D. A new role for commodities in development strategies

This section discusses the challenges and opportunities of commodity-based growth and development strategies in relatively high but volatile pricing environments. It first provides an overview of historical price developments in agriculture and natural resources. It then goes on to analyse how developing countries have been able to leverage agricultural and natural resource export potential in this high-price environment to underpin their development. The section highlights which policies have been useful, but also pinpoints remaining challenges in realizing this export potential. Finally, it also considers those challenges arising from heightened volatility, with a particular focus on food importers and natural resource exporters vulnerable to boom-bust cycles.

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Some key facts and findings

- The real annual price index for energy and for metals and minerals more than doubled between 2000 and 2011. Agricultural prices nearly doubled during the same period. The largest price increases occurred up to 2008. Despite recent price reductions from these historical highs, there are reasons to believe the high-price environment is likely to stay. Price volatility will also continue to characterize commodity markets.
- Between 2001 and 2011, G-20 developing countries increased their share in global agricultural exports from 19 per cent to 26 per cent. The share of other developing countries increased from 8 per cent to 10 per cent.
- Traditional market access barriers such as tariffs and subsidies continue to affect agricultural exports from developing countries, but non-tariff measures are playing an increasingly important role in agricultural trade.
- Trade in natural resources increased significantly between 2000 and 2010, not only in value terms but also in terms of volume. In 2012, the combined share of agricultural products and fuel and mining products in world trade was 31.7 per cent, up from 25.4 per cent in 2005 and 21.7 per cent in 2000.
- Several resource-rich countries achieved significant growth rates during the years of soaring natural resource prices, but the social and environmental impact of natural resource extraction remain significant challenges.

Throughout this section, the word "commodities" will refer both to what Morris et al. (2012) call "soft commodities" (predominantly agriculture) and to what they call "hard commodities" (predominantly mining) and "energy commodities" (predominantly oil and gas). Mineral products (including metals) and energy products (coal, oil and natural gas) will fall under the designation of "natural resources". Agricultural products, in turn, will include traditional products, fresh fruit and vegetables, specialty products and processed products (see Box D.3). In line with the rest of the Report, in this section G-20 developing countries indicates developing country members of the G-20 (as defined in Appendix Table B.1) and not the "G-20 group of developing countries" relevant for agricultural negotiations at the WTO.

This section will analyse natural resources[1] and agriculture separately. This is for three main reasons. First, there are differences in the production and consumption structure across the two sectors. The weight of the agricultural sector in terms of employment and consumption is significantly higher than that of the natural resources sector. Moreover, agricultural production relies a lot more on smallholder production than the natural resources sector. Secondly, most (although not all) of the development challenges and opportunities are different in the two sectors. To provide an example, while the issue of management of windfall revenue is crucial in the natural resources sector, it does not play a significant role in the agricultural sector.[2] Thirdly, the trade policy issues are very different. While in the natural resources sector they mostly relate to export restrictions applied by exporting countries, in the agricultural sector they also relate to market access (subsidies, tariffs and non-tariff measures applied by importing countries).

This section is divided into six parts. Section D.1 provides an overview of historical price developments in natural resources and in agriculture. For a long time, the debate about the role of commodities in developing countries has been dominated by the notion that the price of primary products, such as natural resources, relative to manufactured goods tends to decline, a phenomenon known as the Prebisch-Singer Hypothesis. Although the validity of this hypothesis, dating from the 1950s, is disputed by experts (see discussion in Cadot et al., 2011), it has often been used as an argument against developing countries' strengthening and expanding production in the primary sector, and in favour of these countries diversifying into other areas, such as manufacturing. Recent years have been characterized, however, by high commodity prices. The aim is to establish whether the high prices that have been characteristic of this sector since the mid-2000s are likely to stay, especially in view of the recently observed price reductions from the historical highs of 2008 and 2011. At this stage, the analysed evidence seems to suggest that, in the medium-term, commodity prices are likely to remain relatively high but that high prices will be accompanied by the volatility typical for prices in this sector.

Section D.2 focuses on the link between agricultural trade and development and investigates how the changing structure and nature of agricultural trade affects this link. Section D.3 considers the policy environment in agriculture, focusing on productivity-enhancing policies, standards, market access restrictions, bargaining power within global value chains, and policies to cope with volatility. Section D.4 considers natural-resource-based growth. It asks whether such growth can be sustained and whether it can be translated into positive development outcomes. Section D.5 considers trade policies explicitly, with a particular focus on the policies implemented by resource-endowed countries in their quest for development. Section D.6 concludes.

1. The rise (and fall) of a commodity "super-cycle"?

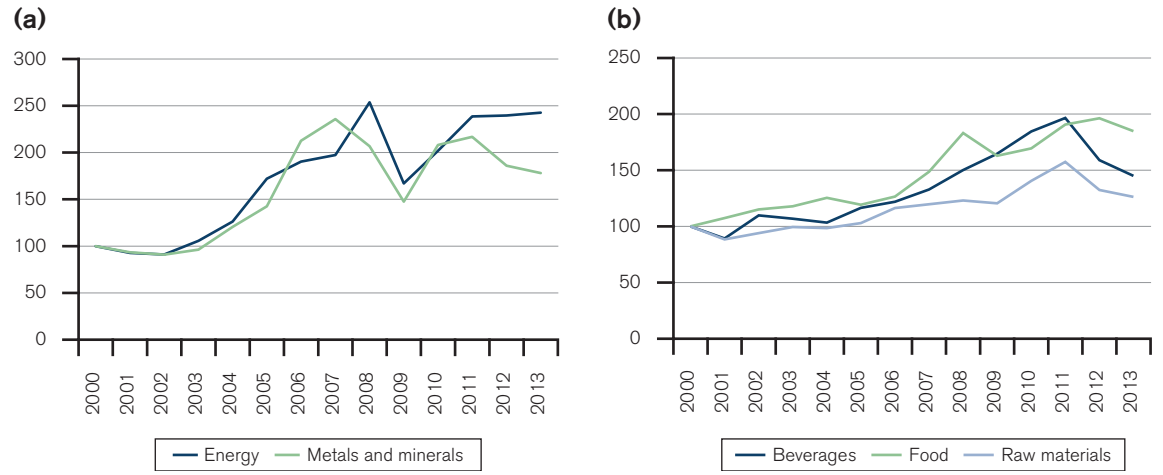
The prices of natural resources and of agricultural products increased significantly between 2000 and 2008 (with particularly steep rises from 2003). The real annual price index of energy and of metals and minerals more than doubled during this period (see Figure D.1). A subsequent slump in 2008-09 was caused by the global financial and economic crisis. However, they increased again between 2009 and 2011. Agricultural prices nearly doubled between 2000 and 2011, as reflected in Figure D.1.

While energy prices have remained remarkably stable since 2011 (mostly due to stability in oil prices), prices of metals and minerals have experienced a significant downward trend in the last two years. As reported by the World Bank (2014), real prices of internationally traded metals, denominated in US dollars, declined by 30 per cent between their peaks in early 2011 and November 2013. In the same period, real prices of internationally traded food, denominated in US dollars, declined by 13 per cent. Even though prices have eased recently, they are still twice as high compared with a decade ago.

Episodes of increasing commodity prices and boom-bust cycles are not uncommon (Fuglie, 2012; WTO, 2010). Figure D.2 plots the historical evolution of real commodity prices since 1960. In the top panel, it is immediately apparent that energy prices and, to a lesser extent, mineral prices have experienced several episodes of upward and downward evolution between 1960 and 2000. The same volatility is also apparent for agricultural commodities. Box D.1 discusses in more detail the volatility of commodity prices.

Some authors have argued that the steep increase in commodity prices that occurred at the beginning of the 2000s has been a reflection of a third commodity "super-cycle", after the first super-cycle driven by demand-side American industrialization in the late 19th century and the second driven by the post-Second World War reconstruction in Europe and Japan.[3] The rapid pace of industrial development and urbanization in several G-20

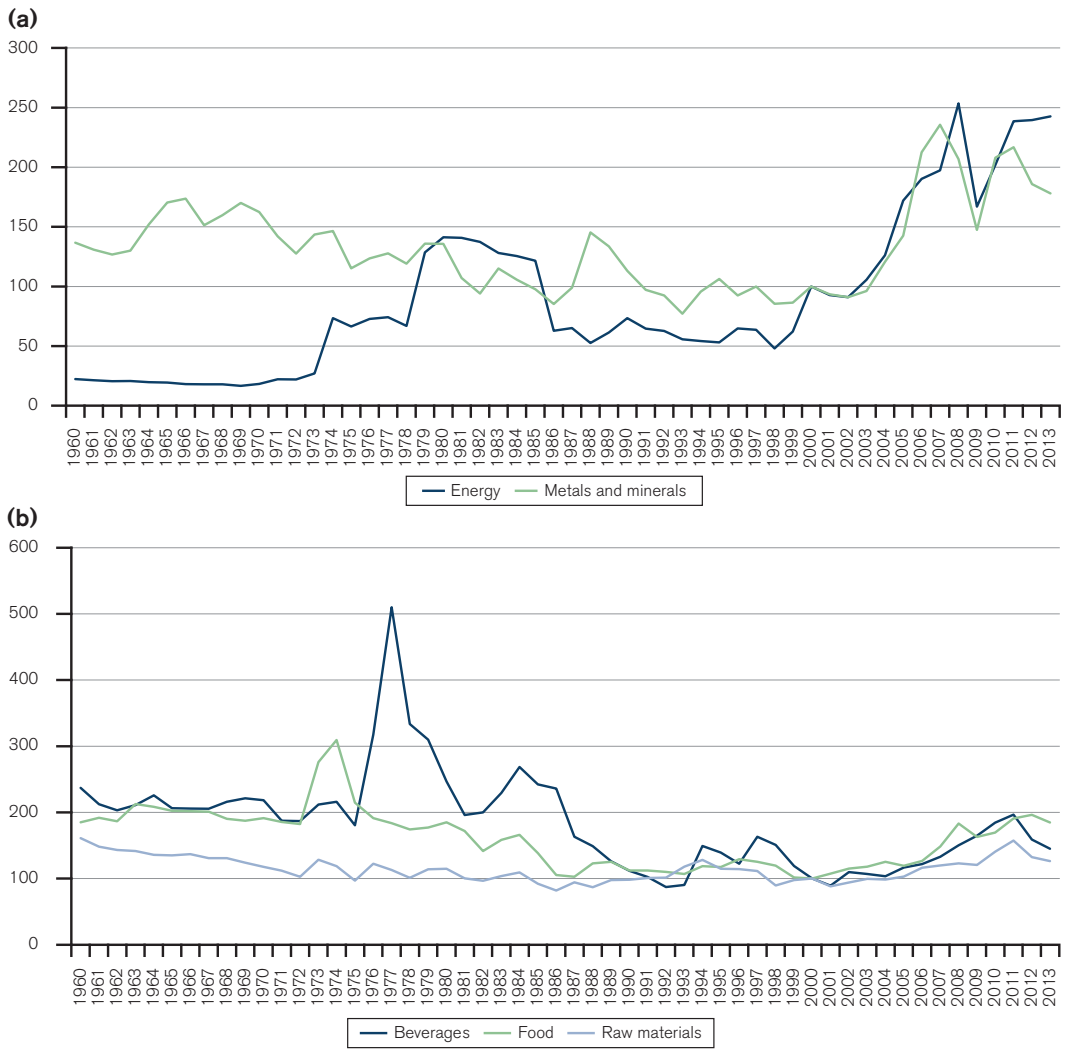
Figure D.1: **Real annual price indexes of selected commodities, 2000–13**
(2000 = 100; real 2005 US$)



Source: World Bank Commodity Price Data.

Note: A detailed description of the series, including data sources, is available in the "Description" section of the annual World Bank Commodity Price Data.

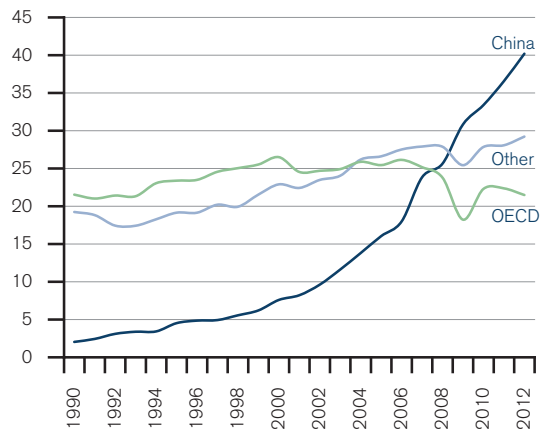
Figure D.2: **Real annual price indexes of selected commodities, 1960–2013**
(2000 = 100; real 2005 US$)



Source: World Bank Commodity Price Data.

Note: A detailed description of the series, including data sources, is available in the "Description" section of the annual World Bank Commodity Price Data.

Figure D.3: **Consumption of metals, 1990–2012** (million tons)



Source: World Bureau of Metal Statistics.

developing economies has been the main driver of the third super-cycle. As argued by the Africa Progress Panel (2013) with reference to mineral commodities, China has been the real game-changer in global commodity markets because of its rapid resource-intensive growth, coupled with the high costs of extraction of its ores.[4] Figure D.3 shows the evolution of demand for metals for China, countries of the Organisation for Economic Co-operation and Development (OECD) and the group of other countries. The spectacular growth in China's consumption is clearly apparent.

China's demand for energy has also increased substantially, both in absolute terms and in comparison with other industrial countries. Analysis of BP data (British Petroleum (BP), 2013) shows, for instance, that China's demand for oil almost tripled (a 273 per cent increase) between 1992 and 2012, and almost doubled (94 per cent increase) between 2002 and 2012. In comparison, demand for oil in OECD countries rose by 6 per cent between 1992

Box D.1: **Commodity price volatility**

It is widely recognized that natural resource prices are highly volatile. The WTO (2010), for instance, included volatility in the list of distinctive characteristics of natural resources. As explained by the WTO (2010) with reference to oil prices, volatility (at least in the long run) is largely caused by demand-driven factors, such as the rapid income growth of key G-20 developing economies. Volatility has long been a concern for resource-exporting countries for at least three reasons. First, it is a source of uncertainty that adversely affects investment and production decisions. Secondly, risk-averse consumers need to spend income on hedging against the risk of large swings in resource prices. Thirdly, when exporters borrow against high export earnings to fund additional imports and consumption, they may confront worrisome debt burdens when natural resource prices fall.[5]

Volatility of agricultural commodity and food prices has also been a concern for several decades. As argued by Gilbert and Morgan (2010), volatile grain prices impact disproportionately the poorer rather than the richer economies, and the poor rather than the rich within each economy. This is because direct consumption of grains declines as societies and individuals get richer. They argue that food price volatility can raise consumer price inflation and create exchange rate uncertainty. In particular, scarce foreign exchange reserves can be exhausted relatively quickly following a sudden spike in food prices, as the demand for food imports is relatively constant despite fluctuations in prices. Price volatility can even lead to social unrest.

Following Lee et al. (2012), we have constructed two measures of commodity price volatility, using monthly data from the World Bank Commodity Price Data since 1970. The first measure is a moving-window standard deviation. The second measure is a moving-window coefficient of variation (standard deviation divided by mean). In both cases, each window is defined over a 60-month interval. The first measure, therefore, captures standard deviation of monthly values from the five-year average. The second measure captures the percentage deviation from the same average.

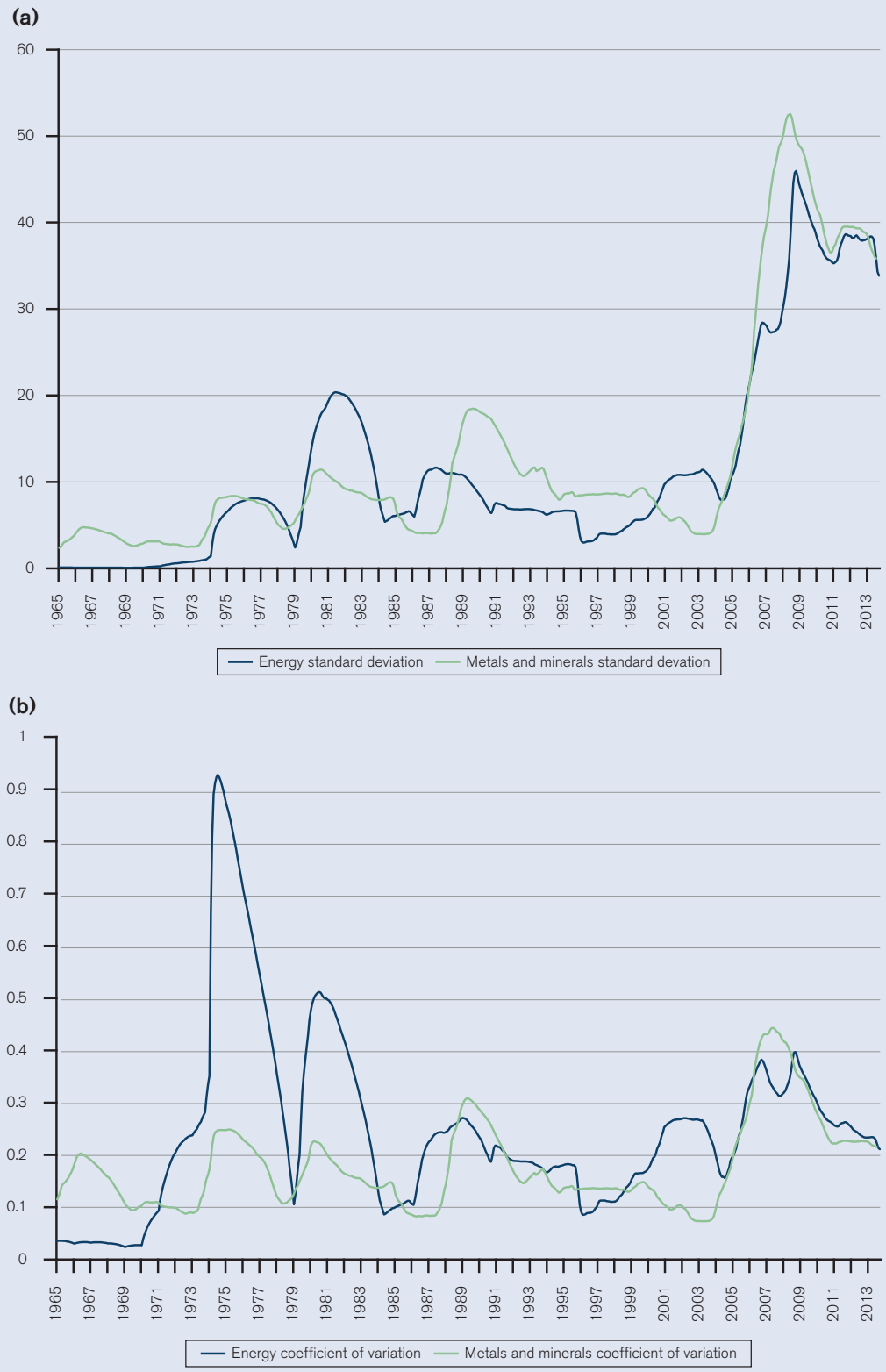
The results for energy and for metals and minerals prices are, respectively, in the top and bottom panels of Figure D.4. Prices are indeed volatile, and volatility has been high during the last decade. An interesting question is whether price volatility has increased over time. To answer this question, one should probably consider the relative size of price shocks in proportion to prevailing price levels (bottom panel) rather than the absolute size of price fluctuations (top panel). The time-series evolution of the coefficient of variation indicates that energy prices were far more volatile after the first oil price shock of 1973 than in the aftermath of the crisis of 2008. Metals and mineral prices, conversely, experience record-high levels of volatility in 2008 compared with any other year since 1960.

Observers appear to agree that price volatility for agricultural commodities in the last five years has been higher than in the previous two decades, but lower than in the 1970s. When comparing recent price changes with price behaviour over the very long run, there is also no evidence that there has been a permanent increase in commodity price volatility (Jacks et al., 2011). This is confirmed by the data reflected in Figure D.5 that illustrates the standard deviation and the coefficient of variation of agricultural products (raw agricultural materials, food products and beverages).

The overall conclusion is that, in recent years, volatility has been high. In most cases, it has not reached the peaks observed during the 1970s. Still, price volatility is, and is likely to continue to be, a concern for importing and exporting countries.

Box D.1: **Commodity price volatility** (continued)

Figure D.4: **Volatility of price indexes of selected commodities, 1965m1–2013m9***



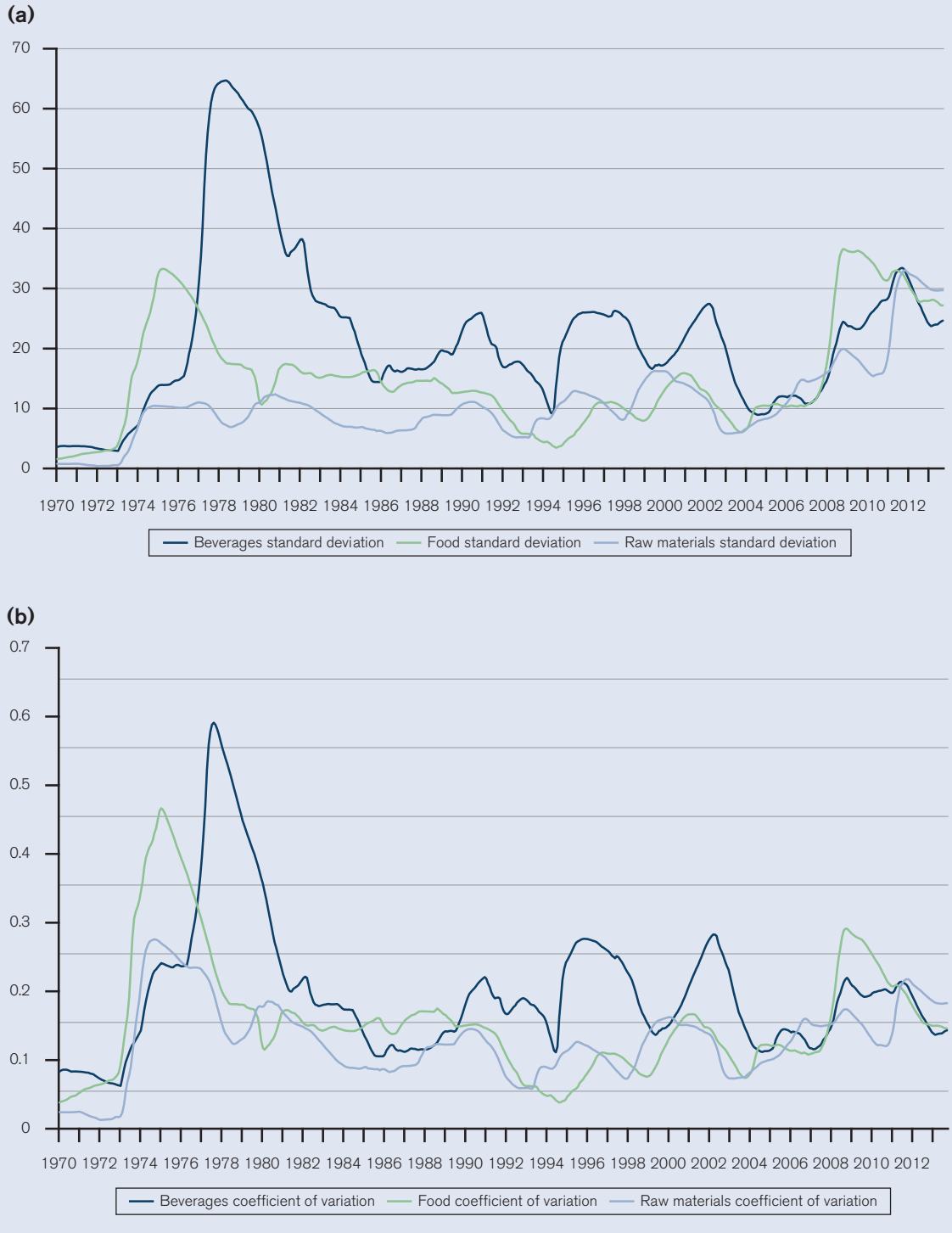
Source: World Bank Commodity Price Data.

Note: Panel (a) moving window (60 months) standard deviation; panel (b) moving window (60 months) coefficient of variation (standard deviation/mean).

* "m" refers to "month".

Box D.1: **Commodity price volatility** (continued)

Figure D.5: **Volatility of price indexes of selected commodities, 1970m1–2013m9***



Source: World Bank Commodity Price Data.

Note: Panel (a) moving window (60 months) standard deviation; panel (b) moving window (60 months) coefficient of variation (standard deviation/mean).

* "m" refers to "month".

and 2012, and it fell by 5.5 per cent in the last decade. Demand for oil in countries other than China or the OECD group rose by 32 per cent between 1992 and 2012, and by 14 per cent in the last decade.

Economic growth is slowing down in China but growth rates remain high. GDP growth, which was as high as 10 per cent (measured in USD 2005 PPP), is projected to attain a still considerable 6.6 per cent in the period 2011-30 (OECD, 2012). Accordingly, there is little reason to expect any significant slowdown in its demand for imports of mineral resources. The Chinese steel industry, for instance, is set to increase output from 700 million tonnes (Mt) to 900 Mt by 2030 (Lee et al., 2012). At the same time, other G-20 developing economies will experience high and sustained growth rates in the next decades. Notably, in the period 2011-30, Brazil's GDP is projected to grow at a rate of 4.1 per cent, Indonesia's at 5.3 per cent and India's at 6.5 per cent (OECD, 2012). Although some G-20 developing economies are net exporters of metals, OECD projections suggest that overall demand for metals will grow at 5 per cent a year up to 2030, mainly driven by new players in the international economic arena. Recent price declines of metals reflect moderate demand growth in G-20 developing and most OECD economies, together with a strong supply response. The latter was the result of increased investment of the past few years which was induced by high prices (World Bank, 2014).

Demand-side effects will continue to dominate energy price trends in the near future. The International Energy Agency (IEA) (2013) predicts that global energy demand will increase by one-third from 2011 to 2035. Although the share of fossil fuels, such as coal, oil or natural gas, in the world's energy mix is predicted to fall from 82 per cent to 76 per cent in 2035, demand will grow for all forms of energy, including fossil fuels.[6] Notably, demand for natural gas is expected to rise by almost 50 per cent by 2035 (IEA, 2013).

In the case of agricultural commodities, different causes have been identified for the price hikes that began in 2003. The most notable are extreme weather, policies to promote use of biofuels, depreciation of the US dollar, longer-term economic growth in several large developing countries, increased demand for commodity futures markets as a result of both speculation and portfolio diversification, low levels of stocks caused in part by some of the factors noted above, and trade policies that encouraged producers to withhold supplies (Anderson et al., 2013; Gilbert and Morgan, 2010).

There are, however, reasons to believe that demand for food will grow in the future because of the growth in a number of large G-20 developing economies. The Food and Agriculture Organization of the United Nations (FAO) (2011b), for instance, predicts that by 2050 global food production will have to further expand by 70 per cent in order to feed a growing world population and simultaneously address existing malnutrition and hunger. Some have therefore argued that high (rather than declining) food prices are going to predominate in years to come.

Another reason why agricultural and food prices are likely to remain high in the years to come is the relationship between oil and food prices, which has increased dramatically since 2006. Some claim that the connection between food and oil is systemic: modern agriculture uses oil products to fuel farm machinery, to transport other inputs to the farm and to transport farm output to the ultimate consumer (Heinberg, 2011). Moreover, oil is often used as input in agricultural chemicals. Oil price increases therefore put pressure on all these aspects of commercial food systems. The European Commission (2012) confirms that energy prices (costs) cause an increase in the price of fertilizers and food commodity prices. A recent study by Baffen and Dennis (2013) reaches similar conclusions: oil prices affect food prices more significantly than several other long-term price drivers, including exchange rates, interest rates and income.[7]

Demand- and supply-side developments, technological change, environmental policies, consumers' preferences and several other factors will interact in complex ways to affect the evolution of prices of commodities.[8] Such evolution is therefore subject to uncertainty, and that uncertainty needs to be taken into account when formulating growth strategies based on commodity production and export.

2. Agricultural trade and development

The agricultural sector represents an important share in the overall economy in developing countries and above all in least-developed countries (LDCs). In many countries, technological change and changes in production and distribution processes have contributed to modernizing parts of the agricultural sector in recent years and to giving the sector a more dynamic role within the overall economy. High agricultural prices relative to other sectors have also provided an opportunity for some countries to reap windfall benefits, notably through agricultural exports. For other countries, high agricultural prices have increased the cost of importing food, with potentially undesirable consequences for poverty levels.

The question discussed in this section is whether recent changes in the agricultural sector are likely to affect the sector's role in developing countries. The question is also asked whether these countries have been able to take advantage of recent price changes or whether those changes have represented a burden for them.

(a) The agricultural sector is important for development

In many developing countries, the agricultural sector is crucial both in terms of production and consumption. On

the supply side, the agricultural sector employs around half of the labour force in the developing world. The sector represents over 70 per cent of the labour force in LDCs. The sector's relevance in terms of consumption stems from the fact that poor households tend to spend a large share of their income on food. Combined with the fact that three out of every four poor people live in rural areas in developing countries and that most of them depend on agriculture for their livelihoods (World Bank, 2007), it is obvious that the sector is of utmost importance for any development strategy in the developing world.

Evidence suggests that growth in agriculture delivers more poverty reduction than growth in other sectors in low-income economies and that virtually all economies that managed to reduce poverty significantly went through a period of increased agricultural productivity (World Bank, 2007; Timmer, 2009). More specifically, Christiaensen et al. (2011) find that growth in agriculture is significantly more effective in reducing poverty among the poorest of the poor than growth in other sectors. This is the case because of the much larger participation of poorer households in growth from agriculture and the lower poverty reducing effect of non-agriculture sectors, particularly extractive industries.

According to Maertens et al. (2011), a positive effect on reducing poverty also materializes if agricultural productivity is enhanced through the integration of developing countries into global value chains – effectively world production lines. Globally, over one-third of the workforce active in agriculture has the status of "own account workers" (i.e. the self-employed) and around one-quarter of the workforce consists of contributing (unpaid) family workers (Cheong and Jansen, 2013). This suggests that informal employment is widespread in developing countries' agriculture as both groups of workers are often informally employed (International Labour Office (ILO) and WTO, 2009). Households in this sector are also often resource-poor and lowly educated. One way through which integration in global markets contributes to poverty reduction is by giving such households access to paid (wage) employment in the agro-industry. The number of smallholders may decline but overall the effect on poverty reduction is significant because the poorest households are better off in a situation of wage employment (Maertens and Swinnen, 2009; Maertens et al., 2011).

In the following section, we examine whether recent developments in the agricultural sector have affected developing countries' possibilities to use increased integration in global agricultural markets as a development strategy.

(b) Agricultural trade: new opportunities and challenges for developing countries

The agricultural sector has changed remarkably in the past decades. Global agricultural trade has increased significantly and the relative weight of different market segments has changed both in terms of products and destination markets. In addition, new production structures are being used across the world. These changes represent both opportunities and challenges for developing countries.

(i) Agricultural trade contributes to growth and poverty reduction

Recent decades have witnessed an increase in global agricultural trade and therefore increased opportunities for exporters of agricultural products. In terms of value, exports of agricultural products nearly tripled between 2000 and 2012 (WTO, 2013). This change was to a large extent driven by the price increases described above. In volume terms, exports increased by around 60 per cent over the same period (WTO, 2013). There are reasons to believe that agricultural exports will continue to increase in volume terms. The FAO, for instance, predicts that trade in agricultural commodities will continue to expand considerably until 2050 (FAO, 2009).

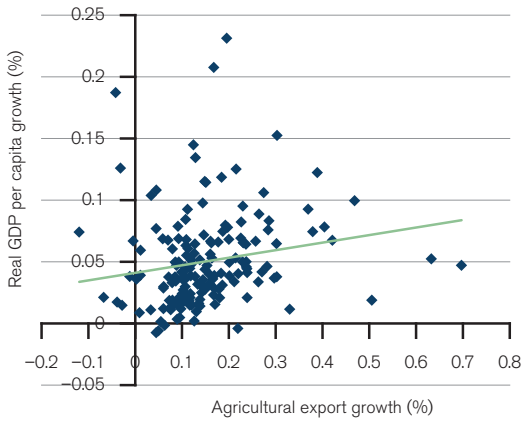
Agricultural trade as a share of domestic agricultural production and consumption has also increased in recent decades. The average annual volume growth in agricultural trade between 1950 and 2010 was about 4 per cent and therefore higher than the annual growth in global agricultural production of 2 per cent (Cheong and Jansen, 2013; Cheong et al., 2013). This reflects an increased integration of the agricultural sector into global markets. For many developing countries, revenue from agricultural exports is today a major source of income. In Latin America, excluding Mexico, the share of agricultural export revenue in total merchandise export revenue is 30 per cent (Cheong et al., 2013). In some sub-Saharan African countries and several other low-income countries, agricultural products account for almost half of merchandise export revenue.

Increased demand for high-value products and high prices in international food markets have created opportunities for developing countries to generate economic growth through increased exports (Maertens and Swinnen, 2014). The simple correlations reflected in Figure D.6 suggest that increased agricultural exports have been associated with higher GDP per capita growth during the past decade.[9]

In addition to the growth potential of agricultural exports, those exports have a particularly strong potential for raising rural incomes and reducing poverty as explained above (Aksoy and Beghin, 2005; Anderson and Martin, 2005; World Bank, 2007). Many developing countries recognize these opportunities and explicitly mention in their Poverty Reduction Strategy Papers (PRSPs) the development of high-value food export sectors (mainly horticultural exports) as an important strategy to foster growth and alleviate poverty (Maertens and Swinnen, 2014).

The role of agricultural exports in reducing poverty is also frequently highlighted by Diagnostic Trade Integration Studies (DTISs). These are used to analyse the export potential of

Figure D.6: **Agricultural exports and economic growth, 2001–12**



Source: FAO data and World Development Indicators (WDI).

Note: The chart reflects the correlation between GDP per capita growth and the average growth of agricultural exports per employee.

different sectors and sub-sectors and to identify supply-side constraints. DTISs typically contain an action matrix with advice on how to overcome the most important supply-side constraints. This information is used by the Enhanced Integrated Framework (EIF), a multi-donor programme that coordinates trade-related technical assistance for LDCs.

The 12 DTISs analysed for this report all highlighted the potential role of agricultural exports for poverty reduction. Nine of them also indicated that there was potential for increased exports in the sector.[10] Cotton, coffee and fish are among the products with export potential most frequently highlighted in the 12 DTISs (see Table D.1).

Recent microeconomic studies have made it possible to get a better understanding of the channels through which agricultural exports contribute to poverty reduction. Box D.2 illustrates this using the example of bean and tomato exports in Senegal. Increasingly, private and public sector initiatives build on this experience to increase the integration of domestic production in global markets, with resulting benefits for the local economy.

Awareness of the potential of agricultural exports for development has thus risen in recent years. Increasingly, developing countries have access to tools and information that can help them to connect to global markets. Implementing an export strategy successfully nevertheless remains challenging for many developing countries, notably in the context of the dynamic and changing environment described in the following sections.

(ii) New market segments gaining in prominence

Agricultural products differ significantly regarding the climate in which they are produced (e.g. temperate vs. tropical), the production process used (plantation vs. small scale; gestation period), transport methods used for trade (marine bulk cargo vs. air cargo) and the role of the product in the population's diet (e.g. staple crops vs. other food items). As a consequence, different categorizations for agricultural products have been used in the trade literature.

For the purpose of this section on the role of agricultural trade for development, agricultural trade is subdivided into four groups: traditional exports, fresh fruit and vegetables, specialty products, and processed agricultural goods (see

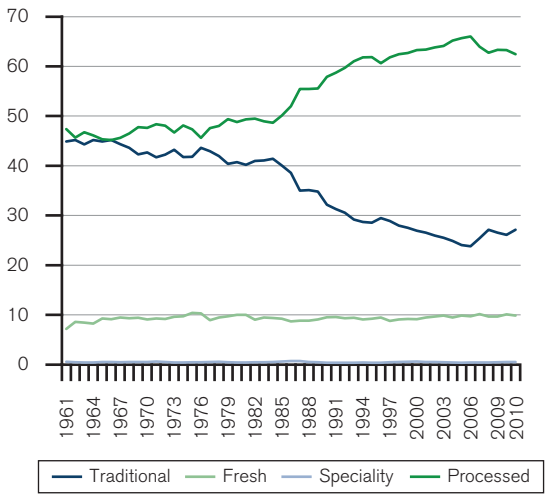
Table D.1: **Products with export potential identified in selected DTISs**

		Cashews	Cocoa	Coffee	Cotton	Fish	Flowers	(Ground)nuts	Livestock	Tea	Tobacco
Mauritania	2001					X			X		
Mozambique	2004	X				X					
Niger	2008								X		
Rwanda	2005			X						X	
Sao Tomé and Principe	2006					X					
Senegal	2003					X		X			
Sierra Leone	2006	X	X					X			
Sudan	2008				X				X		
Tanzania	2005	X		X	X					X	X
Togo	2010		X	X	X						
Uganda	2013			X	X	X	X			X	
Zambia	2005			X							X

Source: Authors' computations based on selected DTISs.

Note: Only products mentioned in at least two DTISs are represented in this table.

Figure D.7: **Share of traditional, processed, fresh and specialty products in total agricultural exports, 1960–2010**
(per cent)



Source: WTO Secretariat calculations based on FAO data.

Note: The product classification used is inspired by the FAO (2004), and has been established as follows: (i) traditional agricultural exports: bananas and citrus; beverages of crude materials; staple crops, (ii) fresh fruit and vegetables: fresh fruit, fresh vegetables and nuts; (iii) specialty products: spices; (iv) processed agricultural products: alcoholic beverages; animal food; meat and eggs; milk; oils and fats; processed beverages; processed crops; processed fruit and vegetables; processed materials; sugar; chocolate.

Box D.3). The three last groups are typically considered to represent high value added agricultural exports and are therefore considered by some to have a greater potential to contribute to growth. Box D.3 provides more insights on the composition of the groups and on how the categories used in this section relate to those used in the relevant literature.

An important phenomenon of the past 50 years has been that the share of raw traditional agricultural exports in global agricultural exports has declined significantly, implying that the weight of high value-added agricultural trade has increased. The traditional agricultural exports segment includes cereals (including wheat, rice and maize), beverages (coffee, tea, cocoa), banana and citrus fruit, oilseeds and raw materials (including wood and rubber). Until the mid-1980s, raw traditional agricultural products represented around 40 per cent of total trade in agricultural goods. In the following decade, the share dropped sharply by over ten percentage points (see Figure D.7). Processed agricultural products (which include processed traditional export products) now represent over 60 per cent of total exports of agricultural goods.

(iii) New destination markets

Patterns of trade have changed significantly in recent years. The share of Asia – and in particular of China – as an importer of agricultural products has increased significantly in the past decades. In 1990, agricultural imports of European countries were twice as high as those of Asian countries. In 2000, European imports exceeded those of Asia by less than 50 per cent and in 2012 by a mere 25 per cent. China was the ninth-largest importer of agricultural products in 2000 but ranked second in 2012 behind the European Union.[11]

These changes in the relative weight of different destination markets are even more pronounced in trading patterns of developing countries. Asia has overtaken Europe as the main LDC export market for agricultural products. In 2012, 39 per cent of LDC exports went to Asia. Africa, with a market share of 23 per cent, was the second-largest regional destination market for LDC exports, followed by Europe with 22 per cent (see Table D.2). The role of Asia as a destination market for LDC exports is lower in agriculture than it is for fuel and mining products (54 per cent) but more important than in the case of manufacturing exports (19 per cent).

Table D.3 reflects changes in the export patterns of LDCs according to income groups. In 2000, half of LDC agricultural exports were directed towards developed economies. WTO estimates suggest that this share had shrunk to one-third by 2012. Other developing countries as a group now receive 69 per cent of LDC agricultural exports. The export share to other LDCs nearly doubled over the 12-year period and the export share to developing countries that are neither LDCs nor G-20 increased by around 50 per cent. The weight of G-20 developing economies in LDC agricultural exports remained fairly stable.

(iv) New production structures

The agricultural sector has been undergoing a number of other important changes in recent years. The sector has attracted significant levels of investment, including in the form of foreign direct investment (FDI). Food standards are spreading rapidly and food supply chains are characterized by increased levels of vertical coordination. These changes have important implications for developing countries (Maertens and Swinnen, 2014).

A series of major food safety problems in high-income countries has led to increased demand in these countries for food safety and for standards and regulation guaranteeing food safety. As a consequence, there appears to be an increased use of food safety and quality standards within agricultural value chains. Those standards can be of a public or private nature.[12] The need for final consumer products to meet certain standards has led to an increased emphasis on quality control within agricultural value chains and this, in turn, has affected the way in which such chains function. In addition, final good producers and retailers in industrialized countries increasingly apply product differentiation strategies in food products. This means that competition takes place not only in price but also in factors such as reliability, product variety, product quality and speed of innovation (Dolan and Humphrey, 2010). Increasingly,

Box D.2: **Bean and tomato exports from Senegal**[13]

Two Senegalese case studies illustrate the channels through which agricultural exports contribute to poverty reduction. They also show that contributions to poverty reduction can be strong in cases where smallholder farming is replaced by wage employment.

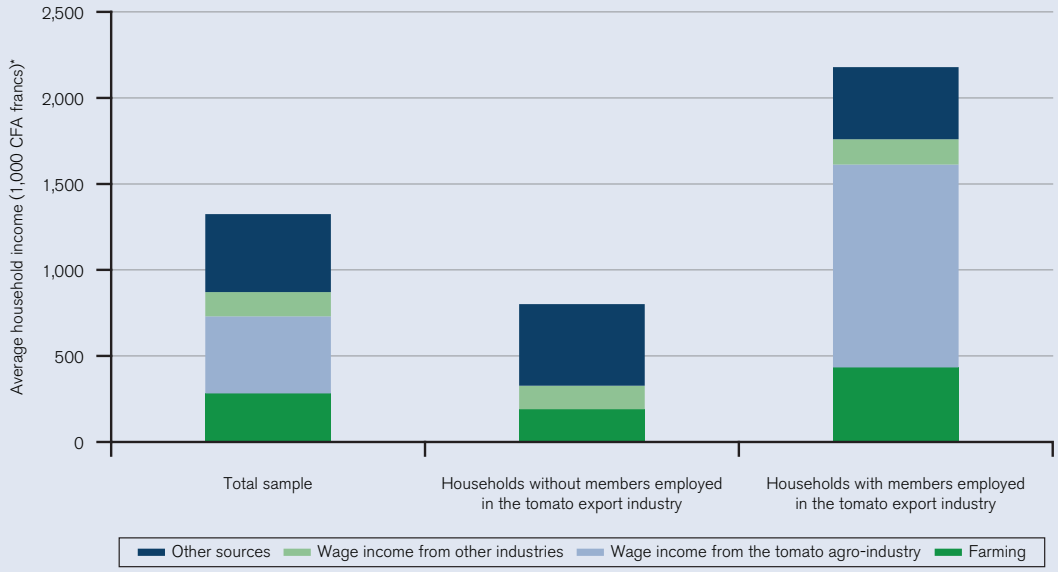
The Senegalese tomato export sector is dominated by one multinational company that started exporting tomatoes from Senegal to the European Union in 2003. The tomato export supply chain is completely vertically integrated under a common ownership. Smallholder procurement is 0 per cent and production, processing, trade and distribution are completely integrated within the subsidiaries of the multinational company. This is an extreme case of complete vertical integration. Rural households only benefit through labour market effects as there is no contract-farming and procurement from smallholder farms.

Evidence, however, suggests that poor households, and in particular the poorest among them, benefit from this form of integration because of the creation of employment in tomato export chains. Households employed in the tomato export industry, either on the fields or in the processing units of the export company, have incomes that are more than double the income of other households in the region (see Figure D.8). Before the multinational company was established in 2003, these households had lower land and non-land asset holdings. Increased tomato exports have resulted in increased employment, increased incomes and ultimately reduced levels of poverty and extreme poverty (see Figure D.9).

The Senegalese bean export sector has also been characterized by increased vertical integration although to a lesser extent. In this sector, increasing standards have prompted a shift from smallholder contract-farming to vertically integrated estate production by the exporting companies themselves. It is estimated that smallholder procurement under contract decreased from 95 per cent of export produce in 1999 to 52 per cent in 2005. The change in the supply chain structure has also shifted the way that local households benefit. These benefits are increasingly through agro-industrial employment and labour market effects rather than through contract farming and product market effects.

In the bean sector, both participation in contract farming and participation in agro-industrial employment have resulted in significantly higher incomes (see Figure D.10). It is estimated that contracting within the export sector leads to incomes that are 110 per cent higher than the average income in the region, while for employment in the export industry this is 60 per cent. It is important to emphasize that the shift in the supply chain structure, with increased agro-industrial production, has resulted in a stronger poverty-alleviating effect. This is because the poorest households, with less land and non-land asset holdings and a lower level of education, mainly benefit through labour market effects and agro-industrial employment.

Figure D.8: **Comparison of household income in Senegal, by employment status in the tomato export industry**

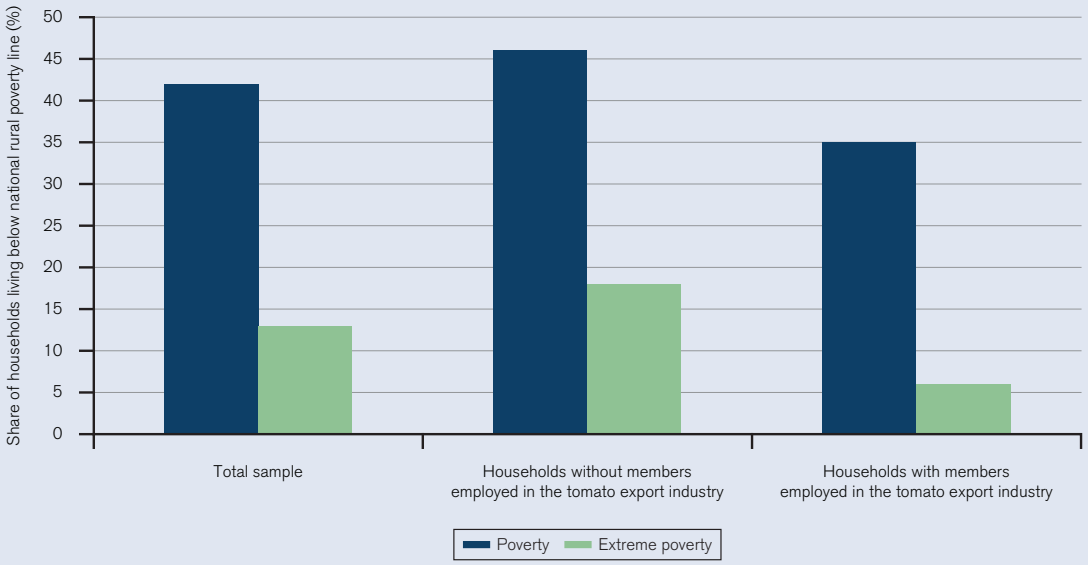


Source: Maertens and Swinnen (2011).

Note: "Total sample" refers to 299 households in 18 villages in two rural communities (Gandon and Ross Bethio).

*CFA stands for "Communautés Financières d'Afrique" ("African Financial Community").

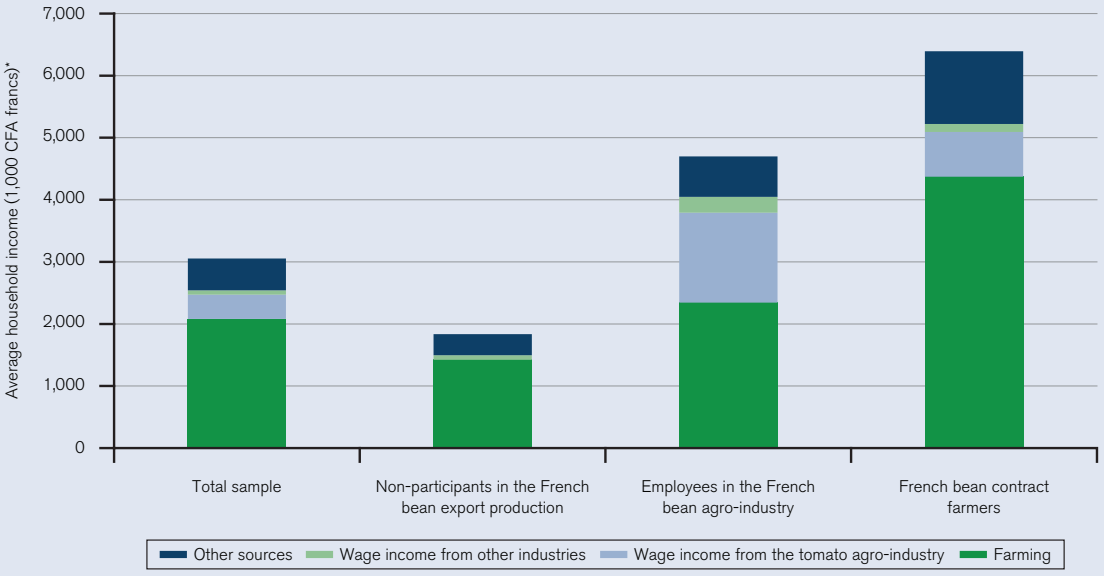
Figure D.9: **Comparison of household poverty in Senegal, by employment status in the tomato export industry**



Source: Maertens et al. (2011).

Note: "Total sample" refers to 299 households in 18 villages in two rural communities (Gandon and Ross Bethio).

Figure D.10: **Comparison of household income in Senegal, by employment status in the French bean export industry**



Source: Maertens and Swinnen (2009).

Notes: "Total sample" refers to 300 households in 15 villages in three rural communities (Sangalkam, Diender, and Noto).

*CFA stands for "Communautés Financières d'Afrique" ("African Financial Community").

When comparing employees in certified and non-certified export companies, employees in certified companies are found to reap greater rewards. Certification to GlobalGAP is found to increase the length of companies' export season, which results in longer employment periods for workers in certified companies. In addition, workers in certified companies receive slightly higher wages than workers in non-certified companies.

Moreover, employees in the export sector invest the wage earned in the export companies at least partially in their own farms. Access to wages from the export sector therefore has a positive effect on farm intensification and leads to increased use of modern inputs, such as mineral fertilizer and improved seeds.

Table D.2: **Product composition of LDCs' exports by destination, 2000–12**
(US$ billion and per cent)

	Value	Share in LDC exports		Annual percentage change		
	2012	2000	2012	2011	2012	2000–12
Agriculture						
World	21	100	100	26	2	11
Asia	8.2	30	39	27	6	13
Africa[a]	4.8	16	23	34	4	14
Europe	4.5	37	22	26	–9	6
Middle East	1.9	7	9	25	–8	13
North America	0.6	7	3	13	5	2
Commonwealth of Independent States (CIS)	0.4	0	2	64	5	27
South and Central America	0.1	1	0	0	–11	3

Source: WTO, 2013a.

Table D.3: **LDCs' agriculture exports by destination, 2000–12**
(US$ billion and per cent)

	Value	Share in LDC exports		Annual percentage change		
	2012	2000	2012	2011	2012	2000–12
World	21	100	100	26	2	11
Developed economies	6.5	51	31	20	1	6
G-20 developing economies	4.6	19	22	41	–1	12
Other developing economies	7.8	24	37	25	5	15
LDCs	2.2	6	11	19	2	16

Source: WTO Secretariat estimations.

retail chains or producers of final consumption goods try to coordinate production processes within value chains from the top, imposing, for instance, requirements regarding costs, quality, delivery, product variety and quality systems. This has led to increased levels of vertical integration within the value chain.

Increasing flows of FDI across the globe have allowed multinational retailers or food companies to invest directly in the countries where the raw product is produced. Worldwide inflows of FDI increased from USD 54 billion in 1980 to USD 1,350 billion in 2012 (Maertens and Swinnen, 2014). While there are no global data on FDI targeted at the agri-food sector, there are strong indications that the agri-food sector has taken advantage of these increases. According to United Nations Conference on Trade and Development (UNCTAD) (2012), about 6 per cent of total world FDI flows in 2012 were realized in the food processing sector. Within the manufacturing sector, the largest increases of FDI flows during the most recent years have been observed in the food and beverage sector. In Africa, about 20 per cent of FDI inflows in the manufacturing sector – or 6 per cent of total FDI inflows – are in the food and beverage sector. In Latin America and the Caribbean, the food industry represents 30 per cent of FDI in manufacturing or 11 per cent of total FDI inflows (UNCTAD, 2012).

Increased FDI inflows, the increasing role of standards within value chains and increased levels of vertical integration within those chains have together probably contributed to an increased level of technological transfers to developing country producers that are integrated in those chains. Such technological transfers can represent important contributions to productivity increases in the agricultural sector and resulting poverty-reducing effects. These new production structures, however, can also lead to situations of "capture", whereby lead firms in the value chain use their dominant position to appropriate most of the gains generated within the chain (see also Section C). It is, therefore, important for developing country exporters to adjust to these new structures and processes applied in agricultural value chains.

(c) The changing nature of agricultural trade

The changes in agricultural trade described above have impacted developing countries in different ways depending notably on their competitive position. Some countries have managed to enter the growing processed food market while others have increased their contribution to the growing fresh fruit and vegetable segment. For many net importers of food, however, rising food prices have represented a challenge rather than an opportunity.

Box D.3: **Categories of agricultural exports**

The classification used in this report is inspired by the discussion of development strategies: processing or new products. According to our classification, there are two dimensions of agricultural product classification. The first one is based on the stage of processing (raw vs. processed). The second one is based on the type of product: traditional, fruit and vegetables (including nuts), specialties, and others. Processed agricultural goods, fresh fruit and vegetables, and specialty products are typically considered to represent relatively high value added products.

Table D.4 reflects the allocation of agricultural product groups into the categories used in this section. Whenever the terms traditional, specialties or fresh fruit and vegetables are used alone, they only refer to the raw products within this category. Whenever the term "processed" agricultural goods is used alone, it refers to all the processed product lines identified in the right-hand column.

Table D.4: **Agricultural goods classification**

	Raw	**Processed**
Traditional	Cereals Beverages Raw materials Banana and citrus Oilseeds	Processed cereals Processed beverages Processed raw materials Processed citrus Processed oilseeds Sugar
Specialities	Spices Cut flowers Other live plants	Processed spices
Fruits, vegetables and nuts	Fresh fruits Fresh vegetables Nuts	Processed fruits Processed vegetables Processed nuts
Others	Live animals	Meat Milk product Animal products Fish Prepared meat and fish Water Alcohol Processed others

The differentiation between the segments of fresh fruit and vegetables, specialities and processed goods used in this section has been inspired by the FAO (2004) study on non-traditional agricultural exports. FAO data on trade flows, however, do not include information on cut flowers and on fish. These two product groups are therefore only included in this section when WTO trade data or WTO tariff data are used.

The definition of the category "processed agricultural goods" is consistent with the definition used in the study by Liapis (2011) on processed agricultural exports. The classification used in this section is consistent with the one used in WTO (2008), but is broader as it covers product lines not included in the discussion of tariff escalation in that document.[14] More generally, the definition of "agricultural products" used in this section is also broader than the one applied in the WTO Agreement on Agriculture, which does not cover, for instance, fish, fish products, rubber and wood.

Last but not least, the categories used in Maertens and Swinnen (2014) differ from the ones used here. Their "tropical and temperate" agricultural exports category is close to "traditional exports" in the table above. The "high value" products group in Maertens and Swinnen (2014) includes fruit, vegetables, meat and meat products, milk and dairy products.

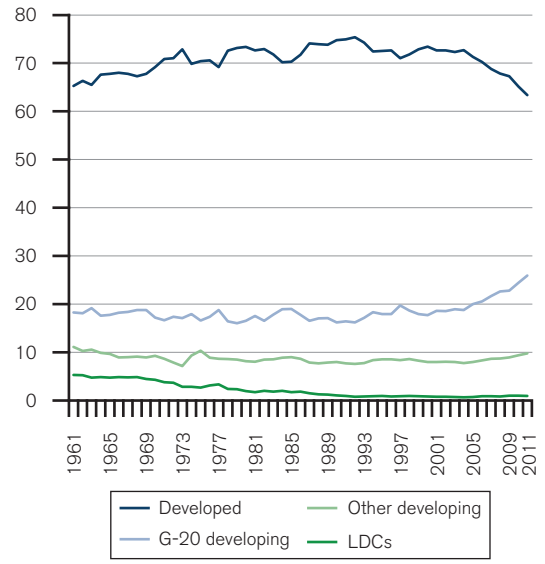
(i) Emerging economies and the exports of processed products

Industrialized countries are the dominant players in agricultural markets and have been so for the past 50 years. Their share in global exports increased steadily between the early 1960s and 1990. In the early 1990s, however, they started to lose market share, and developing countries have increased their share in world agricultural trade from 30 per cent to around 40 per cent in recent years. Figure D.11, however, illustrates that the share of developing countries in global agricultural trade was only slightly higher in 2011 (37 per cent) than it was in the early 1960s (35 per cent). It also shows that the increased market share of developing countries in recent years mainly reflects the increased role of emerging economies' exporters (i.e. developing countries that are members of the G-20) and to a lesser extent growth in other developing countries. LDCs have experienced a constant decline in their share of global agricultural exports.

In the light of the discussions above on the role of different market segments, it is interesting to highlight that G-20 developing countries notably managed to increase their market share in the growing processed goods segment. Figures D.12 and D.13 reflect exports in traditional agricultural products and in fruit and vegetables for different country groupings. The left-hand panels reflect exports in raw products and the right-hand panels reflect exports in processed products. The figures illustrate that, in the last decade, G-20 developing countries have expanded their share in global markets in all four market segments depicted below.[15]

G-20 developing countries and – to a lesser extent – other developing economies have also increased their role in "other

Figure D.11: **The share of developing countries' and LDCs' agricultural exports in world agricultural exports, percentages, 1961–2011**



Source: WTO Secretariat calculations based on FAO data.

processed goods" – a segment that notably includes poultry and dairy products. This market segment, however, continues to be largely dominated by developed economies that together hold around 70 per cent of the share of global exports.

(ii) The share of high value-added products in LDC agricultural exports

Traditional raw agricultural products represent an important export item for LDCs, with beverages and cotton being prominent export products. Among the top items for LDC exports, agricultural products rank significantly behind a number of fuel and mining and textile products. Fish and crustaceans are in eighth place; coffee, tea, mate and spices are in ninth position; and cotton is tenth (WTO, 2013a).

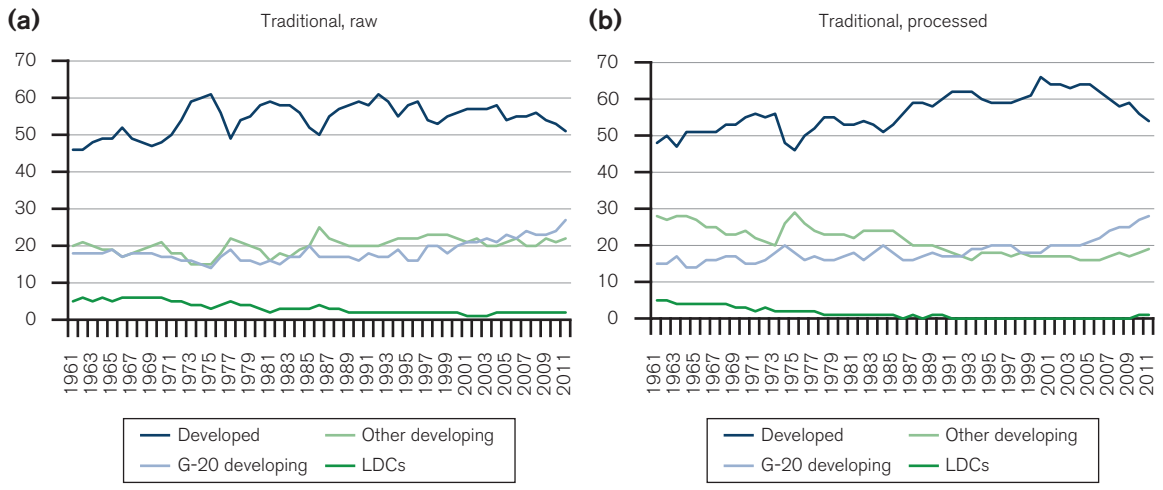
In recent years, high value-added product segments have played an increasingly important role in LDC agricultural exports. Figure D.14 illustrates that the share of traditional agricultural exports has dropped by around ten percentage points in the last decade. LDCs have managed to move increasingly into exporting processed agricultural goods and fresh fruits, vegetables and nuts. It nevertheless continues to be the case that the share of these segments in total exports is lower in LDC exports than in global export, reflecting that their revealed comparative advantage continues to be in traditional agricultural exports.

(iii) Agricultural exports and their changing weight in developing countries' GDP

In G-20 developing countries, agricultural exports represent a lower proportion of the economy than in LDCs or in other developing countries.

Figure D.15 shows that agricultural exports as a share of GDP make up only around 3 per cent in G-20 developing countries, while they stand at around 7 per cent for other developing economies. The sharp price increases in agricultural products have, on average, not been accompanied by an increased role of agricultural exports in GDP. Only emerging economies have seen the weight of agriculture increase in the recent period of high prices. One of the reasons for this is that many developing countries are also exporters of fuels and mining products.

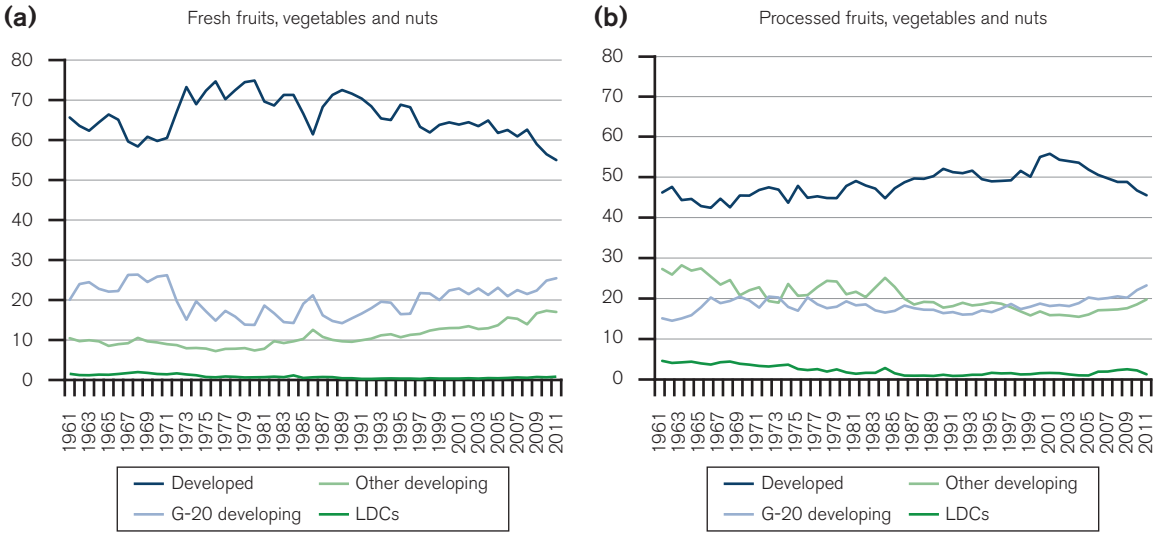
Figure D.12: **Share of different country groups (income groups) in traditional agricultural exports, 1961–2011** (per cent)



Source: WTO Secretariat calculations based on FAO data.

Note: In these figures, "G-20 developing countries" indicates developing country members of the G-20 (as defined in Appendix Table B.1).

Figure D.13: **Share of different country groups (income groups) in the exports of fruit and vegetables, 1961–2011**
(per cent)



Source: WTO Secretariat calculations based on FAO data.

Note: In these figures, "G-20 developing countries" indicates developing country members of the G-20 (as defined in Appendix Table B.1).

In LDCs, for instance, export growth in fuels and mining products were twice as high as those of agricultural goods (WTO, 2013a).[16] As a result, the overall share of agricultural goods in LDC exports went down from 21.1 per cent in 2000 to 9.7 per cent in 2012.

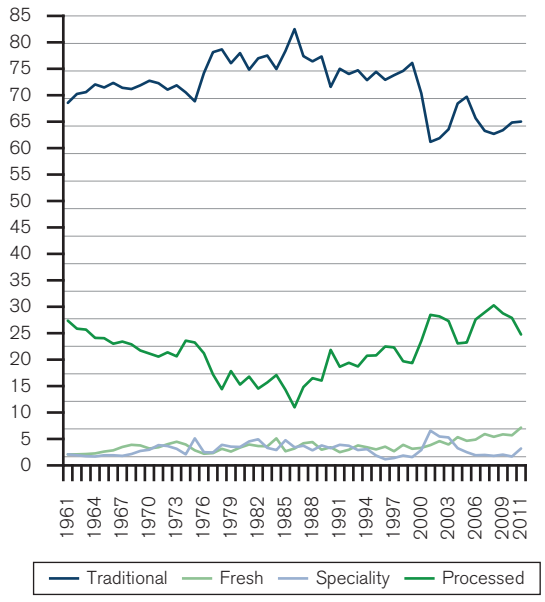
(iv) LDCs and increasing prices of food imports

Price volatility is a particular challenge for net food importers. As a group, LDCs import more agricultural goods in absolute value than they export, and most LDCs are net food-importing countries (Cheong et al., 2013). Ng and Aksoy (2008), however, highlight that countries with larger food deficits tend to be either oil exporters or countries in conflict.[17]

Figure D.16 illustrates that the gap between the value of imports and the value of exports of food has increased over time in LDCs. This is in line with findings in Ng and Aksoy (2010b), who find that trade deficits increased in low-income countries over the period 2000–07.[18] In middle-income countries, on the other hand, food exports increased more than food imports over the same period. These findings are in line with the evidence presented above that emerging economies and "other developing countries" have been more successful than LDCs in taking advantage of the agricultural price boom.

Food represents a high share of spending for poor households, which typically cannot further reduce the quantities they consume (low price elasticity). Price hikes therefore hit poor households particularly hard (FAO, 2011a), and there is evidence that price hikes affect the food intake of the poor.[19] The ILO (2011) reports that, in most developing countries, the poorest households (those in the lowest income quintile) spend more than 60 per cent of their income on food, according to a sample

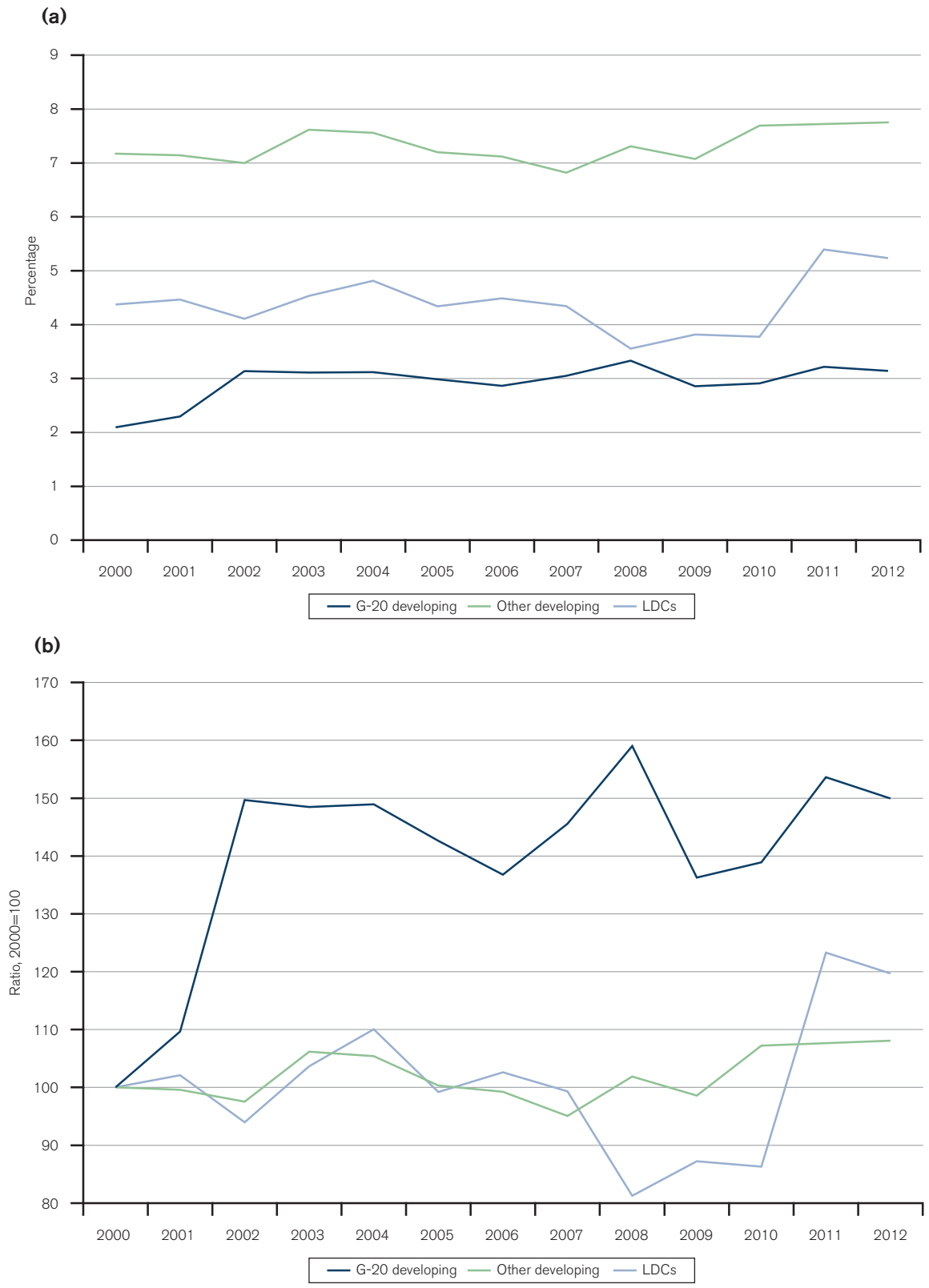
Figure D.14: **Share of different agricultural market segments in LDC exports, 1961–2011**
(per cent)



Source: WTO Secretariat calculations based on FAO data.

Note: For definition of product segments, see Table D.2.

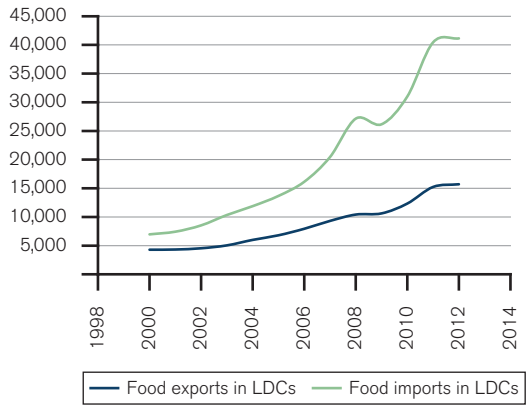
Figure D.15: **Agricultural exports as ratio of GDP in developing countries, 2000–12**



Source: WTO Statistics Database.

Note: Ratios are based on current values.

Figure D.16: **Food exports and imports in LDCs, 2000–12**
(US$ million, current prices)



Source: WTO Secretariat.

of 72 developing countries. The World Bank (2011) has estimated that rises in food prices between June and December 2010 pushed an additional 44 million people below the US$ 1.25 a day poverty line. This is despite the fact that the high food prices experienced in international markets have probably not been fully reflected in the domestic markets of many developing countries (Ng and Aksoy, 2010a).

3. Making agricultural trade work for development: the policy environment

Given the importance of the agricultural sector for poverty reduction and given the increasing importance of international trade for agricultural activity, the policy and institutional environment governing agricultural trade has important impacts on developing countries' development strategies. Indeed, the agricultural sector is much more likely to contribute positively to growth within a sound policy environment and with high-quality institutions (Mehlum et al., 2006). This is the case for both net exporters and net importers. In the next section, five policy areas will be discussed that affect the role agriculture can play in development strategies:

(a) productivity gap – where significant productivity gaps exist, developing country producers may find it hard to maintain existing production levels or to grow through exports when markets are open
(b) price-based policy measures, such as tariffs and subsidies – these have been frequently used in the agricultural sector and may continue to affect developing country exporters
(c) trade-related fixed costs, such as those related to implementing sanitary and phytosanitary (SPS) measures, present a particular challenge to producers in developing countries
(d) value chains in the agricultural sector – these chains are characterized by market concentration, creating problems in particular for small producers in developing countries
(e) prices in the agricultural sector – these are notoriously volatile, creating difficulties for resource-constrained consumers and for producers needing to take investment decisions.

(a) Overcoming productivity gaps

Investments in agricultural research and development (R&D) have turned the agricultural sector into a dynamic sector with rapid technological change in much of the world, including in developing countries (World Bank, 2007). It is therefore more important than ever for developing countries to "apply knowledge to nature"[20] – i.e. to promote scientific research, education and training in the agricultural sector in order to enhance crop, soil, water and livestock management and to develop more sustainable and resilient agricultural systems (Wood, 2003; World Bank, 2007).

In numerous countries, productivity growth in agriculture has contributed to economic growth, beginning in the early 1990s, as reflected in Table D.5.[21] In a number of emerging economies, notably Brazil and China, agricultural total factor productivity (TFP) growth has been particularly high. Both Brazil and China have also been able to increase their market share in global agricultural exports. Other middle-income countries – particularly Argentina, India, Iran, Nigeria and Russia – also worked towards increasing agricultural productivity and significantly increased their spending on public agricultural R&D in the 1990s (Fuglie and Nin-Pratt, 2012; World Bank, 2007).

Another factor likely to have affected agricultural productivity and export trends, notably in the 2000s, is FDI. Recent reports suggest that increased global food prices have significantly affected investment interests (e.g. Deininger et al., 2011).[22] Reports by UNCTAD (2013b) also reflect an increased interest in agriculture as a sector for FDI. In Africa, a survey among investment promotion agencies identified agriculture as the most promising sector for attracting FDI. Similarly in Asia, agriculture (including forestry and fishing) was the second most promising sector for attracting FDI, behind the food industry, which was ranked number one among potential FDI interest. However, FDI may be affected negatively by possible future downturns in food prices. Indeed, there is evidence that land acquisitions peaked in 2009 when food prices peaked and returned to more moderate levels afterwards (Arezki et al., 2011).

The rates of return on agricultural R&D are notoriously high (World Bank, 2007), with R&D arguably being the single most

Table D.5: **TFP growth in agriculture and export share, by region and decade, 1961–2010**

	Agricultural TFP growth (annual %)					Average share in world agricultural exports (%)				
Region	**1961–70**	**1971–80**	**1981–90**	**1991–2000**	**2001–09**	**1961–70**	**1971–80**	**1981–90**	**1991–2000**	**2001–09**
Selected developing countries (by region)										
Sub-Saharan Africa	0.2	–0.1	0.8	1.0	0.5	10.0	5.0	3.1	2.2	2.0
Latin America and Caribbean	0.8	1.2	1.0	2.3	2.7	13.9	13.5	12.3	10.6	13.1
Brazil	0.2	0.5	3.0	2.6	4.0	3.3	4.1	3.7	3.1	4.8
Asia (except West Asia)	0.9	1.2	1.4	2.7	2.8	11.9	9.6	10.8	11.6	13.1
China	0.9	0.7	1.7	4.1	3.1	2.5	2.4	3.7	4.5	3.8
India	0.5	1.0	1.3	1.1	2.1	1.6	1.2	1.0	1.1	1.6
West Asia and North Africa	1.4	1.7	1.6	1.7	1.9	4.4	3.1	2.5	2.5	2.7
World	0.2	0.6	0.6	1.7	1.8	100.0	100.0	100.0	100.0	100.0

Source: Fuglie (2012) and FAO. Compositions of regional groupings are based on Fuglie (2012).

important contributor to increases in total factor productivity and thus competitiveness in developing countries (Fuglie, 2010). Yet, it is notoriously difficult to attract private funding into agricultural R&D because of the difficulty for investors to benefit from relevant investments (World Bank, 2007). One reason for this is that many technologies of importance to poor farmers cannot be protected cost-effectively by intellectual property rights (IPRs). Public investment in agricultural R&D therefore remains crucial, in particular in developing countries. Yet, agricultural investments are risky and tend to show their benefits only in the long term, i.e. after ten years or more (World Bank, 2007). This may be one of the reasons why it is not necessarily easy to gather policy support for agricultural R&D investment, even in periods of high agricultural prices.

Efforts to stimulate private investments in agricultural R&D could take the form of strengthening the investment climate for private investors in general, facilitating access to information for potential private investors and addressing credit constraints that smallholders may face when considering an investment in R&D. Producer organizations or public-private partnerships can play an important role in searching for, developing and diffusing new technology options.[23] On the trade policy side, the lowering of barriers to the importing of new technologies could also contribute to fostering private investments in agricultural R&D (World Bank, 2007).

While increased R&D spending is likely to affect the agricultural sector positively, R&D and resulting productivity increases are unlikely to affect all farmers equally. It has been argued that large-scale developing country farmers are more likely than subsistence farmers to gain from this (Pray et al., 2007). The overall economic effects of such productivity increases are nevertheless likely to be significant. Cheong and Jansen (2013), for instance, highlight, the possible contribution of increases in agricultural productivity to decreasing informal urban employment.

(b) Price-based policy interventions

Price-based measures have traditionally been quite prominently used in global agricultural markets and have most likely played a role in determining agricultural trade patterns. The phenomenon of tariff escalation – the practice of imposing higher import duties on semi-processed and finished products than on raw materials – has often been raised in the debate about the difficulties that developing countries face to move into processed agricultural exports. Another price-based measure that has mainly been used by industrialized economies is export or producer subsidies.

(i) Tariffs

It has been illustrated above that emerging economies have been significantly more successful than poorer developing countries, notably LDCs, in taking advantage of high prices in the agricultural sector. They have also been more successful in moving away from traditional agricultural exports of raw commodities and into processed exports.

Table D.6 illustrates unweighted average applied tariffs that countries of different income groups face in partner countries, broken down according to the market segments described in Box D.3.

LDC exports tend to face lower tariffs than exports from other developing countries, in particular for exports destined for industrialized economies. Average weighted tariffs imposed by developed countries on LDC agricultural exports decreased from 3.6 per cent in 2000 to 1.0 per cent in 2011.[24] The preference accorded to LDCs is significant in the agricultural sector as developing countries faced an average tariff of 9.2 per cent in 2000 and of 7.2 per cent in 2011. Regarding tariff escalation, the tariff pattern faced by LDCs does not differ significantly from the pattern faced

Table D.6: **Tariffs on exports by partner country, product segment and processing stage, 2011**
(per cent)

	Traditional products		Fruit and vegetables		Specialty products		Others	
(a) LDC exports								
	Raw	Processed	Raw	Processed	Raw	Processed	Raw	Processed
Developed	0.35	0.63	0.11	0.52	0.00	0.06	0.00	0.00
Emerging	18.83	22.47	21.33	15.37	7.76	10.49	9.52	8.60
Other developing	13.60	8.04	10.34	8.82	5.89	8.97	10.64	7.11
LDCs	18.69	16.99	20.10	21.27	16.60	17.38	17.95	11.22
(b) Other developing economies' exports								
	Traditional products		Fruit and vegetables		Specialty products		Others	
	Raw	Processed	Raw	Processed	Raw	Processed	Raw	Processed
Developed	0.37	0.78	0.21	0.42	0.00	0.02	0.08	0.00
Emerging	18.95	27.45	17.06	14.87	8.51	9.98	12.81	9.85
Other developing	12.99	8.86	12.03	10.92	9.12	9.69	13.94	6.10
LDCs	17.82	14.99	19.82	19.25	15.29	15.17	17.14	9.38
(c) Emerging economies' exports								
	Traditional products		Fruit and vegetables		Specialty products		Others	
	Raw	Processed	Raw	Processed	Raw	Processed	Raw	Processed
Developed	0.39	0.76	0.30	0.37	0.00	0.03	0.16	0.12
Emerging	18.54	31.56	16.85	13.11	7.84	10.36	12.86	12.41
Other developing	12.20	8.01	11.57	10.18	8.77	9.57	12.93	5.25
LDCs	18.21	14.35	19.69	19.98	15.94	17.04	16.75	9.22
(d) Developed economies' exports								
	Traditional products		Fruit and vegetables		Specialty products		Others	
	Raw	Processed	Raw	Processed	Raw	Processed	Raw	Processed
Developed	0.85	1.01	0.52	0.65	0.00	0.03	0.18	0.00
Emerging	20.50	35.25	16.21	13.11	7.51	10.38	15.80	12.22
Other developing	12.87	8.95	12.18	15.82	9.13	11.21	15.49	6.91
LDCs	16.84	12.67	18.96	20.03	13.96	13.92	16.83	8.39

Source: WTO Tariff Data Base.

Note: Unweighted averages of most-favoured nation (MFN) applied tariffs are used. For LDC exports, LDC preferential tariffs are taken into account.

by other developing countries. In general, tariff escalation is rather low for exports to developed economies.

Tariffs on agricultural goods are, however, often higher than tariffs on other goods. The WTO (2013b), for instance, finds that, in developing countries, the average duty applied on agricultural imports from LDCs was above 12 per cent in 2011. This is significantly higher than the average duty applied to oil or minerals (close to zero) and to non-agricultural products (around 2 per cent).

(ii) Production and export subsidies

Historically, policy regimes tended to have a pro-agricultural bias in high-income countries and an anti-agricultural bias in developing countries (Anderson et al., 2013). This reflects a general tendency of countries to gradually move in the course of their economic development from taxing to subsidizing agriculture. Subsidies have been prominently used in the agricultural sector, in particular by industrialized countries. However, since the 1980s, the relative rate of assistance (RRA) in both developed and developing economies has on average converged towards zero.[25] A significant anti-agricultural bias nevertheless continued to exist over the 2005-10 period in Côte d'Ivoire, Zimbabwe, Nicaragua, Ecuador, Argentina, Bangladesh, Egypt, Sri Lanka, Uganda and Mozambique.[26] The pro-agricultural bias was highest in Japan, Iceland, the Republic of Korea, Norway and Switzerland.[27]

Support differs significantly across products, and individual export products continue to receive significant support by individual countries (Anderson et al., 2013). Some products experience high support in almost all countries. This is notably the case for sugar, rice and milk. For other products, support is high in developed economies but

highly negative in developing countries. This is above all the case for cotton. Products experiencing relatively low support in all countries include feed grains and soybeans, pork and poultry (Anderson et al., 2013).

(c) Food standards, regulations and procedural obstacles

Standards and regulations are prominent policy tools in the agricultural sector and they are often meant to guarantee the safety of human and animal health. Information on SPS notifications to the WTO and on certification issued by GlobalGAP – Global Good Agricultural Practice, a non-governmental organization that sets voluntary standards for the certification of agricultural products – is reported in Figure D.17. It suggests that the number of standards in international food trade has increased in recent years. There also appears to be agreement that the complexity of standards has increased (Gibbon and Lazaro, 2010).

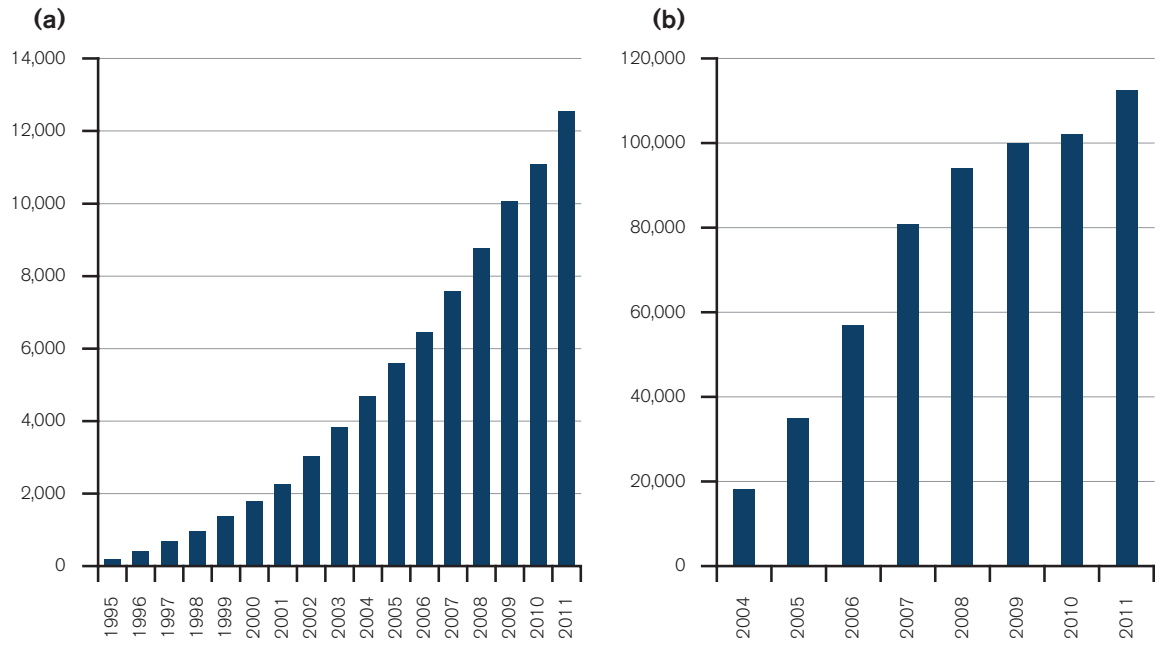
According to evidence from business surveys conducted by the International Trade Centre (ITC), agricultural exports are disproportionately affected by non-tariff measures (NTMs), such as SPS measures. In the 11 countries covered by the surveys, 53 per cent of surveyed businesses indicated that they were negatively affected by NTMs or related obstacles to trade.[28] This percentage was higher for businesses in the agricultural sector (60 per cent) and lower among manufacturing firms (51 per cent).

Although non-tariff measures exist to pursue valid policy objectives, they can seriously hamper trade. Costs can arise through a variety of channels. Meeting foreign standards or regulations can, for instance, increase production costs for exporters, in particular if foreign measures differ from those applied at home (Jansen, 2010; WTO, 2005; 2012; Ferro et al., 2013). Additional costs arise from the fact that exporters often need to be able to prove that their products actually meet foreign standards. Related certification procedures can be prohibitively costly, in particular for exporters from developing countries.[29]

Additional production and certification costs may arise both in the case of public standards or regulations and in the case of voluntary private standards. The latter can have an important influence on trade flows, in particular if they are applied by well-positioned NGOs or by major players in the distribution channels in the destination market. While the nature of the costs involved with complying with standards is by now well understood, little is known about the size of compliance costs. Only a few studies have attempted to estimate compliance costs empirically, and their estimates vary widely.[30]

Private (voluntary) standards are developed by a number of entities, including companies, non-governmental standardizing bodies (such as regional or international bodies), certification and/or labelling schemes (e.g. the Marine Stewardship Council scheme) and sectoral associations (e.g. Florverde for flowers) (WTO, 2012) (see Box D.4). Standards tend to be set to ensure a certain level of quality or to ensure compatibility with existing standards. In markets characterized by a limited number of active purchasers,[31] however, standards can be used to leverage the market power of purchasers (WTO, 2012).

Figure D.17: **Panel (a) Number of new SPS notifications to the WTO, 1995–2011**
Panel (b) Number of GlobalGAP certified producers, 2004–11



Sources: WTO Secretariat (http://www.wto.org/ accessed in 2011) and GlobalGAP (http://www.globalgap.org/ accessed in 2011).

Quantitative research has shown that regulatory measures applied by OECD countries can significantly reduce developing countries' exports to OECD countries but do not necessarily affect trade between OECD members (Disdier et al., 2008). On the other hand, there is evidence that increased standards introduced through multinationals investing in developing countries may contribute to increased trade for these countries and significant poverty reduction effects (Maertens et al., 2011). Also, Kadigi et al. (2010) find positive effects of standards for the fishery sector in East Africa.

The seemingly contradictory evidence about the effects of standards on trade can be explained in the following way. Meeting a standard implies costs but adhering to higher standards may also make it easier to conquer new market segments and/or to benefit from the higher prices attached to products meeting higher standards. The lower the cost of meeting the standard and the higher the return from meeting the standards – in terms of higher sales or higher prices – the more likely it is that the benefits from adhering to standards is positive.

Existing evidence suggests that positive outcomes are more likely in cases where suppliers have a medium- to long-term relationship with their buyers. Iacovone et al. (2011) describe the advantages that Mexican suppliers have from linking up with the retailer Walmart. The retailer requests suppliers to meet certain product and process standards and to accept very competitive market prices. On the other hand, the retailer significantly decreases transaction costs for the suppliers and makes it possible for them to supply markets nationally while producing locally. Iacovone et al. (2011) show that this arrangement is very profitable for suppliers that are relatively productive and that find it relatively easy to meet standards. The direct link to the retailer thus contributes to a process that ultimately leads to increased productivity in the relevant market segment.

Similar evidence exists for cases where suppliers sell inputs into downstream production processes, notably where the buyer of the inputs is a multinational. In these cases, part of the costs of meeting higher standards is borne by the foreign multinational, which has an implicit role in transmitting new technological know-how.

In cases where the types of private sector linkages described above do not exist, technical assistance can contribute to overcoming the costs of meeting standards or to facilitating access to foreign markets for products meeting standards. Box D.5 provides an example of a relevant technical assistance project.

Another type of fixed cost that can have a significant impact on export and import flows is costs occurring at the border. Some of these costs stem from administrative processes linked to the certification of standards or regulation. Other costs simply stem from administrative or logistical processes related to the importing or exporting of goods in general. To the extent that such processes take time, they can significantly hamper exports or imports, in particular for time-sensitive products such as fresh fruit and vegetables or flowers. The United States Agency for International Development (USAID) (2007) estimates that even for less perishable crops, such as cereals, each day of delay from harvest to market corresponds to a 0.8 per cent tariff equivalent.[32] Liapis (2011) finds that measures that reduce time delays in crossing borders also have a significant effect on the export performance of processed agricultural goods. Measures reducing time spent at borders can notably take the form of computerizing relevant operations and combining this with the training of relevant staff (Kiriti, 2014).

(d) Capturing mark-ups and influencing policy-making

The presence of economies of scale in different segments of the food chain has led to situations where individual segments are dominated by a few companies, often large multinational agro-enterprises. Concentration of market power is, for instance, present at the beginning of chains where the provision of inputs, such as pesticides or seeds, is dominated by a few players. The World Bank (2007) reports that in 2004 the four top providers of agrochemicals held 60 per cent of the global market. In the case of seeds, the top four providers held 33 per cent of the market. Similar levels of concentration can be observed towards the end of the chain.

The World Bank (2007) reports that the top four international traders of coffee held a market share of 40 per cent and the top four coffee roasters a share of 45 per cent. This implies that nearly half of the coffee produced by an estimated 25 million farmers and farm workers is channelled through only four companies before reaching an estimated 500 million consumers. This reflects one reason why the share of the retail price retained by producers is often relatively small and why the revenue of producers does not necessarily move in parallel with price fluctuations at the retail end.

One way to strengthen the bargaining position of small and medium-sized suppliers within global value chains is to create producer organizations. Producer organizations can also play a role in influencing policy-making, including trade policy-making (World Bank, 2007). In many countries, smallholders only influence trade policy-making indirectly through the agricultural ministry while large landowners and agro-businesses have direct access to the trade ministries (Cheong et al., 2013). Organizations grouping together smallholders find it easier to directly influence trade policy-making. Examples even exist of efforts to create

Box D.4: **Asparagus export sector in Peru**[33]

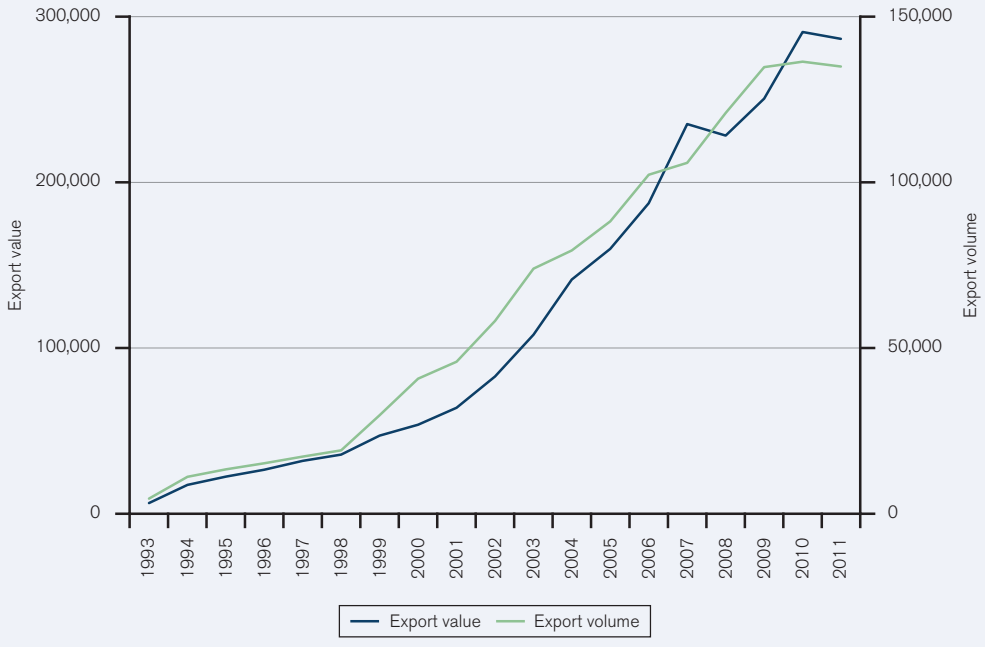
Peru is the largest exporter of fresh asparagus worldwide. The sector currently accounts for about 25 per cent of the country's total agricultural exports. More than 220,000 tons of asparagus are produced yearly. There is no domestic market for asparagus so 99 per cent of production is exported, of which 70 per cent is fresh produce and mainly sent to the United States and the European Union.

Asparagus exports from Peru have increased tremendously in the past decades, from 4,590 tons with a value of US$ 6.4 million in 1993 to 134,992 tons with a value of US$ 286.5 million in 2011 (see Figure D.18). The number of firms exporting each year has tripled, from around 40 firms at the end of the 1990s to almost 120 firms in 2006, and has stabilized at around 100 firms per year since 2006 (see Figure D.19). A variety of private standards – including GlobalGAP (Global Good Agricultural Practices), HACCP (Hazard Analysis and Critical Control Points), BRC (British Retail Consortium), LEAF (Linking Environment And Farming), IFS (International Featured Standards), GMP (Good Manufacturing Practices), SQF2000 (Safe Quality Food 2000) – have been established in the sector since the early 2000s.

With the spread of private standards, the export volumes and values have continued to increase. Yet, this does not necessarily imply that private standards have had a positive effect on export volumes. Certified firms are observed to export larger volumes and values but they were already doing so before they became certified. It is the best-performing companies that seek certification and this can be confounded with certification having an impact on the export performance of companies.[34]

However, certification in line with private standards has had an effect on the sourcing strategies of export companies. Certified export firms currently source less from smallholder producers (1.5 per cent) than do non-certified firms (25 per cent). Before becoming certified (in 2001), instead, export firms sourced more from smallholder producers (20 per cent). The evidence reported in these studies therefore suggests that certification in line with private standards, especially production standards such as GlobalGAP, has decreased sourcing from smallholder suppliers in the case of asparagus exports from Peru (see Figures D.20 and D.21).

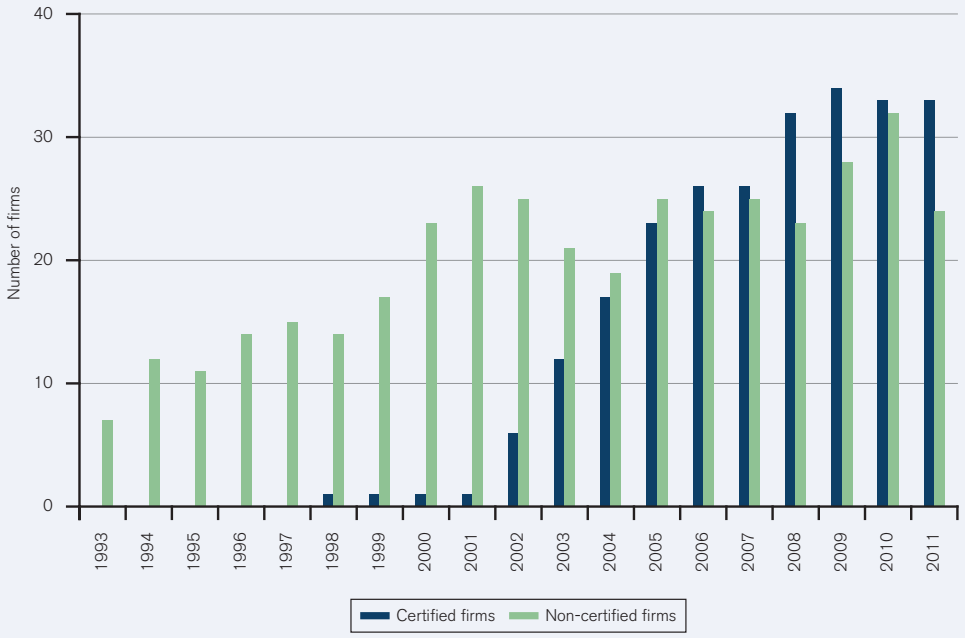
Figure D.18: **Evolution of fresh asparagus export volumes and values, 1993–2011**
(US$ thousands and tons)



Source: Authors' calculation based on SUNAT custom data, Peru.

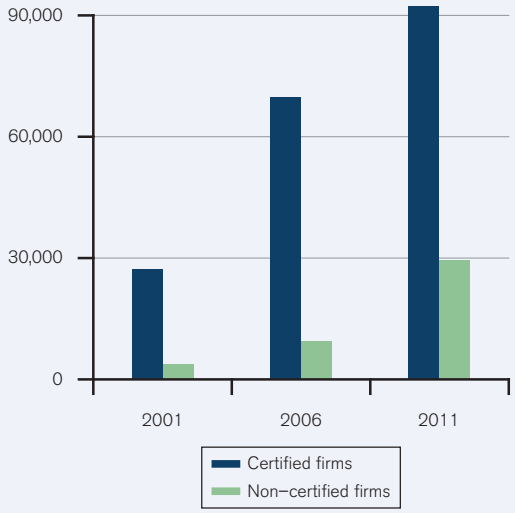
Note: Population of 567 export firms over 1993-2001.

Figure D.19: **Evolution of the number of certified and non-certified export firms, 1993–2011**



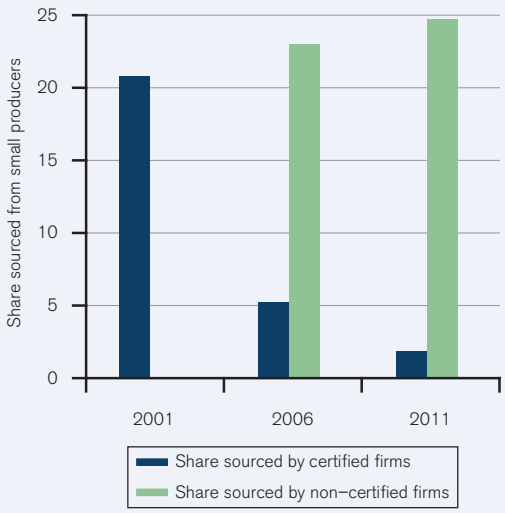
Source: Authors' calculation based on SUNAT and survey data.
Note: Sample of 87 export firms over 1993-2011.

Figure D.20: **Export volumes of currently certified and non-certified firms**
(tons)



Source: Authors' calculation based on SUNAT and survey data.
Note: Sample of 66 export firms exporting in 2011.

Figure D.21: **Sourcing from small producers for currently certified and non-certified firms**
(per cent)



Source: Authors' calculation based on SUNAT and survey data.
Note: Sample of 66 export firms exporting in 2011.

alliances between trade unions and small farmers' organizations in order to strengthen the bargaining position of vulnerable populations in rural areas. An example of such an alliance – and the largest of this nature – is the Confederação dos Trabalhadores na Agricultura (CONTAG) in Brazil (ILO, 2008).

(e) Dealing with price volatility

Commodity prices are notoriously volatile, as discussed in Section D.1. Price volatility is a major challenge for both producers and consumers. For producers, it is difficult to take investment decisions in an environment of volatile

Box D.5: **Access to European markets for Central American agrofood exports**

Agro-food exporters in a number of Central American countries face three main challenges in connecting to global value chains, according to the Centre for the Promotion of Imports from developing countries (CBI) (2014). These challenges are to identify products with export potential, to meet relevant product standards and to establish access to the relevant supply or retail chains.

The Centre's technical assistance activities have helped to address these challenges in the following ways:

1) To identify products with export potential, first research was undertaken. Products with high export potential for European markets were identified as tropical fruit (including avocado, mango, pineapple, banana, rambutan and berries), processed fruits and ingredients (including fruit juice, fruit pulps and concentrates) and honey, sesame seed, peanuts and spices.

2) To help exporters meet relevant product standards, technical assistance was provided in the form of coaching and support for businesses and business support organizations. For the identified products with export potential, compliance with food safety protocols is typically a minimum requirement. Furthermore standards certifying sustainable production and Corporate Social Responsibility play an important role.

3) To help exporters establish access to the relevant supply or retail chains, assistance has focused on the development of branding and marketing strategies at the national level and supporting individual exporters in attending European trade fairs relevant for their products.

prices, in particular in the case of crops that have a relatively lengthy gestation period.[35] For consumers, volatile prices are above all a problem when prices are high, as was the case at the end of the 2000s. Poor households typically spend a large share of their income on food, and high food prices can have severely negative impacts on these households, as discussed above. This explains why concerns about food security were at the forefront of the political debate during the Great Recession of 2008-09, as reflected, for instance, in the establishment of the High Level Panel of Experts on Food Security and Nutrition (HLPE) as the science-policy interface of the UN Committee on World Food Security (CFS).

Different policy instruments exist to deal with price volatility. The High Level Panel of Experts on Food Security and Nutrition (HLPE) (2011) distinguishes between two types of measures that aim at reducing the impact of price volatility: measures to manage price volatility and measures to cope with price volatility. In addition, measures can be designed to work through the market and mainly private actors, through direct state interventions or through and with civil society.

Measures to cope with price volatility include emergency loan programmes for producers or consumers and social protection schemes for vulnerable households (e.g. cash and food benefits and school feeding programmes). Measures to manage price volatility include financial products (e.g. crop insurance) and investments in agriculture, notably to stabilize food production through diversification and the resilience of food systems (HLPE, 2011).

In periods of increased concern about food security, as experienced at the end of the 2000s, governments often intervene directly in markets, with the objective of reducing prices and price volatility. Governments may, for instance, use food tariffs or taxes in a "counter-cyclical" way, which would involve decreasing taxes or tariffs when international prices increase. Such policies, however, affect governments' budgets. Quantitative measures include the use of export restrictions. Governments that hold public stocks may consider releasing those when food prices are high.

All of these policies have the potential to affect international markets. Evidence notably suggests that if countercyclical measures are introduced jointly by net importers and net exporters, price hikes may actually be exacerbated. Indeed, if governments restrict exports in net-exporting countries and subsidize consumption in net-importing countries, this is likely to increase excess demand globally and lead to further price increases (Anderson et al., 2013). Giordani et al. (2012) have, for instance, shown that countercyclical measures in the form of export restrictions contributed significantly to the food price increases observed in 2008-10. In this context it has been argued that predictability and stability of policies are likely to be key in order for prices not to overshoot significantly in periods of price volatility (see, for instance, World Economic Forum (WEF), 2014).

4. Trade in natural resources and development: challenges and opportunities

This section begins by analysing recent trends in trade in natural resources. It highlights that it increased significantly in volume terms, and even more significantly in value terms, between 2000 and 2008 and then again after the 2008

slump. The share of fuel and mining products in global manufacturing exports has increased therefore, especially in regions such as Sub-Saharan Africa and Latin America and the Caribbean.

Countries in these regions have experienced noticeable economic growth during the years of sustained resource price increases. The question is, however, whether resource-based growth can be sustained and translated into positive development outcomes. A series of policies can potentially underpin resource-based development. These are analysed in the second part of the section and include policies to harness windfall revenues, diversification policies, FDI policies, and policies to address social and environmental concerns.

(a) Trade in natural resources: recent trends

Trade in natural resources increased significantly between 2000 and 2010, notwithstanding the slump in 2008, as shown in Figure D.22. Trade rose not only in value terms (an unsurprising result, given large price increases up to the 2008 crisis) but also in terms of volume.

Mostly because of rising prices (at least until 2008), the share of fuels and mining products in world merchandise exports increased from 13.2 per cent in 2000 to 22.7 per cent in 2012. Manufactured goods still make up the bulk of world merchandise exports but their share decreased from 72.5 per cent in 2000 to 62.4 per cent in 2012 (see Figure D.23).

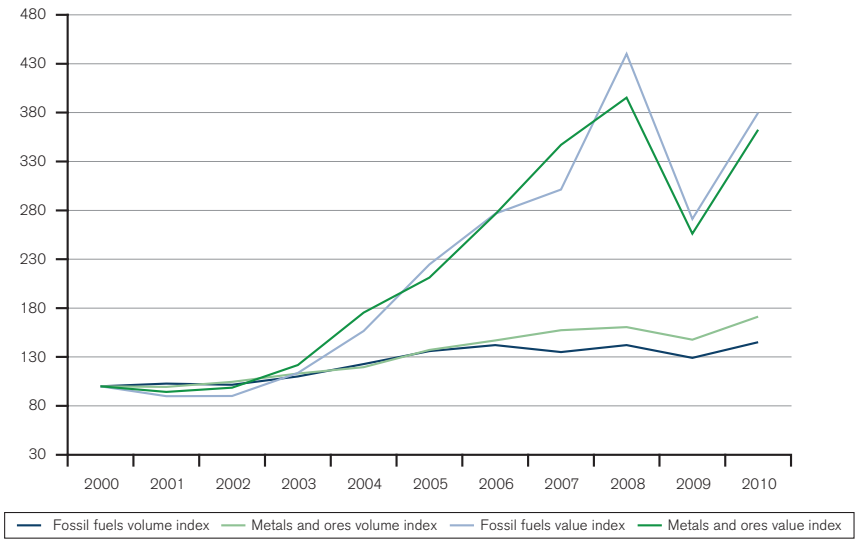
Dobbs et al. (2013a) define "resource-driven countries" as those economies where the oil, gas and mineral sectors play a dominant role, using three criteria: (1) resources account for more than 20 per cent of exports; (2) resources generate more than 20 per cent of fiscal revenue; or (3) resource income is more than 10 per cent of economic output. According to their estimates, the number of resource-driven countries increased from 58 in 1995 (representing a share of 18 per cent of global GDP) to 81 in 2011 (with a share of 26 per cent of global GDP). In regions such as Sub-Saharan Africa and Latin America and the Caribbean, the share of fuels and mining products in total merchandise exports increased significantly (see Figure D.24).

For countries and regions with high shares of natural resources in exports, fiscal revenue or economic output, the question is whether specialization in natural resource sectors can be an engine of growth and development.

(b) Can the "natural resource curse" be made history?

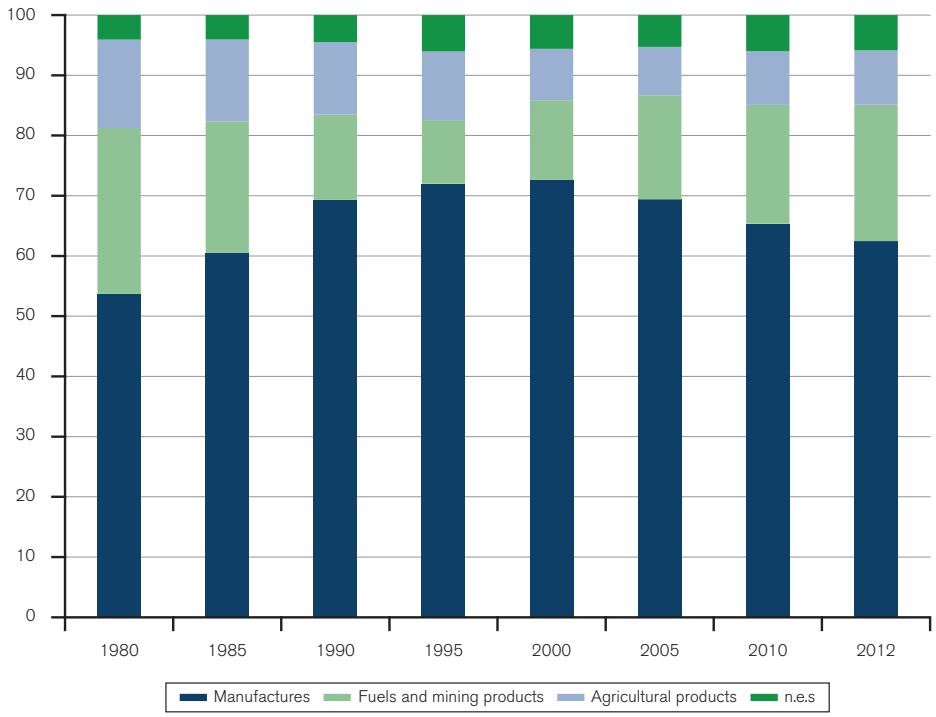
The idea that there is a "natural resource curse" is common. The WTO (2010) identifies three transmission channels for the resource curse: (1) the "Dutch disease"; (2) adverse effects on institutional determinants of growth; and (3) civil conflict. First, the Dutch disease occurs when an increase in revenues from natural resources de-industrializes a nation's economy by raising the real exchange rate, making the manufacturing sector less competitive. Secondly, resource dominance may hamper growth in the presence of weak institutions, such as badly defined property rights, poorly functioning legal systems, and weak rule of law, or it may itself contribute

Figure D.22: **Global trade in fossil fuels and metals and ores, volume indexes and value indexes (2000=100), 2000–10**
(million tonnes and US$ billion)



Source: Chatham House Resource Trade Database.

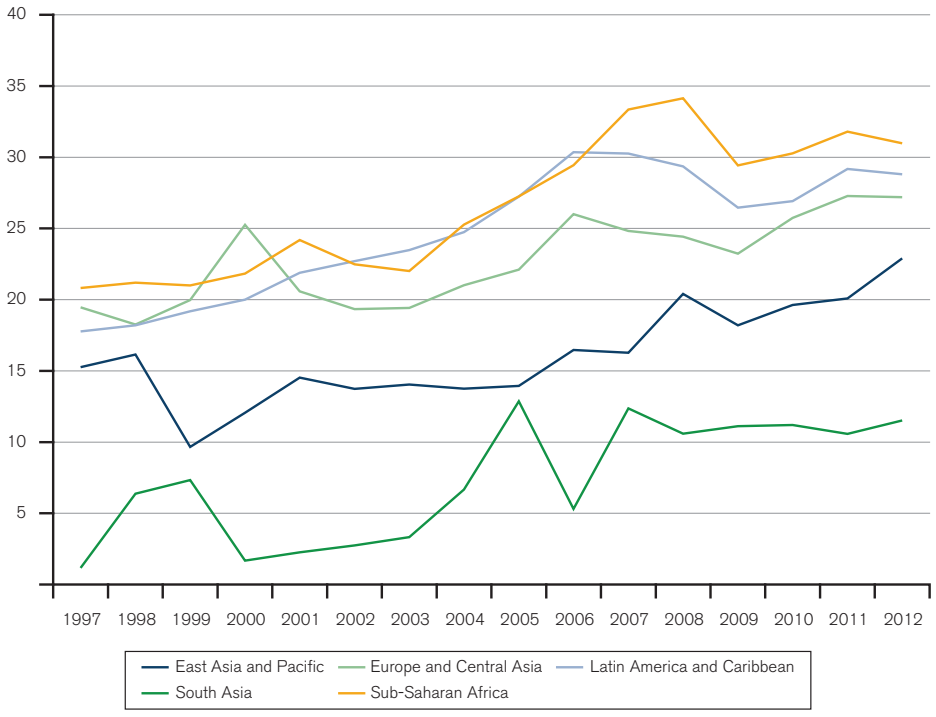
Figure D.23: **Share of product groups in world merchandise exports, 1980–2012**
(per cent)



Source: WTO Statistics Database.

Note: "n.e.s." stands for "not elsewhere specified".

Figure D.24: **Share of fuels and mining products in total merchandise exports, averages by region, 1997–2012**
(per cent)



Source: WTO Statistics Database.

to institutional worsening. Thirdly, natural resources may increase the probability of civil wars, especially in countries marked by an uneven distribution of natural resources within their territory and ethnic divisions.

As argued in WTO (2010), however, the empirical relevance of the resource curse is mixed.[36] On the one hand, greater natural resource wealth is associated with higher GDP per capita in a cross-country sample (Sinnott et al., 2010). On the other hand, almost 80 per cent of resource-driven countries identified by Dobbs et al. (2013a) have per capita income below the global average. Since 1995, more than half of these countries have failed to match the average growth rate (of all countries). These seemingly contradictory results also emerge from a recent study by Bluedorn et al. (2013). They analyse episodes of growth take-offs in nearly 70 developing economies or low-income countries (LICs) over the past six decades. The study reveals that resource-rich LICs with recent growth take-offs performed particularly well (with GDP per capita typically rising by 80 per cent in ten years) but at the same time many resource-rich countries did not manage to jump-start growth.

The sustained increase in natural resource prices in the early- and mid-2000s documented in Section D.1 has, without any doubt, contributed to economic growth in several resource-rich developing countries, especially in Sub-Saharan Africa and in Latin America. Since 2000, resource exporters in Sub-Saharan Africa have experienced higher GDP per-capita growth than other countries in the region (International Monetary Fund (IMF), 2012c).[37] According to the IMF analysis, the stronger growth reflects not only favourable commodity-price developments but also the effects of new resource discoveries (for example, in Angola, Equatorial Guinea and Tanzania). For Latin America, *The Economist* (2010) suggests that the rise in world prices of commodities, and the related increase in their output (and exportation), may have accounted for between one-third and one half of the region's growth over the decade 2000-10.

Natural resource abundance, however, has not been the only route to strong and sustained growth in these regions. In a recent study, the IMF (2013a) identifies the top six growth performers in Sub-Saharan Africa between 1995 and 2010 based on two criteria: real output growth greater than 5 per cent and real GDP per capita growth of more than 3 per cent. The following countries meet these criteria: Burkina Faso, Ethiopia, Mozambique, Rwanda, Tanzania and Uganda. None of these countries was resource-rich at the beginning of the sample period.[38] In these countries, growth was spurred and sustained by improved macroeconomic management, stronger institutions, increased aid and higher investment in both physical and human capital (IMF, 2013a). High prices of natural resources played an indirect role, with some of these countries (especially Mozambique) having received large investments related to discovery of natural resources.

Some countries have managed to translate growth into broad-based prosperity (Dobbs et al., 2013a). The relationship between natural resource dependence and broad measures of social development, such as health and education, is however a source of concern. Figure D.25 shows the correlation between natural resource abundance (proxied by total natural resources income as a percentage of GDP) and the Human Development Index (HDI), which uses statistics on life expectancy, education and income to rank countries.[39] The correlation is negative, meaning that growing dependence on natural resources is associated with declining levels of health and education.

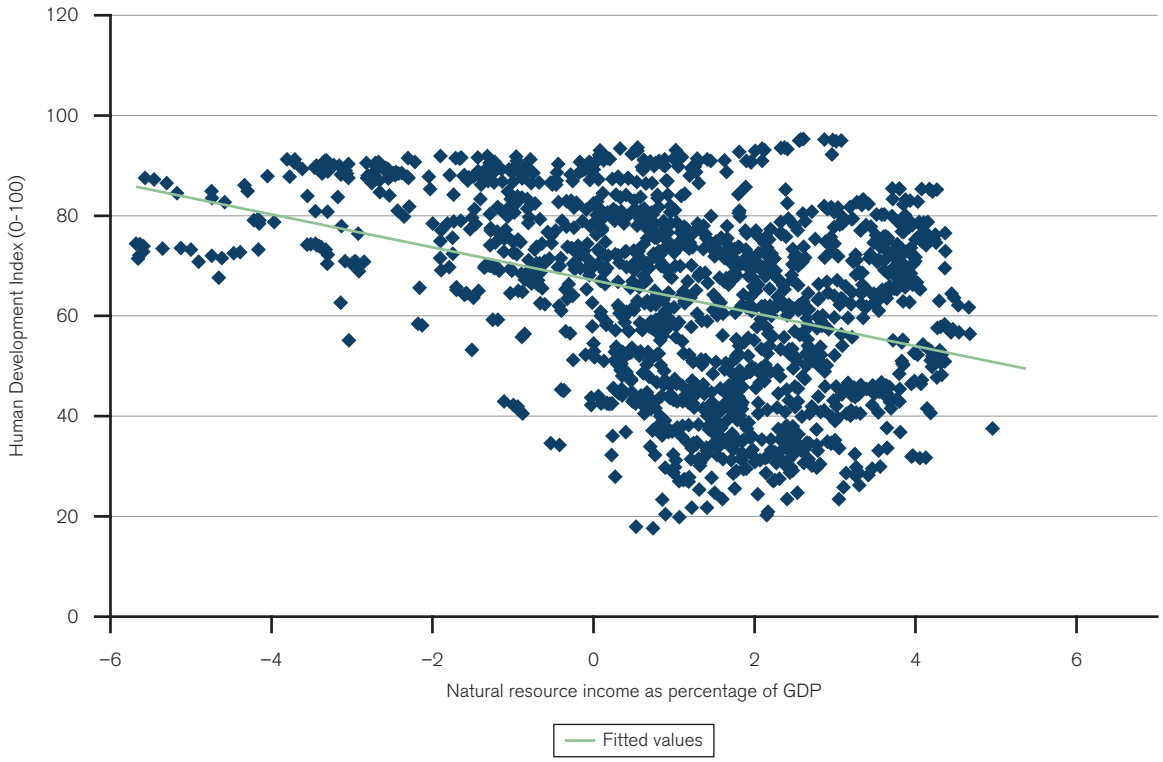
The empirical literature has consistently found that social development is, on average, lower in resource-rich countries. Carmignani and Avom (2010) argue that, after taking per-capita income and other macroeconomic and institutional factors into account, a higher dependence on primary commodity exports is negative for social development. A similar result is obtained by Bulte and Damania (2005), who find that countries with a greater reliance on point resources (i.e. resources such as oil and gold with a single identifiable source) perform worse than others. With all other things being equal, they have lower HDI scores and life expectancy, and higher percentages of the population suffer from undernourishment or lack of access to safe water. Resources from diffuse sources (e.g. agricultural products) are conversely associated with improvements in levels of health and education. The IMF (2012b) further supports the view that faster growth, at least in the oil producers, does not necessarily translate into faster improvements in aggregate social welfare (measured by various indicators, such as HDI, youth literacy rate, infant mortality, measles immunization, primary school attendance) in Sub-Saharan Africa.

The question of whether natural resources can be leveraged to sustain broad-based development remains therefore open. The remainder of this section considers several challenges faced by resource-abundant countries in the implementation of a resource-based development strategy. Not only the economic but also the social and environmental aspects will be analysed.

(i) Harnessing revenues and avoiding boom-bust cycles

Both in the metals and mineral sectors and in the energy sectors, rising prices have led to increased exploration efforts in several countries. Mining investments have increased more than fourfold over the past decade, to around US$ 80 billion, with iron ore and copper dominating. Exploration and development expenditure by the 70 largest global companies in the oil sector increased from US$ 315 billion in 2007 to US$ 480 billion in 2011 (Africa Progress Panel, 2013). Accordingly, Lee et al. (2012) report growth in reserves between 2000 and 2010 of 21 per cent for iron ore, 13 per cent for potash,

Figure D.25: **Correlation between log of natural resource income (as percentage of GDP) and Human Development Index (1990–2010)**



Source: WTO Secretariat estimations based on World Development Indicators (WDI) and United Nations Development Programme (UNDP) data.
Note: Each point represents a country-year observation.

21 per cent for bauxite, 103 per cent for copper, 32 per cent for zinc, 38 per cent for nickel and 10 per cent for rare earths.[40] According to OPEC data (Organization of the Petroleum Exporting Countries (OPEC), 2013), proven oil reserves worldwide increased by 27 per cent between 2002 and 2012, corresponding to a 12 per cent increase in the ratio of reserves to production.

The pace and intensity of new discoveries have been particularly intense in Africa, where, since 2000, drilling has increased threefold and the ratio of proven oil reserves to production has increased from 30 to over 40 per cent (Africa Progress Panel, 2013). Oil and natural gas exploration has increased both in traditional West African producers, such as Angola and Nigeria, but also in East Africa. It is estimated that the coastal areas of the Indian Ocean could hold more oil than the known reserves of the United Arab Emirates and the Bolivarian Republic of Venezuela. Due to under-exploration so far, the success rate of new explorations is exceptionally high in East Africa, and the exploration and development costs exceptionally low, at US$ 6-14 per barrel (Africa Progress Panel, 2013).[41] A similar pattern holds for mineral resources, in particular iron ore, with increased exploration especially in West Africa.

Increased exploration and exploitation of natural resources implies large potential revenue windfalls. Governments face a number of policy options in making productive use of such windfalls.[42] The commonly held view is they should not be consumed immediately but put in a fund, typically a sovereign wealth fund (see Box D.6), to spread the benefits across generations and deal with the otherwise adverse effects of the Dutch disease and the resource curse (Van der Bremer and Van der Ploeg, 2013). The optimal policy is, however, dependent on factors such as the price volatility of the resource in question, the level of development of the country and the broader constraints faced by the economy. Van der Ploeg and Venables (2011) examine policy options for a country experiencing a pre-announced windfall in oil revenues, lasting between T_0 and T_1 (see Figure D.26).

A possible strategy would be to consume the revenue as it comes in, so that the increment in consumption is equal to the revenue flow (green line in the figure). Under the permanent income hypothesis (PIH), however, the optimal policy would be the spreading of consumption over a number of years, as indicated by the PIH dashed line. This involves borrowing ahead of the revenue flow, then during the period of flow first repaying debt and subsequently accumulating assets in a sovereign wealth fund. After the windfall, the interest on the wealth fund pays for the permanent increase in public spending and private consumption. There is

Table D.7: **Assets held by sovereign wealth funds (SWFs), 2012**
(US$ billion and percentage of GDP)

Country	Year started	Origin	Assets (US$ billion)	GDP (US$ billion)	Assets (% of GDP)
China	1997	Non-commodity	1,142.0	8,227.1	13.9%
United Arab Emirates	1976	Oil	803.2	383.8	209.3%
Norway	1990	Oil	611.0	500.0	122.2%
Saudi Arabia, Kingdom of	n/a	Oil	532.8	711.0	74.9%
Singapore	1974	Non-commodity	404.7	276.5	146.4%
Kuwait, the State of	1953	Oil	296.0	183.2	161.5%
Hong Kong, China	1993	Non-commodity	293.3	263.3	111.4%
Russian Federation	2008	Oil	149.7	2,014.8	7.4%
Qatar	2005	Oil	100.0	192.4	52.0%
Australia	2006	Non-commodity	80.0	1,532.4	5.2%
United States	1854	Oil/Minerals/Non-commodity	79.0	16,244.6	0.5%
Kazakhstan	2000	Oil	58.2	203.5	28.6%
Algeria	2000	Oil	56.7	205.8	27.6%
Republic of Korea	2005	Non-commodity	43.0	1,129.6	3.8%
Malaysia	1993	Non-commodity	36.8	305.0	12.1%
Azerbaijan	1999	Oil	30.2	66.6	45.3%
Brunei Darussalam	1983	Oil	30.0	17.0	176.9%
Ireland	2001	Non-commodity	30.0	210.6	14.2%
France	2008	Non-commodity	28.0	2,611.2	1.1%
Iran	1999	Oil	23.0	552.4	4.2%
New Zealand	2003	Non-commodity	15.9	171.3	9.3%
Canada	1976	Oil	15.1	1,779.6	0.8%
Chile	2007	Copper	15.0	269.9	5.6%
Brazil	2008	Non-commodity	11.3	2,252.7	0.5%
East Timor	2005	Oil and Gas	9.9	1.3	765.7%
Bahrain, Kingdom of	2006	Non-commodity	9.1	30.4	30.0%
Oman	1980	Oil and Gas	8.2	78.1	10.5%
Total			**4,977.1**		
Total oil- and gas-related			**2,789.0**		

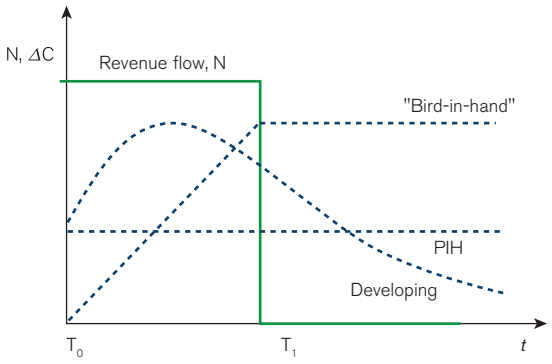
Source: Sovereign Wealth Fund Institute and World Development Indicators. (WDI).

Note: Canada: Alberta; United States: Alaska, New Mexico and Texas; United Arab Emirates: Abu Dhabi and Dubai. If a country has more than one fund, the column "Origin" is the earliest year and the column "Assets (US$ billion)" is the sum of the assets of each fund.

a third, more conservative approach, which is to build up a sovereign wealth fund and only consume its interest, generating a consumption profile represented by the "bird-in-hand" dashed line. Under this approach, consumption would build up more slowly than under the PIH approach, as it would reach its maximum only after the resource has been depleted.

For countries with under-developed capital markets and high sovereign borrowing costs, however, Van der Ploeg and Venables (2011) show that the optimal strategy implies: (1) an immediate increase in consumption, to raise incomes of the present generation, which is poorer than future generations; (2) investment in domestic assets (physical infrastructure and human capital); and (3) some repayment of foreign debt, to reduce interest rates in the domestic economy. This generates the hump-shaped consumption path in Figure D.26. The initial increment to consumption is balanced with the

Figure D.26: **Paths of consumption growth after a resource windfall**



Source: Van de Ploeg and Venables (2011).

Note: The horizontal axis represents time. The vertical axis represents the revenue flow (N) and the change in consumption, ΔC.

Box D.6: **Sovereign wealth funds**

There are two main origins of funding for sovereign wealth funds (SWFs): resources such as oil, gas and copper; and financial non-commodity sources. The focus of this box is on resource-backed SWFs.

If natural resources generate a substantial stream of income, resource-rich countries will often channel this into their newly established SWFs. As already highlighted, these funds are created not only to stabilize the economy and to support intergenerational savings but also to boost domestic investment, mainly in infrastructure. Even though SWFs are a relatively recent phenomenon, they have managed to accumulate significant reserves. In 2012, the average amount of assets in SWFs of an oil-rich country was above 100 per cent of the country's GDP, as shown in Table D.7.

Some African countries have developed explicit fiscal frameworks aimed at saving resources for the future or creating a fiscal "buffer" to help protect budget spending from revenue volatility. Since 1994, fiscal policy in Botswana has been guided by a Sustainable Budget Index principle, which seeks to ensure that non-investment spending is financed only with non-resource revenue. Nigeria created a SWF in 2011. Ghana put 70 per cent of petroleum revenue revenues into public spending and divided the rest between a stabilization fund and a heritage fund.

Investment in social protection is one of the most powerful ways in which governments in Africa can extend the benefits of resource wealth to their citizens. The United Nations Educational, Scientific and Cultural Organization (UNESCO) (2012) estimates that increased revenue from minerals could put another 16 million children into school across 17 resource-rich countries. In Rwanda, much of the rapid decline in poverty, from 57 per cent of the population in 2006 to 45 per cent in 2011, results from the Umurenge Programme of Public Works and from government payments to the poor. During the 2011 drought in East Africa, Ethiopia's Productive Safety Net Programme not only saved lives but also provided support to help people cope with the crisis without having to sell off vital productive assets or take children out of school.

need to finance infrastructure and debt reduction. Higher investment puts the economy on a higher growth path, with beneficial effects on wages and on subsequent consumption. After depletion, the consumption increment remains positive, but moves towards zero. This is because instead of building up an overseas sovereign fund, the resource wealth has been used to build up the human and physical capital stock of the economy, improving its growth prospects.

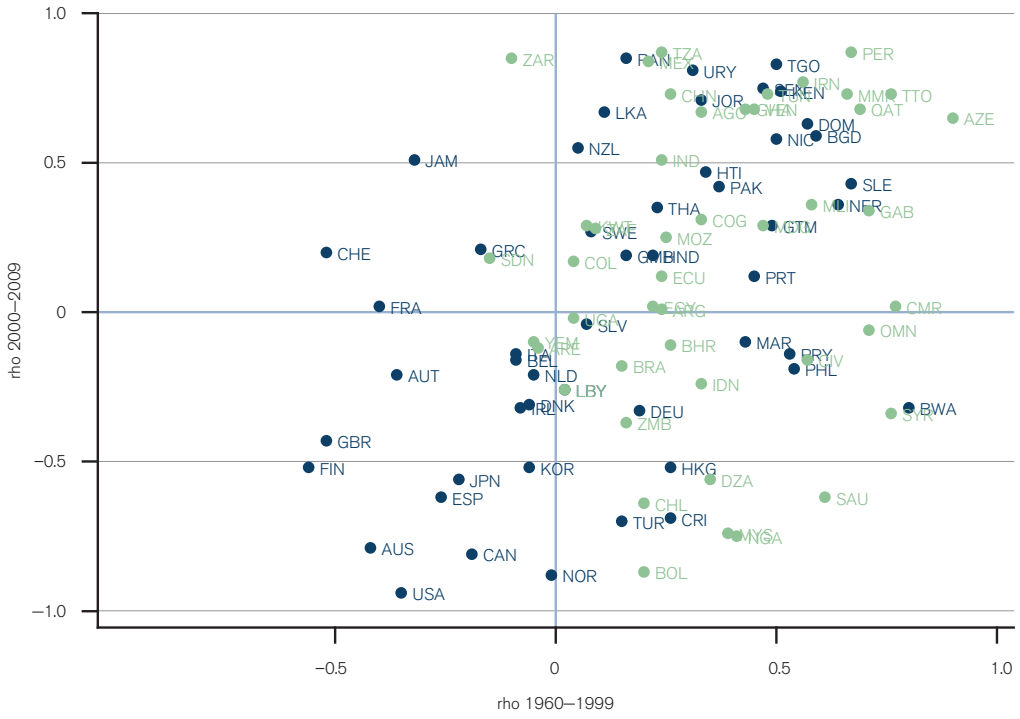
The results of Van der Ploeg and Venables (2011) suggest that the establishment of an intergenerational fund that would spread out the benefit of resource windfalls across generations is relatively more attractive for rich countries than for poor countries.[43] Resource-rich countries facing capital scarcity and paying a risk premium on their sovereign debt would instead find it more attractive to build a domestic investment fund (Van der Bremer and Van der Ploeg, 2013; Arezki et al., 2012). Such a fund would channel part of the windfall towards domestic investment in infrastructure, health and education. The important caveat, underlined both by Van der Bremer and Van der Ploeg (2013) and by Arezki et al. (2012), is that, if a country has limited capacity to utilize funding (due to planning and implementation lags, for example), there is a rationale for temporarily putting savings in a "parking fund" until capacity constraints are addressed.

As discussed above, natural resource sectors are subject to high volatility in prices. Since supply tends to remain constant despite fluctuations in prices, at least in the short run, this translates into high volatility in revenues. For this reason, Van der Bremer and Van der Ploeg (2013) and Cherif and Hasanov (2013) argue in favour of the establishment of a liquidity fund to accumulate savings that would help to protect exporters from price volatility. According to Van der Bremer and Van der Ploeg (2013), the size of such a liquidity fund is increasing with price volatility, with the degree of risk aversion of policy-makers, and with the size of the windfall revenue over time. Conversely, growth in the non-resource part of the economy curbs the need for precautionary savings in the liquidity fund.

Volatile commodity prices have often induced boom-bust cycles (Van der Ploeg, 2011). During the 1970s when commodity prices were high, several resource-rich countries used revenue as collateral for debt but during the 1980s commodity prices fell significantly, contributing to the onset of debt crises. At the root of boom-bust cycles is the link between surging resource revenue and increased spending levels (i.e. pro-cyclical spending), especially in countries with relatively weak institutional environments (Arezki et al., 2012).[44]

Cyclical fiscal policy was common in developing countries until the early 2000s. Since then, there has been a shift towards counter-cyclical fiscal policy in a large number of countries. Frankel et al. (2013) consider the cyclicality of government spending, measuring the correlation between the cyclical components of spending and GDP, in a sample of 94 countries (21 developed and 73 developing countries).[45] A positive correlation indicates

Figure D.27: **Fiscal policy of resource-rich developing economies, 1960–2009**



Source: Frankel et al. (2013) dataset.

Notes: "rho" indicates the correlation between the cyclical components of spending and GDP.

pro-cyclical (destabilizing) government spending. A negative correlation indicates counter-cyclical (stabilizing) government spending.

Between 1960 and 1999, more than 90 per cent of the developing countries in the sample show positive correlations (pro-cyclical spending) while around 80 per cent of industrial countries show negative correlations (counter-cyclical spending). The situation changes dramatically in the 2000-2009 period, when 26 out of 73 developing countries (around 35 per cent) show negative correlations (counter-cyclical spending). Frankel et al. (2013) argue that the main reason for this change in fiscal behaviour in developing countries is improvement in institutions (law and order, bureaucracy quality, levels of corruption, and other risks to investment). This is because institutional quality and cyclical spending are inversely correlated, meaning that as institutional quality increases, pro-cyclical spending declines.

Within the group of developing countries, resource-rich countries have followed a similar pattern to resource-poor countries. Using the dataset of Frankel et al. (2013) and defining resource-rich as those developing countries with total natural resource income (as per cent of GDP) above the median of developing countries between 1960 and 2009, we identify 45 resource-rich developing countries. Out of those, 16 (around 35 per cent) graduated from a pro-cyclical to a counter-cyclical fiscal policy (see Figure D.27).

The 45 resource-rich developing countries are indicated with green dots, all other countries are indicated with blue dots. Countries in the south-east quadrant graduated from pro-cyclical fiscal policy in the 1960-99 period to counter-cyclical fiscal policy in the 2000-09 period. Countries in the north-east (south-west) quadrant had pro-cyclical (counter-cyclical) fiscal policy in both periods. Countries in the south-west quadrant switched from counter-cyclical fiscal policy in the 1960-99 period to pro-cyclical fiscal policy in the 2000-09 period.[46]

(ii) Diversification

Diversification of the production and export structure has long been at the forefront of economic policy in most resource-rich countries. A very general rationale for diversification is that diversified economies tend to perform better over the long term (Hesse, 2008; Imbs and Wacziarg, 2003; Lederman and Maloney, 2007).[47] There are other rationales for diversification that apply in particular to economies that specialize in natural resources.

First, diversification towards non-natural resource sectors may be justified if: (1) these sectors are characterized by positive spillovers on the rest of the economy, such as learning-by-doing or knowledge spillovers; and (2) these sectors would shrink due to Dutch disease effects.[48] Secondly, diversification into other tradable goods/services becomes a prerequisite for sustained growth

if resource production is subject to quick depletion (Sustainable Development Solutions Network (SDSN), 2013), significant impact on the environment and technology shocks that threaten to eliminate or sharply reduce comparative advantage (Gelb, 2010).[49] Thirdly, diversification is called for in cases of substantial price volatility of the dominant natural resource (Sinnott et al., 2010; Cherif and Hasanov, 2013; Van der Bremer and Van der Ploeg, 2013).

Diversification can occur within the resources sector or in other sectors. Diversification within the resource sector can be of two types: horizontal and vertical (Hvidt, 2013). Horizontal diversification implies seeking new opportunities for high-value and high-quality varieties within product categories. Vertical diversification entails adding more stages of processing – for instance, in the case of an oil-producing country, developing capital-intensive fertilizer and petrochemical industries. Vertical diversification encourages upstream and downstream linkages in the economy (as the output of one activity becomes the input of another) and it entails a shift from one sector or industry (generally, the primary sector) to another (generally, secondary and tertiary sectors) (Hvidt, 2013). Diversification away from the natural resources sector, conversely, can entail the development of other productive sectors (including labour-intensive manufacturing) and tradable services.[50]

Advocates of diversification away from natural resources have often argued that the production of fuel and mineral products is carried out in enclaves, with little or no linkages with the rest of the economy. A prominent example is Rodrik (2013), who contrasts "natural resource enclaves" with "escalator industries". In Rodrik's view, the former are skill and capital intensive, and disentangled from the domestic economy. The latter are adept at absorbing technologies from abroad, they employ relatively unskilled workers, and they establish significant linkages with the domestic economy. A related argument is that natural resources production has a lower growth potential than other economic sectors because it carries little scope for innovation and productivity growth. While both critiques are valid in several contexts,[51] they cannot be applied generally. For instance, evidence on Peruvian gold mining shows the presence of extensive linkages through purchases of local labour and other inputs. Each 10 per cent increase in the mine's purchases is associated with a 1.7 per cent increase in local incomes, with a significant impact on alleviating poverty.[52]

In the presence of within-sector diversification, Sinnott et al. (2010) argue that the mining sector can generate a high degree of innovation and productivity growth. In particular, international trade in metals is associated with a high degree of intra-industry trade and with good potential to specialize in (and upgrade to) high-value, high-quality varieties within product categories (horizontal diversification). It is also associated with moving up the value chain to more processed products (vertical diversification).[53] Sinnott et al. (2010) estimate that much of the growth in sectoral exports of Latin American countries can be attributed to these countries moving towards production of more sophisticated and higher-value-added metal products. Diversification within the resource sector also carries the potential to alleviate the tendency to real exchange rate appreciation associated with resource windfalls (Beverelli et al., 2011).[54]

Each option for diversification has advantages and disadvantages, and there is no one-size-fits-all approach. Rather, the right kind of diversification that can (from a positive perspective) or should (from a normative one) be attained depends on sector- and country-specific characteristics. If the natural resource is subject to accelerated depletion, for instance, the only viable option might be diversification into other sectors rather than the development of a downstream industry. If the economic and institutional environment functions well, the incentives may favour quality upgrading and technological spillovers rather than enclave production (Sinnott et al., 2010).[55]

A final point concerns employment. As argued by UNCTAD (2013b), "where exports are based on natural resource extraction, the employment intensity of growth has been low. In countries whose tradable sector is dominated by export-oriented labour-intensive manufactures, by contrast, more jobs have been generated". This observation calls for particular emphasis on job creation in any diversification effort, be it within or away from natural resource sectors.

(iii) Foreign direct investment

Resource-seeking is, in principle, a motive for firms to be engaged in foreign direct investment (FDI) because natural resources are location-specific. Indeed, according to Dunning (1993), natural resources justified much of the FDI flows in the 1800s and early 1900s, largely from the most industrialized nations to the less developed areas of the globe. The exploration and extraction of natural resources is often conducted by foreign multinationals. Due to a combination of high commodity prices and concerns about the security of supply of critical resources, in recent years there has been a global surge in investment activity – including exploration – in resource sectors (see Section D.1).

Overseas investment activities by state-owned enterprises (SOEs) have received particular attention (Lee et al., 2012). Though accounting for only 11 per cent of global outward FDI in 2010, overseas investments by SOEs is concentrated in resource sectors (accounting for nearly two-thirds of overall FDI by SOEs). According to Lee et al. (2012), there has been a rapid increase of FDI by SOEs from G-20 developing economies, from 42 per cent of total SOE outflows in 2003 to 59 per cent in 2010.

While resource abundance unambiguously increases FDI in resource sectors, its effect on overall FDI is less clear. On the one hand, studies such as Sanfilippo (2010), Cheung et al. (2012) and Kolstad and Wiig (2012) find a positive effect of resource abundance on FDI. On the other hand, Poelhekke and van de Ploeg (2010) argue that resource-based FDI (which is positively affected by resource abundance) displaces non-resource-based FDI (which is negatively affected by resource abundance). Therefore, they argue, aggregate FDI is lower in resource-rich countries, especially if they are geographically close to many other big markets.

A potential risk is that resource-based FDI is very capital-intensive and can lead to fewer beneficial spillover effects into the non-resource sectors of the host economy than non-resource FDI if it relies less on local sub-contractors or suppliers. As argued above, the outcome in terms of spillover effects of resource FDI on the local economy is likely to depend on the economic and institutional environment. Moreover, recent experience in Sub-Saharan Africa shows that resource FDI has positive spillovers on physical infrastructure (Kaplinsky and Morris, 2009).[56] It can therefore lead to opening up growth corridors that can be beneficial to other sectors in the economy, such as agriculture (Weng et al., 2013).

There are several other FDI-related challenges facing resource-rich countries. First, there may be substantial differences in access to information between a government and a multinational oil or mining company, whereby the latter has better access to geological analysis, commercial market information, and information on technologies for exploration and extraction (Africa Progress Panel, 2013). To overcome such differences, the Sustainable Development Solutions Network (SDSN) (2013) proposes the establishment of competitive bidding mechanisms because they can reveal the market value of a host country's assets.[57]

Secondly, and related to the first, there is the "hold-up" problem, whereby a government may have an interest in renegotiating *ex post* the terms of a contract, and investors are likely to be deterred by the consequent risk. Since these changes (renegotiation or outright nationalization) are most likely to occur if outcomes are better than expected,[58] they have the effect of reducing the expected returns to investment, and the government will receive a lower payment in the initial auction of licences (Collier and Venables, 2010).[59] To address such hold-up problems, the Sustainable Development Solutions Network (SDSN) (2013) proposes the establishment of a tax regime that builds on contingencies such as changes in global commodity prices.

Thirdly, foreign investors in extractive industries tend to operate across jurisdictions and through complex company structures (Africa Progress Panel, 2013). The presence of offshore-registered companies in the ownership chain limits public disclosure requirements and creates opportunities for trade mispricing, aggressive tax planning and tax evasion. To address these problems, the Africa Progress Panel (2013) proposes: (1) the deepening of voluntary reporting standards, such as those embodied in the Extractive Industries Transparency Initiative (EITI);[60] (2) the establishment of mandatory reporting standards, such as those embodied in the 2010 US Dodd-Frank Act and in similar legislation recently approved in the European Union; and (3) enhanced multilateral tax cooperation.

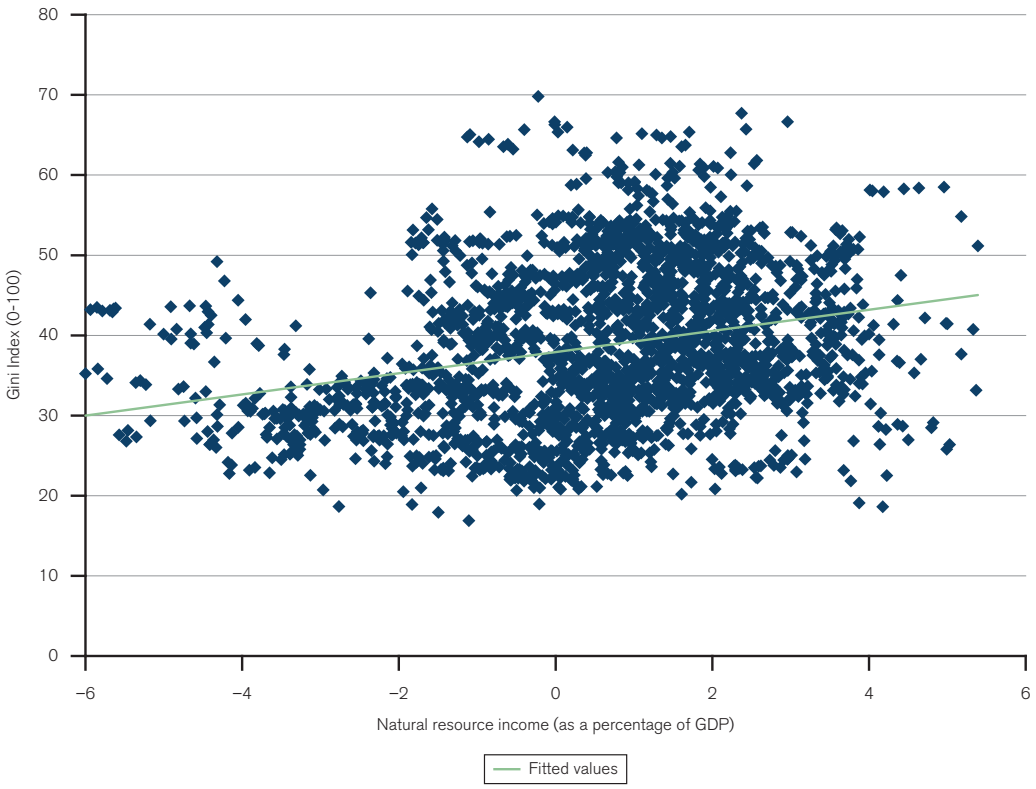
(iv) Addressing social and environmental concerns

The distribution of natural resource windfalls across the population is an important question in every country but it is particularly important in most developing countries in view of its role in poverty reduction. There is no consensus in the economic literature on whether natural resource wealth is associated with inequality. Davis and Vásquez Cordano (2013), for instance, find no support either for the claim that extraction-led growth is good for the poor or that it is bad for the poor. Goderis and Malone (2011) show that a rise in the prices of non-agricultural commodities lowers inequality in the same year but it has no impact on the long-run income inequality. In a study on commodity price shocks in Australia, Bhattacharyya and Williamson (2013) show that a sustained increase in the price of renewables (wool) reduces inequality whereas the same for non-renewable resources (minerals) increases inequality.

Across countries and years, the correlation between natural resource abundance (proxied by total natural resources income as a percentage of GDP) and inequality (proxied by the Gini index of income distribution) is positive, as shown in Figure D.28, suggesting that inequality increases in line with a country's abundance of natural resources. However, the correlation loses statistical significance in a regression controlling for general country- and year-specific factors.[61] The impact of natural resources on income inequality, therefore, is likely to depend on other country characteristics. Fum and Holder (2010) show that the degree of ethnic polarization matters. Natural resources raise income inequality in ethnically polarized societies but reduce income inequality in ethnically homogenous ones.

Natural resource-based industries commonly impose environmental harm. In the case of large-scale mining, there is degradation of the land surface and underlying strata as well as degradation of surface and underground water resources, both in the exploration and exploitation phases (Sinnott et al., 2010). In the case of small-scale mining, the major environmental problems are due to mercury escaping into the environment (Sinnott et al., 2010). Finally, in the case of oil production, the major environmental problems are related to waste pits contaminated with oil or drilling mud,[62] un-remediated spills, discharge of untreated produced water, installations

Figure D.28: **Correlation between log of natural resource income (as a percentage of GDP) and Gini index, 1990–2010**



Source: WTO Secretariat estimations based on World Development Indicators (WDI) and United Nations University – World Institute for Development Economics Research (UNU-WIDER) data.

Note: Each point represents a country-year observation.

decommissioned or abandoned without proper planning, and flaring of associated gas (Sinnott et al., 2010).[63]

The aggregated data show a negative correlation between natural resource abundance (proxied, as above, by total natural resources income as a percentage of GDP) and the Environmental Performance Index (EPI),[64] as shown in Figure D.29. This correlation stays negative, although it loses statistical significance after controlling for general country- and year-specific factors.

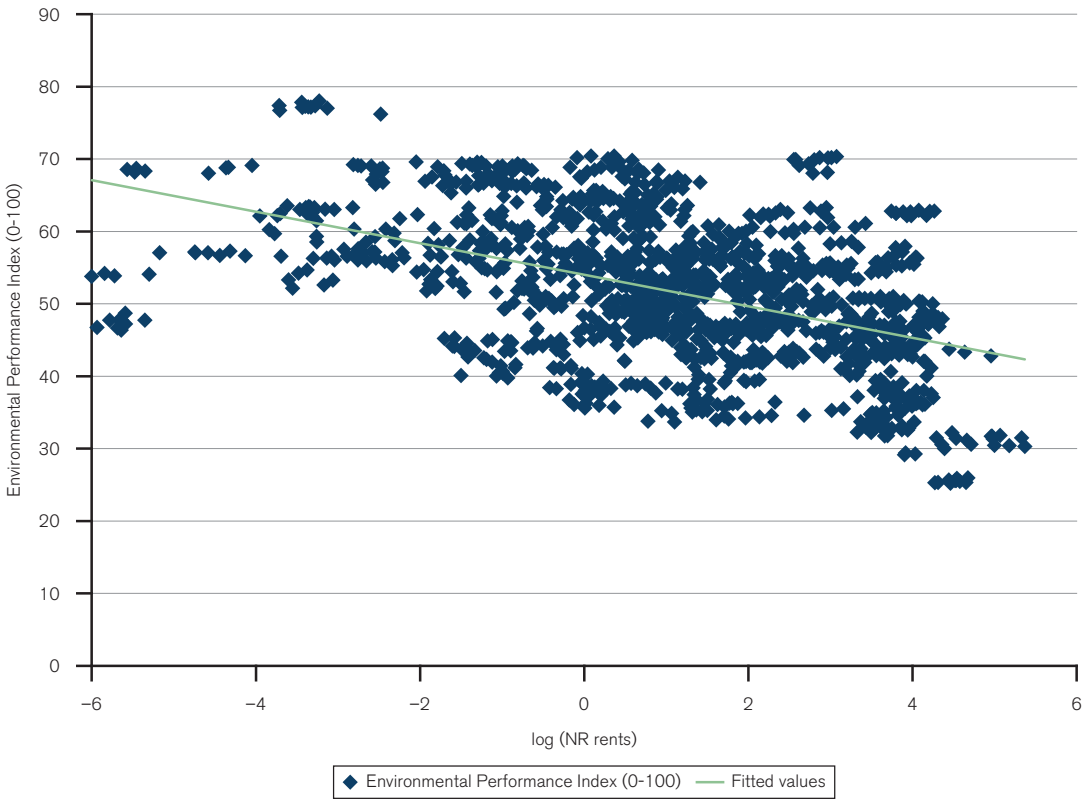
5. Role of trade policy measures for natural resources

In natural resource sectors, it may be argued that the world is "upside-down": import restrictions are much less prevalent than export restrictions. As argued by the WTO (2010), tariff protection in these sectors is generally lower than for overall merchandise trade. In particular, tariff protection is very low in mining and fuels, with an average applied tariff of 5.7 and 5.8 per cent, respectively, as compared to 10.3 per cent for overall merchandise trade in 2007. Conversely, there is a higher incidence of export taxes applied by exporting countries to natural resources relative to other sectors (WTO, 2009; 2010). Eleven per cent of world trade in natural resources is covered by export taxes, while just 5 per cent of total world trade is covered by export taxes. For some countries, export taxes on natural resources cover a large percentage of their total exports in natural resources.

The OECD recently collected an inventory of more than 5,000 restrictions on industrial raw materials applied by 57 countries between 2009 and 2012 (Fliess and Mård, 2012). The inventory, which includes both taxes and quantitative export restrictions (prohibitions, quotas, automatic and non-automatic licensing, etc.), covers mostly Harmonized System (HS) categories 25-28 (mineral products; chemicals and allied industries); 44-46 (wood); 71-72 (stones and metals); and 74-81 (copper, nickel, aluminium, lead, zinc, tin and base metals). Table D.8 shows that, on average, more than 40 per cent of the measures were export taxes, followed by licensing requirements (more than 30 per cent). The very low number (and share, less than 10 per cent) of export prohibitions is likely to be due to the General Agreement on Tariffs and Trade (GATT) Article XI provisions on the elimination of quantitative restrictions that affect WTO members in the sample.

From a theoretical perspective, export restrictions may serve the following purposes: achieve terms-of-trade

Figure D.29: **Correlation between log of natural resource income (as a percentage of GDP) and Environmental Performance Index, 2000–10**



Source: WTO Secretariat estimations based on WDI and Yale Center for Environmental Law and Policy.

Table D.8: **Export restrictions on industrial raw materials, by type and year**

Type	2009	2010	2011	2012	Total
Licensing requirement	558	635	391	295	1,879
Export tax	844	802	551	181	2,378
Export prohibition	88	168	96	112	464
Others	220	341	147	74	782
Total	**1,710**	**1,946**	**1,185**	**662**	**5,503**

Source: OECD Inventory of Restrictions on Exports of Raw Materials.

gains; production relocation; support to downstream sectors (closely related to the production relocation motive); export diversification (closely related to the two previous motives); protection of the environment; avoidance of resource depletion; income stabilization; and response to tariff escalation in export markets (see WTO 2009; 2010). The OECD inventory reports an alleged justification for 3,236 measures, which constitute almost 60 per cent of the 5,503 measures included in the dataset. This makes it possible to compare governments' stated motives with the various rationales put forward by economic theory. The motives stated in the OECD inventory can be split into seven broad categories: addressing the current economic conditions; preventing illegal activities; collecting revenues; ensuring export; protecting domestic industries; conserving exhaustible resources; and protecting the environment.

As shown in Table D.9, most measures for which a purpose is declared are explicitly imposed to protect domestic industries. Promotion of domestic processing/value added is a more frequently cited justification for regulation of exports of semi-processed commodities than for regulation of exports of unprocessed raw materials (Fliess and Mård, 2012). These findings are consistent with the fact that several resource-rich countries set de-escalating (or degressive) export tax structures (WTO, 2010).

Table D.9: **Export restrictions on industrial raw materials, by stated purpose**

Purpose	Number	Percentage
Protecting domestic industries	1,244	38.44
Addressing the current economic conditions	669	20.67
Preventing illegal activities	648	20.02
Conserving exhaustible resources	281	8.68
Collecting revenues	236	7.29
Ensuring export	83	2.56
Protecting the environment	75	2.32
Total	3,236	100
Without justification	2,268	
Total	**5,504**	

Source: OECD Inventory of Restrictions on Exports of Raw Materials.

On the import side, the low level of tariff protection does not tell the whole story. In the mining sector (but not in fuels) there is evidence of tariff escalation (i.e. the use of higher import duties on semi-processed products and on finished products than on raw materials) in developed countries, which represent the biggest markets for developing country exporters. Latina et al. (2011) argue that export restrictions can be a response to tariff escalation in a production relocation effort. The evidence presented above on "protection of domestic industries" being the most cited motivation for export restrictions is in line with their argument. More research is however needed on discerning the determinants of export restrictions.

One of the overarching objectives of resource-rich countries has been to increase local content (the share of domestic products in the inputs used by extractive industries) or local value added (the share of domestic value added in total value added). Governments use various instruments to implement local content/value added policies. Tordo et al. (2011) list nine categories of instruments, ranging from contractual requirements that favour the use of local goods and services to direct government intervention through state-owned enterprises (SOEs). The aim of local content policies has evolved from creating backward linkages (that is, supplying input to the local economy through transfer of technology, the creation of local employment opportunities, and increasing local ownership and control) to creating forward linkages (that is, processing the sector's output prior to export) (Tordo et al., 2011). Economic theory argues that the capability of the domestic economy to develop backward linkages is important for local content policies to be effective tools of long-term economic development (Tordo et al., 2011).

6. Conclusions

The substantial price increases between 2003 and 2008 have led some commentators to argue in favour of a "commodity super-cycle". Although prices of natural resources and of agricultural products have recently subsided, they are still substantially higher than a decade ago. The question of whether commodities could be part of a development strategy remains relevant. It is certainly not possible to offer a definitive "yes" or "no" answer. Rather, the focus of this section has been on the challenges and opportunities that resource-endowed developing countries face.

Trade in natural resources (defined as fuels and mining products for the purposes of this report) has increased both in value and in volume terms since 2000 (notwithstanding a slump in 2008), especially in regions such as Sub-Saharan Africa and Latin America and the Caribbean. Countries in these regions have experienced noticeable economic growth during the years of sustained resource price increases. Several countries have improved the management of windfall revenues and have managed to attract significant FDI related to exploration and exploitation of newly discovered resources. Economic diversification and the broad social and environmental impact of natural resource extraction and trade, however, remain significant challenges.

Several countries (mostly, but not exclusively developing ones) adopt some type of restriction on the exportation of their natural resources. There are, in principle, several reasons behind this. Based on a recent OECD database, the section has reviewed the available evidence on the alleged purpose of export restrictions. Most measures are explicitly imposed to protect domestic industries and to promote domestic processing/value added. This may partly be in response to tariff escalation in importing countries. Local content schemes are also motivated by the wish to increase domestic value added. Economic theory argues that the capability of the domestic economy to develop backward linkages is important for local content policies to be effective tools of long-term economic development.

Agriculture represents an important sector, both in terms of production and in terms of consumption, for many developing and least-developed countries (LDCs). The sector therefore plays a crucial role for their development strategies. Countries that managed to increase productivity in the agricultural sector have been characterized by high rates of economic growth and poverty reduction (in particular, improvements in the livelihoods of the very poor). Agricultural trade has increased significantly in recent years, in the context of high and rising agricultural prices. This has created opportunities for developing countries to leverage agricultural exports for development.

This section has highlighted the various development challenges facing exporters of agricultural goods, and in particular LDCs. First, the rising share of processed goods in total agricultural trade, which reflects increased vertical coordination of production structures, indicates that involvement in food supply chains is very important. Secondly, productivity gaps may represent a disadvantage for developing country producers in global competition. Thirdly, access to developed and G-20 developing countries' markets continues to be an issue, especially for LDC exporters. This is partly due to relatively high agricultural tariffs but in particular it is due to the costs of meeting standards (including private standards) and sanitary and phytosanitary (SPS) regulations, and to the costs caused by delays in crossing borders.

The section has highlighted two more challenges. First, numerous value chains in the agricultural sector are characterized by market concentration, sometimes at multiple points along the value chain. This may create problems for small producers in developing countries. Secondly, prices in the agricultural sector are notoriously volatile, which can create difficulties for consumers and for producers in the light of investment decisions they may have to take. Evidence suggests that if counter-cyclical measures that aim at reducing volatility are introduced jointly by net importers and net exporters, price hikes may actually be exacerbated.

Endnotes

1 Forestry and fishery are excluded from the definition of natural resources because the focus of the literature that has analysed the link between natural resource exports and development has exclusively been on extractive resources, such as minerals and oil.

2 Some challenges are, however, common to both the natural resources and agricultural sectors. These include the management of price volatility and the attraction of foreign direct investment (FDI).

3 See, for instance, Erten and Ocampo (2012). The authors define commodity super-cycles as episodes in which the upward price trend lasts much longer than usual (10-35 years) and covers a broad range of commodities.

4 The Africa Progress Panel (2013) reports that since the end of the 1990s, consumption of refined metals in China has climbed by 15 per cent a year on average. The country's share of global demand for copper, aluminium and zinc has more than doubled; for iron ore, nickel and lead it has tripled. Metal intensity (measured as resource use per US$ 1,000 of real GDP) is nine times higher in China than the global average. The fact that China's ores are lean and difficult to smelt raises their extraction costs (China.org.cn, 2013).

5 See WTO (2010) for an in-depth discussion on the causes of oil price volatility and on its effects on oil-exporting and on oil-importing countries.

6 Following the shifting patterns in global economic activity outlined in WTO (2013c), global energy trade will be re-oriented from the Atlantic basin to the Asia-Pacific region. China will become the largest oil-importing country and India will become the largest importer of coal by the early 2020s (IEA, 2013).

7 An alternative explanation is proposed by Baumeister and Kilian (2013). They argue that the link between food and oil prices is largely driven by common macroeconomic determinants, rather than the pass-through from higher oil prices to food prices.

8 For an in-depth discussion on mineral and energy commodities, see Lee et al. (2012). Studies that argue in favour of permanently higher prices of commodities include Kaplinsky and Morris (2009) and Dobbs et al. (2013b).

9 Any analysis of the relationship between export growth and development suffers from obvious endogeneity problems. The relationship depicted in Figure D.6 is nevertheless striking as it contrasts with the more common finding that primary exports are associated with poor economic performance (e.g. Wood, 2007).

10 The 12 countries covered are Mauritania (2001), Mozambique (2004), Niger (2008), Rwanda (2005), Sao Tomé and Principe (2006), Senegal (2003), Sierra Leone (2006), Sudan (2008), Tanzania (2005), Togo (2010), Uganda (2013) and Zambia (2005).

11 WTO International Trade and Market Access data accessed on 2 April 2014.

12 See also the discussion in Section D.4 on the role of standards in agricultural trade.

13 The sources of this information are Maertens and Swinnen (2014), based on Maertens et al. (2011), Maertens, 2009; Maertens and Swinnen, 2009; Colen et al., 2012.

14 For the sake of consistency, the same category definitions will be used for the discussion of trade flows and of tariff structures in this section.

15 See also similar findings in Liapis (2011).

16 LDC exports of agricultural goods have, for instance, grown by an annual 11 per cent in the years between 2000 and 2012 (see Table D.6). Growth was significantly stronger among food items (11.6 per cent) than among raw materials (6.4 per cent). Average annual growth (2010-12) was somewhat stronger, i.e. 12.8 per cent, for LDCs that are categorized by the WTO as "exporters of agricultural products". Within this group, annual export growth of agricultural products was strongest in Rwanda (22.4 per cent) and Burkina Faso (21.6 per cent).

17 See also Ng and Aksoy (2010b).

18 Their "low-income country group" overlaps to a significant extent with the "LDC group" in this section.

19 Iannotti and Robles (2011) as cited in International Food Policy Research Institute (2011).

20 Quote from Wood (2003), page 163.

21 See also the evidence presented in Szirmai (2012).

22 However, reports also indicate that there is a significant difference between expressed interest in investments and actual investments in farm operations (e.g. Arezki et al., 2011).

23 See, for instance, Delich and Lengyel (2014) on the role of the Fundación Pro Arroz in the export success of Argentinian rice.

24 WTO (2013). Average tariffs are based on best applicable tariffs (MFN and preferential treatments granted to LDCs and developing countries), and weighted using a standard export structure based on 2000-01 (WTO, 2013b).

25 The RRA is a measure based on price-related distortions to agricultural markets. It notably takes into account the output-price-altering equivalent of any product-specific input subsidies or taxes (Anderson et al. 2013, p. 428).

26 Order according to severity of bias from high to low according to Anderson et al. (2013), Figure 5.

27 Order according to severity of bias from high to low according to Anderson et al. (2013), Figure 5.

28 See Figure C.15 in WTO (2012) based on "ITC Business Surveys on NTMs". The countries covered by the surveys are Burkina Faso, Egypt, Jamaica, Kenya, Madagascar, Mauritius, Morocco, Paraguay, Peru, Rwanda and Uruguay.

29 Sometimes certification costs are the only costs developing countries have to incur, for instance in cases where traditional production methods meet importing countries' sustainability criteria (Gibbon and Lazaro, 2010).

30 Maertens and Swinnen (2014) report that Aloui and Kenny (2005) and Cato et al. (2005) have estimated the cost of compliance with SPS measures for tomato exports from Morocco and for shrimp exports from Nicaragua respectively to be only a small fraction, less than 5 per cent of total production costs, while Asfaw et al. (2010) find that investment costs related to GlobalGAP certification represent 30 per cent of annual crop income for vegetable farmers in Kenya. From their own interviews with asparagus exporters in Peru in 2009, Maertens and Swinnen (2014) estimate the cost of certification and audits related to a variety of private standards to be around US$ 4,500 to US$ 7,000 annually, but this cost is small relative to total production costs (less than 1 per cent).

31 Also called "monopsonistic markets".

32 Versus a 0.6 per cent tariff equivalent for textiles and 0.3 per cent for pharmaceuticals as reported in WEF (2014) based on USAID (2007).

33 Box adapted from Maertens and Swinnen (2014) based on Schuster and Maertens (2013a; 2013b).

34 For example, Schuster and Maertens (2013a; 2013b) have examined the relationship between certification and exports for the case of Peru. They do not find evidence of certification having a direct impact on firms' export performance.

35 See, for instance, Mc Millan et al. (2002) on the difficulties of farmers in Mozambique to take decisions regarding the planting of cashew trees in an uncertain policy environment.

36 For a recent overview of the resource curse literature, see Heinrich (2011).

37 This is partly confirmed by regression analysis that estimates the conditional correlation between GDP per-capita growth and two measures of natural resource exports (respectively, the share of fuels and the share of mining products in total merchandise trade) for the sub-sample of Sub-Saharan African countries, controlling for country- and year-fixed effects. The coefficient on the share of fuel in total merchandise trade turns from statistically not significant in the 1980-99 period to positive and statistically significant in the 2000-12 period. The coefficient on the share of mining products in total merchandise trade turns from negative and statistically significant in the 1980-99 period to statistically not significant in the period 2000-12.

38 Three of these countries became resource-rich after the beginning of the sample: Burkina Faso, Tanzania and Mozambique. Burkina Faso has become a gold producer since the mid-1990s. Tanzania and Mozambique are both on the Indian Ocean, where large discoveries of oil and natural gas were made recently. With production that could reach 100 million tonnes over the next decade, Mozambique is also primed to become a major exporter of coal to India and China (Africa Progress Panel, 2013).

39 Several studies have used the ratio of primary exports to total exports as a proxy for natural resource abundance. Wood (2007) criticizes this measure because the export ratio depends on a country's stock of physical and human capital, which in turn is strongly correlated with development success. To address this issue, the measure of natural resource abundance used in this section is total natural resource income as a percentage of GDP. It is defined as the difference between the value of production at world prices and total costs of production for oil, natural gas, coal, minerals and forestry.

40 Lee at al. (2012), however, point out that despite increased exploration efforts, world-class mineral discoveries have become less frequent. Moreover, as ore grades decline for base and precious metals, production costs are increasing significantly in mature mining countries, such as Chile and South Africa (Africa Progress Panel 2013).

41 Collier and Venables (2010) show the significant extent of under-exploration in Africa relative to OECD countries: as of the year 2000, some US$ 114,000 of sub-soil assets were known to lie beneath the average square kilometre of the OECD. The equivalent figure for Africa was a mere US$ 23,000. This reflects, among other things, the need for commitment technologies for resource exploration and exploitation.

42 See IMF (2012b) for an in-depth discussion.

43 According to Van der Bremer and Van der Ploeg (2013), the size of an intergenerational fund would then be larger if future generations are not expected to be much richer than current generations.

44 Increased spending during commodity price booms is, among other things, associated with real exchange rate appreciation (this is the so-called "spending effect" of the Dutch disease – see WTO (2010)). If a bust follows the boom, governments are then forced to cut spending and allow sharp devaluations of the real exchange rate (Sinnott et al., 2010).

45 Most studies focus on government spending because tax receipts are endogenous with respect to the business cycle. Indeed, as explained by Frankel et al. (2013), an important reason for pro-cyclical spending is that government receipts from taxes or mineral royalties rise in booms, and the government cannot resist the temptation or political pressure to increase spending proportionately, or more.

46 A cautionary note is in order. Analysing the cyclicality of fiscal behaviour in 28 developing oil-producing countries during 1990-2009 – and correcting for reverse causality between non-oil output and fiscal variables – Erbil (2011) provides evidence of strong pro-cyclicality of fiscal policy in oil-rich countries. The results are not uniform across income groups: expenditure is pro-cyclical in the low- and middle-income countries, while it is counter-cyclical in the high-income countries.

47 Imbs and Wacziarg (2003) find a U-shaped pattern, whereby countries in the earlier stages of development diversify production and countries above a certain level of income tend to re-concentrate production.

48 For a detailed explanation, see WTO (2010), especially Box 10.

49 In case of severe environmental degradation, the marginal environmental damage may be larger than the marginal benefit of extracting the resource, making it optimal to keep the resource in the ground. Technological shocks that threaten comparative advantage include the invention of substitutes or the opening up of new sources of supply. A notable example is hydraulic fracturing (fracking) technology, which has largely increased the availability of unconventional oil and, especially, natural gas reserves in the United States – see *The Economist* (2013).

50 Diversification into manufactured goods characterized countries such as Malaysia, Thailand, Indonesia and Sri Lanka (Coxhead, 2007). Diversification into services with high growth potential has been noticeable in some Gulf Cooperation countries in the last decades. Bahrain, for instance, developed a financial services industry following the relocation of the international banking community from Lebanon after the outbreak of the civil war in Lebanon in 1975. The development of aviation, tourism, real estate, recreational, educational, logistics and business services in countries such as Qatar (which will host the FIFA World Cup in 2022) and the United Arab Emirates constitute other notable examples. For an overall critical assessment of economic diversification in Gulf Cooperation countries, see Hvidt (2013).

51 Africa Progress Panel (2013) reports, for instance, that Africa's growth surge over the past decade was driven by extractive industries operating in enclaves with few links to the local economy and exporting largely unprocessed oil and minerals.

52 Aragon and Rud (2009), cited in Sinnott et al. (2010).

53 See Coxhead (2007) for an account of the Chilean experience in achieving growth by widening the range of resource-based exports to include new and more sophisticated products.

54 Beverelli et al. (2011) build a theoretical model showing that the appreciation of the real exchange rate (Dutch disease) can be escaped if patterns of specialization shift towards the manufacturing industries that use the natural resource more intensively. Using various sources of available information on oil discoveries in 132 countries, they provide empirical support for this hypothesis.

55 As noted by Sinnott et al. (2010), this is true of manufacturing sectors as well, explaining why enclave-like export processing zones can sometimes succeed in countries with poor business

environments. For an articulated discussion on the link between natural resource endowment and institutional quality, see WTO (2010).

56 Examples include: large investments in an oil pipeline and associated port facilities in Sudan; the construction of a deep-water port at Santa Clara, a railway track running 560 km from Belinga to the coast and a hydro-electric power plant (Gabon); the refurbishment of the rail network connecting Angola, the Democratic Republic of the Congo and Zambia.

57 For example, in Iraq the government allocated its service contracts for oil extraction through highly successful open and competitive auctions. The winning consortium at the Rumaila oil field will be taking US$ 2 per barrel less than demanded by the nextbest bidder, which could result in a difference of US$ 1.8 billion per annum to the Iraqi Treasury by 2017 (Sustainable Development Solutions Network (SDSN), 2013).

58 Guriev et al. (2011) analyse the determinants of nationalizations in the oil industry around the world during 1960–2006. They show, both theoretically and empirically, that high oil prices increase the likelihood of nationalization.

59 For a detailed discussion of the hold-up problem in natural resource sectors, see WTO (2010), Section E.

60 On the EITI and other transparency initiatives, such as the Kimberley Process Certification Scheme (KPCS), see WTO (2010), Section E.

61 Country fixed effects capture any country-specific characteristic that does not vary over time. Year fixed effects control for global business cycles.

62 Production of a barrel of shale oil can generate up to 1.5 tons of solid waste, which may occupy up to 25 per cent greater volume than the original shale (European Academics Science Advisory Council, 2007).

63 Over 150 billion cubic metres (or 5.3 trillion cubic feet) of natural gas are being flared and vented annually. The gas flared annually is equivalent to 25 per cent of the United States' gas consumption (Global Gas Flaring Reduction public-private partnership (GGFR), 2013). A public-private partnership called Global Gas Flaring Reduction Partnership (GGFR) was launched at the World Summit on Sustainable Development in Johannesburg in 2002. Poverty reduction is also an integral part of the GGFR programme, which is developing concepts for how local communities close to the flaring sites can use natural gas and liquefied petroleum gas that may otherwise be flared and wasted. The programme has already evaluated opportunities for small-scale gas utilization in several countries.

64 The Environmental Performance Index (EPI), constructed by the Yale Center for Environmental Law and Policy, ranks how well countries perform on high-priority environmental issues in two broad policy areas: protection of human health from environmental harm and protection of ecosystems.