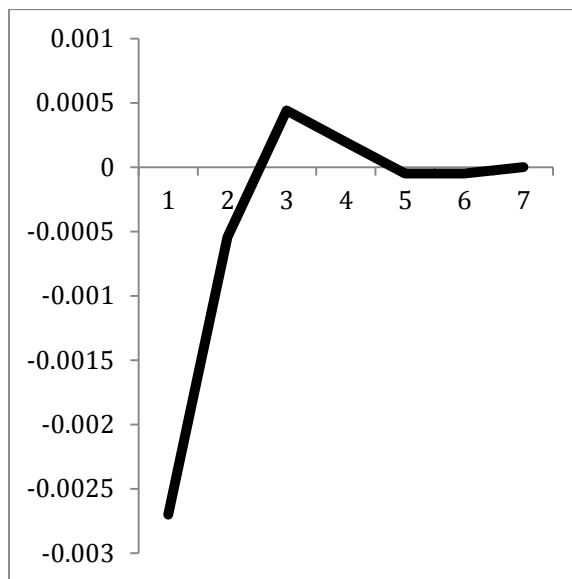


(d) Shock to natural gas price

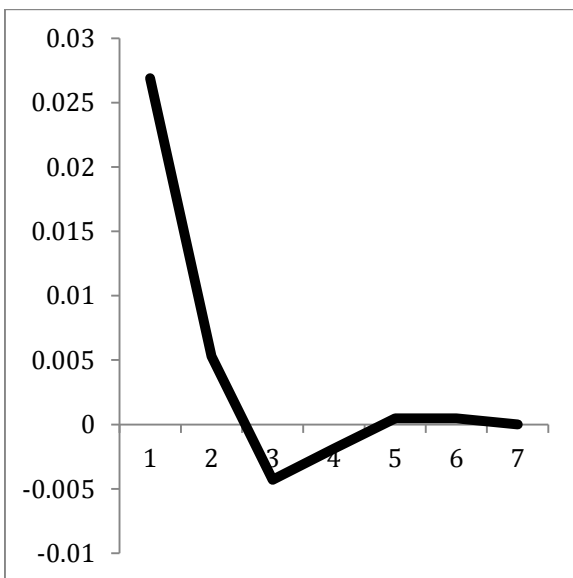
Panel (E): Meat



(a) Shock to beef price

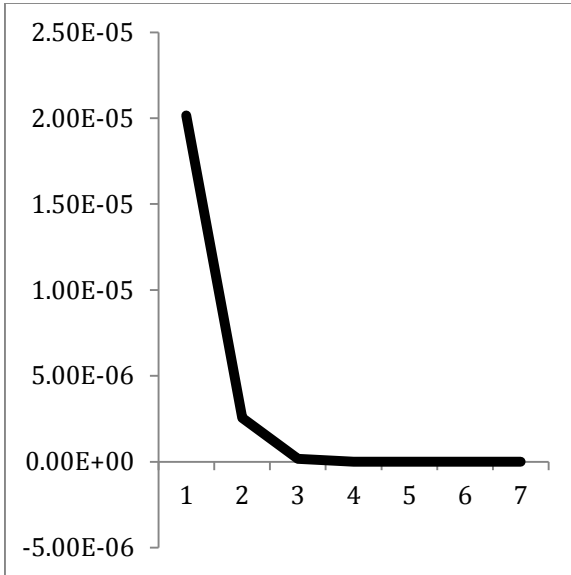


(b) Shock to chicken price

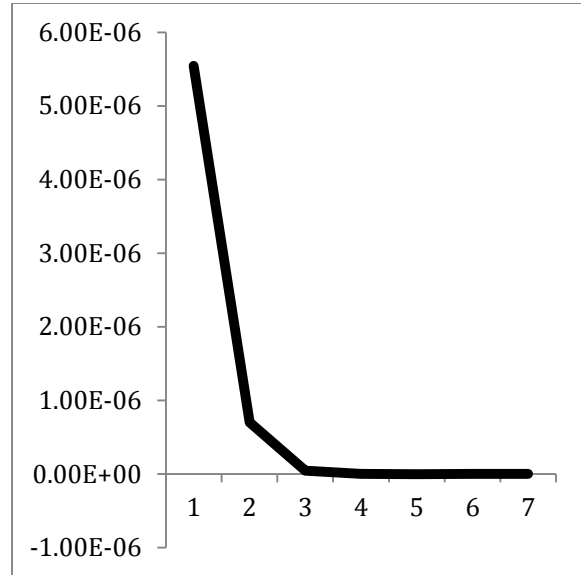


(c) Shock to sheep price

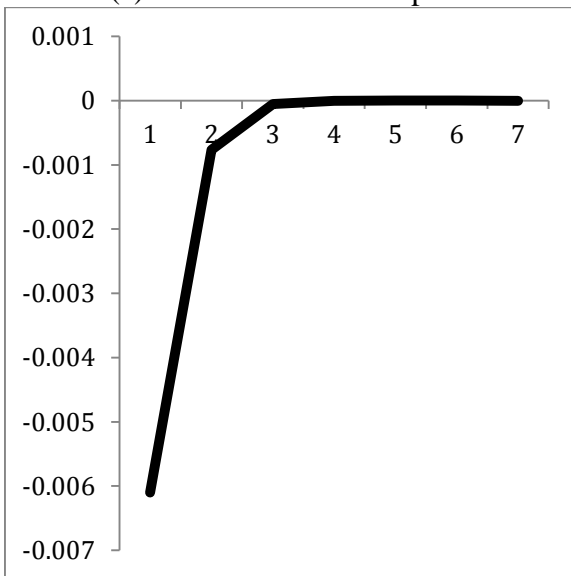
Panel (F): Metal



(a) Shock to aluminum price



(b) Shock to gold price



(c) Shock to diamond price