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COMMODITY DEPENDENCE: A TWENTY-YEAR PERSPECTIVE

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Table of contents

List of acronyms

LDC	least developed country
LLDC	landlocked developing country
CDDC	commodity-dependent developing country
GDP	gross domestic product
UNCTAD	United Nations Conference on Trade and Development
SIDS	small island developing state

1. Introduction

A country is considered to be dependent on commodity[1] exports when commodities constitute the predominant share[2] of its exports. The combination of a high concentration of exports and the large share of commodities in those exports has important implications for development. In particular, export concentration on primary commodities, or "commodity dependence", has long been conceptually and empirically linked with underdevelopment.[3]

Despite the importance of measuring and analysing commodity dependence, there have been few efforts to empirically analyse and monitor its different dimensions, apart from some national or regional studies. This study seeks to fill this gap by contributing to a better monitoring of world commodity dependence and improving an understanding of the challenges it poses to development.

Section 2 examines the state of commodity dependence throughout the world during the period 1998 to 2017, using trade data for 189 countries. It shows that commodity dependence is a very common phenomenon, found in more than half the countries in the world. Moreover, it shows that commodity dependence is almost exclusively a developing- country issue. In particular, it affects vulnerable developing countries which are classified as least developed countries (LDCs) and landlocked developing countries (LLDCs); and in regional terms, it is the most pervasive in sub-Saharan Africa and South America (within Latin America and the Caribbean region).

Section 3 explores in more detail the fact that commodity dependence (i.e. a high proportion of commodities in exports) is a challenge almost exclusively affecting developing countries. Using panel data techniques, it shows that there is a strong positive correlation between the level of export diversification and the level of development of a country (proxied by gross domestic product (GDP) per capita). The simplified model used also suggests that the shape of this relationship is non-linear – a finding that is consistent with the model presented by Hausmann and Hidalgo (2011).

Section 4 discusses the evolution of commodity dependence during the 20-year period between 1998 and 2017. The analysis finds that commodity dependence changed little in these two decades. Indeed, three-quarters of all countries did not change their main export product group during the period, while an additional 5 per cent of countries registered temporary changes. Overall, commodity dependence increased slightly during the period, from 92 countries in 1998–2002 to 102 of them (including two newly independent countries) in 2013–2017. In the countries that registered changes in their main export group, the relative price changes among different commodity groups and also vis-à-vis manufactures were an important contributing factor. These commodity price changes are presented and discussed.

However, such price changes were not the only important factor explaining the observed changes in commodity dependence during the 1998–2017 period. Other contributory factors included, in particular, the evolution of domestic production and government policies. Section 5 identifies different groups of countries according to changes in their export baskets during the period and presents some examples within each group of countries where changes in production played an important role. Its main findings are as follows:

i) Several energy-dependent countries diversified their export basket by producing and exporting energy derivative products such as petroleum products, including refined fuels and petrochemicals, while in others the production and export of these products stagnated or fell.

ii) Some energy- and mineral-dependent countries diversified their production and exports to include more agricultural products, while in others, production and exports of agricultural products stagnated or fell.

iii) Although some commodity-dependent countries became more commodity dependent, they also increased their non-commodity exports, even during the observed commodity price boom, as a result of growth in some categories of manufactures.

Commodity dependence can negatively affect economic growth and welfare in the short and medium terms, as it increases the vulnerability of commodity-dependent countries to negative commodity price shocks. Section 6 discusses the evolution of GDP growth and external debt in commodity-dependent developing countries (CDDCs) between 2008 and 2017, following such a negative commodity price shock. It finds that 62.7 per cent of commodity-dependent countries registered growth deceleration during the period, while some of these countries also experienced an outright recession. It also shows that, concomitant with the growth deceleration, and sometimes reinforced by public expenditure patterns, several CDDCs faced fiscal challenges during the period, as indicated by the observed increases in external debt over a short period of time.

Section 7 concludes with a discussion of some important policy issues faced by CDDCs, which are necessary to address in order to turn resource abundance into a development tool.

2. Commodity dependence around the world

Choosing specific criteria to classify countries according to their commodity dependence is challenging, in a similar way as classifying countries according to income or any other criteria that set thresholds based on value ranges of one or a few variables. This study, following past UNCTAD practice,[4] considers a country to be commodity-export dependent if more than 60 per cent of its merchandise exports are commodities.[5]

Using these selection criteria for the period 2013-2017 – the last five-year period[6] for which data were available, out of the 189 countries covered in this study there were 102 commodity-dependent countries (i.e. 54 per cent of the total). Also, 97 out of 151 developing and transition economies (64.2 per cent) were commodity-dependent.

While only those countries that had more than the threshold of 60 per cent of commodities in their exports were considered to be commodity dependent, in a number of developing countries a large share of their exports comprised commodities. For example, nine more countries had more than 50 per cent, but less than 60 per cent of commodity exports: Cuba, the Democratic People's Republic of Korea, Egypt, Grenada, Honduras, Indonesia, Nicaragua, South Africa and Tuvalu.

Box: Data issues in calculating commodity dependence

There are at least two data issues that affect the classification and characterization of commodity dependence.

The first issue concerns non-attributed trade. Detailed trade statistics, such as those used in this study, have the characteristic that many countries report one value for total exports to the world that is different from the sum of each product exported to each trading partner; the difference between those two values is referred to as *non-attributed exports*. Choosing between using total *reported* exports or the sum of *attributed* exports as a denominator of commodity export shares implies a value judgement about which of the two values is more representative of total exports. In this study, we use *total reported exports*.

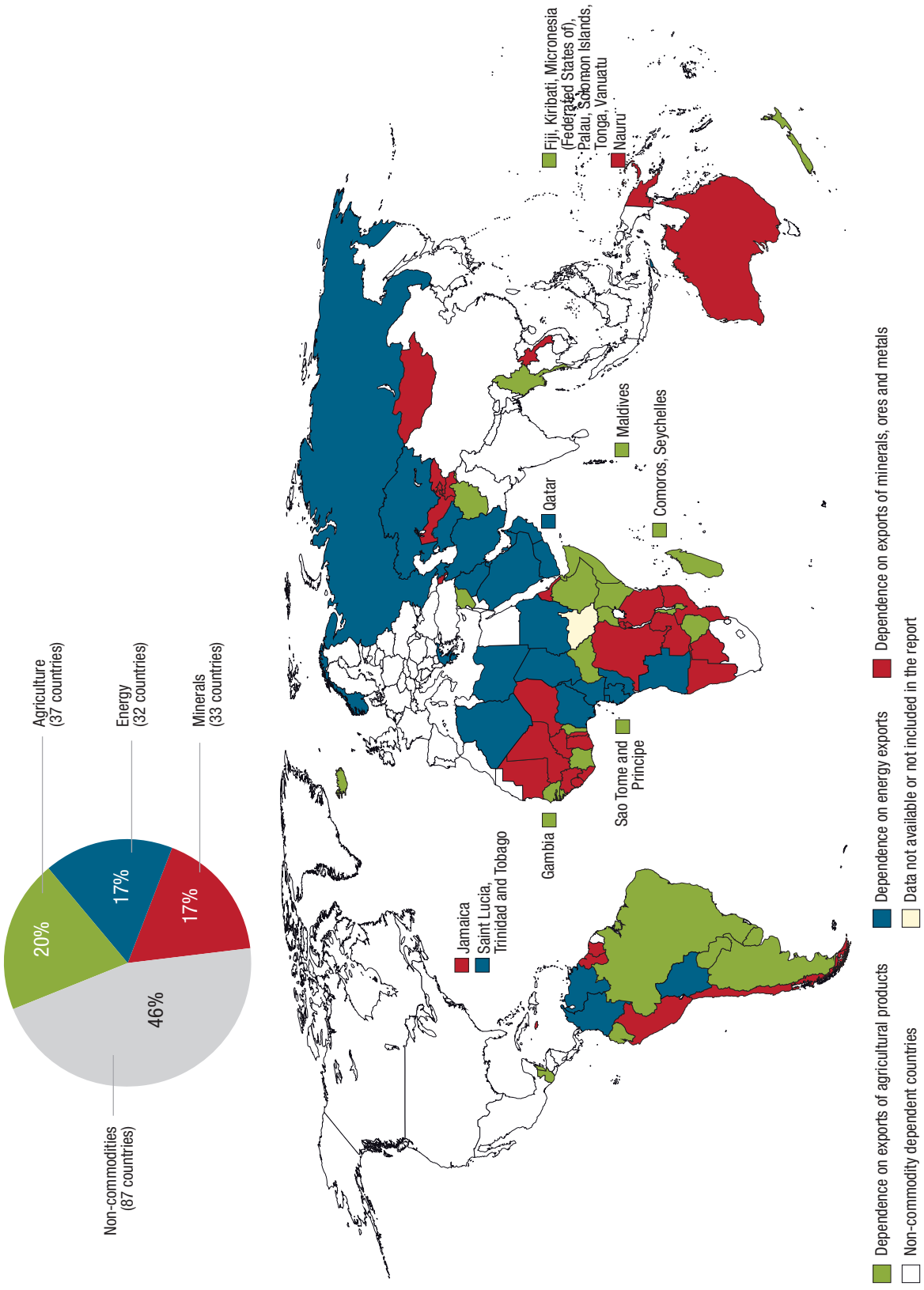
Due to the possible presence of non-attributed exports, the total of commodity plus non-commodity exports does not add up to 100 per cent, and in a few cases, it may also result in a country that would normally be classified as commodity dependent if there were no non-attributed export data, being considered non-commodity dependent.

A second challenge concerns separating *exports* from *re-exports*, particularly in developing countries. Due to the probable inclusion of re-exports in the data on exports available for many countries and given the fact that non-commodity products are usually* more likely to be re-exported by developing countries than commodities, non-commodity exports are often artificially inflated. This results in a downward bias in our calculations of commodity dependence, so that commodity-dependence, in reality, is probably higher in many developing countries than the values calculated using available data and presented in this study.

One example concerns the product code 793 in the Standard International Trade Classification (SITC) Revision 3: "Ships, boats & floating structures". Exports registered under this product line often include re-exports of used ships, or registry of ships under flags of convenience. For example, in Liberia, which has an extensive convenience flag registry, exports of products under the code 793 during the period 2013–2017 constituted 32.3 per cent of total goods exports. Also, in several countries there are indications, such as data on car production, that exports of assorted industrial products such as cars and other motor vehicles are, in fact, re-exports of products that are not manufactured domestically but imported.

* That is not always the case, especially with sensitive products that have been exported through neighbouring countries to mask their illegal origin, such as conflict diamonds or illegally logged hardwoods.

Figure 1.
Distribution of commodity-dependent and non-commodity-dependent countries by commodity group, 2013-2017
(percentage and number of countries)



Source: Author, based on data from UNCTADStat.

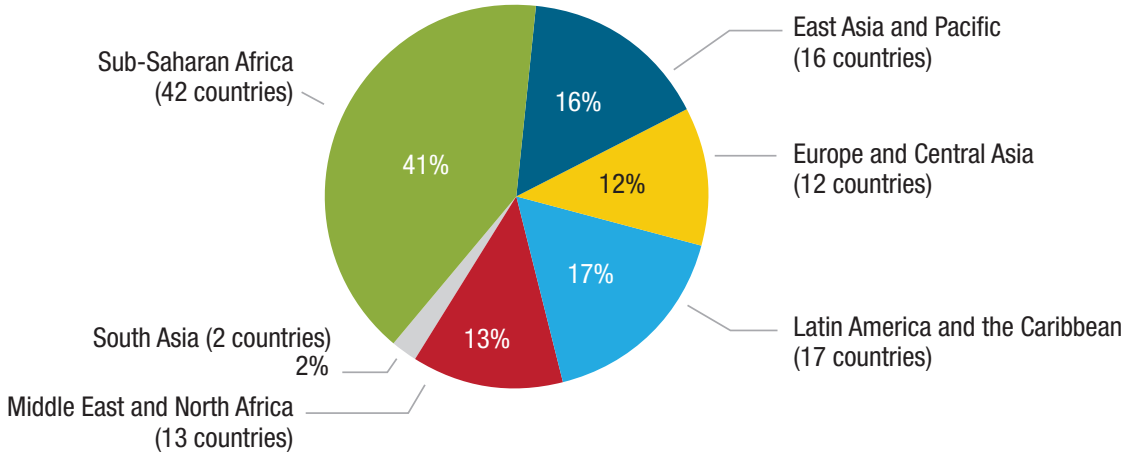
Within the group of commodity-dependent countries, the weight of commodity exports in total merchandise exports varies, with some countries having not only very high commodity dependence, but also an extremely high concentration of exports in one or a few products. To show this, table A1 in annex 1 presents the 50 countries with the highest degree of commodity dependence,[7] ranked in descending order according to the size of the share of commodity exports in their total exports. This table also lists countries where individual products had a high share of total exports: 54.8 per cent, on average; and in 24 countries in the table the export share of a single product was higher than this average (highlighted in the table). Among the latter countries, crude petroleum was the top export product in half of them.

In order to examine the main commodity groups exported by commodity-dependent countries, commodities were classified[8] into three groups: Agricultural Products (Agriculture), Minerals, Ores and Metals (Minerals), and Energy. Among the commodity-dependent countries, each country was considered to be commodity-dependent in the commodity group which had the largest share of total merchandise exports to the world during the average of the last five-year period for which data were available.

Using this classification, figure 1 shows which commodity group dominated exports in each commodity-dependent country in 2013–2017. In total, for 37 commodity-dependent countries, the largest commodity category exported was agricultural products (in green), for 33 countries it was mineral products (in red) and for 32 of them it was energy products (in blue). The figure shows clearly the pervasiveness of commodity dependence in Africa and in South America.

Figures 2 and 3 show the geographical dimension of commodity dependence during the period 2013–2017. Two out of every five commodity-dependent countries were located in sub-Saharan Africa (figure 2). As the sizes of different world regions vary in terms of the number of countries, figure 3 shows the percentage of countries in each region that were commodity-dependent. It reveals that commodity dependence was particularly pervasive in sub-Saharan Africa, where it existed in 89.4 per cent of countries. Both figures show that high dependence also existed in other regions as well: two thirds of the countries in the Middle East and North Africa, and more than half of the countries in Latin America and the Caribbean (including all 12 countries in South America), and in East Asia and the Pacific were commodity dependent. On the other hand, only a quarter of countries in South Asia and in Europe and Central Asia were commodity-dependent, while there were none in North America. Additionally, table A1 in annex 1, which provides a list of the

Figure 2.
Distribution of commodity-dependent countries by geographic region, 2013-2017
(percentage and number of countries)

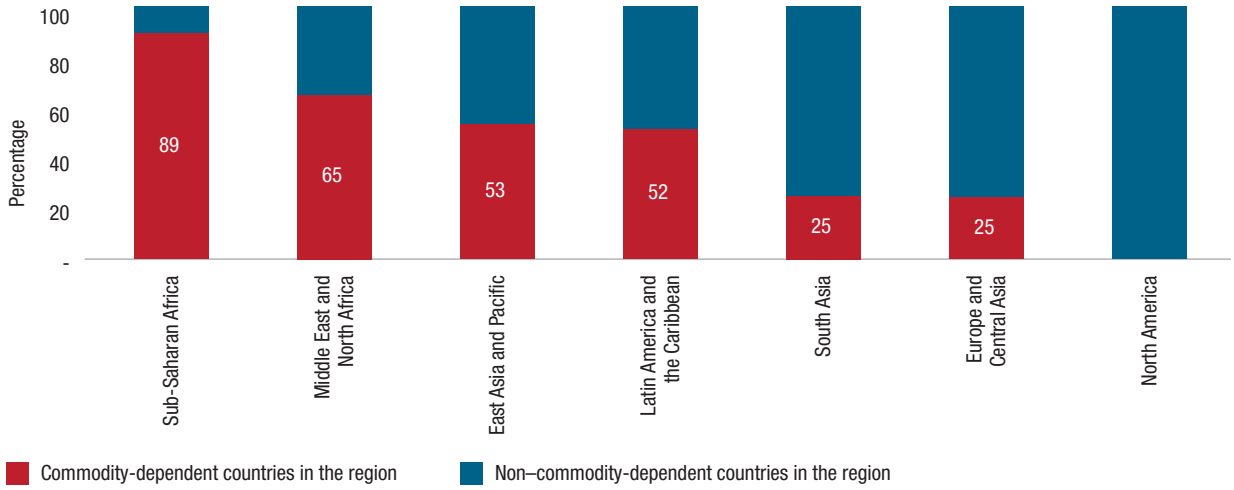


Source: Author, based on data from UNCTADStat and using the World Bank country classification by region (accessed on 3 December 2018).

50 most commodity-dependent countries in the world, includes 24 sub-Saharan African countries and 7 countries in South America. This indicates that over half the total number of countries in each of these regions were highly commodity dependent.

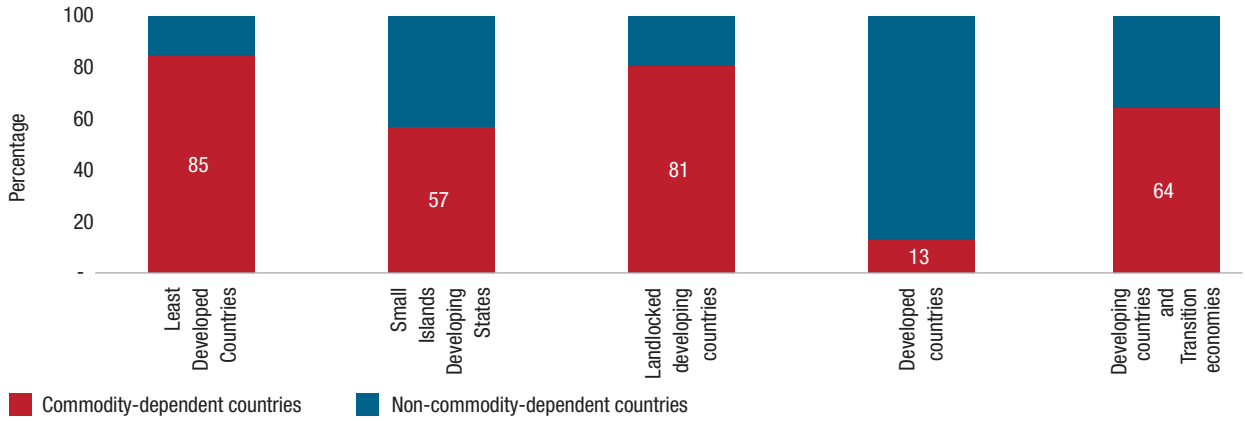
Therefore, figures 1, 2 and 3 suggest that there may be a relationship between the level of development and commodity dependence. Reinforcing this, figure 4 shows that commodity-dependence is almost exclusively a developing-country phenomenon. Only 13.2 per cent of developed countries are commodity-dependent, in contrast to almost two thirds (64.2 per cent) of developing and transition economies.

Figure 3.
Distribution of commodity-dependent and non-commodity-dependent countries within each geographic region, 2013-2017
(percentage)



Source: Author, based on data from UNCTADStat and using the World Bank country classification by region (accessed on 3 December 2018).

Figure 4.
Distribution of commodity-dependent and non-commodity-dependent countries within each development group, 2013-2017
(percentage)

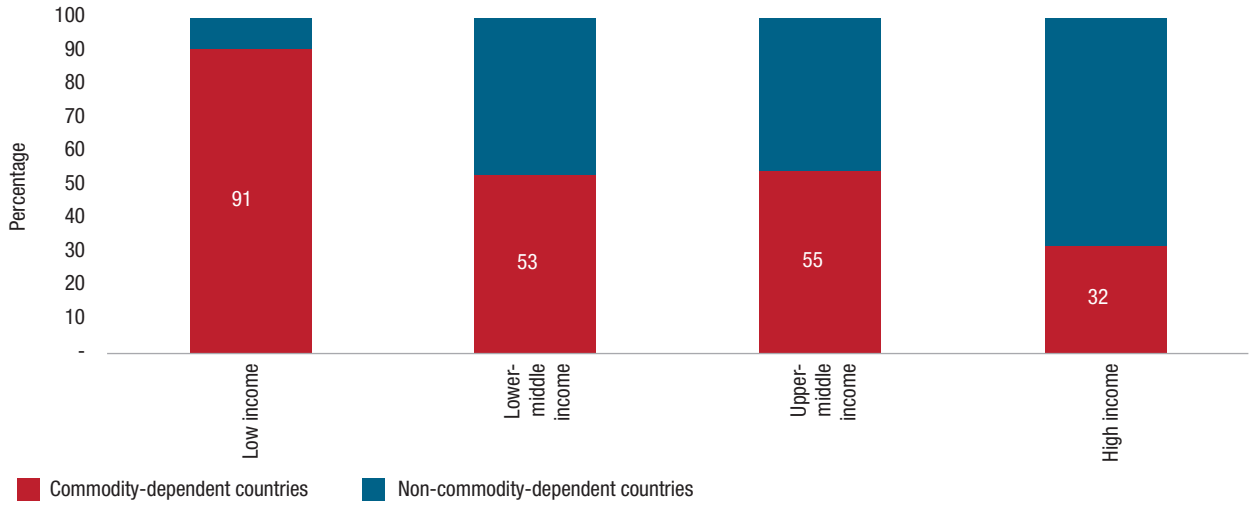


Source: Author, based on data from UNCTADStat and UNCTAD country classification.

Taking a closer look at the developing and transit economy group, it can be observed that commodity dependence is especially pervasive in those countries that are the most vulnerable: 84.8 per cent or 39 out of 46 LDCs, 80.6 per cent or 25 out of 31 landlocked developing countries (LLDCs), and 57.1 per cent or 16 out of 28 small island developing countries (SIDCs) in the sample.[9] For those developing and transition countries that do not belong to any of these especially vulnerable groups, 52.2 per cent or 36 out of 69 of them are commodity-dependent.

Figure 5 classifies each country using World Bank income categories; it indicates that 90.9 per cent of low-income countries are commodity-dependent, compared with less than one third (32.1 per cent) of high-income countries. Of the 18 high-income countries that are commodity-dependent, more than half (55.6 per cent) are energy-dependent.[10] This strongly suggests the existence of a close relationship between a country's level of development and whether (and to what extent) it is commodity dependent, that is, whether or not its exports are concentrated and composed mainly of commodities. The next section explores this issue further.

Figure 5.
Distribution of commodity-dependent and non-commodity-dependent countries within each income group, 2013-2017
(percentage)



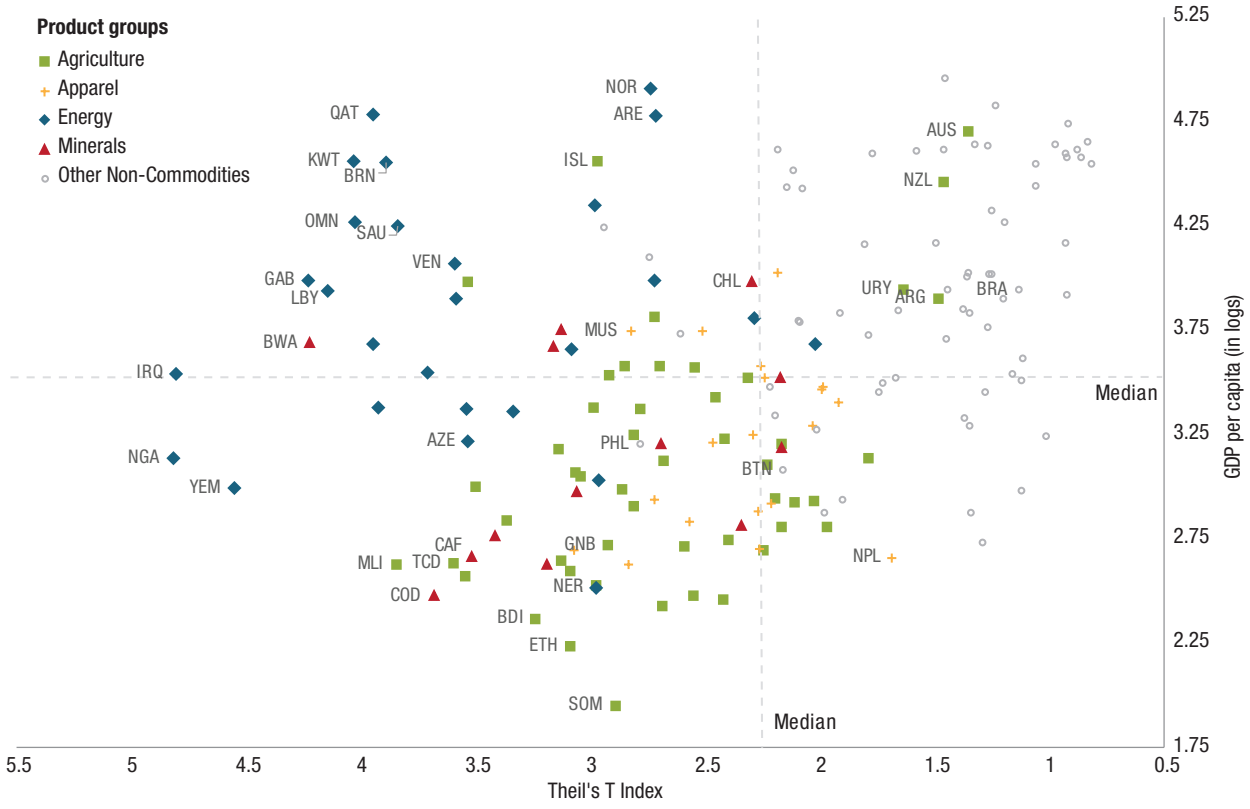
Source: Author, based on data from UNCTADStat.

3. An empirical exploration of the link between income level, export concentration and commodity dependence

The discussion in section 2 has suggested that a negative relationship exists between a country's level of income and its extent of commodity dependence. This section uses a simple panel data model to test the existence and nature of the relationship between a country's level of income, measured by GDP per capita, and its degree of export concentration/diversification measured by Theil's T concentration index, while controlling for the country being dependent on different commodity groups.[11]

Figures 6a and 6b help to visualize the nature of this relationship. They present the average GDP per capita (in logs), the value of Theil's T concentration index[12] and the main export group of each country for the 5-year periods 1998–2002 and 2013–2017, respectively, for 174 countries (listed in annex 2). Each figure is divided into four quadrants by using the median values of Theil's T concentration index and GDP per capita. In each figure the north-east quadrant consists of relatively wealthy and export-diversified countries,

Figure 6a.
Log GDP per capita, Theil's T concentration index and dominant export commodity groups, selected countries, 1998–2002



Source: Author, based on UNCTADStat data.

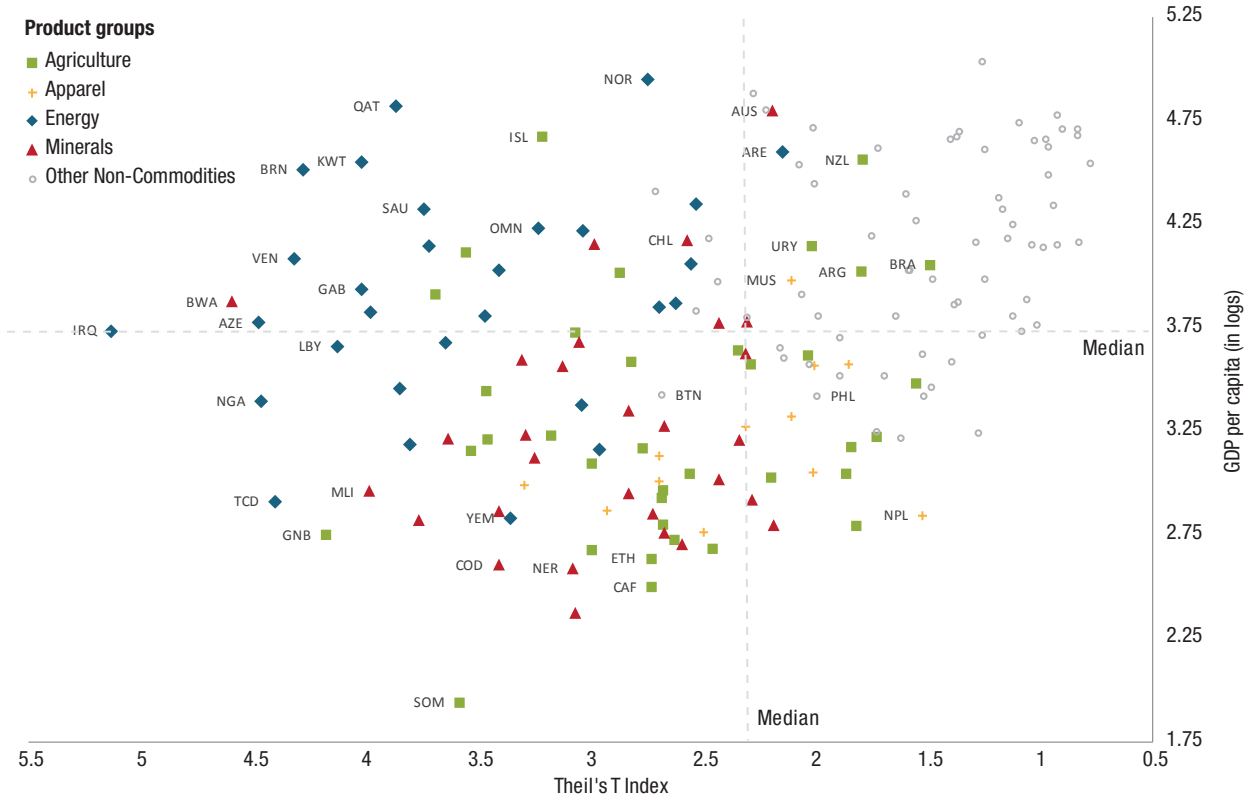
Note: The figure uses official UNSTAT acronyms that are spelt out as follows: ARE (United Arab Emirates), ARG (Argentina), AUS (Australia), AZE (Azerbaijan), BDI (Burundi), BRA (Brazil), BRN (Brunei Darussalam), BTN (Bhutan), BWA (Botswana), CAF (Central African Republic (the), CHL (Chile), COD (Congo (the Democratic Republic of the), ETH (Ethiopia), GAB (Gabon), GNB (Guinea-Bissau), IRQ (Iraq), ISL (Iceland), KWT (Kuwait), LBY (Libya), MLI (Mali), MUS (Mauritius), NER (Niger), NGA (Nigeria), NOR (Norway), NPL (Nepal), NZL (New Zealand), OMN (Oman), PHL (Philippines (the), QAT (Qatar), SAU (Saudi Arabia), SOM (Somalia), TCD (Chad), URY (Uruguay), VEN (Venezuela (Bolivarian Republic of), YEM (Yemen).

the south-west quadrant of relatively poor and export-concentrated countries, the north-west quadrant of relatively wealthy but export concentrated countries, and the south-east quadrant of relatively poor but diversified countries. The labelled points in each of the figures show how some individual countries evolved in terms of export concentration/diversification, (log) GDP per capita and the dominant export product group.

It is worth noting that in both figures, the relatively wealthy and export diversified countries in the north-east quadrant are almost exclusively exporters of non-commodity products other than apparel. The exceptions in both figures are a few commodity-dependent developed countries, such as Australia and New Zealand, and a few commodity-dependent developing countries that export mainly agricultural products, namely Argentina, Brazil and Uruguay. Interestingly, the United Arab Emirates, an energy-export-dependent country, and Mauritius, an apparel-exporter, diversified their exports significantly during the period and moved into the north-east quadrant.

In both figures, the south-west quadrants comprise relatively poor and less diversified developing countries that are almost exclusively CDDCs. Only the Philippines (in 1998–2002) and Bhutan (in 2013–2017) located in this quadrant are non-commodity exporters. Agriculture- and mineral-dependent countries make up more than two thirds of the countries in this quadrant. Also to be found in this quadrant are one third of the total number of energy-exporting countries, including Nigeria and Chad, half of the total number of apparel-exporting countries, and more than two thirds of all sub-Saharan

Figure 6b.
Log GDP per capita, Theil's T concentration index and dominant export commodity groups, selected countries, 2013–2017



Source: Author, based on UNCTADStat data.
Note: The figure uses official UNSTAT acronyms that are spelt out as follows: ARE (United Arab Emirates), ARG (Argentina), AUS (Australia), AZE (Azerbaijan), BDI (Burundi), BRA (Brazil), BRN (Brunei Darussalam), BTN (Bhutan), BWA (Botswana), CAF (Central African Republic (the), CHL (Chile), COD (Congo (the Democratic Republic of the), ETH (Ethiopia), GAB (Gabon), GNB (Guinea-Bissau), IRQ (Iraq), ISL (Iceland), KWT (Kuwait), LBY (Libya), MLI (Mali), MUS (Mauritius), NER (Niger), NGA (Nigeria), NOR (Norway), NPL (Nepal), NZL (New Zealand), OMN (Oman), PHL (Philippines (the), QAT (Qatar), SAU (Saudi Arabia), SOM (Somalia), TCD (Chad), URY (Uruguay), VEN (Venezuela (Bolivarian Republic of), YEM (Yemen).

African countries covered by the data. Moreover, it includes the largest concentration of especially vulnerable developing countries: more than 8 out of every 10 LDCs and more than two thirds of all LLDCs during both 5-year time periods presented in the figures.

The relatively poor but diversified south-east quadrant contains mostly countries that are dependent on non-commodity exports (including apparel exporters such as Nepal), as well as some countries dependent on agricultural exports that are relatively diversified. The north-west quadrant, which contains relatively wealthy but export-concentrated countries, is largely populated by energy-export-dependent countries, which make up more than half the countries found in this quadrant. Also, two-thirds of the total number of energy-export-dependent countries in the data sample are located in this quadrant.

All this reinforces our prior interest in testing the form and strength of the relationship between income per capita and export concentration/diversification. It also suggests that energy-dependence of a country may influence the relationship between both variables, given the large proportion of these countries in the north-west quadrants of both figures 6 and 7.

A dataset of 3,987 observations covering 174 countries with yearly observations between 1995 and 2017[13] was used to test the relationship between GDP per capita and export concentration measured by Theil's T index. Each yearly observation was assigned one dummy variable according to one of five categories: whether the country was commodity dependent – the main commodity export groups being agriculture, energy or minerals – or whether it was non-commodity-dependent (i.e. commodities were equal to or less than 60 per cent of exports) with its main export product group being apparel or other non-commodities.

First, a panel model was tested, where the data were pooled and parameters estimated using ordinary least squares, including all possible export group dummies and interaction effects between Theil's T concentration index in square roots and in levels (to account for the potential non-linearity of the relationship by using a standard quadratic model specification). The following was the specification of model 1:

$$GDPpc_{it} = \beta_0 + \beta_1\sqrt{Theil'sT}_{it} + \beta_2 Theil'sT_{it} + \beta_3 Agriculture_{it} + \beta_4 Minerals_{it} +$$

$$+\beta_5 Energy_{it} + \beta_6 Apparel_{it} + \beta_7 Agriculture_{it} \times \sqrt{Theil'sT}_{it} + \beta_8 Minerals_{it} \times \sqrt{Theil'sT}_{it} +$$

$$+\beta_9 Energy_{it} \times \sqrt{Theil'sT}_{it} + \beta_{10} Apparel_{it} \times \sqrt{Theil'sT}_{it} + \beta_{11} Agriculture_{it} \times Theil'sT_{it} +$$

$$+\beta_{12} Minerals_{it} \times Theil'sT_{it} + \beta_{13} Energy_{it} \times Theil'sT_{it} + \beta_{14} Apparel_{it} \times Theil'sT_{it} + \epsilon_{it}$$

with ϵ_{it} being the errors.

Table 1 presents the estimated coefficients of the model and its standard errors in its first column. As the yearly data has a significant autocorrelation, as expected,[14] and heteroskedasticity, the variance-covariance matrix was estimated for all ordinary least square models included in table 1 using a "sandwich"-type correction, as proposed by Arellano (1987), with clustering of errors by country, which is robust against cross-sectional heteroskedasticity and serial correlation of arbitrary form.

The results in the first column of table 1 indicate that the Theil's T index is significantly correlated with the log of GDP per capita, both in terms of square roots and levels, with very high significance. However, only the energy and apparel dummies and their interaction effects with the square root and level of Theil's T index are significant, at 5 per cent significance. Another pooling model was then fitted, which included only those two dummies and their interaction effects. This revealed the apparel dummy's interaction effects with Theil's T index to be significant only at 10 per cent significance (table 1, second column).[15] With regard to the energy dummy and its interaction effects, all the terms in the model were seen to have at least 5 per cent significance (see table 1 third column).[16]

Table 1.
Results from different specification of the OLS pooling model, yearly data

	Model 1	Model 2	Model 3	Model 4
Intercept	8.620***	7.253***	7.529***	8.769***
	(1.319)	(0.790)	(0.748)	(0.619)
Sqrt Theil's T	-6.607***	-3.827***	-4.256***	-6.313***
	(2.171)	(1.182)	(1.117)	(0.878)
Theil's T	2.242***	0.861**	1.007**	1.839***
	(0.862)	(0.423)	(0.401)	(0.298)
Agriculture	3.181			
	(3.283)			
Minerals	6.726			
	(5.035)			
Energy	-8.793**	-7.426**	-7.702**	
	(3.503)	(3.276)	(3.267)	
Apparel	-12.144**	-10.777*		
	(5.896)	(5.802)		
Sqrt Theil's T x Agriculture	-3.417			
	(4.316)			
Sqrt Theil's T x Minerals	-6.744			
	(6.132)			
Sqrt Theil's T x Energy	11.265***	8.485**	8.914**	
	(4.203)	(3.673)	(3.655)	
Theil's T x Apparel	16.216**	13.436*		
	(7.644)	(7.427)		
Theil's T x Agriculture	0.613			
	(1.440)			
Theil's T x Minerals	1.403			
	(1.895)			
Theil's T x Energy	-3.568***	-2.187**	-2.333**	
	(1.318)	(1.036)	(1.028)	
Theil's T x Apparel	-5.627**	-4.245*		
	(2.472)	(2.357)		

***p < 0.01, **p < 0.05, *p < 0.1
Source: Author, based on data from UNCTADStat.

These results indicate that, as expected, there is a significant positive correlation between export diversification and GDP per capita, and that this relationship is non-linear, as both parameters of the quadratic specification used in models 1 to 4 are significant (table 1). They also suggest that the relationship between both variables may be different for energy-dependent countries.

Figure 7 presents this relationship when fitted to the five-year averages of the dataset. The convex black and concave blue dashed lines show the relationship for energy-dependent and all other countries, respectively. The convex black line plotting energy-dependent observations is much flatter than the curve for countries that export predominantly other products. Combining the data for both curves (i.e. fitting a model without dummies or interaction effects using the five-year average data), results in the concave violet line in the figure, due to the influence on the estimated parameters of high-income but concentrated energy-dependent countries in the north-west quadrant of the figure.

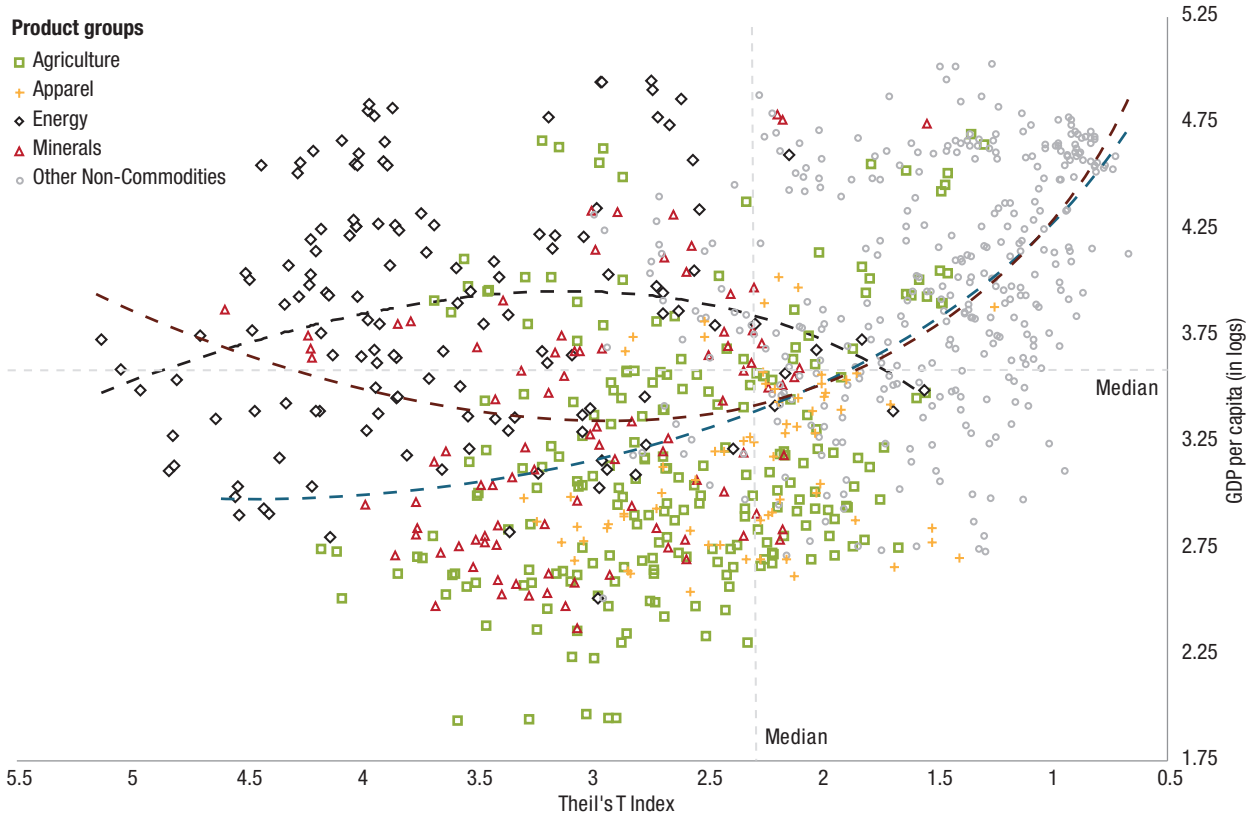
One hypothesis for explaining the observed non-linear relationship between export diversification measured by Theil's T index and (log) income per capita was posited by Hausmann and Hidalgo (2011). These authors proposed a model where countries differ

in terms of *capabilities*, which are necessary to produce and export different products. Products also differ in terms of the number and sophistication of the capabilities they require. Thus, countries with only a few capabilities will be able to produce and export only a few types of products, resulting in high export concentration in basic goods such as commodities, and in low income per capita levels, while countries with many capabilities will have diversified production and exports, and high-income levels. Additionally, as the number and level of sophistication of capabilities increase in a country, the marginal use of an additional capability grows. This occurs because the number of products (of growing complexity) that can be produced with additional capabilities increases in a non-linear (concave) way. Thus, according to this hypothesis, the reason for the observed non-linear relationship in the data is the higher returns resulting from additional, more sophisticated, capabilities.

For energy-dependent countries with smaller populations, such as many of those in the north-west quadrant of figures 6a and 6b, however, it is possible that as they add capabilities but stay initially energy-dependent, the relationship between diversification and income per capita stays flat until a significant number of capabilities has been accumulated. This is because energy exports generate high levels of income, but require low Hausman-Hidalgo capabilities. For countries with large populations, such as Nigeria, or for those countries where the amount of petroleum per capita is low, such as Chad, the normal non-linear and concave relationship would apply. This suggests, in turn, that the different relationships identified by the simple ordinary least squares (OLS) pooling model for energy-dependent countries may actually be the result of model oversimplification, and it would disappear under other model specifications. Nevertheless, if the conceptual hypothesis mentioned above is true, it is expected that the non-linear relationship between income per capita and diversification would be robust to such different model specifications.

Figure 7.

Log GDP per capita, Theil's T concentration index and dominant export commodity groups
(averages of five-year periods between 1995 and 2017 and OLS-fit lines)



Source: Author, based on UNCTADStat data.

Clearly, the pooling OLS models in table 1 are only a first attempt to identify the relationship between GDP per capita and export concentration, as the economic literature suggests that several other country-specific variables, such as the quality of institutions, different policy regimes and trade barriers, as well as time-specific variables, such as the terms of trade or international liquidity conditions, may also influence this relationship. Therefore, not only the conceptual discussion above, but also extensive previous research about different possible determinants of different GDP per capita across countries, suggest that the effect of the energy-dependence dummy in the pooling OLS models is the result of model oversimplification.[17]

To address these issues while maintaining the focus of the analysis on the relationship between only two main variables of interest, two different types of fixed-effect panel models were used. First, two standard models with generalized least squares were used, which included country- and year-specific fixed effects, with (model 5) and without (model 6) the energy-dependent dummies and their interaction effects. Again, the variance-covariance matrix of these models was estimated using Arellano's method, as it is robust to cross-sectional heteroskedasticity and serial correlation.[18] Second, a feasible generalized least squares estimator was used in model 7, including country fixed effects, which is robust to serial dependence and time-varying variance in the errors.[19] Table 2 presents the results from these models.

The equation estimated for model 5 is as follows:

$$GDPpc_{it} = \beta_0\sqrt{Theil'sT}_{it} + \beta_1 Theil'sT_{it} + \beta_2 Energy_{it} +$$

$$+\beta_3 Energy_{it} \times \sqrt{Theil'sT}_{it} + \beta_4 Energy_{it} \times \sqrt{Theil'sT}_{it} + \mu_{it} + \epsilon_{it}$$

with μ_{it} being the country and time period fixed effects, and for the FGLS model, only country effects are estimated, so μ_i.

Table 2.
Results from different fixed-effect models, yearly data

	Model 5	Model 6	Model 7
Sqrt Theil's T	0.105	-0.564*	-0.238***
	(0.254)	(0.301)	(0.032)
Theil's T	-0.029	0.215**	0.093***
	(0.082)	(0.101)	(0.010)
Energy	-0.135		
	(0.806)		
Sqrt Theil's x Energy	-0.264		
	(0.926)		
Theil's x Energy	0.209		
	(0.268)		

***p < 0.01, **p < 0.05, *p < 0.1

Source: Author, based on data from UNCTADStat.

Note: Models 5 and 6 were estimated using OLS with both country and time-fixed effects. Model 7 was estimated using a feasible generalized least squares estimator with country effects.

The fixed-effects OLS model, including the energy dummy and interaction effects (see table 2, first column), indicates that the inclusion of these variables is not significant. The fixed effects generalized least squares GLS results (table 2, second column) and the results estimated using feasible generalised least squares (table 2, third column),

both estimated without the energy dummy and its interactions, suggest that the bivariate relationship between GDP per capita and export concentration is significant even when using robust standard errors, and that it is concave in nature, as the sign of the square root of Theil's T concentration is negative.

The concave nature of the relationship implies that, as countries become more diversified, the same increase in export diversification is associated with higher income per capita. This result suggests that, as mentioned above, the "special" form of the relationship between GDP per capita and export diversification for energy-dependent countries is not robust to changes in model specification. In particular, the inclusion of country- and time-specific fixed effects removes a series of other country or time-invariant determinants not included in the simple pooling OLS model that affect the relationship between both variables, thereby eliminating the significance of the energy-dependence dummy and its interaction effects.

The evidence in this section then underlines the importance of diversification for development, as both variables are positively and significantly correlated. As the non-linearity and concave nature of the relationship between both variables was robust to the different model specifications used, it supports the conceptual analysis of Hausmann and Hidalgo (2011) about the importance of developing domestic capabilities in order to diversify production and exports, and foster economic and social development.

4. The evolution of world commodity dependence, 1998–2017, and the commodity price cycle

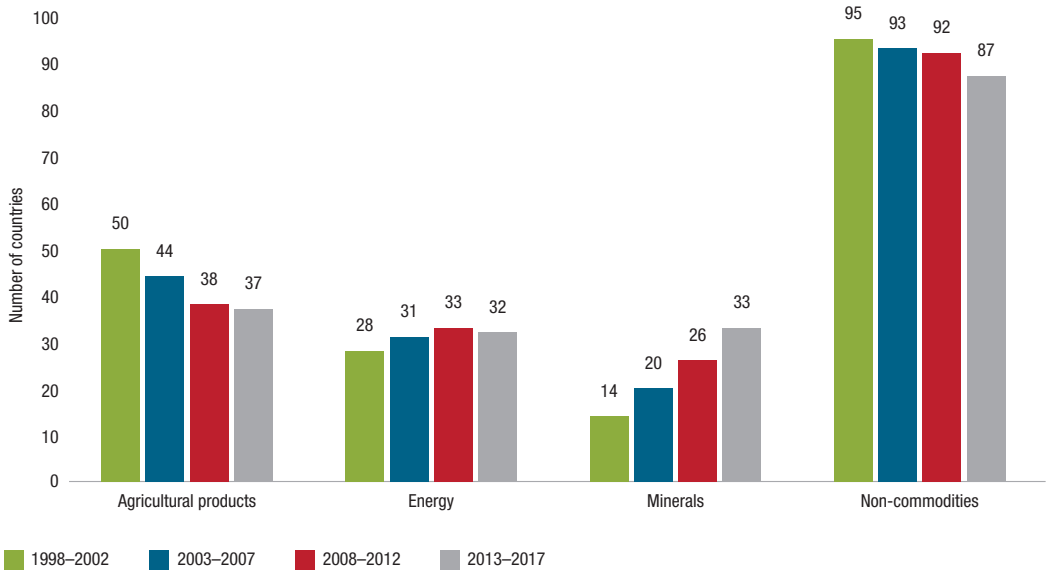
Three interesting facts stand out about the evolution of world commodity dependence over the two decades between 1998 and 2017.

First, the number of commodity-dependent countries increased from 92 in 1998–2002 to 102 in 2013–2017, including two commodity-dependent countries that became newly independent during the period: Timor-Leste and Montenegro.

Associated with this, the median and mean of commodity exports as a percentage of total exports increased consistently from 56 per cent and 55.3 per cent, respectively, in 1998–2002 to 64.4 per cent and 59 per cent, respectively, in 2013–2017. This reinforces the observation that commodities have become, by value, a larger component of exports for the average country. This increase in both the median and mean values of the commodity export share in total exports has been even more marked for vulnerable country groups such as the LDCs and the LLDCs. In these countries, the median and mean commodity export shares rose from 78.2 per cent and 70.9 per cent, respectively, in 1998–2002 to 85.3 per cent and 75.7 per cent, respectively, in 2013–2017.

Second, the main commodity groups on which countries were export-dependent has changed during the 20-year period (figure 8).[20] Specifically, the number of agriculture-dependent countries fell from 50 to 37 during the period, in parallel with an increase in the number of mineral-dependent countries, which rose from 14 in 1998–2002 to 33 in 2013–2017. There was also a small increase in the number of energy-dependent countries, from 28 to 32. Meanwhile, the number of non-commodity-dependent countries declined from 95 to 87.

Figure 8.
Evolution in the number of commodity-dependent countries by commodity group, 1998–2017
(five-year averages)

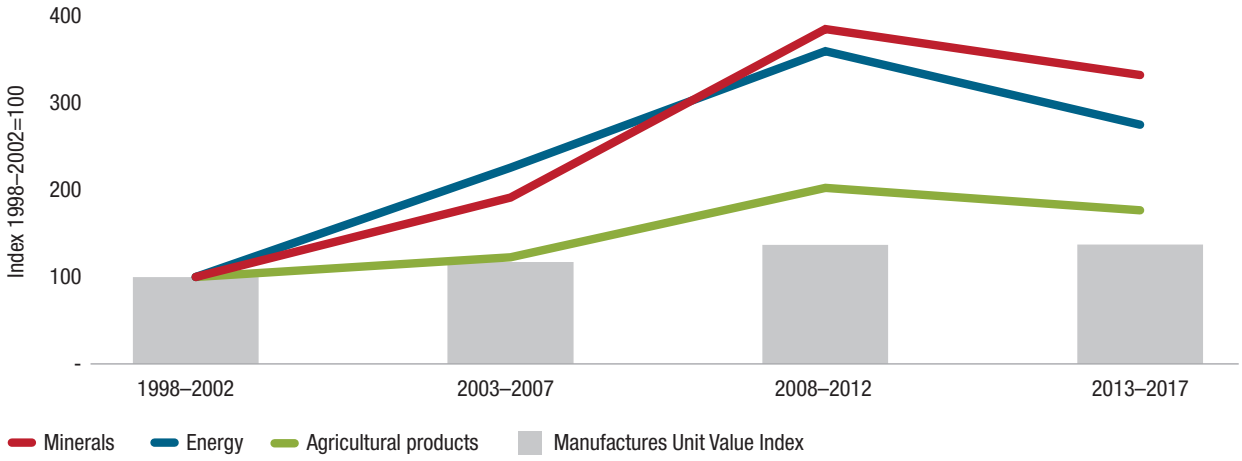


Source: Author, based on data from UNCTADStat.

Third, during this period, in three quarters of all the countries covered by the data (142 out of 189 countries), the product group on which they were export-dependent did not change, even temporarily. Additionally, in nine countries (including Ecuador, Egypt and Indonesia, which became energy-export-dependent during the boom in energy prices) there was a temporary change in the predominant commodity on which they were dependent, though they were dependent on the same product group in 2013–2017 as in 1998–2002. This indicates the strong persistence of commodity dependence, even in the face of the large commodity price shock starting in the early 2000s.

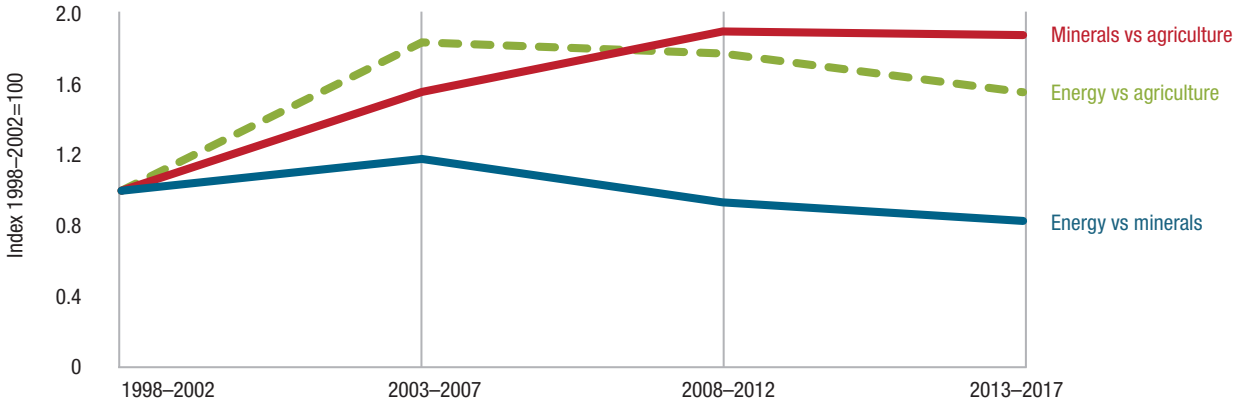
The prices of all three commodity groups – agricultural products, energy and minerals – increased from 1998–2002, and during the two subsequent five-year periods, but fell in 2013-2017. Nevertheless, they remained significantly higher than the prices registered in 1998–2002 (figure 9a)[21] The figure shows that commodity prices for all commodity groups also increased with respect to the prices of manufactures, as represented in the figure by the manufactures unit value index.

Figure 9a.
Evolution of commodity price indices, 1998– 2017
(five-year averages; index base period: 1998-2002=100)



Source: Author, based on data from UNCTADStat.

Figure 9b.
Ratio of commodity price indices, 1998–2017
(five-year averages; index base period: 1998-2002=100)



Source: Author, based on data from UNCTADStat.

Table 3 shows the average values for the periods 1998–2002, 2003–2007, 2008–2012 and 2013–2017 of the Manufacture Unit Value Index (MUV) of UNCTAD's All Commodities Price Index, and of the latter's component indexes: agricultural products, energy and minerals. The "boom" phase of the cycle is captured by comparing the price index levels between 1998–2002 and 2008–2012, while its "bust" phase registers the changes between this latter period and 2013–2017.

The table shows the magnitude of the positive terms-of-trade shock during the period. While the All Commodities Index increased 228.8 per cent between during the "boom" phase of the cycle until 2008–2012, the MUV increased only 36.9 per cent during the same period. The boom was especially strong for mineral and energy prices, which increased 285.4 per cent and 259.6 per cent, respectively, during the period, while agricultural prices "only" increased 102.4 per cent. During the "bust" phase of the cycle, between 2008–2012 and 2013–2017, the All Commodities Index fell 20.3 per cent, and all its component commodity groups fell too. The largest fall was in energy prices, by 23.5 per cent, while mineral, ores and metals prices fell 13.8 per cent and agricultural prices by 12.7 per cent. Despite this, all commodity prices, even those of agricultural products, were, on average, much higher during the period 2012–2017 than during 1998–2002.

Table 3.
Five-year average commodity prices (index values) and price changes (percentage)

Commodity group	Index base 2015 = 100				Price changes (percentage)	
	1998–2002	2003–2007	2008–2012	2013–2017	Boom change	Bust change
Energy	48.0	108.2	172.6	132.1	259.6	-23.5
All commodities	47.6	94.0	156.5	124.8	228.8	-20.3
Minerals	34.9	66.8	134.5	116.0	285.4	-13.8
Agriculture	61.9	75.9	125.3	109.4	102.4	-12.7
Manufacture Unit Value index	76.5	89.8	104.7	105.2	36.9	0.5

Source: UNCTADStat.
Note: *Boom* change is the percentage change between the periods 1998–2002 and 2008–2012.
Bust change is the percentage change between the periods 2008–2012 and 2013–2017.

Figure 9b shows the large relative price changes that occurred after 1998–2002 in the different commodity groups, with energy and mineral prices both increasing substantially compared with agricultural products. Such relative price changes among different commodity groups and vis-à-vis non-commodities contributed to some countries modifying their main export product groups. For example, countries such as Mozambique and the Plurinational State of Bolivia switched from being dependent on agricultural exports in 1998–2002 to being energy- or mineral-dependent in 2008–2012 as energy and minerals prices soared. These relative price changes also help to explain the "temporary" changes in countries' commodity group- or commodity-export dependence observed during the period. For example, Egypt and Indonesia were considered non-commodity-dependent in 1998–2002, but during the petroleum price peak[22] in the period 2008–2012, they became energy-dependent, reverting to non-commodity dependence in 2013–2017 when energy prices fell.

These large observed changes in commodity prices were important determinants of the changes in commodity dependence during the 1998–2017 period. This is suggested by the high correlation between the changes in commodity prices and corresponding export value changes, especially in energy-dependent countries. The changes in energy prices during the period were correlated with the changes in energy exports of energy-dependent countries, with an average value of 78.2 per cent per cent during the 1998–2017 period, whereas the average value of the correlation for all commodity-dependent countries between commodity exports and UNCTAD's All Commodities Index (which is dominated by energy prices) was 54.1 per cent.

5. Did CDDCs diversify their exports and productive sectors between 1998 and 2017?

Section 4 discussed commodity price changes and the evolution of commodity dependence between 1998 and 2017. However, the evolution of commodity prices is only one of several factors that affected the composition of CDDCs' exports during the period. The varying evolution of the productive sectors in different CDDCs also contributed to the different results observed in terms of export diversification across different countries during the period.

This section briefly looks at three groups of countries that registered important changes in the product composition of their export baskets during the period. Specifically, different examples within each group of countries are presented, in order to highlight and discuss what role, if any, changes in sectoral production played in the evolution of the composition of their export baskets.

5.1 Diversification by energy-dependent countries into downstream value-added products

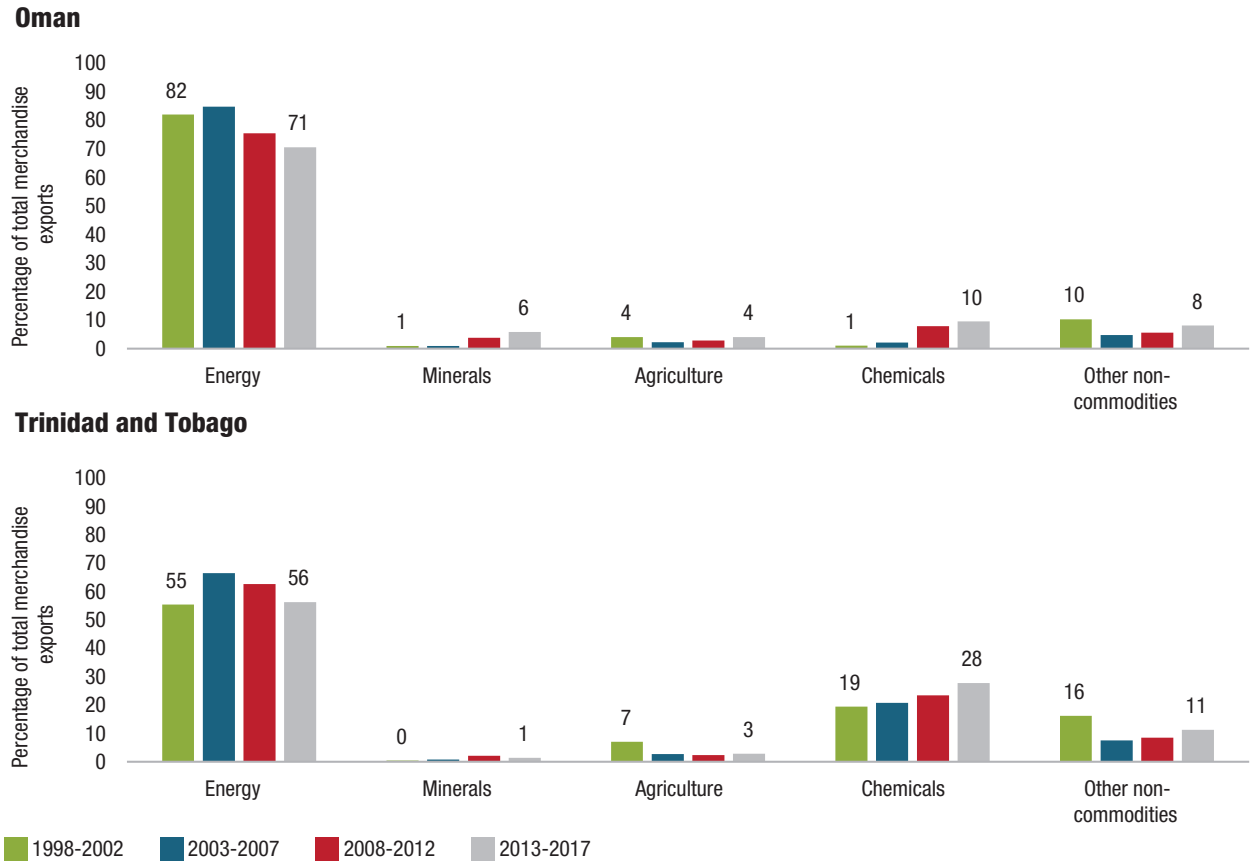
Between 1998 and 2017, several energy-export-dependent countries diversified their export baskets by producing and exporting value-added products that are energy-intensive or that use crude petroleum or natural gas as inputs. Chief among such value-added products are petroleum derivative products in general, including refined fuels, such as gasoline or kerosene, and assorted petrochemicals, including alcohols, fertilizers and plastics. Additionally, several of the same countries boosted the production and export of energy-intensive products such as aluminium, often importing all or most of the other non-energy inputs required for its manufacture, such as alumina or bauxite.

For example, in the Islamic Republic of Iran, Oman, Trinidad and Tobago, Egypt and Saudi Arabia, the share of chemicals[23] in total exports increased by 9.1, 8.5, 8.2, 7.9 and 5.8 percentage points, respectively, between 1998–2002 and 2013–2017. Figure 10 shows the evolution of the shares of different product groups for two of these countries: Oman and Trinidad and Tobago. It shows that Oman increased its export share of chemicals from 1 per cent of exports to 9.5 per cent during this period, on the back of an increase in the exports of fertilizers and different hydrocarbon derivatives, such as alcohols and phenols. In Trinidad and Tobago, the share of chemicals (including different products such as fertilizers) in exports rose from 19.4 per cent to 27.7 per cent.

The increase in export diversification resulted in part from greater accumulated investment in the petrochemical sector in both countries. In Trinidad and Tobago, for example, three plants that opened between 2002 and 2009 increased the installed capacity for the production of ammonia[24] by 1.9 million tons, while two plants, opened in 2004 and 2005, increased annual methanol[25] production by 3.6 million tonnes. Similarly, in Oman the authorities have fostered value addition in the energy sector. This includes an expansion of refining capacity, such as the opening of the Suhar 1 (2006) and Suhar 2 refineries (2017), as well as an increase in the production of chemical products,[26] such as paraxylene and benzene, along with the opening of an aromatics plant in 2010.

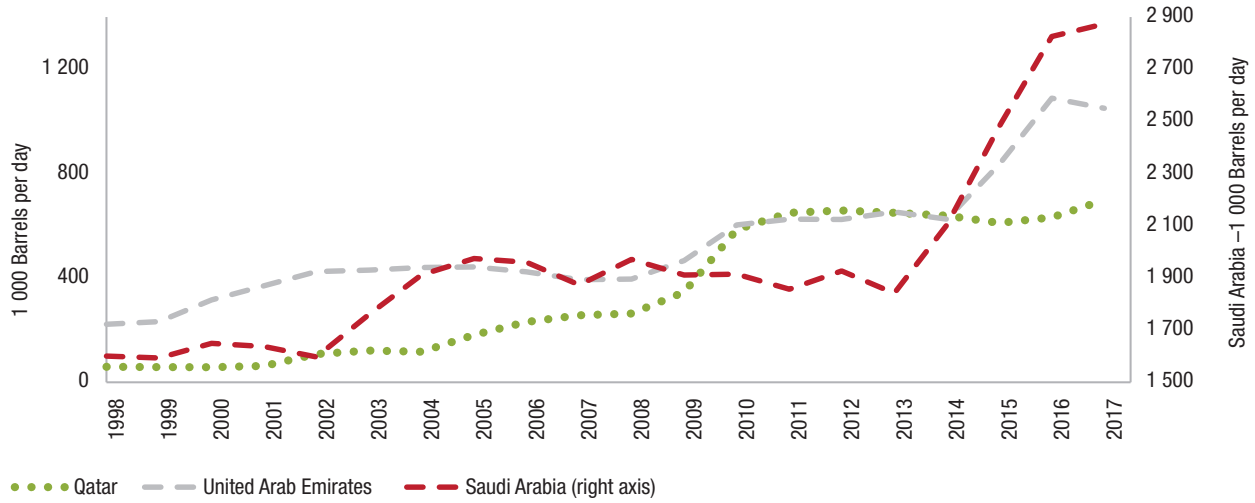
Several energy-export-dependent countries, such as Algeria, the Islamic Republic of Iran, Kazakhstan, Qatar, Saudi Arabia and the United Arab Emirates, expanded significantly their production of processed petroleum and gas products[27] during the period (figure 11a for the last three countries). Saudi Arabia, the United Arab Emirates and Qatar increased their refining capacity by, respectively, 1.1 million, 840,000 and 370,000 barrels of petroleum a day between 1998 and 2017, while also maintaining high refinery capacity utilization rates.[28]

Figure 10.
Evolution of exports shares of different product groups in Oman and Trinidad and Tobago, five-year averages between 1998 and 2017
(percentage of total merchandise exports)



Source: Author, based on data from UNCTADStat.

Figure 11a.
Production of petroleum products in Qatar, Saudi Arabia (right axis) and the United Arab Emirates, 1998–2017
(1,000 barrels per day)

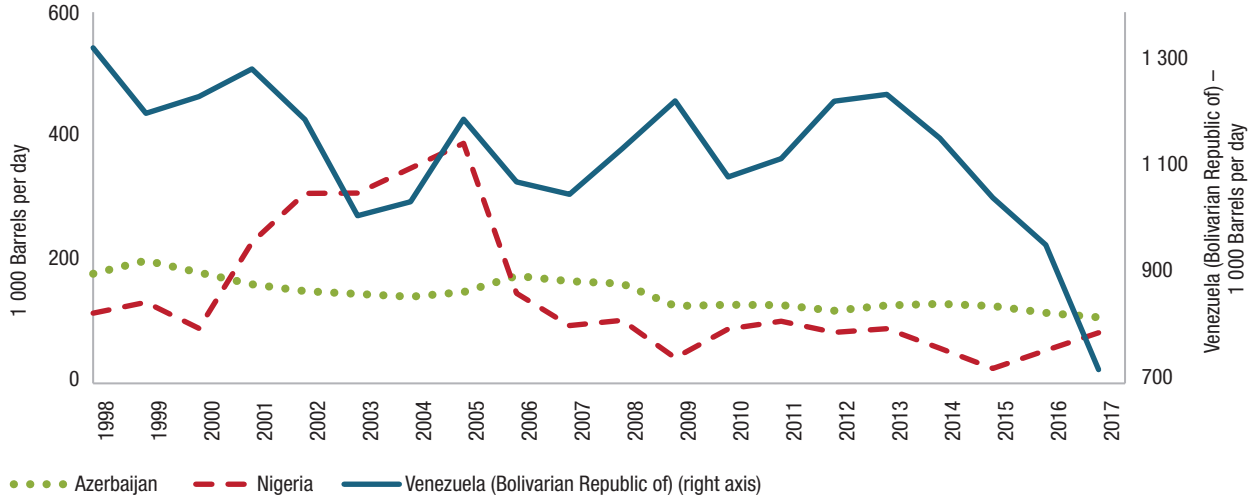


Source: Author, based on data from OPEC Annual Statistical Bulletin (various years).
Note: The petroleum products data provided by OPEC can be disaggregated into gasoline, kerosene, distillates, residuals and others.

Similarly, and taking advantage of their abundant energy resources, countries like Bahrain, Oman, Qatar, Saudi Arabia and the United Arab Emirates also diversified into energy-intensive aluminum production (figure 12).

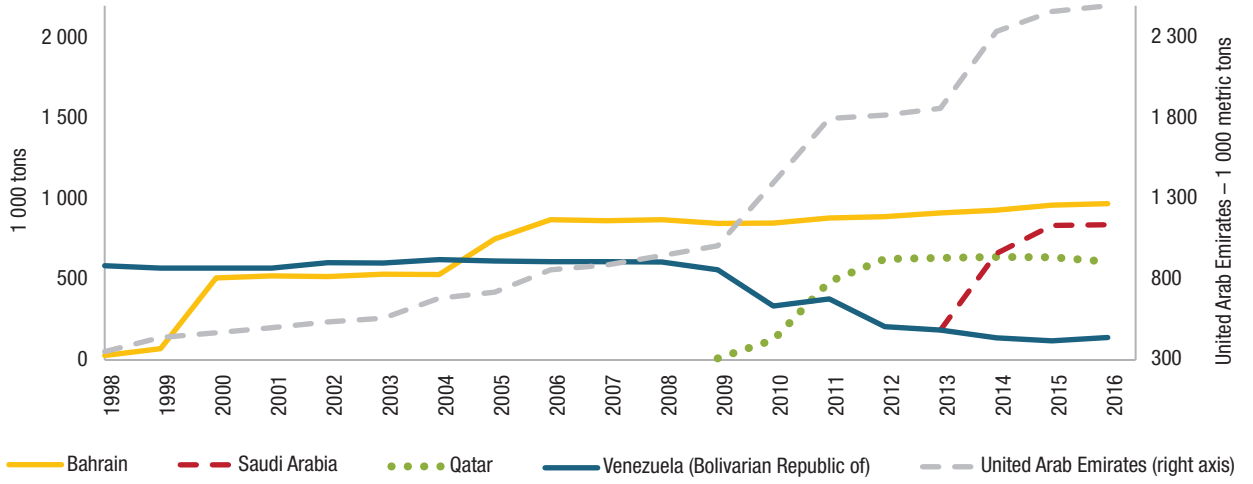
However, in other energy-dependent developing countries, exports of value-added downstream products from crude petroleum or natural gas, such as chemicals, petroleum derivative products or energy-intensive primary aluminium, stagnated or fell.

Figure 11b.
Production of petroleum products in Azerbaijan, Nigeria and the Bolivarian Republic of Venezuela (right axis), 1998–2017
(1,000 barrels per day)



Source: Author, based on data from OPEC Annual Statistical Bulletin (various years).
Note: The petroleum products data provided by OPEC can be disaggregated into gasoline, kerosene, distillates, residuals and others.

Figure 12.
Aluminium production in selected countries, 1998–2017
(1,000 tons)



Source: Author, based on data from the United States Geological Survey.

For example, in Azerbaijan, Egypt, Kuwait, Nigeria and the Bolivarian Republic of Venezuela, production of petroleum derivative products fell, while in others, such as Gabon, it changed little between 1998 and 2017. Figure 12b shows the evolution of production of these products in Azerbaijan, Nigeria and the Bolivarian Republic of Venezuela. The lack of growth in production of petroleum derivative products in these countries was due to either stagnation or a reduction in installed refining capacity, low refinery capacity utilization, or both. For example, refining capacity in Egypt increased by 215,000 barrels a day, but capacity utilization fell to 66.5 per cent in 2017. In the Bolivarian Republic of Venezuela, despite the increase in refining capacity by 623,000 barrels a day, production of processed petroleum products in the country dropped 45.5 per cent between 1998 and 2017 (figure 11b), as refinery capacity utilization fell from 93 per cent to 55.4 per cent. In Angola and Gabon, refining capacity remained unchanged during the period, while in Azerbaijan and Kuwait it fell. In Nigeria, while refining capacity changed little, the utilization rate fell from 34.5 per cent in 1998 to only 18.3 per cent in 2017. Similarly, production of aluminium fell in some energy-dependent developing and transition economies such as Azerbaijan and the Bolivarian Republic of Venezuela (figure 12), and stagnated or did not grow in other energy-dependent CDDCs.

5.2 Diversification of energy- or mineral-dependent countries into agricultural products

A second group concerns developing countries that depend on energy or mineral exports, which succeeded in diversifying into agricultural exports, helped by production increases in the latter sector. In a few of these countries, such as Armenia, Tajikistan and Liberia, agricultural exports not only increased in value, but also as a share of their total exports. In these countries, agricultural exports grew faster than their mineral or energy exports, despite the relative price increases of energy and minerals vis-à-vis agricultural products (observed in figure 9b above).

In Armenia, while the production and export of copper, its main export product, increased between 1998–2002 and 2013–2017, there was an even greater growth of its agricultural exports (excluding manufactured tobacco),[29] from 14.5 per cent to 18.4 per cent of total merchandise exports. The increase was led by exports of alcoholic beverages, especially brandy, most of it going to the Russian Federation (86.7 per cent of the total exports of the product), and much less to the Ukraine (2.3 per cent) and Belarus (2.2 per cent). Other dynamic agricultural exports consisted of food, including fruits, fresh vegetables and their preparations, which increased by 1.9 percentage points of total exports. This increase in food exports occurred in parallel to the increase in the production of fresh vegetables, grapes and other fruits such as apples.[30]

In several other CDDCs, such as Cameroon, Chile, Ghana, Peru and Rwanda, which are dependent on energy or mineral exports, agricultural exports expanded during the period. However, the agricultural exports expanded less than the growth in the value of minerals or energy exports.

Rwanda became a mineral-export-dependent CDDC over the 20-year period of analysis, as mineral exports increased from 25 per cent to 43.9 per cent of total exports between 1998–2002 and 2013–2017 (figure 13). This growth was largely driven by a sharp rise in the production and prices of niobium and tantalum, which are products used in the aerospace (e.g. aeroengines), power (e.g. turbine blades) and electronics (e.g. capacitors for mobile phones) industries around the world. The country also boosted its agricultural exports, which explained 34.2 per cent of the increase in total export value during the period.[31] Especially dynamic were exports of coffee and tea due to an increase in their production by 8.3 per cent and 64.8 per cent, respectively, as well as their higher prices.

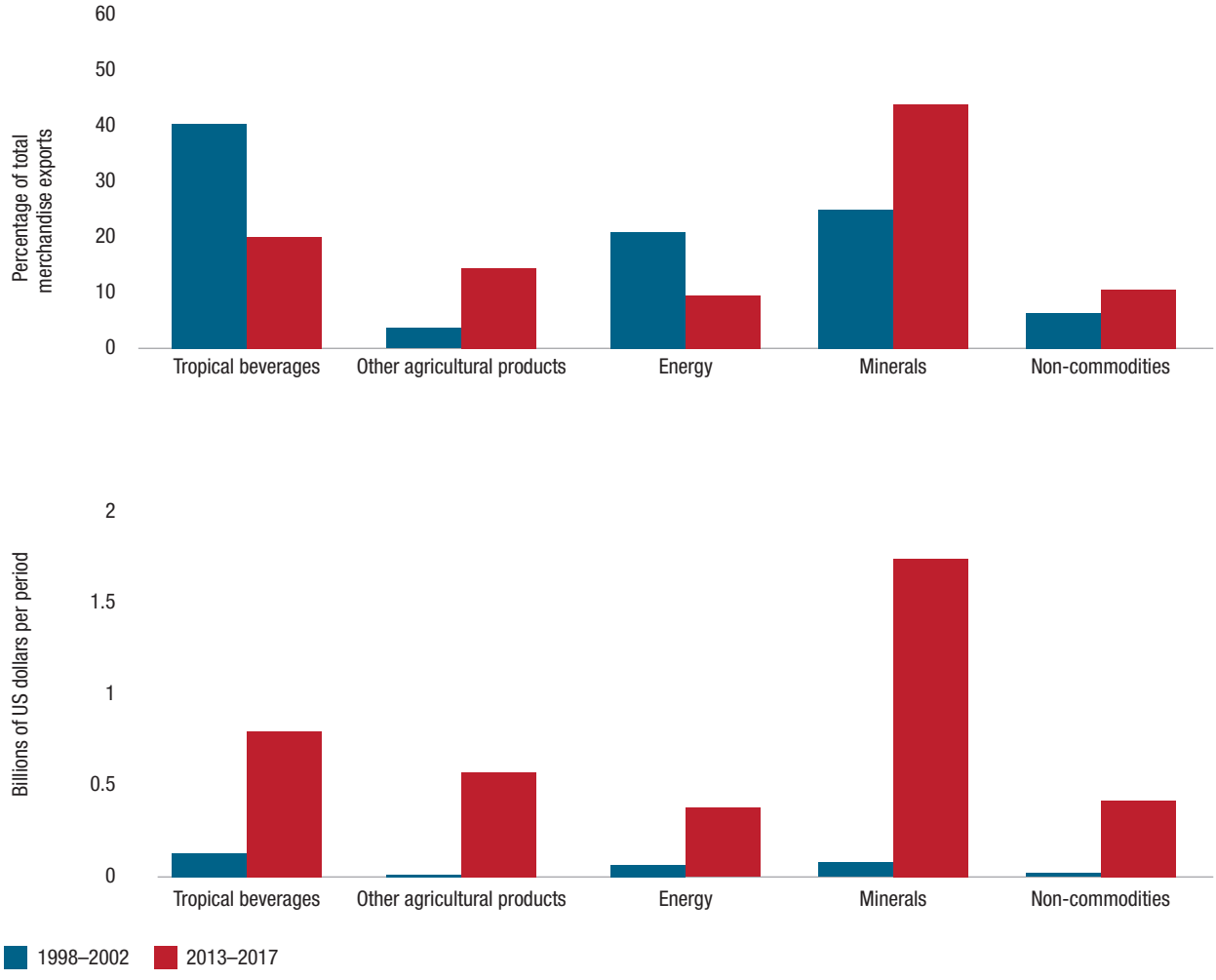
Cameroon remained an energy-export-dependent CDDC between 1998–2002 and 2013–2017, with the value of its energy exports increasing by a factor of 1.4. At the same time, its agricultural exports also increased significantly in value terms (figure 14),

accounting for 38.1 per cent of the increase in the country's total export value. This was due, in particular, to higher cocoa and wood exports, and, to a lesser extent, fruits such as bananas and plantains. The growth of exports of cocoa, plantains and, to a lesser extent, bananas was due to an expansion in their production with the production of cacao increasing by a factor of 1.3 and that of plantains by a factor of 2.4.

However, in a few countries that are dependent on energy or mineral exports, the agricultural sector contracted, and export concentration increased during the period. In Chad, for example, the value of exports grew substantially after oil extraction started in 2003, accompanied by increases in gold exports. However, agricultural exports fell in value by 16 per cent between 1998–2002 and 2013–2017, especially as a result of a 40.3 per cent fall, in value terms, of cotton exports, and despite some increases in exports of oilseeds and gum arabic. This decline in cotton exports was largely due to a 28.2 per cent reduction in cotton production and a 43.3 per cent decrease in the planted area (figure 16). All this led to the share of agricultural exports in total exports plummeting from 92.5 per cent to 5.8 per cent.

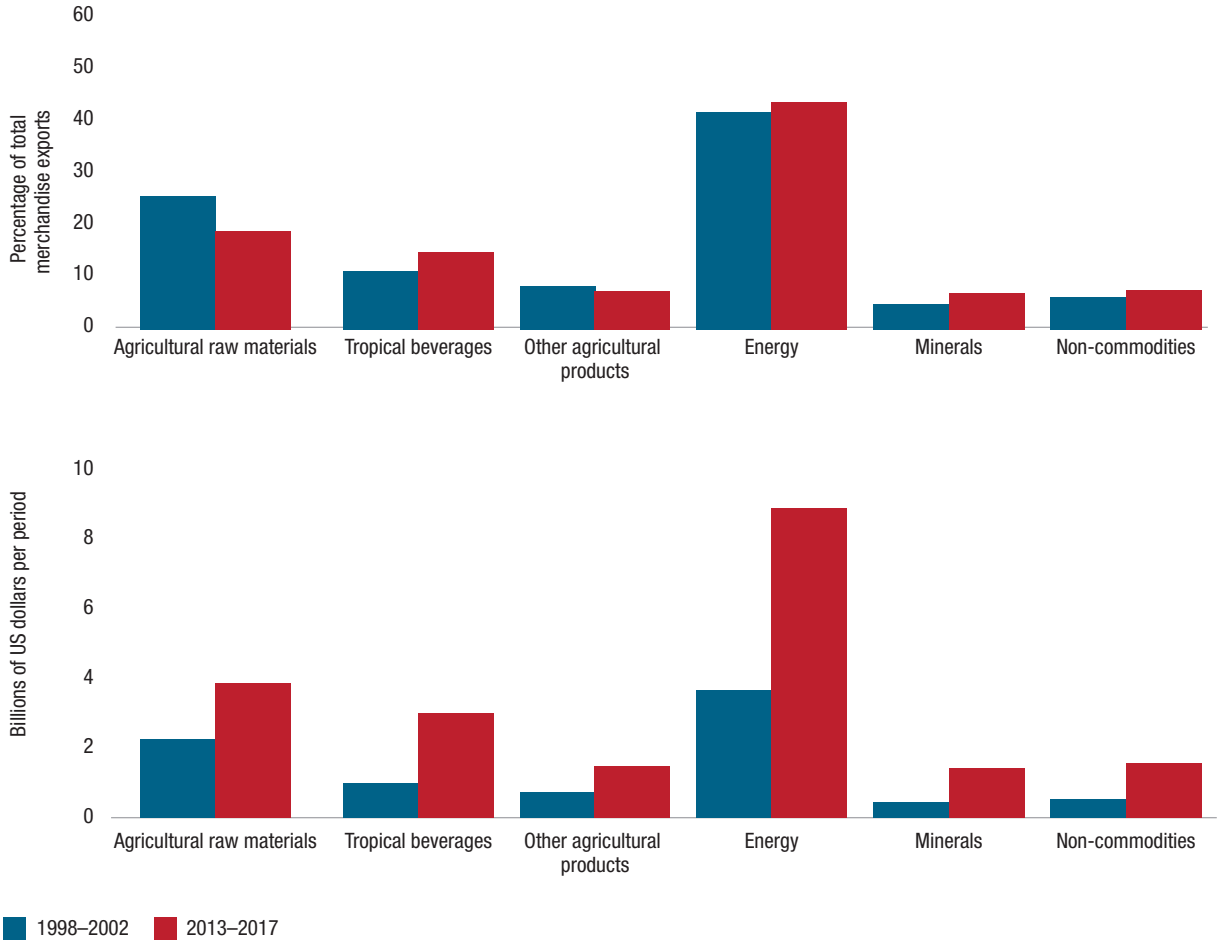
In Equatorial Guinea, petroleum production started in 1994 and peaked in 2004. The cocoa sector, which had been important before the petroleum boom, registered a fall in production of 90.9 per cent between 1988–1992 and 2013–2017 (figure 17). By the latter period, energy accounted for 91 per cent of exports, mostly in crude form, as the country does not produce petroleum derivative products.

Figure 13.
Rwanda: Evolution of merchandise exports by commodity group, 1998–2002 and 2013–2017
(percentage of total merchandise exports and billions of US dollars)



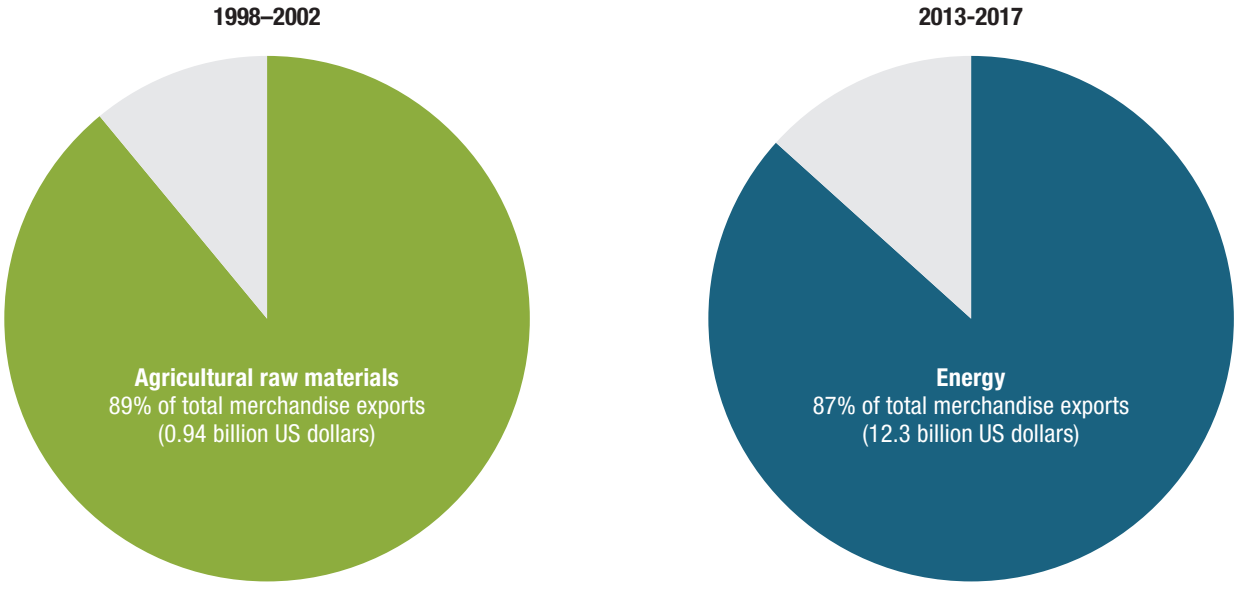
Source: Author, based on data from UNCTADStat.

Figure 14.
Cameroon: Evolution of merchandise exports by commodity group, 1998–2002 and 2013–2017
(percentage of total merchandise exports and billions of US dollars)



Source: Author, based on data from UNCTADStat.

Figure 15.
Chad: Leading export product group, 1998–2002 and 2013–2017
(percentage of total merchandise exports)

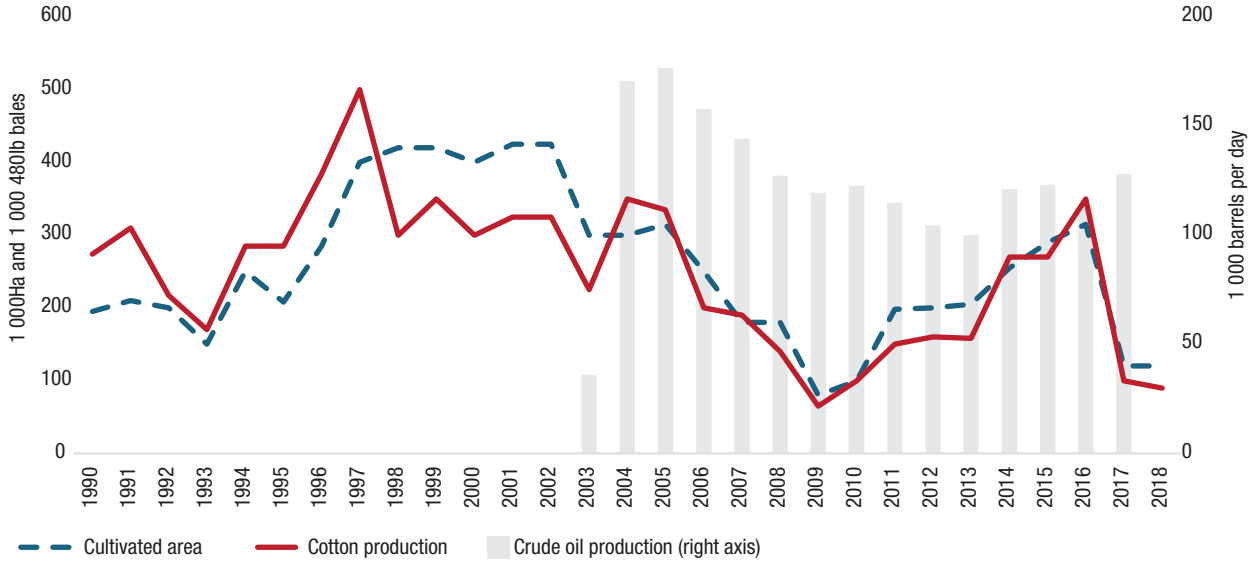


Source: Author, based on data from UNCTADStat.

5.3 In some CDDCs, exports of manufactures grew, but less than commodity exports

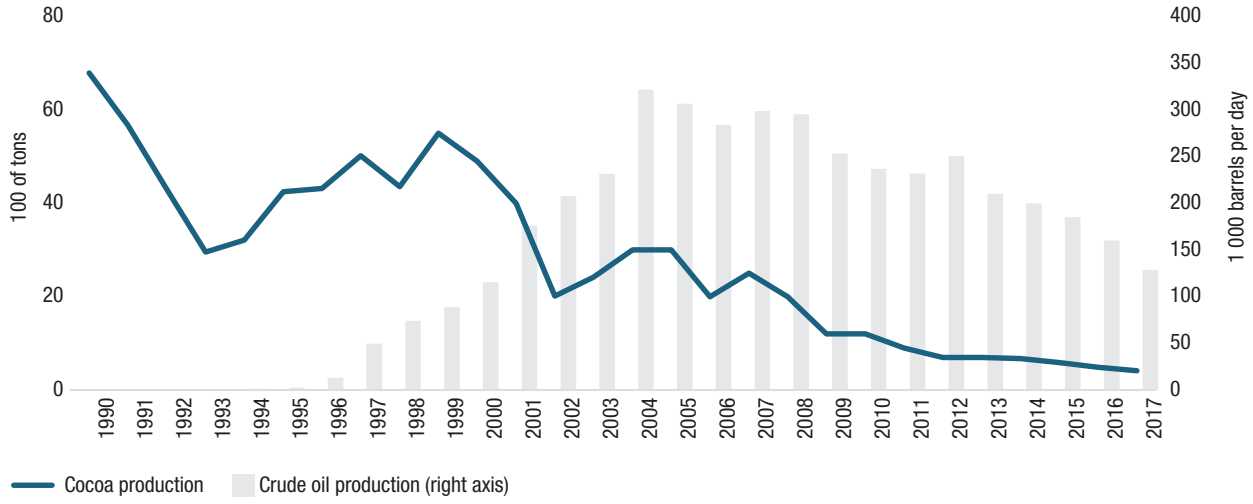
In some CDDCs, while exports of manufactures[32] increased between 1998 and 2017, their commodity exports increased even more, so that they became more commodity dependent. This section examines the cases of Brazil, Colombia and Indonesia.

Figure 16.
Chad: Petroleum production (1,000 barrels per day), cotton production (1,000 480-lb bales per year) and cultivated area (1,000ha), 1990–2018



Source: Author, based on data from the United States Department of Agriculture (USDA) for cotton, and the United States Energy Information Administration (EIA) for petroleum.

Figure 17.
Equatorial Guinea: Petroleum production (1,000 barrels per day) and cocoa production (100 tons per year), 1990–2018

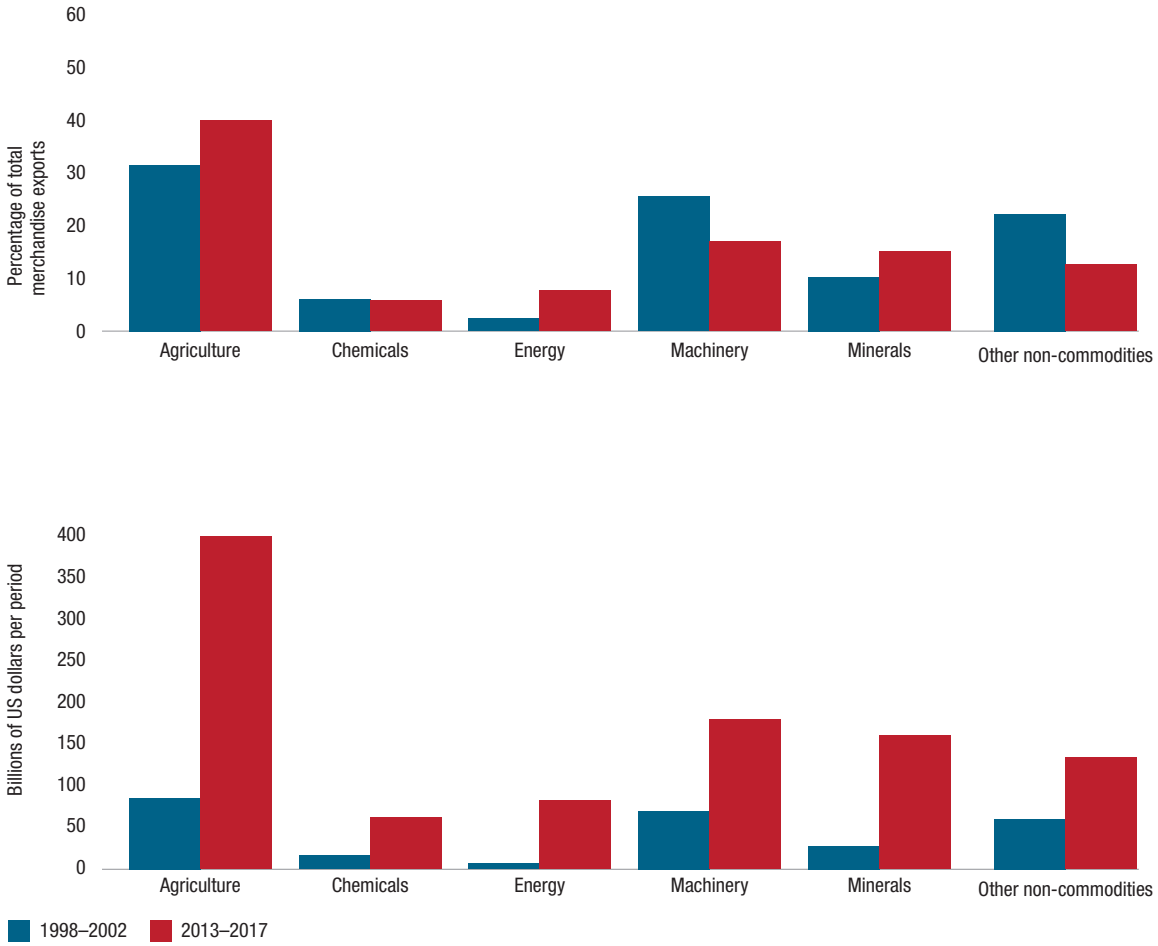


Source: Author, based on data from FAOSTAT for cocoa and the OPEC's Annual Statistical Bulletin 2018 for petrolum.

In Brazil, the share of commodity exports increased from 44.3 per cent in 1998–2002 to 62.8 per cent in 2013–2017. While all commodity groups increased their share in total merchandise exports, agricultural exports grew the most, by 390 per cent and accounted for 42.8 per cent of the increase in export value during the period (figure 18). And even though non-commodity exports grew by 160 per cent, their share in total exports fell, accounting for 29.1 per cent of the growth of exports. Transport equipment and associated goods was the largest contributor to the expansion of non-commodity exports.

Motor vehicle production increased significantly during the 1998–2017 period. For example, the production of passenger cars rose from 1,347,923 to 2,269,468 vehicles between 2000 and 2017.[33] With regard to exports, given that Brazilian motor vehicles benefit from trade preferences within the Southern Common Market (MERCOSUR), 75.6 per cent and 70 per cent, respectively, of total Brazilian exports of motor vehicles for the transport of persons (code 781) and of goods (code 782) were purchased by Argentina, Paraguay and Uruguay. Table 4 shows the yearly average shares in total merchandise exports of non-commodity products whose exports were greater than 0.5 per cent of total exports, by value, during each five-year period. It shows that other important contributors to the expansion of non-commodity exports were iron and steel products, aircraft,[34] chemical products and some manufactures.

Figure 18.
Brazil: Evolution of merchandise exports by commodity group, 1998–2002 and 2013–2017
(percentage of total merchandise exports and billions of US dollars)



Source: Author, based on data from UNCTADStat.
Note: Machinery refers to machinery and transport equipment.

Table 4.
Brazil: Changes in levels of non-commodity exports and their shares in total exports between 1998–2002 and 2013–2017

SITC code	Product	1998–2002		2013–2017		Change (millions of US dollars)
		Exports (millions of US dollars)	Share (per cent)	Exports (millions of US dollars)	Share (per cent)	
793	Ships, boats & floating structures	39.9	0.07	3 372.0	1.59	3 332.1
781	Motor vehicles for the transport of persons	1 696.6	3.11	4 677.5	2.2	2 980.9
671	Pig iron & spiegeleisen, sponge iron, powder & granu.	857.1	1.57	3 231.1	1.52	2 374.0
714	Engines & motors, non-electric; parts, n.e.s.	93.6	0.17	2 147.5	1.01	2 053.9
672	Ingots, primary forms, of iron or steel; semi-finis.	1 244.5	2.28	3 156.0	1.49	1 911.5
784	Parts & accessories of vehicles of 722, 781, 782, 783	1 585.6	2.9	3 391.3	1.6	1 805.7
792	Aircraft & associated equipment; spacecraft, etc.	2 628.9	4.82	4 352.6	2.05	1 723.7
611	Leather	731.9	1.34	2 322.4	1.09	1 590.5
699	Manufactures of base metal, n.e.s.	225.9	0.41	1 747.3	0.82	1 521.4
723	Civil engineering & contractors' plant & equipment	393.9	0.72	1 838.9	0.87	1 445.0
782	Motor vehic. for transport of goods, special purpose	656.4	1.2	2 075.9	0.98	1 419.5
641	Paper and paperboard	586.7	1.07	1 739.5	0.82	1 152.8
512	Alcohols, phenols, halogenat., sulfonat., nitrat. der.	180.9	0.33	1 292.6	0.61	1 111.7
571	Polymers of ethylene, in primary forms	259.7	0.48	1 225.9	0.58	966.2
713	Internal combustion piston engines, parts, n.e.s.	1 159.0	2.12	2 069.0	0.97	910.0
716	Rotating electric plant & parts thereof, n.e.s.	279.2	0.51	1168.8	0.55	889.6
625	Rubber tyres, tyre treads or flaps & inner tubes	511	0.94	1258	0.59	747
743	Pumps (excluding liquid), gas compressors & fans; centr.	531.7	0.97	1074.5	0.51	542.8
673	Flat-rolled prod., iron, non-alloy steel, not coated	442	0.81	903.6	0.43	461.6
778	Electrical machinery & apparatus, n.e.s.	346.1	0.63	672.7	0.32	326.6
634	Veneers, plywood, and other wood, worked, n.e.s.	484	0.89	759.5	0.36	275.5
821	Furniture & parts	451.1	0.83	649.6	0.31	198.5
635	Wood manufacture, n.e.s.	302.1	0.55	427.1	0.2	125
642	Paper & paperboard, cut to shape or size, articles	331.8	0.61	255.3	0.12	-76.5
851	Footwear	1510.4	2.77	1211.6	0.57	-298.8
764	Telecommunication equipment, n.e.s.; & parts, n.e.s.	953.3	1.75	370.5	0.17	-582.8

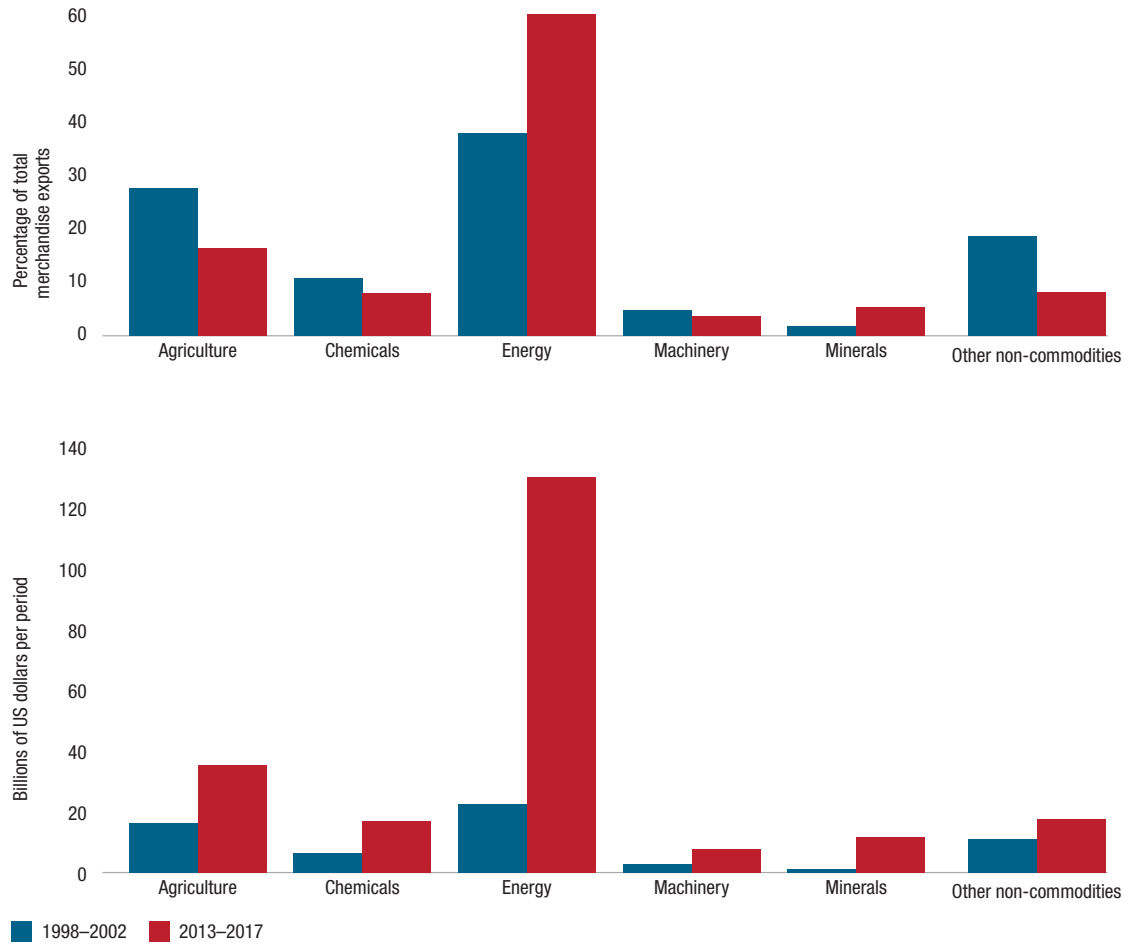
Source: UNCTADStat trade data.
Note: n.e.s. = not elsewhere specified.

In Colombia, commodity dependence increased from 66.5 per cent in 1998–2002 to 80.6 per cent in 2013–2017, mainly due to the large increase registered in the value of energy exports (petroleum and coal), which explains two thirds of the growth in the value of its total exports (figure 19). While the share of non-commodity exports in total exports fell during the period, non-commodity exports grew by 110 per cent and accounted for 14 per cent of the increase in total exports, half of which consisted of chemical products (figure 19, lower panel). Additionally, agricultural exports increased in nominal terms by 116 percent, due mainly to dynamic coffee exports. However, although agricultural exports accounted for around 11 per cent of the increase in total exports, their share in total exports fell.

Indonesia presents another interesting case, even though the country was, by a small margin,[35] not considered an energy-dependent CDDC in 2013–2017. While its largest group of commodity exports is energy, which stood at 25.3 per cent of exports in 2013–2017, Indonesia diversified into agricultural exports and also expanded its manufacturing exports between 1998 and 2017. During this period, its non-commodity exports increased by a factor of 1.4. Although lower than the growth rates of agricultural, energy and mineral exports, its non-commodity exports accounted for more than one third of the increase in total merchandise exports. Important products exported were footwear, motor vehicles and wood products, including paper, furniture and other worked wood products. Regarding motor vehicles, their export growth accompanied increases in production such as those of passenger vehicles, which rose from 250,000 vehicles in 2000 to 980,000 in 2017.[36]

Similarly, owing to growth in the country's agricultural sector, the share of exports of agricultural products in total merchandise exports rose from 14.3 per cent in 1998–2002 to 26.1 per cent in 2013–2017. As a result, agricultural products were responsible for one third of the increase in total exports. In particular, there was growth in exports of vegetable oils (led by palm oil), and to a much lesser degree, natural rubber. The shares of crude or refined vegetable oils in total merchandise exports increased from 3 per cent to 11.4 per cent, natural rubber from 1.7 per cent to 2.9 per cent, and processed oils and fats from 0.3 per cent to 1.4 per cent between 1998–2002 and 2013–2017.

Figure 19
Colombia: Evolution of merchandise exports by commodity group, 1998–2002 and 2013–2017
(percentage of total merchandise exports and billions of US dollars)



Source: Author, based on data from UNCTADStat.
Note: Machinery refers to machinery and transport equipment.

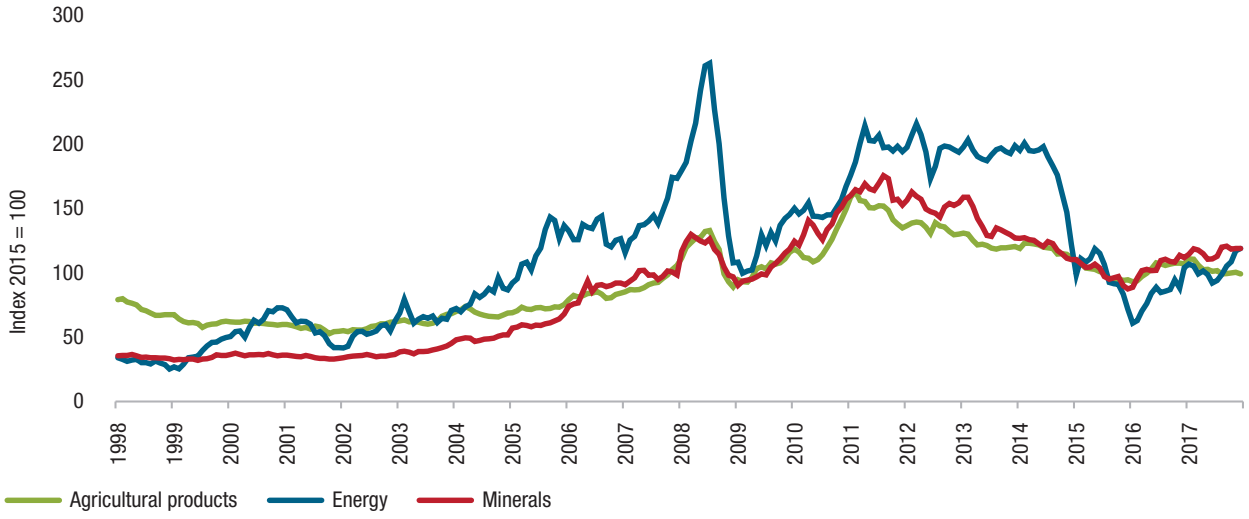
6. Commodity price bust, GDP growth and external debt in CDDCs

Export concentration in commodities (i.e. commodity dependence) can negatively impact development through different channels. In particular, commodity-dependent countries are vulnerable to negative terms-of-trade shocks[37] and commodity price volatility.[38] The combination of both can result in lower aggregate public and private investment, while also reducing investments associated with high productivity growth that are riskier, with longer maturing periods. The resulting persistent reduction in the amount and quality of investments in productive sectors can negatively affect a country's development by reducing trend economic growth. Additionally, negative terms-of-trade shocks also have an adverse impact on the welfare of the population of CDDCs, not least leading to a deterioration in the fiscal balance.

These deleterious effects of negative price shocks and commodity price volatility can be especially challenging for CDDCs, many of which already suffer from high poverty levels and inequality. Many of these countries, and especially LDCs, LLDCs and SIDCs, are more vulnerable than developed countries as they have less capacity to absorb negative commodity price shocks. In terms of growth vulnerability, many CDDCs have low capital-labour ratios, and are far from the technological frontier, so that the productivity of capital and of newer technologies is higher. Thus a decline in investments may be particularly damaging for trend growth. Negative commodity price shocks also often result in the (endogenous) adoption by CDDC governments of different policy measures to address fiscal imbalances worsened by the shock. Such policy changes in turn may exacerbate contractionary pressures on economic activity, resulting in low-growth periods that are longer, deeper or both. They also induce increases in poverty and in inequality,[39] as well as putting additional pressure on the quality of institutions and on socio-political stability.[40]

Figure 20 complements figure 9a and table 5 in presenting not only the boom-bust cycle experienced by commodity prices during the 1998–2017 period, but also the very high volatility of commodity prices and of the relative prices between different commodity

Figure 20.
Monthly commodity price indices, 1990–2018
(base year 2015=100)



Source: Author, based on data from UNCTADStat.

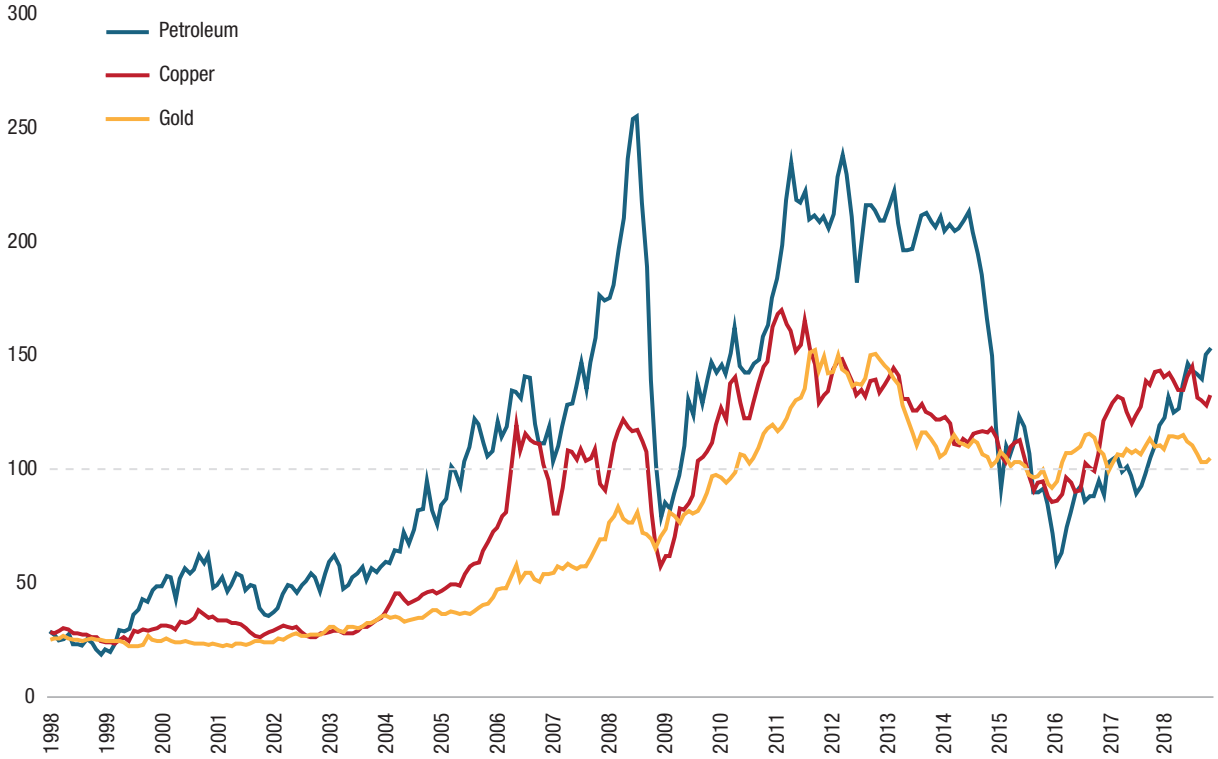
groups. Mineral prices were particularly volatile during this period, in particular due to the price volatility of precious metals (e.g. gold), but were followed closely by the volatility of energy prices. The prices of agricultural products, on the other hand, were a little over half as volatile as those of minerals.[41]

There was also variation in price evolution and volatility within some commodity groups. Figures 21a and 21b present the monthly evolution of prices of important individual commodities in each commodity group, showing both their boom-bust cycles and the sometimes close but imperfect correlation of commodity prices even within the same commodity groups. As examples of the differences between groups in terms of internal co-movement of prices, the figures show the evolution of the monthly prices of gold and copper in the minerals group, which had a correlation of 92 per cent in the 1998–2017 period, and among soya beans, cocoa and coffee in the agricultural products group, where cocoa and coffee prices had a correlation of 62.3 per cent during the same period.

The negative terms-of-trade shocks that occurred between 2008–2012 and 2013–2017, together with both external and domestic factors, contributed to an economic slowdown in 64 commodity-export-dependent countries, only one of which (i.e. Australia) was a developed country. Of these 64 countries (excluding Libya, the Syrian Arab Republic and Yemen, due to the role of conflict in hampering their GDP growth), 23 experienced growth decelerations larger than 3 percentage points, which was the mean value of changes in the GDP growth rate during the period. These countries are presented in table 5, which lists 10 energy-dependent, 8 mineral-dependent and 5 agriculture-dependent countries. Figure 23, in turn, shows the changes in GDP growth for those countries listed in table 5 that experienced negative growth (i.e. recession),[42] on average, during 2013–2017.

In four of the countries shown in figure 22, income per capita fell sharply between 2011 and 2017, by 36.9 per cent in Equatorial Guinea, 32.8 per cent in the Bolivarian Republic of Venezuela, 27.8 per cent in the Central African Republic and by 23.9 per cent in

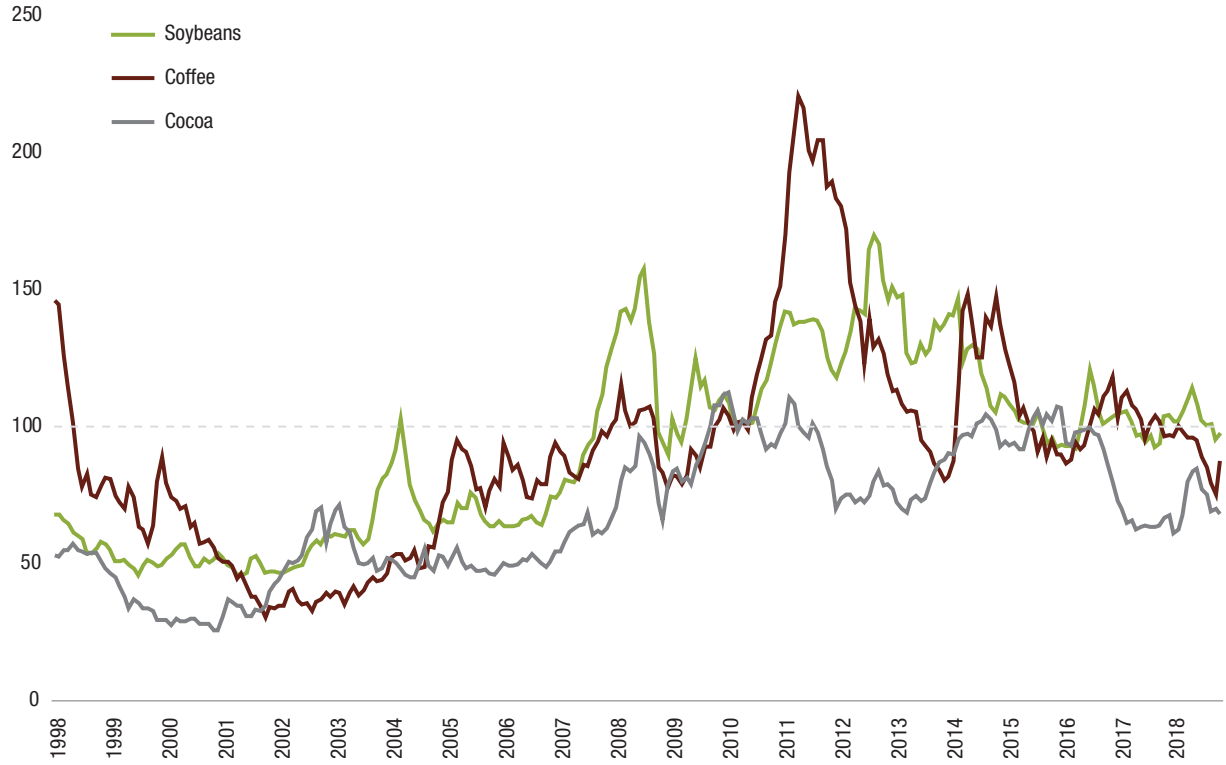
Figure 21a.
Commodity price indices of crude petroleum and selected mineral products, Jan. 1998–Jan. 2018
(index 2015=100)



Source: Author, based on data from UNCTADStat.

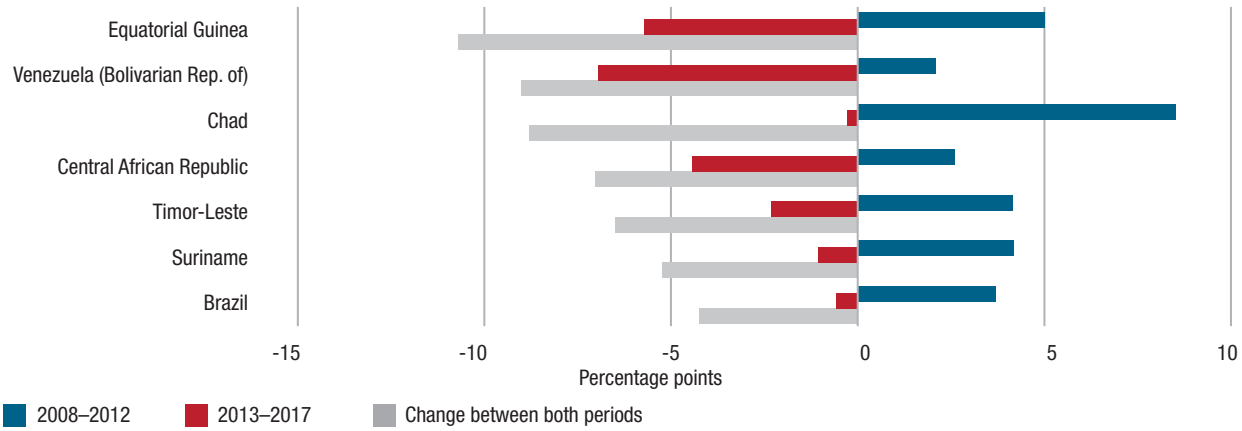
Timor-Leste. Both the Central African Republic and Timor-Leste are LDCs, and in 2017 their income per capita levels were US$335 and US$772 respectively. They ranked, respectively, 184 and 129 in the Human Development Index; 66.3 per cent (in 2008), 30.3 per cent (in 2014) of their population lived below the international poverty line; and 61.8 per cent and 27.2 per cent of their population suffered from undernourishment.

Figure 21b.
Commodity price indices of selected agricultural products, Jan. 1990–Jan. 2018
(index 2015=100)



Source: Author, based on data from UNCTADStat.

Figure 22.
Average annual growth of GDP in selected countries, 2008–2012 and 2013–2017
(percentage points)



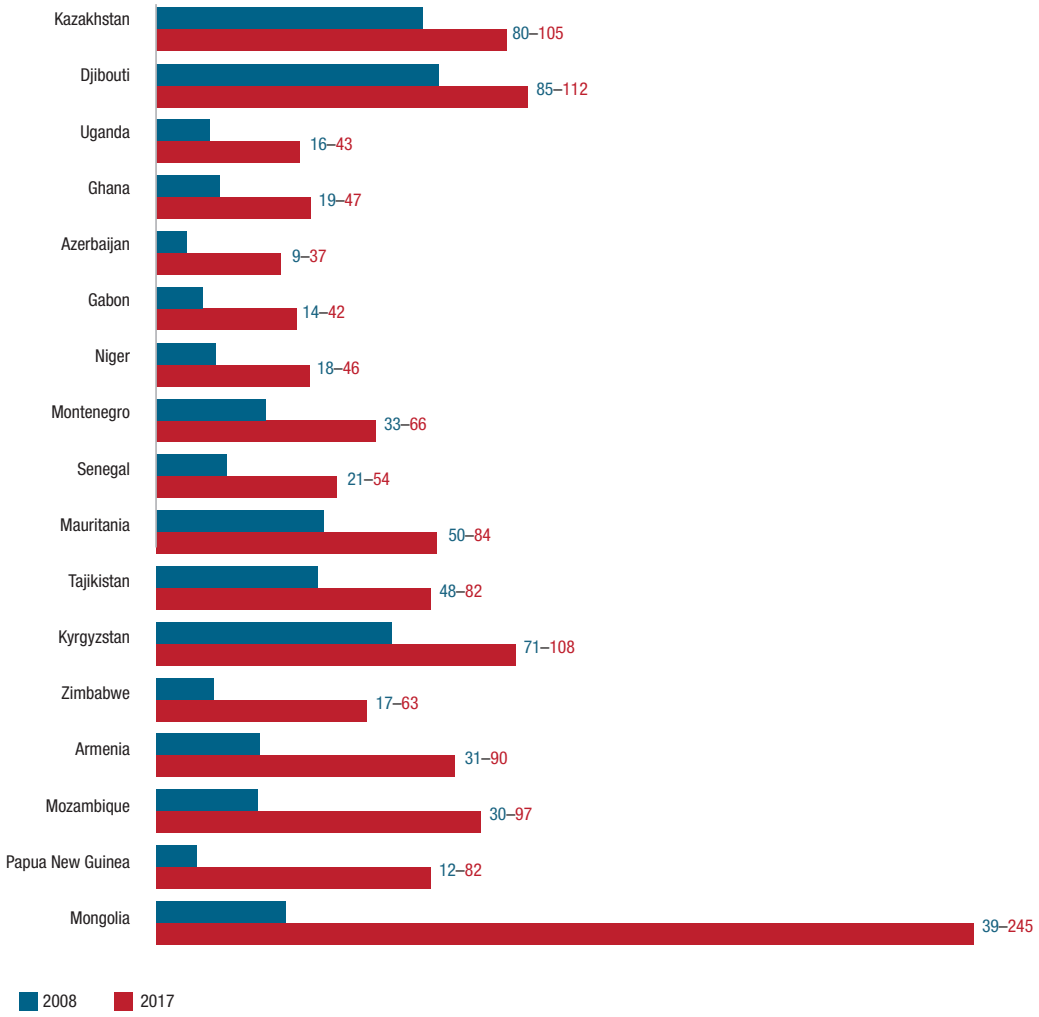
Source: Author, based on data from UNCTADStat.

In addition to the deceleration of GDP growth, several CDDCs also experienced a deterioration of their public finances in parallel with the fall in commodity prices after 2011. As a result, many saw increases in their public debt. For those CDDCs which do not have well-developed domestic public debt markets, and whose private sectors are often unable to access international capital markets directly, such an increase in public debt corresponded to an increase in their external debt.

Figure 23 shows the 17 CDDCs where increases in external debt as a percentage of GDP between 2008 and 2017 were in the top quartile, rising by more than 25 percentage points of GDP. More than three quarters of these countries[43] (13 out of 17) belong to at least one particularly vulnerable group: 6 of them are LLDCs, 4 are LDCs and an additional 3 are both LDCs and LLDCs. And 82.3 per cent of the countries in figure 23 are dependent on exports of either minerals or energy.

Combined with the deceleration of GDP growth described above, increases in their external debt following the commodity price bust suggest that CDDCs in general, and exporters of exhaustible resources, in particular, were very vulnerable to the negative commodity price shock that occurred after 2011. Several research efforts have shown the procyclical nature of fiscal policy in CDDCs.[44] A major reason for such procyclicality is the substantial shrinking of public revenue resulting either directly or indirectly from lower

Figure 23.
External debt-to-GDP ratio in selected countries, 2008 and 2017
(percentage)



Source: Author, based on data from UNCTADStat.

commodity prices. Direct effects often occur, for example, via reductions in royalties and other direct taxes, and via falls in the revenues of public firms exporting such commodities. Indirect effects occur, for example, via fewer taxes on economic activity, such as value added tax (VAT) or income tax, especially with respect to firms, as personal income tax collection in many developing countries tends to be low.

However, the effect of a negative commodity price shock on a CDDC's fiscal balance also depends on the levels of public expenditure previous to the occurrence of such a shock. In particular, the pre-shock evolution of public expenditure in public consumption, payments of interest on public debt stocks, and public investment also contribute to the post-shock increases in public debt.[45] As examples of the potential role played by public expenditure in debt dynamics, figure 25 shows the evolution of both public consumption and external debt a percentage of GDP in Mozambique and Zambia during the 2004–2017 period. In both countries, the ratio of external debt to GDP was falling until 2008, at the time when the commodity price boom paused during the world financial crises, even though public consumption was growing.

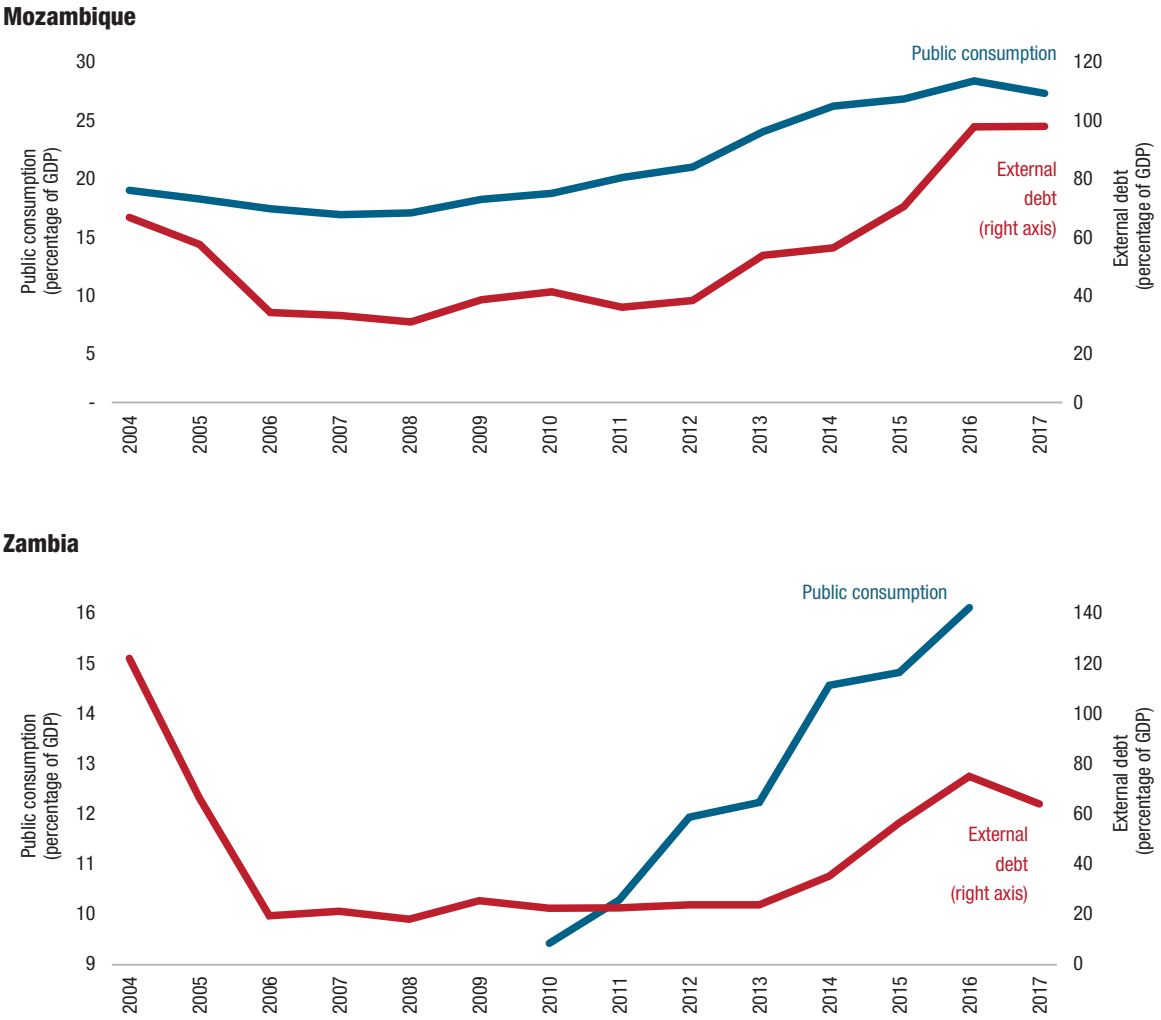
Table 5.
Average period GDP growth and its deceleration, selected countries, 1998–2002 vs. 2013–2017
(percentage points)

Country	Average GDP growth rate (percentage)		Change (percentage points)	Commodity export dependence
	2008-2012	2013-2017		
Zimbabwe	20	2.4	-17.6	Agriculture
Equatorial Guinea	5.0	-5.7	-10.7	Energy
Qatar	12.8	3.1	-9.7	Energy
Venezuela (Bolivarian Rep. of)	2.1	-7.0	-9.0	Energy
Chad	8.5	-0.3	-8.8	Energy
Nauru	26.4	17.6	-8.8	Minerals
Central African Republic	2.6	-4.4	-7.0	Agriculture
Timor-Leste	4.2	-2.3	-6.5	Energy
Afghanistan	8.5	2.8	-5.7	Agriculture
Suriname	4.2	-1.1	-5.2	Minerals
Congo	5.9	1.5	-4.4	Energy
Angola	5.7	1.4	-4.3	Energy
Liberia	8.5	4.2	-4.3	Minerals
Brazil	3.7	-0.6	-4.2	Agriculture
Zambia	8.1	4.1	-4.0	Minerals
Ghana	9.0	5.1	-3.9	Minerals
Sierra Leone	7.1	3.3	-3.8	Minerals
Azerbaijan	5.0	1.4	-3.7	Energy
Nigeria	6.0	2.7	-3.3	Energy
Turkmenistan	11.2	7.8	-3.3	Energy
Mali	10.2	7.1	-3.1	Minerals
Mongolia	8.7	5.6	-3.1	Minerals
Uruguay	5.6	2.5	-3.1	Agriculture

Source: UNCTADStat.
Note: The countries are listed in descending order according to the amount of GDP deceleration. The value for Zimbabwe in 2008-2012 is heavily influenced by the growth of GDP of 64% registered by the data between 2008 and 2009.

From the evolution of GDP and external debt described in this section, as well as from the extensive literature that has reviewed the relationship between commodity price fluctuations, GDP and fiscal responses,[46] it emerges that CDDCs, and especially LLDCs and LDCs, are extremely vulnerable to commodity price shocks. This in turn highlights the need for these countries to adopt economic policies that at least do not worsen, and hopefully mitigate, such macroeconomic fluctuations. These points are discussed further in the next section.

Figure 24.
Public consumption and external debt in Mozambique and Zambia, 2004–2017
(percentage of GDP)



Source: Author, based on data from World Bank, World Development Indicators database.

7. Conclusions and brief policy discussion

This study has reviewed the characteristics and evolution of commodity dependence around the world during the 20-year period from 1998 to 2017. In particular, it shows that export concentration in commodities is essentially a developing-country phenomenon, and that export diversification is positively correlated with the level of income (measured by the GDP per capita) of a country.[47]

Addressing the negative relationship between export concentration in commodities (i.e. commodity dependence) and development requires sustainable policy efforts by CDDCs. This poses a considerable challenge due to the persistence over time of different elements that affect economic development, such as relative resource endowments (e.g. human or physical capital), the development of more and more sophisticated domestic "capabilities" (Hausmann, Hwang and Rodrik, 2006; Hausman and Hidalgo, 2011), and the quality and types of institutions (Acemoglu *et al.*, 2003).

In order to reduce commodity dependence, a country needs to diversify its productive and export bases over time. In particular, this involves initiating and fostering a structural transformation process in the country, where resources are transferred progressively to the more productive and modern sectors of the economy. If this is achieved, the country diversifies its productive base and exports, moves up the value chains in which it already participates, and its productive sectors progress towards products with higher "product spaces" (Hidalgo *et al.*, 2007) that require more and more sophisticated "capabilities" (Hausmann and Hidalgo, 2011), thereby further enhancing development prospects. Such a structural transformation process will result in progressively reducing the importance of commodity production and exports as the basis for economic growth and development.

However, such a process requires sustained policy efforts along different dimensions. One is along the savings and investment dimension, so as to foster human and physical capital accumulation, including infrastructure, given its complementarity and multiplier effects on other types of capital. Another relates to the strengthening of domestic institutions and governance, especially strengthening the rule of law, but also government transparency and efficacy in carrying out its functions. A third but related dimension concerns the need to create a level playing field for firms and other stakeholders operating in the country, which includes preventing the abuse of market power by establishing competition policy or adequate regulations. However, the authorities need to be alert to minimizing introduced distortions, "red tape" and other elements that negatively affect the ease of doing business, in general, and overall productivity of the non-commodity private sector in particular. Additionally, and given the increasing disaggregation of value-added production across borders, it is important to increase the capacity of the economy to adopt, adapt and later create new productive technologies, in order to enable domestic stakeholders to successfully participate in international value chains at higher levels of value added. Resource-abundant countries, especially those that experience sudden windfalls resulting from energy or mineral discoveries, can use part of the rents obtained from the export of natural resources to sustainably advance in these areas.

There are many examples of the specific challenges faced by CDDCs in undertaking overall structural transformation, or even in fostering product and export diversification in specific sectors of the economy. One such challenge concerns the creation of backward or forward linkages with the extractive sectors on which they depend. Looking at the group of energy-dependent countries which diversified into value-added downstream products described in section 5.1 provides an example. In general, achieving diversification of exports into value-added products downstream from crude petroleum and gas requires both large investments in capital-intensive refineries and petrochemical processing

plants, as well as maintaining high capacity utilization in the refining infrastructure. In turn, this presents diverse practical challenges for stakeholders in CDDCs, such as:

i) Sustainably financing large and sunk capital investments, which often requires access to international financial markets, development of domestic capital markets, attracting foreign direct investment, or all of these;

ii) Creating adequate incentives for public or private firms operating in these downstream sectors that minimize rent-seeking behaviour and foster productivity increases, revenue-shifting and other practices that are detrimental to long-term development;

iii) Developing domestically the necessary human resources for supporting the development of these sectors and the associated ecosystem of specialized services firms; and

iv) Sustainably fostering the development of supplier firms that are internationally competitive and that can participate in regional and international value chains in these sectors.

Each of these challenges is in turn related to several of the structural transformation dimensions mentioned above, such as education, infrastructure, regulations, quality of government and development of the financial sector.

Structural change processes, however, can take many years as demonstrated by the successful experiences of East Asian economies such as Japan, the Republic of Korea and, more recently, China,[48] and ongoing efforts in Viet Nam. Therefore, while it is important for policymakers to maintain a strategic view of development and to undertake the necessary institutional, governance and microeconomic reforms that are necessary to achieve structural transformation, it is also important to deal, in the short term, with the negative consequences of commodity dependence. This, in order to bolster structural transformation and to mitigate its short- and medium-term deleterious effects on welfare.

From the discussion in section 6 above, it emerges that CDDCs' vulnerability to commodity price volatility and negative terms-of-trade shocks is a significant challenge. This highlights the importance of adopting short- and medium-term policy measures aimed at overcoming this vulnerability on a sustained basis, rather than resorting to post-negative-shock adjustments that always harm economic growth and welfare, as demonstrated by the experience of stop-and-go growth cycles in Africa and Latin America. Thus, the CDDCs need to look beyond the current state of commodity price cycles in order to foster macroeconomic stability using fiscal and also, when possible, monetary policy tools.[49] While important for all CDDCs, this is particularly relevant for the most vulnerable countries such as LDCs, where such policies can play an important role in reducing downside risks for the attainment of the Sustainable Development Goals.

Sustainable fiscal policy in commodity-dependent countries needs to enable the provision of goods and services by the public sector (including public goods), while at the same time ensuring against contributing to macroeconomic instability via unsustainable debt accumulation, external deficits and inflation. In practice, this is a very challenging objective: many countries increase their expenditure to unsustainable levels during commodity price booms and when the commodity price cycle turns, they need to resort to debt accumulation or monetary financing of the deficits. Therefore, fiscal management is especially important during the upward segment of the cycles, fuelled by high commodity prices and procyclical credit availability.[50]

Different policy tools can contribute to stabilizing public revenue and expenditure across the commodity cycle and reducing procyclical biases in fiscal policy.[51] On the revenue side, it is important to increase domestic resource mobilization so that volatile commodity-related public revenue becomes a smaller part of the total. This can be done by improving the revenue administration through modern and progressive tax systems, an improved tax policy and more efficient tax collection, as indicated by the Addis Ababa Action Agenda.[52] On the expenditure side, it is necessary to adopt more transparent

and forward-looking budgetary practices such as multi-year budgets and binding fiscal rules of different types (i.e. fiscal balance rules, expenditure rules and public debt rules), in particular ensuring that large fiscal windfalls resulting from commodity price booms are properly managed. Additionally, the successful implementation of sovereign funds of different types can contribute to sustainable fiscal policy that is also inter-generationally equitable.

However, there are significant technical and political economy challenges to implementing a sustainable fiscal policy along these lines. For this reason, it is important to ensure widespread national dialogue and transparency in the design and implementation of fiscal stabilization rules and sovereign funds to manage natural resource windfalls.

Monetary policy, combined with policies that reduce the risk of persistent and significant overvaluation of the real exchange rate (a phenomenon known as "Dutch Disease"),[53] can potentially also contribute substantially to stabilizing the economy and thus reducing the deleterious effects of negative terms-of-trade shocks.

To conclude, the successful implementation of both short- and long-term economic policies that foster the sustainable management of commodity price shocks, along with the progressive advance of structural change, are necessary for commodity-dependent countries to successfully transform commodity abundance into a tool that fosters sustained progress along the development path.

Indeed, while commodity dependence presents many development challenges, the abundance of natural resources that underlies commodity dependence also presents a number of opportunities for development. Among many possible benefits, sustainable and well-managed windfalls from natural resource extraction and exports can reduce dependence on foreign savings in low-income commodity-dependent countries and foster physical and human capital accumulation. In turn, increased provision of education, health and infrastructure services can not only increase the quality of life of the population, but also boost economic growth via an increase in the quality and quantity of available factors of production (e.g. human capital) and foster productivity growth. Efforts to attain the Sustainable Development Goals have an important role to play in this regard.

Similarly, the revenues gained from the export of natural resources can also finance the creation of a modern and efficient civil service that can better support development. The consequent improvement in government services, better enforcement of the rule of law, and greater peace and security, will complement, in general, the role of the private sector in fostering structural transformation. In some cases, such as those of some previously major agricultural product exporters which have now diversified into manufactures, such as Malaysia, a large commodity sector can lead to increased vertical and horizontal links to other, higher value-added sectors, contributing thereby to structural change, export diversification and development. A key element for a commodity-dependent country to transform resource abundance into a development tool, however, is to manage resource abundance in a way that minimizes the negative effects of commodity dependence and fosters structural change in the economy.

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Annex 1.
The 50 most commodity-dependent countries

Table A1.
The 50 most commodity-dependent countries, 2013–2017

Rank	Country	Total	Agriculture (per cent)	Minerals (per cent)	Energy (per cent)	Sectoral Dependence	Most exported products	Share
1	Angola	100.0	0.1	2.3	97.6	Energy	Crude petroleum	96.1
2	Iraq	99.7	0.2	2.0	97.5	Energy	Crude petroleum	96.4
3	Chad	99.0	5.8	6.5	86.7	Energy	Crude petroleum	85.0
4	Guinea-Bissau	98.4	93.7	0.3	4.4	Agriculture	Fresh or dried fruits/nuts	88.4
5	Nigeria	98.0	3.5	1.2	93.3	Energy	Crude petroleum	78.3
6	Algeria	97.9	0.8	0.2	96.9	Energy	Crude petroleum	39.0
7	Sudan	97.8	17.8	25.4	54.6	Energy	Crude petroleum	53.3
8	Mauritania	97.7	34.2	57.8	5.7	Minerals	Iron ore and concentrates	35.3
9	Mongolia	97.4	6.2	63.3	27.9	Minerals	Copper ores, conc., mattes	39.3
10	Azerbaijan	96.7	4.0	1.3	91.4	Energy	Crude petroleum	84.8
11	Libya	96.1	0.3	3.9	92.0	Energy	Crude petroleum	73.3
12	Papua New Guinea	96.0	25.9	39.6	30.5	Minerals	Gold	18.9
13	Bolivia (Plurinational State of)	95.4	17.8	31.4	46.2	Energy	Natural gas	42.7
14	Burkina Faso	95.4	27.8	63.7	3.9	Minerals	Gold	60.8
15	Kiribati	95.3	94.4	0.1	0.8	Agriculture	Fresh fish	88.2
16	Yemen	95.2	9.6	3.2	82.3	Energy	Crude Petroleum	39.6
17	Brunei Darussalam	94.7	0.2	0.4	94.1	Energy	Natural gas	51.6
18	Botswana	94.2	2.1	91.8	0.3	Minerals	Pearls and precious stones	85.0
19	Maldives	94.1	85.6	1.3	7.2	Agriculture	Fresh fish	72.3
20	Equatorial Guinea	93.7	2.4	0.3	91.0	Energy	Crude petroleum	67.0
21	Ecuador	93.6	45.9	3.4	44.3	Agriculture	Crude petroleum	42.0
22	Somalia	93.3	88.0	5.3	0.0	Agriculture	Other live animals	70.7
23	Mozambique	93.0	21.0	36.7	35.3	Minerals	Aluminium	26.1
24	Dem. Rep. of the Congo	92.8	2.8	81.3	8.6	Minerals	Copper	41.8
25	Turkmenistan	92.8	7.4	1.3	84.0	Energy	Natural gas	73.8
26	Micronesia (Federated States of)	92.7	92.5	0.2	0.1	Agriculture	Fresh fish	76.0
27	Venezuela (Bolivarian Rep. of)	92.7	0.7	1.7	90.2	Energy	Crude petroleum	73.6
28	Ghana	92.4	30.7	39.6	22.1	Minerals	Gold	36.0
29	Cameroon	92.2	41.3	7.1	43.9	Energy	Crude petroleum	35.8
30	Gabon	92.0	11.5	6.0	74.5	Energy	Crude petroleum	71.2
31	Timor-Leste	91.0	20.7	0.9	69.3	Energy	Crude petroleum	62.4
32	Mali	90.9	22.0	68.1	0.9	Minerals	Gold	67.7
33	Guyana	90.7	34.9	55.7	0.1	Minerals	Gold	44.6
34	Paraguay	90.7	69.9	1.3	19.5	Agriculture	Oil seeds/fruits	26.4
35	Eritrea	90.2	31.5	58.7	0.0	Minerals	Copper ores, conc., mattes	32.6
36	Guinea	89.8	8.9	69.6	11.3	Minerals	Gold	34.4
37	Seychelles	89.7	72.9	0.5	16.3	Agriculture	Prepared fish/inverteb.	54.9
38	Burundi	89.3	39.9	49.1	0.3	Minerals	Gold	44.5
39	Peru	88.8	20.5	58.8	9.5	Minerals	Copper ores, conc., mattes	21.5
40	Jamaica	88.6	22.0	48.0	18.6	Minerals	Aluminium ores/concentr.	46.1
41	Kuwait	88.4	1.5	0.5	86.4	Energy	Crude petroleum	65.7
42	Rwanda	88.0	34.5	43.9	9.5	Minerals	Base metals ores/concent.	27.2
43	Qatar	87.7	0.1	1.6	86.1	Energy	Natural gas	47.5
44	Solomon Islands	87.7	81.6	6.0	0.1	Agriculture	Wood, rough	60.8
45	Kazakhstan	87.4	4.2	12.2	71.0	Energy	Crude petroleum	62.2
46	Sierra Leone	87.2	12.3	74.7	0.2	Minerals	Iron ore and concentrates	44.2
47	Zambia	87.1	13.1	72.7	1.3	Minerals	Copper	67.0
48	Iceland	86.5	45.9	39.1	1.6	Agriculture	Aluminium	38.4
49	Chile	86.3	30.0	55.4	0.9	Minerals	Copper	27.2
50	Ethiopia	85.9	72.9	8.5	4.5	Agriculture	Coffee and coffee substitutes	22.9

Source: UNCTADStat.
Note: Countries where the export share of the most exported product was higher than the average (54.8% of total exports) appear in red in the table.

Table A2 presents the SITC Revision 3 codes, the short names used in Table A1 for each product, and the official names in the UNCTADStat database corresponding to these products.

Table A2.
Top exported products of the most commodity-dependent countries

Code	Product Short Name	Product Long Name
333	Crude petroleum	Petroleum oils, oils from bitumin. materials, crude
057	Fresh or dried fruits/nuts	Fruits and nuts (excluding oil nuts), fresh or dried
281	Iron ore and concentrates	Iron ore and concentrates
283	Copper ores, conc., mattes	Copper ores and concentrates; copper mattes, cement
971	Gold	Gold, non-monetary (excluding gold ores and concentrates)
343	Natural gas	Natural gas, whether or not liquefied
034	Fresh fish	Fish, fresh (live or dead), chilled or frozen
667	Pearls and precious stones	Pearls, precious & semi-precious stones
001	Other live animals	Live animals other than animals of division 03
684	Aluminium	Aluminium
682	Copper	Copper
222	Oil seeds/fruits	Oil seeds and oleaginous fruits (excluding flour)
037	Prepared fish/inverteb.	Fish, aqua. invertebrates, prepared, preserved, n.e.s.
285	Aluminium ores/concentr.	Aluminium ores and concentrates (incl. alumina)
287	Base metals ores/concent.	Ores and concentrates of base metals, n.e.s.
247	Wood, rough	Wood in the rough or roughly squared

Source: UNCTADStat.

Annex 2.
Countries covered by the data used in section 3

Afghanistan
Albania
Algeria
Andorra
Argentina
Armenia
Australia
Austria
Azerbaijan
Bahrain
Bangladesh
Barbados
Belarus
Belgium
Belize
Benin
Bhutan
Bolivia (Plurinational State of)
Bosnia and Herzegovina
Botswana
Brazil
Brunei Darussalam
Bulgaria
Burkina Faso
Burundi
Cambodia
Cameroon
Canada
Central African Republic
Chad
Chile
China
Colombia
Comoros
Congo
Costa Rica
Côte d'Ivoire
Croatia
Cuba
Cyprus
Czech Republic
Democratic People's Republic of Korea
Democratic Republic of the Congo
Denmark
Djibouti
Dominica
Dominican Republic
Ecuador
Egypt
El Salvador
Equatorial Guinea
Eritrea
Estonia
Eswatini
Ethiopia
Fiji
Finland
France
Gabon
Gambia (The)
Georgia
Germany
Ghana
Grenada
Guatemala
Guinea
Guinea-Bissau
Guyana
Haiti
Honduras
Hungary
Iceland
India
Indonesia
Iran (Islamic Republic of)
Iraq
Ireland
Israel
Italy
Jamaica
Japan
Jordan
Kazakhstan
Kenya
Kiribati
Kuwait
Kyrgyzstan
Lao People's Democratic Republic
Latvia
Lebanon
Lesotho
Lithuania
Luxembourg
Madagascar
Malawi
Malaysia
Maldives
Mali
Malta
Mauritania
Mauritius
Mexico
Micronesia (Federated States of)
Mongolia
Morocco
Mozambique
Myanmar
Namibia
Nauru
Nepal
Netherlands
New Zealand
Nicaragua
Niger
Nigeria
North Macedonia
Norway
Oman
Pakistan
Palau
Panama
Papua New Guinea
Paraguay
Peru
Philippines
Poland
Portugal
Qatar
Republic of Korea
Republic of Moldova
Romania
Russian Federation
Rwanda
Saint Kitts and Nevis
Saint Lucia
San Marino
Sao Tome and Principe
Saudi Arabia
Senegal
Serbia
Seychelles
Singapore
Slovakia
Slovenia
Solomon Islands
Somalia
South Africa
Spain
Sri Lanka
Sudan
Sweden
Switzerland
Syrian Arab Republic
Tajikistan
Thailand
Togo
Tonga
Trinidad and Tobago
Tunisia
Turkey
Turkmenistan
Uganda
Ukraine
United Arab Emirates
United Kingdom of Great Britain and Northern Ireland
United Republic of Tanzania
United States of America
Uruguay
Uzbekistan
Venezuela (Bolivarian Republic of)
Viet Nam
Yemen
Zambia
Zimbabwe

Note: There were 23 yearly observations of all varieties in all the countries except four: Egypt (15 observations), Indonesia (18 observations), Kazakhstan and Sudan (each with 22 observations).

Endnotes

[1] Throughout this document, the term "commodity" refers to "primary commodity". The United Nations Conference on Trade and Employment of 1948, the predecessor to the World Trade Organization, defined a primary commodity in its Article 56 as "…any product of farm, forest or fishery or any mineral, in its natural form or which has undergone such processing as is customarily required to prepare it for marketing in substantial volume in international trade" (United Nations, 1948).

[2] Specifically, in this document a country is considered to be commodity dependent if more than 60 per cent of its total merchandise exports are commodities (see section 2).

[3] In the economic literature, the many challenges to development posed by commodity dependence are usually referred to as "the natural resources curse" (see Sachs and Warner, 2001; Frankel, 2010; and Van der Ploeg, 2011).

[4] Nkurunziza *et al.* (2017) found that in CDDCs where commodity exports constitute more than 60 per cent of goods exports, commodity dependence is associated with low human development, as measured by the Human Development Index of the United Nations Development Programme (UNDP).

[5] Total reported exports to the world by country are considered in the denominator for calculating this ratio.

[6] The study often refers to five-year periods, for two reasons. First, this addresses the volatility of yearly changes of some variables and reduces the risk of mismeasurement in one specific year. Second, it enables comparisons between periods by reducing the risk of choosing specific, atypical years.

[7] Our list of 50 countries almost coincides with the top quartile of countries based on the empirical distribution of commodity exports as a share of total exports, which are 47 countries.

[8] The individual products that comprise each commodity group, at the three digit level of the SITC Revision 3 are as follows: i) *Agricultural Products*, which in turn can be divided into the sub-groups *Food* (codes 4XX, 22X, and 0X except 07), *Tropical Beverages and Spices* (codes 07X), *Beverages and Tobacco* (codes 1XX), *Agricultural Raw Materials* (codes 21X, 23X, 24X, 25X, 26X and 29X); ii) *Minerals, Ores and Metals* (codes 27X, 28X, 667, 68X and 971); and iii) *Energy* (codes 3XX). All other products are considered *non-commodities*. Within non-commodities the different sub-groups are: *Chemical Products* (codes 5XX), *Manufactures* (codes 61X, 62X, 63X, 64X, 67X, 69X and 66X except 667), *Machinery and Transport Equipment* (codes 7XX), *Apparel and Textiles* (codes 65X and 84X) and *Other Manufactures* (codes 8XX except 84X). This classification follows closely that of UNCTADStat, except that code 26X (Textile Fibres and their Wastes) is not included in *Apparel and Textiles,* but in *Agricultural Raw Materials* (see https://unctadstat.unctad.org/EN/Classifications/DimSitcRev3Products_DsibSpecialGroupings_Hierarchy.pdf).

[9] There is no data for South Sudan. Out of the 46 LDCs covered by the data, 16 are both LDCs and LLDCs, while 7 are both LDCs and SIDCs.

[10] This includes 10 predominantly energy exporters (i.e. Bahrain, Brunei Darussalam, Greece, Kuwait, Norway, Oman, Qatar, Saudi Arabia, Trinidad and Tobago, and the United Arab Emirates); 6 countries which are predominantly exporters of agricultural products (i.e. Argentina, Iceland, New Zealand, Palau, Seychelles and Uruguay); and 2 are mineral exporters (i.e. Australia and Chile).

[11] This short study does not attempt the more ambitious goal of empirically testing potential determinants of the observed differences of income per capita among countries. Instead, it focuses on testing whether a statistically significant correlation exists between GDP per capita and export concentration; however, it does not attribute causality or control for other variables

that the economic literature suggests affect this relationship, such as commodity prices, institutional quality and others.

[12] Theil's T index, a widely used measure of export concentration, is calculated as:

$$TEI = \frac{1}{n}\sum_{k=1}^{n}\frac{x_k}{\mu}ln\left(\frac{x_k}{\mu}\right) \quad where\ \mu = \frac{\sum_{k=1}^{n} x_k}{n}$$

, x_k being the yearly value of product k exports in a country, with each product defined according to the three-digit SITC Revision 3 classification; n is the total number of different products exported, and μ is the average value of exports. A higher value of the index indicates greater export concentration, while a lower value indicates greater export diversification.

[13] See annex 2 for the list of countries covered. Of these 174 countries, 170 had 23 yearly observations, two had 22 observations, and one country each had 18 and 15 observations.

[14] GDP per capita and Theil's T concentration index are slow-moving, highly persistent variables.

[15] The apparel intercept dummy was significant at 6.3 per cent, and the two interaction effects were significant at 7.1 per cent and 7.2 per cent. Observations with the apparel dummy were only 8 per cent of the total in the dataset.

[16] The adjusted R^2 of both models was very similar: 33.5 per cent for model 2 and 32 per cent for model 3. While not presented here, the same models were estimated using five-year averages of the data (868 observations, 5 periods per country) in order to ameliorate potential issues with non-persistent measurement errors in the trade data. With period data, in model 2 the apparel dummy and its interaction effects were not significant, while the other results were similar to those in table 1.

[17] Conceptual concerns about the form of the specification are also confirmed by running some simple tests on the models' residuals, suggesting the existence of fixed effects.

[18] For fixed-effects GLS model 6 without the energy dummy effects, the variance-covariance matrix was used, which accounted for double clustering, but the significance levels of the estimated parameters were similar.

[19] See Wooldridge, 2010, chapter 10.

[20] These changes are based on the trade statistics available for the period. The box in section 2 mentioned the challenges posed by distinguishing between exports and re-exports, and by non-attributed trade. Therefore, some countries that are classified at certain times as being non-commodity-dependent may be affected by these issues, especially those facing data collection challenges.

[21] UNCTADStat's commodity price indexes were used as indicators of the prices of each product group. These indexes are weighted averages of the different products within each group, using trade shares as weights. For an explanation of the methodology, see: http://unctadstat.unctad.org/wds/TableViewer/summary.aspx?ReportId=140864 .

[22] The price of a barrel of Brent petroleum rose from a monthly average of US$51.9 per barrel between January 2003 and December 2007, to an average of US$92.4, on average, between January 2008 and December 2012 – an increase of 78 per cent.

[23] The United Arab Emirates registered a large increase in the value of its exports of chemical products, second only to that of Saudi Arabia, while the share of chemicals in its total exports grew by 2.3 percentage points.

[24] Source: Ministry of Energy and Energy Industries of Trinidad and Tobago(http://www.energy.gov.tt/our-business/lng-petrochemicals/petrochemicals/ammonia/)-

[25] Source: Ministry of Energy and Energy Industries of Trinidad and Tobago (http://www.energy.gov.tt/our-business/lng-petrochemicals/petrochemicals/methanol/).

[26] Source: Oman Oil Refineries and Petroleum Industries Company (https://www.orpic.om/

assets.html).

[27] The data on petroleum (derivative) products can be disaggregated into gasoline, kerosene, distillates, residuals and other products (see *OPEC Annual Statistical Bulletin,* 2018).

[28] In 2017, the three countries had refinery capacity utilization rates of 99 per cent, 95 per cent and 85.1 per cent, respectively. Refinery capacity utilization was calculated by dividing OPEC's refinery throughput data by refining capacity.

[29] Manufactured tobacco products grew from 0.9 per cent of exports in 1998–2002 to 9.2 per cent in 2013–2017, but since the available data do not control for the possible presence of re-exports, they are excluded from the analysis of the growth in agricultural products.

[30] This increase in production of vegetables and fruits was much larger than the increase in their planted area, which is an indication of improved productivity in the sector

[31] Calculated with respect to the changes in total reported merchandise trade.

[32] Analysing the evolution of exports of manufactures presents additional challenges. First, for some categories of non-commodities it is difficult to distinguish between exports and re-exports, as mentioned earlier. Additionally, the growing integration of middle-income countries into different segments of international value chains reduces the value for analysis of available manufacturing statistics, which do not control for value addition across borders.

[33] Source: http://www.oica.net/category/production-statistics/ (see statistics of passenger cars for 2000 and 2017).

[34] The regional aircraft manufacturer, EMBRAER, is a Brazilian company.

[35] Indonesia's commodity exports were 58.2 per cent of total merchandise exports in 2013–2017, and its non-commodity exports were 41.8 per cent.

[36] Source: International Organization of Motor Vehicle Manufacturers statistics, available at: http://www.oica.net/category/production-statistics/2017-statistics/.

[37] Such shocks can be temporary but more or less persistent, or permanent. An example of a common negative temporary shock is a significant reduction in the price of the commodities exported by a country (e.g. petroleum). An example of a permanent negative shock occurs when the commodity exported by a country suffers a significant drop in demand due to technological changes or to policy decisions (e.g. the ongoing efforts to reduce the consumption of coal permanently due to its impact on climate change).

[38] The low and volatile economic growth rates of CDDCs are found to be associated with high commodity price volatility, due to these economies' strong concentration on the commodity sector (Van der Ploeg and Poelhekke, 2009).

[39] Vegh and Vuletin (2014) find a statistically significant relationship between the degree of cyclicality of fiscal policy and social indicators such as poverty, inequality and unemployment – a relationship that it is stronger when there is a more procyclical fiscal policy.

[40] Frankel (2010) and Van der Ploeg (2011) have surveyed past research on the relationship between commodity dependence and institutional quality.

[41] This ordering of the price volatilities of the different commodity groups is maintained when using both the coefficient of variation and the quartile coefficient of dispersion as measures of volatility.

[42] Figure 23 presents the seven countries, excluding Libya, the Syrian Arab Republic and Yemen, which had *both* larger- than-average GDP growth decelerations (i.e. 3 percentage points of GDP) *and* a recession, on average, in 2013–2017. Brunei Darussalam and Trinidad and Tobago also experienced recessions during the period, but they were not included because their growth decelerations were small. In two countries in the table (i.e. Afghanistan and the Central African Republic), internal security issues may also have contributed significantly to their growth deceleration.

[43] The World Bank's *World Development Indicators*, the source of data for external debt as a percentage of GDP, had data for the period considered for 115 developing and transition countries.

[44] For example, using data for developing countries between 1990–2010, Spatafora and Samake (2012) have shown that commodity prices had a significant impact on fiscal outcomes, as both public revenue and expenditures rose in response to commodity price increases.

[45] For example, Celasun *et al.* (2015) observed that primary public expenditure rose in six large countries in Latin America during the commodity price "boom" period.

[46] For example, Medina (2010) found that Latin American countries' fiscal positions reacted strongly to commodity price shocks, although their sensitivity to such shocks varied considerably.

[47] Additional future research is needed, incorporating other important variables possibly affecting this relationship, as discussed in the economic literature.

[48] Between 1998 and 2017, China's GDP per capita increased by a factor of 3.8.

[49] For countries with fixed exchange rate regimes or pervasive fiscal dominance, monetary policy is endogenous and cannot be used as an independent tool.

[50] As pointed out by Ocampo (2002:29): "The importance of countering excess fiscal spending during booms became quite clear in Latin America during the debt crisis of the 1980s, since the over-expansion of public expenditure during the preceding credit boom generated fiscal imbalances that ultimately proved to be untenable.… Two lessons were thus painfully learned: that the lack of fiscal discipline during booms is extremely costly, and that 'go-stop' cycles significantly reduce the efficiency of public-sector spending ".

[51] There is an extensive body of literature that discusses policy tools for reducing procyclicality of fiscal policy in developing countries, and evaluates the effects of their implementation. For example, Alberola *et al.* (2017) analyse the role of fiscal financing conditions and of fiscal rules in the behavior of discretionary fiscal policy in eight Latin American countries.

[52] See Addis Ababa Action Agenda of the Third International Conference on Financing for Development, para. 23, available at: https://www.un.org/esa/ffd/wp-content/uploads/2015/08/AAAA_Outcome.pdf.

[53] Harding and Venables (2009) found that, as predicted by the "Dutch Disease" hypothesis, natural resource exports have a strong negative effect on non-resource exports, and also a weaker positive effect on imports.

COMMODITY DEPENDENCE: A TWENTY-YEAR PERSPECTIVE