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## Commodity price shocks, growth and structural transformation in low-income countries

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### ABSTRACT

This paper uses a panel-VAR approach to estimate both the dynamic and structural macroeconomic response of resource-rich, low-income countries to global commodity price shocks. I use a block recursive ordering, as well as a simple Choleski decomposition, to identify structural commodity price shocks for a set of developing countries. The block recursive identification strategy assumes only that global macroeconomic conditions do not respond to individual low-income country conditions contemporaneously. The results suggest that a one standard deviation increase in commodity prices raises per capita income in developing countries by 0.26% and government spending and investment by 4.4% and 12.4%. The effects are larger for less developed countries, economies with fixed exchange rate regimes and those that are more dependent on commodity exports. Commodity price shocks also result in significant transformation of these economies, with the share of value-added in manufacturing contracting by 0.17–0.22 percentage points. Whilst these effects may appear small, they represent the effect of exogenous commodity price shocks that are not due to changes in aggregate demand or global financial conditions. This suggests that commodity price movements alone may be less important in explaining the volatility of low-income country growth than other explanations. Taken together, these results present a more nuanced picture of the ‘resource curse’ in poor countries. Whilst per capital income levels are positively affected by resource booms, the potential for de-industrialisation does exist. The channel through which this link operates appears to be the real exchange rate, with resource booms leading to appreciation pressures. To illustrate the relevance of these results, I investigate the impact of the recent oil price collapse on the Nigerian economy.

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### 1. Introduction

The recent collapse of world commodity prices has led to some analysts calling this the end of the so called commodities ‘super-cycle’.<sup>1</sup> Diminishing growth prospects for emerging market economies, especially China, combined with abundant supply has continued to put downward pressure on the prices of most commodities, with the oil price reaching its lowest levels since the early 2000s according to the 2016 World Economic Outlook from the International Monetary Fund (IMF). The question of how resource booms and busts affect growth is as pertinent today as it has ever been, particularly for commodity exporting low-income countries.

The empirical evidence on the effect of natural resource wealth on economic growth and development is mixed. Whilst some studies find that resource booms are a blessing, others find that they are a curse, and others still find that the outcome depends on a number of factors.<sup>2</sup> Two key challenges have faced this literature from the start. The first, is that measures of resource wealth are likely to be endogenous to a whole host of economic and political factors. The second is that the channels through which any positive or negative economic impacts of a resource boom may operate are numerous and multifaceted. These include an appreciation in the real exchange rate, de-industrialisation, increased volatility, political patronage and rent-seeking, and violent conflict, to name but a few.

This paper aims to shed light on both these fronts. It develops a new proxy for resource wealth, based on subterranean reserves, that is exogenous to economic conditions in low-income countries. A panel vector auto-regression (panel-VAR) is used to orthogo-

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<sup>1</sup> The term commodities ‘supercycle’ is often defined as a decades-long, above-trend movements in a wide range of base material prices (Erten and Ocampo, 2013; Heap 2005; Rogers 2004).

<sup>2</sup> See Van der Ploeg (2011) for a survey of the literature.

nalise movements in the commodity prices, specifically minerals and hydrocarbons, against global and local economic conditions. The short-run macroeconomic response for low-income, resource-rich economies is investigated, as well as the de-industrialisation effects and a possible 'Dutch disease' channel.

Original work by [Sachs and Warner \(1995, 1999\)](#) finds a negative relationship between resource wealth and long-run economic growth, whilst more recent work by [Mehlum, Moene, and Torvik \(2006\)](#) finds that this is particularly the case in countries with poor institutions. This result continues to hold even after controlling for a whole host of potential omitted variables, as shown by [Van der Ploeg \(2011\)](#). Given the long time periods used, these findings can be thought of as the long-run relationship between resource booms and economic growth.

The key challenge facing this early work was the endogeneity of potential measures of resource wealth. The standard approach has been to use resource abundance (the share of resources in GNP) as the independent variable. However, this measure is likely to be endogenous for two reasons. First, by construction, dividing by GDP means that higher GDP will correlate with lower resources as a share of GDP thus setting up a negative correlation. Second, this scaling exercise implies that resource wealth as a share of GDP is no longer independent of the economic policies and institutions that drive both economic growth and the scale of resource production.

Controlling for this endogeneity results in the negative effect on growth coming into question. [Brunnschweiler and Bulte \(2008\)](#), for example, instrument for resource dependence, using resource abundance, constitutions, and institutions, and find that natural resource booms lead to *higher* growth. [Van der Ploeg and Poelhekke \(2010\)](#) use economically recoverable reserves as a proxy for resource wealth and find that there is no evidence for either a curse or a blessing, unless one allows for an indirect negative effect via volatility.

Another strand of the literature, which is similar in vein to this paper, focuses on the short-run effects of resource shocks on growth. Early work by [Deaton and Miller \(1996\)](#) finds a positive effect of commodity price booms on income levels in the Pan-Africa region using a vector auto-regression (VAR) framework. More recent work by [Raddatz \(2007\)](#) makes use of a panel-VAR to study the impact of different external shocks, including commodity price shocks, on output volatility in low-income countries. They find that positive commodity price shocks significantly raise income in the short run, but that these shocks in general can only explain a small fraction of the output variance of a typical low-income country. In a slightly different approach, [Collier and Goderis \(2012\)](#) use a panel error correction model (ECM) to show that commodity booms have unconditional positive short-term effects on output, but potentially negative long-run effects in countries with poor governance.

These studies take similar approaches to addressing the endogeneity issues that have plagued the earlier growth literature. The approach is based on the work by [Deaton and Miller \(1996\)](#) who weight world commodity price indices by country specific commodity export shares in 1975, which are held constant over time. The authors argue that international commodity prices are typically unaffected by the economic conditions of individual countries and, as a result, can be treated as exogenous. [Raddatz \(2007\)](#) uses the same country specific commodity price indices whilst [Collier and Goderis \(2012\)](#) augment the indices by weighting them by the share of net commodity exports in GDP, which is also held constant. The validity of this approach hinges crucially on the exogeneity of these commodity price indices.

One concern is that commodity exports as a share of output may be correlated with unobservable characteristics in low income countries ([Manzano & Rigobon 2001](#)). In addition, resource exports themselves may also be endogenous. Higher resource exports tend

to be associated with fewer non-resource exports, less openness to trade and lower foreign direct investment. [Van der Ploeg and Poelhekke \(2010\)](#) argue that economically recoverable reserves are a more exogenous measure of resource wealth.

The first contribution of this paper is to construct an exogenous measure of resource wealth for low-income countries. The approach involves constructing measures of country specific commodity reserves which are then used to weight movements in global commodity price indices. By using reserves instead of exports, I argue that this new measure of resource wealth in low-income countries is more exogenous than those used in the literature to date.

Another concern is the assumed exogeneity of commodity prices and developing country economic conditions. Work by [Hamilton \(2003\)](#) and [Kilian \(2008\)](#) find that much of the increase in crude oil prices since the 1970s, and particularly since 2002, has been due to increase in aggregate demand for all industrial commodities, rather than exogenous supply shocks. To the extent that global demand shocks may simultaneously affect both commodity prices and low-income country economic output, via export demand, foreign investment and capital flows, the endogeneity of commodity prices will be an issue.

Within the VAR literature, additional consideration must be given to the contemporaneous exogeneity assumptions imposed upon the system. [Raddatz \(2007\)](#), for example, imposes a lower triangular structure on the two blocks of the panel-VAR. The first block contains high income country GDP, commodity based terms-of-trade, the international interest rate, and global disasters, with the second block containing low income country per capita GDP and aid flows. The key identifying assumption is that the flow of causality runs from rich country GDP to commodity prices to world interest rates, but not in reverse. However, this ignores the potential for monetary policy in rich countries to affect aggregate demand, as well as commodity prices.

The second contribution of this paper is to develop a framework that allows for the high degree of simultaneity between global demand, commodity prices and low-income country growth. To this end, the panel-VAR approach serves two purposes. First, it allows us to control for the interdependence between global economic conditions and low-income country growth. And second, by using a block recursive causal ordering, it allows for a greater degree of simultaneity within the global variables block and the local variables block. The results suggest that a one standard deviation increase in commodity prices (around 17.7% on average) raises per capita income levels in low-income countries by 0.26%, government spending by 12.4% and investment by 4.4%. The effects are larger for less developed countries, economies with fixed exchange rate regimes and those that are more dependent on commodity exports.

The final contribution of this paper is the investigation of the impact on the structure of the extracting economies following commodity price shocks. Specifically, I ask whether commodity price shocks lead to de-industrialisation in low-income, resource-rich countries. In an important contribution to the early literature, [Corden and Neary \(1982\)](#) formalised the de-industrialisation process that may result from resource booms. They distinguish between two channels: the 'resource movement' effect, which describes the process by which labour may be pulled out of the traditional manufacturing sector following a boom, and the 'spending effect', which describes the increase in demand for non-tradables following a boom. Using data from the UN on sectoral value added, I find that resource booms lead to significant de-industrialisation. A one standard deviation increase in commodity prices results in the share of value-added in manufacturing contracting by 0.17–0.22 percentage points (pp), whilst transport and other non-tradable service sectors expand by around 0.10–0.13 pp and 0.26 pp recep-

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