Commodity Price Changes and Economic Growth in Developing Countries

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Abstract: Using panel data 43 developing countries over the period 1980-2010, the paper examines the impact of the Commodity Terms of Trade (CTOT) Index on the real GDP per capita growth in developing countries. The study finds that for all countries in the sample, an increase in the CTOT index instantaneously leads to a statistically positive impact on the GDP per capita growth rate. Furthermore, the study finds evidence of resource curse under the Commodity Terms of Trade Index in developing countries. This suggests the need for improved management in the natural resources of developing countries. The energy sector proves to independently account for a resource curse. Better management is needed in the energy sector to counter the resource curse that has been reflected in the regression estimates especially in countries with a low score on the governance index.
Key words: Commodity; Index; Trade; Developing; Governance
JEL codes: C23; F10; O43

1. Introduction

Understanding the relationship between commodity prices economic growth has become increasingly important in light of the most recent decade of booming global commodity demand and continued mixed results on growth in developing countries.

This paper estimates the short-run relationship between commodity prices and economic growth in developing countries from 1980 to 2010. The relationship between GDP per capita and a country-specific Commodity Terms of Trade (CTOT) Index is modelled as a dynamic panel and estimated with the Arellano-Bond Dynamic Panel Difference GMM estimator. To test whether the impact varies by type of commodity, the relationship is further examined using sub-indices by commodity type: Agricultural, Energy, Industrial, Meats, and Metals. Finally, the significance of all impacts are assessed conditional on governance.

Much literature has assessed the empirical predictions for economic growth made by the neoclassical growth model (Mankiw et al. (1992), Barro and Sala-i-Martin (1995), Caselli et al. (1996)). In this model, long-run steady state growth is determined by exogenous technological change, while the growth rate during the transition to the steady state is a function of the *level* of the variables that determine the steady-state output, as well as the initial output. While real per capita GDP growth rate is an imperfect measure of economic growth since it does not take into account the distribution effect of wealth, it still remains a common measure of economic progress in national boundaries.

Natural resource abundance has been extensively studied as a determinant of steady state economic growth. Using cross-country regressions, Sachs and Warner (2001) and other studies have found empirical evidence for a "resource curse" – namely, slower economic growth for resource rich countries versus resource poor countries.

Subsequent studies using different measures of resource "richness" and panel data have found either insignificant or positive effects of natural resource abundance (Brunnschweiler and Bulte (2008), Alexeev and Conrad (2009), Haber and Menaldo (2011)). While empirical results are mixed, a key outcome of this literature is that the existence of the resource curse is conditional on country-specific factors such as the quality of institutions and governance, as well as the type of commodity specialization.

This paper intends to bring together strands of research on the resource curse, commodity price volatility, and terms of trade growth impacts. In contrast to much of the empirical terms of trade literature that uses an overall terms of trade measure, this paper will use a Commodity Terms of Trade Index to estimate the commodity-only terms of trade effects on economic growth. Further, the use of a Commodity Terms of Trade Index, instead of a commodity export price index, distinguishes this paper from that of Deaton and Miller (1996) and Collier and Goderis among others (2009). This model should provide a fuller estimation than export price-only models of the extent to which commodity price-related changes in terms of trade impact economic growth.

2. Empirical Specification

The Arellano Bond "Difference GMM" methodology is used to evaluate the impact of commodity terms of trade on economic growth in the short-run. This methodology is a first differences dynamic model that handles endogeneity with instruments that begin with the second lag in levels.

$$\Delta gdpcap_{i,t} = \beta_1 \sum_{j=1}^{k} \Delta gdpcap_{i,t-1} + \beta_2 \sum_{j=1}^{k} \Delta ctotAll_{i,t} + \beta_3 \sum_{j=1}^{k} \Delta tragdp_{i,t} + \beta_4 \sum_{j=1}^{k} \Delta gdpdef_{i,t} + \beta_5 \sum_{j=1}^{k} \Delta resgdp_{i,t} + \Delta v_{i,t}$$

Where "*gdpcap*" is the log of per capita GDP, current US$, "*ctotAll*" is the log of Commodity Terms of Trade Index, "*tragdp*" is the measure of trade openness or the ratio of total value of exports plus imports to GDP, in current US$, and "*gdpdef"* is the measure of inflation or the ratio of current GDP to constant GDP (local currency), "*resgdp*" is the ratio of reserves to GDP, in current US$ and finally the random error term is "$v_{i,t}$." The above model is expanded to examine the growth impacts of commodity terms of trade conditional on governance as represented in table 2 of the econometric results. Further, the model is be expanded to explore the terms of trade impact for specific types of commodities. Three separate commodity

terms of trade indices – one for agriculture commodities, one for metal commodities, and one for energy commodities.

3. Data

Using panel data on 43 developing countries (roughly 10 Low Income and 33 Middle Income, as defined by World Bank GNI per capita cut-offs in 2010) for the years 1980-2010. Drawing upon previous commodity baskets constructed by Deaton and Miller (1996), Collier and Goderis (2009) and Spatafora and Tytell (2011), a set of 54 commodities have been used to construct an overall Commodity Terms of Trade index series for each country, along with sub-indices for Agricultural, Energy, Industrial, Meat, and Metal commodities. Import and export data for each country were retrieved from the UN Comtrade database for the year 1995. Following Deaton and Miller (1996), data for a single year is used to ensure that changes in the value of the index depend only on relatively exogenous changes in prices, and not due to changes in the composition of a country's imports or exports. The year 1995 was chosen because it was in the middle of our sample of years. Finally, the quarterly CTOT index for country *i* at time *t* incorporates data on j commodities, and is calculated following Spatafora (2011) methodlogy.

4. Estimation Results

The Difference GMM was used to estimate the model for all the countries and commodities. The results suggest that the lagged GDP per capita is statistically significant for the first two lags at 5% level of significance. The CTOT index, which is the Commodity Terms of Trade Index, is statistically significant at 5% level of significance for both lags. This is because in a year when the commodity terms of trade is high, the exports where higher relative to imports and by implication this would mean a positive impact on both the GDP growth and thus per capita GDP conditional of annual real GDP growing at a faster rate than the annual population growth rate. The coefficient is however not positive in the second lag. This may happen under a resource curse or when the increase in exports may have affected welfare in the domestic economy through for instance poor governance barriers to trade.

The coefficient of trade to GDP ratio is not statistically significant on per capita GDP but its lag is statistically significant at all conventional levels of significance suggesting a possible lagged impact on GDP. The coefficient on reserves to GDP ratio is statistically significant at the 5% level of significance and the impact on per capita GDP is negative. The GDP deflator shows that its impact on GDP per capita is negative for the current period and positive the first lag but statistically significant for both periods. The impact in the current period can be

negative if the increase in inflation affects expectations and becomes detrimental to the planning of managers. The lagged GDP deflator is however positive suggesting that the lagged effect of inflation on GDP per capita is positive. For the estimates in Table (1), below, the first regression is the Difference GMM for all countries – both with a high governance index and a low governance index. The second regression is the Difference GMM for all countries with robust standard errors. The third regression is the Difference GMM for all countries with a low governance index while the fourth regression is the Difference GMM for all countries with high governance Index.

Table 1: The difference GMM Using the Governance Index

CTOT - Diff GMM, Hi/Low Gov

Variable	all_rgse_dg	all_rbse_dg	all_lgov_dg	all_hgov_dg
gdpcap				
L1.	1.0146505***	1.0146505***	1.0786005***	1.2375108***
L2.	.09088097***	.09088097	.1425406***	-.39456899
L3.	-.01036915	-.01036915	.05473357	.27686289
L4.	-.123493***	-.123493***	-.20145447***	-.40959549**
ctotAll				
--.	2201.6972***	2201.6972	4464.313***	12609.38
L1.	-2193.3742***	-2193.3742*	-2197.6229***	5471.6484
L2.	-1044.9908	-1044.9908	-517.0927*	22936.485*
tragdp				
--.	-143.82511	-143.82511	298.97906	3022.2215
L1.	652.19955***	652.19955**	592.07981**	525.05859
resgdp				
--.	-2724.24***	-2724.24***	-3120.9094***	2051.7208
L1.	3609.0418***	3609.0418***	948.66482	20023.625**
gdpdef				
--.	-.01470638***	-.01470638	-.2131643	-.55270715**
L1.	.07913647***	.07913647	-.07353148	.45386366***
N	1118	1118	598	520

legend: * p<0.05; ** p<0.01; *** p<0.001

As Table (1) shows, the coefficient on reserves to GDP ratio in column 3 has a negative statistically significant impact on per capita GDP growth for countries with a low score on the governance index. This suggests a resource curse. For the countries with a high score on the governance index, the lag on the coefficient on reserves to GDP has a positive statistically significant impact on GDP per capita at all conventional levels of significance. This suggests a lagged positive impact of reserves to GDP for countries with a higher score on the governance index.

One of the most important results of the above table is the impact of on GDP per capita which was more significant in countries with score low on the governance index. The coefficient on countries, which are poorly managed, was statistically significant while the coefficient on countries which score high on the governance index was not statistically significant. A variety of reasons account for this; First, poor governed countries normally tend to be low-income countries. Low-income countries in turn usually depend on commodities and trade is a significant share of GDP. On the other hand, the share of CTOT in well governed countries which typically tend to be either middle income or developed countries is significantly relatively low compared to GDP reducing its impact on GDP per capita. Further, there is less volatility in CTOT in relatively more developed countries and its smaller share in GDP makes it less impactful on GDP per capita. The coefficient CTOT is also statistically significant on the regression estimate where both countries with a high score and low score on governance index are included.

For further investigation on the CTOT impact on GDP per capita, the regression was expanded to estimate contain three indexes – the energy index, the agriculture index and the metals enough. Under each of the three indexes, countries were divided in either the category under which they scored high on the governance index or low on the governance index and the performance was then evaluated. One of the important results concerns the for the CTOT on Energy Index - for countries with a lower score on the governance index, the coefficient on the instantaneous and lagged variable has a statistically significant impact on GDP per capita. For the countries with a high score on the governance index, this is not the case as all coefficients and lags are not statistically significant suggesting that the Energy Index has a statistically significant impact on growth in countries with a score on governance index.

Regarding the CTOT for the Agriculture Index - for the commodity agriculture index, in countries with a lower score on the governance index, its lag has a statistically significant impact on the GDP per capita growth rate. For THE agriculture index in countries with a high score on the governance index, the impact of the coefficients on the GDP per capita is not statistically significant. Next, the CTOT for the Metals Index - for the commodity metals index, the coefficients in both the sample with countries with a higher score on the governance index and countries with a lower score on the governance index is not statistically significant – suggesting a limited impact on the GDP per capita growth rate.

5. Conclusion

The results suggest that higher CTOT Index levels are associated with statistically significant higher levels of per capita GDP, while a one-period

lagged increase in the CTOT index is associated with a statistically significant lower level of per capita GDP. For countries classified as having poor governance, there is a contemporaneous positive and a lagged one- and two-period negative effect, all of which are statistically significant. When restricting the index to include only Energy commodities and restricting the sample to those countries rated as having poor governance, there is a similar pattern of a contemporaneous positive effect and negative lagged effects of CTOT. Our results are generally consistent with the existing terms of trade and resource curse literature. As explained by Spatafora (2011), changes in the CTOT can be interpreted as the net trade gains or losses relative to GDP as a result of changes in commodity prices. Therefore we would expect that a higher CTOT Index would have an initial positive impact on GDP per capita, though the magnitude is dependent on the proportion consumed or invested domestically as well as the timing. Additionally, the resources literature predicts that countries with high CTOT levels will suffer from the curse of lower economic growth, and we do find that lagged levels of the CTOT index are negatively associated with current per capita GDP. The paper found evidence of resource curse under the Commodity Terms of Trade Index in developing countries. This suggests the need for improved management in the natural resources of developing countries. The energy sector also proved to independently account for a resource curse. Better management is needed in the energy sector to counter the resource curse that has been reflected in the regression estimates especially in countries with a low score on the governance index.

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