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World shocks, world prices, and business cycles: An empirical investigation☆

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ABSTRACT

SVAR models that include a single world price (such as the terms-of-trade) predict that world shocks explain a small fraction of movements in domestic output (typically less than 10%). This paper presents an empirical framework in which multiple commodity prices transmit world disturbances. Estimates on a panel of 138 countries over the period 1960–2015 indicate that world shocks explain on average 33% of output fluctuations in individual economies. This figure doubles when the model is estimated on post 2000 data. The findings reported here suggest that one-world-price specifications significantly underestimate the importance of world shocks for domestic business cycles.

1. Introduction

The conventional wisdom is that world shocks transmitted by the terms of trade represent a major source of aggregate fluctuations in both developed and developing countries. This view is to a large extent based on the predictions of calibrated open economy real business-cycle models (Mendoza, 1995; Kose, 2002). However, recent empirical work based on structural vector autoregression models suggests that world shocks transmitted by the terms of trade alone explain on average only 10% of variations in output and other indicators of aggregate activity in poor and emerging countries (Schmitt-Grohé, forthcoming). These authors recommend the use of more disaggregated world price measures in the formulation of empirical and theoretical models, on the grounds that the terms of trade in particular and other single measures of world prices in general may provide insufficient information to uncover the channels through which world shocks are transmitted to domestic economies.

Accordingly, this paper presents an empirical model in which multiple world prices transmit the effects of global shocks to domestic business cycles. Specifically, it estimates an SVAR model with a foreign bloc and a domestic bloc. The foreign bloc is common to all countries and includes three commodity prices (agricultural, metal, and fuel prices) and the world interest rate. The domestic bloc is country specific and includes four domestic macroeconomic indicators, output, consumption, investment, and the trade balance, and the four world prices featured in the foreign bloc. The SVAR is estimated for 138 countries over the period 1960 to 2015.

We find that world shocks account for about one third of movements in aggregate activity in the median country. This number is three times as large as those obtained in single world price specifications. These findings suggest that one-world-price specifications significantly underestimate the importance of world shocks for domestic business cycles.

An additional contribution of the present paper is to correct for a small-sample bias in the variance decomposition. We find that

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the small sample bias is large, about twelve percentage points of the share of the variance of domestic macroeconomic indicators explained by world shocks. Thus the uncorrected measure of the contribution of world shocks, which is the appropriate statistic for comparison with the existing literature, is 45%.

A natural question is whether for each individual country a single commodity price transmits the majority of the effects of world shocks. For example, is the price of metals the primary transmitter of world shocks to Chile, or the price of fuel the primary transmitter of world shocks to Norway? We find that this is not the case. For the typical country one commodity price is important for transmitting world shocks to one macroeconomic indicator but not to other indicators. For example, for a given country metal prices can be important for transmitting world shocks to domestic output whereas agricultural prices might be important for transmitting world shocks to domestic consumption. An implication of this finding is that a multiple price specification is needed to capture the transmission of world shocks even if the exports or imports of a country are highly concentrated in a particular commodity.

The period elapsed since the turn of the century has been special as far as world shocks are concerned for two reasons. First, the period witnessed the greatest global contraction since the Great Depression of the 1930s. Second, world commodity markets have experienced enormous financial innovation, a phenomenon that has come to be known as financialization. With this motivation in mind, we ask whether during this period world shocks were particularly important in driving domestic business cycles, and if so, how much of the difference is due to the financialization of commodity markets. To this end, we begin by estimating the model post-2000. We find that during this period world shocks explain on average 79% of the variance of output. This is 46 percentage points more than in the 1960 to 2015 sample. This finding is consistent with Fernández et al. (2015), who estimate that a country-specific commodity price measure explains about 50% of aggregate fluctuations in Brazil, Chile, Colombia, and Peru over the period 2000 to 2014. It is also consistent with the findings of Shousha (2015), who documents that in a group of advanced and emerging commodity exporters world price shocks played a major role in driving short-run fluctuations since the mid-1990s.

To investigate how much of the increased importance of world shocks may be accounted for by the financialization of commodity markets, we conduct a counterfactual exercise in which the stochastic process for world prices (the foreign bloc) is fit to the post-2000 period but the domestic bloc of the empirical model is fit over the whole sample. We find that only ten percentage points of the estimated 45 percentage points increase in the importance of global shocks since the 2000s is due to a change in the stochastic process of world prices. We interpret this result as suggesting that financialization has not played a major role in the observed increased importance of world disturbances in domestic business cycles post-2000. The remainder of the paper is organized as follows. Section 2 describes the data set. Section 3 presents summary statistics of the commodity price data. Sections 4 and 5 introduce the foreign and domestic blocs of the empirical model, respectively. Section 6 describes the small-sample bias correction procedure. Section 7 shows estimation results for the case in which world shocks are transmitted by commodity prices, and Section 8 for the case in which they are transmitted in addition by world interest rate shocks. Section 9 considers the case in which world output enters the foreign bloc either by itself or in conjunction with world commodity prices. Section 10 compares the results of the baseline estimation to the case in which the foreign bloc consists of a single world price. Section 11 analyzes the robustness of the main findings. Section 12 investigates the financialization hypothesis and Section 13 concludes. An online appendix presents country-by-country results and some additional robustness tests.

2. The data

We use a panel of three world commodity-prices and five country-specific macroeconomic indicators. The sample is annual and covers the period 1960–2014 for 138 countries.

Data on commodity prices come from the World Bank's Pink Sheet. This is a publicly available data set that contains monthly series on dollar-denominated nominal commodity price indices (see http://www.worldbank.org/en/research/commodity-markets). We focus on three aggregate commodity price indices: Fuel, Agriculture, and Metals and Minerals. The fuel index is a weighted average of spot prices of coal, crude oil and natural gas. The agricultural index is a weighted average of prices of beverages (cocoa, coffee and tea), food (fats and oils, grains, and other foods), and agricultural raw materials (timber and other raw materials). The price index of metals and minerals is based on the spot prices of aluminum, copper, iron ore, lead, nickel, steel, tin, and zinc. We interpret all other goods as a composite, whose price is proxied by the U.S. consumer price index. We use this composite good as the numeraire. Accordingly, we deflate the three commodity-price indices by the monthly U.S. Consumer Price Index. To obtain annual time series, we take simple averages over the twelve months of the year.

The five country-specific series are real GDP (denoted Y), real consumption (denoted C), real investment (denoted I), the trade balance-to-output ratio (denoted TBY), and the terms of trade (denoted TOT). The terms of trade are the ratio of trade-weighted export and import unit-value indices. We use the terms of trade to compare multiple-world-price models with single-world-price models. The series Y, C, and I are in constant local currency units. The sources for Y, C, I, TBY, and TOT are the World Bank's World Development Indicators (WDI) database and the IMF's World Economic Outlook (WEO) database. We do not mix WDI and WEO data at the country level. Instead, for each country, we use data from the data set that contains the longest balanced panel for the first four country-specific indicators, that is, for Y, C, I, and TBY. If the range happens to be identical in the two, we use WDI as the default. The WDI database is publicly available on the web at http://data.worldbank.org. The WEO database is also publicly available but not for all time series. To complete the WEO data we use an appendix of the WEO that the IMF shares with other multilateral organizations. We discard countries for which no balanced panel can be formed of a minimum of 25 annual observations. This delivers a sample of 138 countries. The mean country sample spans 38 years from 1977 to 2014. The longest sample contains 55 years from 1960 to 2014 and occurs in 5 countries. The shortest sample contains 25 years and occurs in 7 countries. The data used in this paper is available online with the rest of the replication materials. The Appendix at the end of the paper provides country-by-country information about data ranges and sources.

3. Commodity prices: some empirical regularities

The left panel of Fig. 1 displays the level of the real price of three groups of commodities, agricultural, fuels, and metals. All prices are deflated using the U.S. CPI index, and normalized to 1960=1. The three commodity price indices share some common characteristics. In the early 1970s agricultural and fuel prices increased dramatically, with fuel prices rising eightfold. Metal prices, however, remained more or less stable. In the 1980s and 1990s, the prices of all three commodities were in a gradual decline. Both agricultural and fuel prices fell by a factor of 4 and metals by a factor of about 3. Then, in the early 2000s all three prices recovered vigorously until the Great Contraction of 2008, which was accompanied by widespread declines in commodity prices.

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