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

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SUSTAINING LONG-RUN GROWTH AND MACRO STABILITY IN LOW-INCOME COUNTRIES: THE ROLE OF STRUCTURAL TRANSFORMATION AND DIVERSIFICATION— BACKGROUND NOTES

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DIVERSIFICATION: A GROWTH DETERMINANT IN LOW-INCOME COUNTRIES[1]

A. Introduction

1.   A fundamental paradigm of economic theory and empirics is that economic development involves structural transformation, the dynamic reallocation of resources from less productive to more productive sectors (see McMillan and Rodrik, 2011, and Lin, 2012). This section explores the link between structural transformation and economic growth. Specifically, it examines the effects of export and production diversification on economic performance in low-income countries (LICs). Historically, LICs have depended heavily on a narrow range of traditional primary products. Recent theories suggest that such limited diversification reflects market and government failures which limit technology spillovers and hamper productivity and economic growth. Imbs and Wacziarg (2003) provide empirical support suggesting that increases in per capita income are first associated with diversification and then with reconcentration in production. Cadot et al., (2011) go one step further and argue that this nonlinear diversification pattern "is an inherent feature of the economic development process."

2.   While economic transformation and diversification are correlated with development, it remains unclear whether a causal relationship exists. After all, growth may actually drive diversification to generate the observed positive correlation between the variables. For policy considerations, the issue of causality is of prime importance to answer the question whether policies should target growth or diversification. A second unresolved problem in the previous literature is whether the development-diversification relationship survives when alternative determinants of growth are included in formal econometric models that go beyond bivariate scatter plots. Previous analyses of diversification and development did not include many traditional growth determinants in regressions such as investment, education, and population growth.

3.   The approach presented here represents the first integrated empirical treatment of the diversification-growth debate. To establish a causal effect of diversification on growth, it is imperative to control for endogeneity and include all previously relevant candidate growth determinants motivated by theory and to examine the growth-diversification relationship using novel statistical tools and data. The underlying dataset uses the export and output diversification measures developed by Papageorgiou and Spatafora (2012), and the empirical approach leverages Instrumental Variable Bayesian Model Averaging (Eicher, Lenkoski, and Raftery, 2009), IVBMA, a method specifically designed to allow for a potentially large set of growth determinants when causality is drawn into question.

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[1] Prepared by Theo Eicher (University of Washington), David Kuenzel (University of Washington), and Ke Wang (IMF).

4.   **This paper builds on Durlauf et al., (2008; DKT thereafter) seminal panel growth study.** First, it extends the time dimension of the DKT data and then introduces trade diversification as a potential growth determinant. Second, it extends Durlauf et al.'s methodology to fully account for a large set of growth determinants in the presence of potential reverse causality.

5.   **The key finding is that the longer panel confirms Durlauf et al.'s earlier results that aggregate trade measures are not robust growth determinants.** Once export diversification is introduced however, the results show that it is a crucial determinant of economic growth for LICs. The effect is not only statistically significant but also economically important: a one standard deviation increase in export diversification is shown to increase the average annual growth rate by 0.8 percentage points for LICs. Therefore, export diversification should be an important growth policy target for LICs. Aside from trade diversification, the growth determinants suggested by the approach are those central to all previous studies: initial GDP, population growth and investment reflecting neoclassical models; governance quality and government expenditures reflecting new growth theories.

6.   **Output diversification, measured by value added of real sectors, also matters for growth.** LICs could greatly benefit from diversifying their real sectors. More specifically, the estimates imply that a one standard deviation increase in output diversification in LICs raises their average annual growth rate by about 1.4 percentage points.

B.   Conceptual Framework

7.   **There exist a multitude of theories that link diversification to growth and with potentially distinct channels at different stages at development**. One channel is that diversification helps to achieve stable growth by reducing growth volatility as implied by portfolio selection theory. Diversification could also enable a gradual allocation of resources to their most productive uses to increase growth (Acemoglu and Zilliboti, 1997). The impact of export diversification on growth is ultimately an empirical question, and the Theil index of export diversification developed in Papageorgiou and Spatafora (2012) can be used to examine this relationship. Conceptually their aggregate diversification measure is composed of two diversification dimensions: the extensive and intensive margins. Intuitively, the extensive margin measures the number of different export sectors, while the intensive margin represents the diversification of export volumes across active sectors. The intensive margin measures is therefore a less intuitive aspect of diversification, as it identifies countries as rather less diversified when GDP or export revenues are driven only by a few sectors (although the country might export/produce many different goods).

8.   **As noted previously, quantifying any link between export diversification and economic growth is complicated by the fact that there are likely to be numerous feedback effects between export diversification and growth.** Growth may affect diversification as the country advances and expands its product space and exports. Thus, the dynamic development process renders it difficult to identify whether growth drives diversification or the other way around. An example for the simultaneity of growth and diversification is the dynamic reallocation of resources from less productive to more productive sectors and activities as outlined by McMillan and Rodrik (2011). Prime examples are the development experiences of the East Asian Tigers and Tiger Cubs in

the 1970s and 1980s and many ex-Soviet bloc economies in the 1990s as they transformed from relatively agrarian to manufacturing economies. LICs still remain largely specialized in agriculture and other resource-based activities with limited potential for quality upgrading. Structural transformation will inevitably involve diversification, both in terms of domestic production and, given small domestic market size, external trade.

9.   To counter potential simultaneity issues in this note, it is necessary to instrument for export diversification with a number of geographical features. In the spirit of Frankel and Romer (1999), the instruments in the empirical analysis are the log of a country's land area, a dummy taking the value one for landlocked countries, and the log of a country's population. While having the advantage of being predetermined with respect to growth rates, geographical features are also important drivers of export diversification. A country with a large population can develop and produce more types of products while a country with large land area is more likely to have specialization clusters across the country. At the same time, a landlocked country is less likely to engage in international trade and will thus have lower export diversification.

C. **Econometric Methodology**

10.   The plethora of growth theories and their associated candidate regressors has given rise to a sizable literature seeking to identify robust growth determinants. Early approaches used Leamer's (1978) Extreme Bound Analysis (Levine and Renelt, 1992, and Sala-i-Martin, 1997), which suffers from arbitrary robustness thresholds ("Extreme Bounds"). Extreme Bound Analysis examines specific combinations of all possible growth determinants in millions of regressions and examines if estimates change signs for individual growth determinants. If a sign change is observed, the variable is said to be not robustly related to growth.

11.   The problem with Extreme Bound Analysis is not only the arbitrary search for regressors and regressions in which sign changes occur, but also the notion that all regressions should carry identical weight. Clearly some regressions that omit key growth determinants are grossly misspecified and suffer from rampant omitted variable bias. Subsequent approaches employ Bayesian Model Averaging, a methodology specifically designed to address model uncertainty empirically (Fernández at al., 2001, Brock and Durlauf, 2001, Sala-i-Martin et al.,2004, Ciccone and Jarocinski, 2010, Eicher et al.,2011). However, none of these approaches tackled endogeneity.

12.   DKT (2008) addresses endogeneity within the BMA context by producing fitted values for endogenous regressors via OLS in a first stage. The fitted values are then used in a second stage that is subjected to BMA. Subsequently, Eicher et al., (2009) develop a comprehensive two-stage extension of BMA to allow for model selection in both stages. Similar approaches have been suggested by Moral-Benito (2012) and Chen et al., (2009) who introduce BMA Generalized Method of Moments (GMM). Koop et al., (2012) develop a Bayesian IV methodology that does not rely on Eicher et al., (2009) approximations to integrated likelihoods and Karl and Lenkoski (2012) introduce conditional Bayes factors to resolve mixing difficulties associated with Koop's et al., (2012) search algorithm. Details of the IVBMA methodology are provided in Appendix II.

13.   **The intuition behind IVBMA is that an efficient search algorithm explores the model space spanned by all candidate growth determinants.** The methodology then averages coefficients over all empirical models, while weighting each model by its quality. Hence, highly misspecified models are weighted down. The approach has highly appealing statistical prosperities. In contrast to single regression approaches or Extreme Bound Analysis, IVBMA does not suffer from inflated t-statistics or artificially narrow confidence bands. Hence, it also delivers the best predictive performance and the lowest mean square error compared to these approaches. (See Raftery (1995) and Raftery and Zheng (2003).) For the policy maker, IVBMA produces a key statistic of interest: the *posterior inclusion probability (PIP)*. Inclusion probabilities provide a probability statement regarding the importance of a particular growth determinant regressor that directly addresses what is often the policy maker's prime concern: what is the probability that the regressor has an effect on the dependent variable? The general rule developed by Jeffreys (1961) and refined by Kass and Raftery (1995) stipulates effect thresholds for posterior inclusion probabilities. Posterior inclusion probabilities lower than 50 percent are seen as evidence against an effect, and the evidence for an effect is either weak, positive, strong, or decisive for posterior inclusion probabilities ranging from 50-75 percent, 75-95 percent, 95-99 percent, and higher than 99 percent respectively. In this analysis, a regressor is "effective" if its posterior inclusion probability exceeds 50 percent.

D.   A Brief Look at the Data

14.   **Using non-overlapping five-year periods, the dataset includes 84 countries from the period 1965 to 2009 and comprises 583 country-period observations**. Because the focus is on the relationship between diversification and growth, resource-rich economies that generate more than 20 percent of their GDP with resource rents (as reported by the World Development Indicators) are excluded from the sample. Resource-rich countries represent sizable outliers with unusually low export diversification relative to their income levels. Removing resource-rich countries therefore focuses of the empirical analysis on understanding whether the development of diversified export structures and broad-based comparative advantages are advantageous for growth. Small states were also removed small states from the sample. None of the above described changes to the dataset impact however, the qualitative results. The only country belonged Small States (with population less than 1.5 million) in the regression sample is Sierra Leone. The regression results remain the same significance level and the coefficients hardly change without this country.

15.   **The dependent variable is the average growth rate of GDP per capita during each five-year period.** Per capita income data are obtained from Penn World Tables 7.1. All empirical specifications include period and regional dummies (Sub-Saharan Africa, East Asia, Latin America and the Caribbean) to control for spatial and time effects on growth. The primary measure of export diversification is the Total Theil index; results using the decomposition of the Total Theil into its extensive margin (between Theil) and intensive margin (Theil) components are also included. Finally, the analysis is extended to the more general concept of output diversification. As mentioned

previously, all measures of diversification (external and real) are from Papageorgiou and Spatafora (2012).[2]

16.   All additional covariates and instruments which are used in the empirical analysis are obtained from the growth determinants study of DKT (2008), which was recently updated by Henderson et al., (2011). DKT base their variable selection on Barro (2003), one of the most comprehensive approaches to growth determinants. Specifically, DKT introduce proxies for seven different growth theories:

i)   Regressors suggested by neoclassical growth theory include initial per capita income and the per-period averages of population growth, the investment to GDP ratio, and education (share of the working population with secondary schooling times the rate of successful completion of secondary school). The analysis follows DKT and instruments for these four variables with one-period lagged values.

ii)   Regressors that serve as proxies for demographic change include the reciprocal of life expectancy at age one and the logarithm of the total fertility rate, which are both assumed to be exogenous.

iii)   Theories that link macroeconomic policies to growth are proxied by the average ratio of government consumption to GDP, openness (exports + imports) over GDP filtered for land mass and population, and the average change in the CPI. All three variables are instrumented with their respective lagged values.

iv)   Theories that link geography to growth are proxied by the land area within 100km of an ice-free coast and the percentage of tropical land area, which are assumed to be exogenous.

v)   Theories linking institutions to growth are proxied with the risk of expropriation, constraints on the executive, and the World Bank governance index. Dummy variables for the English and French origin of a country's legal system are included. Lagged values of the expropriation risk are used to instrument for the current value of the same variable. All other variables are treated as exogenous.[3]

vi)   The relation of religion to growth is proxied by the shares of the population adhering to Eastern, Hindu, Jewish, Muslim, Orthodox, Protestant, and other religions. As in DKT, the respective shares in 1900 as used instruments.

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[2] Their dataset combines importer- and exporter-reported data from COMTRADE to maximize comprehensiveness, while ensuring internal consistency by using the methodology of Asmundson (forthcoming). Their measure of export and output diversification, the Theil index, has the advantage of being decomposable into diversification along the extensive and intensive margins. Notice that lower values of the Theil index indicate higher diversification.

[3] Government expenditure as share of GDP is obtained from the World Development Indicators and is used instead of government expenditures net of education and military expenditures as share of GDP. In addition, the DKT "Cheque" data (legal procedures required to collect a bounced check, from the World Bank Doing-Business Indicators) are available only for a limited set of countries. Since Djankov et al., (2003) and LaPorta et al., (2008) document the strong empirical relationship between legal origin and current legal procedures and standards, Legal Origins (French and English) is substituted for Cheque in the regressions.

vii)   Regressors proxying for the impact of fractionalization within a country on growth are two linguistic fractionalization and ethnic tension indices. Both variables are assumed to be exogenous. The dataset used in the empirical analysis is described in more detail in the appendix, which also lists the variable sources and definitions.

17.   The empirical strategy involves three steps:

- Introduce export diversification as a potential growth determinant;

- Address model uncertainty due to the large number of growth theories that predict different candidate regressors and/or opposing effects of trade on growth;

- Examine the importance of controlling for endogeneity in growth regressions.

18.   Table 1 presents the IVBMA results. A linear diversification term is included in column 1, and nonlinear diversification effects are introduced in column 2. In columns 3 and 4, the Total Theil export diversification measure is replaced with the intensive (within) and extensive (between) Theil indices. In both cases, the regression specifications allow for nonlinear diversification effects as described in the previous section. In addition to posterior inclusion probabilities (PIP) (see also Figure 1), the conditional means and standard deviations for the coefficients are reported. The coefficients can be interpreted as in standard OLS and 2SLS estimation (see Appendix Table 3). Complete results see Appendix Table A1.

**Table 1. IVBMA Regressions for Growth on Export Diversification,
Developing Countries, 1965-2009**

	Theil Index		Theil Index		Between Theil		Within Theil	
	PIP	Cond. Mean	PIP	Cond. Mean	PIP	Cond. Mean	PIP	Cond. Mean
Initial GDP	**1**	-0.015	**1**	-0.021	**1**	-0.02	**1**	-0.021
Investment	**1**	0.013	**1**	0.015	**0.666**	0.009	**1**	0.015
PopulationGrowth	**0.955**	-0.049	**0.987**	-0.057	**0.996**	-0.057	**1**	-0.062
SubSaharanAfrica	**0.925**	-0.012	0.144	-0.006	**0.874**	-0.013	0.197	-0.007
GovernanceQuality	**0.919**	0.008	**1**	0.011	**1**	0.01	**1**	0.011
GovExpend	**0.855**	-0.08	**0.97**	-0.109	**0.99**	-0.117	**0.975**	-0.111
ProtestantFraction	**0.655**	-0.014	0.322	-0.011	0.143	-0.008	0.282	-0.011
Inflation	**0.572**	0	0.49	0	**0.575**	0	**0.627**	0
Export Diversification [1/]	0.283	-0.004	0.149	-0.001	0.489	-0.014	0.154	-0.001
Export Diversification in Low Income♠			**0.997**	-0.008	**1**	-0.037	**0.976**	-0.008
Export Diversification in Lower Medium Income♠			0.217	-0.001	**0.592**	-0.012	0.224	-0.001
Export Diversification in Upper Medium Income♠			0.174	-0.001	**0.514**	-0.014	0.242	0.002
Export Diversification x Low Income			**0.984**	-0.008	**0.962**	-0.031	**0.944**	-0.008
Low Income Dummy			**0.647**	0.022	0.233	0.011	**0.53**	0.018
Sargan test p-value	0		0		0		0	
Observations	583		583		583		583	

Notes: ♠ Composite coefficient reported, based on the joint posterior distribution of Diversification and Diversification*CountryIncome interaction. Since the PIP is not defined for the composite, we report the percentage of the joint posterior distribution of Diversification*CountryIncome interaction that is non-zero.

1/: "Diversification" in this table is measured by different Theil indexes with lower values indicating higher levels of diversification.

Figure 1. Posterior Inclusion Probabilities from BMA Growth Regression, Developing Countries, 1965-2009

Export Diversification (Theil)
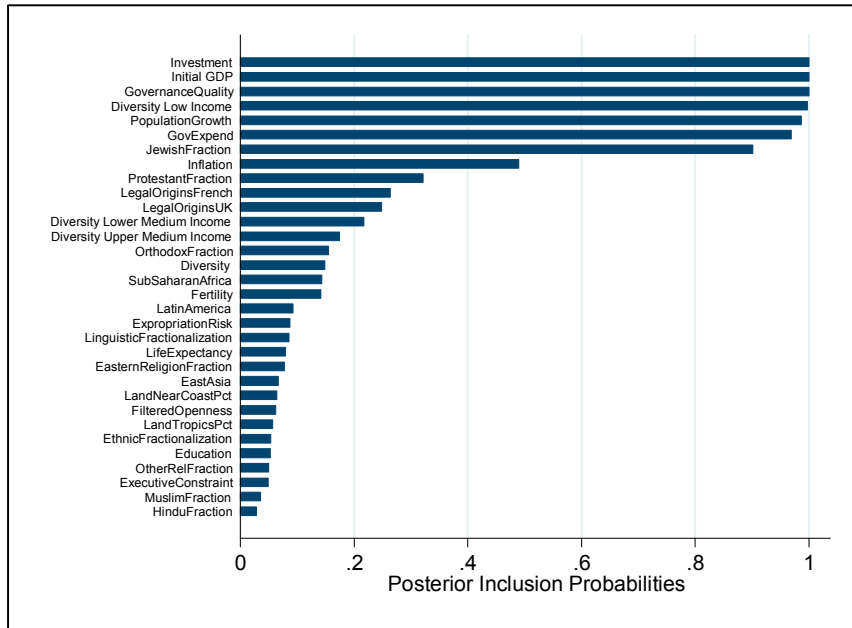
Output Diversification (Theil)
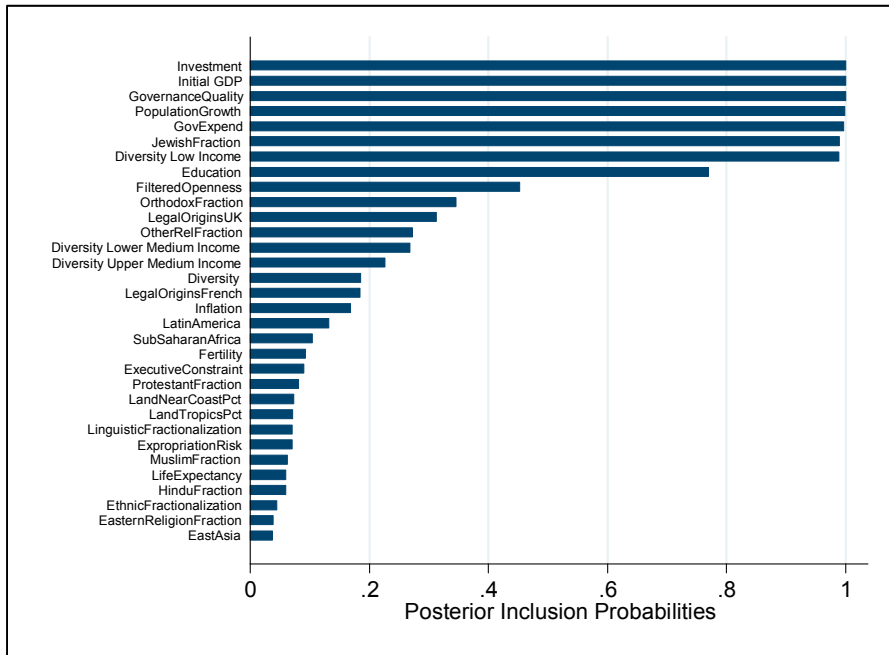
ce the set of

19.   The first set of estimates in column 1 indicates that the traditional growth determinants exhibit the highest effect thresholds: Initial GDP, Government Quality, Investment, Population Growth, and Government Expenditure followed by Protestant Fraction, Sub Saharan Africa dummy, and Inflation. Export Diversification does not have an effect on growth volatility in the global sample, which may be due to the existence of nonlinearities that countries become less diversified after they achieve certain income level.

20.   Export diversification has a decisive impact on growth for LICs once nonlinearities are introduced in the specification (see column 2). Using the results in column 2, a one standard deviation increase in LICs' export diversification raises their growth rate by about 0.8 percentage points. As discussed above, the IVBMA-Sargan test outlined in Eicher et al., (2009) indicates instrument validity in all IVBMA specifications in Table 1. This suggests export diversification is crucial for growth in LICs.

21.   The set of growth determinants identified by IVBMA is parsimonious but expected. With Initial GDP, Government Quality, Investment, Population Growth, and Government Expenditure, the results provide support for both the neoclassical growth model as well as new growth theories that rely on productive government expenditures and the quality of institutions.

22.   Replacing the Total Theil export diversification measure by the intensive and extensive Theil indices (see columns 3 and 4) results in very similar conclusions for LICs. The extensive Theil index indicates export diversification by expanding to new products; the intensive Theil index indicates diversification by equalizing the shares of different products. Thus, LICs can stimulate growth by diversifying their exports both at the extensive and intensive margins. There is also some evidence in column 3 that lower- and upper-middle income countries can benefit from increasing the diversification of their exports at the extensive margin.

E.   Output Diversification and Growth

23.   Export diversification and output diversification are in principle interlinked, the former reflecting diversification in the external sector, and the latter capturing diversification in the domestic production process across sectors. This section examines if the previous results hold on a broader level. Instead of focusing on export diversification, a measure of output diversification is now included in the empirical specification. The total Theil index of output diversification is calculated using value-added shares in seven real subsectors reported in the UN sectoral database. Table 2 presents IVBMA results with a linear output diversification term in column 1, while nonlinear output diversification effects are introduced in column 2. Note that the total Theil index in the present context measures the inequality between sectoral production shares in each country. Complete results see Appendix Table A2.

**Table 2. IVBMA Regressions for Growth on Output Diversification,
Developing Countries, 1965-2009**

|		Real Theil				
		(1)			(2)	
	PIP	Cond. Mean	Cond. SD	PIP	Cond. Mean	Cond. SD
GovernanceQuality	**0.995**	0.014	0.004	**1**	0.013	0.003
Investment	**0.949**	0.012	0.003	**1**	0.013	0.003
Initial GDP	**0.924**	-0.012	0.004	**1**	-0.02	0.003
PopulationGrowth	**0.838**	-0.038	0.014	**0.998**	-0.06	0.013
ProtestantFraction	**0.613**	-0.014	0.006	0.081	-0.004	0.005
LegalOriginsFrench	**0.515**	-0.006	0.003	0.185	-0.004	0.003
GovExpend	0.293	-0.066	0.046	**0.996**	-0.128	0.031
JewishFraction	0.12	0.024	0.018	**0.989**	0.051	0.013
Education	0.091	-0.001	0.001	**0.769**	-0.003	0.001
Diversification	**0.769**	-0.117	0.065	0.186	0.006	0.039
Diversification Low Income♠				**0.988**	-0.176	0.079
Diversification Lower Medium Income♠				0.268	0.009	0.037
Diversification Upper Medium Income♠				0.227	0.005	0.042
Diversification*LowIncome				**0.983**	-0.178	0.078
LowIncomeDummy				**0.65**	0.023	0.012
Sargan test p-value		1			1	
Observations		531			531	

Note: ♠ Composite coefficient reported, based on the joint posterior distribution of Diversification and
Diversification*CountryIncome interaction. Since the PIP is not defined for the composite, w e report the percentage
of the joint posterior distribution of Diversification*CountryIncome interaction that is non-zero.

1 "Diversification" in this table are measured by different Theil indexes, w ith the low er value means more diversified.

24.   **Two results emerge when comparing the output diversification results (Table 2, column 1) to the one linear export diversification result (Table 1, column 1).** First, in contrast to export diversification, output diversification is significant in the linear specification. And second, in the output diversification specification, there is strong support for neoclassical and institutional growth determinants. When allowing for a nonlinear output diversification effect in column 2, the results show that LICs are the likely driver of the aggregate effect (column 1). Overall, the results shown in column 2 indicate that LICs can greatly benefit from diversifying their production structure. More specifically, the estimates imply that a one standard deviation increase in output diversification in LICs

raises their average annual growth rate by about 1.4 percentage points.[4] This effect is even greater than the one found for export diversification.

F.   Conclusions

25.   This section has examined the impact of diversification on economic growth. In the five-year period panel ranging from 1965 to 2009, there is decisive evidence that export diversification is a substantial driver of growth in LICs. The findings are robust to the two biggest caveats encountered in growth regressions, endogeneity and model uncertainty, which are addressed through the use of the Instrumental Variable Bayesian Model Averaging (IVBMA) estimator. The results also show that both export diversification at the intensive and extensive margins are drivers of economic growth in LICs. These conclusions carry over to the more general concept of output diversification.

26.   Overall, the results suggest that countries at early stages of development could benefit considerably by diversifying their exports. At later stages of development, export diversification seems to be rather a by-product of prosperity rather than its cause. Export diversification could be the driver of a country's early development through several channels. For one, a more diversified economy offers an insurance against idiosyncratic sectoral shocks, especially at low stages of development when countries produce only few goods for export, such as agricultural products and natural resources. And second, countries with greater export diversification at early development stages are more likely to be able to move into new products and spur development further. Hausmann and Hidalgo (2011) and Kali et al., (2013) offer a detailed discussion of this point from an economic network's perspective.

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[4] The standard deviation of output diversification in low income countries is 0.078, resulting in a predicted increase in the growth rate of LICs by 100x(-0.078)x(-0.176)=1.373 percentage points.

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Appendix I. OLS and 2SLS Growth Regression

This appendix compares standard OLS and 2SLS growth regression results with export diversification (see Table A3).

OLS Results

The OLS results provide a baseline for direct comparison with previous growth determinant studies. Column 1 in Appendix Table A3 reports OLS results without export diversification, producing roughly comparable results to the OLS regressions in Barro (2003). As expected, InitialGDP, Investment and PopulationGrowth are significant as suggested by the neoclassical model. Institutional factors suggested by new growth theories are also significant (GovExpenditures, and ExecutiveConstraints). In addition, one individual religious measure (Jewish) is significant while the only trade measure, FilteredOpenness (the filtered ratio of imports plus exports over GDP), is significant at the 10 percent level. Both Barro (2003) and DKT (2008) found that the weak OLS trade effect disappeared once they controlled for endogeneity. Inflation, Fertility and LandNearCostPct are also found to have a significant effect on growth.

The linear export diversification term (Diversification) in column 2 is not significant in the global OLS panel. This result is not surprising given that the slope of the partial correlation between growth and export diversification is close to zero in Figure 2. Column 3 allows for nonlinearities in the relationship between export diversification in growth by introducing income dummies and their respective interaction terms with diversification. The income dummies are derived from the World Bank's definition of high-, upper-middle-, lower-middle-, and low- income levels. However, in the OLS specification, export diversification still has no significant effect for any income group.[5] The absence of any effect in the OLS specification, however, does not surprise given the ample evidence for feedback effects between growth and trade.

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[5] Diversification effects by country-income levels are calculated as the sum of the main export diversification coefficient and the respective country-income interaction with the diversification term. The standard errors of the composite coefficients effects are calculated using the Delta method.

Controlling for Endogeneity

Column 4 in Appendix Table 3 acknowledges not only trade endogeneity, but also the potential endogeneity of 18 other growth determinants in the dataset.[6] Given the large number of endogenous regressors, the Angrist-Pischke test statistics are reported. These test statistics indicate whether a particular endogenous regressor alone is identified. The Angrist-Pischke first-stage chi-squared and F statistics are tests of under-identification and weak identification.[7] Under-identification and weak identification are rejected at the 1 percent level for all endogenous variables. The Sargan-Hansen J statistic rejects, however, instrument validity in the 2SLS regression, indicating that a more parsimonious 2SLS specification is likely to be preferred.

In terms of significance, the 2SLS results in column 4 coincide by and large with the OLS growth determinants in column 3. Now, after controlling for endogeneity, export diversification becomes significant for LICs. The economic effect of diversification on LICs is sizable, implying that a one standard deviation increase in export diversification raises average annual growth in LICs by about 0.9 percentage points.[8] Investment and the marginally significant variables ExecutiveConstraint and Fertility all lose significance in the 2SLS approach. The loss of significance for Investment is worrisome, but not surprising. While Investment is seen as a universal growth determinant in theory, previous panel studies (e.g., DKT, 2008, and Barro, 2003) also find that the significance of Investment decreases substantially after controlling for endogeneity. Note that investment becomes insignificant only after controlling for endogeneity but before addressing model uncertainty.

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[6]The endogenous regressors are EasternReligionFraction, OrthodoxFraction, HinduFraction, Initial GDP, ProtestantFraction, ExecutiveConstraint, MuslimFraction, FilteredOpenness, GovExpend, Education, Investment, PopulationGrowth, OtherRelFraction, JewishFraction, Inflation, Diversification, and Diversification with three income interactions. The instruments follow directly from Barro (2003) and Durauf et al., (2008).

[7] In the case of a single endogenous regressor, the AP statistic is identical to the Cragg-Donald (if errors are i.i.d.) or the Kleibergen-Paap (if errors are not i.i.d.) under-identification statistics, respectively.

[8] Note that a lower Theil index implies an increase in export diversification. The coefficient of -.009 and the 1.029 standard deviation of export diversification for low income countries imply that a one standard deviation increase in diversification increases growth by about 0.9 percentage points (100x(-.009)x(-1.029) = 0.926%).

Appendix II. IVBMA Methodology

IVBMA (Instrumental Variable Bayesian Model Averaging) functions as a Bayesian Model Averaging (BMA) procedure at the first and second stages where the final model weight takes into account the model uncertainty in both stages. The sketch of the mechanics below follows Eicher et al., (2009). Traditionally, endogeneity is addressed by applying 2SLS and certifying over-identification and instrument restrictions (e.g.,, Wooldridge, 2002). The canonical setup is characterized by

$$y = \beta' \begin{pmatrix} w \\ x \end{pmatrix} + \eta, \tag{1}$$

$$w = \theta'_z z + \theta'_x x + \varepsilon, \tag{2}$$

where y is the dependent variable, x is a set of covariates, w is the set of endogenous variables, and z is the set of instruments. The x and θ_x are of dimension p_x, and z and θ_z have dimension p_z. To simplify the exposition, it is assumed that w is univariate. Assuming that

$$\begin{pmatrix} \eta \\ \varepsilon \end{pmatrix} \sim N \left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma^2_\eta & \sigma^2_{\eta\varepsilon} \\ \sigma^2_{\eta\varepsilon} & \sigma^2_\varepsilon \end{pmatrix} \right), \tag{3}$$

the classical endogenous variable situation arises when $\sigma^2_{\eta\varepsilon} \neq 0$, causing w to violate the regression assumption of independence of the error term, η. The determination of w then leads to inconsistent estimates of the entire coefficient vector, β. 2SLS solves the consistency problem, but relies on the existence of a set of instrumental variables (IV), z, which are independent of y, given w and the vector of covariates, x. The IV-based estimates, $\beta_{IV} = (\overline{w}'\overline{w})^{-1}\overline{w}'y$, obtained using the fitted values from the first stage, $\overline{w}$, are consistent if the conditional independence assumptions are valid.

IVBMA combines the IV and BMA methodologies. It processes the data much like a two stage least square estimator while also addressing model uncertainty in both stages. The first stage is a straight BMA application to identify effective instruments, where the properties of BMA in stage 1 are as follows. Let Δ be a quantity of interest and let the set of potential models in the first stage, $\widetilde{M}$, be comprised of $\widetilde{M}_i \in \widetilde{M}$ individual models. The posterior distribution of Δ given the data, D, is given by the weighted average of the predictive distribution under each model, using as weight the models' corresponding posterior probabilities:

$$pr(\Delta \mid D) = \sum_{\widetilde{M}_i \in \widetilde{M}} pr(\Delta \mid \widetilde{M}_i, D) pr(\widetilde{M}_i \mid D), \tag{4}$$

where $pr(\Delta \mid \widetilde{M}_i, D)$ is the predictive distribution and $pr(\widetilde{M}_i \mid D)$ is the posterior model probability of model $\widetilde{M}_i$. The posterior model probability, $\widetilde{\pi}_i$, for each model in the first stage is given by $\widetilde{\pi}_i = pr(\widetilde{M}_i \mid D) \propto pr(D \mid \widetilde{M}_i) pr(\widetilde{M}_i)$ where $pr(D \mid \widetilde{M}_i) = \int pr(D \mid \theta_i, \widetilde{M}_i) pr(\theta_i \mid \widetilde{M}_i) d\theta_i$ is the integrated likelihood of model $\widetilde{M}_i$ with model parameters θ_i. The prior densities for parameters and models are given by $pr(\theta_i \mid \widetilde{M}_i)$ and $pr(\widetilde{M}_i)$, respectively. The posterior mean in stage 1 is $\hat{\theta}_{BMA} = \sum_{\widetilde{M}_i \in \widetilde{M}} \hat{\theta}_i \widetilde{\pi}_i$, which is given by the sum of the posterior means of all models, weighted by their respective posterior model probabilities. Similarly, the posterior variance can be calculated as

$$\hat{\sigma}_{BMA}[\theta] = \sum_{\widetilde{M}_i \in \widetilde{M}} \widetilde{\pi}_i \, \hat{\sigma}_i + \sum_{\widetilde{M}_i \in \widetilde{M}} \widetilde{\pi}_i \left(\hat{\theta}_i - \hat{\theta}_{BMA} \right)^2. \tag{5}$$

The variance has a clear interpretation that highlights how model uncertainty is accounted for by standard errors of the BMA methodology. The first term in (5) is the weighted variance for each

model, $\hat{\sigma}_i = Var\left(\hat{\theta}_i \mid \tilde{M}_i, D\right)$, summed over all relevant models, and the second term indicates how stable the estimates are across models. The more the estimates differ across models, the greater is the posterior variance.

The posterior distribution for a parameter is a mixture of a regular posterior distribution and a point mass at zero, which represents the probability that the parameter equals zero. The sum of the posterior probabilities of the models that contain the variable is called the inclusion probability and can then be taken as a measure of the importance of a variable

$$\mu_{BMA}[\theta] = pr\left(\hat{\theta} \neq 0 \mid D\right) = \sum\nolimits_{\tilde{M}_i \in \tilde{M}_A} \tilde{\pi}_i. \tag{6}$$

where $\tilde{M}_A$ is the set of models in the first stage in which parameter θ is not constrained to zero.

IVBMA is then a nested approach that first determines the posterior model probabilities in the first stage according to the BMA methodology, and then uses the predicted values from each model, $\overline{w}_i$, to derive second stage model posterior model probabilities, $\pi_j[\overline{w}_i]$, and estimates, $\hat{\beta}_j[\overline{w}_i]$. The set of models in the second stage is denoted by M, which consists of all second stage models $M_j \in M$. The posterior means for the second stage can then be derived to be $\tilde{\hat{\beta}}_{IVBMA} = \sum\nolimits_{\tilde{M}_i \in \tilde{M}} \sum\nolimits_{M_j \in M} \tilde{\pi}_i \pi_j[\overline{w}_i]\hat{\beta}_j[\overline{w}_i] = \sum\nolimits_{\tilde{M}_i \in \tilde{M}} \tilde{\pi}_i \tilde{\hat{\beta}}_{i,BMA}$, which implies that the IVBMA estimate is the sum of the averaged posterior IV means obtained using the fitted values from each first stage model, $\tilde{M}_i$, weighted by the respective quality of each individual first stage specification.

The posterior variance reflects how stable the estimates are across models, and how estimates differ across models in both the first and second stage, just as in the canonical BMA setup in (5) (captured in the $\hat{\sigma}_{BMA}[\beta]$ term). However, IVBMA also takes into account the model weights derived in the first stage so that the posterior variance is again weighted by the quality of its incrementing models: $\hat{\sigma}_{IVBMA}[\beta] = \sum\nolimits_{\tilde{M}_i \in \tilde{M}} \tilde{\pi}_i \hat{\sigma}_{i,BMA}[\beta]$. Therefore, results generated by underperforming instrument models are deemphasized, while those based on strong instrument models receive relatively high posterior weights. A similar interpretation holds for the IVBMA inclusion probabilities: $\mu_{IVBMA}[\beta] = pr\left(\hat{\beta} \neq 0 \mid D\right) = \sum\nolimits_{\tilde{M}_i \in \tilde{M}, M \in M_A} \tilde{\pi}_i \mu_{i,BMA}[\beta]$, where M_A indicates the subset of second stage models for which the coefficient β is not constrained to zero.

Appendix Table A1. Export Diversification

IVBMA Estimates Export Diversification (Theil indexes)

	Extended DKT IVBMA			Extended DKT (Total Theil) IVBMA			Extended DKT (Total Theil) IVBMA			Extended DKT (Between Theil) IVBMA			Extended DKT (Within Theil) IVBMA		
	PIP	Cond. Mean	Cond. SD	PIP	Cond. Mean	Cond. SD	PIP	Cond. Mean	Cond. SD	PIP	Cond. Mean	Cond. SD	PIP	Cond. Mean	Cond. SD
Initial GDP	**1**	-0.015	0.002	**1**	-0.015	0.002	**1**	-0.021	0.003	**1**	-0.02	0.003	**1**	-0.021	0.003
GovernanceQuality	**0.955**	0.009	0.003	**0.919**	0.008	0.003	**1**	0.011	0.002	**1**	0.01	0.003	**1**	0.011	0.002
Investment	**0.999**	0.013	0.003	**1**	0.013	0.003	**1**	0.015	0.003	**0.666**	0.009	0.003	**1**	0.015	0.003
GovExpend	**0.856**	-0.079	0.029	**0.855**	-0.08	0.031	**0.97**	-0.109	0.029	**0.99**	-0.117	0.027	**0.975**	-0.111	0.028
PopulationGrowth	**0.988**	-0.05	0.012	**0.955**	-0.049	0.012	**0.987**	-0.057	0.013	**0.996**	-0.057	0.013	**1**	-0.062	0.012
JewishFraction	0.289	0.032	0.015	0.295	0.032	0.016	**0.901**	0.045	0.013	**0.989**	0.05	0.013	**0.925**	0.045	0.013
LegalOriginsUK	0.145	0.003	0.003	0.154	0.003	0.003	0.249	0.004	0.002	0.135	0.004	0.003	0.242	0.005	0.002
LegalOriginsFrench	0.449	-0.006	0.002	0.466	-0.006	0.002	0.263	-0.005	0.003	0.205	-0.004	0.002	0.209	-0.005	0.002
ProtestantFraction	**0.755**	-0.014	0.005	**0.655**	-0.014	0.005	0.322	-0.011	0.005	0.143	-0.008	0.005	0.282	-0.011	0.006
OrthodoxFraction	0.09	0.008	0.006	0.111	0.009	0.006	0.156	0.011	0.005	0.211	0.011	0.006	0.212	0.011	0.006
Inflation	**0.707**	0	0	**0.572**	0	0	0.49	0	0	**0.575**	0	0	**0.627**	0	0
Fertility	0.142	-0.001	0.001	0.182	-0.002	0.001	0.142	-0.001	0.001	0.117	-0.001	0.001	0.101	-0.001	0.001
LatinAmerica	0.064	-0.003	0.003	0.103	-0.004	0.003	0.093	-0.005	0.003	0.26	-0.007	0.004	0.114	-0.005	0.003
HinduFraction	0.045	-0.003	0.01	0.039	-0.005	0.009	0.028	-0.001	0.011	0.074	-0.007	0.012	0.035	0.001	0.01
LinguisticFractionalization	0.065	-0.002	0.005	0.074	-0.004	0.006	0.085	-0.005	0.004	0.061	-0.002	0.006	0.136	-0.005	0.005
EthnicFractionalization	0.04	-0.003	0.005	0.028	-0.001	0.006	0.054	-0.003	0.005	0.054	0	0.005	0.045	-0.002	0.005
OtherRelFraction	0.155	0.015	0.011	0.2	0.016	0.011	0.051	-0.001	0.009	0.078	-0.002	0.01	0.083	-0.006	0.008
ExecutiveConstraint	0.037	0.001	0.004	0.048	0	0.004	0.05	-0.002	0.004	0.07	-0.003	0.004	0.079	-0.001	0.004
FilteredOpenness	0.04	0.003	0.004	0.075	0.004	0.004	0.063	0.004	0.004	0.112	0.005	0.004	0.095	0.004	0.004
ExpropriationRisk	0.05	0	0.007	0.052	-0.002	0.009	0.087	0.001	0.008	0.074	0.002	0.009	0.064	0.003	0.007
SubSaharanAfrica	**0.932**	-0.011	0.004	**0.925**	-0.012	0.004	0.144	-0.006	0.004	**0.874**	-0.013	0.005	0.197	-0.007	0.004
LifeExpectancy	0.084	0.002	0.009	0.065	0.001	0.008	0.079	0	0.005	0.058	-0.002	0.007	0.037	0	0.005
EastAsia	0.096	0.005	0.003	0.092	0.004	0.004	0.067	0.003	0.003	0.075	0.004	0.004	0.048	0.003	0.004
EasternReligionFraction	0.09	0.008	0.006	0.098	0.008	0.006	0.077	0.006	0.006	0.132	0.009	0.007	0.106	0.008	0.006
LandTropicsPct	0.041	0	0.003	0.041	0.001	0.003	0.058	0.002	0.003	0.058	0.003	0.003	0.063	0.002	0.003
MuslimFraction	0.059	0.003	0.004	0.073	0.003	0.004	0.035	0	0.003	0.07	-0.002	0.005	0.032	0	0.004
Education	0.071	0	0.001	0.051	0	0.001	0.053	0	0.001	0.045	0	0.001	0.045	0	0.001
LandNearCoastPct	0.034	-0.001	0.003	0.041	0	0.003	0.065	0	0.003	0.033	0	0.003	0.05	-0.001	0.003
Diversification				0.283	-0.004	0.003	0.149	-0.001	0.003	0.489	-0.014	0.008	0.154	-0.001	0.004
Diversification Low Income♠							**0.997**	-0.008	0.003	**1**	-0.037	0.013	**0.976**	-0.008	0.003
Diversification Lower Medium Income♠							0.217	-0.001	0.003	**0.592**	-0.012	0.007	0.224	-0.001	0.004
Diversification Upper Medium Income♠							0.174	-0.001	0.003	**0.514**	-0.014	0.009	0.242	0.002	0.009
Diversification*LowIncome							**0.984**	-0.008	0.003	**0.962**	-0.031	0.013	**0.944**	-0.008	0.004
Diversification*MedIncome							0.08	-0.001	0.002	0.198	-0.001	0.014	0.111	0	0.004
Diversification*UpperMedIncome							0.031	0	0.004	0.054	-0.009	0.014	0.094	0.007	0.012
LowIncomeDummy							**0.647**	0.022	0.011	0.233	0.011	0.01	**0.53**	0.018	0.012
LowerMedIncomeDummy							0.115	0.001	0.007	0.085	-0.003	0.005	0.085	0.002	0.009
UpperMedIncomeDummy							0.048	0	0.007	0.04	0.003	0.005	0.062	-0.02	0.026
Sargan test p-value	0			0			0			0			0		
Observations	583			583			583			583			583		

♠ Composite coefficient reported, based on the joint posterior distribution of Diversification and Diversification*CountryIncome interaction.

Since the PIP is not defined for the composite, we report the percentage of the joint posterior distribution of Diversification*CountryIncome interaction that is non-zero.

Appendix Table A2. Output Diversification

	IVBMA Estimates Production Diversification (Total Theil)					
	Extended DKT IVBMA			Extended DKT IVBMA		
	PIP	Cond. Mean	Cond. SD	PIP	Cond. Mean	Cond. SD
Initial GDP	**0.924**	-0.012	0.004	**1.000**	-0.020	0.003
GovernanceQuality	**0.995**	0.014	0.004	**1.000**	0.013	0.003
Investment	**0.949**	0.012	0.003	**1.000**	0.013	0.003
GovExpend	0.293	-0.066	0.046	**0.996**	-0.128	0.031
PopulationGrowth	**0.838**	-0.038	0.014	**0.998**	-0.060	0.013
JewishFraction	0.120	0.024	0.018	**0.989**	0.051	0.013
LegalOriginsUK	0.312	0.005	0.003	0.312	0.006	0.003
LegalOriginsFrench	**0.515**	-0.006	0.003	0.185	-0.004	0.003
ProtestantFraction	**0.613**	-0.014	0.006	0.081	-0.004	0.005
OrthodoxFraction	0.133	0.011	0.006	0.345	0.014	0.006
Inflation	0.318	0.000	0.000	0.168	0.000	0.000
Fertility	0.088	-0.001	0.001	0.093	0.000	0.001
LatinAmerica	0.116	-0.005	0.004	0.132	-0.004	0.003
HinduFraction	0.040	0.002	0.011	0.060	-0.009	0.015
LinguisticFractionalization	0.052	0.001	0.005	0.070	-0.001	0.005
EthnicFractionalization	0.053	0.001	0.006	0.045	-0.001	0.005
OtherRelFraction	0.135	0.014	0.014	0.273	-0.017	0.010
ExecutiveConstraint	0.079	0.002	0.005	0.091	0.000	0.005
FilteredOpenness	0.061	0.004	0.004	0.452	0.009	0.004
ExpropriationRisk	0.071	-0.001	0.008	0.070	0.004	0.007
SubSaharanAfrica	0.379	-0.010	0.010	0.105	-0.004	0.006
LifeExpectancy	0.120	0.012	0.015	0.060	-0.001	0.004
EastAsia	0.038	0.002	0.004	0.037	0.002	0.004
EasternReligionFraction	0.057	0.003	0.008	0.038	-0.001	0.007
LandTropicsPct	0.070	0.003	0.003	0.071	0.002	0.003
MuslimFraction	0.076	0.004	0.004	0.063	0.001	0.005
Education	0.091	-0.001	0.001	**0.769**	-0.003	0.001
LandNearCoastPct	0.054	-0.002	0.003	0.073	-0.002	0.003
Diversification	**0.769**	-0.117	0.065	0.186	0.006	0.039
Diversification Low Income♠				**0.988**	-0.176	0.079
Diversification Lower Mid Income♠				0.268	0.009	0.037
Diversification Upper MidIncome♠				0.227	0.005	0.042
Diversification*LowIncome				**0.983**	-0.178	0.078
Diversification*MedIncome				0.098	0.012	0.031
Diversification*UpperMedIncome				0.056	-0.001	0.047
LowIncomeDummy				**0.650**	0.023	0.012
LowerMedIncomeDummy				0.121	-0.001	0.009
UpperMedIncomeDummy				0.083	-0.004	0.009
Sargan test p-value	1.000			1.000		
Observations	531			531		

♠Composite coefficient reported, based on the joint posterior distribution of Diversification and Diversification*CountryIncome interaction. Since the PIP is not defined for the composite, only the percentage of the joint posterior distribution of Diversification*Country Income interaction that is non-zero is reported.

Appendix Table A3. OLS and 2SLS Estimation

	OLS and 2SLS Estimates Export Diversification								
	Extended DKT OLS		Extended DKT OLS		Extended DKT OLS		Extended DKT OLS		AP p-values
	Coeff	SE	Coeff	SE	Coeff	SE	Coeff	SE	$X2$	F
Initial GDP	-0.010***	0.003	-0.010***	0.003	-0.011***	0.003	-0.018***	0.004	0.000	0.000
GovernanceQuality	0.004	0.003	0.004	0.003	0.005	0.003	0.009***	0.003		
Investment	0.010***	0.003	0.010***	0.003	0.011***	0.003	0.006	0.004	0.000	0.000
GovExpend	-0.114***	0.026	-0.114***	0.026	-0.115***	0.027	-0.128***	0.041	0.000	0.000
PopulationGrowth	-0.038***	0.011	-0.038***	0.011	-0.040***	0.011	-0.055**	0.022	0.000	0.000
JewishFraction	0.039***	0.009	0.040***	0.009	0.038***	0.010	0.063***	0.017	0.000	0.000
LegalOriginsUK	0.004	0.003	0.004	0.003	0.007**	0.003	0.008*	0.005		
LegalOriginsFrench	-0.001	0.003	-0.001	0.003	-0.000	0.003	0.001	0.004		
ProtestantFraction	-0.006	0.004	-0.005	0.004	-0.004	0.004	-0.005	0.006	0.000	0.000
OrthodoxFraction	0.007	0.005	0.008	0.006	0.005	0.006	0.008	0.006	0.000	0.000
Inflation	-0.000***	0.000	-0.000***	0.000	-0.000***	0.000	-0.000**	0.000	0.003	0.008
Fertility	-0.003*	0.001	-0.002	0.002	-0.003*	0.002	-0.002	0.002		
LatinAmerica	-0.004	0.005	-0.003	0.005	-0.007	0.005	-0.007	0.008		
HinduFraction	-0.002	0.012	-0.002	0.012	-0.003	0.014	-0.017	0.016	0.000	0.000
LinguisticFractionalization	-0.008	0.005	-0.009	0.005	-0.007	0.006	-0.013**	0.006		
EthnicFractionalization	-0.004	0.006	-0.004	0.006	-0.004	0.006	-0.002	0.006		
OtherRelFraction	-0.008	0.008	-0.007	0.008	-0.010	0.008	-0.012	0.015	0.000	0.000
ExecutiveConstraint	-0.006*	0.004	-0.006*	0.004	-0.006*	0.004	-0.001	0.005	0.000	0.000
FilteredOpenness	0.007*	0.004	0.007*	0.004	0.005	0.004	0.005	0.005	0.000	0.000
ExpropriationRisk	0.000	0.010	-0.001	0.011	-0.000	0.011	-0.006	0.012		
SubSaharanAfrica	-0.003	0.005	-0.003	0.005	-0.003	0.006	-0.000	0.008		
LifeExpectancy	0.014	0.013	0.014	0.013	0.013	0.013	0.007	0.014		
EastAsia	0.004	0.004	0.004	0.004	0.002	0.005	0.008	0.006		
EasternReligionFraction	0.005	0.006	0.005	0.006	0.007	0.007	-0.004	0.009	0.000	0.000
LandTropicsPct	0.003	0.004	0.003	0.004	0.002	0.005	0.003	0.005		
MuslimFraction	-0.002	0.004	-0.002	0.004	-0.005	0.005	-0.007	0.007	0.000	0.000
Education	-0.001	0.001	-0.000	0.001	-0.001	0.001	-0.000	0.001	0.000	0.000
LandNearCoastPct	-0.007*	0.004	-0.007*	0.004	-0.006	0.004	-0.008**	0.004		
Diversification			-0.001	0.002	0.001	0.003	0.001	0.005	0.000	0.000
Diversification Low Income♠					-0.001	0.003	-0.009**	0.004	0.000	0.000
Diversification Lower Medium Income♠					-0.003	0.002	-0.005	0.006	0.000	0.000
Diversification Upper Medium Income♠					0.002	0.008	-0.006	0.017	0.000	0.000
Diversification*LowIncome					-0.003	0.004	-0.009	0.006	0.000	0.000
Diversification*MedIncome					-0.004	0.004	-0.005	0.007	0.000	0.000
Diversification*UpperMedIncome					0.000	0.008	-0.006	0.017	0.000	0.000
LowIncomeDummy					0.005	0.013	0.024	0.019		
LowerMedIncomeDummy					0.017*	0.009	0.019	0.014		
UpperMedIncomeDummy					0.001	0.017	0.013	0.034		
Sargan test p-value							0.000			
R-squared	0.408		0.409		0.417		0.376			
Observations	583		583		583		583			

♠ Composite coefficient comprised of Diversification and Diversification*CountryIncome interaction, calculated using Delta Method.

Data Appendix

Variable	Mean	SD	Min	Max	Definition	Source
Extensive Theil (Exports)	0.413	0.423	-0.025	2.667	Average extensive Theil measure of export diversification.	IMF
Intensive Theil (Exports)	2.489	0.882	0.970	5.751	Average intensive Theil measure of export diversification.	IMF
EastAsia	0.106	0.309	0.000	1.000	Dummy variable for East Asia.	World Bank
EasternReligionFraction	0.056	0.188	0.000	0.967	Eastern Religion share in 1970, 1980, 1990 and 2000 as fraction of the population who expressed adherence to some religion and corresponding share in 1900.	Durlauf, Kourtellos, Tan (EJ 2008) for 1900, 1970, 1980, 1990 and McCleary for 2000
Education	-3.769	1.859	-11.56	-0.488	Logarithm of the average percentage of a country's working age population that attended secondary school x the completion rate of secondary school for all periods.	Barro and Lee dataset
EthnicFractionalization	0.397	0.260	0.002	0.930	Measures the degree of tension within a country attributable to racial, nationality, or language divisions.	Alesina (2003)
ExecutiveConstraint	0.635	0.350	0.000	1.000	A measure of the extent of institutionalized constraints on the decision making powers of chief executives. This variable ranges from one to seven where higher values equal a greater extent of institutionalized constraints on the power of chief executives. This variable is calculated as per period average. The variable was transformed first using (x-1)/6.	Henderson, Papageorgiou, Parmeter (EJ 2011) and Polity IV Project
ExpropriationRisk	0.720	0.205	0.160	1.000	Risk of "outright confiscation and forced nationalization" of property. Rescaled, from 0 to 1, with a higher score indicating less risk of expropriation.	Henderson, Papageorgiou, Parmeter (EJ 2011) and Durlauf, Kourtellos, Tan (EJ 2008).
Fertility	3.569	2.098	0.073	8.072	Logarithm of the total fertility rate in inital years of 5-year periods.	Henderson, Papageorgiou, Parmeter (EJ 2011) and World Bank.
FilteredOpenness	-0.037	0.301	-0.505	1.497	Average ratio exports plus imports to GDP, filtered for the relation of this ratio to the logs of population and area.	Openness, GDP, population and area data from PWT 7.1 and World Bank.
g	0.020	0.025	-0.070	0.109	Average per capita GDP growth rate.	Henderson, Papageorgiou, Parmeter (EJ 2011 - PWT 6.2), PWT 7.1.
GovernanceQuality	0.347	0.902	-1.690	1.930	Average Composite Governance index. It is calculated as the average of six variables: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, and control of corruption.	World Bank
GovExpend	0.149	0.054	0.041	0.387	Average ratio of government consumption to GDP.	World Bank.
HHI	0.125	0.154	0.002	0.859	Average Herfindahl measure of export diversification, calcluated using 4-digit SITC data (for 1960-1989) and 6-digit HS data (1990-2009).	Authors' own calculations, trade data: Feenstra et al., (2005), Comtrade
HinduFraction	0.019	0.100	0.000	0.820	Hindu share in 1970, 1980, 1990 and 2000 as fraction of the population who expressed adherence to some religion.	Durlauf, Kourtellos, Tan (EJ 2008) for 1900, 1970, 1980, 1990 and McCleary for 2000
Inflation	12.952	23.312	-3.079	270.65	The average consumer price inflation rate.	Henderson, Papageorgiou, Parmeter (EJ 2011) and World Bank.

Data Appendix (continued)

Initial GDP	8.542	1.087	6.177	10.806	Logarithm of initial per capita GDP in each period.	Henderson, Papageorgiou, Parmeter (EJ 2011 - PWT 6.2), PWT 7.1.
Investment	2.746	0.537	1.097	4.515	Average ratio of investment to GDP.	Henderson, Papageorgiou, Parmeter (EJ 2011), PWT 7.1.
JewishFraction	0.015	0.103	0.000	0.896	Jewish share in 1970, 1980, 1990 and 2000 as fraction of the population who expressed adherence to some religion.	Durlauf, Kourtellos, Tan (EJ 2008) for 1900, 1970, 1980, 1990 and McCleary for 2000
LandNearCoastPct	0.508	0.345	0.000	1.000	Percentage of a country's land area within 100km of an ice-free coast.	Henderson, Papageorgiou, Parmeter (EJ 2011).
LandTropicsPct	0.307	0.395	0.000	1.000	Percentage of land area classified as tropical and subtropical via the in Koeppen-Geiger system.	Henderson, Papageorgiou, Parmeter (EJ 2011).
LatinAmerica	0.235	0.424	0.000	1.000	Dummy variable for Latin America and the Caribbean.	World Bank
LegalOriginsFrench	0.470	0.500	0.000	1.000	Dummy variable that takes value if 1 if a country legal system is based on French legal code.	Durlauf, Kourtellos, Tan (EJ 2008).
LegalOriginsUK	0.345	0.476	0.000	1.000	Dummy variable that takes value if 1 if a country legal system is based on British legal code.	Durlauf, Kourtellos, Tan (EJ 2008).
LifeExpectancy	0.201	0.492	0.012	2.253	Reciprocals of life expectancy at age 1 in inital years of 5-year periods.	Henderson, Papageorgiou, Parmeter (EJ 2011) and World Bank.
LinguisticFractionalization	0.350	0.303	0.000	0.923	Measure of linguistic fractionalization based on data describing shares of languages spoken as "mother tongues".	Henderson, Papageorgiou, Parmeter (EJ 2011) and Alesina (2003).
LowerMedIncome Dummy	0.400	0.490	0.000	1.000	Dummy variable taking value one for lower medium income dummies, using 1988 World Bank definition.	World Bank
LowIncomeDummy	0.216	0.412	0.000	1.000	Dummy variable taking value one for low income dummies, using 1988 World Bank definition.	World Bank
MuslimFraction	0.193	0.331	0.000	0.995	Muslim share in 1970, 1980, 1990 and 2000 as fraction of the population who expressed adherence to some religion.	Durlauf, Kourtellos, Tan (EJ 2008) for 1900, 1970, 1980, 1990 and McCleary for 2000
OrthodoxFraction	0.037	0.157	0.000	0.972	Orthodox share in 1970, 1980, 1990 and 2000 as fraction of the population who expressed adherence to some religion.	Durlauf, Kourtellos, Tan (EJ 2008) for 1900, 1970, 1980, 1990 and McCleary for 2000
OtherRelFraction	0.107	0.182	-0.560	0.904	Other Religion share in 1970, 1980, 1990 and 2000 as fraction of the population who expressed adherence to some religion.	Durlauf, Kourtellos, Tan (EJ 2008) for 1900, 1970, 1980, 1990 and McCleary for 2000
PopulationGrowth	-2.718	0.163	-3.201	-2.204	Logarithm of average population growth rate plus 0.05.	Henderson, Papageorgiou, Parmeter (EJ 2011), PWT 7.1.
ProtestantFraction	0.152	0.261	-0.007	1.460	Protestant share in 1970, 1980, 1990 and 2000 as fraction of the population who expressed adherence to some religion.	Durlauf, Kourtellos, Tan (EJ 2008) for 1900, 1970, 1980, 1990 and McCleary for 2000
SubSaharanAfrica	0.184	0.387	0.000	1.000	Dummy variable for Sub-Saharan Africa.	World Bank
Total Theil (Exports)	2.902	1.057	0.992	5.939	Average Total Theil measure of export diversification.	IMF
Total Theil (Output)	0.236	0.101	0.054	0.516	Average Total Theil measure of output diversification.	IMF
UpperMedIncome Dummy	0.105	0.306	0.000	1.000	Dummy variable taking value one for upper medium income dummies, using 1988 World Bank definition.	World Bank

Data Appendix (conclude)

Instruments						
EasternReligionFraction 1900	0.060	0.206	0.000	0.990	Eastern Religion share in 1900 as fraction of the population who expressed adherence to some religion and corresponding share in 1900.	Durlauf, Kourtellos, Tan (EJ 2008) for 1900, 1970, 1980, 1990 and McCleary for 2000
HinduFraction1900	0.024	0.111	0.000	0.816	Hindu share in 1900 as fraction of the population who expressed adherence to some religion.	Durlauf, Kourtellos, Tan (EJ 2008) for 1900, 1970, 1980, 1990 and McCleary for 2000
JewishFraction1900	0.006	0.016	0.000	0.090	Jewish share in 1900 as fraction of the population who expressed adherence to some religion.	Durlauf, Kourtellos, Tan (EJ 2008) for 1900, 1970, 1980, 1990 and McCleary for 2000
LagEducation	-4.111	2.021	-12.18	-1.024	One period lag of logarithm of the average percentage of a country's working age population that attended secondary school times the completion rate of secondary school for all periods.	Durlauf, Kourtellos, Tan (EJ 2008) for 1900, 1970, 1980, 1990 and McCleary for 2000
LagExecutiveConstraint	0.622	0.369	0.000	1.000	One period lag of constraints on executive measure.	Durlauf, Kourtellos, Tan (EJ 2008) for 1900, 1970, 1980, 1990 and McCleary for 2000
LagFilteredOpenness	-0.082	0.286	-0.569	1.364	One period lag of filtered openness ratio.	Durlauf, Kourtellos, Tan (EJ 2008) for 1900, 1970, 1980, 1990 and McCleary for 2000
LagGovExpend	0.146	0.055	0.041	0.406	One period lag of average ratio of government consumption to GDP.	Durlauf, Kourtellos, Tan (EJ 2008) for 1900, 1970, 1980, 1990 and McCleary for 2000
LagInflation	14.205	23.796	-3.079	270.65 1	One period lag of average consumer price inflation rate.	Durlauf, Kourtellos, Tan (EJ 2008) for 1900, 1970, 1980, 1990 and McCleary for 2000
LagInitial GDP	8.434	1.052	5.805	10.445	One period lag od logarithm of initial per capita GDP in each period.	Durlauf, Kourtellos, Tan (EJ 2008) for 1900, 1970, 1980, 1990 and McCleary for 2000
LagInvestment	2.680	0.554	0.750	4.515	One period lag of average ratio of investment to GDP.	Durlauf, Kourtellos, Tan (EJ 2008) for 1900, 1970, 1980, 1990 and McCleary for 2000
LagPopulationGrowth	-2.706	0.164	-3.255	-2.204	One period lag of logarithm of average population growth rate plus 0.05.	Durlauf, Kourtellos, Tan (EJ 2008) for 1900, 1970, 1980, 1990 and McCleary for 2000
Landlocked	0.137	0.344	0.000	1.000	Dummy variable for landlocked countries	CEPII
lLand	12.627	1.577	9.131	16.048	Logarithm of land area.	CEPII
lPop	9.671	1.376	6.473	13.978	Logarithm of average population size.	PWT 7.1
MuslimFraction1900	0.165	0.302	0.000	0.964	Muslim share in 1900 as fraction of the population who expressed adherence to some religion.	Durlauf, Kourtellos, Tan (EJ 2008) for 1900, 1970, 1980, 1990 and McCleary for 2000
OrthodoxFraction1900	0.042	0.164	0.000	0.982	Orthodox share in 1900 as fraction of the population who expressed adherence to some religion.	Durlauf, Kourtellos, Tan (EJ 2008) for 1900, 1970, 1980, 1990 and McCleary for 2000
OtherRelFraction1900	0.200	0.321	0.000	0.997	Other Religion share in 1900 as fraction of the population who expressed adherence to some religion.	Durlauf, Kourtellos, Tan (EJ 2008) for 1900, 1970, 1980, 1990 and McCleary for 2000
ProtestantFraction1900	0.151	0.302	0.000	0.999	Protestant share in 1900 as fraction of the population who expressed adherence to some religion.	Durlauf, Kourtellos, Tan (EJ 2008) for 1900, 1970, 1980, 1990 and McCleary for 2000

DIVERSIFICIATION AND VOLATILITY[9]

A. Introduction

27.   Macroeconomic stability has been instrumental to sustained growth and development in developing countries. This section examines the relationship between limited diversification in the export sector and the volatility of economic growth.

28.   The existing literature provides some evidence that economic diversification can increase a country's resilience to external shocks. Openness to trade is often a source of output growth volatility. The more open an economy is, the more susceptible it is to external shocks; on the other hand, openness to trade helps insulate against domestic growth slowdowns by providing access to additional markets. As Hadad et al., (2013) point out, countries that have a more diversified basket of export goods are less likely to be impacted negatively by external shocks. Export diversification could reduce volatility by reducing dependence on particular products, especially primary products and commodities which tend to be associated with higher risk. Stanley and Bunnag (2001) show that for four countries in Central America, greater export diversification leads to lower income instability within the 1974 to 1995 period. In addition, they argue that different product combinations can have different impacts on income stability. The effects of reducing instability are stronger if the new products are less volatile or negatively co-vary with the current exports. Agosin (2007) shows negative correlation between export diversification and export growth variance. He suggests export diversification could influence growth by reducing the variance of export growth. Koren and Tenreyro (2007) show evidence that the productive structure moves to less volatile sectors and the degree of sectoral concentration declines as countries develop. Mobarak (2005) finds that higher levels of diversification lower growth volatility. Bertinelli et al. (2009) use a panel data set of developing countries to estimate the trade-off between export earnings and its variability based on modern portfolio theory. They find there are welfare gains from export diversification structure.

29.   With this in mind, the focus is on developing countries and three key questions.[10] First, are episodes of significant, sustained diversification associated with increased macroeconomic stability? Second, does export diversification of products help reduce growth volatility, and as a follow-up to this question, does this effect happen through extensive or intensive diversification? Lastly, does output diversification have an effect on reducing growth volatility?

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[9] Prepared by Ke Wang.

[10] Developing countries refer to the emerging and developing country group using the IMF WEO classification.

Stylized Facts

30. **Developing countries have experienced a higher level of growth volatility** (Figure 2). While growth volatility declined after 1995 in both EMs and LICs, it still remains higher than in advanced countries.
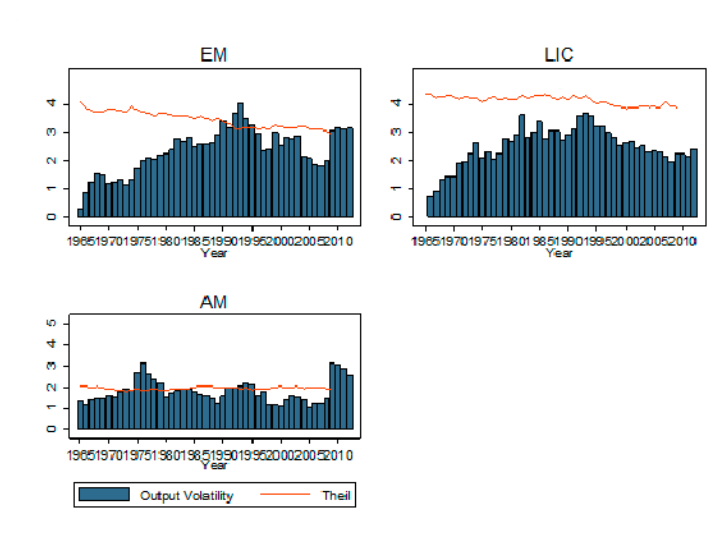
Figure 2. Growth Volatility,

by IMF Income Groups, 1962-2010
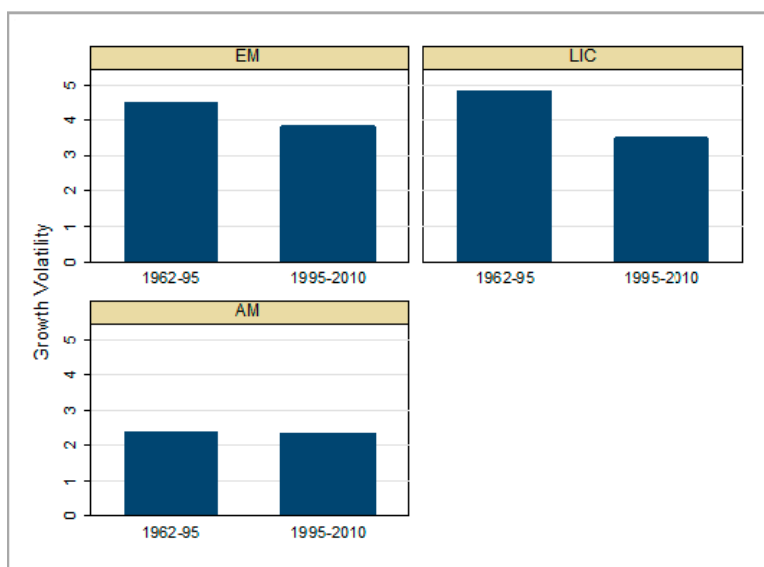
Sources: World Bank WDI, IMF staff calculations.

31. **A higher level of export diversification is generally associated with lower growth volatility**. Figures 3 and 4 show the relationship between the Theil index and output volatility. The Theil index is a measure of inequality; here it is used as a measure of concentration for exported products, and a lower Theil index indicates higher diversification in exports. As shown in Figure 3, overall, LICs and EMs have a higher level of output volatility and a higher Theil index than AMs; Figure 4 shows the positive relationship between higher output volatility and lower diversification, particularly for LICs. This relationship continues to hold even after controlling for other determinants of growth volatility (Lederman and Maloney, 2012). Indeed, recent evidence suggests that industry diversification helped attenuate the impact of the global financial crisis (da Costa Neto and Romeu, 2011).

Figure 3. Growth Volatility and Export Diversification by IMF Income Group, 1962-2010

Sources: UN Comtrade; World Bank WDI; IMF staff calculations.

Figure 4. Export Diversification and Growth Volatility, 1962-2010
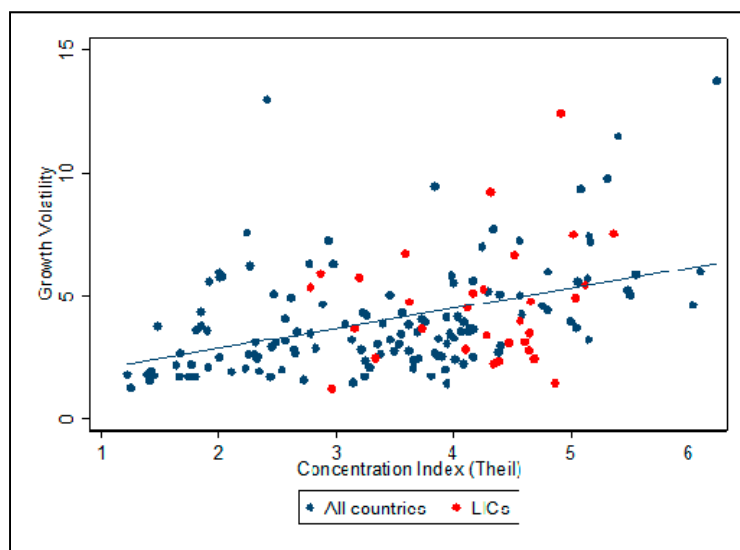
Sources: UN Comtrade; World Bank WDI; IMF staff calculations.

32.   The link between diversification and volatility is easiest to observe in the context of large diversification spurts. A total of 61 diversification spurts[11] in 51 developing countries were identified in the post–1962 period. Diversification spurts occurred more frequently in the 1960s and

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[11] Diversification spurts are identified based on the Berg and others (2012) procedure for identifying growth spells.

1990s and were evenly distributed across regions (after controlling for the relative number of countries). For the sample as a whole, the spurts lasted 13 years on average; in the East Asia and Pacific region, spurts lasted 20 years on average. Diversification spurts are associated with a reduction in the volatility of output growth in developing countries. The decrease is especially pronounced in LICs, where growth volatility decreases 1.5 percentage points in the wake of diversification spurts (Figure 5).

Figure 5. Growth Volatility and Diversification Spurts in LICs, 1962-2010
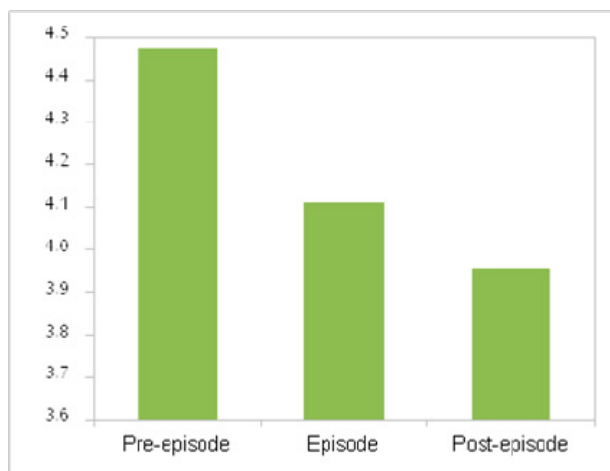
Sources: UN Comtrade; World Bank WDI; IMF Staff calculations.

B. Export Diversification and Volatility

33. **The following specification for the growth volatility estimations is used:**

$$Vol_{i,t} = \alpha Vol_{i,t-1} + \beta Div_{i,t} + \rho x_{i,t} + \gamma_t + \epsilon_i + \varepsilon_{i,t}$$

The data cover the time period from 1962-2010. $Vol_{i,t}$ denotes the growth volatility in country i at time t. It is calculated as the standard deviation of GDP growth using a five-year window. $Div_{i,t}$ denotes the diversification index, and four different diversification indices were tried in separate regression specifications. The first two indices, Total Theil and the Herfindahl index, capture the effect a country's overall level of diversification has on volatility. The second two indices, the extensive and intensive margins, can be obtained from a decomposition of the overall Theil index. Extensive diversification occurs when a country exports new product lines, while intensive diversification occurs when a country exports a more balanced mix of existing products. Lower values for all four indices indicate a higher level of diversification.

34. **$Open_{i,t}$ denotes the trade openness level for each country/year, defined as total exports and imports as a share of GDP.** Several regressions include interaction terms between the diversification index and a measure of trade openness ($Open_{i,t} * Div_{i,t}$ denotes the interaction term). $x_{i,t}$ denotes other control variables such as terms of trade volatility, inflation volatility, and exchange rate volatility. γ_t is time effect. ϵ_i is unobserved time-invariant country-specific effects. $\varepsilon_{i,t}$ is residual

error. The data are five-year averages for each variable in order to exclude extreme values and business cycles; thus, t denotes each five-year period.

35.   Regressions are estimated using the two-step GMM model because of the dynamic nature of the regression equation. Since there is a lagged dependent variable in the estimation, fixed effects model estimates are biased. Following Arellano and Bond (1991), the GMM estimator thus is necessary to obtain consistent estimates.

C.   Empirical Results

36.   Export diversification helps to reduce growth volatility. The GMM regression results are reported in Tables 3 to 4. Table 3 shows the regression results based on the sample of developing countries. Table 4 shows the results for all countries. Note that a lower Theil index (total, intensive, or extensive) or Herfindahl index (HFI) means a higher level of diversification in export products. The regression results in first two columns of Table 3 show positive coefficients on diversification measures Theil and HFI, which suggests product diversification helps reduce growth volatility. From column (3), the coefficient on the intensive Theil index is also significant and positive, suggesting the effect of diversification on growth volatility is through equalizing the export shares of the current export basket (see Figure 6). Similar results hold when all countries are included in the regressions.

Figure 6. Intensive Diversification and Growth Volatility
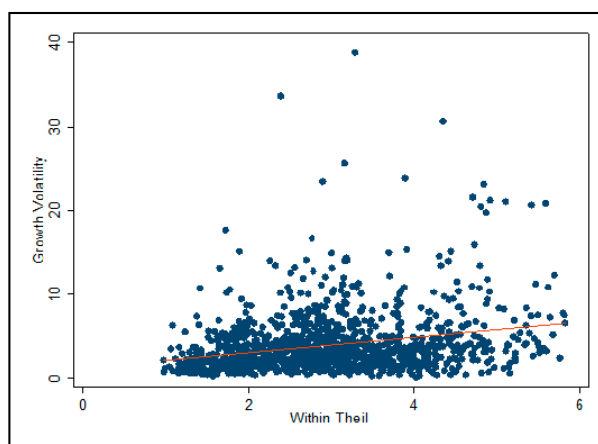
Sources: UN Comtrade; World Bank WDI; IMF Staff calculations.

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Table 3. System GMM Regressions for Growth Volatility on Export Diversification of Products, Developing Countries, Panel of 5 Year Average, 1962-2010

	Developing Countries											
	Product Diversification			Product Diversification with Trade Openness			Product Diversification with Control Variables			Product Diversification with Trade interaction and controls		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Lagged volatility	0.459***	0.629***	0.445***	0.222*	0.0299	0.330**	0.113	0.217	0.122	0.0379	0.0191	-0.00322
	[3.343]	[4.023]	[3.608]	[1.676]	[0.149]	[2.021]	[0.897]	[0.897]	[1.049]	[0.354]	[0.132]	[-0.0257]
Theil index	0.823**			0.834**			0.969*			-0.865		
	[1.987]			[2.135]			[1.761]			[-0.460]		
HFI index		5.605**			5.022**			8.178**			1.324	
		[2.226]			[2.304]			[1.998]			[0.154]	
Within Theil			1.137*			0.961*			1.549**			-4.048*
			[1.841]			[1.693]			[2.086]			[-1.683]
Trade openness				0.00567	0.000810	-0.0126				-0.0477	0.0147	-0.150**
				[0.318]	[0.0400]	[-0.552]				[-0.705]	[0.533]	[-2.467]
Theil x Openness										0.0202		
										[0.982]		
HFI x Openness											0.0769	
											[0.901]	
Within Theil x Openness												0.0515**
												[2.286]
Terms of trade volatility							-0.0960***	-0.0544	-0.0684*	-0.0796**	-0.0738*	-0.0207
							[-2.651]	[-0.976]	[-1.894]	[-1.974]	[-1.718]	[-0.599]
Exchange rate volatility							0.0462	-0.00562	0.0120	0.0454**	0.0470	0.0410
							[1.098]	[-0.141]	[0.576]	[2.062]	[0.975]	[1.582]
Inflation volatility							-0.00119	-0.00175	-0.00151	-0.00162	-0.00150	-0.000202
							[-0.267]	[-0.803]	[-0.777]	[-1.355]	[-0.974]	[-0.148]
Constant	-0.799	1.438**	-1.635	-0.570	2.202	0.601	2.129	2.069	1.014	6.195	2.908	14.65***
	[-0.512]	[1.988]	[-0.781]	[-0.270]	[1.364]	[0.240]	[0.777]	[0.938]	[0.347]	[0.992]	[1.042]	[2.578]
Observations	886	925	886	864	900	864	289	292	289	288	291	288
Number of id	133	141	133	132	140	132	55	56	55	55	56	55
No. of instruments	15	15	15	18	18	18	27	27	27	35	35	35
Hansen test p-value	0.139	0.188	0.0763	0.108	0.162	0.0444	0.652	0.621	0.522	0.629	0.471	0.194
A-B AR(1) test p-value	0.000635	0.0338	0.000605	0.00440	0.107	0.00393	0.0254	0.0201	0.00621	0.0255	0.0608	0.0308
A-B AR(2) test p-value	0.695	0.574	0.775	0.441	0.454	0.672	0.931	0.978	0.856	0.922	0.892	0.785

Robust z-statistics in brackets. *** p<0.01, ** p<0.05, * p<0.1

Note: Dependent variable is Volatility of GDP Per Capita Growth.

Period dummies and a constant were included, but not reported.

Table 4. System GMM Regressions for Growth Volatility on Export Diversification of Products, All Countries, Panel of 5 Year Average, 1962-2010
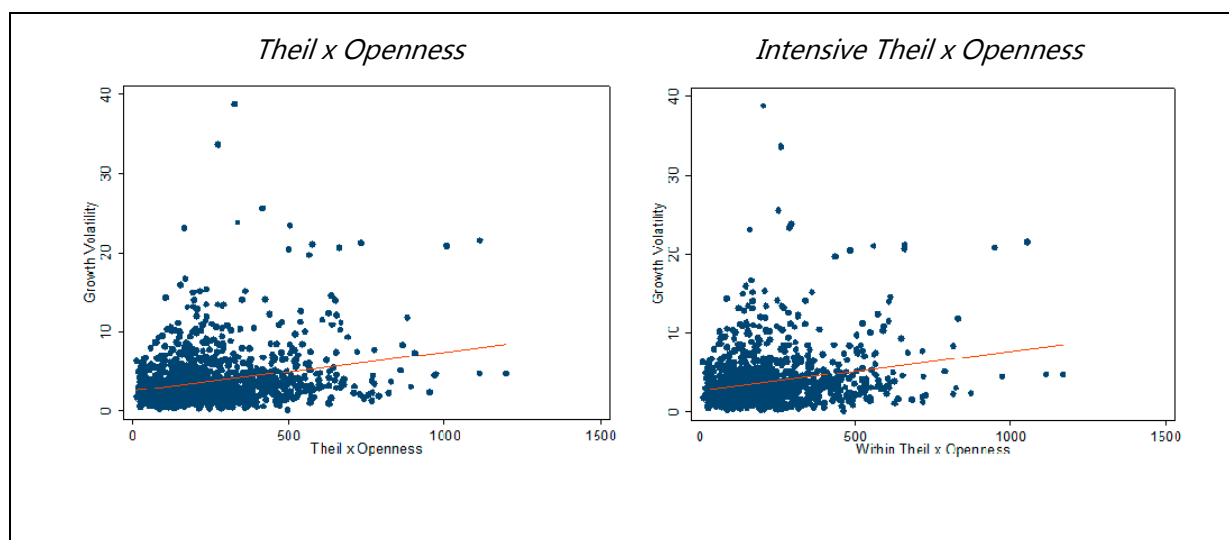
| | All Countries | | | | | | | | | | | |
| | Product Diversification | | | Product Diversification with Trade Openness | | | Product Diversification with Control Variables | | | Product Diversification with Trade interaction and controls | | |
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Lagged volatility	0.434***	0.629***	0.445***	0.245*	0.0695	0.277*	0.465***	0.562**	0.562**	0.220*	0.152	0.259**
	[3.448]	[4.023]	[3.608]	[1.839]	[0.436]	[1.932]	[3.017]	[2.244]	[2.244]	[1.746]	[0.913]	[2.101]
Theil index	1.845***			0.906			0.714			-1.397*		
	[2.887]			[1.394]			[1.564]			[-1.779]		
HFI index		3.196*			4.814*			7.487**			-12.35	
		[1.651]			[1.945]			[2.150]			[-1.181]	
Within Thei			1.882***			0.930*			0.810			-2.262
			[3.157]			[1.787]			[1.191]			[-1.210]
Trade openness				0.0131	0.0149	0.00698				-0.0399*	0.00172	-0.0499
				[1.301]	[1.583]	[0.591]				[-1.732]	[0.131]	[-1.306]
Theil x Openness										0.0237**		
										[2.522]		
HFI x Openness											0.193*	
											[1.920]	
Within Theil x Openness												0.0289*
												[1.918]
Terms of trade volatility							0.0903	0.0246	-0.0818	-0.0342	-0.0238	0.00783
							[0.612]	[0.306]	[-0.568]	[-0.575]	[-0.473]	[0.168]
Exchange rate volatility							-0.0248	-0.0490	0.00706	0.0342	0.0564	0.0230
							[-0.544]	[-1.282]	[0.206]	[1.100]	[1.068]	[0.988]
Inflation volatility							0.000178	0.000560	0.00120	0.00110	-0.000354	0.00218
							[0.0650]	[0.160]	[0.271]	[0.385]	[-0.150]	[0.695]
Constant	-4.095**	-1.167**	-3.604**	-1.244	1.066	-0.551	-1.168	-1.492*	0.848	4.124**	0.0528	5.892
	[-1.961]	[-2.163]	[-2.004]	[-0.532]	[0.986]	[-0.291]	[-0.644]	[-1.939]	[0.331]	[2.458]	[0.0313]	[1.208]
Observations	1,116	1,350	1,116	1,094	1,144	1,094	448	536	451	450	538	450
Number of id	163	179	163	162	173	162	81	85	81	81	85	81
No. of instruments	15	16	15	18	18	18	25	26	22	31	29	28
Hansen test p-value	0.176	0.124	0.0998	0.127	0.0950	0.0298	0.314	0.470	0.638	0.182	0.419	0.318
A-B AR(1) test p-value	0.000571	0.000303	0.000304	0.00372	0.0363	0.00310	0.0169	0.00694	0.00827	0.0301	0.0456	0.0185
A-B AR(2) test p-value	0.710	0.979	0.802	0.432	0.458	0.539	0.929	0.900	0.642	0.688	0.850	0.626

Robust z-statistics in brackets *** p<0.01, ** p<0.05, * p<0.1

Note: Dependent variable is Volatility of GDP Per Capita Growth.

Period dummies and a constant were included, but not reported.

37.   The effects of diversification on growth volatility hold after including trade openness and other control variables. Columns (4) to (6) in Table 3 show the regression results after adding the trade openness variable. The HFI and intensive Theil diversification measures are still significant with positive signs; the sign on total Theil is still positive but the coefficient is no longer significant. These results suggest that even after accounting for trade openness, increased export diversification reduces growth volatility. Additional control variables (terms-of-trade volatility, exchange rate volatility, and inflation volatility) are added to the baseline specification. Now, only the HFI diversification measure remains positive and significant. The control variables follow the paper by Haddad et al. (2013). Results for all countries are similar.

38.   Export diversification reduces growth volatility when a country is more open to trade. Columns (10) to (12) in both tables show the regression results when the interaction terms of diversification and trade openness are included. The overall pattern of results mirrors what Haddad et al. (2013) find: negative coefficients on both trade openness and the measure of concentration, and a positive and significant coefficient on the interaction term of trade openness and diversification. For developing countries, while the signs are the same as Haddad et al., (2013), the coefficients for trade openness, total Theil index, and HFI coefficients are not significant. When all countries are included, again, the coefficients on trade openness and HFI are not significant. Now though, the total Theil index is significant and the intensive Theil is not. Figure 7 presents a graphic representation of the positive relationship between trade openness and diversification interaction term and output growth volatility.

### Figure 7. Interaction of Diversification and Openness vs. Growth Volatility

Sources: UN Comtrade; World Bank WDI; IMF Staff calculations.

39. **There is some evidence that output diversification also helps lower growth volatility in developing countries.** The output diversification measures are calculated based on value added data from UN databases. There are seven sectors available, and the data start in 1970. (See Table 5 and Figure 8.) The results in columns (7) and (8) of Table 5 show that the interaction term of real diversification and trade openness is significant; thus, a country that is more diversified and has a higher level of trade openness has lower growth volatility.

Table 5. System GMM Regressions for Growth Volatility on Output Diversification, Panel of 5 Year Average, 1970-2010

VARIABLES	Developing Countries				All Countries				Low-income Countries	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lagged volatility	0.0703	0.0939	0.183	0.141	0.211	0.247*	0.191	0.130	-0.141	-0.264
	[0.369]	[0.442]	[1.444]	[0.918]	[1.404]	[1.676]	[1.479]	[0.975]	[-0.436]	[-0.599]
Theil index, Real Sectors	13.03		9.323*		4.045		-13.53**		23.23**	
	[1.373]		[1.858]		[0.507]		[-2.061]		[2.123]	
HFI index, Real Sectors		26.76		19.53*		1.419		-35.00**		59.03**
		[0.773]		[1.757]		[0.0866]		[-2.482]		[2.437]
Trade openness	0.00204	-0.00696			-0.00426	0.000764	-0.0198	-0.0683***	0.0190	0.0443
	[0.110]	[-0.384]			[-0.431]	[0.0585]	[-1.383]	[-2.727]	[0.595]	[1.255]
Real Theil x Openness							0.138***			
							[3.452]			
Real HFI x Openness								0.337***		
								[3.273]		
Terms of trade volatility			0.00935	-0.00828			0.00423	0.000469		
			[0.247]	[-0.238]			[0.157]	[0.0178]		
Exchange rate volatility			0.0202	0.0256			0.0520**	0.0584*		
			[0.826]	[0.812]			[2.081]	[1.955]		
Inflation volatility			-0.00531	-0.00575			-0.00463	-0.00540		
			[-0.616]	[-0.547]			[-1.522]	[-1.389]		
Constant	0.406	-2.140	0.219	-1.903	2.225	2.226	4.380**	9.936***	-2.672	-11.97***
	[0.134]	[-0.249]	[0.235]	[-0.829]	[1.078]	[0.689]	[2.417]	[2.812]	[-1.163]	[-2.820]
Observations	803	803	294	294	1,004	1,004	459	459	176	176
Number of id	143	143	55	55	174	174	81	81	31	31
No. of instruments	19	19	27	27	19	19	35	35	19	19
Hansen test p-value	0.468	0.122	0.490	0.441	0.0549	0.0120	0.863	0.938	0.478	0.492
A-B AR(1) test p-value	0.0711	0.0974	0.283	0.376	0.0180	0.0131	0.0501	0.109	0.294	0.529
A-B AR(2) test p-value	0.595	0.631	0.876	0.823	0.685	0.682	0.397	0.484	0.355	0.354

Robust z-statistics in brackets. *** p<0.01, ** p<0.05, * p<0.1
Note: Dependent variable is Volatility of GDP Per Capita Growth.
Period dummies and a constant were included, but not reported.

Figure 8. Output Diversification vs. Growth Volatility
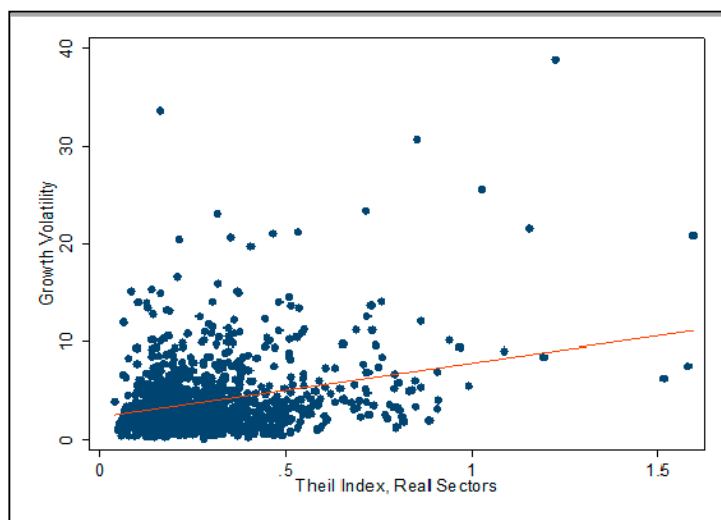
Sources: UN Value added database, World Bank WDI, IMF Staff calculations.

D. Conclusions

40.   Export diversification matters for macro-stability in developing countries. This is particularly true for vulnerable LICs where increasing export diversification will help reduce growth volatility. Export diversification could happen through either the extensive or intensive margin or both; however, the results show that intensive diversification is very important for reducing volatility. Increased intensive diversification could lower output growth volatility. When an economy becomes less concentrated in specific products, especially those products with volatile prices or high demand volatility such as primary commodities, the country could experience a decrease in growth volatility. There is also evidence on the impact of output diversification on growth volatility.
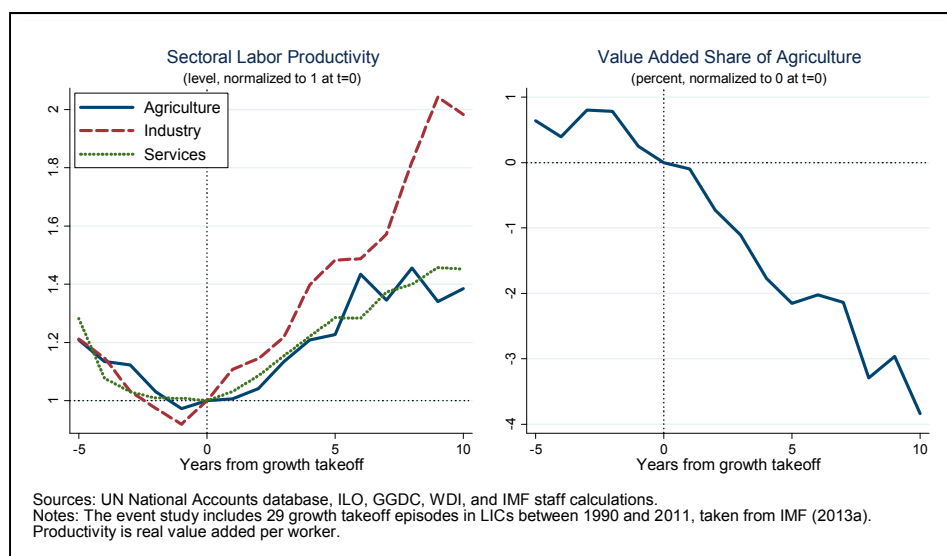
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STRUCTURAL TRANSFORMATION AND SECTORAL PRODUCTIVITY IN LOW-INCOME COUNTRIES[12]

A. Introduction

41.   The past two decades have seen unprecedented growth and rapid catch-up convergence in low-income countries (LICs). Growth in per capita output for many LICs rebounded in the early 1990s, and since then has surpassed that in many advanced and even emerging market economies, particularly in the period after the global financial crisis. The frequency of growth takeoffs—sustained high growth episodes—in LICs has also risen markedly during this time, and takeoffs have lasted longer (IMF, 2013a). Part of this solid performance can be attributed to favorable commodity prices in the 2000s, but even non-commodity exporting LICs have done well (IMF, 2013b). Improved macroeconomic stability through better policy making, healthier economic and political institutions, and the undertaking of wide ranging economic and structural reforms are all potential contributors to the recent growth acceleration.

Figure 9. Sectoral Dynamics Around Growth Takeoffs

Sources: UN National Accounts database, ILO, GGDC, WDI, and IMF staff calculations.
Notes: The event study includes 29 growth takeoff episodes in LICs between 1990 and 2011, taken from IMF (2013a).
Productivity is real value added per worker.

42.   Underpinning this solid growth performance is robust productivity dynamics and labor reallocation at the sector level. Historical growth takeoffs in LICs, on average, have been accompanied by productivity surges in broad economic sectors—agriculture, industry, and services (Figure 9). Productivity gains can also come from better reallocation of resources across and within sectors of the economy, i.e.,, structural transformation, and labor reallocation out of the low-productivity agricultural sector has contributed to this process. As economies diversified their production, trade diversification as measured by changes in the type and quality of export products

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[12] Prepared by Ho Giang.

also increased (Papageorgiou and Spatafora, 2012). This section seeks to analyze the dynamics of sectoral reallocation and sectoral productivity[13] in the recent past, understand their contribution to economy-wide productivity growth and structural transformation, and examine their policy and institutional drivers with a view to draw policy implications for the future.

43.   Notwithstanding significant heterogeneity across LICs, some key patterns emerge. There is a tight relationship between sectoral productivity growth and structural transformation/diversification. Some economies benefit from a virtuous and mutually enforcing cycle characterized by rapid sectoral productivity growth, productivity-enhancing labor reallocation and increasing export diversification. Others are stuck in a less optimal equilibrium characterized by slow growth, stagnant productivity, little diversification, and productivity-reducing sectoral shifts. The process of structural transformation is not automatic and tends to be strongly influenced by the policy, business, and institutional environment. The results also show that a number of structural reform measures, such as removing trade barriers and reforming the banking and networks industries, have proven effective in kick-starting sectoral productivity growth and structural transformation in low-income countries.

44.   Many LICs are experiencing rapid changes in the structure of the economy, but the pattern is uneven across countries. Over the past four decades in LICs, the agricultural share in total value added has continued to decline, accompanied by a commensurate increase in service share, whereas the share of manufacturing has not changed dramatically and remains at a low level (about 12 percent) for the average LIC (Figure 10, top left panel). Both the pace and nature of sectoral reallocation of resources in LICs have been different compared to the historical experience of advanced and emerging market economies.

45.   Dabla-Norris et al., (2013b) showed that many LICs, particularly those in Sub-Saharan Africa (SSA), have higher agricultural shares and lower manufacturing shares than as predicted by the level of economic development and country fundamentals. In addition, the high and growing share of services at low levels of development is a striking feature of many LICs, and marks a departure from the development path of many dynamic economies in industrial Asia, who transformed largely through expansion of low-wage manufacturing. However, the service sector in LICs tends to be dominated by low-skilled and less productive activities such as retail, social, and personal services, although construction, transportation, and communication have recently been gaining value added shares from a low level. In manufacturing, there has been a gradual movement towards higher skill-intensive activities, but the majority of manufacturing value added continues to be generated by low-skilled industries such as food, clothing, and footwear (Figure 10, top right panel).

46.   The agricultural employment share tends to decline much more rapidly in economies with a more diversified export base, possibly thanks to the availability of alternative productive

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[13] Average labor productivity rather than TFP is used due to limited data availability for sectoral capital stocks.

opportunities that greater diversification provides, and similarly in the group of non-commodities exporters (Figure 10, bottom left panel). There is also significant heterogeneity in the regional distribution of sectoral employment (Figure 10, bottom right panel).[14] While the employment share of agriculture has declined across regions between 1990 and 2007, the change has been more pronounced in Asia but less so in SSA. In the average SSA country, over 60 percent of the workforce continues to be employed in agriculture despite the sector's low value-added share, pointing to very low agricultural productivity.

Figure 10. Dynamics of Sectoral Shares in LICs
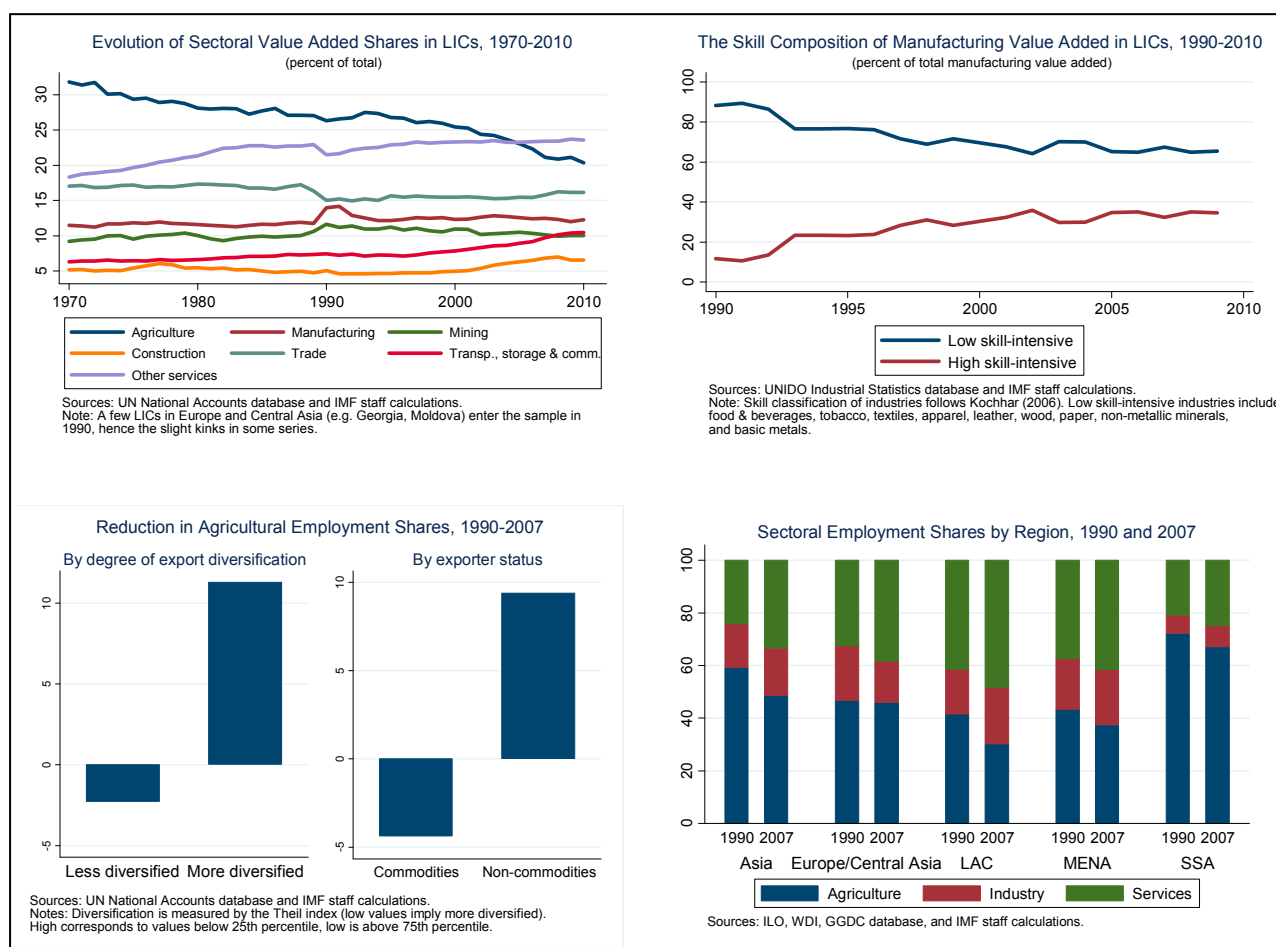

47.   Sectoral productivity growth in LICs experienced a strong rebound in the 2000s (Figure 11, top left panel). The productivity surge was most pronounced in agriculture and services, reflecting marked improvements in the terms of trade, robust investment rates, and significant

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[14] Sectoral employment data in low-income countries tend to be of low quality and the coverage is uneven. The panel dataset on sector-level employment uses three main data sources: Groningen Growth and Development Center (GGDC) database, ILO, and WDI. While every effort was made to check for consistency in the series, sectoral employment and productivity figures in LICs should be interpreted with caution.

reforms in both real and financial sectors. In addition, countries that have experienced greater reduced agricultural shares on average exhibited strong and broad-based productivity growth at the sector level, in marked contrast to those who have not (Figure 11, top right panel).

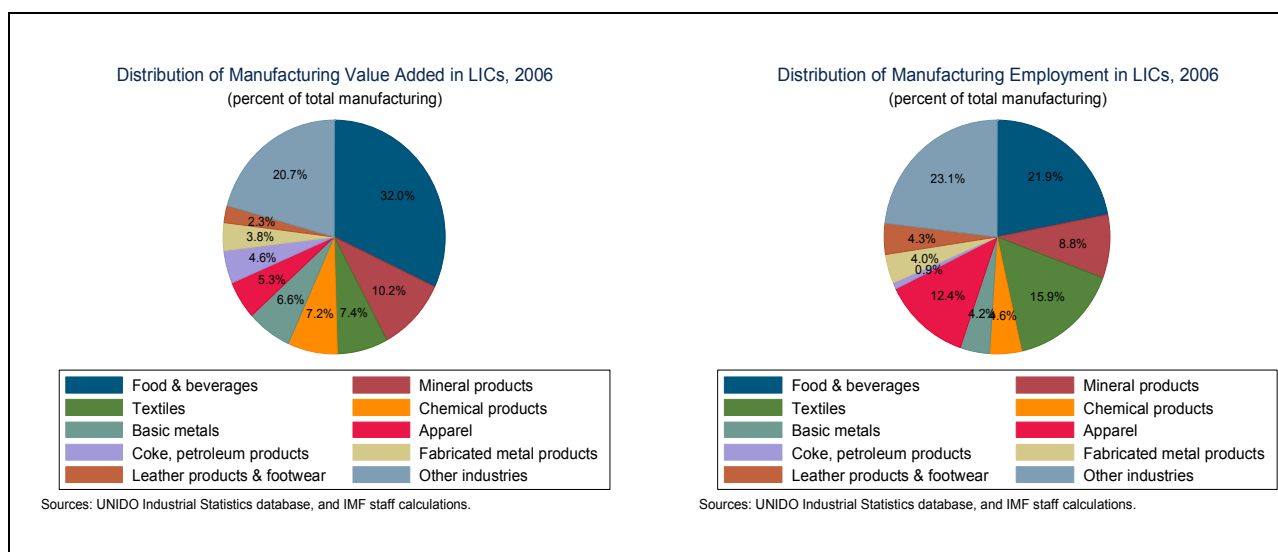**Figure 11. Sectoral Productivity Growth in LICs**
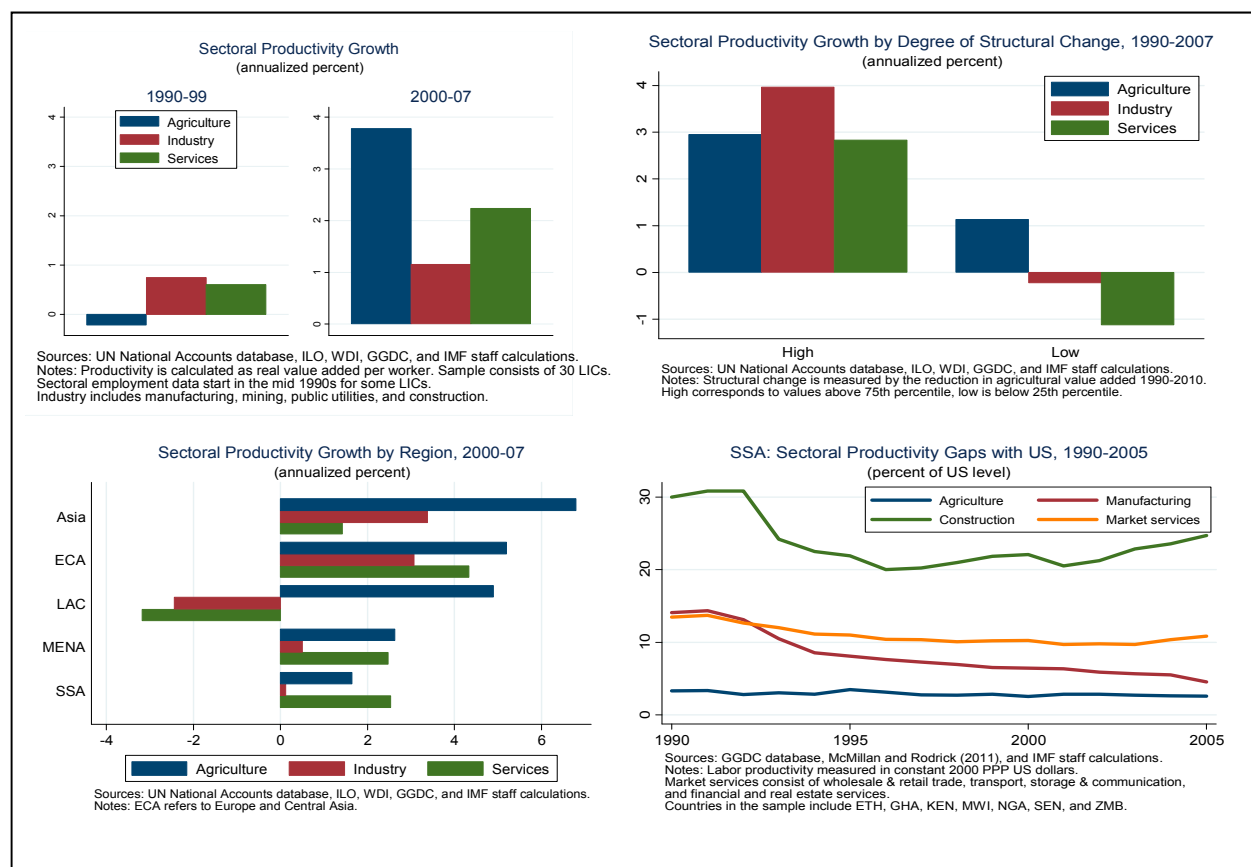
48.   As with sectoral shifts, the average pattern of sectoral productivity masks considerable disparities at the regional level (Figure 11, bottom left panel). Recent productivity performance was strongest for countries in Asia and Europe and Central Asia (ECA)—the former led by frontier markets such as Vietnam, and the latter by Albania and Georgia, whereas performance was mixed in Latin America and the Caribbean (LAC), Middle-East and North Africa (MENA) and SSA. LAC economies registered high productivity growth in agriculture, but productivity declined in industry and services. For MENA and SSA, agriculture and services have performed well, while industry productivity stagnated.

49.   Despite recent improvements, productivity gaps between LICs and advanced economies remain large and show little sign of narrowing. Figure 11 (bottom right panel) illustrates the evolution of labor productivity as a percentage of the U.S. level in agriculture, manufacturing, construction, and market services (broadly defined as non-governmental services) for several SSA economies where PPP-adjusted sectoral labor productivity data are available. Not

surprisingly, agriculture in SSA economies exhibits the widest productivity gap (averaging less than five percent of U.S. level), with the gap remaining roughly unchanged over the fifteen-year period. Stagnation in industry is driven by low productivity in manufacturing—the sector in which gap with the U.S. has actually been widening, whereas relative labor productivity in construction is higher at about 25 percent of U.S. level. Mining productivity (not shown here) often exceeds that in the U.S. given the important role that the resource sector plays in many SSA economies and the capital intensive nature of the sector.

50.   Manufacturing value added and employment in LICs are concentrated in low-technology, labor-intensive activities, e.g., agro processing industries (Figure 12). For example, food and beverages on average contributed 32 percent to total manufacturing value added in 2006, and 22 percent to employment. Other large employment creating industries within manufacturing include textiles and apparel, but value added creation from these industries is rather limited, contributing to low average productivity. On the other hand, average productivity is relatively higher in mineral products, chemical products, and basic metals, whose value added contribution exceeded employment contribution. There is very little reliable information on informal manufacturing activities, whose size can be substantially larger than the formal manufacturing sector analyzed here.

Figure 12. Distribution of Value Added and Employment in Manufacturing

Distribution of Manufacturing Value Added in LICs, 2006
(percent of total manufacturing)

Distribution of Manufacturing Employment in LICs, 2006
(percent of total manufacturing)

Food & beverages / Textiles / Basic metals / Coke, petroleum products / Leather products & footwear / Mineral products / Chemical products / Apparel / Fabricated metal products / Other industries

Sources: UNIDO Industrial Statistics database, and IMF staff calculations.

B.   Contribution to Aggregate Productivity Growth

51.   LICs that experienced larger reduction in agricultural share and more diversification have reaped economy-wide productivity gains (Figure 13). Larger reduction in the agricultural share, on average, is associated with faster aggregate labor productivity increases during 1990-2010 period. This is intuitive since agriculture tends to be less productive than the rest of the economy, so that reallocation of labor from a less to more productive sector raises economy-wide labor

productivity (and hence temporarily boosts productivity growth). Similarly on the trade side, economies with a more diversified export base have registered stronger productivity gains.

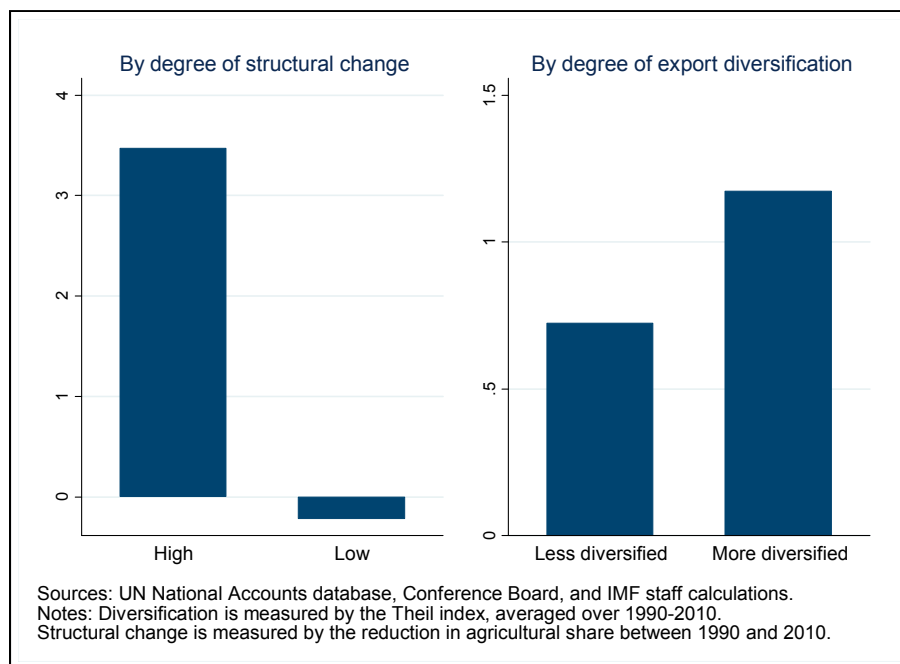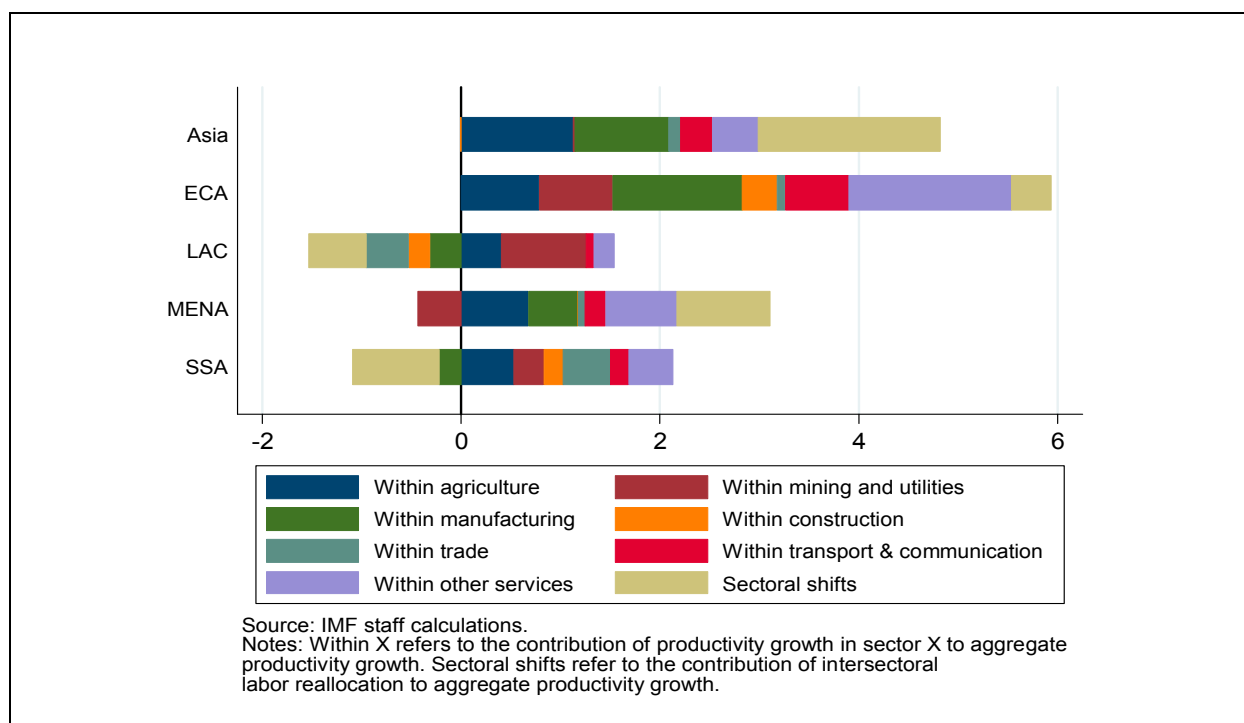## Figure 13. Aggregate Productivity Growth, 1990-2010
(Annual Average, Percent)

Sources: UN National Accounts database, Conference Board, and IMF staff calculations.
Notes: Diversification is measured by the Theil index, averaged over 1990-2010.
Structural change is measured by the reduction in agricultural share between 1990 and 2010.

Figure 14. Decomposition of Aggregate Productivity Growth, 1990-2007
(Annual Average, Percent)

Source: IMF staff calculations.
Notes: Within X refers to the contribution of productivity growth in sector X to aggregate productivity growth. Sectoral shifts refer to the contribution of intersectoral labor reallocation to aggregate productivity growth.
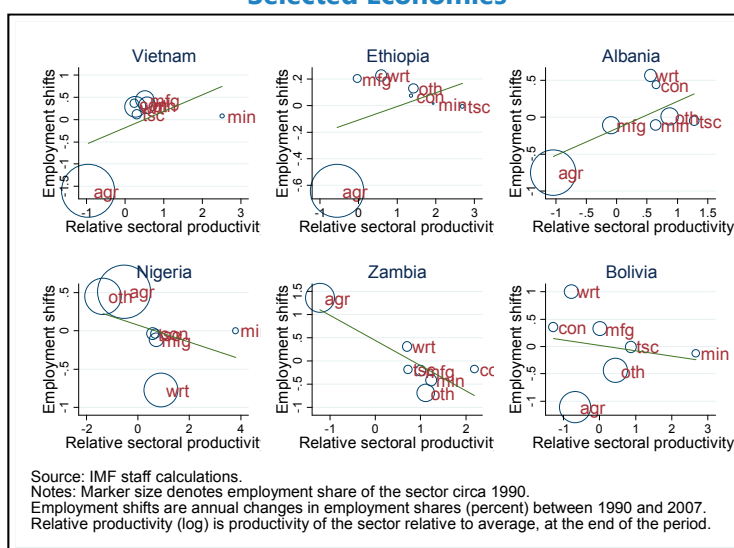
52.   The contribution of sectoral shifts to aggregate productivity growth varies greatly across regions (Figure 14). A shift-share analysis decomposes aggregate labor productivity growth during 1990-2007 into relative contributions of within-sector productivity growth and a sectoral shifts component (see e.g., McMillan and Rodrick, 2011).[15] It shows that inter-sectoral labor reallocation has been most productivity-enhancing in Asia, whereas it contributed negatively to aggregate productivity growth in LAC and SSA. In addition, while within-sector productivity growth has been the main driver of economy-wide productivity, there was considerable heterogeneity in the relative importance of different sectors. For Asia's LICs, tradable sectors such as agriculture and manufacturing were the primary sources of productivity growth. Mining played a relatively dominant role in LAC, ECA, and to an extent SSA. Services, in particular wholesale and retail trade, were a relatively important part of SSA economies and made a sizable contribution to aggregate productivity growth during 1990-2007.

53.   Productivity-enhancing labor reallocation is closely linked to reduced employment in agriculture. Changes in the sectoral composition work to enhance aggregate productivity if labor moves to activities with relatively higher productivity. In economies where sectoral shifts have contributed positively to aggregate productivity growth (e.g.,, Vietnam, Ethiopia, and Albania), employment has migrated out of agriculture – often the sector with lowest average productivity and largest employment share – and into more productive

Figure 15. Sectoral Productivity and Employment Changes in Selected Economies

Source: IMF staff calculations.
Notes: Marker size denotes employment share of the sector circa 1990.
Employment shifts are annual changes in employment shares (percent) between 1990 and 2007.
Relative productivity (log) is productivity of the sector relative to average, at the end of the period.

activities such as construction, manufacturing, and services (Figure 15). Thus in these economies, there was a positive correlation between sectoral productivity and employment changes. At the other spectrum are countries that have experienced productivity-reducing sectoral shifts (e.g., Nigeria, Zambia, and Bolivia). In Nigeria and Zambia, for example, the employment share of agriculture has *increased* between 1990 and 2007. In Bolivia, less productive services have gained employment share at the expense of more productive industries such as transportation and communication.
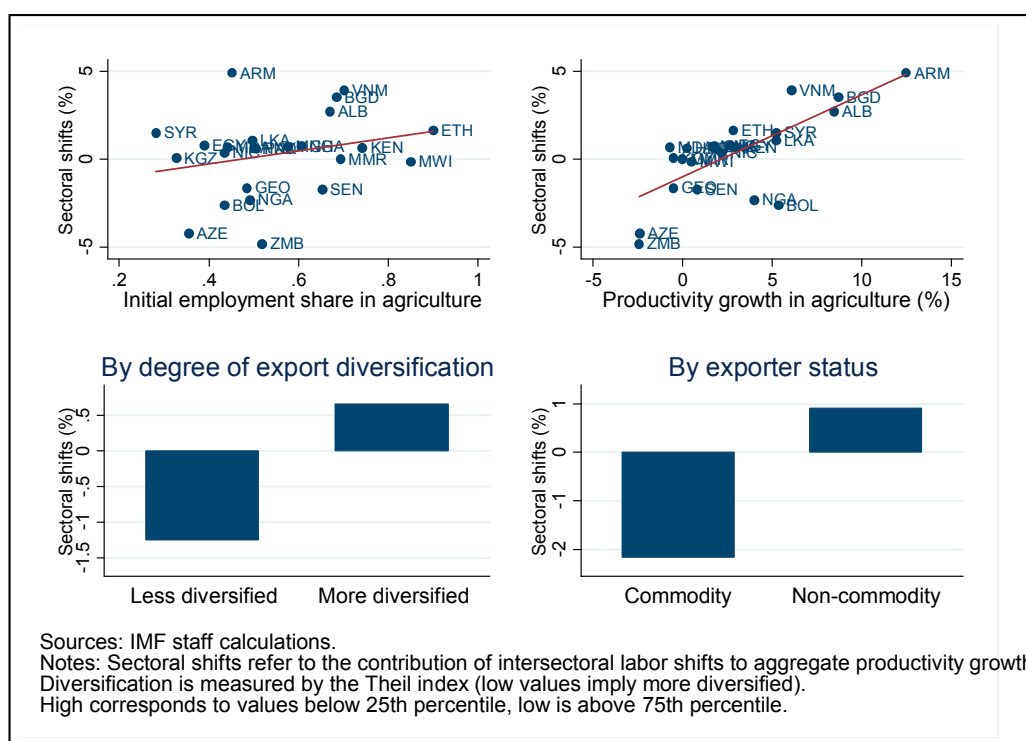
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[15] This method provides a first-order decomposition and does not take into account the feedback effects between sectoral productivity growth and sectoral shifts. Limited employment data at the sector level does not permit extending the analysis to 2010.

54.   High productivity growth in agriculture and a diversified export base are associated with productive sectoral shifts (Figure 16). Part of the process of moving labor out of agriculture would occur unconditionally, i.e., countries with an initially large agricultural sector have more scope to reduce the agricultural share and therefore are more likely to benefit from structural transformation. But improving productivity growth in agriculture, according to one theory of structural transformation[16], is critical to facilitate labor movements. Countries that have gained from structural transformation (e.g., Vietnam, Albania) tend to have high productivity growth in agriculture during the period.[17] The contribution of sectoral shifts to aggregate productivity also tends to be higher in more diversified versus less diversified economies, and in the group of non-commodity exporters compared to the group of commodity exporters.
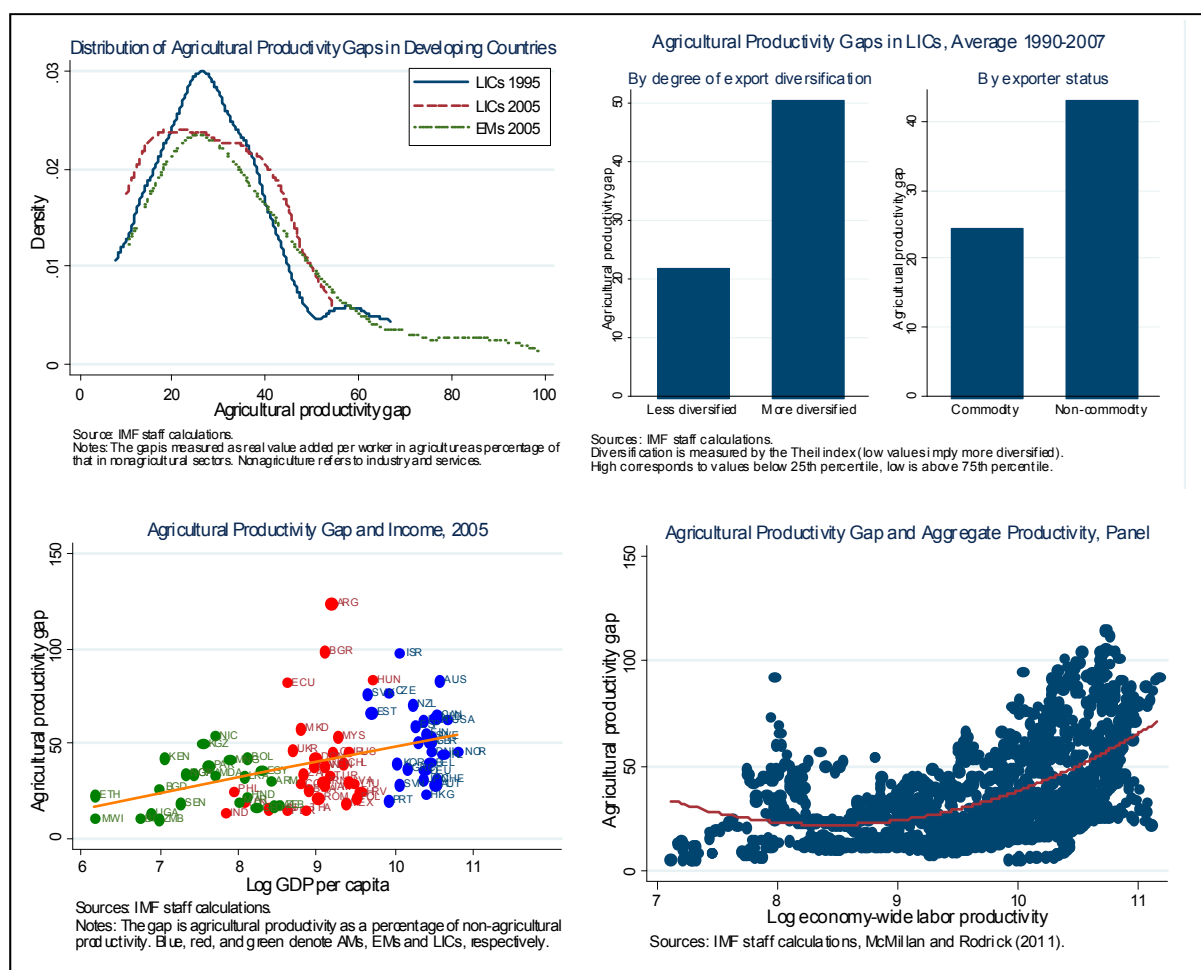
Figure 16. Correlation with Sectoral Shifts Component

Sources: IMF staff calculations.
Notes: Sectoral shifts refer to the contribution of intersectoral labor shifts to aggregate productivity growth. Diversification is measured by the Theil index (low values imply more diversified).
High corresponds to values below 25th percentile, low is above 75th percentile.

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[16] Among competing theories of structural transformation in the literature, the technological explanation is that productivity growth differentials across sectors facilitate resource shifts through change in relative prices (see e.g., Caselli and Coleman, 2001; Gollin, Parente, and Rogerson, 2002; Ngai and Pissarides, 2007; Duarte and Restuccia, 2010). Higher agricultural productivity growth relative to the rest of the economy enables release of labor from agriculture into other activities, e.g., manufacturing, if demand is price inelastic. Another theory argues the opposite, that productivity gains in manufacturing "pull" labor out of agriculture (e.g., Lewis, 1954; Hansen and Prescott, 2002). The latter theory is consistent with a small open economy interpretation, in which relative prices are exogenously determined, and productivity gains in manufacturing induce structural change by shifting the country's comparative advantage toward manufacturing.

[17] There is of course possible reverse causality: labor moving out of agriculture would, *ceteris paribus,* increases the productivity of the remaining agricultural workers.

Figure 17. The Agricultural Productivity Gap in LICs

Distribution of Agricultural Productivity Gaps in Developing Countries

Source: IMF staff calculations.
Notes: The gap is measured as real value added per worker in agriculture as percentage of that in nonagricultural sectors. Nonagriculture refers to industry and services.

Agricultural Productivity Gaps in LICs, Average 1990-2007

Sources: IMF staff calculations.
Diversification is measured by the Theil index (low values imply more diversified).
High corresponds to values below 25th percentile, low is above 75th percentile.

Agricultural Productivity Gap and Income, 2005

Sources: IMF staff calculations.
Notes: The gap is agricultural productivity as a percentage of non-agricultural productivity. Blue, red, and green denote AMs, EMs and LICs, respectively.

Agricultural Productivity Gap and Aggregate Productivity, Panel

Sources: IMF staff calculations, McMillan and Rodrick (2011).

55.   Productivity gaps between agriculture and non-agricultural sectors remain large in LICs, implying considerable scope for further productivity gains from either within-sector productivity growth or labor reallocation. The gap is measured as agricultural productivity as a percentage of labor productivity in non-agricultural sectors (i.e., industry and services).[18] It averaged about 30 percent in 2005 for LICs—little changed from a decade ago, compared to 40 percent in emerging market economies, but with considerable dispersion across countries (Figure 17, top left panel).

56.   Less diversified economies (in terms of exports) tend to exhibit much wider productivity gaps compared to more diversified economies; similarly, the productivity gap is larger on average for commodity exporters (Figure 17, top right panel). There is also a clear relationship with the level of development. From a cross-country perspective at a point in time, LICs

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[18] Data to adjust the gaps for human capital differences across sectors are not available, as done in Gollin et al., (2013). Relatively lower human capital in agriculture compared to other sectors may bias the gaps downwards. However this bias is unlikely to vary significantly over time.

tend to have lower relative productivity in agriculture (Figure 17, bottom left panel). However, as McMillan and Rodrick (2011) found (and replicated here), there is a U-shape relationship across countries and over time, so that relative agricultural productivity would initially worsen (as the non-agricultural sectors expand) before improving once the economy achieves a certain level of development (Figure 17, bottom right panel).

C.   Drivers of Sectoral Productivity and Structural Transformation

57.   This section presents cross-country evidence on the policy drivers of within-sector productivity growth and sectoral shifts. The stylized facts presented in the previous section show considerable heterogeneity in countries' experience; some LICs have managed to reallocate labor towards productive sectors and kick-start sectoral productivity growth, whereas others have been less successful. While there is a general consensus that the country's structural and institutional settings matter, little empirical evidence is available on the type of policy measures that can help remove the impediments to a successful transformation, particularly in the LICs context. Notwithstanding challenges in assessing the impact of polices on performance as well as questionable data quality for LICs, this paper try to fill this gap, focusing on *de jure* type of reform measures that are at the disposal of policy makers.[19]

Model and Data

58.   The following specification for the behavior of sectoral productivity growth is postulated:

$$\Delta y_{i,t} = \alpha + \beta y_{i,\text{US},t-1} + \gamma X_{i,t-1} + \mu_t + \nu_i + \varepsilon_{i,t}$$

Here, $y_{i,t}$ denotes the logarithm of average labor productivity in either agriculture, manufacturing, or services in country *i* at time *t*. Thus the dependent variable is the annual productivity growth rate at the sector level. There is also interest in explaining resource shifts across sectors of the economy, in which case $y_{i,t}$ denotes the value added or employment share of agriculture, manufacturing, or services.

59.   The goal is to identify the policy and institutional variables that matter for sectoral productivity growth and structural transformation in LICs. A large literature (e.g., Prati et al.,2013; Buera and Shin, 2011) has discussed the role of structural reforms in removing distortions and boosting productivity growth. The model includes a range of reform indices capturing reforms

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[19] This section abstracts from the dynamic interaction between sectoral productivity and sectoral shifts. The relationship between sectoral productivity growth and structural transformation is a complex and intertwined phenomenon – one that can only be captured in a general equilibrium framework. Even in such a framework, outcomes depend on the underlying model and the associated assumptions. The empirical exercise focuses on estimating the short-term impact of reforms on sectoral productivity and sectoral shifts separately, keeping in mind that by ignoring feedback effects between the two variables the true longer-run policy impacts may be underestimated.

in various areas such as international trade, domestic financial sector, and product markets.[20] This set of key structural reforms is complemented with other key variables such as labor cost, labor market and business regulation, infrastructure stock, and education. These variables (lagged one period) enter the model one-by-one as $X_{i,t-1}$. In addition, the initial sectoral productivity/share gap with the US, $y_{i,US,t-1} = y_{i,t-1} - y_{US,t-1}$, is included to capture possible convergence effects. μ_t and v_i denote year and country fixed effects, the latter controlling for time-invariant country characteristics that may affect sectoral productivity/shares as well as the adoption of reforms.

60.   The two-step GMM estimator proposed by Arellano and Bond (1991) is used to estimate the econometric model. The model above can be rewritten as:[21]

$$y_{i,t} = \alpha + (1 + \beta)y_{i,t-1} + \gamma X_{i,t-1} + \mu_t + v_i + \varepsilon_{i,t}$$

It is well-known that in dynamic models with the lagged dependent variable included as a regressor, fixed effect OLS estimates are inconsistent since the lagged dependent variable is correlated with the lagged error term. The problem diminishes as the number of time periods increases, but there are only 15 years in the sample. Thus the GMM estimator, which takes the first differences of the above equation to remove country-specific unobserved heterogeneity and uses two or more lags of the dependent variable as instrument, is necessary to obtain consistent estimates. The model is estimated using a de-trended measure of $y_{i,t}$, with country-specific linear trends. The panel consists of 28 LICs for the period 1995-2010. While the time window is primarily constrained by availability of sectoral data, it corresponds to the period of unprecedented growth in LICs.

D.   Results

Sectoral productivity

61.   A number of structural reforms are associated with boosting productivity growth at the sector level, but different sectors require different policy focuses (Table 6). For example, removing tariff barriers to international trade and financial sector reform in the area of interest rate controls have a positive effect on agricultural productivity growth in LICs. In theory, tariff liberalization can improve the efficiency of farming through better market and technology access, cheaper imported inputs, and greater competition with imports. However, the effect of other reform measures, including agricultural reform, on agricultural productivity is not statistically significant.

62.   Domestic financial sector reforms, capital account liberalization (FDI), and improvement in road infrastructure and tertiary education matter for manufacturing productivity. Reforms in the domestic financial sector encompass several aspects, i.e., removal of

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[20] See Prati et al., (2013) for a more detailed description of the reform measures. The reform indices are normalized between 0 and 1.

[21] The US productivity variable can be absorbed by the year fixed-effects.

credit and interest rate controls, privatization, and entry liberalization in the banking sector. By removing distortions and forcing banks to be efficient, these reforms can improve the allocation of capital in the economy, which has been found to boost productivity (Banerjee and Duflo, 2005; Hsieh and Klenow, 2009). In a similar vein, several empirical studies have found positive "spillover" effects of service sector reforms on manufacturing productivity, given that services form an increasing proportion of the inputs used in manufacturing as the economy develops[22]. Improving the quantity and quality of the road network is essential, particularly for LICs, to foster connectivity to markets and facilitate the production and distribution of goods and services. More education at the tertiary level also benefits skill-intensive manufacturing.

63.   Liberalization of network industries, specifically telecommunication, is found to generate productivity gains in the service sector. These reforms aim to 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. Productivity gains from networks liberalization have been found for OECD countries (Boylaud and Nicoletti, 2001; Bena et al., 2011), and it is encouraging that similar findings are extended to LICs context. Improving road infrastructure also has a positive effect on service productivity growth, especially given that distribution services (e.g., transportation, wholesale and retail trade) are becoming increasingly important for many LICs.

Sectoral shifts

64.   Policies and institutions can also have direct impacts on sectoral shifts (Table 7). This section consider shifts in both the (real) value added[23] and employment shares of the sectors. While employment shifts may be the preferred measure of structural transformation, sectoral employment data for LICs are particularly patchy, and need to be complemented with value added shifts. As discussed above, policies may have indirect impacts on sectoral shifts through their impact on sectoral productivity, which are not considered in this simple framework.

65.   There is some evidence that removing tariff barriers to international trade is associated with resources moving from agriculture to manufacturing and services. Structural shifts occur both in terms of employment and value added shares (although the latter mostly in manufacturing). The role of trade openness in generating structural transformation has recently gained attention in the theoretical literature, given the weak ability of traditional theories in explaining the observed patterns of structural shifts (see e.g., Matsuyama, 2009; Yi and Zhang,

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[22] See e.g., Arnold et al., (2008) for Sub-Saharan Africa; Arnold et al., (2012) for India; Duggan et al., (2013) for Indonesia.

[23] The use of real value added rather than nominal is to avoid bias stemming from price effects (e.g., if a reform reduces the relative price of a sector, this will bias its nominal value added share downwards despite real value added growth).

2011[24]). The intuitive explanation is that trade openness changes the relative prices across sectors, inducing resources to move into the sectors with relative comparative advantage. Cross-country empirical evidence is more mixed and varies with the set of trade liberalization episodes used, the level of sectoral disaggregation, among others.[25] However, individual case studies have found an important role of trade policies in increasing labor demand within manufacturing, thus contributing to moving labor from agriculture into manufacturing activities (see e.g., McCaig and Pavcnik, 2013 for Vietnam).

66.   Structural transformation also responds to the infrastructure and regulatory environment, which affects labor mobility, and the supply of skilled labor. In particular, liberalization of the electricity market, easing credit and labor market and business regulations (as captured by the Fraser regulation index) are linked to higher industry employment share. Improving tertiary education is found to increase the value added shares of manufacturing and services.

E. Conclusions

67.   Sectoral shifts and sectoral productivity growth are two key features of the growth and development process. This section documents stylized facts on the patterns of sectoral shifts and productivity in LICs, and empirically examines their policy and institutional drivers. Despite many years of progress, the state of structural transformation in LICs remains low and uneven. Some economies, especially those in Asia, have been able to engender robust productivity growth across economic activities, continue to move labor out of traditional agriculture, and produce and export higher value-added and new products. Meanwhile, others have not been as successful; their economic structure continues to be concentrated in a small number of low value-added activities, with little technology and skill spillovers to the rest of the economy.

68.   Structural transformation does not occur automatically and countries need to have the "right" conditions in place. This means having a structural and institutional setting that is conducive for productivity growth and labor mobility. The empirical exercise here, based on a sample of LICs reform experience over the past fifteen years, seeks to identify policy measures that can potentially remove distortions and provide the short-term impulse to sectoral productivity and sectoral shifts. A number of policy/reform measures have proven effective, including removing tariff barriers, reforming the financial and networks sectors, and improving education, infrastructure, and the regulatory framework, but challenges in different sectors require different focus.

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[24] These models share the mechanism that changes in productivity and in trade barriers, together with an elasticity of substitution across sectoral goods less than one, affect expenditures and net export shares, which in turn affect employment shares across sectors.

[25] For example, Seddon and Wacziarg (2004), based on 25 trade liberalization episodes, found some evidence of increased sectoral change at the three-digit level within manufacturing, but not at the one-digit level. Dabla-Norris et al., (2013b) obtained similar findings as presented here using value added shares for a large sample of countries at all stages of development.

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Table 6. Policy Determinants of Sectoral Productivity

	Dependent variable: Sectoral productivity growth		
	Agriculture	Manufacturing	Services
Trade liberalization (tariff)	0.175	0.053	-0.177
	[0.093]*	[0.096]	[0.107]*
Domestic financial sector reform	-0.014	1.013	-0.036
	[0.429]	[0.483]**	[0.164]
Liberalization of FDI	-0.418	0.369	0.175
	[0.394]	[0.214]*	[0.122]
Removal of interest rate control	0.640	0.079	0.123
	[0.275]**	[0.185]	[0.139]
Agriculture reform	0.048	0.081	0.099
	[0.094]	[0.086]	[0.078]
Networks reform	0.011	0.068	0.138
	[0.093]	[0.168]	[0.063]**
Telecom	-0.054	-0.090	0.122
	[0.139]	[0.167]	[0.053]**
Electricity	0.100	0.041	-0.036
	[0.084]	[0.107]	[0.034]
Labor cost (average tax wedge)	0.237	-0.774	-0.441
	[1.219]	[1.573]	[0.405]
Fraser regulation index	-0.003	-0.013	-0.038
	[0.031]	[0.038]	[0.024]
Road infrastructure	0.114	0.091	0.100
	[0.078]	[0.028]***	[0.044]**
Tertiary education	-0.026	0.017	-0.007
	[0.014]*	[0.009]*	[0.010]

Note: Estimation method is two-step GMM, with 3 lags of dependent variable as instrument. Reforms indices are from Prati and others (2013) and are normalized between 0 and 1. Labor cost is the average tax wedge. Fraser regulation index ranges from 0 to 10, with higher score indicating less regulation. Road infrastructure is the log of per capita road network. Tertiary education is the percentage of high school. Policy determinants enter each regression one by one. All specifications include year fixed effects. Significant at * 10%, ** 5%, and *** 1%.

Table 7. Policy Determinants of Sectoral Shifts

	Dependent variable: Value added shares			Dependent variable: Employment shares		
	Agriculture	Manufacturing	Services	Agriculture	Manufacturing	Services
Trade liberalization (tariff)	0.550	1.388	-0.197	-5.537	1.167	1.714
	[0.823]	[0.606]**	[1.450]	[1.742]***	[0.671]*	[0.467]***
Domestic financial sector reform	2.783	3.416	-9.215	1.562	-0.792	2.553
	[7.008]	[1.812]*	[8.629]	[12.756]	[5.576]	[10.153]
Liberalization of FDI	5.990	5.062	-2.336	7.489	4.991	-5.564
	[2.654]**	[2.583]*	[3.854]	[4.779]	[3.878]	[3.470]
Removal of interest rate control	-2.744	1.571	-4.585	-4.859	-5.891	7.818
	[2.095]	[1.046]	[4.034]	[8.490]	[5.970]	[11.865]
Agriculture reform	-1.713	1.694	-2.232	1.953	-1.752	0.829
	[1.385]	[1.143]	[1.568]	[1.949]	[0.530]***	[1.097]
Networks reform	-1.232	-0.213	1.848	3.348	0.287	-1.509
	[0.786]	[0.207]	[1.082]*	[5.994]	[1.306]	[1.083]
Telecom	1.328	0.070	-0.833	3.359	-1.071	0.880
	[0.955]	[0.439]	[0.591]	[1.717]*	[0.861]	[2.332]
Electricity	-2.261	-0.084	2.625	-2.555	1.541	0.262
	[0.732]***	[0.127]	[0.881]***	[2.603]	[0.777]**	[0.252]
Labor cost (average tax wedge)	-20.491	6.538	-0.628	23.278	-5.549	-16.737
	[8.586]**	[3.848]*	[3.650]	[22.703]	[4.993]	[8.990]*
Fraser regulation index	0.241	0.009	0.237	-0.638	2.138	0.858
	[0.803]	[0.418]	[1.050]	[0.943]	[0.888]**	[0.870]
Road infrastructure	-0.319	0.184	-1.015	0.308	-0.762	-1.034
	[0.221]	[0.191]	[1.283]	[0.634]	[0.847]	[0.544]*
Tertiary education	0.324	0.958	0.608	0.780	-0.039	-0.747
	[0.321]	[0.444]**	[0.352]*	[0.677]	[0.143]	[0.634]

Note: Estimation method is two-step GMM, with 3 lags of dependent variable as instrument. Reforms indices are from Prati and others (2013) and are normalized between 0 and 1. Labor cost is the average tax wedge. Fraser regulation index ranges from 0 to 10, with higher score indicating less regulation. Road infrastructure is the log of per capita road network. Tertiary education is the percentage of high school. Policy determinants enter each regression one by one. All specifications include year fixed effects. Significant at * 10%, ** 5%, and *** 1%.

OPPORTUNITIES FOR QUALITY UPGRADING IN LOW-INCOME COUNTRIES[26]

A. Introduction

69.　Economic development is associated with the transformation of a country's economic structure in two dimensions—both are important for LICs. These dimensions are horizontal (across sectors) and vertical (within a sector). Diversification into new higher value added sectors is the horizontal dimension. Quality upgrading is the vertical dimension and focuses on producing higher quality (and generally higher priced) products within existing sectors. Producing higher-quality varieties of existing products helps build on existing comparative advantages to boost export revenues and productivity. This section shows that both of these dimensions are important for LICs' development. It focuses particularly on the quality upgrading dimension—which has been less explored to date—and its link to economic development.

70.　**The two dimensions—sectoral diversification and quality upgrading—are complementary.** The potential for quality upgrading is considerably higher in some products than others (Khandelwal, 2010). Notably, it has been found to be higher in manufactures than in agriculture and natural resources. Among LICs, some currently remain specialized in products with limited quality upgrading potential. Consequently, diversification is a precondition for these countries to reap large gains from quality improvement. Meanwhile, many LICs are already engaged in sectors with large quality upgrading potential and could harness it as a driver of development (Hausmann et al., 2007; Sutton and Trefler, 2011).

71.　**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 and interestingly they increase with GDP per capita (Schott, 2004; Hummels and Klenow, 2005). This sparked an interest in estimating export quality, for which 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.

72.　**The multi-level export quality database used in this section is now available to Fund economists as an online toolkit.[27]** The database is developed in Henn, Papageorgiou, and Spatafora (2013) and provides quality measures that correct unit values for these above factors.[28]

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[26] Prepared by Christian Henn.

[27] The database can be accessed by clicking the following link: toolkit.

[28] This paper draws extensively on the IMF Working Paper by Henn, Papageorgiou and Spatafora (2013) to which interested readers are referred for further details, in particular on estimation methodology, which was adapted from Hallak (2006).

Built with the motivation of achieving the best possible LIC coverage, including going back in time, this database is far more extensive than previous efforts. It covers 178 countries and 851 products over 1962–2010.[29] At the most disaggregate SITC 4-digit level it consists of more than 20 million product-exporter-importer-year observations. Quality estimates are also supplied at the 1) SITC 3-, 2-, and 1-digit levels; 2), country-level for the BEC classification (which allows links to national accounts data); and 3) three broad sector level for the BEC classification (agriculture, manufactures, and non-agricultural commodities). To enable cross-product comparisons, all quality estimates are normalized to the world frontier quality, which is assumed to be the 90th percentile in each product-year combination. The resulting quality values typically range between 0 and 1.2. At each aggregation step, the normalization to the 90th percentile is repeated. This normalization implies that if a country's quality measure is rising, it is upgrading quality faster than the world on average.

73.   Based on this new database, this section highlights important stylized facts on quality upgrading in low- and lower-middle- income countries. Notably, on a regional basis, quality upgrading among low- and lower-middle- income countries was most strongly driven by East Asian success in the manufacturing sector. The apparel sector has constituted an important first beachhead in the manufacturing sector, and these countries have been quite successful in upgrading quality in this sector. Among LICs, only non-fragile countries managed to upgrade their quality considerably and have further potential to do so. In contrast, non-fragile LICs have thus far been left behind in many sectors, and some indeed will first need to achieve horizontal diversification into new sectors to enable considerable quality upgrading. At the quality levels currently produced by LICs, higher quality typically translates into higher export prices, so that these countries could experience an improvement in their terms of trade from such upgrading.

74.   Higher export quality is associated with higher incomes, and quality upgrading is associated with growth. Quality upgrading is particularly rapid during the early stages of development, with quality convergence 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; thus, it is possible to identify its strong association with GDP per capita growth. LICs that converged fast in quality during 1995-2010 typically grew one percentage point per year more than countries that converged slowly. The link between quality upgrading and growth is strongest for manufacturing, and quality upgrading in manufacturing is accompanied by increasing share of the sector in LIC economies. Ample quality upgrading opportunities also exist in agriculture, but these are typically associated with a rebalancing of the sector toward higher value products, and increasing productivity typically leads the sector to set free resources.

75.   Important policy implications are derived by investigating the determinants of quality upgrading. Given that quality upgrading is associated with growth, it is important for policymakers

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[29] Quality estimations by other authors (Khandelwal, 2010, Hallak and Schott, 2011, and Feenstra and Romalis, 2012) use different methodologies with their own merit, but their data requirements rule out such an extensive country and time coverage.

to be aware of its determinants to be able to harness it for development. An important result is that, once a country has entered an export product, quality tends to converge unconditionally over time. This suggests that policymakers should focus on facilitating entry into new markets, both for domestic and foreign firms, particularly if those are characterized by large quality upgrading potential. Moreover, improvements in institutional quality and human capital are associated with faster quality upgrading. Meanwhile, there is no evidence that lack of demand for quality in LICs' and lower-middle- income countries' existing destination markets constrains their quality upgrading prospects. Consequently, opening up new export markets could take a lower priority initially.

B. Export Quality: Stylized Facts

Quality Developments across Country Groups and Broad Sectors

76.   **There is a marked contrast between non-fragile and fragile LICs: only non-fragile LICs have upgraded their export quality considerably (Figure 18).** In the late 1980s, average export quality of non-fragile LICs was among the lowest five percent worldwide. Since then, non-fragile LICs have upgraded substantially and their average quality level has risen to three-fourths of the world frontier quality, with the manufacturing sector of particular importance in underpinning this trend. Meanwhile, 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 (3.4 vs. 1.1 percent). Another important early takeaway is that quality tends to evolve gradually.

Figure 18. Export Quality in LICs Quality Over Time for All Sectors Relative to Quality Ladder
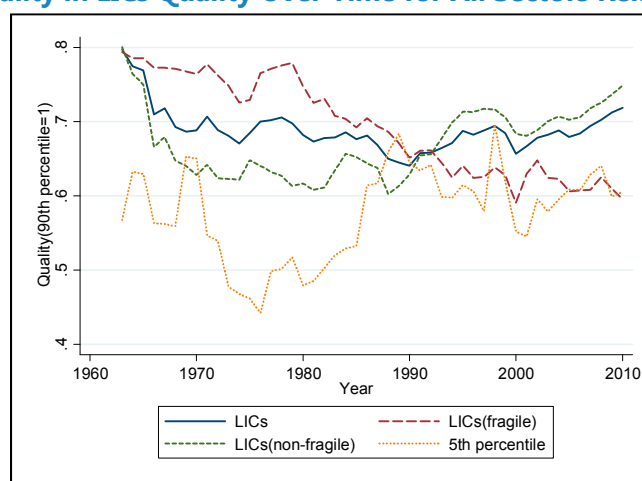
77.   **Quality upgrading among low- and lower-middle-income countries was most strongly driven by East Asian success in the manufacturing sector.** Figure 19 illustrates this for regional aggregates of low- and lower-middle-income countries. In the manufacturing sector, there has also been some quality upgrading since 1990 in Sub-Saharan Africa, though very gradual. Meanwhile Latin America's quality has been stagnant in the manufacturing sector and falling until the early 2000s in the agricultural sector. In agriculture, there are some indications that quality upgrading is now also underway since 2000 in East Asia and the Middle East and North Africa. Further analysis in

shows that heterogeneity in quality upgrading experiences is not limited to regions, but is also strong among countries within those regions.

Figure 19. Export Quality by Region for LICs and Lower Middle Income Countries
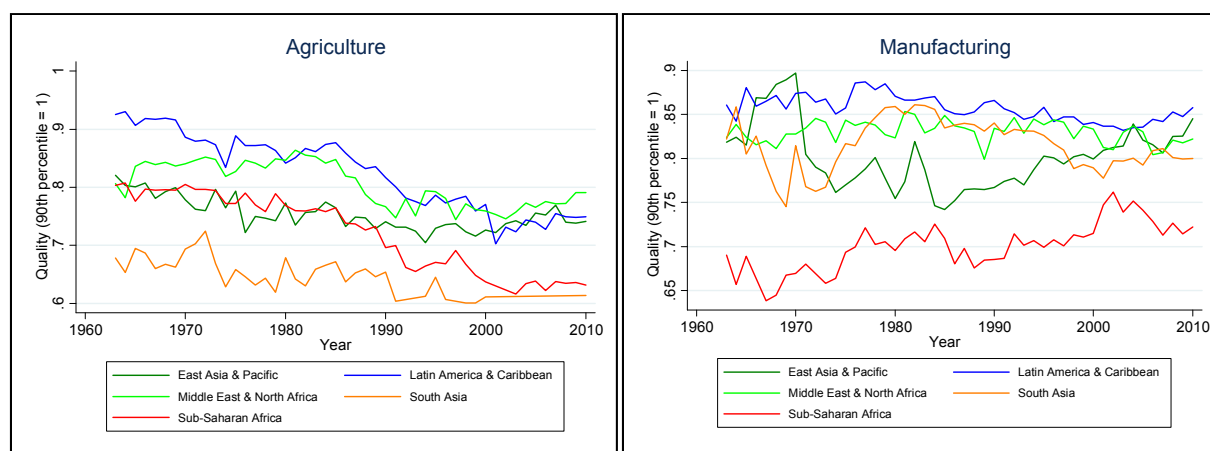
78. **Quality increases lead to higher export prices at the quality levels at which most LICs currently produce (Figure 20).** The data suggest that quality increases translate into export price increases until a country's quality level reaches about 80-85 percent of the world frontier. With LICs' quality levels for most products being below that level, this implies that quality increases would likely result in terms of trade improvements for them. Quality increases beyond that 80-85 percent level tend to not to drive prices higher, possibly because higher efficiency in production may keep prices stable.[30] Also, quality increases are particularly strongly correlated with price increases in agricultural goods, a key sector for both exports and employment in most LICs.

Figure 20. Quality and Unit Values
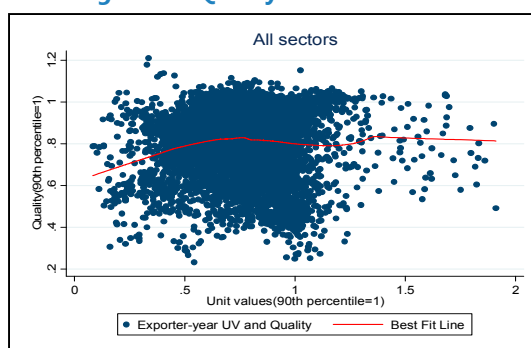
Notes: Each dot depicts an exporter-year combination. The 90th percentile is set to unity for both unit values and quality observations.

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[30] Some countries have experienced considerable increases in quality accompanied by stable unit values: here, quality increases offset price declines on constant-quality products, as is common in the computer and electronics sectors for instance.

C.   Quality in Important LIC Export Sectors

79.   Fragile LICs have been lagging behind non-fragile LICs in quality upgrading in many important sectors (Figure 21). The figure illustrates three SITC 2-digit sectors which make up a high percentage of LIC exports: fruit and vegetables; coffee, tea, cocoa, and spices; and apparel. In all three cases, the better performance of non-fragile LICs is again apparent.[31] The coffee, tea, cocoa, and spices sector is a traditional agricultural export sector for LICs. Non-fragile LICs have been successful in turning quality increases into market share gains in this sector. Since the early 2000s, fragile LICs have been reversing previous quality declines but have not yet achieved market share gains in response.

Figure 21. Quality, Export Prices, and Market Shares in Two Important LIC Export Sectors

Unit Value and Quality Over Time for Fruit and Vegetables Sector

Unit Value and Quality Over Time for Coffee, Tea, Cocoa, Spices, etc. Sector.

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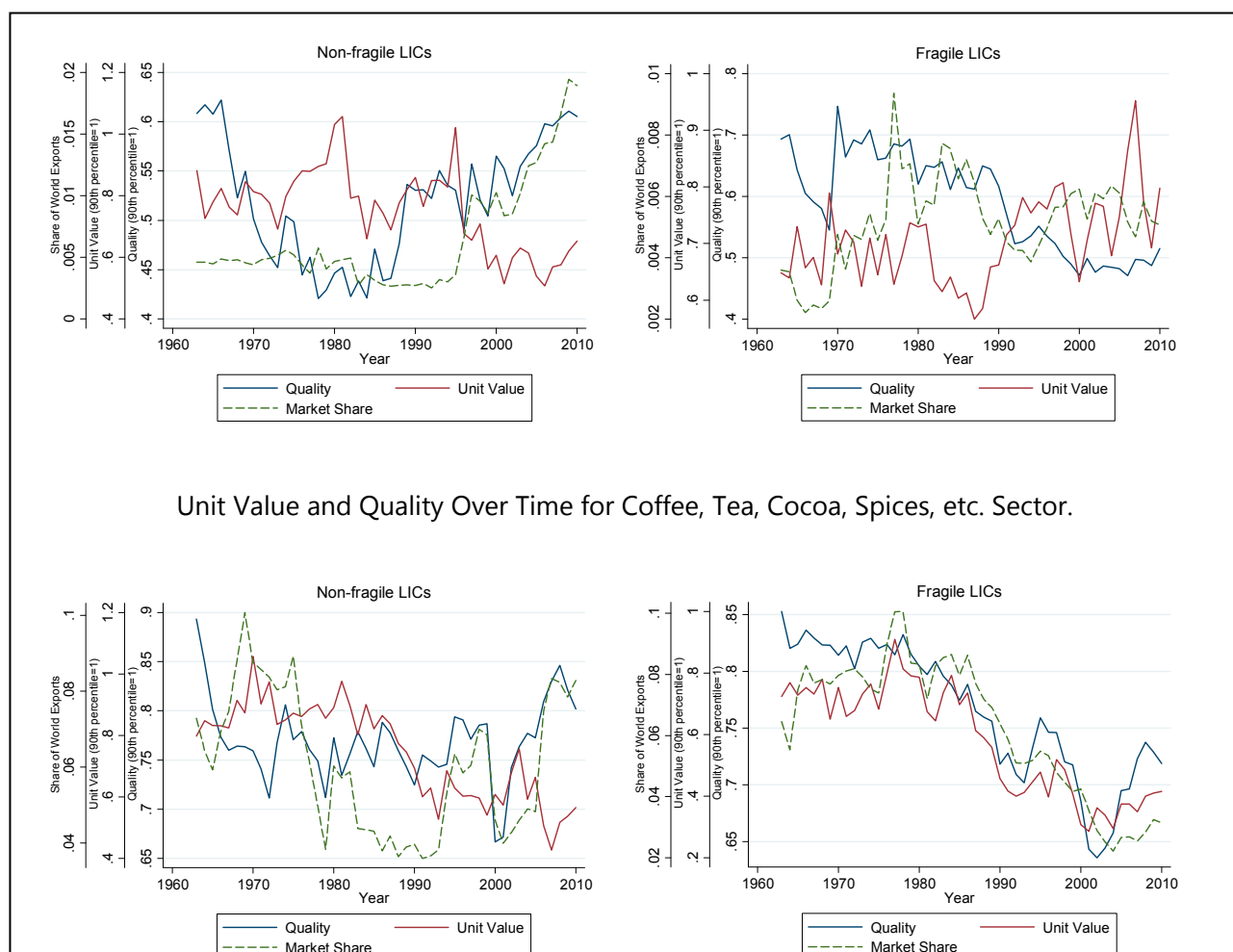
[31] Developments for the group of all LICs (not shown in interest of space) are generally mirror those of non-fragile LICs, given their larger export size relative to fragile LICs.

80.   Fruits and vegetables is the agricultural subsector in which many African LICs have experienced new export success during the last decade. This again was driven by non-fragile LICs. They have been strongly upgrading quality in this sector since 1990, yielding steep world market share increases starting about five years on, which were later further boosted by price reductions. There are anecdotal success stories underpinning this success, often driven by integration into regional or global value chains through capacity building. For instance, Zambia become a net exporter in the sector shortly after the entry of foreign-owned supermarket chains boosted local producers' capability to meet international food standards.[32] Meanwhile, fragile LICs' quality has been declining during the same time and they were unable to increase their market share.

81.   The apparel sector is of particular importance for LICs because it is typically one of the first manufacturing sectors a country enters. Non-fragile LICs have been particularly successful in this sector, recording quality increases since the late 1980s and drastic increases in their market share. This trend has been mostly driven by the Asian LICs such as Bangladesh and Vietnam, which are today among the largest exporters in the sector. East Africa has also been increasing its world market share, though from a still low base. In contrast, LICs in other regions of Africa have generally not been able to enter this export industry on a scale worth mentioning. In this sector, fragile LICs have also been upgrading their apparel export quality since 2000, but their market share has not yet responded. Henn et al., (2013) expore further country-specific experiences and illustrate for instance that Korea and Thailand have entered and subsequently withdrawn from the apparel sector as they developed further.[33] Moreover, they show that China's (and to more limited extent India's) success in the sector has come against a backdrop of substantial quality increases against stable prices.

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[32] In Kenya and Ethiopia, exports of a closely related sector, fresh cut flowers, have flourished in response to expedient air transport (Sutton and Kellow, 2010).

[33] Their paper also includes an example of the car sector for the U.S., Germany, Japan, and Korea. It is quite illustrative, because many readers are likely to recognize the brands and have some intuition as to their relative quality.

D.   Quality Ladders: Potential for Quality Upgrading

82.   Countries' positions on sectoral quality ladders indicate potential for quality upgrading in the existing product basket. Figure 22 illustrates such sectoral quality ladders at the relatively aggregated SITC one-digit level alongside the composition of export baskets in 2010 for a series of LIC groupings. The length of quality ladders varies considerably by sectors, and likewise a country's relative position may vary considerably across sectors. This remains the case also when looking at the most disaggregated SITC four-digit level as demonstrated by Henn et al., (2013).

Figure 22. Quality Ladders by SITC1 Sector, 2010
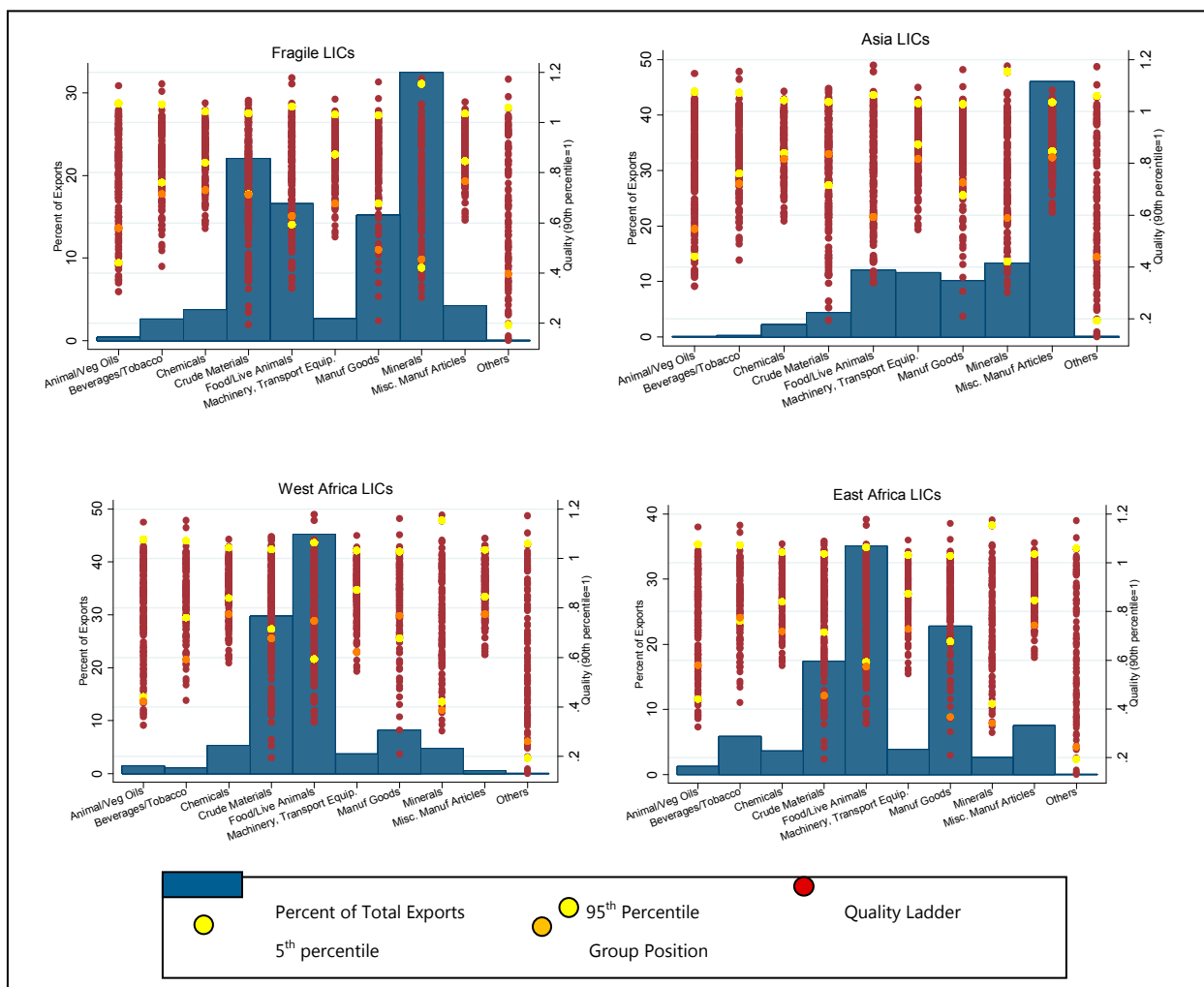
83.   Non-fragile LICs are in a strong position to gain from quality upgrading. As a group they have already managed to diversify into manufactures, with apparel (included in miscellaneous manufactured articles) being especially important in Asian LICs. To a lesser extent, this type of

diversification is also ongoing in East Africa.[34] While manufactured goods may not necessarily have longer quality ladders than agriculture and natural resources, this type of diversification is important because quality upgrading in manufacturing is the least obstructed by geological and climatic limitations. Non-fragile LICs typically occupy relatively low rungs on these ladders, implying that considerable quality upgrading potential may exist. Henn et al., (2013) show that there is still large potential for quality upgrading in the Asian LICs, including in the apparel sector in which many have already done well.[35]

84.   In fragile LICs, horizontal diversification combined with quality upgrading would seem to hold the most promise. Fragile LICs are still much more heavily specialized in the minerals, crude materials and food/live animals sectors. Among regions, West Africa and Central Africa[36] have remained highly dependent on these sectors. Within their existing sectors of specialization, fragile LICs occupy generally lower rungs on quality ladders than their non-fragile counterparts. This suggests that they would nonetheless have quality upgrading opportunities in these agricultural and commodity sectors, but these would be subject to climatic and geological limitations.

85.   Horizontal diversification may also become paramount again at later development stages for some countries. In fact, it may be the precondition for some of the more mature Asian countries to enable more quality upgrading. Henn et al., (2013) show, for instance, that Malaysia is heavily specialized in electronics exports, a subcategory of the machinery and transport equipment sector, but it is already approaching the world frontier quality in this sector. Moreover, quality increases in this sector generally tend to be offset by price declines for constant-quality products (Sutton and Trefler, 2011). Thus, to enable further quality upgrading, Malaysia may first need to diversify horizontally. This diversification could occur across SITC1 sectors, as well as across other subsectors within machinery and transport equipment. Meanwhile, China's position in most sectors is between Asian LICs and Malaysia. Some quality upgrading potential has already been realized, but some also remains. These countries may also be able to increase the value added in their existing exports by engaging in more sophisticated tasks than, say, assembly, as highlighted by a growing literature on offshoring (see, for instance, Grossman and Rossi-Hansberg, 2008; Baldwin and Robert-Nicoud, 2010).[37]

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[34] 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.

[35] Quality upgrading potential may however be limited by segmented markets. For instance, the market for world frontier quality apparel is small and limited to high-end consumers. In these cases, beneficial quality upgrading for a LIC manufacturer such as Bangladesh may mean to start serving the higher-end markets without necessarily abandoning their mainstay lower-end market.

[36] Central Africa is not shown in Figure 22 due to space constraints.

[37] The quality measure used here can only evaluate the quality of a good exported by a country, not how much domestic input it includes. It may thus prove misleading for cases where a country combines low-value assembly services and high-quality imported intermediates to generate (high-quality) exports.

E.   Export Quality and Development

Export Quality and Income Levels

86.   Export quality and income per capita are correlated, and particularly strongly so in early stages of development (Figure 23)**.** This holds both at the aggregate level, and for manufacturing, agriculture, and non-agricultural commodities separately.[38] Quality upgrading is particularly rapid until GDP per capita reaches $10,000. Quality convergence then continues at a diminishing rate, and is largely complete by the time GDP per capita reaches $20,000. Among high-income countries, average export quality levels only vary within a narrow band. The pattern is similar also for small states (Box 1). Henn et al., (2013) show also that this relationship also holds when focusing purely on within-country changes—export quality still increases as countries grow richer. They also illustrate that, in contrast, unit values increase with income at a relatively constant rate.

Figure 23. Quality and GDP per Capita
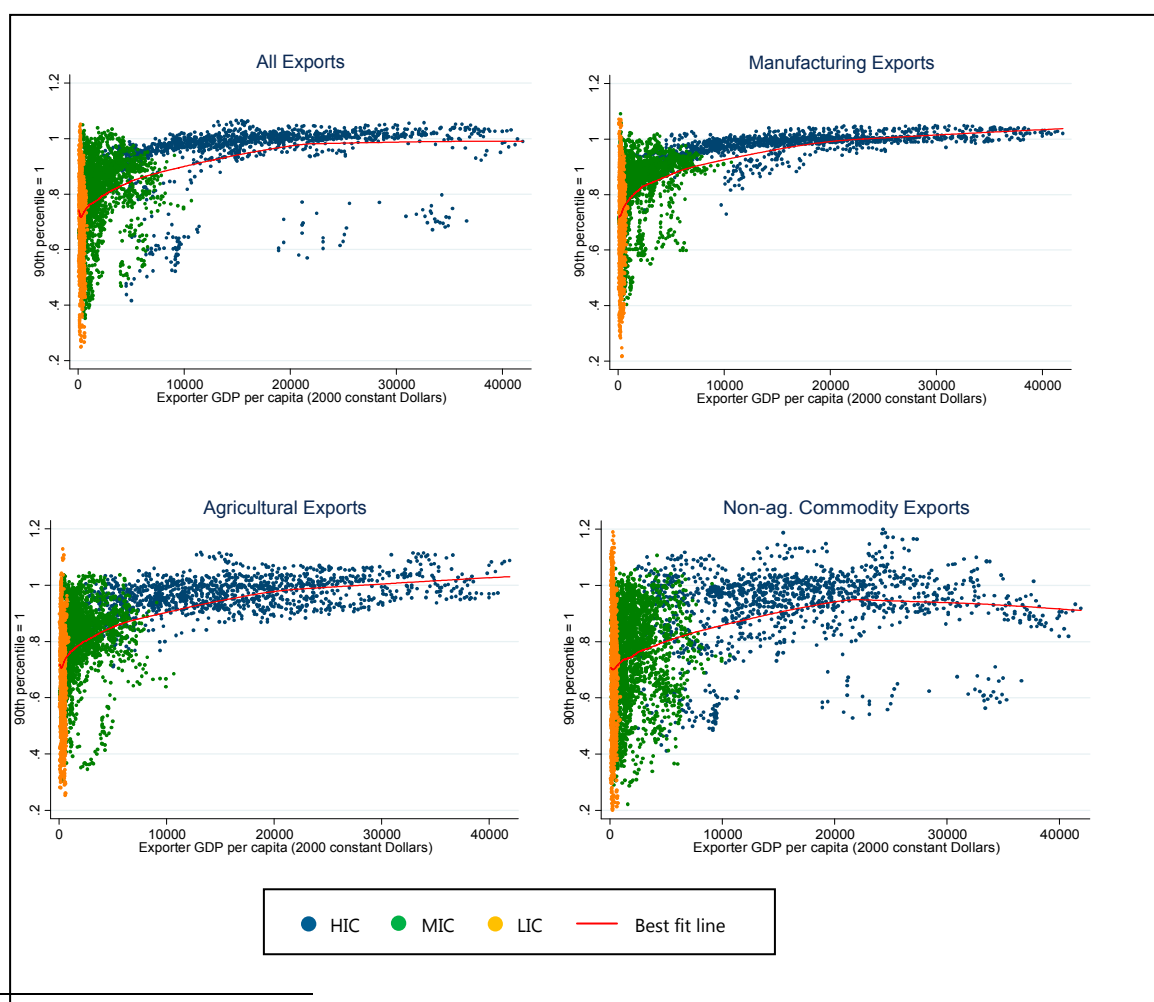
[38] These finding are consistent with Hummels and Klenow (2005) and Sutton and Trefler (2011). However, the sectoral results presented in this section show that the correlation between income and unit values for non-agricultural commodities is relatively weak.

87.   Again, wide variation in quality levels underlines that prioritization among horizontal and vertical diversification needs to be country specific. Quality estimates vary widely, particularly among low-income but also middle-income exporters. Those 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.

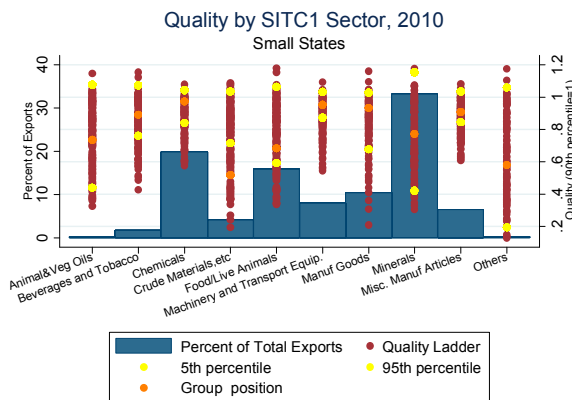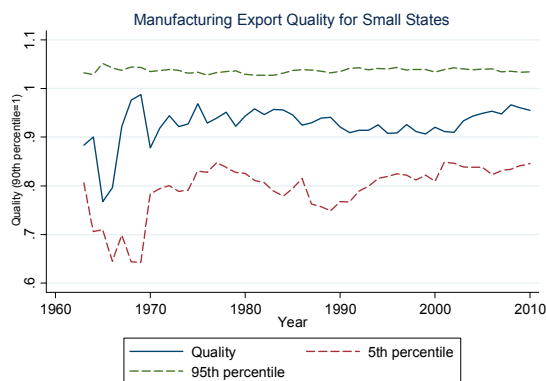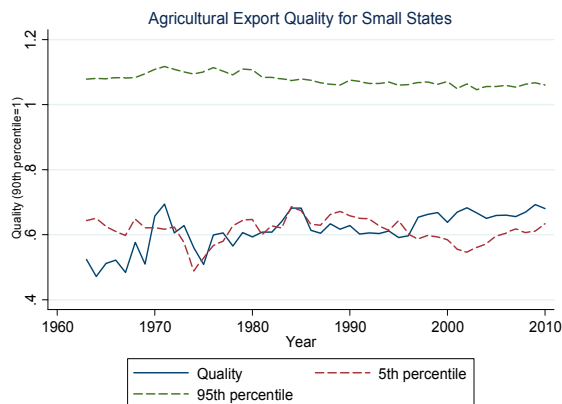**88.   There is scope for quality upgrading not just in manufacturing but also in agriculture.** As countries develop, the quality of both agricultural products and commodities increases substantially. The latter likely reflects countries shifting toward more processed products within each commodity category. Lengths of quality ladders vary substantially across subsectors in both agriculture and manufacturing (Henn et al., 2013). All this suggests that early development need not necessarily be driven primarily by the establishment of a manufacturing base. Although soil and climate may impose some limitations, the finding that considerable increases in quality can be registered in agricultural exports is important from an inclusive growth perspective, because in many LICs a large share of the labor force remains concentrated in agriculture.

Box 1. Quality Upgrading in Small States

With regards to the relationship between quality upgrading and development, small states follow similar patterns as other countries: quality rises with income particularly sharply for income levels below $10,000 (Henn et al., 2013).[1]

Small states have upgraded their quality considerably in the manufacturing sector since the early 2000s, from already high levels, and are now approaching world frontier quality in manufactures. Meanwhile in agriculture, export quality in small states remains low, although some quality upgrading has taken place since the mid-1990s. During the same period, quality upgrading has however been respectable in the fish and fish preparations subsector (not shown), which is important for many island countries among the small states group and has resulted in world market share gains.

Small states' position on sectoral quality ladders is relatively high, particularly in the manufactured goods, chemicals and machinery, and transport equipment sectors. In these areas, 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.

Agricultural Export Quality for Small States

Manufacturing Export Quality for Small States


Quality by SITC1 Sector, 2010
Small States

[1] Countries are classified as small states if their population is less than 1.5 million in either 2010 or 2011, using Penn World Tables (2012) and World Development Indicators (2011) data. This classification does not include fuel exporters that are high income (as per World Bank definition), including Bahrain, Brunei, and Equatorial Guinea.

F. Quality Upgrading and Growth

90.   Quality upgrading is associated with higher growth. Figure 24 illustrates the relationship between annual GDP per capita growth and total export quality growth in agriculture, manufacturing, and commodities during the 1995-2010 period. For the sample of all countries, this is the case in each of the three broad sectors. The link is weak in the commodity sector, but quite strong for agriculture, where a 0.1 quality increase during 1995-2010 was associated with additional annual GDP per capita growth of 0.5 percentage points. These results on agriculture also hold when LICs are considered by themselves, with growth benefits hardly varying between the fragile and non-fragile subgroups. In contrast, there does not seem to be any growth benefit in LICs from quality upgrading in the commodity sector, likely suggesting limited integration and spillovers from this sector to the broader domestic economy.[39]

### Figure 24. Quality Upgrading and GDP per Capita Growth, 1995-2010

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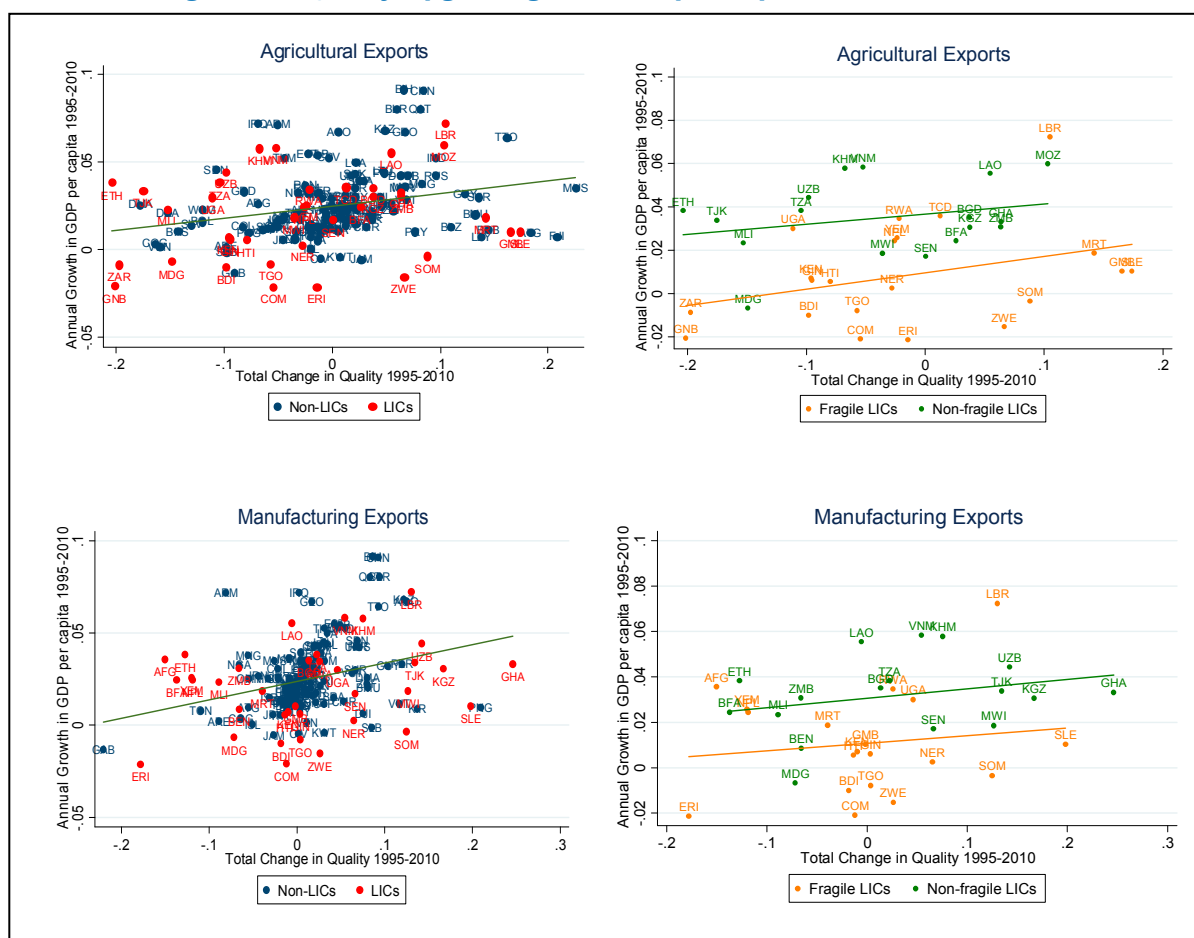
[39] In addition, Henn et al., (2013) find for a commodity exporter subgroup of countries that their GDP per capita levels are uncorrelated with export quality levels.

91.   The link between quality upgrading and growth is strongest for manufacturing. Here quality upgrading of 0.1 during the 15 year period was associated with additional annual growth of one percentage point. Again, the strength of the effect is similar for LICs. These results on manufacturing are in line with Rodrik (2012), who finds that convergence in manufacturing output is unconditional, i.e., independent of other country circumstances, and quite rapid. He concludes that overall growth in LICs is mainly being held back by the small size of the manufacturing sector.

92.   Quality upgrading in manufacturing is accompanied by an increasing importance of the sector in LIC economies. This is demonstrated by Figure 25, which relates quality upgrading in manufacturing in LICs to growth of manufacturing output, which is obtained from a new IMF database containing supply-side disaggregated GDP for African and Asian LICs during 2000-10. In contrast, quality upgrading in agriculture is associated with a lower growth of the sector, implying a rebalancing into higher value products, which typically goes hand in hand with a redeployment of resources toward the manufacturing and service sector. This is intuitive given low agricultural productivity in many LICs and the stylized fact that manufacturing firms tend to be much more productive, which is also reflected in higher wages (e.g., Sutton and Kellow, 2010).

Figure 25. Quality Upgrading and Sectoral Growth in LICs, 2000-10
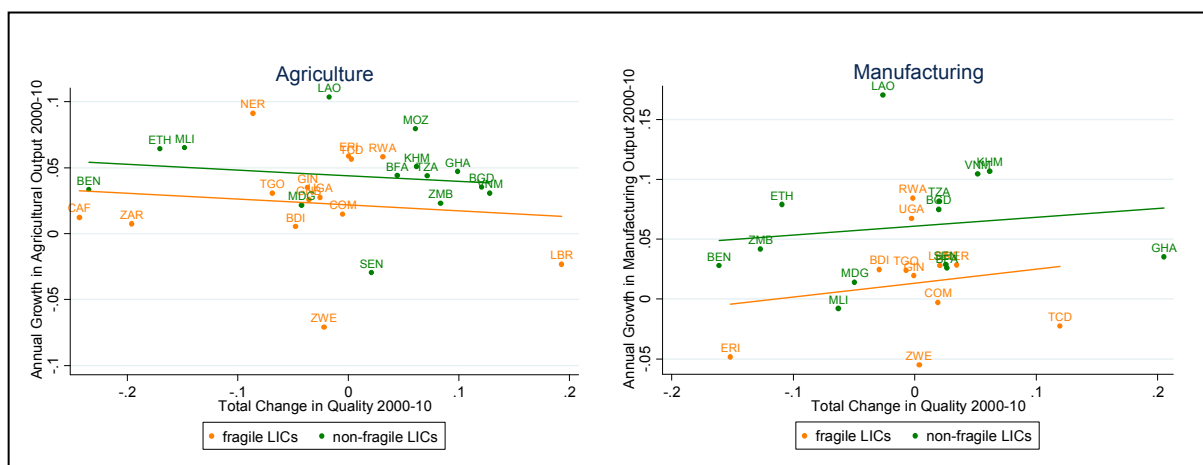
93.   There are considerable differences across countries in their paces of quality upgrading. Figure 26 considers the quality trajectories of select low- and lower-middle-income countries in Asia and Africa and groups them into countries with faster and slower quality convergence based on their experiences during the 1995-2010 period.[40]

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[40] Countries with a quality convergence of at least 0.05 between the 1994-96 and 2008-10 periods are assigned to the fast converger group. Alternative thresholds give similar results for Figure 27.

Figure 26. Country-level Heterogeneity in Quality Upgrading in Asia and Africa
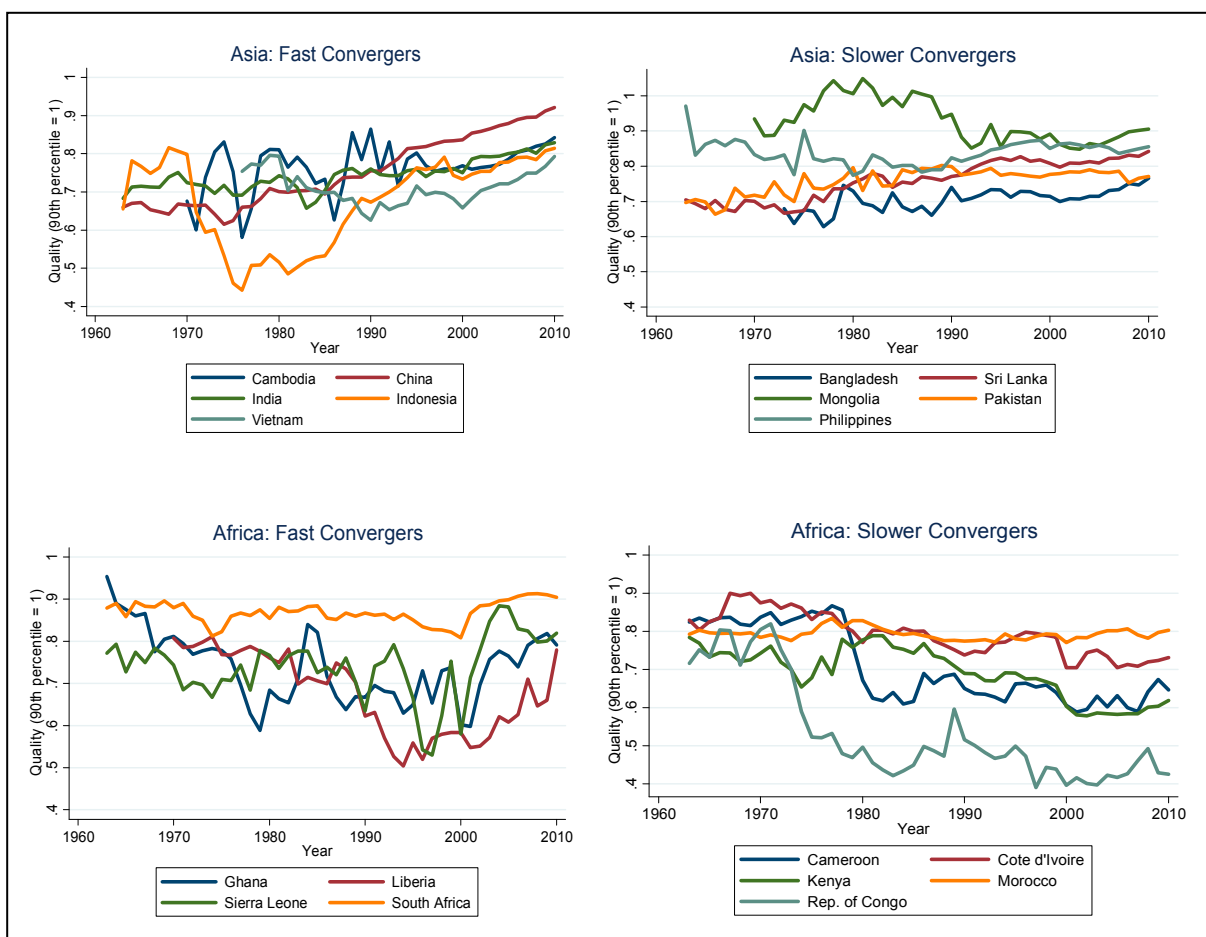
94.   A subset of low- and lower-middle-income countries has experienced fast quality convergence, mostly since the late 1990s.[41] Within Asia, only a few countries experienced fast quality convergence prior to the late 1990s. They include China and Indonesia, which experienced rapid quality upgrading starting in the mid-1980s. For other still less developed Asian countries, like India, Vietnam and Cambodia, rapid quality upgrading started only in the late 1990s. This is also the case for fast convergers in Africa, which include South Africa, Ghana, Liberia, and Sierra Leone.

95.   Another subset of countries experienced either stagnant export quality or slower convergence. These include, for instance, Pakistan and the Philippines in Asia and Morocco and Cote d'Ivoire in Africa. In other slower convergers, there are tentative signs for quality upgrading, but only starting in the mid-2000s. These include Bangladesh and Sri Lanka in Asia and Cameroon and Kenya in Africa.

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[41] Similar figures in Henn et al., (2013) also include some upper-middle- and high-income countries.

96.   Growth has been much higher in countries experiencing fast quality convergence.
Figure 27 reports how GDP per capita growth has varied between those countries with fast and
slower quality convergence during 1995-2010. It demonstrates that annual growth was more than
one percentage point higher on average in faster than in slower quality LIC convergers (during the
quality convergence period after 1995).[42] The result is strengthened slightly further when lower-
middle-income countries are considered. In contrast, when focusing on Africa only, countries
received a lower growth dividend from quality upgrading, though still in excess of one-half a
percentage point per annum. This may be related to less favorable business environments or
advantages of Asian countries in geographic proximity to neighbors integrated into supply chains.
Finally, growth in small states has seemingly also benefitted strongly from fast quality convergence
with additional annual per capita growth of two percentage points relative to slow converging peers.

Figure 27. Additional GDP per Capita Growth in Fast Convergers

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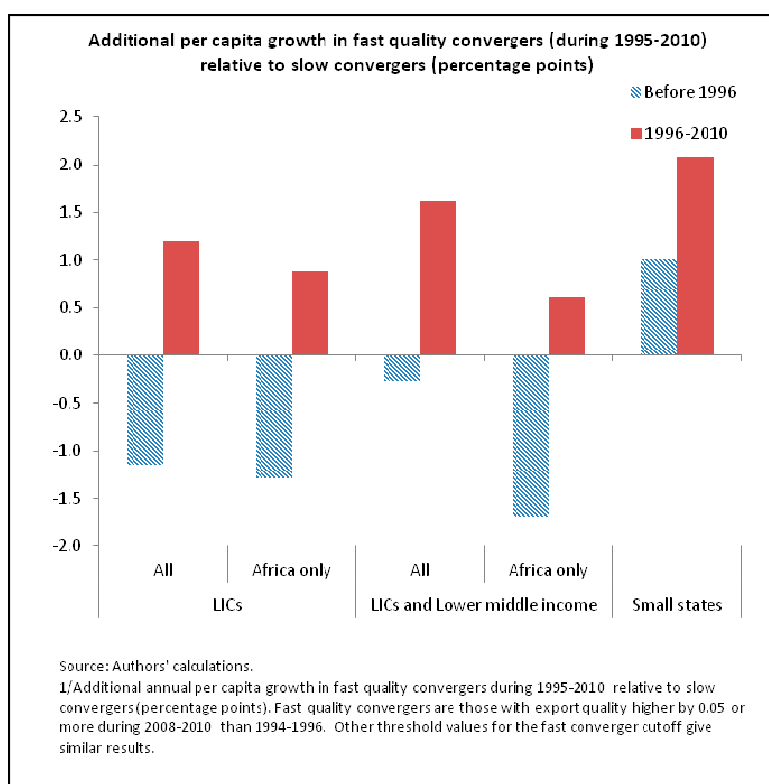
[42] The figure is based on a sample of all LICs and lower-middle-income countries in the world, not just those in Figure
26. Figure 27 also illustrates that fast quality convergers during 1995-2010 had experienced lower growth before
1996. Thus, there seems to be a structural break during the mid-1990s, which may be associated with the different
quality upgrading experiences.

G. Determinants of Quality Upgrading

97.   Given that quality upgrading is associated with growth, it is important for policymakers to know its determinants. Table 1 presents a series of regression results aimed at identifying determinants of quality upgrading, which are summarized in this section.

98.   The quality of individual products tends to converge across countries over time. This convergence can be observed unconditionally, and is unchanged by adding other potential determinants to the analysis. It implies that new entrants into a sector on average see their quality rise over time towards the world frontier. The speed of convergence is relatively fast at 4-5 percent per annum. However, quality convergence for individual products need not imply fast quality convergence for countries' overall export baskets, given that over time countries may diversify horizontally into other products and enter at low quality levels.

99.   Quality tends to converge even more rapidly within manufacturing. The speed of convergence within manufacturing is about 7 percent per annum and may reflect greater scope for flows of quality-enhancing knowledge within this sector.[43]

100.   Fruitful government policies may focus on improving the institutional environment and human capital as well as on supporting open markets. The previous unconditional convergence result suggests that if governments can facilitate entry into new markets, for domestic as well as foreign firms, their countries would be expected to gain from "automatic" quality convergence. The results highlight that both institutional quality and human capital are associated with the growth rate of product quality, and their improvement is typically accompanied by substantial quality increases.[44] In addition, the results show that a liberal trade regime, liberal agricultural policy and liberalized domestic financial markets support a faster pace of quality upgrading.

101.   Developing countries' potential for quality upgrading does not appear to be limited by low demand for quality in their destination markets (Figure 28). Lower-income countries do tend to serve markets that import lower-quality products. However, the differences are not substantial enough to act as a constraint on quality upgrading. 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. This pattern is also evident within 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 more advanced Asian LICs. Upgrading potential also remains for small states in their existing destination markets.

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[43] These results are not reported here. See Henn et al., (2013).

[44] Henn et al., (2013) report that a one standard deviation increase in institutional quality or in human capital is associated with, respectively, a 0.3 and a 0.2 standard deviations increase in the pace of quality upgrading.

Figure 28. Quality Upgrading and Destination Markets, by Country Group
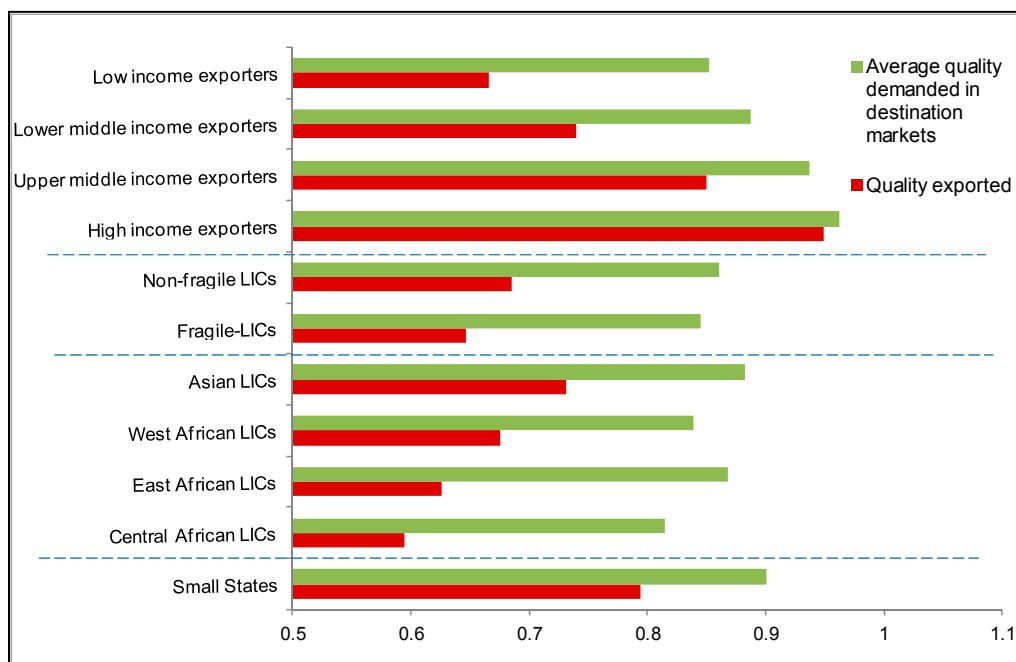
102.   Likewise, slower convergers' quality upgrading is not hindered by demand in destination markets (Figure 29). For countries with slower convergence, export quality remains substantially lower than the average quality of their trade partners' imports, especially for African countries. While fast convergers have closed the gap between quality exported and demanded a bit, also for those economies, quality demanded by trading partners does not yet pose a constraint to upgrading. This evidence suggests that policy should focus on creating a domestic environment broadly conducive to quality upgrading. In contrast, facilitating entry into higher-quality export markets constitutes a less urgent priority.

**Figure 29. Quality Upgrading and Destination Markets,
for Fast and Slower Quality Convergers among Low- and Lower-Middle-
Income Countries**

H.   Conclusions

**103.   Quality is strongly correlated with income per capita, and quality upgrading is
associated with per capita growth.** Further, quality upgrading is particularly rapid during the early
stages of development, until a country reaches a GDP per capita of about $10,000. Convergence in
export quality continues at a slower pace until GDP per capita reaches $20,000, and levels off
thereafter. Overall, those countries and time periods that have witnessed faster growth in quality
have also experienced faster growth in GDP per capita.

**104.   Substantial cross-country and regional differences in the pace of quality upgrading
suggest that policies may have a significant impact.** At the regional level, product quality in sub-
Saharan Africa and South Asia is lower, and has been growing more slowly, than in East Asia. But
there is considerable heterogeneity within regions, with quality rising far more rapidly in Ghana or
South Africa than in Cote d'Ivoire or Cameroon. Fragile LICs, which tend to be strongly natural
resource based, are in stronger need to diversify horizontally across sectors before being able to
harvest quality upgrading opportunities than their non-fragile peers. Horizontal diversification may
also become paramount again at later development stages: Some middle-income countries that
have increased quality sharply in the past, such as Malaysia and to a lesser extent China, may now
have less scope left to upgrade quality within existing export sectors.

**105.   Sectors with long "quality ladders" may hold particular potential given that, within
any given product line, quality converges to the "frontier" over time.** This suggests that
removing barriers to entry into new sectors could boost growth in developing countries by
increasing the potential for future quality upgrading. Diversification across sectors and quality

upgrading can thus be thought of as complementary. Importantly for LICs, there is also substantial potential for quality upgrading in agriculture, where large parts of their labor force are still concentrated, with this productivity-enhancing process typically setting free labor in favor of manufacturing and services sectors.

106.   Quality upgrading and expansion of agricultural exports hold potential to drive development in many LICs. The results illustrate that there are large quality upgrading opportunities in agriculture for many LICs. There are also various success stories of African countries expanding exports in agricultural products, often in types of fruit, vegetables, or flowers they did not produce before. However, these successes will have to become much more widespread to deliver major development impacts. Policymakers are well advised to identify and address key constraints, such as efficient air transport in the success stories of Kenyan and Ethiopian fresh cut flowers. Doing so will likely involve close co-operation with the private sector and openness to foreign direct investment to facilitate capacity building through integration into global value chains.

107.   Both institutional quality and human capital are strongly associated with the pace of quality upgrading. In contrast, there is no evidence that lack of demand for quality in a country's existing destination markets on average constrains quality upgrading. This suggests that, to encourage quality upgrading, governments should pursue horizontal rather than sector-specific policies to shape a domestic environment with open markets that is broadly conducive to quality upgrading, as well as create new upgrading opportunities through diversification. Horizontal policies may also be more suitable in light of the unpredictability of export successes: for instance, Easterly et al., (2009) document that relatively few 'big hit' products account for a large share of many developing countries' exports.

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EXPERIENCES AND POLICY LESSONS FROM FIVE CASE STUDIES[45]

A. Introduction

108.   Diversification has been a longstanding ambition for many LICs. Most LICs have historically relied on a narrow range of traditional primary products and few export markets for a large share of their export earnings, and their economies have been dominated by agriculture and, in some cases, extractive industries. The question arises whether such limited diversification may result in less broad-based and sustainable growth, with production and exports concentrated in sectors characterized by low technology spillovers and limited opportunities for productivity growth or quality upgrading. Another key concern is that lack of diversification may increase exposure to adverse external shocks and vulnerability to macroeconomic instability.

109.   Recent analytical work suggests that there is a close link between diversification and the early stages of the development process and structural transformation. This work is primarily based on case studies and suggests that the early stages of development are accompanied by significant changes in the nature of LICs' trade, in terms of both their traded products and their trading partners (Gaertner and Papageorgiou (2011) and IMF (2011)). Empirical evidence of a positive effect of export diversification on growth in income per capita is provided by Hesse (2008) and Lederman and Maloney (2007). Other analyses indicate that higher incomes per capita are associated first with diversification, and then with re-concentration in production and employment (Imbs and Wacziarg, 2003). Nonlinearity between a country's income level and export diversification has also been found by Hesse (2008). This nonlinearity in the diversification process suggests that it is important to consider LICs, middle-income countries (MICs), and advanced economies separately. Diversification therefore appears desirable, but there is only limited experience regarding which aspects of diversification are important, what its drivers are, and how to promote it while avoiding the risks of policies that "pick winners."

110.   This section analyzes the diversification paths followed by selected countries. It attempts to identify specific diversification patterns and highlights the factors that may have facilitated or undermined diversification. The country-specific assessments are based on IMF country teams' ongoing policy interaction with the countries' authorities. This initial empirical investigation should be viewed as a starting point for further work to deepen the understanding the causes of diversification and whether it should represent a policy objective in itself or the result of a broad based set of policy reform pursued for independent reasons.

111.   The analysis is based on five case studies, which illustrate lessons from structural transformation at different stages of development and from different development challenges. They are carefully selected from LICs and MICs in Sub-Saharan Africa (SSA) and East

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[45] Prepared by Alexander Pitt, Thelma Seoeun Choi, Nombulelo Duma, Nikoloz Gigineishvili, and Samuele Rosa.

Asia and span a wide range of income levels, and some feature specific economic structures that have an impact on diversification. The countries considered are: Tanzania and Bangladesh, two LICs with income per capita well below $1,000; Angola, the second largest oil exporter in SSA and a MIC still facing significant physical and human capital needs; Vietnam, a country on the threshold to MIC status; and Malaysia, a MIC whose income per capita has grown 20-fold over the past 40 years. Vietnam and Malaysia illustrate the experiences of countries that have successfully diversified or are successfully diversifying their economies. In the other cases, the diversification process is underway but in Tanzania, per-capita incomes are still relatively low; in Bangladesh, the diversification process has stalled at some point; and in Angola, the diversification process faces specific challenges related to the dominance of the natural resources sector..

112.   With the sample countries fairly heterogeneous, there is no single diversification trajectory followed by all (and on which they are currently positioned at different stages). However, there are some similarities in outcomes along several dimensions of diversification among some countries that suggest that successful diversification is linked to certain policy and economic factors. The significance of these factors is confirmed by the countries where these factors are absent or weaker. While the sample size is too small to establish firm conclusions about the effect of economic policies or other factors on diversification, common threads do emerge.

B.   Diversification—Cross-Country Evidence

113.   This section considers diversification across the sample countries along two dimensions: output and exports. While the sample is too small to draw general conclusions, some observations are relevant to all of the sample cases and may be so even for a wider group of countries.

Output Diversification

114.   The analysis of output diversification across countries in this paper is supported by a new dataset compiled by IMF staff. The dataset comprises data on 12 economy-wide sectors for over 50 LICs and MICs in Africa and Asia, including the sample economies, for 2000-11,[46] but even this cannot capture important diversification trends within large sectors such as agriculture or manufacturing. Nonetheless, in the analysis of these data, some common patterns emerge:

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[46] For Angola, data are available only for six sectors.

Figure 30. Output Diversification

A

Real Sector Diversification, 2000-11
(Index 1/)

Malaysia
Vietnam
Bangladesh
Tanzania
Angola (RHS)

1/ Herfindahl index based on 12 sectors (6 sectors for Angola).

B

Change in Sector Shares in GDP, 2000-11
(In percentage points)

Manufacturing
Agriculture

C

Manufacturing and GDP Growth, 2000-11

Real manufacturing output
(percent change)

Angola

Tanzania
Vietnam
Bangladesh

Malaysia

PPP GDP per capita

D

Agriculture and GDP Growth, 2000-11

Real agricultural output
(percent change)

Angola

Malaysia
Tanzania
Bangladesh
Vietnam

PPP GDP per capita

E

Manufacturing and Inflation, 2000-11

Inflation

Tanzania
Vietnam
Bangladesh

Average inflation
(percent)

Variability of inflation
(standard deviation)

Malaysia

Average share of manufacturing in GDP (percent)

F

Agriculture and Inflation, 2000-11

Inflation

Average inflation
(percent)

Variability of inflation
(standard deviation)

Vietnam

Bangladesh

Tanzania

Malaysia

Average share of agriculture in GDP (percent)

Sources: Country authorities, IMF staff calculations.

- Output diversification—i.e., a broadening of the product palette—in all but one of the sample countries increased overall (Figure 30A). The exception is Vietnam, where overall diversification as measured by the Herfindahl concentration index[47] decreased, 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 (see below).[48]

- In all countries, the share of agriculture in output declined, and that of manufacturing increased (Figure 30B), except in Malaysia, which is the most advanced country of the sample and which already had the lowest agricultural share and a very high manufacturing share at the beginning of the comparison period.

- Countries in the sample with the fastest growth in GDP per capita also experienced the fastest growth in manufacturing output (Figure 30C). This holds true even if Angola, where per capita growth was driven to a large extent by oil production (and manufacturing increased significantly at the same time), is excluded. Conversely, the countries with the fastest growth in GDP per capita experienced the slowest growth in agricultural output (if Angola is excluded; Figure 30D).

- Economies with higher manufacturing and lower agricultural shares in output tend to experience lower inflation and lower variability of inflation (if Angola is excluded, which has experienced a commodities boom that drove inflation up, and where both manufacturing and agricultural shares in the economy are low; Figures 30E-F).

C.   Export Diversification

115.   The available data for assessing export diversification are somewhat more comprehensive than those for the economy as a whole. In particular, data series that decompose exports (COMTRADE and from UNCTAD) on a comparable basis reach back much further than the output data. In addition, the IMF's Direction of Trade statistics provide data on trade geography. However, these data are in nominal terms; therefore, price fluctuations can suggest diversification where there is none in volume terms, or can obscure diversification where it occurs. The results in this section will therefore need to be interpreted cautiously.

116.   Diversification of exports has followed a similar pattern as that of output, though there are some differences.

- The general trend over time has been for greater diversification in terms of export products, and a move away from agricultural exports (Figure 31A). However, the experiences have been

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[47] The Herfindahl index is calculated as the sum of component shares (for output, the components are economic sectors; for exports they are different export products). A smaller number indicates greater diversification.

[48] While diversification measures the relative shares in output of different sectors in the economy, structural change refers to the evolution of sectors themselves. For example, in an economy where the share of agriculture declines by the same amount as that of industry increases, there is structural change but no change in diversification, as measured by these sectors' shares. Of course, there could be significant diversification within sectors.

uneven: 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, experienced a re-concentration of exports; and 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.

- In the sample countries, higher income is associated with higher exports, regardless of diversification: the countries with the fastest per capita GDP growth also experienced the fastest growth in exports as a share of GDP (Figure 31B). This also holds for Bangladesh, which exports largely textiles with decreasing export diversification and has seen rising per-capita output and exports.

- The share of agricultural in total exports declined in all countries and that of manufacturing increased (Figure 31C) except in Malaysia, where agricultural products, largely rubber and palm oil continue to contribute significantly to total exports, and exports of manufactured goods declined as commodities gained again in importance.[49] The share of nonagricultural primary commodities in total exports, however, remained remarkably stable in most countries, except in Tanzania, where gold has become the single largest export product (driven primarily by rapidly rising gold prices).

- At the same time, the share of relatively unsophisticated (i.e., labor-intensive, resource-based and low-skill and -technology) manufactures in overall manufacturing exports declined everywhere except in Bangladesh, where the textile sector remains dominant (Figure 31D). However, they gained share in total exports in some countries where total export growth has been rapid. Conversely, the share of more sophisticated manufactures in total manufacturing exports (and to some extent in total exports) increased in most countries, though it declined in Bangladesh. Somewhat surprisingly, Malaysia also saw a decline in sophisticated manufactured exports in total exports (and no expansion in overall manufactured exports); this is likely related to the increasing value of commodity exports.

- While diversification measures *per se* do not suggest a correlation with vulnerability to terms-of-trade shocks, the share of non-agricultural primary commodities (mainly fuel, metals, and gold) in total exports appears strongly related to terms-of trade movements (Figure 31E).

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[49] In Angola, the dominance of oil in overall exports (99 percent of exports consist of oil) implies that the shares of other export product barely change even if there is absolute growth. However, the rising price of oil likely obscures some (modest) export diversification.

Figure 31. Export Diversification

A

Export Product Diversification, 1975-2010
(Index 1/)

1/ Herfindahl index based on 9 product categories.

Malaysia
Vietnam
Bangladesh
Tanzania
Angola (RHS)

B

Exports and GDP Growth, 1975-2011

GNFS Exports
(change in percent age points of GDP)

Vietnam
Malaysia
Bangladesh
Tanzania
Angola

PPP GDP per capita

C

Change in Export Shares, 1995-2011
(In percentage points of total exports)

Agriculture
Manufactures
Nonagricultural primary commodities

Malaysia   Angola   Bangladesh   Vietnam   Tanzania

D

Change in Export Shares of Unsophisticated Manufactures, 1995-2011 1/
(In percentage points)

As percentage of total exports
As percentage of exports of manufactures

1/ Labor-intensive, resource-based and low-skill and -technology intensive manufactures.

Bangladesh   Malaysia   Vietnam   Tanzania   Angola

E

Nonagricultural Commodity Exports and Terms of Trade, 2000-2011

Variability of terms of trade
(standard deviation)

Angola
Bangladesh
Tanzania
Malaysia
Vietnam

Average share of nonagricultural

F

Share of Top 5 Trading Partners in Total Exports 1981-2011
(In percent of total exports)

1981
1996
2011

Malaysia   Vietnam   Bangladesh   Tanzania   Angola

Sources: UNCTAD, country authorities, IMF staff calculations.

- Exports generally also diversified in geographic terms (Figure 31F). The share of the top five trading partners in exports declined in all countries since 1981, except in Bangladesh, which saw increasing reliance on a few markets only. In Angola, geographic trade concentration has decreased but remains high, as its oil is destined to a few markets.[50]

117.   The analysis in this section can only provide a relatively rough comparison between countries. Cross-country comparability comes at the price of a loss of granularity which can obscure significant trends at a more microeconomic and country-specific level. Important aspects of diversification are difficult to compare across countries, as they pertain to specific sub-sectors of the economy that are only relevant for a particular country, or relevant data of higher granularity are not available on a cross-country basis (or are not comparable across countries). In addition, the factors behind the evolution of diversification are better gleaned, and policy lessons more easily drawn, on an individual-country level. Therefore, the discussion turns now to country-specific experiences.

D.   Diversification—Country Experiences

118.   This section presents individual case studies for the selected countries to illustrate varying experiences of structural transformation and portray successes and challenges at different stages of development.[51] The first country presented is Malaysia, which is the most advanced country in the sample and has the longest history of diversification. It has also successfully transformed its economy from largely agricultural into an important manufacturer and exporter of industrial goods and is moving to further diversification through services. The next country considered is Vietnam, which is well advanced on its way to middle-income status and, to some extent, most closely resembles Malaysia. Then the attention is turned to Tanzania, which in recent years has made significant progress in diversifying its economy, both in terms of output and exports, accompanied by a rise in the GDP growth rate. Bangladesh represents a case where some key dimensions of diversification stalled after a very successful push to move away from agricultural exports. Lastly, Angola, although a middle income economy thanks to its oil wealth, has begun efforts to diversify the economy only recently, and is presented with specific challenges due to the dominance of the natural resources sector, as well as the legacy of a decades-long civil war.

MALAYSIA

119.   Over the past four decades, Malaysia witnessed rapid economic growth accompanied by significant transformation of its economic and trade structures. GDP per capita (on a PPP basis) rose from less than $900 forty years ago to over $16,000 in 2011, while exports of goods and nonfactor services (GNFS) increased from about 40 percent of GDP in the early 1970s to more than 100 percent in the mid-2000s. Largely an agricultural economy until the 1980s, Malaysia managed to

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[50] However, with the price of oil determined in a global market, diversification of export destinations will do little to mitigate risks.

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

successfully diversify its output and exports, first within agriculture, and then to manufacturing of increasingly sophisticated products. However, Malaysia also illustrates the limits of diversification based on policies designed to promote strategic sectors as well as the challenges associated with transition to advanced-economy status.

120.   Malaysia's economic diversification took place in distinct phases and was generally actively supported by government policies that targeted specific sectors. Economic policies were also explicitly aimed at easing social tensions. In particular, after severe civil disturbances broke out in 1969, the government in its New Economic Policy adopted an explicit policy of increasing the share of Malay (as opposed to Chinese, Indian, and foreign) ownership in the national economy, and diversification was used as a tool to this end as well.

Primary Commodities and Agriculture

121.   The first phase of Malaysia's diversification was widely based on broadening the range of primary commodities and derived products. Exports of tin, crude oil, and rubber, which during the 1960s accounted for two-thirds of Malaysia's total exports (Figure 32A), were joined by palm oil, and crude oil gained in prominence in the 1970s following the first oil shock. While some of the shifts in export shares are explained by commodity prices, the primary sector did diversify during the first decades after independence (Figure 32B).

122.   The development of the palm oil industry marked the beginning of Malaysia's diversification. At independence in 1957, agriculture was dominated by rubber cultivation. However, the bulk of existing trees were nearing the end of their economic life, and replanting with new varieties capable of higher yields would necessitate a gestation period of seven years. The government offered cash support but also encouraged switching to palm oil cultivation, which offered quicker returns, through a comprehensive set of policies to promote the cultivation, processing, and exporting of palm oil and palm oil products (Drabble 2010). These policies ranged from tax incentives and government support for export promotion activities to publicly funded research and training programs. In addition, the government also opened new land for cultivation by smallholders, using the reorientation of the agricultural sector to ease social tensions. The coordinated efforts of government and the private sector fostered the development of new products and manufacturing methods to raise productivity and maximize the value added of palm oil production and processing. These policies helped to diversify Malaysia's export base away from tin and rubber during the early 1970s.

123.   As palm oil gained in importance, so did crude oil. While rising prices helped increase the nominal share of crude oil in overall exports, the discovery of large new deposits of oil in the 1970s also boosted production. The share of crude oil in exports rose steadily, until it peaked at 30 percent in 1984, when manufacturing began to take off.

Industrialization

124.   In parallel with agricultural diversification, the authorities also pursued a policy of industrialization. In its first phase, the goal was import substitution industrialization (ISI) aimed primarily at the domestic market, as well as some processing of agricultural products for export. The government initially used mainly tax incentives and also provided financial and other assistance (e.g., some tariff protection and, for foreign investors, freedom to repatriate profits and capital) to attract domestic and, importantly, foreign investors (Drabble 2010). This met with some success, as the share of manufacturing in the economy rose from 8.5 percent of GDP in 1961 to 16.5 percent to 1975 (Chee, 1987).

125.   In the late 1960s and early 1970s, the government shifted the focus of industrial development. ISI was replaced with an export-oriented and labor-intensive industrial development strategy that relied heavily on free trade zones (FTZs).[52] Again, foreign investment played a strong role, rising from 2.25 percent of GDP in 1970 to almost 9 percent in 1992, before declining again. The use of FTZs was complemented by government policies that included sound macroeconomic management, microeconomic deregulation (not only in FTZs) including relatively liberal trade policies, and emphasis on human resource development. In addition, in the 1990s, the government began to emphasize the development of information technology (IT) as part of its strategic push to reach developed-country status by 2020 (Vision 2020). This included the creation of the Multimedia Super Corridor (MSC), which was designed to use IT applications, as well as attract investment by IT companies (Harris 1998). Political stability after the 1969 riots, and a generally benign external economic environment—Malaysia was located in the fastest-growing region in the world—also contributed to the success of this strategy. In terms of industrialization and export growth, this policy was successful: manufacturing rose from 12 percent of GDP in 1969 to a peak of 31 percent in 2006, and from 6 percent of total exports to 74 percent during the same time (Figure 32C).

126.   The geography of Malaysia's trade also broadened (Figure 32D). In addition to its traditional trade partners such as EU, Japan, and Singapore, more recently Malaysian goods reached China, Hong Kong (China), Thailand and other countries in the region and beyond, including emerging and developing economies. As a consequence, the share of the top five export destinations in total exports declined from 67 percent in 1981 to 51 percent in 2011.

127.   However, the strong emphasis on FTZs and the emphasis on IT in national economic planning led to a dominant role of the electronics industry. During the 1990s, this industry's share in manufacturing and total exports rose to a peak of over 72 percent and 58 percent, respectively in 2000 (Figure 32E). This re-concentration of exports has exposed Malaysia to terms of trade shocks akin to those in commodities (to which Malaysia was earlier prone), and has led to

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[52] In addition, the state also began invest directly in particular industries, but these investments never played a significant role in Malaysia's industrial development.

higher volatility in Malaysia's terms of trade than in other countries in the region (Figure 32F). [53] [54] Only in the last decade has the share of electronics in manufacturing and exports declined again.

Lessons and Challenges

128.   Malaysia's example underscores the possibilities of a deliberate diversification and export promotion policy. While diversification has not necessarily been the primary cause of Malaysia's economic growth, both are closely linked: the same policies that helped diversification also promoted growth, whether directly or indirectly through the broadening of the economy's base. However, while government action, including the provision of sector-specific public goods, can provide important impetus for new industries and products, the focus on specific sub-sectors can also skew the economic structure and become a source of vulnerability, as the experience with electronic exports has shown. In addition, the opportunity costs of government support also need to be taken into account.

129.   As Malaysia has reached middle-income status, the dominance of manufacturing is declining. At the same time, this sector will need to diversify further to reduce dependence on a few industries and provide a broader basis for a MIC economy. In addition, the service sector will also likely need to develop—a process that is already well underway. However, the question then arises whether the model of strong state involvement and promotion of specific industries—as well as the FTZ model—remain suitable for such a structurally changed economy.
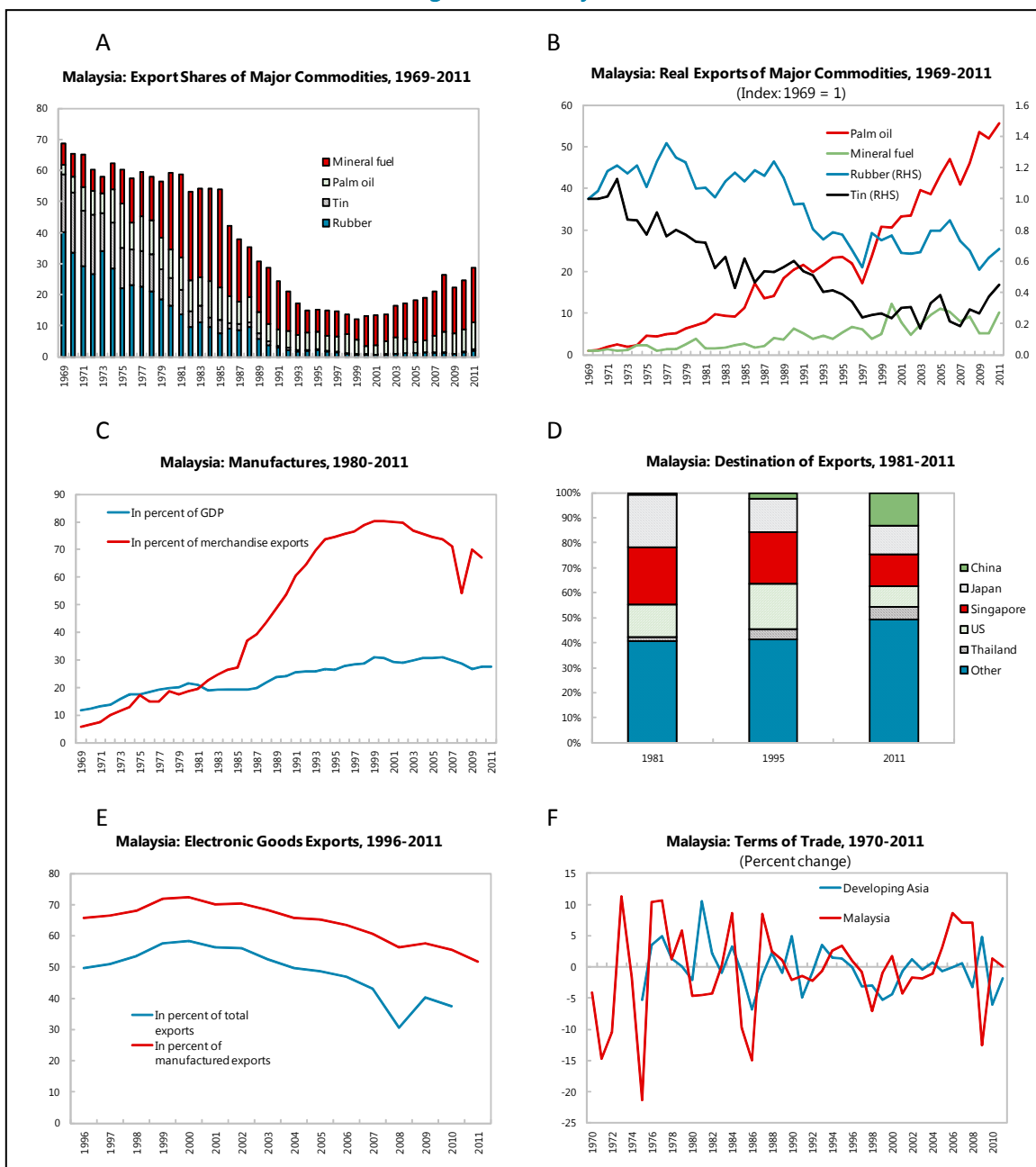
VIETNAM

130.   Vietnam has had remarkable success in achieving broad-based economic growth over the past quarter-century. GDP per capita (on a PPP basis) rose from less than $700 in 1990 to over $3,300 in 2011. At the same time, the economy became much more open: exports of goods and services rose from about one-third of GDP to 86 percent of GDP, and inflows of foreign direct investment (FDI) from an annual average of less than 4 percent of GDP in 1990-92 to 7½ percent of GDP in 2008-11. Hand in hand with growth went significant structural change of the economy. While the economy-wide diversification index (see Section II) does not show diversification, the agricultural sector declined from 32 percent of GDP in 1990 to 16 percent in 2011, while industry and construction rose from 25 percent of GDP to 42 percent over the same period (Figure 33A).

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[53] However, the concentration in the product category "electronics and electrical" in the CEIC database may not capture the moving to higher value-added products.

[54] The standard deviation of terms of trade changes over the past two decades for Malaysia has been more than twice as high than for developing Asia as a whole, and is also higher than Vietnam's, which also exports oil (and is hence exposed to oil price shocks, as is Malaysia).

Figure 32. Malaysia

A

Malaysia: Export Shares of Major Commodities, 1969-2011

B

Malaysia: Real Exports of Major Commodities, 1969-2011
(Index: 1969 = 1)

C

Malaysia: Manufactures, 1980-2011

D

Malaysia: Destination of Exports, 1981-2011

E

Malaysia: Electronic Goods Exports, 1996-2011

F

Malaysia: Terms of Trade, 1970-2011
(Percent change)

Sources: Country authorities, World Development Indicators, CEIC database, Comtrade, IMF staff calculations.

The First Wave

131.   Economic reforms were pursued as a response to challenges that arose to the government's goal of sustaining high growth. Tentative steps toward improving incentives in the agricultural sector and for state-owned enterprises (SOEs) in the early 1980s and the more comprehensive *Đổi Mới ("renovation")* reforms of the late 1980s and early 1990s were launched

when it became clear that the centrally planned economy, dependent to a significant extent on declining external assistance, was not able to deliver high economic growth and rising living standards.

132.   The launch of *Đổi Mới* in December 1986 opened large new areas of activity to the private sector, both domestic and foreign. The first set of reforms concentrated on the agricultural sector, price formation, trade and foreign exchange, and macroeconomic stabilization. In the agricultural sector, individual land use rights were recognized and collective assets privatized, and production was freed from state-set quotas. Between 1987 and 1990, prices were liberalized, the rationing system largely abolished, and subsidies significantly reduced. In the external sector, trade and access to foreign exchange were partially liberalized, the official exchange rate devalued, and the economy gradually opened further to FDI. Macroeconomic policies focused on reducing inflation. In implementing these reforms, the authorities generally moved forward in a step-by-step approach, building on newly-gained experience as they went. (Van Arkadie and Mallon, 2003).

133.   With key constraints removed and macroeconomic conditions improved, domestic entrepreneurs and foreign investors were able to realize the underlying potential of the economy. Key strengths were a large, low-cost and relatively well-educated labor force (education levels were much higher than in countries of comparable per-capita income) bequeathed by the pre-reform era, a strong work ethic and entrepreneurial spirit, a sizable diaspora of overseas Vietnamese to serve as a source of knowledge and capital, and proximity to major economic centers of the fastest-growing region in the world.

134.   With around 80 percent of the population living in rural areas, agriculture was first to expand and diversify. The production of staples, above all rice, increased rapidly, and the sector also diversified into cash crops and marine products, production of which grew even faster than that of rice (Figure 33B). As the agricultural sector grew and diversified, so did its exports, which accounted for almost half of all exports in 1995, before their share declined as oil and industrial products became more prominent. Within agricultural exports, the dominant position of rice gradually eroded, and a more diversified structure took hold (Figure 33C), with coffee, and marine and forestry products gaining in importance.

135.   The opening of the economy to FDI helped develop economic sectors beyond agriculture, diversifying the economy further. Initially, FDI was concentrated in the oil sector, but real estate (including hotels) and food processing and, from the mid-1990s, both heavy and light industries gained in importance as restrictions on ownership were lifted. FDI was instrumental in raising exports, and export patterns mirrored FDI developments as the share of foreign-invested enterprises in exports grew. Exports of oil and heavy industrial products rose first, before light industries, which already had a significant share of exports, increased their contribution even more. Light industries encompass a large variety of products, and Vietnam gradually expanded the range of its output and exports, from textiles to footwear and electronics.

136.   With the diversification of exports and increasing FDI came also a diversification of destinations of exports (Figure 33D). In the late 1980s, the Soviet Union was the most important trade partner, but was replaced by Japan and other Asian countries, and later European countries other than Russia, and the United States. As a result, Vietnam has now a well-diversified range of export destinations. One possible explanation is that as Vietnam was integrated into the emerging global supply chains in various product categories, this essentially opened the global market for products (at least partly) made in Vietnam. One indication for this is that FDI from Asian countries, including Korea, Taiwan POC, Singapore and Malaysia accounted for almost 45 percent of cumulative FDI (up to 2010), whereas the share of exports to these countries remained much smaller. The United States, on the other hand, rapidly became a major export destination for Vietnam, even though U.S. direct investment in Vietnam remained relatively small.
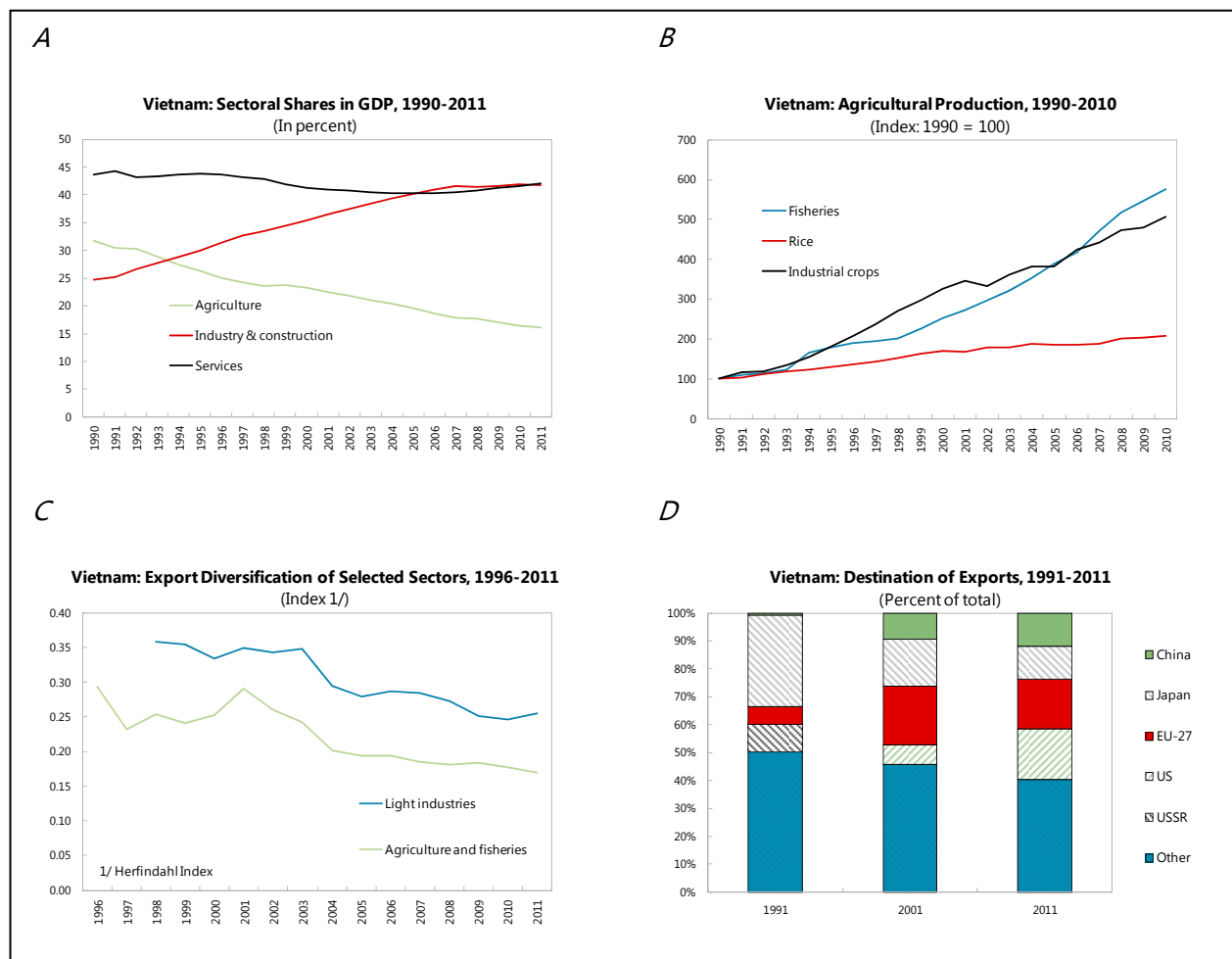
Further Reform: After the Asian Crisis

137.   The first-wave reforms were successful in raising productivity and growth, and opening opportunities. However, they were also limited in scope, and the effect of the initial reforms faded over time and growth began to decline. The Asian crisis in 1997/98—even though Vietnam was relatively less affected than other countries in the region— exposed the limits of the previous reform efforts and spurred the government into a second round of reforms.

138.   These concentrated on reducing and simplifying administrative procedures, improving the legal standing of private and foreign-invested enterprises, further opening the economy to trade and competition, and reducing the cost of doing business. New legislation greatly simplified licensing requirements and other administrative procedures, and ensured the equal treatment of domestic and foreign-invested enterprises. Trade barriers were further reduced. Reforms in the telecommunications and power sectors reduced communication and electricity costs, and investment in infrastructure lowered transportation costs. Importantly, many of these reforms were associated with the accession to the World Trade Organization (WTO) in January 2007, which thereby became a commitment device to reinforce the credibility of reforms. The state also granted preferential treatment to some SOEs with the aim of building strategic industries, e.g., in shipbuilding, but this has not played a major role in diversification.[55]

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[55] While SOEs' performance has improved compared to the pre-reform era, in part due to the greater autonomy they were granted early on, they now tend to lag behind private sector in capital and labor productivity, and autonomy has become detrimental to accountability.

Figure 33. Vietnam

A

Vietnam: Sectoral Shares in GDP, 1990-2011
(In percent)

- Agriculture
- Industry & construction
- Services

B

Vietnam: Agricultural Production, 1990-2010
(Index: 1990 = 100)

- Fisheries
- Rice
- Industrial crops

C

Vietnam: Export Diversification of Selected Sectors, 1996-2011
(Index 1/)

- Light industries
- Agriculture and fisheries

1/ Herfindahl Index

D

Vietnam: Destination of Exports, 1991-2011
(Percent of total)

- China
- Japan
- EU-27
- US
- USSR
- Other

Sources: Country authorities, IMF staff calculations.

139.   These reforms were similar to those of the first wave in that they essentially removed barriers to activity. As a result, overall investment and FDI once more rose rapidly, with a large share of investments going to wholly foreign-owned entities rather than, as previously, to joint ventures. With an improved business environment, remittance inflows (which, to some extent, are driven by profit motives (IMF 2006) and can at least partly be considered capital inflows) also continued to rise.[56] The role of joint stock private banks grew, as did credit to the private sector. In terms of diversification, the new reforms essentially provided the impetus for previously established trends to continue. The industrial structure and exports diversified further, with nontraditional exports (i.e., outside the agricultural and textile sectors) gaining ground, and anecdotal evidence

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[56] The government implemented a series of reforms to encourage remittances. Among others, a 5 percent tax on remittance inflows was abolished, arbitrary treatment and potential seizure discontinued, foreign transfer companies were allowed, and investment opportunities improved.

indicating that even within manufacturing subsectors, e.g., textiles and electronics, exporters have moved to more sophisticated products.

Lessons and Challenges

140.   In Vietnam, "waves" of supportive reforms have sustained diversification and structural transformation. While it is difficult to identify economic diversification as a policy goal *per se*—it has rather been the result of policy reforms that were pursued to promote overall economic development—it is arguable that it has been an important element of Vietnam's successful growth strategy.

141.   At the current juncture, once again, Vietnam finds that reform efforts were successful but have run their course. As the global crisis has developed, Vietnam's increasingly credit- and investment-driven growth model has reached its limits as macroeconomic stability has been eroded and growth slowed. In response, in addition to re-emphasizing macroeconomic stability, the government is preparing a new set of reforms aimed *inter alia* at streamlining public investment and the performance of SOEs as key planks for boosting growth in the medium term.

142.   However, Vietnam is facing a broader set of challenges as it becomes a middle-income economy. For continued income growth, the economy will likely need to move to production and export of a diverse set of higher-value-added products. To upgrade the production structure and diversify it away from low-cost assembly, two key areas of further reform stand out. First, investments in higher education will be needed to equip the workforce to compete not only on price but also on quality and innovativeness, and enable entrepreneurs to move into new areas of production. Second, for the economy to become more flexible and new opportunities to be exploited, the government will need to rely more on market mechanisms and less on direct administrative controls to steer the economy (though regulatory oversight will of course continue to be needed to contain negative externalities and systemic risks, e.g., in the financial sector).

TANZANIA

143.   Tanzania is a prime example of a low income country that experienced a major economic transformation since the 1990s. As in Vietnam, its successful diversification away from low value-added agriculture to higher value-added manufacturing largely owes to waves of comprehensive policy and structural reforms that began in the mid-1980s, and accelerated from the mid-1990s. These reforms aimed at transforming a state-dominated welfare state to a market economy, and covered a broad range of areas including exchange, price and trade liberalization, tax and public finance reforms, introduction of a modern monetary policy and the liberalization of the financial sector, reforms of the public sector and privatization of SOEs, and the onset of regional integration.

144.   From the turn of the millennium, economic performance in Tanzania has improved significantly. Growth accelerated markedly, from an average of 3 percent during the 1990s to an average of 6¾ percent during 2000-2011, with per-capita income (on a PPP basis) more than

doubling to $1,610 since 2000. Labor and total factor productivity increased by more 30 percent in the last decade. Concomitantly, the economy stabilized, as inflation fell from double to single digits, and the public debt burden declined substantially (partly thanks to increased foreign aid and debt relief under the HIPC initiative and MDRI in the mid-2000s). At the same time, the economy began to diversify away from low value-added agriculture to higher value-added manufacturing.

145.   Economic reforms of the socialist economy began in the mid-1980s in response to weak growth, high inflation, and a balance of payments crisis (Edwards, 2012; Nord et al., 2009). The reduction of market and policy distortions started with the launch of the Economic Recovery Program in 1986. The exchange regime was gradually liberalized to eliminate overvaluation that penalized exporters, first by the introduction of a crawling peg in 1986 and subsequently by full exchange rate unification in 1993, eliminating restrictions on current account transactions and on holdings of foreign currency. In parallel, the economy was opened up to international competition by simplifying export and import procedures, removing restrictions on trade, reducing tariff and non-tariff barriers, including in the context of regional integration in the East African Community (EAC), and allowing the private sector to replace state owned marketing boards (state monopolies). By 1991 domestic price controls had also been lifted on almost all products (from more than 400 regulated prices in 1990), except for petroleum and public utilities. The domestic economy has been further deregulated through the reform of loss-making parastatals sector and the launch in 1993 of a comprehensive privatization program. However, reform efforts were derailed in the early 1990s, leading to another episode of weak performance (as well as declining donor support). Eventually, beginning in 1996, the market-oriented reform efforts resumed on a stronger basis of national ownership. Since then, the economy has been transformed. By 2003 most of manufacturing and commercial parastatals have been restructured, liquidated or transferred to private ownership, while non-commercial entities merged into government bodies. Since 2002 the government's efforts shifted to strengthening the business environment, and business licensing and registration were simplified, labor policies reformed, and property rights strengthened. The financial sector was also liberalized—the entry of foreign banks was allowed from 1992, while state-owned banks were restructured and privatized, or liquidated. Consequently, private sector credit took off since 2000, growing from about 4 percent of GDP in the late 1990s to close to 19 percent in 2011. Management of public finances was strengthened through tax policy reforms, including the introduction of VAT in 1998 and improved tax collections, and optimization of expenditures. In addition, increased public investment in infrastructure including in the energy sector, has provided a platform for productivity growth in the private sector and expansion of exports.

146.   The broad front on which reforms have advanced has led to rapid and significant gains. The removal of constraints and the establishment of macroeconomic stability allowed the private sector to exploit new opportunities. This was reinforced by a significant increase in inflows of FDI, attracted by the large-scale privatization of SOEs which presented opportunities in gold mining, manufacturing, tourism, and the financial sector. At the same time, donor support was scaled up in response to the government's reforms, which helped increase public investment and poverty alleviation. As a result, in terms of overall economic diversification, Tanzania, which was the least diversified economy in the sample (except for Angola) in 2000, became the most diversified by 2011.

Similar rapid progress was made in export diversification, both in terms of products and geographical reach.

The Domestic Economy

147.   The agricultural sector's share in total output declined from 32 percent in 1998 to 23 percent in 2011. Even as the share of agriculture in output and exports declined, the sector itself diversified. Output of high-volume cash crops, such as cotton and coffee, continued to grow, but smaller-volume crops such as cashew nuts, tobacco, and tea grew faster. In addition, the sector was also reoriented toward increased production for the domestic market to meet the demands of a rapidly growing population.

148.   During the same time, manufacturing, construction and services (excluding the public sector) have increased their shares of the economy (Figure 34A). Growth in manufacturing was driven primarily by small-scale production aimed at the domestic and regional markets, supported by strengthening demand within the EAC common market, even though the share of exports to the EAC has remained small.[57] Growth was even faster in construction and non-tradable services such as domestic trade and transport. This reflects partly the liberalization of food crop marketing and subsequent replacement of the underdeveloped distribution system of the previous planned economy by private traders, but also spillover effects from tourism and manufacturing.

149.   The mining sector—which consists mainly of gold mining—also has grown rapidly, though it remained small. Supported by FDI, it expanded from 1.6 percent of output in 2000 to 2.7 percent in 2007 (and declined again slightly to 2.3 percent by 2011). However, the impact of gold on trade has been much larger as gold prices rose by over 450 percent during the same period.

Trade

150.   Gold has become the single largest export, accounting for 9¼ percent of GDP in 2011, and 30 percent of total exports of goods and nonfactor services (and 43 percent of exports of goods), making Tanzania the fourth largest gold exporter in Africa. Much of this increase is due to improved terms of trade, but even taking into account the effect of rising gold prices, the volume of gold exports still rose by about 250 percent between 2000 and 2011 (Figure 34B).

151.   The broadening of the domestic economy has also been accompanied by greater export diversification (Figure 34C). Overall exports of goods and nonfactor services have grown from 14½ percent of GDP in 1997 to 31 percent in 2011. Manufacturing exports have grown rapidly, from 3 percent of non-gold GNFS exports to 16 percent (and rose by 5½ percentage points of GDP), while traditional exports declined from 19 percent to 13 percent of non-gold GNFS exports.

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[57] The Annual Survey of Industrial Production 2008, conducted by Tanzania's National Bureau of Statistics, reports that 88 percent of manufacturing enterprises employ less than 5 workers, and 97 percent employ less than 10 workers.

152.   With the changing product structure of exports, the geography of Tanzania's trade has also changed (Figure 34D). The share of the EU as a main trade partner declined considerably and new partners emerged. Most importantly this reflects the emergence of gold as a significant source of exports, accounting for a large share of trade with Switzerland and China. At the same time, Tanzania's regional trade also increased, especially with the EAC and South Africa.

Figure 34. Tanzania
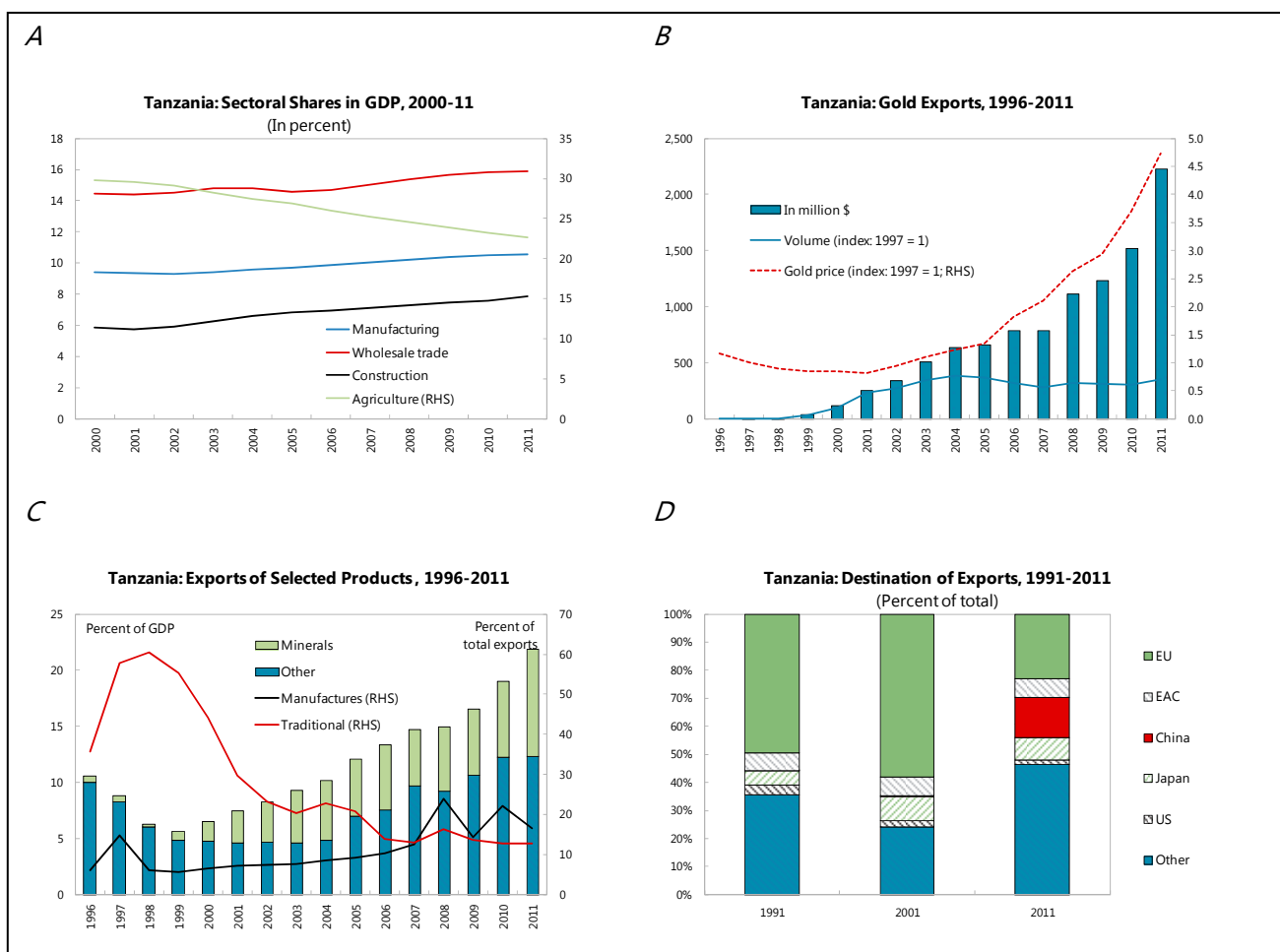
Sources: Country authorities, IMF staff calculations.

Lessons and Challenges

153.   Tanzania has been successful in diversifying its economy. The broad economic liberalization over the past 1½ decades has yielded significant benefits in terms of growth and diversification, suggesting that removal of constraints—as in Vietnam—has been a key factor, even though this process has also been helped by external developments. External factors include rising commodity prices, which have supported investment in new industries and thus diversification of

the economic (and export) base, and provided additional government revenue which, in turn, has enabled higher public investment that benefited other industries as well.

154.   Nevertheless, Tanzania still has relatively low income per capita. To achieve a higher level of development, it will therefore need to sustain its recent growth rates, while increasing the share of manufacturing in output, and further increase trade (which, by East Asian standards, it still relatively small). This will require significant investments in infrastructure as well as human capital—Tanzania is lagging Asian peers significantly in health and education indictors.[58]

155.   However, Tanzania's economy may experience another commodity boom. If the presence of commercial quantities of gas is confirmed in the near future, the country is likely to receive multi-billion dollar foreign investments in the coming years and become one of the largest exporters of natural gas in the region by 2020. Such a development might quickly lift output, but would also make production and exports dominated by commodities. Tanzania will then face significant policy challenges that are common to many resource-rich countries—real appreciation, increase in labor costs, crowding-out of investments in other sectors, difficulties in containing inefficient public spending, and inflationary pressures. If left unaddressed, highly profitable extractive sectors would absorb most productive labor while trapping the rest of the economy in low value-added production. A comprehensive policy and institutional framework for managing natural resource wealth will be required to avoid loss of competitiveness in other tradable sectors and sustain growth in the manufacturing sector, which is a key ingredient to transitioning to an MIC. At the same time, additional reforms are needed to strengthen the business environment and remaining non-tariff barriers, and harmonize regional norms and investment rules to develop and fully exploit comparative advantages within and outside the region.

BANGLADESH

156.   Since independence in 1971, Bangladesh's economy has experienced a significant rise of manufacturing. GDP has grown on average by 4¼ percent per year since 1971, accelerating to over 6 percent in the last decade, and GDP per capita (on a PPP basis) rose 10-fold to over $2,000 in 2011. During the same period, exports of goods and nonfactor services more than tripled as a share of GDP to 23 percent, and inflows of FDI increased strongly. The economy also diversified, though only up to a point: readymade garments (RMGs) replaced jute and jute products as the main export earners. However, subsequently, exports have concentrated again, this time in RMG. Strong growth also helped reducing poverty, raising life expectancy, and improving general socioeconomic conditions (Ahmed and Sattar, 2004).

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[58] In 2008, life expectancy at birth was 56 years, compared with 74 years in Vietnam, and adult literacy 73 percent, compared to 93 percent in Vietnam (World Development Indicators, World Bank).

The First Phase: Readymade Garments

157.   The initial diversification into RMGs was triggered by external factors. The introduction of the generalized system of preferences (GSP) in the early 1970s and the multi-fiber agreement (MFA) in 1975 opened opportunities for the Bangladeshi economy. Following the war of independence, the government had nationalized many medium- and large-size industrial enterprises that had been owned by West Pakistani entrepreneurs. At the same time, attempts to promote domestic private entrepreneurs met with limited success. In response, and using the opportunity afforded by the allocation of textile export quotas in the MFA, the government began to create export processing zones (EPZs), the first of which opened in 1983. EPZs provided a number of incentives, including tax holidays and exemptions, duty-free imports of investment goods [and raw materials], duty-free exports, accelerated depreciation, back-to-back letters of credit, and allowances for remittances of royalty, technical, and consultancy fees (Islam and Mukhtar, 2011). To attract FDI, they also allowed 100 percent foreign ownership.

158.   The success of the EPZs has been startling. In the 1970s, jute and jute products accounted for about 70 percent of export earnings, with other agricultural products accounting for the remainder. Fueled by low wage costs and generous incentives, the manufacturing of RMGs took off in the 1980s: exports of RMG rose from $32 million in 1984 (Ahmed and Sattar, 2004) to $18 billion in 2011 (Figure 35A). The RMG sector also contributed significantly to employment creation and poverty reduction. Backward and forward linkages to the domestic economy over time also increased the domestic content of RMG exports. The share of the manufacturing sector in the economy rose from 11 percent in 1980 to 18 percent in 2011 while that of agriculture fell, and concentration declined (Figure 35B). The EPZs also attracted increasing amounts of FDI, though only beginning in the late 1990s, after Bangladesh had joined the WTO.

159.   However, after initially contributing to diversification, RMGs increasingly dominated exports. This coincided with a concentration in export markets, as RMG exports increasingly went to a few key markets, though more recently, export destinations became again more diversified. (Figure 35C). The failure of EPZs to attract investment in other industries precluded a broadening of the export base, as well as the development of stronger linkages with the domestic economy.

160.   In addition to the EPZs, the government also introduced other reforms. Trade barriers—both tariff and non-tariff—were somewhat relaxed, the role of the state in the economy reduced, including through privatization of some enterprises, and price controls removed. The market for inputs for the agricultural sector was liberalized but restrictions remained on the marketing of the sector's output. While these reforms had partial success (Figure 35D), notably in raising rice production and the development of the shrimp sector,[59] they were insufficient to trigger a decisive

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[59] Exports of frozen food, which consist largely of shrimps, increased more than four-fold since 1990, and the shrimps are now the (albeit distant) second largest export after RMGs. Also as a share of total agricultural output, fishing increased from 15 percent in 1980 to 22 percent in 2011.

increase in private sector investment, or to diversify the economy significantly beyond what was achieved through the EPZs.

The Second Phase: Broader Liberalization

161.   In the early 1990s, the government embarked on a second phase of economic reform, which culminated in accession to the WTO in 1995. Trade was liberalized much more substantially than before through a substantial reduction and rationalization of tariffs and removal of quantitative restrictions (though ad-hoc changes to the tariff regime continue to be made with each budget), the currency devalued and a flexible exchange rate introduced, and restrictions on current payments were lifted in 1994. The reduction of trade protection and exchange reform sorted the manufacturing sector into winners and losers: the RMG sector, which had already been operating in the international marketplace, gained as did small enterprises gained since they were able to reduce input costs, while the less flexible larger enterprises, often publicly owned, had less success in adapting to competition.

162.   As a result, domestic investment rose substantially, partially financed by increasing remittances from overseas Bangladeshis (Figure 35E).[60] This has led to some further diversification of the economy as a whole, even as its pace slowed significantly, as the construction and trade sectors expanded their share of output, and manufacturing continued to grow (Figure 35F). Within manufacturing, diversification has also increased somewhat, as shipbuilding, pharmaceuticals, and light manufacturing have been expanding. However, exports continued to concentrate in RMGs; only in recent years have exports re-diversified somewhat, though to a significant extent within the textile and leather sector.

Lessons and Challenges

163.   Bangladesh has had limited success in diversifying its economy, but there is much room for further progress. Economic reform and the success of the RMG sector in the EPZs have decisively shifted the economy away from its dependence on agriculture, and growth accelerated. Concomitantly, the economy as a whole has diversified, but exports have not since they were confined to essentially one sector. Other industries have not been able to replicate the export success of the RMG sector in EPZs on a large scale. However, Bangladesh's economy and its exports have still much room to expand.

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[60] FDI rose as well, but the amounts remained small, never exceeding 1½ percent of GDP. Furthermore, after the expiration of the MFA in 2005, FDI as a share of GDP declined.

Figure 35. Bangladesh
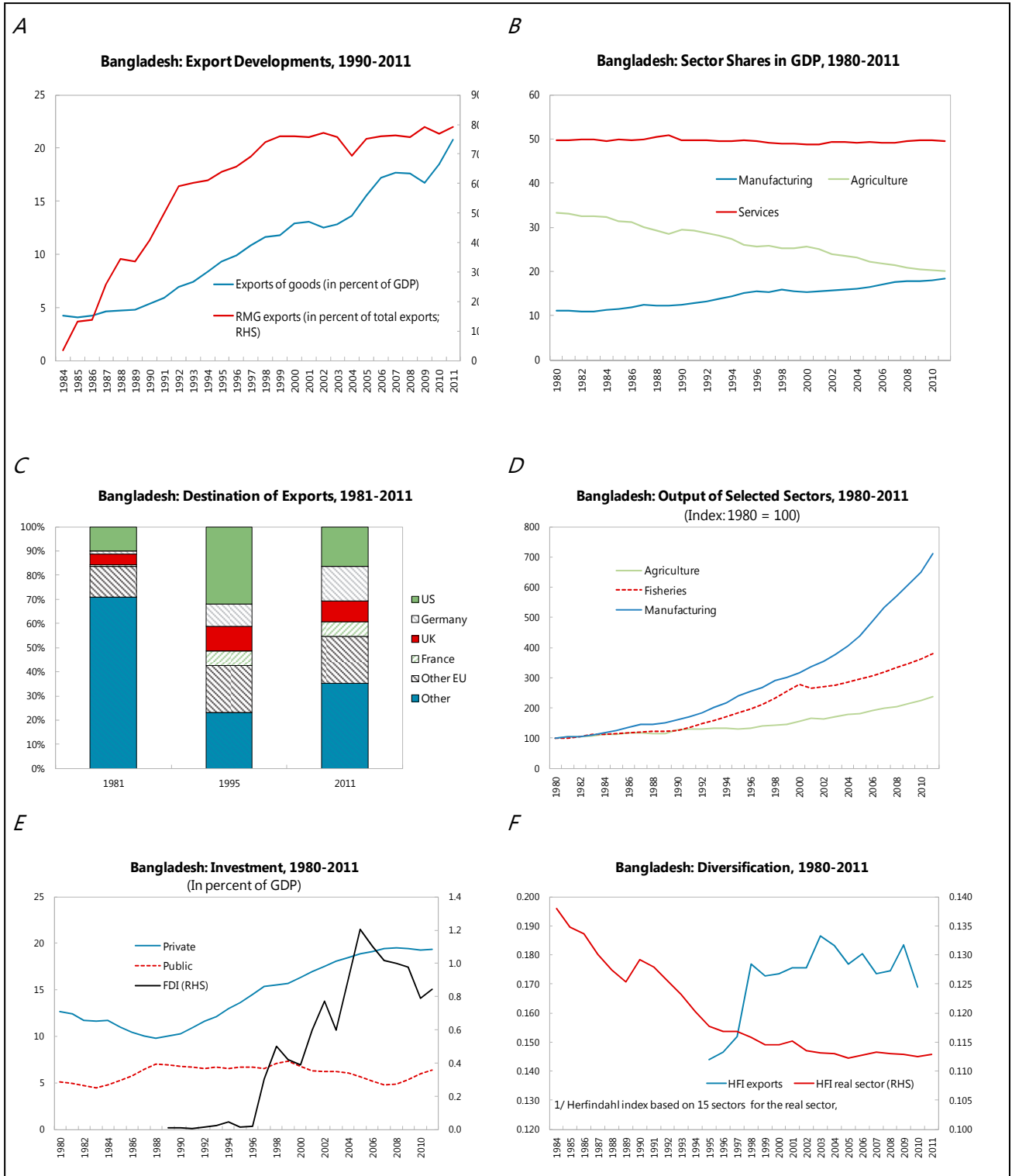
Sources: Country authorities, IMF staff calculations.

164.   **Trade and manufacturing are small relative to the economy's size, and nascent industries could** eventually expand their market share, both in the economy as a whole and in exports.[61] At the same time, it is unrealistic to expect a pace of diversification similar to that prevailing through the mid-1990s in the economy as a whole, even though the beginnings of export re-diversification are visible.

165.   **It is now critical to reduce dependence on a single export sector while sustaining export and output growth.** To improve the investment climate outside of EPZs and set the manufacturing sector on a broader basis, further economy-wide reforms will be needed, as well as investment in infrastructure and human capital. Trade barriers and distortions remain high compared to neighboring countries, and Bangladesh ranks low on control of corruption, government effectiveness, and regulatory quality including with regard to property registration, contract enforcement, and the adjudication processes (IMF 2012). Poor governance performance in the economy as a whole has not impeded investment in EPZs, but is likely hindering a broadening of investment. Furthermore, public investment in improved infrastructure, especially power supply, is needed to increase returns on private investment. To finance this, revenues will need to be raised, but this is more difficult in Bangladesh than for other countries in the sample, since it has fewer natural resources the rent from which can be taxed. Lastly, investment in human capital—health and education—will also need to rise to equip the workforce with the skills needed to move to higher value-added production. Similar to Tanzania, Bangladesh lags East Asian comparators in health and schooling.[62]

ANGOLA

166.   **In 2002, Angola emerged from a decades-long devastating civil war,** to become Africa's second largest oil exporter and its third largest economy. Real GDP rose 2½-fold since the end of the civil war and reached over $6,200 per capita (in PPP terms), and the country has begun to recover from the effects of the war. Nonetheless, the economy remains largely dependent on the oil sector, the revenues of which drive other economic sectors as well as government spending.

The Legacy of the War

167.   **The civil war reinforced the dominance of the oil sector.** While rising oil prices in the 1970s and 1980s would likely have boosted the importance of oil in the economy in any event, the destruction wrought by the civil war reinforced that trend. The war severely decimated infrastructure and weakened institutions, and brought the non-oil economy to a standstill. It destroyed the agricultural sector, damaging farmland through mining; the total crop area fell by over 40 percent during 1975–2003 (Mitchell and Stevens, 2008). Up to 1970, Angola's non-oil sector was dominated

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[61] Total trade in goods as a percentage of GDP was estimated at 48 percent in 2011 compared to 95 percent among low-income ASEAN countries.

[62] In 2008, life expectancy at birth was 66 years, while adult literacy stood at 55 percent (World Development Indicators, World Bank).

by agriculture; the average share of agricultural and livestock in total exports in the first half of the 1970s amounted to 37 percent, but dropped to 13 percent in the second half, and to less than one percent by 2002.[63] Angola was the fourth largest coffee exporter in the world, and also exported substantial quantities of maize, which made it one of the largest staple food exporters in Sub-Saharan Africa. The manufacturing sector, not strong to begin with, also suffered during the conflict. At the same time, oil production rose as offshore fields were largely unaffected by the war.

168.   When the civil war ended, the economy was dichotomous, and oil was dominant. In 2002, it accounted for 50 percent of GDP, [89] percent of public revenue, and over 90 percent of export proceeds (diamonds accounted for a further 6 percent), while much of the remainder of the urban economy depended on inflows of oil revenue, from which the rural economy did not benefit. The extractive industry is characterized by capital-intensive technology with few employment opportunities, though oil revenue fueled other sectors such as construction and trade. At the same time, agriculture accounted for just over 10 percent of total GDP, and received less than [two] percent of total bank financing even though [70] percent of the population were living in rural areas and are directly or indirectly engaged in subsistence farming. Spillovers from the oil economy on the majority of the population have been therefore limited.

Reconstruction

169.   After the conclusion of the peace agreement in 2001, a massive construction effort was launched, financed by oil revenue (Figure 36A). In its first phase, the program focused on repairing essential infrastructure and addressing the conditions of a large, displaced population. Starting in the mid-2000s, a second wave of investment took place, with emphasis on housing and transport infrastructures. These large investments by the public sector, as well as the demand of the oil sector itself, fueled strong growth in the manufacturing, construction, transportation, and (business) service sectors, and contributed to a modest diversification of the economy (Figure 36B).[64] Nonetheless, even while annual GDP growth during 2002-08 averaged 15¼ percent, these sectors ultimately remained dependent on oil revenues, three quarters of GDP is concentrated in the capital Luanda, and the public sector dominates the economic sphere (Figures 36C-D).

170.   The agricultural sector has not benefited from the post-war economic boom. Angola continues to import about 90 percent of its food, while the fertile land in the east and center of the country is largely inaccessible due to the legacy of mining and inadequate transport infrastructure. In addition, storage facilities are insufficient to meet the demands of the large cities, and there is virtually no access to finance. As a result, agriculture remains small, and continues to contribute little to economic growth, despite its huge potential.

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[63] In addition to the impact of the war of independence, which began in 1974, and the subsequent civil war, the rise in international oil prices following the first oil shock also reduced the share of agricultural exports.

[64] The inflow of oil revenues as well as scarcity also contributed to a real estate boom.
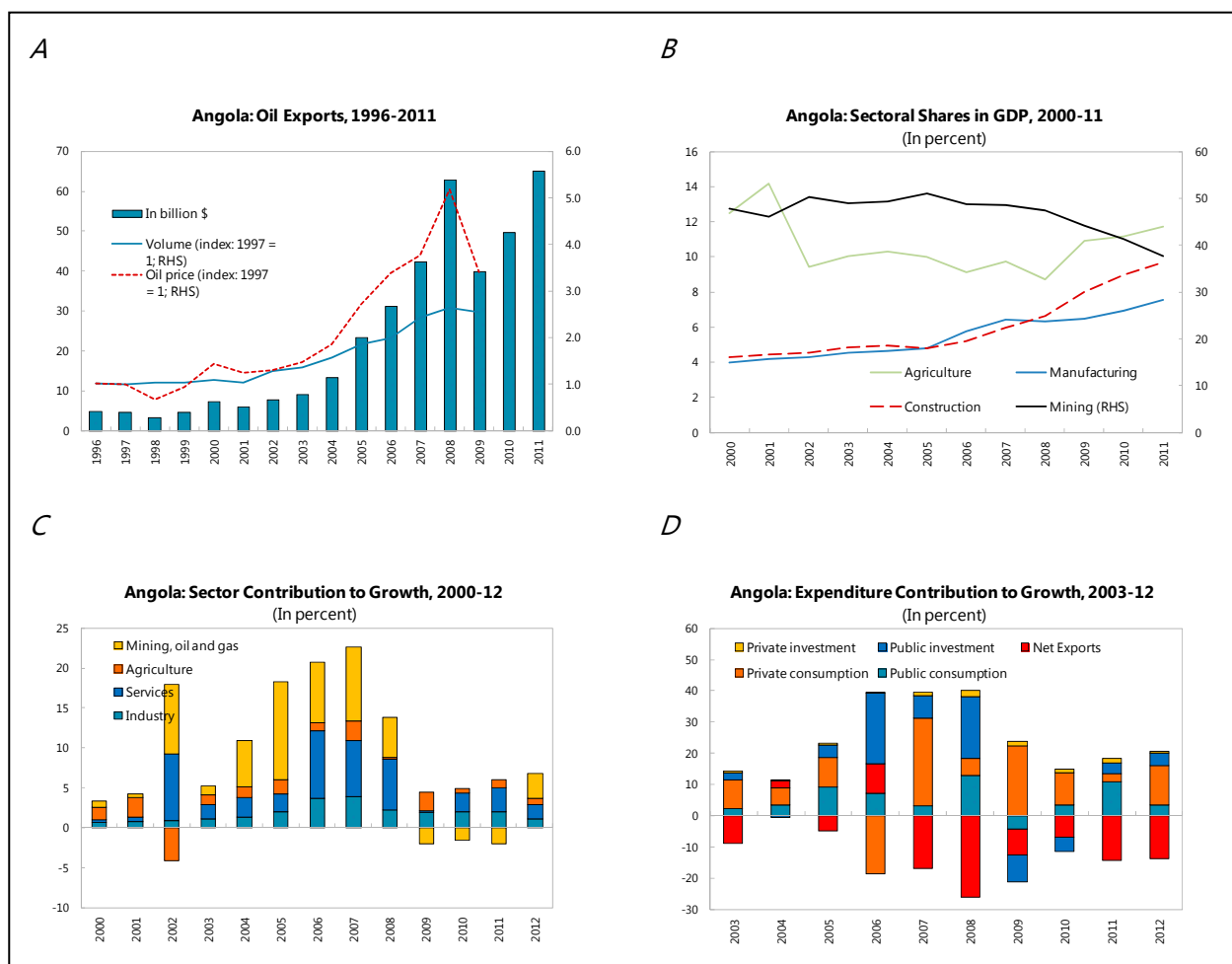
171.   The dominance of oil is also reflected in Angola's export composition. With domestic demand fueled by oil revenue and thus undermining other export sectors, and oil prices and production rising, the share of oil in total goods exports rose further, to 99 percent in 2011. While geographic diversification of globally traded commodities does little to insure against price fluctuations, the replacement of the United States as the largest buyer of Angolan oil by China has been accompanied by an increasing commercial Chinese presence in Angola (oil and construction sectors), as well as a large (and growing) Chinese labor force which, however, has further limited the spillover from oil on the domestic population.

172.   The dependence of the economy on oil was highlighted in the global financial crisis. Oil revenue declined, exacerbated by volatility in oil revenue flows to the treasury, and the exchange rate depreciated, necessitating a sharp fiscal consolidation and triggering a sharp growth slowdown.

Challenges

173.   Diversifying the economy is critical to reduce vulnerabilities and achieve inclusive and sustainable growth. The government has begun to shift its policy focus toward structural transformation and diversification as key strategic goals. For this strategy to be successful, broad-based policy reforms, as in some of the other countries in the sample, will be required to improve the investment environment. This includes both regulatory and governance reform, as well as macroeconomic policies aimed at reducing volatility and securing stability. In addition, investment in infrastructure, in particular transport, power, and water, is needed both for industrial development and to realize the economy's large agricultural potential (and with it, the generation of employment and poverty reduction). Lastly, investment in health and education will also be required, to improve, over time, skills and labor productivity, and reduce poverty.

Figure 36. Angola

A

Angola: Oil Exports, 1996-2011

Legend: In billion $; Volume (index: 1997 = 1; RHS); Oil price (index: 1997 = 1; RHS)

B

Angola: Sectoral Shares in GDP, 2000-11
(In percent)

Legend: Agriculture; Manufacturing; Construction; Mining (RHS)

C

Angola: Sector Contribution to Growth, 2000-12
(In percent)

Legend: Mining, oil and gas; Agriculture; Services; Industry

D

Angola: Expenditure Contribution to Growth, 2003-12
(In percent)

Legend: Private investment; Public investment; Net Exports; Private consumption; Public consumption

Sources: Country authorities, IMF staff calculations.

174.   However, the challenges to greater diversification are formidable. Oil wealth, while financing investment, also tends to crowd out other sectors and render them uncompetitive. In Angola, this effect could be mitigated with appropriate policies as outlined above, since there is a large pool of underemployed labor that could enable labor-intensive industries to operate competitively, in particular if supported by good infrastructure. In addition, agriculture could help diversifying the economy and promote shared growth. Agriculture also has close linkages to other sectors of the economy, and can provide impetus for growth in processing and manufacturing, promoting further diversification.

175.   The question arises if diversification—against the obstacle of a dominant resource sector—can be achieved with the policies outlined above, or whether deliberate policies to tilt the playing field will be required. Some other countries' experience (Malaysia) indicate that deliberate action can help in diversifying the economy, while others (Vietnam, Tanzania) suggest that broader-based policies are more important.

E.   Conclusions

176.   The country cases presented above constitute too small a sample to draw general conclusions or derive policy recommendations. However, they illustrate a range of challenges on the path to diversification, and some successful—and less successful—diversification strategies. Below are some observations believed to be salient and are likely to apply beyond the sample countries.

177.   Entrepreneurs are key to diversification and growth. Branching out into new activities and improving existing products and processes lie at the heart of successful economic development, and reducing the cost of these processes is important to encourage diversification. The case studies illustrate the importance of key ingredients in supporting entrepreneurship:

- Macroeconomic *stability*. Several countries in the sample (Vietnam, Tanzania) show that successful diversification—and higher growth—have coincided with improved macroeconomic policies and a greater degree of stability. Stability provides a more predictable economic environment, and reduces risks arising from volatility and thus the need to devise strategies to hedge against these risks. It thereby frees economic agents to concentrate on exploiting new opportunities and addressing entrepreneurial risks.

- *Removing barriers*. Similar to macroeconomic stability, though more directly, the removal or reduction of direct barriers to entry and operation tends to boost diversification and output. Lower barriers reduce costs and encourage entrepreneurs to spread their reach beyond established activities, thereby contributing directly to diversification. This is most evident in transition economies such as Vietnam where collectivization was reversed and a diverse agricultural sector emerged, but also in Tanzania, where the dismantling of the state distribution system has led to the creation of a vibrant privately-operated system, or in Bangladesh, where the removal of bureaucratic red tape has triggered large investments in EPZs.

- *Investment in infrastructure*. As with macroeconomic stability and the removal of barriers, adequate infrastructure is an important ingredient for diversification (and growth) through its lowering of business costs. This implies that the state has a significant role to play in supporting diversification, as producer and/or regulator. While some infrastructure (e.g., power) can be privately supplied on an individual basis (through generators), this tends to be more costly than reliable provision though a network.

- *Investment in people*. For the countries in the sample, manufacturing has played a large role in diversifying the economy (the exception is Angola, but diversification there is only in its initial stage). While some industries (e.g., textiles) do not require a highly-educated workforce, moving up the quality ladder and branching out into more sophisticated industries, does. In addition, a better educated workforce is also more likely to spawn successful entrepreneurs.

178.   Endowment with natural resources can support diversification, provided the "resource curse" is avoided. While large amounts of natural resources tend to lead to domination of the economy by a single sector, as in Angola, several countries in the sample that have successfully diversified (Malaysia, Vietnam, and Tanzania) have moderate endowments of natural resources. These economies have avoided crowding out effects and the resulting over-dependence on one—capital-intensive—sector of the economy, with few positive spillovers on the rest of the economy.[65] But at the same time, natural resources have boosted export and fiscal revenues in Malaysia and Vietnam (though fiscal revenues from gold exports have remained very small in Tanzania), supporting the balance of payments and the fiscal position, including public investment. Natural resource industries could also serve as a test bed for foreign direct investment, allowing both the authorities and investors to gain experience.

179.   The state can support diversification through deliberate policies, but it will need to be mindful of costs and risks. Several countries in the sample have used state support to underpin specific industries (Malaysia, Vietnam, Bangladesh), but not all were successful. In Vietnam, SOEs have largely failed in becoming leaders in selected strategic industries. In Malaysia and Bangladesh, while targeting of specific industries (palm oil, RMGs, and electronics) has been successful in its own right, the targeted sectors have become dominant, increasing export concentration. The opportunity cost of this support, in terms of foregone tax revenues or direct expenditure, also needs to be taken into account. On the other hand, in Angola, policies may be required to tilt the playing field away from oil. While public policies such as achieving macroeconomic stability, removal of barriers and public investment should help in promoting economic sectors other than oil, the sheer size of the natural resources sector might, for example through appreciation of the real exchange rate and a loss of competitiveness in other sectors (Dutch disease), undermine diversification. However, countering these effects with support for specific industries (as opposed to, for example, general low levels of taxation of the non-oil economy) could easily lead to an intensification of rent-seeking behavior, especially in an environment of weak governance.

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[65] In Vietnam and Malaysia oil exports never exceeded one quarter of total exports, and rarely amounted to even one third of government revenue. In Tanzania, gold exports have reached one-third of total exports, but do not appear to have crowded out other exports. However, if Tanzania becomes a large gas producer, natural resources will become dominant.

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