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SUSTAINING LONG-RUN GROWTH AND MACROECONOMIC STABILITY IN LOW-INCOME COUNTRIES—THE ROLE OF STRUCTURAL TRANSFORMATION AND DIVERSIFICATION

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SUSTAINING LONG-RUN GROWTH AND MACROECONOMIC STABILITY IN LOW-INCOME COUNTRIES: THE ROLE OF STRUCTURAL TRANSFORMATION AND DIVERSIFICATION

March 5, 2014

EXECUTIVE SUMMARY

- Diversification and structural transformation play important roles in influencing the macroeconomic performance of low-income countries (LICs). Increases in income per capita at early stages of development are typically accompanied by a transformation in a country's production and export structure. This can include diversification into new products and trading partners as well as increases in the quality of existing products.

- Diversification in exports and in domestic production has been conducive to faster economic growth in LICs. Increased diversification is also associated with lower output volatility and greater macroeconomic stability. There is both a growth payoff and a stability payoff to diversification, underscoring the case for paying close attention to policies that facilitate diversification and structural transformation.

- Empirical analysis using a newly-constructed cross-country dataset, complemented by country case studies, is utilized to examine the patterns of diversification and transformation in LICs since the mid-1960s. Most LICs have historically been heavily dependent on a narrow range of traditional primary products and on a small number of export markets for the bulk of their export earnings and sources of growth. These patterns have been changing over the past two decades, albeit with significant variation in the extent of diversification both across LICs and within regions. There is still ample scope to upgrade the quality of LICs' existing export basket and/or introduce new higher value-added products, not only in manufacturing but also in agriculture – often the least productive sector in LICs. Development policies in LICs should therefore include rather than abandon agriculture.

- Cross-country empirical evidence points to a range of general policy and reform measures that have proven effective in promoting diversification and structural transformation in LICs. These include improving infrastructure and trade networks, investing in human capital, encouraging financial deepening, and reducing barriers to entry for new products. But there is no one-size-fits-all recipe, as evidenced by the diversity of experiences recorded in the country case studies. A new diversification toolkit developed by Fund staff provides easy access to highly disaggregated, product-level data on export diversification and product quality, enabling country authorities and mission teams to conduct more detailed, country-specific analysis.

Approved By **Siddharth Tiwari**	This paper was prepared by SPR, under the overall guidance of Seán Nolan and Catherine Pattillo, in collaboration with AFR, APD and RES. The staff team was led by Chris Papageorgiou (SPR) and comprising Sarwat Jahan, Giang Ho, Ke Wang, Lisa Kolovich (SPR), Camelia Minoiu (RES), Alun Thomas (AFR), Alex Pitt (APD) and Nikola Spatafora (WB). Substantial contributions were provided by Christian Henn (WTO), Nick Gigineishvili (AFR) and Samuele Rosa (OBP), and Thelma Choi, Nombulelo Duma and Jules Tapsoba (APD).[1]

CONTENTS

Abbreviations and Acronyms

AEs	Advanced Economies
DFID	Department for International Development
EBRD	European Bank for Reconstruction and Development
ECA	Europe and Central Asia
EMs	Emerging Markets
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
HICs	High-Income Countries
IADB	Interamerican Development Bank
IVBMA	Instrumental Variable Bayesian Model Averaging
LAC	Latin America and the Caribbean
LICs	Low-Income Countries
MENA	Middle East and North Africa
MICs	Middle-Income Countries
NBER	National Bureau of Economic Research
PPP	Purchasing Power Parity
RER	Real Exchange Rate
SSA	Sub-Saharan Africa
SITC	Standard International Trade Classification
UN	United Nations
WEO	World Economic Outlook
WTO	World Trade Organization

INTRODUCTION

1.   **There is growing but fragmented evidence of the macroeconomic benefits of diversification.** Conventional trade theory emphasizes the benefits of specialization due to comparative advantage. However, until a country reaches advanced-economy status, diversification in output and employment is associated with higher income per capita (Imbs and Wacziarg, 2003). There is also a long-standing literature that associates more diversified production structures with lower volatility of output and more macroeconomic stability. Diversification therefore appears desirable, but there is only limited analysis as to which aspects of diversification are important, under what conditions is it desirable, and how best to promote it.

2.   **Limited diversification in exports, trading partners, and domestic production has been an intrinsic characteristic of many low-income countries (LICs).** Most LICs[2] have historically been heavily dependent on a narrow range of traditional primary products and on few export markets for the bulk of their export earnings and sources of growth. Moreover, domestic production and exports have often been concentrated in sectors characterized by low technology spillovers and productivity growth. Despite this overall lack of diversification in LICs, GDP per capita has grown at a high rate over the past twenty years, accompanied by increased macroeconomic stability. However, the question arises as to whether such performances can be sustained or improved upon without significant transformation.

3.   **Recent evidence suggests diversification is especially important in the early stages of the development process**. This work is primarily based on cross-country analysis and case studies and shows that diversification in production, exports, and trading partners typically play an important role in accompanying growth.[3] In addition, the latest literature documents that higher incomes per capita are associated first with diversification, and then with re-concentration, in production and employment.[4] The nonlinearity in the diversification process suggests that it is important not just to examine the process as a whole, but also to consider separately LICs, middle-income countries (MICs), and advanced economies.

4.   **Diversification is also closely related to structural transformation, particularly in countries in the early stages of economic development.** Both theory and recent empirical work[5] argue that structural transformation—the dynamic reallocation of resources from less to more productive sectors (see Box 1 for details)—is a key ingredient of economic development. Examples include the East Asian Tigers and Tiger Cubs in the 1970s and 1980s, as they transformed from agrarian economies to manufacturing economies. Today's LICs remain relatively undiversified and are

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[2] Unless otherwise stated, for the analytical work in this paper, LICs (MICs and HICs) are based on the 2009 World Bank definition as most of our datasets end in 2009.

[3] See for instance Papageorgiou and Spatafora (2012) and IMF (2011).

[4] See Cadot et al., (2011) and Imbs and Wacziarg (2003).

[5] See McMillan and Rodrik (2013) and Lin (2012).

typically specialized in agriculture and/or mining exploitation. In their case, economic development and structural transformation almost inevitably involve quality upgrading from low value added to higher value added agricultural products and diversification through a significant expansion in the range of sectors contributing to domestic and export production.

5.   **Despite some progress, analytical work on the role that diversification and transformation play in LIC macroeconomic performance remains sparse; this paper makes an effort to fill in some of these gaps.** The paper extends the existing analysis by considering diversification not just in external trade but also in the broader domestic economy. The paper also examines the role of "quality upgrading," that is, production of higher-quality varieties of existing products, in contributing to development.[6] Product diversification and quality upgrading are often complementary since many resource-based and agricultural activities have limited potential for increases in quality. An underlying theme of this paper is that focusing on the multiple dimensions of diversification provides a comprehensive and illuminating picture of its role in development.

6.   **The analytical work of this paper and the associated new diversification toolkit can enhance the Fund's work on promoting strong and durable growth in LICs**, an important focus of the Fund's surveillance and program work in these countries. Diversification is also an important contributor to increased macroeconomic stability in LICs, making it a relevant concern for Fund operational work independent from its role in contributing to growth.

7.   **The main objectives of the paper are as follows**: (i) Assess the pace and breadth of economic diversification and structural transformation in LICs—encompassing increases in sectoral productivity, export and output diversification, and quality upgrading, using a newly-constructed cross-country dataset complemented by country case studies; (ii) augment understanding of the relationships among diversification, growth, and volatility; here the aim is to go beyond associations and attempt to establish more robust relationships; (iii) identify the policy drivers of diversification; and (iv) inform the policy debate on how diversification and structural transformation can help LICs enhance macroeconomic stability and achieve continued and robust growth over the medium term.

8.   **Key findings include:** (i) a robust relationship between economic growth and diversification exists for LICs; (ii) increased diversification is associated with a reduction in output volatility; (iii) LICs as a whole have diversified away from agriculture and into manufactured goods since the mid–1990s, but (iv) there is still ample room to upgrade the quality of LICs' exports including in agriculture.

9.   **The paper examines several policy questions and concludes that:**

- Development strategies in LICs should place further emphasis on diversification, given its critical role in increasing economic growth and reducing output volatility.

- Development policies in LICs should include rather than abandon agriculture. Agriculture is the least productive sector in LICs and offers fewer opportunities to upgrade product quality than the

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[6] See Khandelwal (2010), Hallak (2006), and Schott (2004).

manufacturing sector, but there is still substantial scope to improve quality and introduce high value-added products.

- While recognizing that there is no one size fits all approach to increasing diversification, in general, authorities in LICs can help promote diversification by improving infrastructure and trade networks and reducing barriers to entry for new products. Improvements in governance, financial deepening, increases in human capital, and agricultural reforms all facilitate diversification as well as quality upgrading.

- The data used for the analysis in this paper will be provided in an accompanying toolkit, which will help authorities and mission teams analyze developments in greater detail, identify country-specific bottlenecks, and construct appropriate policy responses.

- Data limitations continue to constraint the analysis of diversification and structural transformation. For example, the analysis of export diversification and export quality is based on merchandise trade data alone, thereby missing the increasingly important role of service sector exports. Also, the quality of data on sectoral output and employment levels for LICs is uneven and typically available only at a relatively high level of aggregation, limiting the granularity and depth of the analysis of structural transformation that can be undertaken. These deficiencies should not affect the robustness of the main conclusions of the paper, but do suggest that more detailed analysis of issues relating to structural change would require significant data improvements.

10.   **The rest of the paper is organized as follows.** The next section examines broad cross-country patterns of diversification by income and geographic groups, covering both external trade and output diversification, and documenting historical and more recent trends. This section also highlights key patterns of quality upgrading, through which countries may leverage the revenue potential of existing exports. The paper then turns to the links between diversification on the one hand, and volatility and growth on the other. This is followed by an analysis of the main drivers of diversification, sectoral productivity, and quality upgrading in LICs. The paper concludes with a summary of key contributions to the policy debate on how diversification can help LICs enhance macroeconomic stability and promote growth.

RECENT PATTERNS AND STYLIZED FACTS

This section documents the pace and breadth of transformation and diversification in LICs from both a cross-country and case study perspective. It simultaneously analyzes the two interlinked dimensions of diversification – export and output diversification, as well as the patterns of quality upgrading.

The findings reveal that LICs have experienced some progress in diversifying both export products and partners since the mid-1990s, but significant heterogeneity both across and within regions exists. In this process, manufactured exports have gained importance while agricultural exports have declined. LICs typically produce at relatively low quality levels, implying considerable potential for upgrading the quality of the existing export basket. Quality upgrading opportunities are strongest in manufacturing but also exist in agriculture.

A. Export Diversification across Products and Partners

11.   **Export diversification can occur across either products or trading partners.** Product diversification occurs through introducing new product lines (the *extensive* margin) or through exporting a more balanced mix of existing products (the *intensive* margin). Using diversification indices based on new datasets developed by Fund staff, this paper documents historical and more recent trends, focusing on key patterns of diversification by income and geographic group (see Box 1 for key definitions used in this paper).

12.   **Higher per capita income is broadly associated with greater export product diversification.** This general relationship holds true at least until an economy reaches advanced-economy status (with GDP per capita of $25,000-$30,000; see also Cadot et al., 2011).[7] The relationship is evident in Figure 1 (left panel), which plots country-year observations. It also holds true when the figure is restricted to show the pure cross-sectional or time-series variation (e.g., see Figure 1 right panel for cross section); in the latter case, the dataset's extended time dimension is critical to confirming the relationship (see Box 2 for details on the diversification toolkit). More disaggregated scatter plots, for example, with only SSA countries also reveals the same relationship. The export diversification measure used throughout this paper is the Theil index; a lower value of the Theil index signals higher export diversification.

Figure 1. Export Product Diversification and Real GDP per Capita

All Countries and Income Levels

Cross-section (1962-2010)

Source: COMTRADE, Penn World Table 7.0, IMF staff calculations.

Note: Cross-section indicates the average diversification and income levels during the period 1962-2010 for each country.
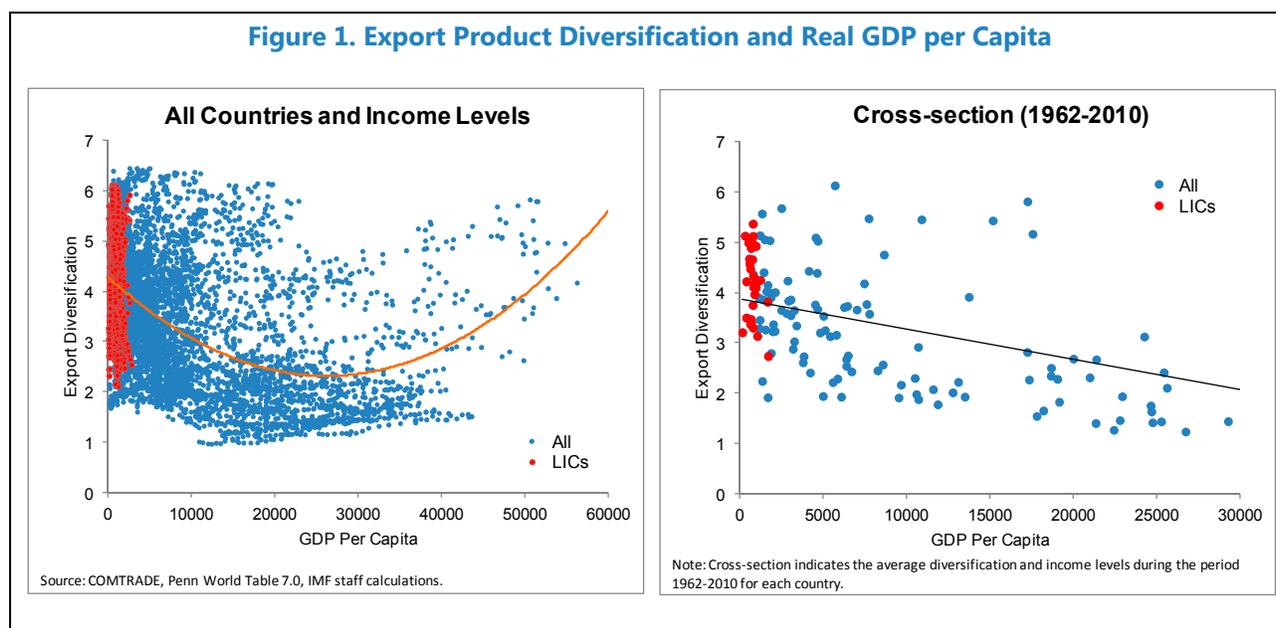
13.   **There is much heterogeneity in diversification levels, even after controlling for income per capita**. Two other special cases also stand out. First, many small states (population less than 1.5

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[7] While there is no theoretical consensus as to why this nonlinear relationship occurs empirically, one explanation is that as countries accumulate capital, they travel across diversification cones. As "new-cone" products emerge and "old-cone" products are slow to die (e.g., due to imcumbency advantages), diversification increases. As time passes, comparative advantage catches up and old products slowly die, reducing diversification (see e.g., Cadot et al., 2011).

million) are relatively undiversified in their output and exports due to their narrow resource base, small domestic markets, and economies of scale in many sectors, particularly manufacturing.[8] Second, commodity exporters are, as expected, relatively undiversified. Less obvious is that higher incomes are not typically associated with greater diversification for commodity exporters (Annex Boxes 1 and 2 provide more analysis on commodity exporters and small states, respectively).[9]

Box 1. Key Definitions and Conceptual Framework

This box defines several dimensions of diversification used throughout the paper and describes the various indices used to measure them. It then defines structural transformation and explains the link between diversification and transformation in LICs.

Defining and measuring diversification

Diversification: The shift to a more varied production structure, involving the introduction of new or expansion of pre-existing products, including higher quality products. The paper considers diversification in both exports, for which detailed data are available, and in output.

> **Export diversification** can occur over either *product* narrowly defined or *trading partners*. It can be broken down into the *extensive* and *intensive* margins of diversification.
>
> - **Extensive export diversification** reflects an increase in the number of export products or trading partners.
> - **Intensive export diversification** considers the shares of export volumes across active products or trading partners. Thus, a country is less diversified when export revenues are driven by only a few sectors or trading partners, even though the country might be exporting many different goods or to many different trading partners. Countries with a more evenly balanced mix of exports or trading partners have a higher level of intensive diversification.
> - The **Theil index** is used in this paper to measure the extent of diversification across a country's exports. It can be decomposed into the extensive and intensive margin of diversification (see Annex 2 Section A). Lower values indicate higher diversification.
>
> **Output diversification**. The index reflects diversification in the domestic production process across seven broad sectors, for which value-added data are available.
>
> **Quality upgrading** occurs when the quality of existing products increases (see Annex 2 Section B on how quality is measured).
>
> **Quality ladders** reflect the extent of heterogeneity in quality across different varieties of a given product. The length of a quality ladder indicates the potential for quality upgrading for each product.
>
> **Interlinkages:** Some of these dimensions of diversification may be interlinked. For instance, diversification in domestic production and external trade will, given relatively small domestic markets, generally be related, but Annex Box 1 discusses some important exceptions. A better understanding of these linkages requires placing more structure on the existing data through modeling (Perez Sebastian et al., forthcoming, for a first effort in this direction), which is beyond the scope of this paper.

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[8] Data limitations restrict our analysis to merchandise exports. If services exports, particularly tourism, could also be evaluated on a bilateral basis, then small states' measured diversification might be higher.

[9] In line with the existing literature, small states and commodity exporters are excluded from the section on stylized facts, and separate boxes on these special groups have been added. Following the WEO definition, countries are classified as commodity exporters if either fuel or primary commodities are the main source of export earnings. The resulting sample includes 44 commodity producers.

Box 1. Key Definitions and Conceptual Framework (concluded)

Interlinkages. Some of these dimensions of diversification may be interlinked. For instance, diversification in domestic production and external trade will, given relatively small domestic markets, generally be related, but Annex Box 1 discusses some important exceptions. A better understanding of these linkages requires placing more structure on the existing data through modeling (Perez Sebastian et al., forthcoming, for a first effort in this direction), which is beyond the scope of this paper.

Defining and measuring structural transformation

Structural transformation: the reallocation of resources across different sectors and products over time. Development typically involves a shift to higher productivity.

Sectoral value added and employment shares are defined as the value added share of a sector in total (economy-wide) value added, and the employment share of a sector in total employment, respectively.

Sectoral productivity is the real value added per worker in a sector.

Sectoral shifts are the reallocation of value added or employment across broad economic sectors over time (agriculture, industry, services).

Growth in aggregate labor productivity can be decomposed into the relative contributions of sectoral productivity growth and sectoral shifts (see Annex 2 Section C).

The relationship between diversification and structural transformation
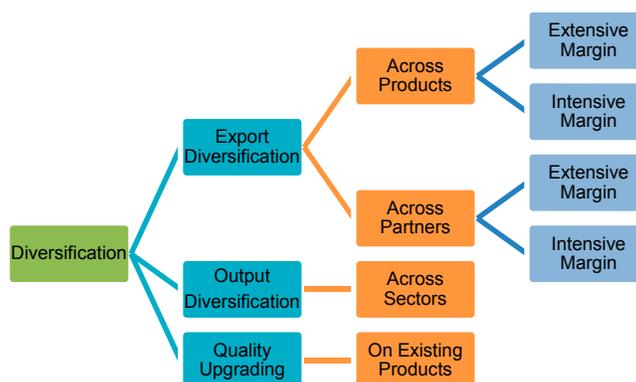
Development involves the transformation of a country's economic structure. *In the early stages of development*, structural transformation and diversification are closely linked. Given that LICs are still largely specialized in a narrow range of agricultural and other resource-based activities, structural transformation through resource reallocation almost inevitably involves diversification into a more balanced production structure. As countries develop, this tight relationship may weaken, since transformation could involve a re-concentration of production within manufacturing or services.

Box 2. The New Diversification Toolkit

A comprehensive diversification toolkit has been developed to capture several dimensions of export diversification and quality upgrading. The toolkit provides analysts (including country teams) with easy access to highly disaggregated data.[10] *Below is a brief discussion of the indices featured in the toolkit and their relevant coverage:*

- **Export diversification indices across products and partners**: The dataset developed by Fund staff (IMF, 2012) includes indices of diversification across products and trading partners. Product diversification indices are further disaggregated into the extensive margin and intensive margin (as defined in Box 1). The main data source is an updated version of the UN–NBER dataset, which harmonizes COMTRADE bilateral trade flow data at the 4-digit SITC (Rev. 1) level. While the existing literature typically focuses on the post–1988 period, this paper uses data extending back to 1962 and covers most LICs. The dataset combines importer- and exporter-reported data to maximize comprehensiveness while ensuring internal consistency, using the methodology of Asmundson (forthcoming).

- **Quality upgrading**: Quality cannot be directly observed and needs to be estimated. Unit values, that is, average export prices for each product category, are the closest observable proxy. However, unit values are at best a noisy proxy because they are also driven by a series of other factors, including production cost differences, firms' pricing strategies, and the fact that shipments to more distant destinations typically consist of higher priced goods. The database developed by Fund staff (Henn et al., 2013) provides quality measures that correct unit values for the above factors.[*] It is the most extensive quality database available, covering 178 countries (including most LICs) and 851 products over 1962–2010, based on more than 20 million product-exporter-importer-year observations. To enable cross-product comparisons, all quality estimates are expressed relative to the *world quality frontier*, defined as the 90th percentile of quality in each product-year combination. At each aggregation step, the normalization to the 90th percentile is repeated. Therefore, an increase in a country's measured product quality means its quality is increasing relative to the world frontier.

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14.   **LICs have experienced some success in diversifying exports across products since the mid–1990s.**[11] For over three decades (1965-1995), few LICs diversified their exports even when controlling for size and commodity-exporting status (Figure 2 left panel; see also IMF (2012) for the recent sub-Saharan Africa (SSA) experience with structural transformation). In contrast, many developing countries, including several LICs, have managed to diversify and transform their economies over the past two decades. Most South Asian countries have made significant progress with export diversification, gaining strong momentum after 1995. Experiences have been more varied in SSA, in which some countries (e.g., Tanzania, Uganda, and Kenya) have experienced significant export diversification in the recent period, whereas many others have not (Figure 2 right panel).

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[10] There is already substantial demand for the toolkit for analytical work purposes, with some parts of the database being used by several country teams in AFR, APD, MCD, EUR, as well as researchers in the World Bank and IADB. This toolkit can be accessed at: http://www-intranet.imf.org/departments/SPR/Databases/Pages/Diversification-Toolkit.aspx#JQueryZoneTabs_0

[11] Cross-country comparisons have been made based on income groups (using World Bank's classification as indicated in footnote 2) or the regional groups based on the grouping provided by the WEO. Regional groups only include developing economies (LICs and EMs).

Figure 2. Export Product Diversification over Time

Source: COMTRADE, IMF staff calculations.
Note: Lower value of Theil index implies more diversified.

Source: COMTRADE, IMF staff calculations.
Note: This chart only includes developing countries (EMs and LICs).
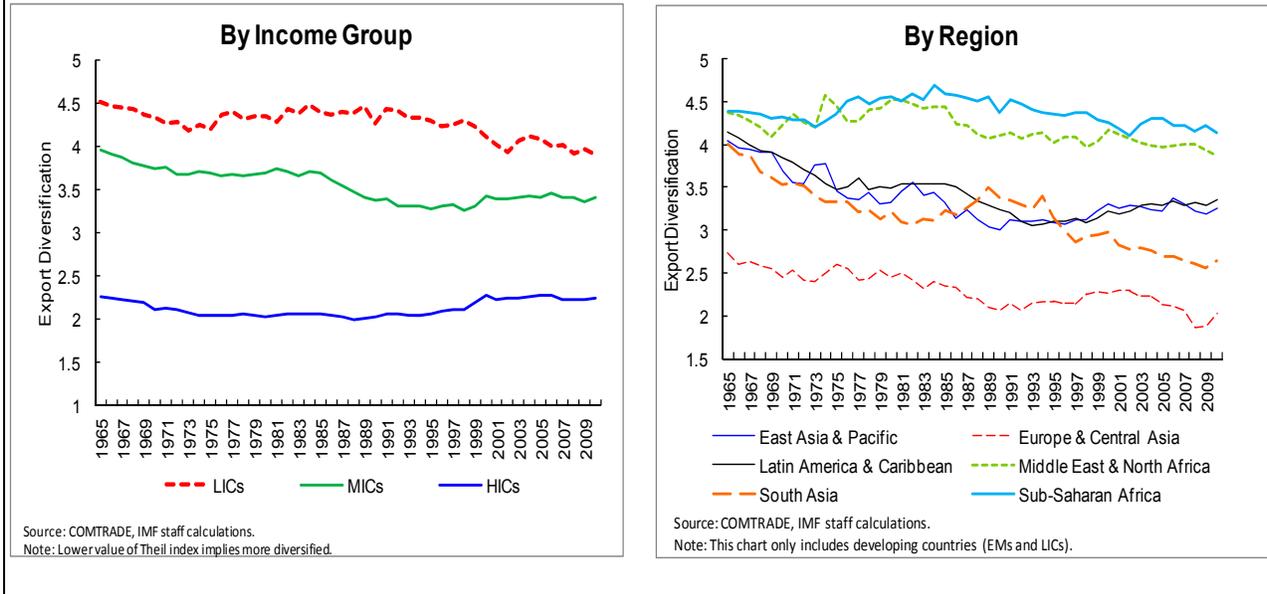
15.   **Changes in export product diversification are broadly paralleled by shifts in the relative importance of agricultural versus manufacturing exports.** For instance, diversification since the 1960s in East and South Asia has been accompanied by a steady and rapid decline in the share of agricultural exports (from 40 percent in 1965-1970 to 15 percent in 2006-2010) (Figure 3 left panel). At the same time, the region experienced almost a quadrupling of its mean share of manufactured exports (from 17 percent in 1965-1970 to 66 percent in 2006-2010) (Figure 3 right panel). In SSA there has been a sizable shift away from agricultural exports but only a small rise in the share of manufacturing exports.

Figure 3. Share of Agriculture and Manufacturing Exports across Time and Regions

Source: COMTRADE, WEO database, IMF staff calculations.
Note: This chart only includes developing countries (EMs and LICs).

Source: COMTRADE, WEO database, IMF staff calculations.
Note: This chart only includes developing countries (EMs and LICs).
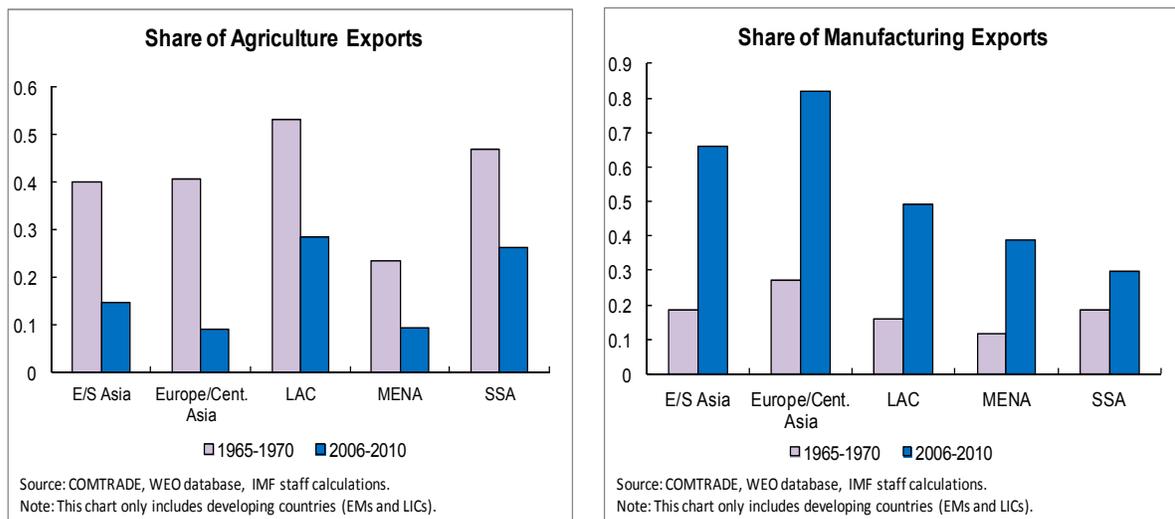
16.   **All regions, including SSA, have made significant progress in diversifying their exports across partners** (Figure 4 left panel). The trend is especially clear when considering the extensive margin, which indicates a significant increase in exports to new partners. This trend is related to the ongoing process of globalization and a clear shift in LICs' trade away from the European Union (EU) and towards Asia (China in particular) and SSA (Figure 4 right panel; see also Samake and Yang, 2011).

Figure 4. Geographic Diversification

Source: COMTRADE, IMF staff calculations.

Source: COMTRADE, IMF staff calculations.
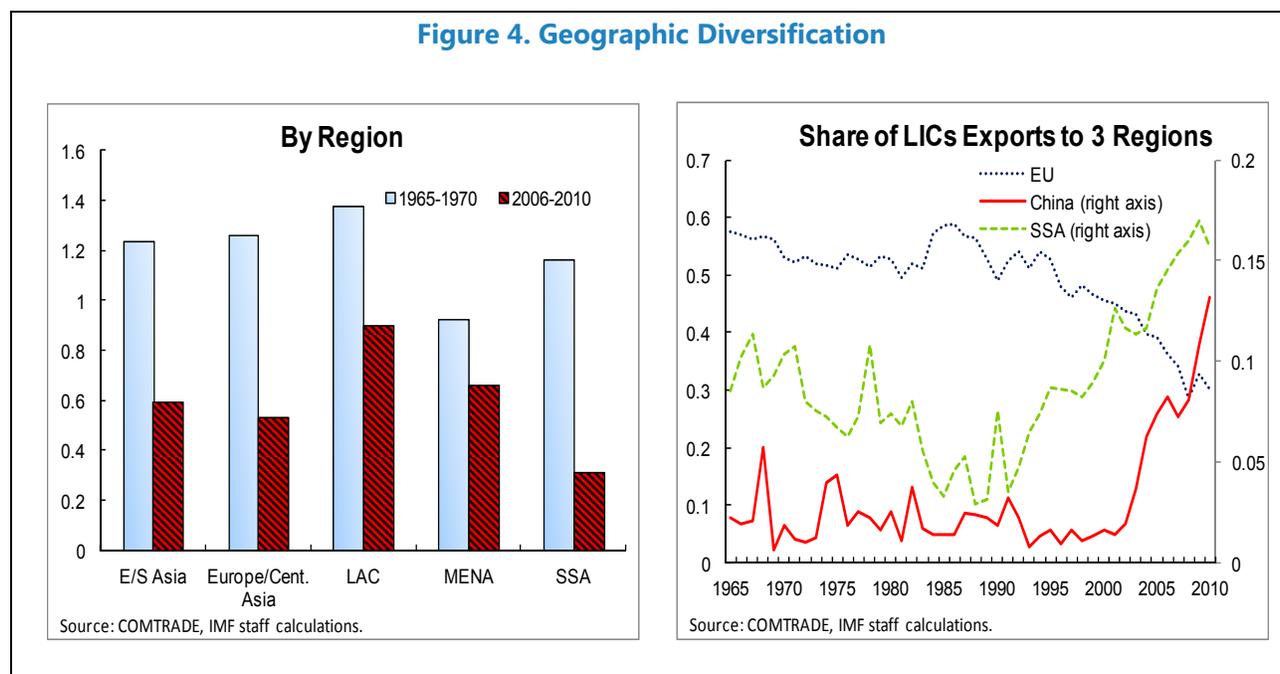
B.   Quality Upgrading

17.   **Economic development is underpinned not just by new products and trading partners, but also by quality improvements to existing products** (see Supplement Note 4). Producing higher quality varieties of existing products can build on existing comparative advantages. It can boost countries' export revenue potential through the use of more physical- and human-capital intensive production techniques. Yet the potential for quality upgrading, that is, the length of a product's quality ladder, varies by product (Khandelwal, 2010; Schott, 2004). Natural resources tend to have lower potential for quality upgrading than agricultural products or manufactures; the latter group typically has the highest quality upgrading potential. For countries at early stages of development, diversifying into products with longer quality ladders may be a necessary first step before large gains from quality improvement can be reaped. On the other hand, LICs' small economic size and limited potential to exploit economies of scale may imply that the cost of moving into many new products is high, making quality upgrading within existing products a more feasible route to diversify.

Figure 5. Quality Upgrading over Time

Source: COMTRADE, IMF staff estimates.
Note: An increase in the quality index indicates higher quality level relative to the world frontier.
These chart only includes developing countries.
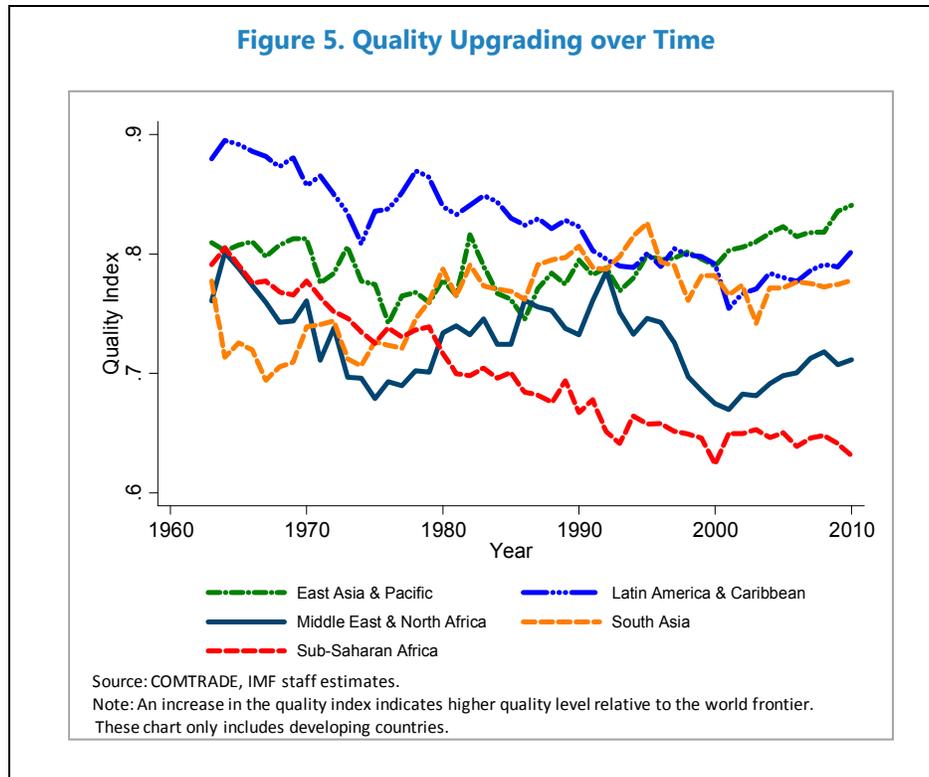
18.   **Since the mid-1980s, developing countries in the East Asia and Pacific region has seen a steady increase in overall export quality levels, while SSA experienced a steady decrease and quality in other regions has remained relatively stagnant** (Figure 5)**.** The success in the East Asia and Pacific region was driven by the manufacturing sector. There has also been limited quality upgrading in the manufacturing sector in SSA, but this was overshadowed by the significant fall in quality upgrading in agriculture leading to a steady fall in quality at an economy-wide level.

19.   **Quality upgrading is particularly rapid during the early stages of development, with quality convergence to the world frontier largely completed as a country reaches upper middle-income status.** This suggests that LICs may gain considerably from quality upgrading. There is wide variation in quality upgrading experiences across countries, which makes it possible to identify its strong association with GDP per capita growth. While the link between quality upgrading and income is strongest for manufacturing as expected, what is surprising is that ample quality upgrading opportunities also exist in agriculture (Figure 6). Quality upgrading prospects in agriculture are typically associated with a rebalancing of the sector toward higher value products and through increasing productivity.

Figure 6. Export Quality Upgrading and GDP per Capita

Source: COMTRADE, WEO database, IMF staff estimates.
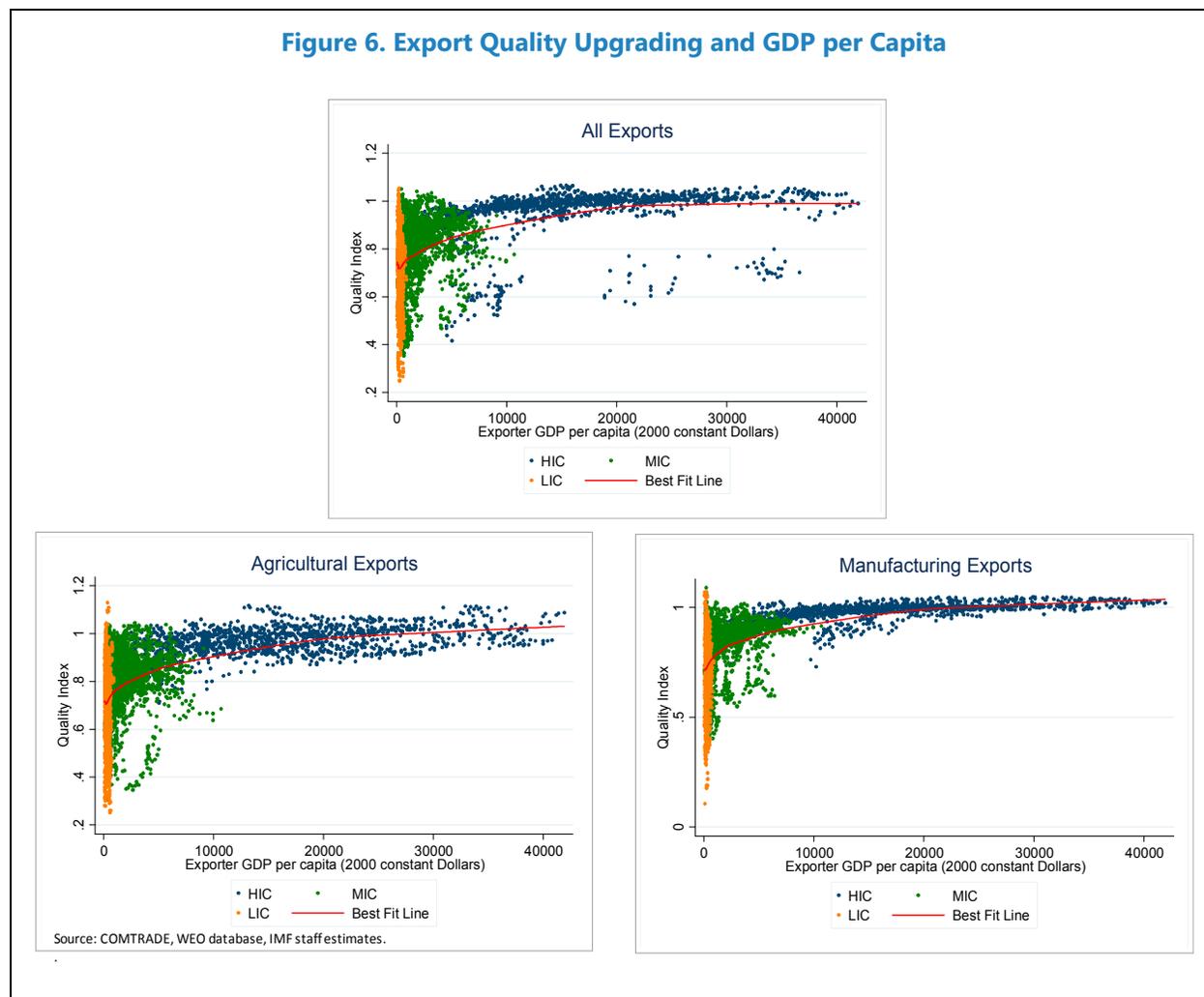
20.   **Countries' positions on sectoral quality ladders indicate the potential for quality upgrading within their existing product baskets.** The length of quality ladders varies considerably by sectors; likewise, a country's relative position may vary considerably across sectors (Figure 7). As a group, LICs, primarily driven by Asia, have already managed to initiate diversification into low-end manufactures, with apparel (included in misc. manufactured articles) being especially important in Asian LICs. To a lesser extent, this type of diversification is also starting to emerge in a few countries in East Africa.[12] LICs typically occupy relatively low rungs on these ladders, implying that considerable quality upgrading potential may exist (see Annex Box 3).

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[12] Regional definitions within Africa are based on IMF division structures, for example countries served by AFR E1 and E2 divisions are grouped into the East Africa region.

Figure 7. Quality Ladders

Source: Comtrade, IMF staff estimates.
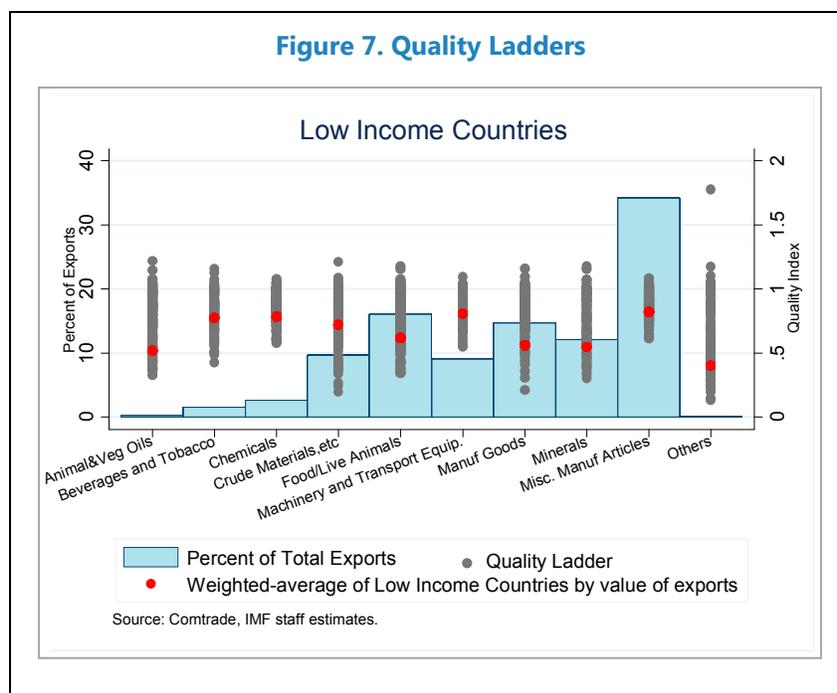
C.   Output Diversification

21.   **Measures of diversification should go beyond trade, to capture domestic sector diversification and the underlying dynamic process of structural transformation.** This is particularly important as historical growth takeoffs in LICs, on average, have been accompanied by productivity surges in broad economic sectors—agriculture, industry, and services. As economies diversified their production, export diversification as measured by changes in the type and quality of export products also increased (Papageorgiou and Spatafora, 2012). This paper therefore also examines diversification in sectoral value-added shares and the sectoral allocation of labor (see Box 1 for description and data sources).

22.   **Output has become more diversified in all regions over the past 40 years** (Figure 8). Both SSA and South Asia have experienced output diversification; however, there has been a significant widening of the gap between these two regions since the early 1980s.

23.   **Over the past decade, the share of agriculture in output in LICs has declined significantly**. Analysis of seven key sectors shows that the gap has been filled largely by non-tradable activities such as construction, wholesale trade, and transportation rather than by manufacturing (Figure 9). There is significant cross-country variation both in the magnitude of the resources shifting out of agriculture and in the precise identity of the sectors that have expanded in agriculture's place (see also Dabla-Norris et al., 2013). Related to this, Ndulu et al., (2007) have argued that geography matters significantly, and that in SSA, the resource-rich countries, the coastal non-resource-rich countries, and the land-locked non-resource-rich countries may all need different growth models. Put differently, one size does not fit all; the heterogeneity of experiences with transformation and diversification will be highlighted in the case studies below.

Figure 8. Output Diversification by Region over Time

Source: IMF internal data, IMF staff calculations.
Note: This chart only includes developing countries (EMs and LICs). Low value means more diversified.
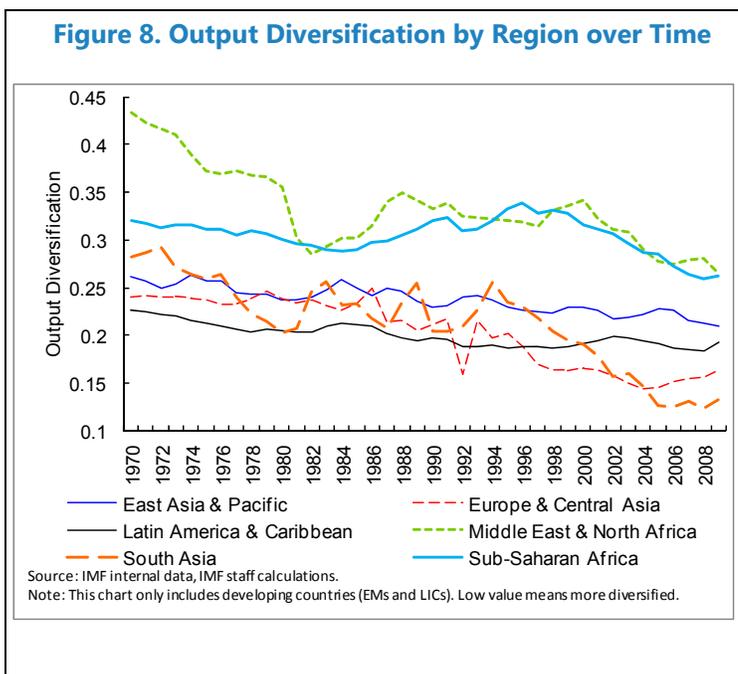
24.   **Export product diversification and quality upgrading are associated with faster and more productive sectoral reallocation.** Over the period 1990-2010, LICs with a more diversified export base experienced a larger reduction in agricultural shares. Faster movement out of agriculture was also observed for economies that have enjoyed relatively faster quality upgrading of their export products (Figure 10 top panel). More importantly, sectoral reallocation also tended to be more productivity-enhancing in these economies (Figure 10 middle and bottom panels). This implies that workers have moved from lower-productivity to higher-productivity activities and sectors, improving the economy's allocation of resources and contributing to higher average productivity growth during the period. The close relationship between export product diversification, quality convergence and broader sectoral shifts in the production of the domestic economy is quite remarkable, given that not all products are tradable, suggesting significant scope for positive spillovers (see Supplement Note 3).

Figure 9. Evolution of Sectoral Value Added Shares in LICs, 1970-2010

Source: UN National Accounts database, IMF staff estimates.
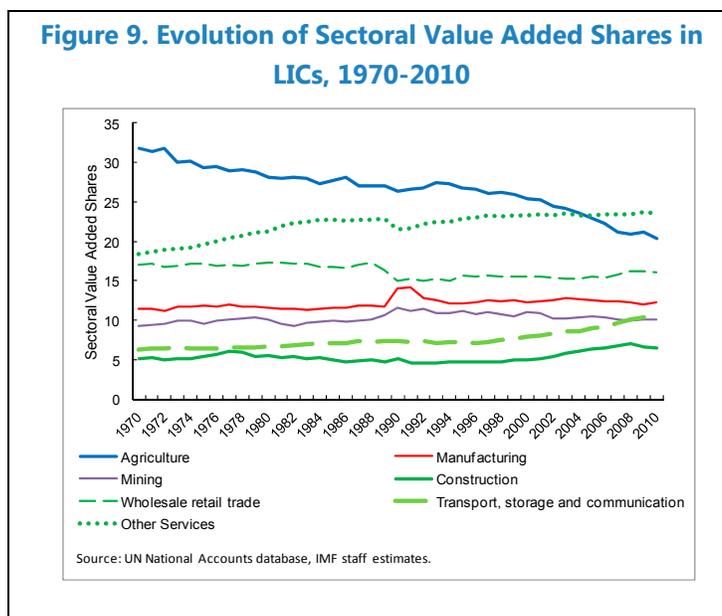
Figure 10. Associations between Export Product Diversification and Measures of Transformation
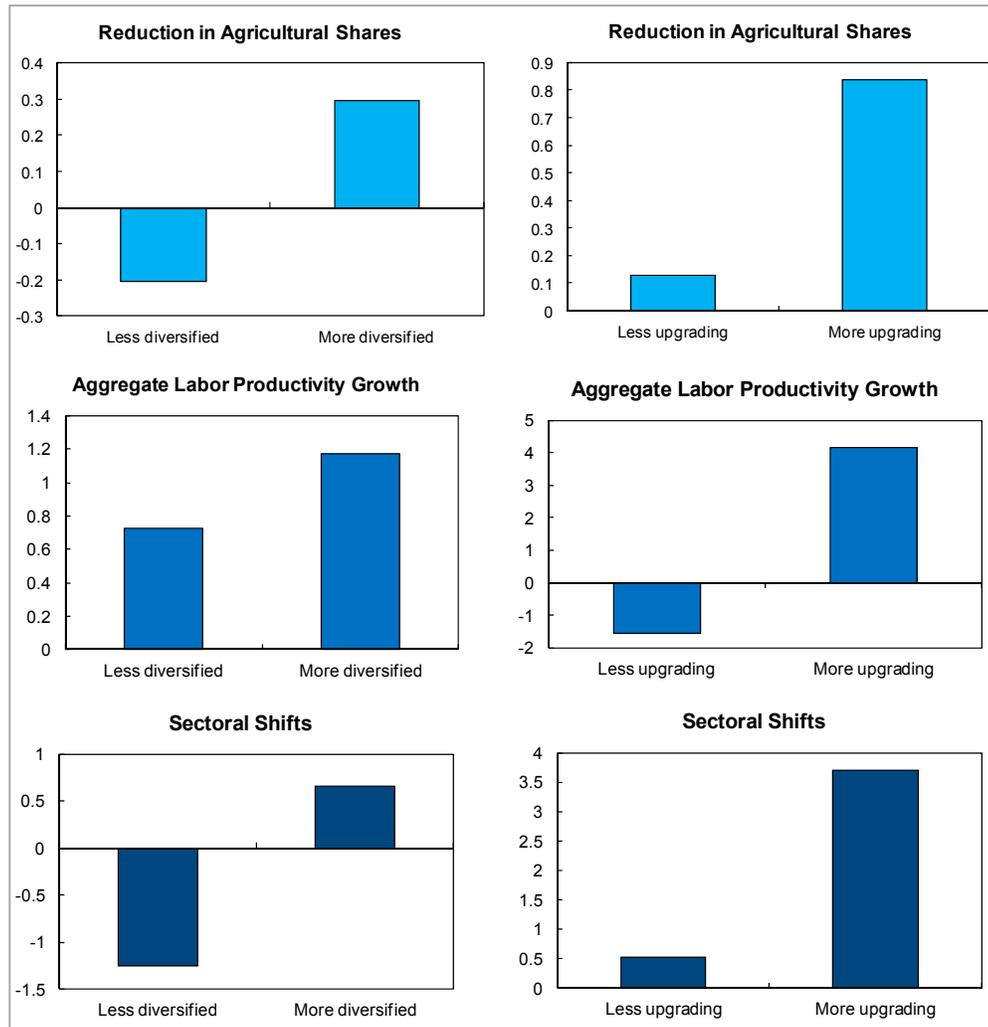
Source: UN National Accounts database, IMF staff estimates.

Notes: Agricultural shares are measured in terms of value added. Labor productivity is output per worker (in 1990 US$, converted at Geary Khamis PPPs). "Sectoral shifts" refer to the contribution of intersectoral labor reallocation to aggregate productivity growth during 1990-2010, computed from a shift-share analysis (see e.g. McMillan and Rodrik, 2011). LICs are classified into "less diversified" (average Theil export product diversification index during 1990-2010 in top quartile) and "more diversified" (average Theil index in bottom quartile); or "less upgrading" (average change in quality index in bottom quartile) and "more upgrading" (average quality change in top quartile).

D.   Case Studies

25.   **Case studies can provide greater granularity in understanding the diversification process for several reasons**. First, diversification often pertains to specific sub-sectors that are only relevant for a small number of countries. Next, relevant data of higher granularity are not available on a cross-country basis (or are not comparable across countries) and the factors behind the evolution of diversification are better gleaned, and policy lessons more easily drawn, on an individual-country

level. The approach taken in this section is to pull together the common lessons from the case studies rather than explore individual country specific idiosyncracies.

26.   **Case studies of six countries show varying experiences of diversification and highlight successes and challenges at different stages of development.**[13] The case studies are selected from LICs and MICs in SSA and East Asia and span a wide range of income levels and experiences with structural transformation. The countries considered are: Rwanda, Tanzania and Bangladesh, LICs with income per capita below $1,000; Angola, the second largest oil exporter in SSA and a MIC still facing significant development challenges; Vietnam, a country on the threshold of MIC status; and Malaysia, a MIC whose income per capita has grown 20-fold over the past 40 years. The latter two cases illustrate the experiences of countries that have successfully diversified or are successfully diversifying their economies. In the other cases, the diversification process is 1) underway, but per-capita incomes are still relatively low (Rwanda and Tanzania); 2) has stalled at some point (Bangladesh); or 3) faces specific challenges related to the dominance of the natural resources sector (Angola).

27.   **Each case study considers output and export product diversification as well as quality upgrading** (see Supplement Note 5) to shed light on the underlying mechanisms and barriers to further transformation:

- *Export Product Diversification*. The experiences have been uneven (Figure 11 left panel). Angola, driven by oil exports, has experienced a steady increase in export concentration as the civil war and Dutch-disease effects have undermined other exports. Bangladesh, after a period of diversification when garments replaced agricultural exports, has seen a re-concentration of exports. Tanzania offers a prime example of a LIC witnessing major changes in its exports since the 1990s with exports of traditional agricultural cash crops (such as cotton, coffee, tea, sisal, cashew nuts, and tobacco) declining considerably in importance. Rwanda has also diversified its exports, albeit starting from a lower level of diversification. Malaysia, for most of the time the most diversified economy in the sample, has experienced some re-concentration of exports as electronic products increasingly dominated overall exports in the 1990s and primary commodities (partly due to price developments) regained some prominence. The share of agriculture in total exports declined in all countries while manufacturing shares increased in all but Malaysia, where agricultural products continue to contribute significantly to total exports, and exports of manufactured goods declined as commodities gained in importance.

- *Output Diversification* increased in five of the sample countries (Figure 11 right panel). The exception is Vietnam, where overall diversification declined in the 2000s, but there was nonetheless rapid structural change as the share of manufacturing in output increased more rapidly than in any other of the sample countries, and the share of agriculture declined very rapidly. The apparent concentration was because of high growth in manufactures, which in itself is quite a diversified sector (but in the 12-sector breakdown of GDP shows up as one sector only).

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[13] The time horizon covered in the individual cases varies. This is largely due to the relevance of the diversification experience, which began at different times across the countries and to the availability of data.

More broadly, the countries in the sample with the fastest growth in GDP per capita also experienced the fastest growth in manufacturing output.

Figure 11. Export and Output Diversification in Six Case Studies

Export Product Diversification

Output Diversification

Source: UN National Accounts database, COMTRADE, IMF staff calculations.
Note: Export product diversification is based on 9 product categories.

Source: UN National Accounts database, COMTRADE, IMF staff calculations.
Note: Output diversification is based on 12 sectors (6 sectors for Angola).

- *Quality Upgrading.* Countries differed significantly in terms of quality upgrading. Malaysia surpassed all other country case studies in terms of average quality level. Vietnam and Rwanda recorded the most improvement in export quality since the 1990s, whereas in Tanzania the average quality of export products relative to the frontier has decreased despite the increase in export product diversification over the same period (Figure 12).

Figure 12. Quality Upgrading in Six Case Studies

Source: COMTRADE, IMF staff calculations.
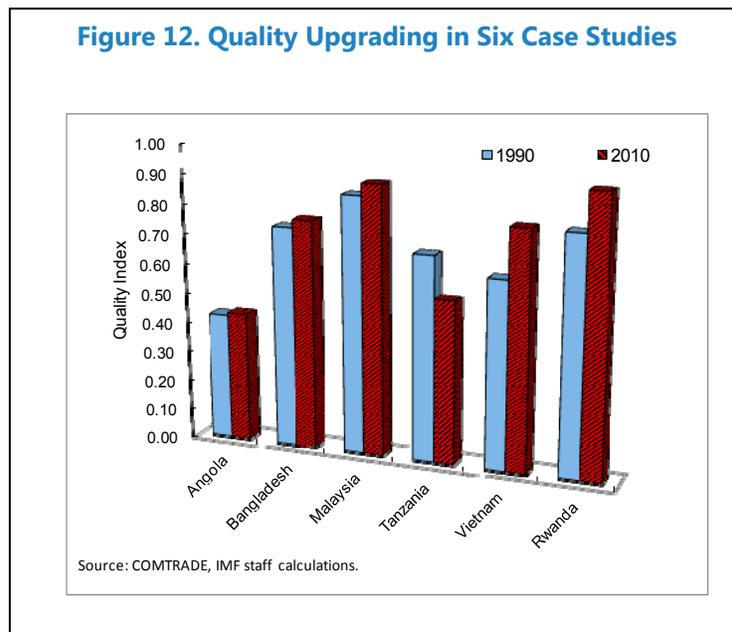
28.   **Export product diversification depends crucially on the frequency with which new products are introduced, the likelihood that they will survive, and their growth prospects**. Initial export product diversification is mainly driven by entry into new products (the extensive margin). In

the above sample of countries, over 1990–2010, there were significant differences (over time and across countries) in three key measures of the extensive margin: (i) the number of new product varieties introduced in a given year,[14] (ii) the survival rates of new varieties, (iii) and the growth rates of surviving varieties. Over time, such differences can accumulate into marked diversity in overall exports. Differences in these measures underline the case studies' varied experiences. Malaysia showed the lowest growth over time in product varieties and, conversely, had the greatest share of exports accounted for by incumbent varieties. While relatively natural for a more mature market, Malaysia's low rates of experimentation may lie behind its recent and possibly premature re-concentration. In contrast, Vietnam and Tanzania showed significant new entry and reductions over time in the relative importance of incumbent varieties, with Rwanda also performing well in the early 2000s. Vietnam in particular stood out as having a high probability of survival for new varieties. In Tanzania, there was less growth in the number of new varieties, but surviving varieties grew more, so that overall, it managed a similar reduction in the share of incumbent varieties. Bangladesh had less experimentation than Tanzania and also less growth in surviving varieties, accounting for its current, unusually high concentration (Figure 13; see Supplement Note 4 and Henn et al., (2013)).

Figure 13. Export Experimentation

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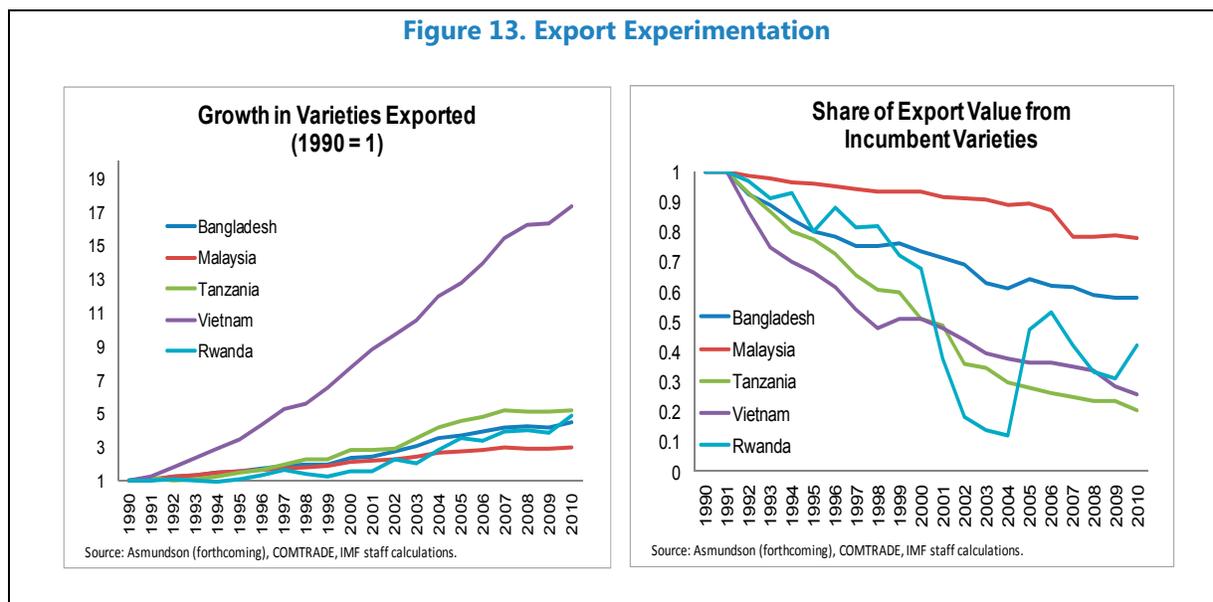
[14] Here, a variety is defined as a specific product exported to a specific country as in Asmundson (forthcoming). Angola is omitted from this analysis due to insufficient data.

GROWTH AND STABILITY THROUGH DIVERSIFICATION AND STRUCTURAL TRANSFORMATION

Is diversification an important channel for growth? Can diversification in products and partners help reduce output volatility?

This paper establishes a robust relationship between growth and diversification (both export and output diversification) in LICs using recently developed econometric methods. Quality upgrading and sectoral reallocation of resources are also positively linked to growth. Export diversification (across products and trading partners) is also associated with lower output volatility. These results attest to the importance of diversification and transformation in sustaining growth and enhancing macroeconomic stability in LICs.

A.   Diversification and Growth

29.   **After a long period of poor performance, many LICs have grown at very high rates over the past 15 years.** Currently, some of the world's fastest growing countries are LICs, and SSA is the world's second fastest-growing region, behind only developing Asia. Part of this solid performance can be attributed to favorable commodity prices in the 2000s, but non-commodity exporting LICs have also done well (IMF, 2013b). Improved macroeconomic stability through better policy making, healthier economic and political institutions, and wide-ranging structural reforms are all contributors to the recent growth acceleration. In contrast, the post–1995 growth spurt was experienced by fewer fragile countries.[15] A similar heterogeneity was observed in terms of diversification; many LICs diversified rapidly, but progress in others, including in particular fragile states, was more halting (Annex Box 3).[16]

30.   **Growth and export product diversification patterns are clearly related, although the relationship displays much heterogeneity.** Consistent with a literature that can be traced as far back as Singer (1950), initial diversification is on average positively associated with subsequent growth, although the relationship is far from precise (Figure 14).

31.   **Diversification "spurts" and growth "accelerations" are also correlated**. Diversification spurts, that is, sharp increases in diversification, are associated with subsequent sharp increases in growth (Figure 15) (see Berg et al., (2012) for a precise definition of growth accelerations; diversification spurts are defined analogously).[17] In a similar vein, growth accelerations are associated

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[15] For details, see *Macroeconomic and Operational Challenges in Countries in Fragile Situations,* IMF (2011).

[16] While beyond the scope of this paper, work has been initiated by Fund staff to investigate the relation between macroeconomic policies and inequality within the process of structural transformation in LICs (Peralta-Alva, 2013, and Peralta-Alva and Telyukova 2014).

[17] See also Kali et al., (2013), who develop a novel measure of how easy it is for a country to move from its current specialization pattern to new products ("network proximity"), and show that the easier it is, the more likely the country is to experience growth accelerations.

with subsequent increases in export product diversification. These results are more pronounced in non-fragile LICs (Annex Box 3).[18]

Figure 14. Export Product Diversification and Growth

Source: COMTRADE, Penn World Table 7.0, IMF staff calculations.
Note: Lower diversification index value means more diversified.

Figure 15. Export Product Diversification Spurts and Growth Accelerations in LICs

Source: COMTRADE, WEO database, IMF staff estimates.
Notes: Per capita GDP growth in LICs during the periods leading up to, and following a diversification spurt. Growth breaks and diversification spurts are identified using Berg et al. (2012).

Source: COMTRADE, WEO database, IMF staff estimates.
Notes: Diversification during the periods leading up to, and following, a growth acceleration.

32.   **While economic diversification is correlated with growth, is there evidence of a causal relationship**? After all, growth may actually be driving diversification. For this reason, the

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[18] In addition to the successful cases of growth and diversification, there are interesting examples of countries where a period of sustained "de-diversification" (that is, increasing concentration in exports) coincides with decelerations in growth (e.g., Haiti).

diversification-growth debate is re-examined using novel econometric tools. Estimation is challenging not only because of causality issues but also because there is a void in the literature in proposing theories with well-established testable hypotheses regarding the effect of diversification on growth.[19] To address both of these challenges the empirical approach leverages a method specifically designed to allow for a large set of potential growth determinants when causality is in question (Eicher et al., 2009).[20] (See Supplement Note 1).

Figure 16. Probability of Effectiveness for Drivers of Growth
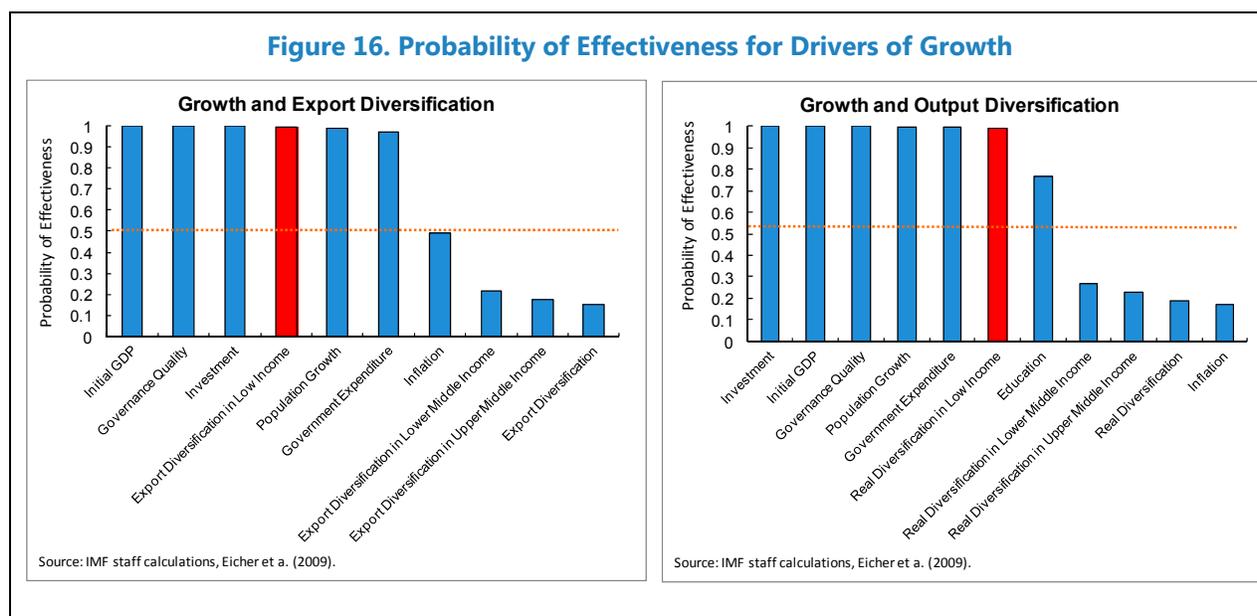
33. **The results suggest that diversification in both exports and output is among the key factors driving growth, but only in LICs**.[21] The posterior inclusion probabilities indicate that export diversification is among the most effective determinants of growth in LICs (Figure 16). Results are similar using diversification measured as the extensive or intensive margin, suggesting that LICs can

[19] One of possibly numerous transmition mechanisms worth investigating in future work is the impact of diversification on reducing volatility, enhancing investment and subsequently growth.

[20] Standard cross-country analysis assumes that the correct theory or model is known and can therefore be tested using standard regression methodology. This is a problem when there are many competing theories, as in the case of the economic growth literature, since it leads to over-confident inferences and decisions that are based on biased results. Bayesian Model Averaging (BMA) provides a coherent mechanism for accounting for this theoretical uncertainty; it is a weighted average over all possible theories and models, where the weights capture model quality. Instrumental Variable Bayesian Model Averaging (IVBMA) controls simultaneously for endogeneity by allowing for model uncertainty in the first and second stages of IV estimation. Eicher, Raftery and Lenkoski et al., (forthcoming, *Econometric Reviews*) show how IVBMA tackles the weak instrument issue by basing its estimation only on models for which a valid first stage exists, and down-weighing weak instrument models. In addition, IVBMA produces the *posterior inclusion probability* (PIP) that provides a probability statement regarding the importance of a particular growth determinant. The posterior inclusion probability answers the question: "what is the probability that a particular growth determinant has an effect on growth?" Consistent with existing literature, a growth determinant is considered as "effective" if its posterior inclusion probability exceeds 50 percent.

[21] Preliminary results indicate that this finding extends also to EMs, albeit only at the extensive margin of export diversification. More in-depth analysis in the future is warranted, given that many EMs, particularly commodities-exporting countries, are still at the early stage of diversification.

stimulate growth by expanding into new products or having a more evenly balanced mix of existing products. This conclusion carries over to the more general concept of output diversification.[22] The magnitude of the growth boost associated with diversification is economically significant: a one standard deviation increase in LICs' export product diversification raises their growth rate by about 0.8 percentage points. Similarly, a one standard deviation increase in output diversification in LICs raises their average annual growth rate by about 1.4 percentage points (for the full set of results see Supplement Note 1).

34.   **Quality upgrading is also associated with higher growth** (Figure 17). Although these are only simple correlations, the link between quality upgrading and growth is strongest for quality upgrading in manufacturing. Ample quality upgrading opportunities also exist in agriculture. These are often associated with a rebalancing of the sector toward higher value products, and increasing productivity typically leads the sector to free-up resources. In contrast, manufacturing's share of GDP tends to expand as quality in the sector increases.

Figure 17. Quality Upgrading and GDP per Capita Growth, 1995-2010

Source: COMTRADE, Penn World Table 7.0, IMF staff calculations.
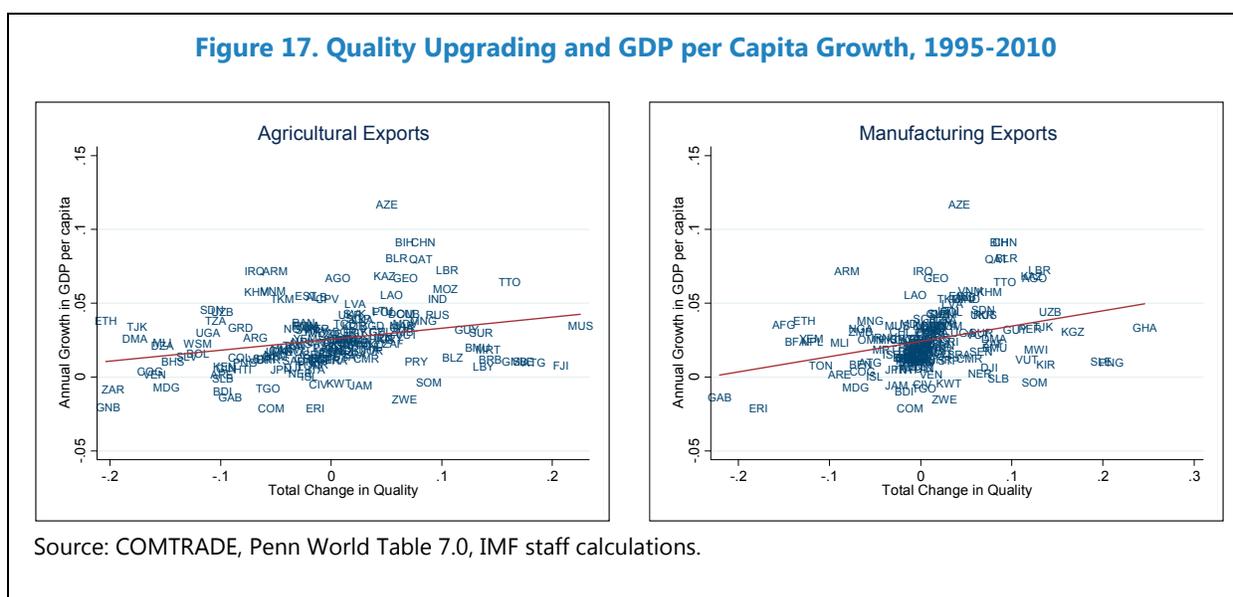
35.   **Growth has been higher in countries experiencing fast quality convergence** (Figure 18). Average annual growth was more than 1 percentage point higher in LICs with fast quality convergence compared to LICs with slow quality-convergence (during the quality convergence period after 1995). The result is slightly strengthened when lower-middle-income countries are also considered. In contrast, when focusing on Africa only, countries received a lower growth dividend from quality upgrading, though still in excess of ½ percentage points per annum in the post-1995 period. This may be related to the relatively less favorable business environments in Africa, or the advantages of Asian LICs being geographically proximate to neighbors and integrating into regional supply chains. Finally, growth in small states has also benefitted strongly from fast quality

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[22] These findings are robust to the two biggest caveats encountered in growth regressions, endogeneity and model uncertainty, which are addressed by employing an IVBMA estimator to control for both issues simultaneously.

convergence with additional annual per capita growth of 2 percentage points relative to slow converging peers.

Figure 18. Additional GDP per Capita Growth in Fast Quality Convergers

Source: COMTRADE, IMF staff calculations.
Note: "LMs" refers to "Lower-middle income countries". Additional annual per capita growth in fast quality convergers during 1995-2010 relative to slow convergers (percentage points). Fast quality convergers are those with export quality higher by 0.05 or more during 2008-2010 than 1994-1996. Other threshold values for the fast converger cutoff give similar results.

36.   **Sectoral reallocation and sectoral productivity also play an important role in the growth process, although there is substantial heterogeneity in country experiences.** Growth in economy-wide labor productivity—the key component of output growth—can be decomposed into the relative contributions of within-sector productivity growth and sectoral shifts (see Annex 2 Section C). The decomposition for LIC regions shows that, for example, agriculture and manufacturing were the primary sources of productivity growth in Asia, in part due to the large shares of agriculture and manufacturing in these economies. The service sector was relatively more dominant in Europe and Central Asia (ECA), Middle East and North Africa (MENA), and SSA, and mining played an important role in Latin America and the Caribbean (LAC). While labor reallocation across sectors has generated the largest productivity gains in Asian countries, it contributed negatively to productivity growth in LAC and particularly SSA (Figure 19).[23]

37.   **Productivity gaps between the agricultural sector and the rest of the economy remain large in LICs** (Figure 20), implying considerable scope for further productivity gains from either within-sector productivity growth or labor reallocation. The agricultural productivity gaps-measured as the average real value added per worker in agriculture as a percentage of that in industry and services-averaged about 30 percent in 2005 for LICs, with large dispersion across countries (see also Gollin et al., 2013).

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[23] The decomposition uses seven sectors: agriculture, mining, manufacturing, construction, wholesale and retail trade, transportation and communication, and other services (with the last four aggregated under "Services"). Using more disaggregated sectors can produce different results from a decomposition using only broad sectors. This is because there are substantial productivity differences within the service sector, and resources moving between different service activities can either increase or decrease the contribution of sectoral shifts to aggregate productivity growth.

Figure 19. Decomposing Productivity Growth

GDP and Labor Productivity Growth in LICs, 1990-2010 (percent)

Source: IMF staff calculations.

Decomposition of Labor Productivity Growth, 1990-2008 (Annual average, percent)

within Agriculture — within Mining — within Manufacturing — within Services — Sectoral Shifts
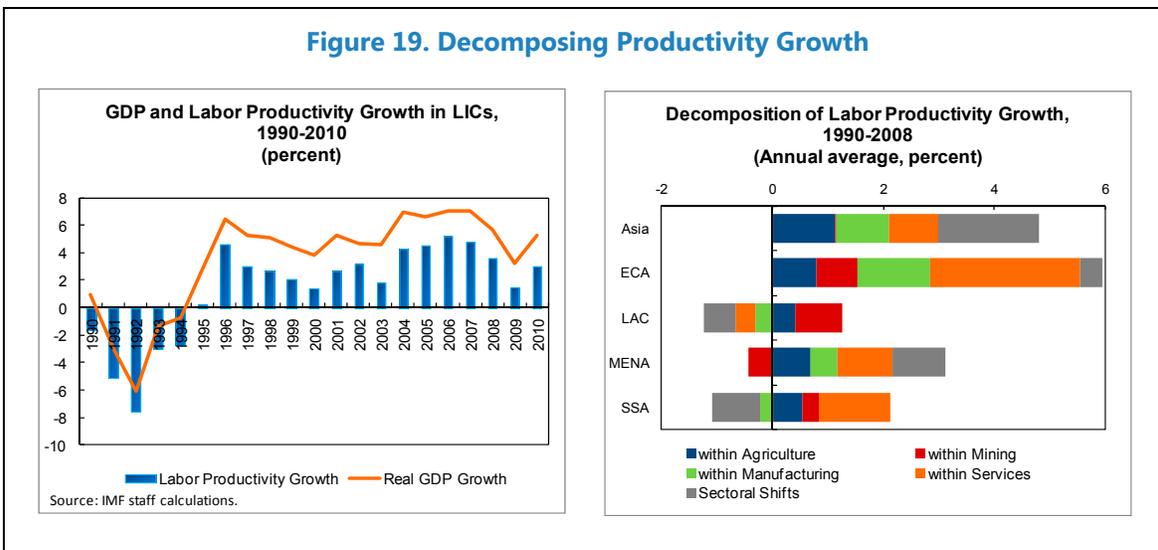
Figure 20. Agriculture Productivity Gap and Income, 2005

Source: IMF staff calculations.
Notes: The gap is agricultural productivity as a percentage of non-agricultural productivity.
Blue, red, and green denote advanced economies, EMs and LICs, respectively.
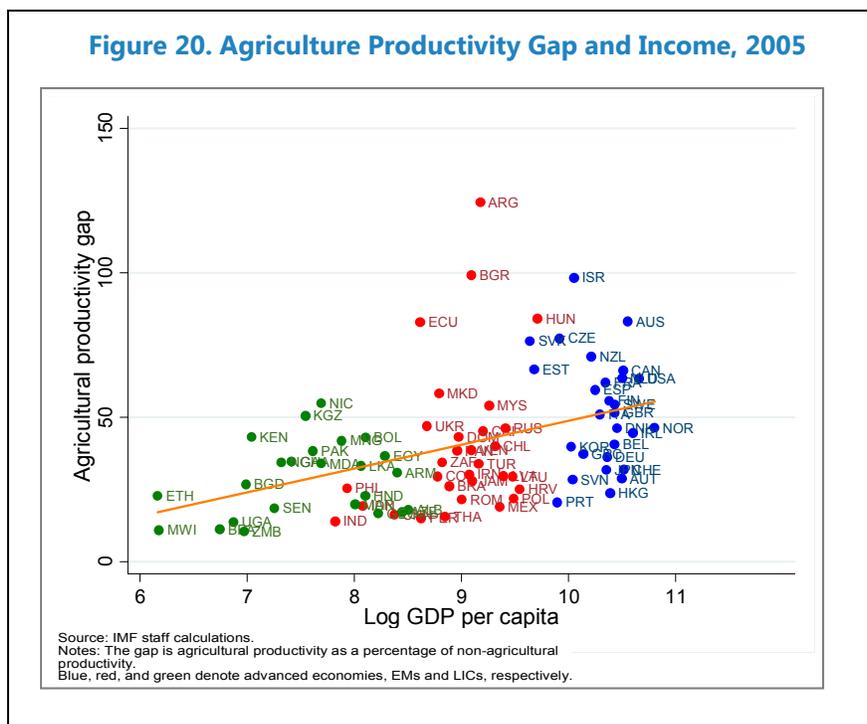
38.   **LICs in Asia tend to be further along in the transformation process compared to SSA LICs**. Between 1990 and 2010, Asian economies such as Vietnam have markedly reduced the size of their agricultural sector and moved workers to higher value-added manufacturing activities (Figure 21, also see e.g., McCaig and Pavcnik, 2013). By comparison, SSA countries during the same period experienced relatively little resource reallocation away from agriculture, a sector that typically exhibited very low productivity. There is a shallow manufacturing base, and the service sector, while relatively dynamic and gaining ground, continues to feature a significant concentration in low-value added activities (see Supplement Note 3). However, there are encouraging signs of structural transformation turning around in Africa: after 2000, resource reallocation has started to contribute positively to Africa's overall productivity growth (see also McMillan and Rodrik, 2013).

Figure 21. Sectoral Reallocation and Productivity in Asia vs. SSA, 1990-2010

Source: IMF staff calculations.

Note: "Sectoral shifts" refer to the contribution of labor reallocation to aggregate productivity growth. Agricultural productivity is measured as real value added per worker in the sector.
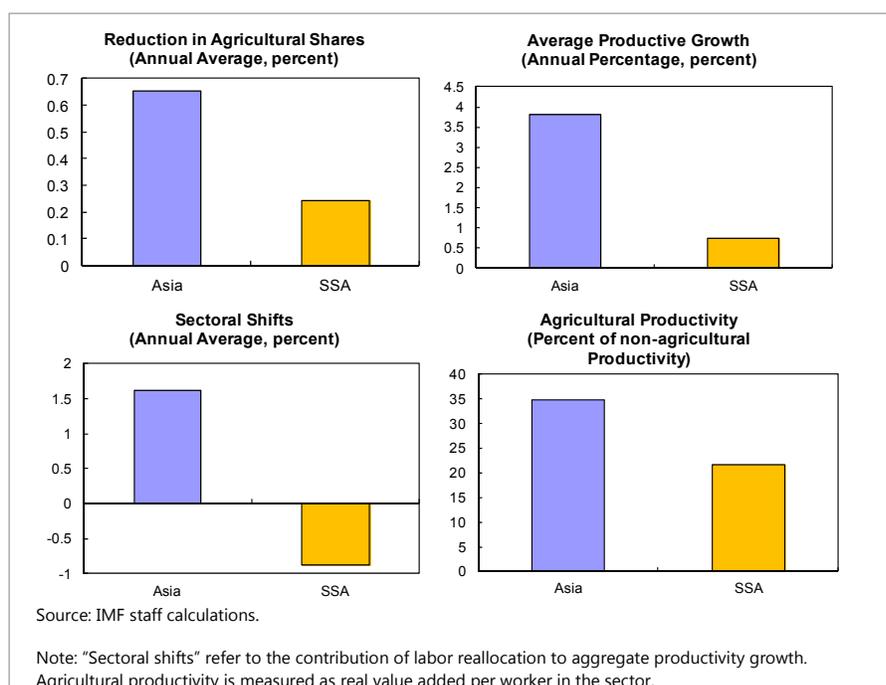
B. Diversification and Volatility

39.   **Both export and output diversifications are associated with lower volatility of output in developing countries** (Figure 22). The empirical analysis (Supplement Note 2) suggests that the effect of diversification on output volatility is primarily driven by a more evenly balanced product mix of the current export basket (intensive margin).[24] This result holds even if countries are more open to international trade (measured by the ratio of exports and imports to GDP). These findings corroborate evidence from the existing literature that economic diversification can increase the resilience of countries to external shocks, and therefore mitigate vulnerabilities caused by globalization and trade openness through external demand or the terms of trade channels (see, e.g., Koren and Tenreyro, 2007, and Haddad et al., 2013). In a similar vein, developing countries that manage to diversify from agriculture into manufacturing and services experience lower volatility of inflation as large and volatile shocks to food supply play a relatively smaller role in the dynamics of inflation (Portillo et al., 2014; Annex Box 4). Diversification across partners also helps reduce volatility of GDP per capita (Jansen et al., 2009; Farshbaf, 2012).

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[24] The volatility regressions used all developing countries (both LICs and EMs) in the sample because of data constraints.

Figure 22. Diversification and Volatility, 1962-2010
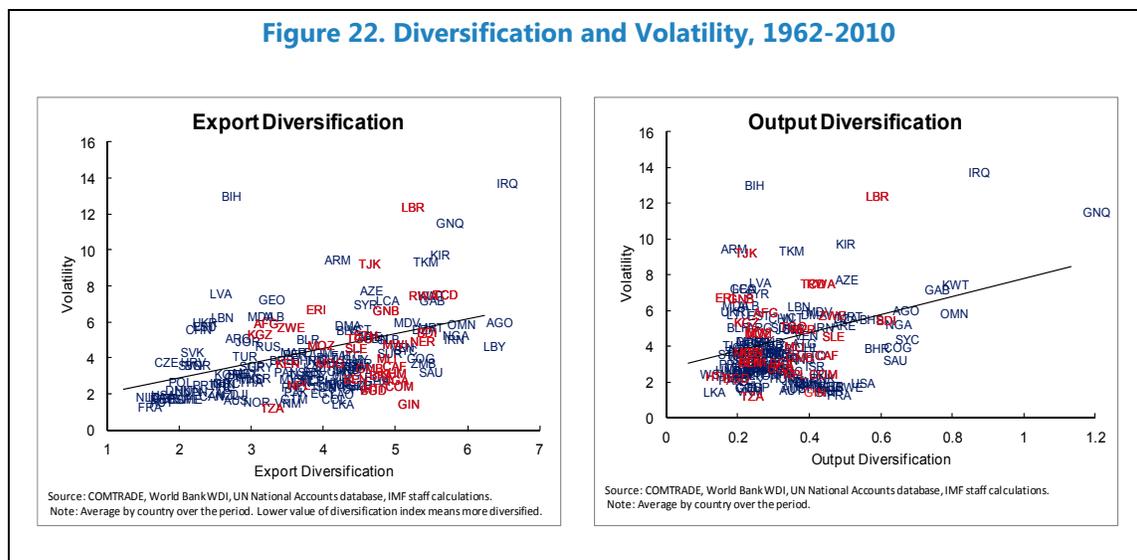
40. **The clearest link between diversification and volatility is in the context of large diversification spurts.** Staff analysis identifies a total of 61 export product diversification spurts in the post–1962 period involving 51 developing countries (Table 1).[25] Diversification spurts occurred more frequently in the 1960s and 1990s and are evenly distributed across regions (after controlling for the number of countries). The spurts last 13 years on average, rising to 20 years in the East Asia and Pacific region. Examples of rapid diversification spurts occurred in Chile, Malaysia, Thailand, Ghana, Madagascar, and Mauritania in the 1970s and 1980s (Figure 23). The identified spurts accord well with the country-specific literature. For instance, as discussed in the case studies, it is broadly accepted that Malaysia underwent rapid and significant diversification in the 1970s and 1980s, but the process came to a halt in the 1990s.[26]

41. **Export product diversification spurts are associated with reduction in the volatility of GDP per capita in developing countries**. The effect is especially pronounced in LICs, where output volatility diminishes by 0.5 percentage points in the wake of diversification spurts (Figure 24). In the rest of the sample the effect is still sizable but about half of that in LICs.

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[25] Previous work by Jerzmanowski and Cuberes (2009) found that barriers to entry for new firms lead to less sectoral diversification and to larger growth volatility. Work in progress by the same authors attempts to relate diversification spurts with growth reversals. The underlying notion is that analysis of periods of significant, sustained diversification can more easily uncover effects on the economy than the customary regression trend analysis (see also Allain et al.,, 2012). The procedure for identifying diversification spurts is based on Berg et al., (2012).

[26] A similar procedure can be carried out to identify episodes of rapid and significant diversification across trade partners. Generally, these are concentrated after 1990 and may be related to reduction in shipping and communications costs.

Table 1. Descriptive Statistics of Export Product Diversification Spurts, 1962–2010

Regions	Number of observations, unless otherwise indicated								
	1962-69	1970-79	1980-89	1990-99	2000-10	Total per region	Duration (In years)	Relative per region (In percent)	Countries
Asia and Pacific	3	2	4	1	1	11	19.4	18.0	10
Europe	4	0	0	3	1	8	8.1	13.1	8
Latin America	4	1	2	2	3	12	11.8	19.7	9
Sub Saharan Africa	8	3	1	3	3	18	12.2	29.5	10
Middle-East and North Africa	5	1	1	4	1	12	10.6	19.7	14
Total per decade	24	7	8	13	9	61	12.6	100.0	51
Relative per decade (In percent)	39.3	11.5	13.1	21.3	14.8	100.0	..	..	..
Duration (In years)	13	13	19	11	8	13	..	..	..
Countries [1]	24	7	8	13	9	61	..	..	..

Note: Diversification episodes identified using a variant of Bai-Perron's multiple breaks technique. Critical values are sample-specific and take into account heteroskedasticity and sample size as opposed to asymptotic critical values. Minimum "interstitiary period" (number of years) between breaks is set to 5 and the significance level to 10 percent. (1) 5 countries have experienced 2 episodes.

Figure 23. Product Diversification Episodes in Selected Countries

Source: COMTRADE, IMF staff calculations.

Figure 24. Export Product Diversification Spurts and Volatility in LICs, 1962–2010
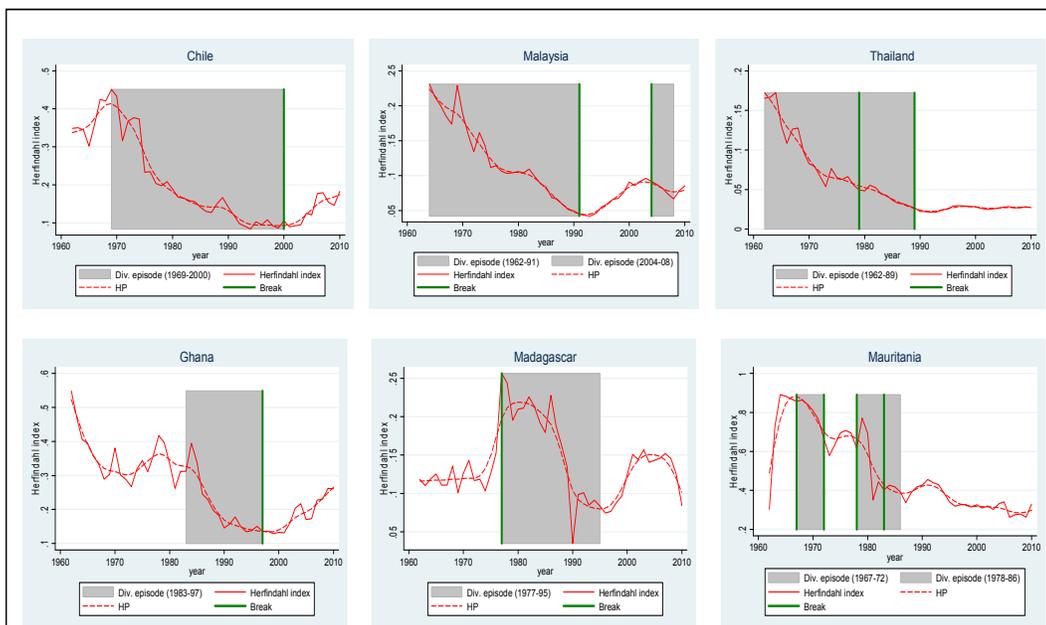
Source: COMTRADE; World Bank WDI; IMF staff calculations.
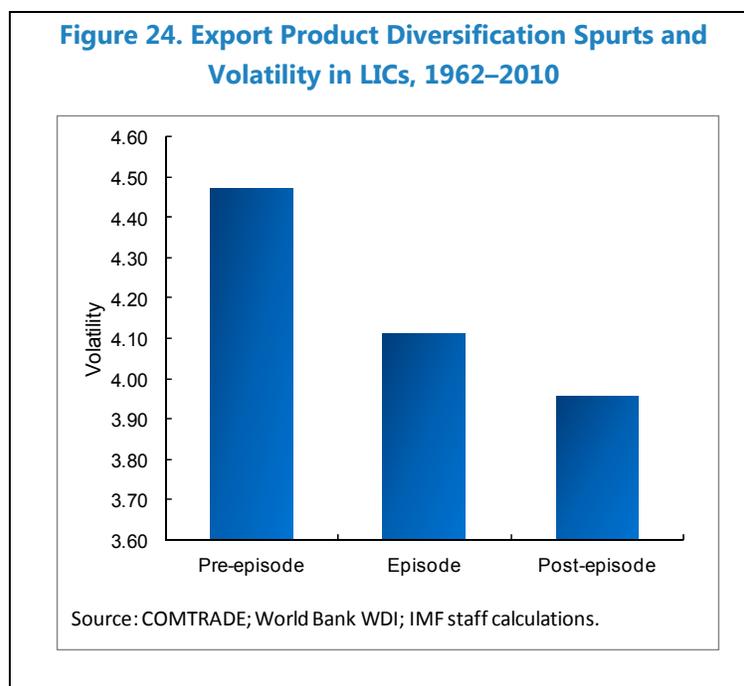
DRIVERS OF EXPORT DIVERSIFICATION, QUALITY UPGRADING, AND SECTORAL PRODUCTIVITY

Having established that diversification and quality upgrading are conducive to faster economic growth and reduced volatility for LICs, the paper next analyzes their underlying determinants to underpin the role of economic fundamentals and the role for policies.

Findings of this paper reveal that a common set of economic fundamentals and policy variables are associated with various dimensions of diversification. Given the nature of the statistical relationships, the results should be interpreted as association rather than causation. The cross-country regression analysis shows that human capital and institutional quality are important for both export product diversification and quality upgrading. Agricultural reforms and financial liberalization have contributed to export product diversification, quality upgrading, and sectoral productivity. Country case studies demonstrate that there is no universal diversification trajectory, and that successful diversification is linked to the removal of barriers to entrepreneurship and investment in infrastructure and people.

A.   Drivers of Export Product Diversification

42.   **Regression analysis reveals that export product diversification is associated with a range of general policy and reform measures.** Given the hump-shaped pattern of export product diversification along the development path (Figure 1), it is important to take into account non-linearities in the empirical analysis. Analytical work shows that countries below a certain level of income per capita (US$ 25,000 in 2005 purchasing power parity dollars) are in the diversification stage while countries above it reconcentrate their export structure.(see e.g., Dabla-Norris et al.,

forthcoming).The following associations were uncovered by using a specification that accounted for this turning point[27] (TP):

- Higher levels of *education* and *institutional quality*, including better *protection of property rights*, are associated with higher export product diversification with the latter economically significant only for developing countries (those below the TP).

- *Deeper financial systems* (measured by the private credit to GDP ratio) are also associated with higher export diversification in developing countries (those below the TP).

- G*lobalization* (measured by the overall KOF index)[28] is associated with higher export diversification for all countries. In addition, recent increasing trends in South-South trade (Figure 4, right panel); higher export shares to all developing economies are correlated with increased export diversification.

- *Proximity to markets* is also important for diversification; for example, landlocked countries are found to be less diversified.

- Several reforms are also correlated with diversification, namely *trade liberalization* and *agricultural reforms*, with the latter having the highest impact on countries at early stages of development. Along this line, Benguria (2014), using different measures of trade policy (e.g., liberalization dates and industry-level tariffs), finds that trade liberalization, by providing access to imported intermediate inputs, has expanded export variety in LICs (including SSA LICs) and led to downstream movements in supply chains (i.e., producing higher value-added and more sophisticated products).

- There is some statistical evidence that real exchange rate (RER) undervaluation (as measured relative to a PPP-based measure of the equilibrium RER that allows for Balassa-Samuelson effects) is associated with higher export diversification, presumably by enhancing the profitability of firms producing tradable products (see Annex Box 5). That said, efforts to maintain a relatively depreciated exchange rate over time can produce either consistently higher levels of inflation (as the real exchange rate equilibrates via adjustments in domestic prices) or sustained diversion of scarce national savings into the accumulation of low-return foreign financial assets (reserves)— neither of which is supportive of growth.[29]

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[27] The turning point is accounted for by including both GDP per capita and its quadratic term in the regression. The sample for this section is all countries (AEs and developing countries).

[28] The overall KOF index of globalization covers the economic, social, and political dimensions of globalization.

[29] The consistent use of exchange rate policy to prevent effective balance of payments adjustment and/or gain an unfair competitive advantage over other members runs counter to IMF member countries' obligations under the Articles of Agreement.

B. Drivers of Sectoral Shifts and Sectoral Productivity

43.   **Policies and institutions have direct impacts on the extent of resource movement (value added or employment)**[30] **across sectors**. Analysis of a group of LICs over the period 1995-2010 shows that sectoral reallocation responds to the infrastructure and regulatory environment, which affects labor mobility. In particular, liberalizing the electricity market, easing credit, and reducing labor market and business regulations are all associated with higher manufacturing employment shares; improving education is linked to increased value added shares for both the manufacturing and service sectors. Reducing the average import tariff rates in this group of LICs is associated with labor moving out of agriculture[31] (Supplement Note 3).

44.   **A number of reforms are associated with boosting productivity growth at the sector level, but different sectors require different policy focuses.** For example, removing tariff barriers to international trade and reducing interest rate controls have a positive effect on agricultural productivity growth in LICs. The likely channel would be that tariff liberalization improves the efficiency of farming through better market and technology access, cheaper imported inputs, and greater competition with imports. Domestic financial sector reforms, capital account liberalization (FDI), and improvement in road infrastructure and education matter for manufacturing productivity. For the service sector, liberalization of networks industries, specifically telecommunication, is found to generate productivity gains. These reforms enhance competition among the providers of telecommunication services, enabling greater innovation, more FDI, and better access to these services at lower prices for both consumers and businesses (Supplement Note 3).

## C. Drivers of Quality Upgrading

45.   **Both human capital and institutional quality are positively associated with the growth rate of product quality**. Consistent with intuition and existing theory (Stockey, 1990), regression estimates indicate that moving up the value chain is associated with an increasingly skilled work force. This is consistent with evidence from country cases studies; for example, Malaysia's, and more recently Vietnam's move to middle range manufacturing was facilitated by major improvements in secondary and tertiary education. In addition, institutional quality is found to be positively associated with the product quality, likely because sound institutional frameworks encourage investments needed for process and product upgrading. Finally, liberal trade regimes, agricultural policy, and

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[30] While employment shifts may be the preferred measure of sectoral shifts, sectoral employment data in LICs are of low quality and the coverage is uneven. Our analysis is based on a carefully constructed database, combining various data sources (i.e. household surveys, the Groningen Growth and Development Center database, World Development Indicators, and ILO). Recognizing the data issues, we supplement employment measure with value added, which is more readily available from the UN National Accounts database.

[31] To the extent that agricultural tariffs in developing countries were substantially higher than tariffs on imports of manufactured goods at the start of the analyzed period (Hertel and Martin, 2000), this finding is consistent with what theory would predict: tariff reduction shifts resources away from the protected sectors. The impact of trade policy on sectoral reallocation is, however, likely to be complex and varied across countries depending on the size of initial tariffs, the sector composition of protection, and the economic structure of trading partners, among others.

domestic financial markets all support a faster pace of quality upgrading. These relationships are significant both statistically and economically (Supplement Note 4)[32]

46.   **LICs' potential for quality upgrading does not appear to be limited by demand in destination markets**. Figure 25 illustrates that the average quality level imported in LIC destination markets (blue bars)[33] is much higher than the average quality of LIC exports (red bars). This highlights that changing destination markets is not necessary for LICs to realize their quality upgrading potential; demand for quality in existing destination market is not an apparent obstacle. Indeed the poorer the exporter, the greater the remaining upgrading (i.e. the gap between the red and blue bars in Figure 25). This pattern is evident throughout LIC subgroups, with fragile LICs showing a larger gap than non-fragile peers, and LICs in all regions in Africa showing a larger gap than LICs with higher income. More limited upgrading potential in existing destination markets also remains for small states. Finally, the figure illustrates that LICs serve destinations importing products that are lower quality than those served by high income countries. Thus, reorientation of trade towards higher income markets is not pressing at this stage to harness quality upgrading potential.

Figure 25. Quality Exported Relative to Quality Demanded by Trading Partners, 2010

Source: IMF staff calculations.
Note: "Average quality demanded in destination markets" refers to the average quality of imports in the trading partners. See Annex 1 Section B for how quality is measured.

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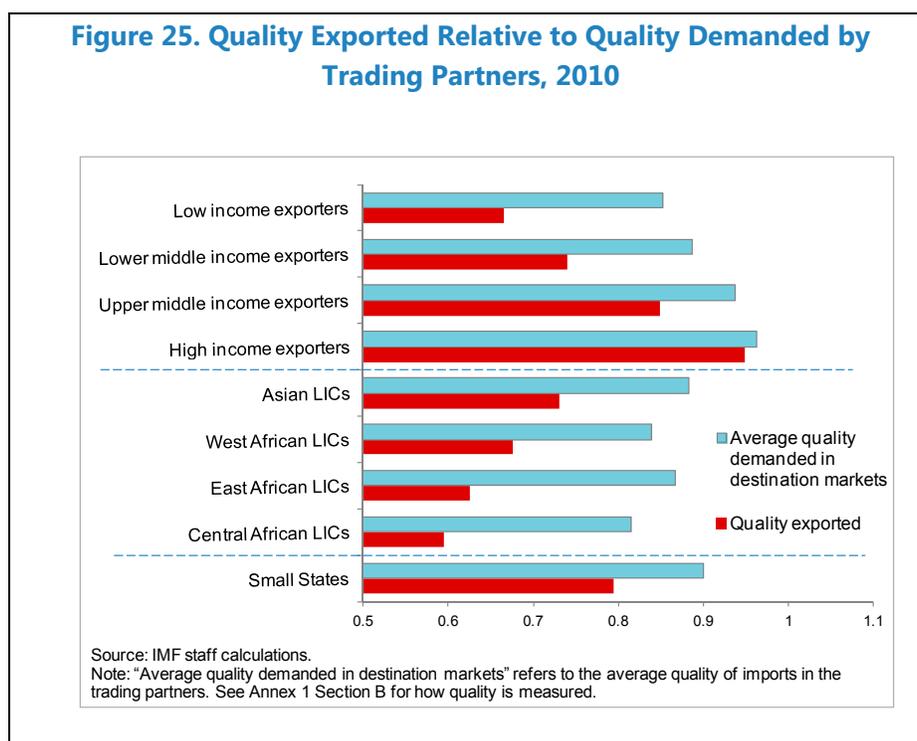
[32] Institutional quality is measured here using the "constraints on the executive variable" from the Polity IV dataset, but similar results are obtained using the Kaufmann-Kraay-Mastruzzi indicators. Human capital is measured using the secondary-school completion rate from the *World Development Indicators*.

[33] This average quality level of imports is calculated across *all* exporters to these destination markets (including middle and high income exporters).

D. Country Case Studies

47.   **Diversification and structural transformation are often underpinned by reforms and policy measures that are general in scope.** While there is no single diversification trajectory followed by all countries, there are similarities in outcomes that suggest that successful diversification is linked to policy measures and economic factors (Supplement Note 5):

- *Macroeconomic stabilization* is a clear example. Specifically, some country cases in the sample, such as Vietnam, Rwanda and Tanzania, show that successful diversification has coincided (no causation claimed) with improved macroeconomic policies and a greater degree of stability.

- *Reduction of barriers to entry* tends to boost diversification by reducing costs and encouraging entrepreneurs to spread their reach beyond established activities. This is most evident in transition economies such as Vietnam where collectivization was reversed and a diverse agricultural sector emerged[34], but also in Rwanda and Tanzania, where the large divestment of state enterprises in the former and the dismantling of the state distribution system in the latter has led to the mushrooming of the private sector. In Bangladesh, the removal of bureaucratic red tape has triggered large investments in export processing zones.

- *Investment in infrastructure* is also an important ingredient for diversification since it lowers business costs. This implies that the state has a significant role to play in supporting diversification, as producer and/or regulator of infrastructure.

- *Investment in people* is crucial especially for moving up the quality ladder. A better-educated workforce is also more likely to spawn successful entrepreneurs seeking to branch out into new activities and improve existing products. Vietnam managed to increase its average years of education by about 50 percent in just two decades, while Rwanda has expanded education through ninth grade for all students.

48.   **Effective policy measures often come in "waves" and aim at exploiting the evolving comparative advantages of the economy in changing external conditions.** The types of reforms underpinning diversification and structural transformation in the early stages of development are different from those required later on and need to be adapted to the internal and external environment faced by the economy. For example, an economy that starts with low initial conditions, including predominantly low-skilled workers, will likely benefit mostly from reforms that would help the economy take advantage of low-cost labor. More concretely, early on in the transformation process it would be crucial to engage in domestic price liberalization, agricultural reforms, and trade liberalization. Later on, the development of the domestic skill base and deepening of the financial system could be the priorities that once again try to match the country's comparative advantage. The recent experience of Vietnam is a good example of reforms that transformed the economy from a

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[34] In Vietnam, the reversal of collectivization went hand in hand with liberalization, or that which constitutes liberalization (from production quotas etc.). This allowed farmers to invest, expand the range of products, and compete.

low-end agricultural exporter into a successful middle-range manufacturing exporter in less than two decades. In Rwanda, reforms in agriculture have boosted agricultural productivity in recent years, helping to achieve large reductions in the poverty count (see also IMF, 2013b).

49. **The extent to which industry-focused and narrowly targeted measures have helped underpin diversification efforts remains an open issue.** Several countries in the sample have used state support to bolster specific industries (Malaysia, Vietnam, Bangladesh), but not all were successful. In Vietnam, state-owned enterprises (SOEs) have largely failed in becoming leaders in selected strategic industries. In Malaysia and Bangladesh, while targeting specific industries (palm oil, ready-made garments, and electronics) has led to increased exports, export concentration has increased due to the success and dominance of these targeted sectors. State support of diversification through explicit subsidies can be risky, especially where weak governance can lead to policy capture by the beneficiaries. And, over time, technological progress and globalization are making it even more difficult to repeatedly pick winners. This said, certain types of industrial policies aimed at facilitating agglomeration (e.g., industrial zones and export processing zones as illustrated by the case of Vietnam) have proved to be effective in encouraging entrepreneurial activities by harnessing economies of scale, skills and knowledge spillovers, and backward and forward linkages associated with large local markets (i.e., "Marshallian externalities").

POLICY VIEWS

Should LICs' development strategy emphasize diversification and transformation? What options do LICs have in diversifying their economies and adding value to their products? What challenges do they face? Drawing on the above analysis, this section summarizes the paper's contributions to the policy debate on how diversification can help LICs enhance macroeconomic stability, and promote a transition to higher and more sustained growth.

50. **LICs should consider structural transformation and diversification a fundamental component of their development strategy, given their important roles in enhancing growth and reducing volatility**. Sustainable development in LICs involves the transformation of a country's economic structure: reallocating resources towards more productive sectors, diversifying into new products, and upgrading the quality of existing products. Success along these dimensions is conducive to faster growth and lower output volatility. While the relative magnitude of the gains from diversification as opposed to quality upgrading will depend on the characteristics of the specific country, diversification and quality upgrading can often be thought of as complementary; for example, entry into products with long quality ladders holds particular potential for quality improvement. [35] There are significant differences across regions and countries in the pace of structural transformation and diversification, and substantial potential for improvement remains. In particular,

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[35] For example, countries with low average quality have considerable scope to upgrade quality even within existing export sectors. Other developing countries may already enjoy relatively high export quality, but given their low incomes this is likely in sectors with short quality ladders or low productivity. These economies could benefit from horizontal diversification into sectors with new opportunities for quality upgrading.

natural resource rich countries, small states, and fragile states all have unique characteristics that warrant special considerations and analyses.

51.   **Development policy should not neglect agriculture, given the scope for significant productivity and quality gains within this sector and the importance of agriculture as a source of employment in LICs.** Structural transformation and diversification is a continuous process that evolves *across* but also *within* economic sectors. For many LICs, a large share of the population is still employed in agriculture – usually the least productive sector, and rapid diversification into manufacturing will remain challenging. Thus, for the economic benefits from diversification to reach the poorest group, agricultural development would need to take a more central role. There are substantial potential productivity and quality gains from transforming the agricultural sector through fostering high value-added agricultural products, entry into new products, and quality upgrading (e.g., by promoting the transition from subsistence agriculture to production for the market). In particular, the scope for quality upgrading is *not* limited to manufacturing: as countries develop, the quality of both manufacturing *and* agricultural products increases substantially, with lengths of quality ladders varying considerably across products in both sectors.

52.   **What role can government policies and reforms play in facilitating diversification, transformation, and quality upgrading?** The answer necessarily depends on whether there are market failures that hinder entry into new lines of economic activity, and to what extent these market failures are country-specific or product-specific. Particularly in LICs, market failures abound in the provision of infrastructure, the accumulation of human capital, the establishment of trade networks and functioning of factor markets, and the creation and management of ideas. Evidence from the cross-country analyses and case studies show that "horizontal" policies such as improving education, infrastructure, and the institutional and regulatory environment, enhancing access to new export markets, and structural reforms (e.g., liberalization of trade, reduction of agricultural subsidies and price controls, financial deepening through reforms in the banking sector) have proved successful in facilitating diversification, resource shifts across activities, and quality upgrading. The extent to which industry-focused and narrowly targeted measures have helped underpin diversification efforts remains an open question; while many attempts to "pick winners" have failed, broader types of policies aimed at resolving specific market failures (e.g., those facilitating industrial agglomeration , and providing information for nascent export oriented industries; Harrison and Rodríguez-Clare, 2009) have played a role in promoting entry into new economic activities in developing countries. In practice, the heterogeneity in country experiences and constraints calls for a flexible, country-specific policy approach.

53.   **To enable more detailed, country-specific analysis, Fund staff has developed a new diversification toolkit**. This toolkit provides easy access to highly disaggregated, product-level data on export diversification and product quality. It will enable country authorities, mission teams, and interested researchers and analysts to assess more carefully the potential for further transformation and quality upgrading.

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Annex 1. List of Low-income Countries

Afghanistan	Liberia
Bangladesh	Madagascar
Benin	Malawi
Burkina Faso	Mali
Burundi	Mauritania
Cambodia	Mozambique
Central African Republic	Nepal
Chad	Niger
Comoros	Rwanda
Congo, Dem. Rep.	Senegal
Eritrea	Sierra Leone
Ethiopia	Tajikistan
Gambia, The	Tanzania
Ghana	Togo
Guinea	Uganda
Guinea-Bissau	Uzbekistan
Haiti	Vietnam
Kenya	Zambia
Kyrgyz Republic	Zimbabwe
Lao PDR	

Source: World Bank (World Development Indicators), 2009.

Annex 2. Measurement of Main Diversification Indices

Theil Index

We calculate the overall, intensive (within), and extensive (between) Theil indices following the definitions and methods used in Cadot et al., (2011). We first create dummy variables to define each product as "Traditional," "New," or "Non-traded." Traditional products are goods that were exported at the beginning of the sample, and non-traded goods have zero exports for the entire sample. Thus, for each country and product, the dummy values for traditional and non-traded remain constant across all years of our sample. For each country/year/product group, products classified as "new" must have been non-traded in at least the two previous years and then exported in the two following years. Thus, the dummy values for new products may change over time.

The overall Theil index is the sum of the intensive and extensive components. The extensive Theil index is calculated for each country/year pair as:

$$T_B = \sum_k (N_k/N) \, (\mu_k/\mu) \, \ln(\mu_k/\mu),$$

where k represents each group (traditional, new, and non-traded), N_k is the total number of products exported in each group, and μ_k/μ is the relative mean of exports in each group.

The intensive Theil index for each country/year pair is:

$$T_W = \sum_k (N_k/N) \, (\mu_k/\mu) \, \{(1/N_k) \sum_{i \in I_k} (x_i/\mu_k) \, \ln(x_i/\mu_k)\}.$$

where x represents export value.

Quality Upgrading

The Theil indices constitute measures of the extent of diversification across product categories. Consequently, they do not cover quality upgrading, which describes the average quality within any product category.

The baseline methodology (see Henn et al., (2013) for more details) estimates quality based on unit values and is a modified version of Hallak (2006), which sidesteps data limitations to achieve maximum country and time coverage. As a first step, for any given product, the trade price (equivalently, unit value) p_{mxt} is assumed to be determined by the following relationship:

$$\ln p_{mxt} = \zeta 0 \quad + \zeta_1 \ln\theta_{mxt} + \zeta_2 \ln y_{xt} + \zeta_3 \ln\text{Dist}_{mx} + \xi_{mxt} , \qquad (1)$$

where the subscripts m, x, and t denote, respectively, importer, exporter, and time period. Prices reflect three factors: unobservable quality θ_{mxt}; exporter income per capita y_{xt} (proxy for differences in

production technologies as in Hallak, 2006); and the (great circle) distance between importer and exporter, Dist_{mx}.[36]

Next, a quality-augmented gravity equation is specified separately for each product, because preference for quality and trade costs may vary across products:

$$\ln(\text{Imports})_{mxt} = \text{ImFE} + \text{ExFE} + \alpha \ln \text{Dist}_{mx} + \beta I_{mxt} + \delta \ln\theta_{mxt}\ln y_{mt} + \varepsilon_{mxt} , \tag{2}$$

ImFE and ExFE denote, respectively, importer and exporter fixed effects. Distance is as defined above. The matrix I_{mxt} is a set of standard trade determinants from the gravity literature. The exporter-specific quality parameter is θ_{mxt}, which enters interacted with the importer's income per capita ymt.

The estimation equation is obtained by substituting observables for the unobservable quality parameter in the gravity equation. Rearranging equation (1) for $\ln \theta_{mxt}$, and substituting into (2), yields:

$$\ln(\text{Imports})_{mxt} = \text{ImFE} + \text{ExFE} + \alpha \text{Dist}_{mx} + \beta I_{mxt} + \zeta_1' \ln p_{mxt}\ln y_{mt} + \zeta_2' \ln y_{xt}\ln y_{mt} + \zeta_3' \ln\text{Dist}_{mx}\ln y_{mt} + \xi'_{mxt}$$

where $\quad \zeta_1' = \frac{\delta}{\zeta_1}, \; \zeta_2' = -\frac{\delta\zeta_2}{\zeta_1}, \; \zeta_3' = -\frac{\delta\zeta_3}{\zeta_1},$ and $\; \xi'_{mxt} = -\frac{\delta\zeta_0' + \delta\xi_{mxt}}{\zeta_1}\ln y_{mt} + \varepsilon_{mxt}.$ \hfill (3)

This equation is estimated separately for each of the 851 SITC 4-digit-plus product categories in the dataset, yielding 851 sets of coefficients. We obtain estimates by two stage least squares.

The regression results are then used to calculate a comprehensive set of quality estimates. Rearranging (1) and using the estimated coefficients, quality is calculated as the unit value adjusted for differences in production costs and for the selection bias stemming from relative distance:

$$\text{Quality estimate}_{mxt} = \delta \ln \theta_{mxt} = \zeta_1' \ln p_{mxt} + \zeta_2' \ln y_{xt} + \zeta_3' \ln\text{Dist}_{mx}.$$

The quality estimates are then aggregated into a multi-level database. The estimation yields quality estimates for more than 20 million product-exporter-importer-year combinations. To enable cross-product comparisons, all quality estimates are first normalized by their 90th percentile in the relevant product-year combination. The resulting quality values typically range between 0 and 1.2. The quality estimates are then aggregated, using current trade values as weights, to higher-level sectors (SITC 4-, 3-, 2-, and 1-digit, as well as country-level totals). At each aggregation step, the normalization to the 90th percentile is repeated. Aggregations are also produced based on the BEC classification, as well as on 3 broad sectors (agriculture, non-agricultural commodities, and manufactures). To allow for easy comparisons with unit values, the latter are also normalized with the 90th percentile set equal to unity.

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[36] It is possible that exchange rate and tariffs play a role in determining trade prices. However, we note that all prices are expressed in U.S. dollars in the estimation and exchange rates should not be a huge issue if exporters only moderately price to market. In addition, Henn et al., (2013) estimates equation (2) for each product separately and includes importer and exporter fixed effects, which control for at least the non-time varying component of tariff patterns and exchange rates.

Sectoral Productivity and Sectoral Shifts

Where labor productivity is denoted by y, the employment shares by s, the value added shares by s^Y, sectors by j, and first difference by d. Aggregate labor productivity growth for any given country and year can first be decomposed as follows:

$$\frac{dy_t}{y_{t-1}} = \sum_j ds_{j,t} \frac{y_{j,t}}{y_{t-1}} + \sum_j \frac{dy_{j,t}}{y_{j,t-1}} s^Y_{j,t-1}.$$

The first term on the right is the sectoral reallocation effect, where the change in employment share of a sector is weighted by its productivity (scaled by initial aggregate productivity), while the second term is the contribution of within-sector productivity growth, as measured by the sector's productivity growth weighted by the initial value added share of the sector.

The data for value added shares in 7 sectors from 1970–2010 come from UN (2013); the data for labor employment shares in 7 sectors from 1969–2009 come from ILO (2011) (1-digit classification).

Annex 3. Country Name Abbreviations

Afghanistan	AFG	Gambia, The	GMB	Netherlands	NLD
Angola	AGO	Guinea-Bissau	GNB	Norway	NOR
Albania	ALB	Equatorial Guinea	GNQ	Nepal	NPL
United Arab Emirates	ARE	Greece	GRC	New Zealand	NZL
Argentina	ARG	Grenada	GRD	Oman	OMN
Armenia	ARM	Guatemala	GTM	Pakistan	PAK
Antigua and Barbuda	ATG	Guyana	GUY	Panama	PAN
Australia	AUS	Hong Kong	HKG	Peru	PER
Austria	AUT	Honduras	HND	Philippines	PHL
Azerbaijan	AZE	Croatia	HRV	Papua New Guinea	PNG
Burundi	BDI	Haiti	HTI	Poland	POL
Belgium	BEL	Hungary	HUN	Portugal	PRT
Benin	BEN	Indonesia	IDN	Paraguay	PRY
Burkina Faso	BFA	India	IND	Qatar	QAT
Bangladesh	BGD	Ireland	IRL	Romania	ROM
Bulgaria	BGR	Iran	IRN	Russia	RUS
Bahrain	BHR	Iraq	IRQ	Rwanda	RWA
Bahamas	BHS	Iceland	ISL	Saudi Arabia	SAU
Bosnia and Herzegovina	BIH	Israel	ISR	Sudan	SDN
Belarus	BLR	Italy	ITA	Senegal	SEN
Belize	BLZ	Jamaica	JAM	Singapore	SGP
Bolivia	BOL	Jordan	JOR	Solomon Islands	SLB
Brazil	BRA	Japan	JPN	Sierra Leone	SLE
Barbados	BRB	Kazakhstan	KAZ	El Salvador	SLV
Botswana	BWA	Kenya	KEN	Somalia	SOM
Central African Republic	CAF	Kyrgyzstan	KGZ	Sao Tome and Principe	STP
Canada	CAN	Cambodia	KHM	Suriname	SUR
Switzerland	CHE	Kiribati	KIR	Slovak Republic	SVK
Chile	CHL	St. Kitts & Nevis	KNA	Slovenia	SVN
China	CHN	Korea, Republic of	KOR	Sweden	SWE
Cote d`Ivoire	CIV	Kuwait	KWT	Swaziland	SWZ
Cameroon	CMR	Lao	LAO	Seychelles	SYC
Congo, Republic of	COG	Lebanon	LBN	Syria	SYR
Colombia	COL	Liberia	LBR	Chad	TCD
Comoros	COM	Libya	LBY	Togo	TGO
Cape Verde	CPV	St. Lucia	LCA	Thailand	THA
Costa Rica	CRI	Sri Lanka	LKA	Tajikistan	TJK
Cyprus	CYP	Lesotho	LSO	Turkmenistan	TKM
Czech Republic	CZE	Lithuania	LTU	Tonga	TON
Germany	DEU	Luxembourg	LUX	Trinidad &Tobago	TTO
Djibouti	DJI	Latvia	LVA	Tunisia	TUN
Dominica	DMA	Morocco	MAR	Turkey	TUR
Denmark	DNK	Moldova	MDA	Tanzania	TZA
Dominican Republic	DOM	Madagascar	MDG	Uganda	UGA
Algeria	DZA	Maldives	MDV	Ukraine	UKR
Ecuador	ECU	Mexico	MEX	Uruguay	URY
Egypt	EGY	Macedonia	MKD	United States	USA
Eritrea	ERI	Mali	MLI	Uzbekistan	UZB
Spain	ESP	Malta	MLT	St.Vincent & Grenadines	VCT
Estonia	EST	Mongolia	MNG	Venezuela	VEN
Ethiopia	ETH	Mozambique	MOZ	Vietnam	VNM
Finland	FIN	Mauritania	MRT	Vanuatu	VUT
Fiji	FJI	Mauritius	MUS	Samoa	WSM
France	FRA	Malawi	MWI	Yemen, Rep. of	YEM
Gabon	GAB	Malaysia	MYS	South Africa	ZAF
United Kingdom	GBR	Namibia	NAM	Congo, Dem. Rep.	ZAR
Georgia	GEO	Niger	NER	Zambia	ZMB
Ghana	GHA	Nigeria	NGA	Zimbabwe	ZWE
Guinea	GIN	Nicaragua	NIC		

Annex Box 1. Commodity Exporters

Commodity exporters are defined as those countries with more than 50 percent of their total exports consisting of fuels and primary commodities. There are many well known risks associated with reliance on primary commodity exports, including the economic volatility associated with commodity prices (see e.g., van der Ploeg and Poelhekke (2009) who argue that volatility is a quintessential feature of the resource curse), and dependence on a sector that does not create substantial employment opportunities. For LIC commodity exporters, the list of challenges includes managing resource revenues given weak institutions and governance. That said, a sufficiently rich resource endowment can sustain high living standards.

Export diversification indices confirm that commodity exporters are undiversified, especially fuel exporting countries. However, focusing on output diversification, whether measured by output or employment , yields a more nuanced picture. For instance, value-added data reveal that differences in output diversification between commodity and non-commodity exporters are significantly less pronounced than differences in export diversification. Even within commodity exporters, greater income is associated with greater output diversification. This cross-county pattern is consistent with the recent experience of some commodity exporters, especially in Latin America, where significant changes in their economic structure occurred over the past decade.

Commodity exporters' position on the sectoral quality ladders is relatively low across almost all sectors but particularly low in manufactures. Commodity exporters have not seen the same reduction in agricultural employment shares as in non-commodity exporters which have a more diversified export base, possibly thanks to the availability of alternative productive opportunities (see Supplement Note 4 on quality upgrading in commodity exporters).


Export Diversification in Commodity Exporters

Quality by SITC1 Sector, Commodity Exporters, 2010

Source: Comtrade, IMF staff estimates.
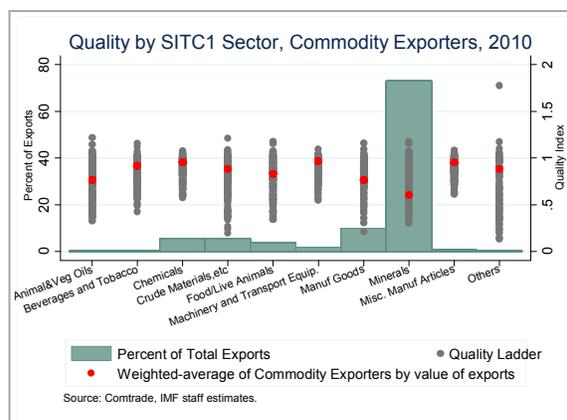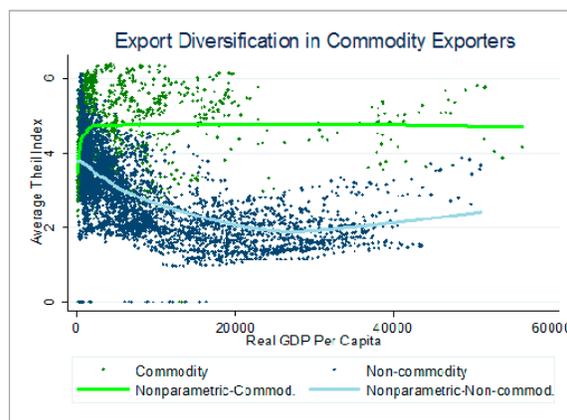
Annex Box 2. Small States[1]

Small states (population below 1.5 million) lack the capacity to diversify because of their small size. The narrow and undiversified production and export bases of small states have often made them more vulnerable to external shocks. It therefore comes as no surprise that the July 2012 IMF survey of mission chiefs in small states reveals that diversification is particularly difficult to achieve in these economies.

Export Diversification in Small States

Analysis of quality upgrading leads to some interesting insights on the relationship between quality upgrading and development. Small states follow similar patterns as other countries: quality rises with income particularly for income levels below $10,000 (Henn et al., 2013). Small states have upgraded their quality considerably in the manufacturing sector since the early 2000s, from already high levels, and are now approaching the world frontier quality in manufactures.[2] In agriculture, export quality in small states remains low, although some quality upgrading has taken place since the mid-1990s.

Quality by SITC1 Sector, Small States, 2010

Source: Comtrade, IMF staff estimates.

Small states' position on sectoral quality ladders is relatively high, particularly in the manufactured goods, chemicals, and machinery and transport equipment sectors. Thus, in these sectors, horizontal diversification into other subsectors may have to preceede further quality upgrading. Currently, quality upgrading potential for small states as a whole seems to be larger in agricultural and commodity sectors.
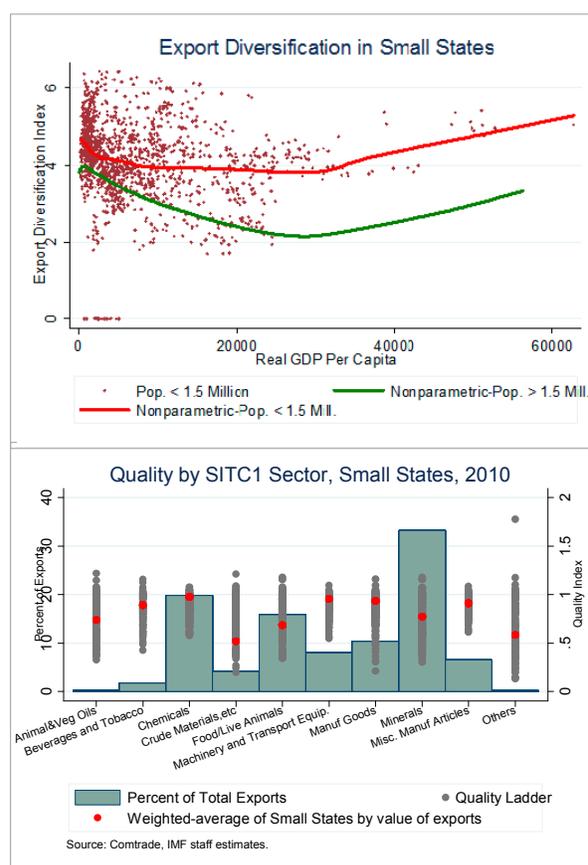
[1] As comprehensive data on services is very limited and often unreliable, the analytical work in this box could not include tourism, an important sector in many small states. As the data quality improves, it is necessary to assess overall diversification in small states by including tourism.

[2] A majority of the small states for which data was available for analysis (16 of 25) were above 0.8 on the world possibility frontier in the manufacturing sector. However, the data and methodology do not allow for a breakdown of commodities by position within a value-chain, countries can be recorded as exporting high-value final products while undertaking only the final assembly or finishing of these goods.

Annex Box 3. Fragile and Non-fragile States

Fragile LICs have weak or failing political, security, or economic institutions and may face challenges in protecting basic human rights and freedoms. Many function in an environment of constrained domestic resources and illegitimate governments. Looking at the diversification trends for non-fragile and fragile LICs, there are noticeable differences between the two groups. Comparing the average level of export diversification from 1965-1990 and 1991-2010, non-fragile LICs have become more diversified than their fragile counterparts.

**Diversification Within LICs**
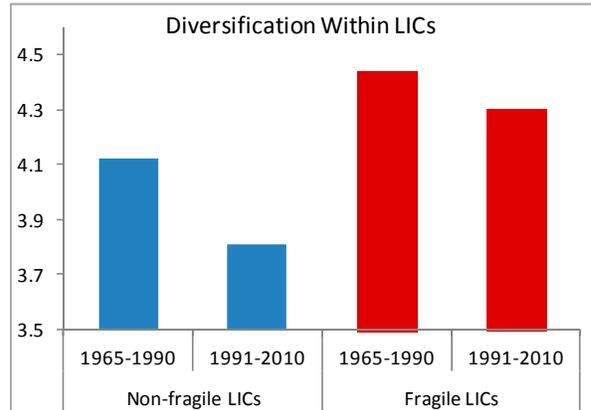
In the late 1980s, average export quality of non-fragile LICs was among the lowest 5 percent among all countries. Since then, non-fragile LICs have enhanced their average quality level, with the manufacturing sector leading the way. However, fragile LICs have not been able to converge in quality during the same period and remain among the lowest quality exporters in the world. This fragile/non-fragile pattern may partly underlie the marked difference in these two groups' annual GDP per capita growth since 1990 (1.1 vs. 3.4 per cent).

Export Product Diversification Spurts and Growth Accelerations

Source: IMF staff calculations.
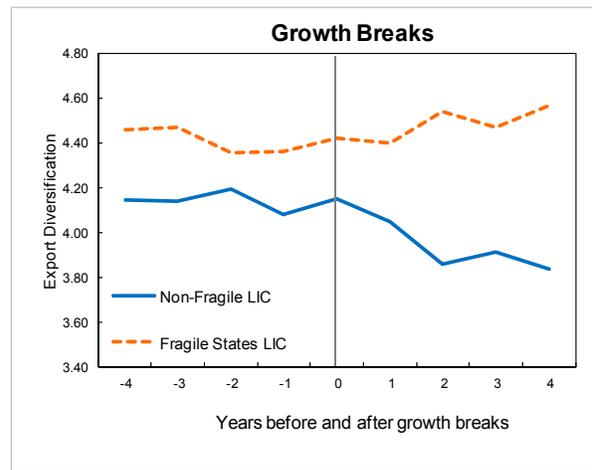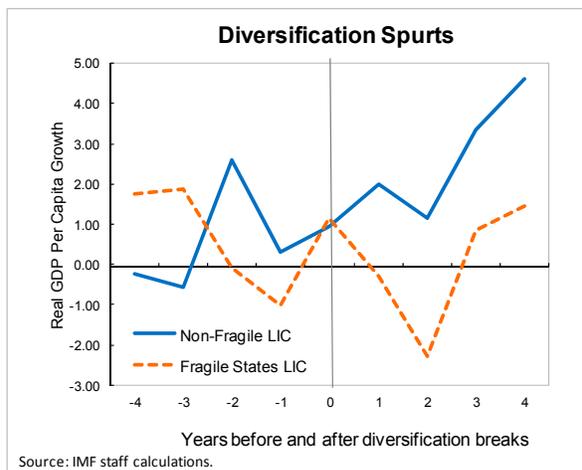
Moreover, while diversification spurts are in general associated with sharp subsequent growth accelerations (Figure 15), this is especially true for non-fragile LICs. In a similar vein, growth accelerations are associated with subsequent increases in diversification among non-fragile LICs. Fragile LICS have been lagging behind non-fragile LICs in quality upgrading in many important sectors. In three SITC 2-digit sectors which make up a high percentage of LIC exports—fruit and vegetables; coffee, tea, cocoa, and spices; and apparel—non-fragile LICs considerably outperform fragile LICs.

Annex Box 3. Fragile and Non-fragile States (concluded)

Quality Ladders in Fragile and non-Fragile LICs

Quality by SITC1 Sector, Fragile LICs, 2010

Percent of Total Exports — Quality Ladder
Weighted-average of Fragile LICs by value of exports
Source: Comtrade, IMF staff estimates.

Quality by SITC1 Sector, Non-fragile LICs, 2010

Percent of Total Exports — Quality Ladder
Weighted-average of Non-fragile LICs by value of exports
Source: Comtrade, IMF staff estimates.
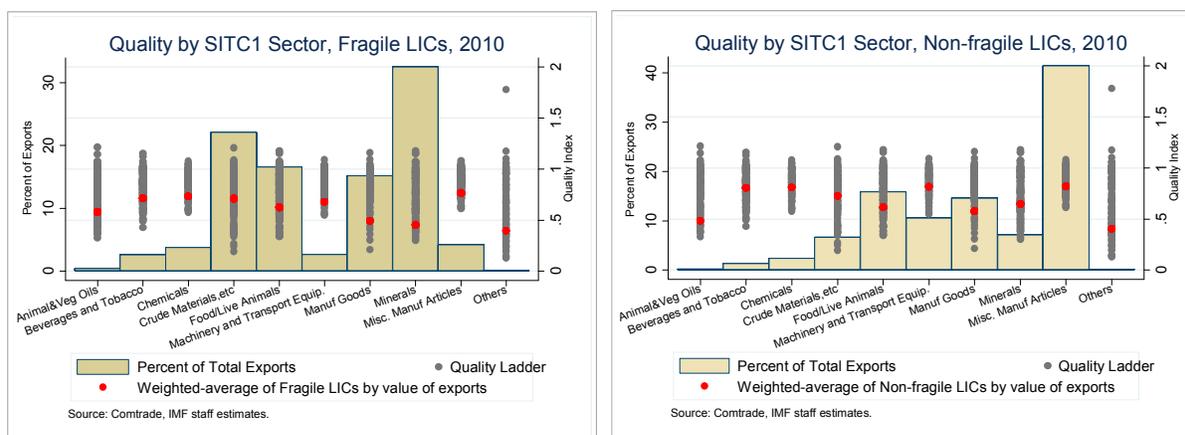
Moreover, non-fragile LICs have been successful in turning quality increases into market share gains in the coffee, tea, cocoa, and spices sector. Since the early 2000s, fragile LICs have been reversing previous quality declines, but have not yet achieved market share gains in response. On average, the poorer the exporter, the greater the gap between its export quality and the average quality demanded by its trade partners in those products that the exporter sells to them (Supplement Note 4).

Annex Box 4. Structural Transformation, Inflation Volatility, and Monetary Policy[1]

The transition from agriculture to manufacturing and services can have important implications for the conduct of monetary policy and the properties of inflation in developing countries.

Countries at early stages of structural transformation have relatively larger agricultural sectors in terms of employment share. In addition, consumers spend a larger share of their total expenditure on food consumption, which implies that the Consumer Price Index (CPI) is heavily influenced by movements in food prices (see Walsh, 2011). This can be seen by plotting the share of food in the CPI against income per capita. As countries transition out of agriculture, consumers also reduce the share of income spent on food, thus changing the composition of the CPI.
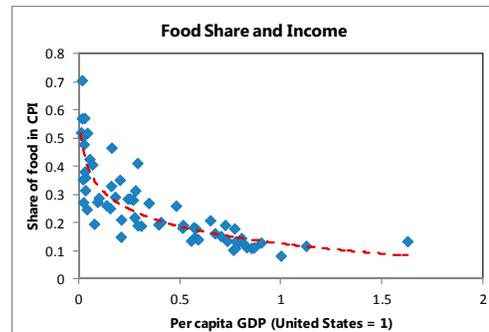
Several implications follow from this transition. First, because the food sector is a flexible price sector, structural transformation affects the importance of sticky prices in the economy. Price stickiness is considered one of the key features of modern economies, with both negative and positive implications. On the one hand it exposes the economy to demand-driven fluctuations, but it also allows monetary policy to gain traction in influencing economic activity and inflation in the short- to medium-term. The importance of monetary policy in guaranteeing price and macro stability will therefore increase as countries transition toward manufacturing and services, ceteris paribus.

Second, the properties of inflation will also change. Overall inflation can be decomposed as the sum of generalized price pressures and changes in relative prices, such as food. At earlier stages of structural transformation, inflation is heavily influenced by shocks to agricultural productivity, with changes in relative food prices shaping much of the inflation dynamics in the short run. Shocks that result in generalized price pressures, such as changes in aggregate demand, play a relatively smaller role. This reflects in part the larger share of food in the consumer basket in these countries. In addition, economies with large agricultural sectors are less able to adjust to shocks to food production. As a result, the relative price of food increases by more whenever a shock hits. Inflation is therefore more volatile.

The cross-country empirical evidence broadly supports this characterization. Portillo et al., (2014) develop a framework to understand the implications of structural transformation for differences in inflation behavior across countries. They find that food price volatility accounts for 50 percent of the volatility of inflation in Africa, compared with only 2 percent in the United States.[2] Inflation is four times more volatile in a sample of 16 African countries than in the United States, with structural transformation accounting for about 16 percent of the volatility gap.

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[1] This box was prepared by Rafael Portillo (RES).

[2] Walsh (2011) also finds a relatively more important role for food inflation in developing countries.

Annex Box 5. Growth, Diversification, and the Real Exchange Rate[1]

The relationship between real exchange rate (RER) undervaluation and growth is a subject of controversy. At one end of the opinion spectrum, Rodrik (2008) argues that an undervalued RER is conducive to growth in developing countries where the tradable sector is subject to larger distortions than the non-tradable sector and is hence suboptimally small. Thus, an undervalued RER acts as a subsidy to the tradable sector and helps correct this inefficiency. Rodrik (2008) uncovers a strong empirical correlation between RER undervaluation and growth in developing countries. Proponents of the opposite view argue that a misaligned RER relative to the fundamentals-implied RER level (or equilibrium)—regardless of its direction—is symptomatic of macroeconomic imbalances that themselves are bad for growth. For instance, a significantly undervalued RER can cause inflation and reduce a country's ability to invest domestically (Williamson, 1990). Aguirre and Calderon (2005) show that significant RER over- and undervaluation are both associated with inferior growth outcomes. Despite active study of the link between the RER and growth, the question remains unsettled due to difficulties in establishing causality and pinning down the exact channels of transmission.

Progress towards understanding this link can be made by interpreting diversification and structural change as mechanisms by which an undervalued RER can affect growth. In particular, an undervalued RER can spur diversification and structural change, especially in developing countries, by reducing the risk associated with investment in new sectors, including those serving foreign markets (Razmi, 2013). Thus, an undervalued RER can subsidize risk-taking in the tradable sector by boosting firm profitability. Nevertheless, a causal empirical link from the RER to diversification is difficult to establish because both are outcomes of complex development processes.

New empirical evidence suggests that RER undervaluation is associated with export diversification in new products and trading partners, while RER overvaluation coincides with less diversification. RER misalignment is measured as the difference between the actual RER and a PPP-based RER stripped of the Balassa-Samuelson effect (as in Rodrik, 2008), with positive values indicating undervaluation and negative values indicating overvaluation. The relationship is borne in a sample of 90 developing countries (comprising 49 emerging market and 41 low-income countries) during 1962–2010, and holds up in the full sample of 116 countries as well (Wang, 2014). The figures depict the relationship between the Theil index as a measure of diversification across export products and trading partners and the degree of RER misalignment. This relationship is expressed as a conditional correlation that controls for the effect of relevant variables such as per capita income (quadratic trend), nominal exchange rate volatility, openness, financial depth, investment, education, and time-invariant country characteristics. There is a negative correlation between diversification and the RER misalignment measure: countries with a higher RER undervaluation exhibit higher export product and partner diversification, while countries with higher RER overvaluation have lower diversification. More detailed analysis would be needed to adjust for the role of hydrocarbon exporters in contributing to this result, given that these economies are typically found to have both low levels of export diversification and and overvalued RERs (as measured via the specific methodology employed). Looking at output diversification, Dabla-Norris et al., (2013) find that an undervalued RER is associated with a higher manufacturing share for countries with low manufacturing shares, while the opposite is the case for countries with high manufacturing shares – but these associations have not been shown to underpin any specific causal relationship.

Product Diversification and Real Exchange Rate

Partner Diversification and Real Exchange Rate

coef = -0.367, se = 0.074, t = -4.980
Source: IMF staff estimates based on Wang (2014) and PWT Mark 7.1 data.

coef = -0.245, se = 0.059, t = -4.160
Source: IMF staff estimates based on Wang (2014) and PWT Mark 7.1 data.
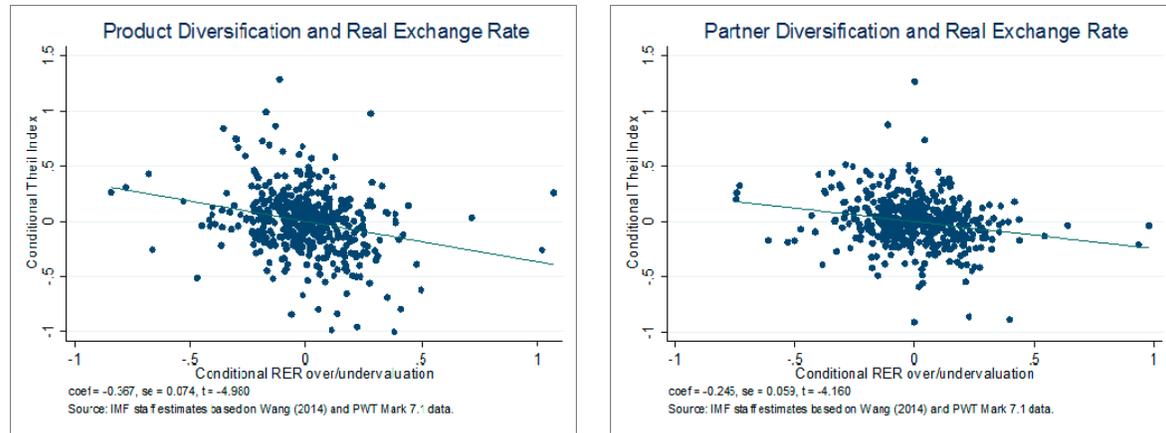
While the use of exchange rate policy as a tool for export promotion—specifically, efforts to maintain an undervalued exchange rate over time—has intuitive appeal, pursuit of such an approach typically entails either accepting elevated and unstable inflation levels (with ensuing costs from reduced macroeconomic stability) or consistent accumulation of high levels of foreign reserves (impyling a misallocation of scarce national savings to acquire foreign financial assets with very low rates of return), neither of which is growth-promoting. To the extent exchange rate depreciation is seen as a correction to other distortions in the economy, it can be expected that a policy that directly targets these institutional weaknesses and market failures will produce superior results, without the adverse side-effects of an exchange rate-based export promotion policy.

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[1] This box was prepared by Camelia Minoiu (RES) and Ke Wang (SPR) drawing on ongoing work by Andrew Berg, Camelia Minoiu, and Jonathan Ostry on real exchange rates and medium-term growth.