ECONOMIC RESEARCH FORUM
منتدى البحوث الاقتصادية
2011

working paper series

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December 2011

The authors thank two anonymous referees and the editor Eric van Wincoop for useful comments and suggestions. Bruckner gratefully acknowledges the financial support of the Spanish Ministry of Science and Technology provided by CICYTECO2008-04997. The views in this paper are those of the author(s) alone and do not necessarily represent those of the IMF or IMF policy.

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First published in 2011 by
The Economic Research Forum (ERF)
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Abstract

This paper examines the effects that windfalls from international commodity price booms have on net foreign assets in a panel of 145 countries during the period 1970-2007. The main finding is that windfalls from international commodity price booms lead to a significant increase in net foreign assets, but only in countries that are ethnically homogeneous. In highly ethnically polarized countries, net foreign assets significantly decreased. To explain this asymmetry, the paper shows that in ethnically polarized countries commodity windfalls lead to large increases in government consumption expenditures and political corruption. The paper's findings are consistent with theoretical models of the current account that have a built-in voracity effect.

ملخص

تفحص هذه الورقة الآثار غير المتوقعة التي تنتج عن ازدهار أسعار السلع الأساسية الدولية على صافي الأصول الأجنبية في لجنة مكونة من 145 بلدا خلال الفترة 1970-2007. الاستنتاج الرئيسي هو أنه ازدهار أسعار السلع الأساسية يؤدي إلى زيادة كبيرة في صافي الأصول الأجنبية، ولكن فقط في البلدان التي تكون متجانسة عرقيا. في البلدان شديدة الاستقطاب العرقي ينخفض صافي الأصول الأجنبية بشكل ملحوظ. لتفسير هذا التباين، تنبين هذه الورقة أن الاستقطاب العرقي في البلدان يؤدي إلى زيادة كبيرة في نفقات الاستهلاك الحكومي والفساد السياسي. النتائج التي توصلت إليها الورقة تتفق مع النماذج النظرية للحساب الجاري والتي لها تأثير نهم.

1. Introduction

Basic intertemporal theory of the current account predicts that countries which experience temporary revenue windfalls from international commodity price booms should experience an increase in their net foreign assets (e.g. Obstfeld and Rogoff, 1995).[1] Because a large share of these revenue windfalls often accrues to the government, this key prediction may not hold however in the data -- there is the common pool problem that counteracts the standard consumption smoothing effect. Lane and Tornell (1998a) show in a non-representative agent model that when there are multiple powerful groups that seek redistribution from the public budget a revenue windfall will lead to large increases in government spending, and thus, depending on the degree of polarization of the fiscal claimants, induce a current account deterioration.[2] An important implication of the model of Lane and Tornell is that the relationship between wealth shocks and the current account is nonlinear. In particular, it may be negative in highly polarized countries.

This paper uses panel data for 145 countries during the period 1970-2007 to rigorously examine the relationship between wealth shocks from international commodity price booms and changes in countries' net foreign assets. A key advantage of the paper's panel data approach is that it allows to examine the relationship between commodity windfalls and changes in net foreign assets based on exclusively the within-country variation of the data. The within-country approach not only makes the results more readily comparable to macro models, which are naturally about a within-country time-series relationship. The within-country approach also allows to circumvent a potentially important cross-sectional omitted variables bias. A further important feature of the paper's empirical analysis is that, because the commodity export price index is constructed by interacting the fixed (i.e. time-invariant) country-specific export shares with the international commodity prices, the time-series variation in the export price index constitutes for most countries a plausibly exogenous source of wealth shocks.

The paper's first main finding is that the average marginal effect of commodity price windfalls on net foreign assets is positive but statistically insignificant. This is true for the impact effect as well as for lagged effects, and holds regardless of whether a static or dynamic panel data model is estimated. Moreover, there is also no significant average effect on changes in net foreign assets when distinguishing between price changes of minerals and hydrocarbon resources, which tend to be more persistent, and price changes of agricultural commodities, which tend to be more transitory. The paper's first main finding therefore stands in contrast with traditional intertemporal models of the current account. It is however consistent with the well-known Feldstein-Horioka (1980) puzzle that changes in savings do not feed one-to-one into the current account.

The paper's second main finding is that the marginal effect of revenue windfalls from commodity price booms on net foreign assets is significantly smaller in countries that are characterized by high levels of ethnic polarization. This cross-country heterogeneity in the relationship is so strong that in countries with very high levels of ethnic polarization commodity windfalls lead to a decrease in net foreign assets. On the other hand, in countries with low levels of ethnic polarization commodity windfalls lead to a significant increase in net foreign assets. While the increase in net foreign assets in the ethnically homogenous

1 Under certain preference parameters more advanced models of the current account which are based on the intertemporal representative agent theory can generate a decrease in net foreign assets following positive transitory wealth shocks. We show in this paper that the mechanism set out by these models is however in contrast with what we find in the data regarding the responses of GDP per capita, investment, and, in particular, government consumption expenditures and political corruption.

2 See also Lane and Tornell (1996, 1998b) and Tornell and Lane (1998) for further models on the voracity effect.

countries can be well explained by standard intertemporal models of the current account, the acyclical average response, and, in particular, the negative response in the highly ethnically polarized countries cannot.

What makes it particularly difficult for standard models of the current account to explain the negative effect of commodity price booms on the net foreign asset position in the ethnically polarized countries is that in these countries investment significantly decreased. Clearly, standard intertemporal models can generate a decrease in the net foreign asset position following a commodity price boom if the boom is of permanent nature.[3] But, in that case there should be also no decrease in investment. The fact that in ethnically polarized countries investment significantly decreased following a commodity price boom is a first indication that the voracity model developed by Lane and Tornell is consistent with the paper's empirical results.

As a further intermediate channel on the voracity effect of commodity price windfalls in ethnically polarized countries, the paper documents that increases in the international prices of exported commodity goods lead to large and statistically significant increases in government consumption expenditures. These increases in government consumption expenditures were associated with significant increases in political corruption in the ethnically polarized countries. Also GDP per capita growth did not increase significantly following the commodity price windfall in these countries – despite the significant increase in government consumption expenditures. On the other hand, in the ethnically homogeneous countries, where the commodity price windfall led to a significant improvement of the current account, GDP per capita growth significantly increased following the commodity price boom.

In terms of measuring the power concentration of groups, an important feature of the paper's empirical analysis is the use of an ethnic polarization index. In contrast to a fractionalization index which is strictly increasing in the number of groups, the polarization index is largest when there are two groups which are of equal size. The polarization index therefore captures that power struggles are maximized when there are two equally powerful groups that lobby (or fight) for resources.[4] As the number of groups increase, the polarization index decreases. This is an important characteristic of the polarization index because a key result of the Lane and Tornell voracity model is that the voracity effect is largest when there are two powerful groups, and diminishes as the number of groups increase.

The remainder of our paper is organized as follows. In Section 2 we describe and contrast the intertemporal representative agent mechanism of the current account with the political economy voracity mechanism. In Section 3 we describe our data and in Section 4 we explain our estimation strategy. In Section 5 we present our main empirical results. And in Section 6 we conclude.

2. Intertemporal Representative Agent vs. Voracity Political Economy Mechanism

We begin this section by briefly reviewing the mechanism through which a commodity windfall affects the current account in the standard intertemporal representative agent model.

3 Depending on other factors, such as for example the anticipation of the revenue windfall, the elasticity of substitution between tradables and nontradables, or the degree of precautionary saving a transitory revenue windfall from a commodity price boom can also generate a decrease in net foreign assets in the standard intertemporal model. See for example Svensson and Razzin (1983), Persson and Svensson (1985), Backus et al. (1994), Mendoza (1995), or Carroll and Jeanne (2009). But, investment and output usually increases in these models following a positive terms of trade shock. Empirical papers that have examined the relationship between the terms of trade and the current account include among others Milesi-Ferretti and Razin (1998), Loayza et al. (2000), Calderon et al. (2002), or Cashin and McDermott (2002). These papers focus on the average effect and do not investigate the role of ethnic polarization in determining the relationship.

4 See for example Esteban and Ray (1994, 1999) or Montalvo and Reynal-Querol (2005a,b).

We then contrast this mechanism to the political economy voracity mechanism that is contained in the model of Lane and Tornell (1998a).

To lay grounds, it is useful to recall from the basic income accounting identity that the current account is equal to the difference between domestic savings and private investment: $CA = S - I = Y - C - G - I$

In the basic intertemporal representative agent model (see for example Obstfeld and Rogoff, 1995, Section 3.1.1) the key mechanism through which a transitory wealth shock affects the current account is the intertemporal smoothing of consumption of the representative agent. Without frictions in the financial markets, the intertemporal theory predicts perfect consumption smoothing over the life-cycle. Thus, in the presence of a temporary wealth shock current consumption of the representative agent reacts little and the representative agent has to decide how to allocate the additional savings between domestic capital and foreign assets. If there are diminishing returns to domestic capital, then domestic investment will not respond because the transitory wealth shock does not affect the productivity of domestic capital. The additional savings will therefore be invested in foreign assets, leading to a current account increase.

An important extension of the basic intertemporal model in relation to our empirical study of the effects that wealth shocks from international commodity price booms have on the current account is the presence of nontradeable goods.[5] When the international prices of tradeable goods change the intertemporal consumption decision of the representative agent is affected much in the same way as changes in the interest rate affect the intertemporal decision to consume. However, while the size of the percentage change in the consumption response to changes in the interest rate depends exclusively on the intertemporal elasticity of substitution, the size – and the sign – of the consumption response to changes in the international prices of tradeables depends on both the intertemporal elasticity of substitution and the intratemporal elasticity of substitution between tradeables and non-tradeables.[6] Intuitively, this is because when the international prices of tradeables are temporarily high the representative household faces a tradeoff between foregoing current consumption and reaping the benefits of the temporarily higher prices in the international commodity market; or increasing current consumption and reaping the benefits of the temporarily cheaper (relative) domestic prices of nontradeables. Hence, in the presence of a temporary commodity windfall that increases income and the relative price of tradeables current consumption, and thus the current account, can either increase or decrease – depending on the constellation of preference parameters.

The underlying mechanism of the voracity model that explains potential cross-country differences in the response of the current account is very different. Rather than predicting a heterogeneous response of the current account to transitory wealth shocks as a function of cross-country differences in preference parameters, the non-representative agent voracity model predicts that the response of the current account to a transitory wealth shock crucially depends on the structure of fiscal claimants. The main idea is that when there are several powerful groups that seek to appropriate revenues from the government budget (which represents a common pool problem) a voracity effect can occur where a temporary wealth

5 See for example Section 3.1.4 of Obstfeld and Rogoff (1995); and also the empirical studies of Bergin and Sheffrin (2000) and Iscan (2000). We are grateful to an anonymous referee for motivating us to discuss this extension.

6 Formally, under a CES utility function the Euler equation is $\Delta \ln C_{t+1} = \sigma \ln(1+r_{t+1}) + (\sigma-\rho)(\Delta \ln P_{t+1}^{T} - \Delta \ln P_{t+1}^{NT})$, where $\Delta \ln C_{t+1}$ is the change of the log of consumption between between period t and t+1; r_{t+1} is the interest rate; $\Delta \ln P_{t+1}^{T}$ is the change of the log of the price of tradeables between period t and t+1; $\Delta \ln P_{t+1}^{NT}$ is the change of the log of the price of nontradeables between period t and t+1; σ is the intertemporal elasticity of substitution; and ρ is the intratemporal elasticity of substitution between tradeables and non-tradeables. See for example Obstfeld and Rogoff (1995) Section 3.1.4.

shock that increases government tax revenues leads to a disproportional increase in government spending. Lane and Tornell (1998a) show that this voracity effect is strongest when there are two powerful groups. In this case, a temporary wealth shock leads to a very large increase in government expenditures that drives down the current account, while at the same time leading to a decrease in investment.

In sum, there are two main differences between the approach of the political economy voracity model and the representative agent intertemporal model. First, the focus on the fiscal sector as a main driving force for changes in the current account. Second, and perhaps more importantly for explaining cross-country differences in the response of the current account to commodity windfalls, the focus on the polarization of groups that seek to obtain revenues from the government budget. This second focus on differences in polarization provides the basis for testing empirically in a world-wide sample of countries how the current account responds to revenue windfalls from international commodity price booms as a function of cross-country differences in polarization.

As discussed in the second paragraph of this section, the intertemporal model can also generate cross-country differences in the response of the current account as a function of differences in preference parameters. These differences in preference parameters are certainly difficult to estimate consistently with real data in a world-wide sample of countries. One would have to argue therefore on a theoretical basis, that cross-country differences in polarization go hand-in-hand with cross-country differences in preference parameters regarding the intertemporal and intra-temporal elasticity of substitution. We believe that this debate goes beyond the realm of this paper. However, it is useful to note that in the voracity model there is a clear prediction that the difference in the current account response should be due to a difference in government expenditures, and this is something that we can test with data. Also, the voracity model predicts that these government expenditures are socially sub-optimal, an element that is not contained in the standard intertemporal approach of the current account. Hence, it will be natural to examine whether there is an adverse response of GDP per capita growth, private investment, and corruption in the polarized countries. If this is indeed the case, then the alternative possibility that these differences in the current account are driven by differences in preference parameters related to the inter- and intra-temporal elasticity of substitution becomes unlikely. We now explain in detail our data and estimation strategy and then follow with a discussion of our main empirical results.

3. Data

Commodity Windfalls. To capture revenue windfalls from international commodity price booms, we construct a country-specific international commodity export price index: $ComPI_{i,t} = \prod_{c \in C} ComPrice_{c,t}^{\theta_{i,c}}$

where $ComPrice_{c,t}$ is the international price of commodity c in year t, and $\theta_{i,c}$ is the average (time-invariant) value of exports of commodity c in the GDP of country i. The data on annual international commodity prices are for the 1970-2007 period from UNCTAD Commodity Statistics. Data on the value of commodity exports are from the NBER-United Nations Trade Database. The commodities included in the commodity export price index are aluminum, beef, coffee, cocoa, copper, cotton, gold, iron, maize, oil, rice, rubber, sugar, tea, tobacco, wheat, and wood. In case there were multiple prices listed for the same commodity a simple average of all the relevant prices is used.

Polarization. Data on ethnic polarization are from Montalvo and Reynal-Querol (2005a,b). The Montalvo and Reynal-Querol polarization index is constructed as:

$$Pol_i = 4\sum_{r=1}^{N}\sum_{k\neq r}\pi_{ir}^2\pi_{ik}$$

where π_{ir} is the proportion of people who belong in country *i t*o group *r*. Formally, this polarization index measures the normalized distance of a particular distribution of groups from a bimodal distribution. The index is maximized when there are two groups which are of equal size. The index emphasizes therefore that conflict tensions are greatest when there are two equally powerful groups.

Note that the polarization index differs from the well-known fractionalization index. The fractionalization index is defined as:

$$Frac_i = 1 - \sum_{r=1}^{N}\pi_{ir}^2$$

A key property of the fractionalization index is that, in contrast to the polarization index, it is strictly increasing in the number of groups. Intuitively, the fractionalization index measures the probability that two randomly selected individuals in a country will not belong to the same group. For further discussion on fractionalization vs. polarization with an application to conflict, see Montalvo and Reynal-Querol (2005a,b).

We furthermore note that for purposes of examining empirically whether there is a voracity effect, the polarization index is much better suited than the index of fractionalization. This is because the voracity model of Lane and Tornell predicts that the voracity effect is strongest when there are two equally powerful groups; that there is no voracity effect when the number of groups is equal to one; and that the voracity effect decreases as the number of groups increases beyond two. This is precisely what the polarization index captures. The fractionalization index, on the other hand, is linearly increasing in the number of groups. Therefore, it does not capture the non-linearity predicted by the Lane and Tornell model. In the empirical exercise we therefore concentrate on the polarization index and show as a robustness check results that use the index of fractionalization.

Net Foreign Assets and Other Data. Our annual data on net foreign assets are from Lane and Milessi-Ferretti (2007). These data are standard and do not require further description here as a detailed description can be found in the paper of Lane and Milessi-Ferretti (2007). Real GDP per capita, total investment, and government consumption expenditures data are from the Penn World Table, version 6.3 (Heston et al., 2009). The data on the net barter terms of trade are from WDI (2010). The data on political corruption and the risk of expropriation are from Political Risk Service (2010) and Kaufmann et al. (2009). Tables 1 and 2 report some summary statistics of these variables.

4. Estimation Strategy

To examine the effects that commodity price windfalls have on net foreign assets and other key variables of interest we estimate the following econometric model:

$$\Delta NFA_{i,t} = \alpha_i + \beta_t + \gamma(\Delta ComPI_{i,t}) + u_{i,t}$$

where α_i are country fixed effects that capture time-invariant country-specific unobservables and β_t are year fixed effects that capture common year shocks. $u_{i,t}$ is an error term that is clustered at the country level. NFA_{it} is the share of net foreign assets in GDP and $\Delta ComPI_{it}$ is the change of the log of the international commodity export price index.

As a baseline regression, we estimate the average marginal effect that commodity windfalls have on net foreign assets in a world sample. We then examine how cross-country differences in ethnic polarization affect the relationship between commodity windfalls and net foreign assets by splitting the sample into different groups based on countries' ethnic polarization. As

a robustness check on whether the heterogeneity is driven by other factors we also present estimates of an interaction model where the international commodity export price index is interacted with other variables that could possibly induce cross-country differences in the relationship between commodity windfalls and net foreign assets.

5. Main Results

Table 3 presents our estimates of the average marginal effect that commodity price windfalls have on net foreign assets. Column (1) shows pooled least-squares estimates that are based on cross-sectional as well as within-country data variation. In column (2) country fixed effects are included to capture cross-country unobservable differences that are driving both the size of the commodity windfall and the change in the country's net foreign assets. Column (3) adds year fixed effects to control for global shocks such as for example the world business cycle or political events such as the end of the Cold War that could affect both the overall yearly change in net foreign assets and the change in international commodity prices.[7] The main result is that windfalls from international commodity price booms have a positive but statistically insignificant effect on the net foreign asset position. And, there continues to be a positive but insignificant effect when adding further lags and leads of the commodity price index (columns (4) and (5)), or when controlling for lagged changes in net foreign assets (columns (6) and (7)).

A possible reason for the insignificant response of the net foreign asset position is that the time-series dynamics of many of the international commodity prices are quite persistent (see the Data Appendix Table 2). Table 4, columns (1) and (2) show however that there continues to be an insignificant effect of commodity price windfalls on the net foreign asset position when distinguishing between mineral and hydrocarbon commodity prices (which tend to be very persistent) and agricultural commodity prices (which tend to be more transitory).

Our identifying assumption is that variations in the international commodity prices are a plausibly exogenous source of variation in revenue windfalls. This assumption is reasonable for the majority of countries in our sample as these countries are price takers on the international commodity market. Hence, variations in the international commodity prices are exogenous to within-country changes in politico-economic conditions, and hence to changes in net foreign assets. There might however be a few countries where the price-taker assumption is less applicable. To demonstrate that our results are not driven by these observations, we report in column (3) of Table 4 results where we exclude large commodity exporting countries. As column (3) shows, there is no significant average effect of commodity price windfalls on countries' net foreign assets positions when we exclude potentially large commodity exporting countries.[8]

The results change substantially when grouping countries according to their levels of ethnic polarization. Column (1) of Table 5 shows that there is a highly significant positive average effect of revenue windfalls on the net foreign asset position in countries that are in the bottom 25th percentile of the cross-country ethnic polarization distribution. Column (2) shows that the effect of commodity windfalls on the net foreign asset position is also positive in the group of countries that are in the bottom 50th percentile. But the coefficient is quantitatively smaller and statistically only significant at the 10% level. Moving to the top 50th percentile

7 Both the country and year fixed effects are jointly significant with a p-value of 0.000.

8 The rule for excluding countries is that they produce for a given commodity good more than 3% of the world commodity supply. The excluded countries are Algeria, Australia, Brazil, Canada, China, Colombia, Cuba, Denmark, Dominican Republic, Egypt, Finland, France, Indonesia, India, Iraq, Iran, Kenya, Kuwait, Liberia, Libya, Malaysia, Mauritius, Mexico, New Zealand, Nigeria, Norway, Pakistan, Philippines, Russia, Saudi Arabia, Sweden, Singapore, South Africa, Sudan, Thailand, Turkey, Uganda, United States, United Kingdom, United Arab Emirates, and Venezuela.

(column (3)) the effect of commodity windfalls on the net foreign asset position is statistically insignificant and quantitatively only about 60% of the size of the estimated average marginal effect of the bottom 25th percentile. Moving to the top 25th percentile (column (4)) the average marginal effect is also statistically insignificant and only about one-tenth of the estimated average marginal effect of the bottom 25th percentile.[9]

What explains this asymmetry in the relationship? Table 6 shows that commodity price revenue windfalls had a significant positive effect on the terms of trade in the group of countries with high and low degrees of ethnic polarization. Therefore, it is not the case that changes in the international commodity prices had no significant effect on the terms of trade in the ethnically polarized countries. In fact, Panel A of Appendix Table 2 shows that through their effects on the terms of trade commodity windfalls had a significant positive effect on the net foreign asset position in the group of countries with low ethnic polarization and an insignificant effect in the group of countries with high polarization. Panel B of Appendix Table 2 also shows that similar results are obtained when directly regressing the change in net foreign assets on the change in the terms of trade.[10]

Table 7 provides a first explanation for the difference in the relationship between commodity windfalls and net foreign assets. The table shows that while in the ethnically polarized countries investment significantly decreased following the commodity windfall, in the group of countries with very low ethnic polarization investment significantly increased.[11] Standard models of the current account readily predict the significant increase in investment following the commodity boom (e.g. Obstfeld and Rogoff, 1995). But, they do not readily predict the significant decrease in the ethnically polarized countries. On the other hand, the voracity model of Lane and Tornell does predict a significant decrease in investment in ethnically polarized countries.

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9 We note that the time-series properties of the majority of the commodity prices in our commodity price index indicates, that what our regressions are capturing is the response of the current account to transitory revenue windfalls. We also made an attempt to isolate those shocks that were on average very persistent, by focusing on the three most persistent commodity prices (iron, oil, and copper) where the AR(1) coefficient on these prices is almost unity (1.03, 0.97, and 0.95 respectively). Hence, variations in these prices represent a shock that is very persistent. Appendix Table 1 shows that if we use these very persistent commodity price shocks, then results are similar: the current account improves due to a positive commodity price windfall in the countries where polarization is low while in the countries where polarization is high the current account response is negative, albeit statistically insignificant. Thus, even if we use only these commodity prices that are very persistent the main finding that the response of the current account to windfalls varies significantly as a function of cross-country differences in polarization continues to hold.

10 Using directly the net barter terms of trade in the least squares estimation may be problematic because within-country changes in the net barter terms of trade are driven also by within-country changes in the quantities of the commodities produced as well as changes in the commodity exporting country's trade policies (e.g. changes in import and export taxes, quotas, etc.). Therefore, within-country changes in the net barter terms-of-trade are much less exogenous to changes in countries' politico-economic conditions, and thus to changes in the current account, than changes in our international commodity export price index. We also note that in the model of Lane and Tornell (1998a), what is crucial for the voracity effect to occur is that the wealth shock affects tax revenues that accrue to the government budget. In principal, a change in the quantity of exports can induce a change in government tax revenues just like a change in the international price of the exported commodity good does in the case of an ad-valorem tax on commodity exports. However, this abstracts from the possibility that a significant part of production could occur in the shadow economy. If the increase of the quantity of the exported commodity good occurs in the shadow economy, then the additional production of the exported commodity good will be out of reach from government taxes. In this case, government tax revenues are unlikely to be affected much by the increase in the production of the commodity good. Hence, one additional advantage of using variations in an international export price index is that these variations in the international commodity prices should feed more directly into changes of tax revenues in the commodity exporting countries.

11 The investment series includes both public and private investment.

To explore further the voracity channel, Table 8 reports estimates of the effect that commodity price windfalls have on GDP growth, government consumption expenditures, corruption, and the risk of expropriation for the above and below median sample ethnic polarization group. Column (1) of Panel A shows that, consistent with the investment response documented in Table 7, there is a negative albeit insignificant effect of commodity price windfalls on GDP per capita growth in the high ethnic polarization sample. Panel B shows on the other hand that in the low ethnic polarization sample commodity price windfalls had a significant positive effect on GDP per capita growth. Also consistent with the voracity model, column (2) shows that there is a significant increase in government consumption expenditures in the above median ethnic polarization group while in the below median ethnic polarization group the response of government consumption expenditures to commodity windfalls is insignificant. Furthermore, columns (3) and (4) of Panel A show that in the above median ethnic polarization group corruption and the risk of expropriation significantly increased, while Panel B shows that in the below median ethnic polarization sample corruption and the risk of expropriation did not increase significantly.

An important robustness check that goes beyond these intermediate channels is whether the heterogeneity in the effect that commodity price windfalls have on net foreign assets survives when controlling for other alternative factors that can drive the cross-country parameter heterogeneity. One obvious control variable that can possibly drive cross-country parameter heterogeneity is ethnic fractionalization. As discussed in Section 2, the ethnic fractionalization index is strictly increasing in the number of ethnic groups while the ethnic polarization index is maximized when there are two groups which are of equal size.

Column (1) of Table 9 shows that the marginal effect of commodity price windfalls on net foreign assets significantly decreases in ethnic polarization when controlling for a possible interaction effect between commodity windfalls and ethnic fractionalization. The interaction estimate in column (1) implies that in the most ethnically polarized countries a commodity windfall had a significant negative effect on the net foreign asset position. Consistent also with the Lane and Tornell voracity model, column (1) shows that the ethnic fractionalization interaction term is significantly positive. This means that commodity windfalls had a stronger positive effect on the net foreign asset position in countries where there are many different ethnic groups.

Column (2) of Table 9 shows that the nonlinearity in the relationship between commodity windfalls and net foreign assets is not due to the polarization and fractionalization index possibly picking up a diminishing or increasing returns to scale effect of commodity windfalls on net foreign assets. In addition, column (3) documents that there continues to be a significant negative interaction effect between commodity price windfalls and polarization when controlling for differences in the relationship that are due to countries being debtor or credit countries.[12]

In order to allow for a possible difference in the relationship between commodity windfalls and net foreign assets in rich and poor countries, column (4) of Table 9 adds to the regression an additional interaction term between commodity price windfalls and cross-country differences in average per capita GDP. The main result is that the ethnic polarization interaction continues to be negative and statistically significant at the conventional confidence level.

Only when controlling in column (5) for an interaction effect between commodity windfalls and cross-country differences in political corruption does the interaction effect between

12 Kraay and Ventura (2000) derive a theoretical model that shows that the relationship between terms of trade shocks and net foreign assets should be different in debtor and creditor countries.

commodity windfalls and ethnic polarization turn insignificant. Political corruption entails excessive fiscal resource appropriation by powerful groups and so this is precisely the channel through which net foreign assets decrease in the voracity model. Hence, the result in column (5) that beyond its effect on political corruption the role of ethnic polarization is insignificant in shaping the net foreign asset response to commodity windfalls is consistent with the mechanism of fiscal resource appropriation laid out in the voracity model of Lane and Tornell.

As a robustness check on our main and preferred measure of polarization, Panel A of Table 10 presents results when using instead of the ethnic polarization measure a measure of countries' religious polarization.[13] The main finding is that more religious polarization significantly reduces the effect that wealth shocks from commodity windfalls have on countries' net foreign asset position. Column (1) of Table 10 shows that there is a highly significant positive average effect of commodity windfalls on the net foreign asset position in countries that are in the bottom 25th percentile of the cross-country religious polarization distribution. Column (2) shows that the effect of commodity windfalls on the net foreign asset position is also positive in the group of countries that are in the bottom 50th percentile. But the coefficient is quantitatively smaller and statistically only significant at the 5% significance level. Moving to the top 50th percentile (column (3)) and 25th percentile (column (4)) shows that the effect of commodity windfalls on the net foreign asset position is statistically insignificant and quantitatively much smaller in absolute size. Panel B shows that similar results are obtained when using as a measure of polarization the interaction between ethnic and religious polarization. In sum, these results echo our main finding that the effects of wealth shocks from commodity windfalls on net foreign assets are significantly smaller in countries where groups are highly polarized.

6. Conclusion

This paper showed that the positive effect of windfalls from international commodity price booms on countries' net foreign asset positions is significantly decreasing in cross-country differences in polarization. Standard intertemporal models of the current account have difficulties in explaining this result, in particular, because in the highly polarized countries the commodity windfall led to a significant decrease in investment. On the other hand, the non-representative agent model developed in Lane and Tornell (1998a) that generates a voracity effect is consistent with the paper's finding of a negative response in both the current account and investment in the highly polarized countries. The paper showed that consistent with the voracity model the commodity windfall led to a large increase in government consumption expenditures and corruption in polarized countries, while in the ethnically homogeneous countries government consumption expenditures and corruption did not increase significantly.

13 Data on religious polarization are from Montalvo and Reynal-Querol (2005b). The unconditional sample correlation between religious and ethnic polarization is 0.29.

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Table 1: Summary Statistics

	Mean	Std. Dev.	Min	Max	Obs.
ΔComPI	0.003	0.021	-0.092	0.439	4616
ΔNFA	-0.004	0.565	-19.931	21.967	4616
ΔGDP	0.035	0.074	-1.107	0.985	4616
ΔGov	0.017	0.131	-2.135	1.719	4616
ΔTOT	0.089	0.189	-2.010	1.463	3494
ΔCorr	-0.031	0.452	-3	3	2042
ΔExprop	0.075	1.195	-8	10	2042
Ethpol	0.502	0.246	0.017	0.982	3828
Ethfrac	0.459	0.291	0.009	0.958	3828

Table 2: Correlation Matrix

	ΔComPI	ΔNFA	ΔTOT	ΔGDP	ΔGov	ΔCorr	ΔExprop	Ethpol	Ethfrac
ΔComPI	1								
ΔNFA	0.040	1							
ΔTOT	0.327	0.090	1						
ΔGDP	0.027	0.055	0.371	1					
ΔGov	0.073	-0.025	0.057	0.237	1				
ΔCorr	0.018	0.014	0.072	0.023	0.026	1			
ΔExprop	0.022	0.023	0.097	0.083	-0.059	0.037	1		
Ethpol	0.045	0.001	-0.049	0.011	0.011	-0.011	0.042	1	
Ethfrac	0.053	0.015	-0.016	0.053	0.053	0.000	0.027	0.615	1

Table 3: Commodity Windfalls and Net Foreign Assets

	ΔNFA						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
	LS	**LS**	**LS**	**LS**	**LS**	**LS**	**SYS-GMM**
ΔComPI	0.237	0.181	0.088	0.112	0.093	0.054	0.052
	(0.58)	(0.39)	(0.17)	(0.22)	(0.19)	(0.10)	(0.08)
L.ΔComPI				0.492	0.457		
				(1.51)	(1.44)		
L2.ΔComPI				0.117	0.034		
				(0.45)	(0.16)		
F.ΔComPI					-0.371		
					(-1.52)		
L.ΔNFA						-0.174	-0.192
						(-0.64)	(-0.70)
Country FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	Yes	Yes	Yes	Yes
Observations	4614	4614	4614	4518	4373	4469	4469
Countries	145	145	145	145	145	145	145

Note: The dependent variable is the change in the net foreign assets to GDP ratio. The method of estimation in columns (1)-(6) is least squares; column (7) system-GMM (Blundell and Bond, 1998). The t-values shown in parentheses below the point estimates are based on Huber robust standard errors that are clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 4: Commodity Windfalls and Net Foreign Assets

	ΔNFA		
	Mineral and Oil Commodities Only	**Agricultural Commodities Only**	**Excluding Large Commodity Exporters**
	(1)	**(2)**	**(3)**
	LS	**LS**	**LS**
ΔComPI	0.174	-0.856	0.328
	(0.31)	(-0.26)	(0.39)
Country FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	4614	4614	3214
Countries	145	145	106

Note: The dependent variable is the change in the net foreign assets to GDP ratio. The method of estimation is least squares; t-values (shown in parentheses) below the point estimates are based on Huber robust standard errors that are clustered at the country level. The commodities used in column (1) for the international commodity export price index are aluminium, copper, gold, iron, and oil. The commodities used in column (2) for the international commodity export price index are beef, coffee, cocoa, cotton, maize, rice, rubber, sugar, tea, tobacco, wheat, and wood. Column (3) uses all commodities but excludes Algeria, Australia, Brazil, Canada, China, Colombia, Cuba, Denmark, Dominican Republic, Egypt, Finland, France, Indonesia, India, Iraq, Iran, Kenya, Kuwait, Liberia, Libya, Malaysia, Mauritius, Mexico, New Zealand, Nigeria, Norway, Pakistan, Philippines, Russia, Saudi Arabia, Sweden, Singapore, South Africa, Sudan, Thailand, Turkey, Uganda, United States, United Kingdom, United Arab Emirates, and Venezuela. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 5: Commodity Windfalls, Polarization, and Net Foreign Assets

	ΔNFA			
	Ethpol <0.25	**Ethpol <0.56**	**Ethpol >0.56**	**Ethpol >0.70**
	(1)	**(2)**	**(3)**	**(4)**
	LS	**LS**	**LS**	**LS**
ΔComPI	0.781***	0.600*	0.481	0.081
	(4.59)	(1.94)	(0.61)	(0.07)
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	737	1916	1912	729
Countries	21	54	53	20

Note: The dependent variable is the change in the net foreign assets to GDP ratio. ΔComPI is the change of the log of the international export price index. The method of estimation is least squares; t-values (shown in parentheses) below the point estimates are based on Huber robust standard errors that are clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence

Table 6: Commodity Windfalls, Polarization, and the Terms of Trade

	ΔTOT			
	Ethpol <0.25	**Ethpol <0.56**	**Ethpol >0.56**	**Ethpol >0.70**
	(1)	**(2)**	**(3)**	**(4)**
	LS	**LS**	**LS**	**LS**
ΔComPI	1.985***	2.783***	1.976***	1.568***
	(11.18)	(6.66)	(8.42)	(4.26)
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	644	1787	1707	722
Countries	18	51	53	21

Note: The dependent variable is the log-change in the terms of trade. ΔComPI is the change of the log of the international export price index. The method of estimation is least squares; t-values (shown in parentheses) below the point estimates are based on Huber robust standard errors that are clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 7: Commodity Windfalls, Polarization, and Investment

	Ethpol <0.25	**Ethpol <0.56**	**Ethpol >0.56**	**Ethpol >0.70**
	(1)	**(2)**	**(3)**	**(4)**
	LS	**LS**	**LS**	**LS**
ΔComPI	1.856***	0.877	-0.441	-0.773***
	(3.46)	(1.04)	(-1.17)	(-1.96)
Country Fe	Yes	Yes	Yes	Yes
Year Fe	Yes	Yes	Yes	Yes
Observations	778	2070	1912	729
Countries	21	55	58	23

Note: The dependent variable is the log of investment per capita. The method of estimation is least squares; t-values (shown in parentheses) below the point estimates are based on Huber robust standard errors that are clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 8: Commodity Windfalls, Growth, Government Spending, and Corruption (Further Intermediate Channels)

	ΔGDP	ΔGov. Expenditure	ΔCorruption	ΔExpropriation
		Panel A: High Ethnic Polarization		
	(1)	**(2)**	**(3)**	**(4)**
ΔComPI	-0.040 (-0.14)	0.240** (1.96)	1.965*** (3.45)	8.791* (1.73)
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	1911	1911	1009	1009
Countries	53	53	46	46
		Panel B: Low Ethnic Polarization		
	(1)	**(2)**	**(3)**	**(4)**
ΔComPI	0.277*** (4.13)	0.469 (1.58)	-1.709* (-1.82)	-2.858 (-0.64)
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	1916	1916	1033	1033
Countries	54	54	48	48

Note: The dependent variable in column (1) is the change of the log of real per capita GDP; column (2) the change of the log of real per capita government expenditures; column (3) the change of the political corruption score (re-scaled so that higher values denote more corruption); column (4) the change of the risk of expropriation score (re-scaled so that higher values denote a higher risk of expropriation). The method of estimation is least squares; t-values (shown in parentheses) below the point estimates are based on Huber robust standard errors that are clustered at the country level. Panel A reports regressions for the sample of countries with above median ethnic polarization (ethpol>0.56). Panel B reports regressions for the sample of countries with below median ethnic polarization (ethpol<0.56). *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 9: Commodity Windfalls, Polarization, and the Current Account (Additional Interactions)

	Δ NFA				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
	LS	**LS**	**LS**	**LS**	**LS**
ΔComPI	0.714*	0.780	-0.056	-0.321	-0.306
	(1.85)	(0.74)	(-0.05)	(-0.26)	(-0.26)
ΔComPI*Ethpol	-3.682**	-3.686**	-3.040**	-2.673*	-0.200
	(-2.18)	(-2.21)	(-2.13)	(-1.84)	(-0.13)
ΔComPI*Ethfrac	4.534**	4.489**	2.581	2.764	-0.514
	(2.32)	(2.07)	(1.32)	(1.46)	(-0.25)
$\Delta ComPI^2$		-0.294	0.925	1.563	2.212
		(-0.07)	(0.22)	(0.37)	(0.53)
ΔComPI*Debtor Country			1.603**	1.897**	1.596**
			(2.09)	(2.42)	(2.27)
ΔComPI*GDP p.c.				0.210	0.178
				(1.12)	(1.06)
ΔComPI*Corruption					-1.497***
					(-3.64)
Country Fe	Yes	Yes	Yes	Yes	Yes
Year Fe	Yes	Yes	Yes	Yes	Yes
Observations	3828	3828	3828	3828	3828
Countries	107	107	107	107	107

Note: The dependent variable is the change in the net foreign assets to GDP ratio. ΔComPI is the change of the log of the international export price index. The method of estimation is least squares; t-values (shown in parentheses) below the point estimates are based on Huber robust standard errors that are clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 10: Commodity Windfalls, Polarization, and Net Foreign Assets (Alternative Polarization Measures)

	ΔNFA			
	Panel A: Measure is Religious Polarization			
	Relpol <0.13	**Relpol <0.54**	**Relpol >0.54**	**Relpol >0.83**
	(1)	**(2)**	**(3)**	**(4)**
	LS	**LS**	**LS**	**LS**
ΔComPI	1.073***	0.934**	0.153	0.187
	(4.68)	(2.29)	(0.23)	(0.24)
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	1014	1933	1895	987
Countries	28	53	54	29
	Panel B: Measure is Interaction Between Ethnic and Religious Polarization			
	Ethpol*Relpol <0.03	**Ethpol*Relpol<0.22**	**Ethpol*Relpol >0.22**	**Ethpol*Relpol >0.51**
	(1)	**(2)**	**(3)**	**(4)**
	LS	**LS**	**LS**	**LS**
ΔComPI	0.976***	0.931**	0.207	-0.046
	(5.40)	(2.26)	(0.35)	(-0.07)
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	1014	1933	1895	987
Countries	28	53	54	29

Note: The dependent variable is the change in the net foreign assets to GDP ratio. ΔComPI is the change of the log of the international export price index. The method of estimation is least squares; t-values (shown in parentheses) below the point estimates are based on Huber robust standard errors that are clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Appendix

Table A1: Persistent Commodity Windfalls, Polarization, and Net Foreign Assets

	ΔNFA			
	Ethpol <0.25	**Ethpol <0.56**	**Ethpol >0.56**	**Ethpol >0.70**
	(1)	**(2)**	**(3)**	**(4)**
	LS	**LS**	**LS**	**LS**
ΔComPI [Iron, Oil, and Copper only]	0.839*** (6.31)	1.244* (1.87)	-0.025 (-0.04)	-0.819 (-0.76)
Country Fe	Yes	Yes	Yes	Yes
Year Fe	Yes	Yes	Yes	Yes
Observations	720	1751	1660	729
Countries	21	54	53	20

Note: The dependent variable is the change in the net foreign assets to GDP ratio. ΔComPI [Iron, Oil, and Copper only] refers to the change of the log of the international export price index that contains only prices of iron, oil and copper. The method of estimation is least squares; t-values (shown in parentheses) below the point estimates are based on Huber robust standard errors that are clustered at the country level. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table A2: The Terms of Trade, Polarization, and Net Foreign Assets

	ΔNFA			
	Ethpol <0.25	**Ethpol <0.56**	**Ethpol >0.56**	**Ethpol >0.70**
	(1)	**(2)**	**(3)**	**(4)**
	Panel A: Two-Stage Least-Squares (IV is ΔComPI)			
ΔTOT	0.417*** (7.68)	0.259*** (2.43)	0.157 (0.42)	-0.024 (-0.04)
First-Stage F-stat	124	44	65	32
Country Fe	Yes	Yes	Yes	Yes
Year Fe	Yes	Yes	Yes	Yes
Observations	639	1715	1610	651
Countries	18	50	47	19
	Panel B: Least Squares			
ΔTOT	0.173*** (2.76)	0.285*** (3.93)	0.308 (1.05)	-0.165 (-0.52)
Country Fe	Yes	Yes	Yes	Yes
Year Fe	Yes	Yes	Yes	Yes
Observations	639	1715	1610	651
Countries	18	50	47	19

Note: The dependent variable is the change in the net foreign assets to GDP ratio. The method of estimation in Panel A is two-stage least squares; Panel B least-squares. The instrumental variable in Panel A is the log-change of the international export price index. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Data Appendix

Table DA1: List of Countries

Country	ComExp/GDP	Ethpol	NFA/GDP
Algeria	5.23	51.39	-24.55
Angola	9.51	57.21	-154.2
Argentina	0.75	57.88	-19.84
Australia	2.48	49.18	-38.97
Austria	0.71	23.98	-12.24
Bahrain	15.29	56.93	77.52
Bangladesh	0.03	13.18	-33.72
Benin	1.22	43.64	-45.38
Bolivia	0.63	76.66	-77.38
Brazil	0.71	77.32	-32.96
Cameroon	4.01	57.56	-42
Canada	2.52	67.24	-31.08
Central African Republic	1.6	57.78	-50.49
Chad	0.82	66.47	-56.61
Congo, Dem. Rep.	2.51	58.59	-101.23
Congo, Republic of	8.66	67.37	-165.38
Costa Rica	1.63	42.04	-49.21
Cyprus	0.45	65.22	-10.01
Cote d`Ivoire	5.97	43.19	-95.16
Denmark	1.01	9.67	-26.95
Dominican Republic	1.64	72.54	-38.54
Ecuador	2.59	83.72	-72.06
Egypt	1.71	42.7	-38.88
El Salvador	1.88	27.91	-31.65
Ethiopia	0.54	77.79	-38.46
Fiji	4.31	92.98	-36.7
Finland	1.68	29.41	-35.03
France	0.63	29.44	1.78
Gabon	14.94	51.88	-55.15
Gambia, The	0.59	68.93	-76.76
Germany	0.62	22.74	9.48
Ghana	4.47	66.1	-48.57
Greece	0.72	18.61	-26.7
Guatemala	1.54	95.47	-10.07
Guinea	1.63	84.29	-78.13
Guinea-Bissau	3.1	53.19	-327.69
Guyana	13.4	81.33	-283.87
Haiti	0.55	20.7	-44.82
Honduras	1.96	42.96	-50.62
Hong Kong	0.14	6.6	132.28
Hungary	0.54	30.8	-61.6
Iceland	2.11	5.52	-49.15
India	0.16	34.82	-17.4
Indonesia	2.12	52.88	-44.41
Iran	4.07	59.84	10.26
Ireland	1.42	14.06	-31.9
Israel	0.29	54.77	-28.41
Italy	0.34	15.4	-6.8
Jamaica	2.69	60.02	-91.44
Japan	0.07	6.72	14.92
Jordan	0.08	98.24	-52.95
Kenya	1.37	38.13	-32.14
Korea, Republic of	0.33	2.78	-20.16
Kuwait	18.85	97.98	246.51

Country	ComExp/GDP	Ethpol	NFA/GDP
Liberia	18.56	39.04	-782.1
Madagascar	1.29	1.67	-62.9
Malawi	2.77	73.59	-82.91
Malaysia	5.55	76.16	-30.81
Mali	1.12	41.99	-70.9
Malta	0.83	16.71	28.28
Mauritania	5.88	53.61	-146.83
Mauritius	2.9	80.31	-10.06
Mexico	0.95	65.36	-35.63
Morocco	0.11	89.74	-42.19
Mozambique	0.79	49.86	-119.29
Nepal	0.08	65.18	-11.41
Netherlands	3.04	21.37	5.32
New Zealand	1.88	36.58	-62.28
Nicaragua	2.72	68.09	-243.17
Niger	0.4	69.77	-54.25
Nigeria	7.52	40.36	-63.85
Norway	5.98	9.02	-3.66
Oman	13.87	40.78	7.44
Pakistan	0.29	69.76	-38.05
Panama	1.09	58.62	-106.04
Papua New Guinea	10.81	66.87	-77.14
Paraguay	1.33	30.96	-12.85
Peru	1.26	81.7	-50.66
Philippines	0.68	49.65	-49.26
Poland	0.3	9.92	-40.58
Portugal	0.32	1.99	-35.58
Rwanda	0.96	40.13	-22.9
Samoa	0.71	38.78	-37.29
Saudi Arabia	13.53	11.39	75.96
Senegal	0.27	55.96	-57.45
Seychelles	2.68	60.02	-65.56
Sierra Leone	0.64	66.63	-90.85
South Africa	0.66	71.78	-24.36
Spain	0.27	69.33	-19.48
Sri Lanka	1.25	74.93	-39.76
Sudan	1.06	69.94	-152.6
Sweden	1.81	33.68	-18.63
Tanzania	1.73	27.1	-71.14
Thailand	1.16	58.23	-32.1
Togo	2.01	67.33	-82.43
Trinidad &Tobago	9.04	84.17	-61.11
Tunisia	1.08	16.73	-89.46
Turkey	0.42	34.24	-23.2
Uganda	2.35	27.86	-34.67
United Arab Emirates	17.41	64	197.02
United Kingdom	1.01	57.06	-0.21
United States	0.34	69.13	-4.06
Uruguay	1.35	42.64	-22.17
Venezuela	5.41	75.79	-3.29
Yemen	11.85	6.35	-15.58
Zambia	7.77	60.63	-157.55
Zimbabwe	1.21	69.78	-41.61
Average	3.17	49.96	-50.38

Note: The table lists countries' average commodity export to GDP ratio, their average net foreign asset to GDP ratio, and their ethnic polarization index. All numbers have been multiplied by 100.

Table DA2: List of Commodities

Commodity	AR(1) Coefficient (Standard Error)	Commodity	AR(1) Coefficient (Standard Error)	Commodity	AR(1) Coefficient (Standard Error)
Aluminium	0.62 (0.12)	Cotton	0.48 (0.15)	Rubber	0.84 (0.13)
Banana	0.53 (0.17)	Gold	0.89 (0.15)	Sugar	0.40 (0.09)
Beef	0.76 (0.07)	Iron	1.03 (0.08)	Tea	0.77 (0.07)
Cocoa	0.78 (0.07)	Maize	0.59 (0.30)	Tobacco	0.51 (0.19)
Copper	0.95 (0.12)	Oil	0.97 (0.06)	Wheat	0.67 (0.10)
Coffee	0.69 (0.12)	Rice	0.56 (0.17)	Wood	0.66 (0.06)