

Implications of Slowing Growth for Poverty

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Abstract

This paper examines the impact of the actual and projected slowdown in the world economy since 2012 on the poor and on the potential for achievement of the Social Development Goals (SDGs). It builds on the changes between 2012 and late 2015 in the IMF's World Economic Outlook projections to provide the basic slowdown scenario. It then uses a global model to assess the impacts of lower rates of productivity growth and consequent lower savings and investment on key price and income variables. The productivity shocks are passed directly to the production activities included in household microsimulation models for more than 300,000 households. These households are also affected by the modeled changes in prices and wages. Simulations allow us to assess the impacts of the slowdown on the real household incomes of the poor, and hence on summary statistics such as the poverty rate. The results suggest that the productivity slowdown—if continued—will slow down the reduction in the global poverty rate, increasing the importance of policy interventions focusing directly on poverty reduction if the SDGs are to be achieved.

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Implications of Slowing Growth in Emerging Market Economies for Hunger and Poverty in Rural Areas of Developing Countries

Since the recent financial crisis, the global economy has suffered a sustained slowdown to levels consistently below forecasts. For example, the IMF forecast for global growth in 2015 declined from 4.8 percent in September 2011 to 3.1 percent in October 2015. Other international organizations expect similar changes: global growth is expected to change quantitatively and qualitatively. This report looks at the implications for poverty of the slowing growth of advanced and emerging market economies, and particularly, how these less optimistic macroeconomic projections may challenge the achievement of the Sustainable Development Goals (SDGs) by 2030.

The approach that we take in this project focusses on several of the key linkages between growth in developing countries and the real incomes of the poor, and particularly the rural poor. In particular, it considers: (i) the impacts of lower productivity growth on the incomes of the poor, (ii) the impacts of changes in wage rates for unskilled workers on the incomes of the poor, (iii) the impacts of changes in key commodity prices on the incomes of the poor, and (iv) the impacts of changes in the cost of living on the incomes of the poor. By taking into account these key changes, we aim to capture the economic impacts of the decline in global, regional and national growth rates. We assess the impacts of changes in growth for individual households, check whether these result in the household rising from below the poverty line to above, or from above the poverty line to below, and use the resulting changes in the poverty headcount as an indicator of their impact on the poor. We could use measures of the poverty gap and the poverty gap squared to provide additional indicators of the impacts on the poor, but we face a plethora of results and have found from experience that these measures usually respond in ways that are similar to the poverty headcount.

In this report, we first consider the conceptual framework, focusing on the links between growth in developing countries and the real incomes of the poor. A good understanding of the ways in which the slowdown might affect people's welfare is crucial to building a cohesive analytical framework. We then describe this analytical framework: a combination of a global computable general equilibrium model offering household disaggregation features developed by the team (MIRAGRODEP) with a systematic household modelling approach to properly identify short term vs long term consequences on poverty and hunger. Finally, we describe the different growth scenarios we analyze and discuss the results.

1 Economic Growth: trend, drivers and projections

Changes in growth rates in developing economies can clearly have large impacts on the welfare of poor people in rural areas. As we have seen during the past 15 years, during which many developing economies have substantially outperformed the industrial economies, rural incomes can rise rapidly and millions can move out of poverty. The projected slowdown in economic growth in many developing countries is therefore a potentially serious source of concern. However, to make any assessment of the implications of this change for the poor, we need to think very carefully about the channels through which the slowdown might affect people's welfare in different countries.

In a first subsection, we examine the recent history of economic growth in developing countries. Then we consider some key channels through which reductions in growth rates in developing countries might be expected to affect the real incomes of the poor and near-poor, and hence poverty rates. Then we review the most recent projections for growth over the next five years. Finally, we turn to consider how we capture the impacts of the growth slowdown on poverty.

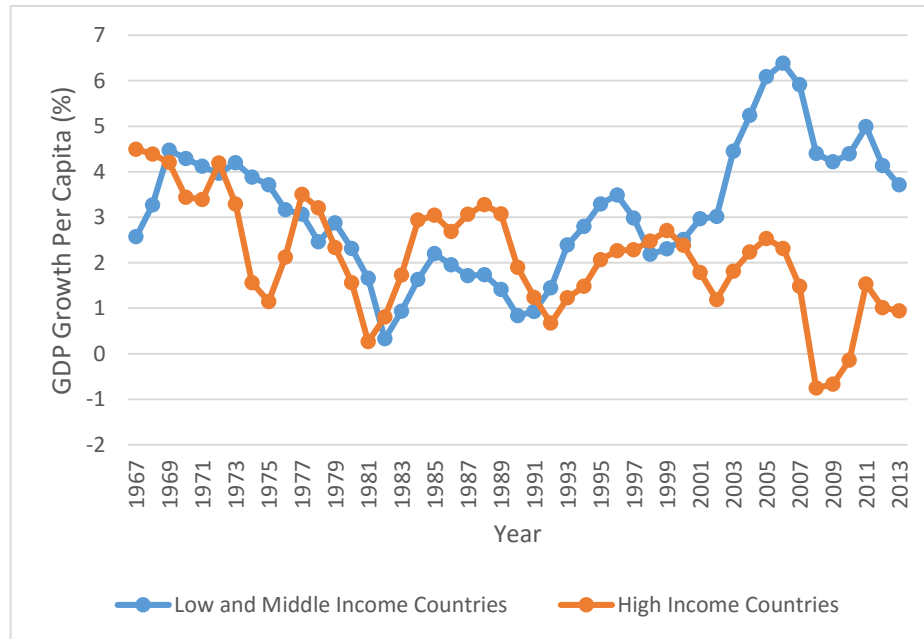
1.1. Developing Country Growth and Poverty: recent trends

There are good reasons to expect that poorer economies should grow faster than higher-income economies. To the extent that the most advanced economies are generally using the best available production techniques, they can only improve the economic efficiency and systematically raise their incomes at the rate that the best-available technology improves. By contrast, in poorer economies, it is possible to increase efficiency by catching up with the economies at the frontier, as well as by taking advantage of improvements in the best available technology. A number of initially-low-income economies have been able to increase their incomes very rapidly in this way (Lucas 1988). Quah (1988) points to a very wide range of cases in which lower-income countries or regions were able to catch up with their higher-income counterparts at a rate of around 2 percent per year. Barro and Sala-i-Martin (1992) pointed to strong convergence between US states, and Dowrick and Nguyen (1989) within the OECD set of developed economies. Ben-David (1994) pointed to convergence between countries with strong trade links.

However, prior to the 1990s, most developing countries appeared unable to grow as rapidly as their more-developed counterparts, with consequent widening of the distribution of income across countries (Lucas 1988). In the 1990s, perhaps following the extensive policy reforms in many developing countries, a pattern of higher growth in developing than in developed countries emerged. As shown in [Figure 1](#), with the exception of the Asian crisis period, average growth rates of per capita incomes in developing countries have been substantially higher than in the high income countries—with the gap in the order of 4 percentage points during much of this period. This graph understates the outperformance of the developing countries to some degree because of a composition effect—some middle income countries with very high growth rates move into the high income group while poor performers initially in the high income group move into the developing country group. The great turnaround in the performance of developing countries has, justifiably, received enormous attention because of its importance in reducing poverty in

developing countries, and raising the geo-political importance of the larger developing countries (O'Neill 2001).

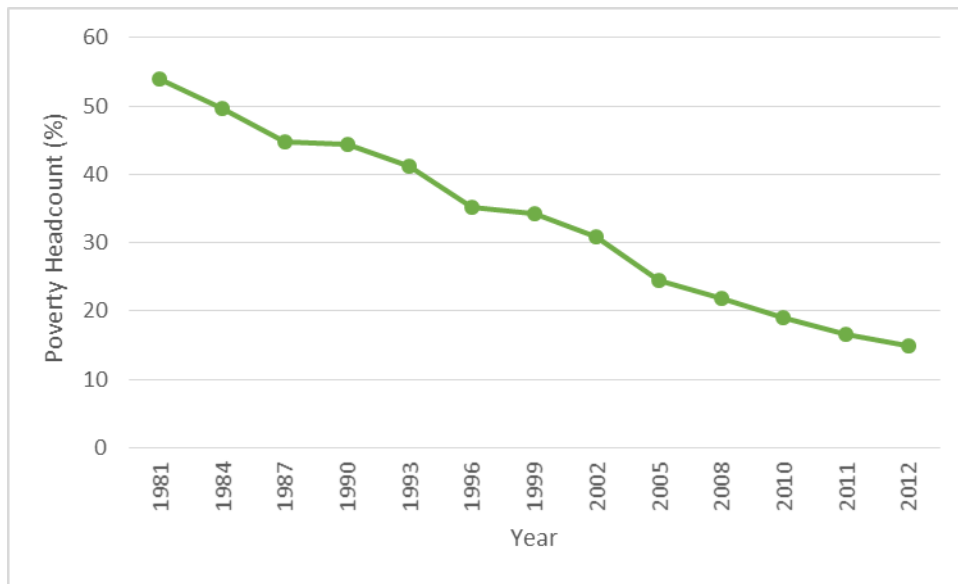
Figure 1. Growth rates of GDP per head in Developed and Developing Countries (3 year moving average)



Source: World Development Indicators, World Bank. Database version updated 24 September 2015

This increase in the growth rates of developing countries contributed to a dramatic reduction in the global poverty headcount, from 44 percent of the world population in 1990 to 13 percent in 2012, the year for which the most recent estimates are available (see Figure 2).

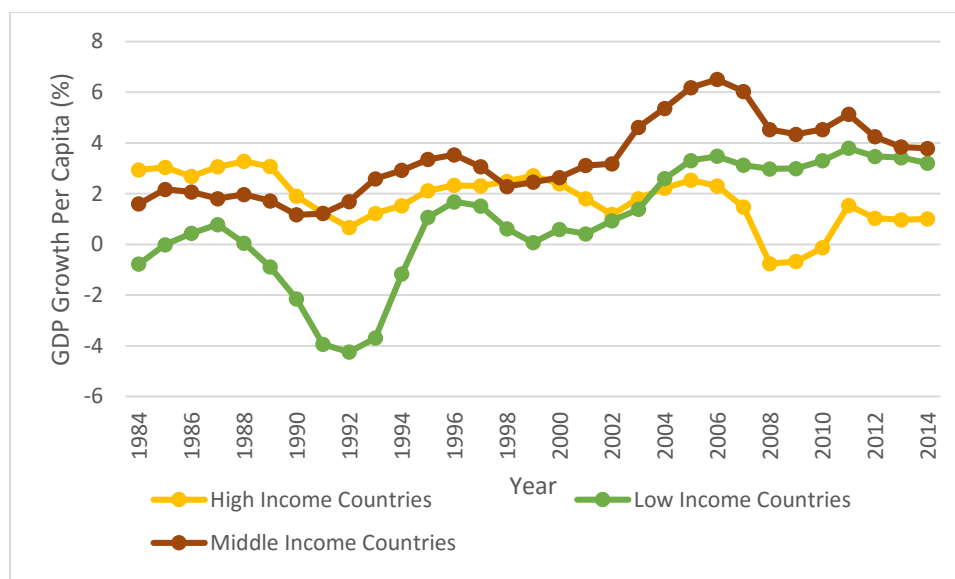
Figure 2. Global Poverty Head Count Rate (% Population)



Source: World Development Indicators (World Bank) - Poverty headcount ratio at \$1.90 a day (2011 PPP) (% of population). Extracted 3/30/2016

However, as shown in Figure 3 we can see that, until the last decade, the low income countries were lagging behind the other groups, increasing the development gap between the most vulnerable economies and the advanced and emerging economies. In the last 10 years, the low income countries have managed to outperform the rich countries despite the composition effect described earlier and, since the last financial crisis, have even surpassed the growth performance of the middle income countries giving, for the first time in decades, inclusive economic growth. In this context, it is crucial to understand the extent to which the global slowdown may oppose or confirm this trend, and, if convergence does occur, the extent to which its speed will be impacted. This outperformance is all the more remarkable given the tendency for this measure to understate the growth performance of the low-income country group as countries with the worst growth performance fall into this group from higher-income groups and the countries with the best growth performance rise out of the group.

Figure 3 Growth rates of GDP per head (% Per year) in low income, middle income and high income countries (3 year moving average)



Source: World Development Indicators, World Bank.

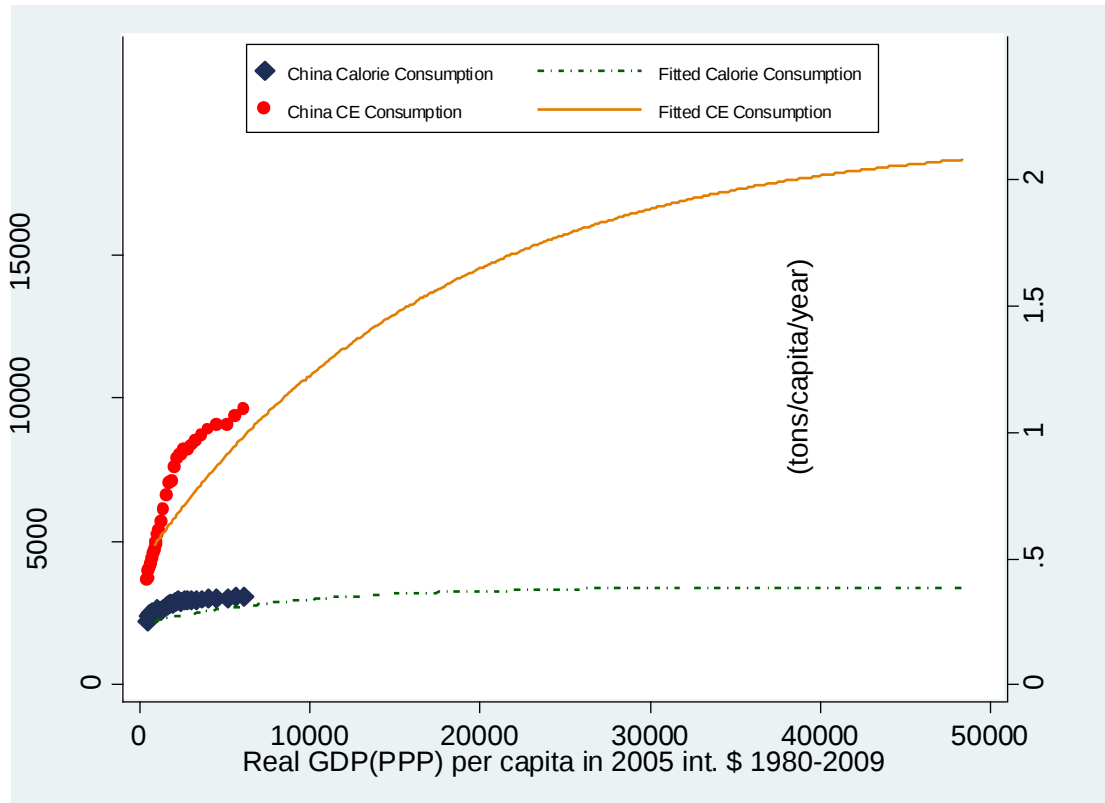
1.2. Drivers of economic growth and implications for the poor

Sustained growth in the measure of GDP used in *Figure 1* can only be achieved through improvements in productivity. The increases in productivity tend to be associated with reforms that allow increased access to imported intermediates (Amiti and Konings 2007) and to other economy-wide policy changes that allow increases in productivity in a wide range of sectors. To the extent that these productivity gains raise the productivity of the business activities of poor households—such as farms or other small businesses—they are likely to be strong contributors to poverty reduction. Productivity gains may also raise the returns to poor households by raising the wage rates earned by their household members.

Other potentially-important linkages between growth in developing countries and poverty are likely to operate through changes in relative prices. Food prices are likely to be particularly important because of their importance in both the consumption and the incomes of many poor people (Ivanic and Martin 2015). One linkage with potentially important impacts on poverty works through demand for food products. While demand for calories tends to flatten out at quite low levels of income, the demand for agricultural output continues to grow quite rapidly through the income range of today's middle-income countries and to level out only at the income level of today's highest income countries. This growth in demand for agricultural output is not for greater quantities of the same products or for more calories, but through shifts in the consumption of food towards products that require greater productive inputs—and particularly through a shift from plant-based to animal-based products (Fukase and Martin 2014). The relationships between income levels and demand for final calories and for total cereal equivalents are shown in *Figure 4*,

with actual figures for China. The cereal equivalent measures in Figure 4 take into account the much higher agricultural output requirements for producing products such as meat and dairy products more heavily consumed in richer countries.

Figure 4. Calorie consumption vs total Cereal Equivalent (CE) Consumption



Source: Fukase and Martin (2016)

Given the concave relationship between food demand and incomes, an average rate of global economic growth resulting from economic converge is likely to result in a larger increase in food demand than one resulting from higher growth in the highest-income countries. These linkages are incorporated in multi-sectoral computable general equilibrium models through higher income elasticities of demand for non-staple foods, and through the high intermediate use requirements for production of products such as meat and dairy products.

Another potentially important linkage between economic growth in developing countries and relative prices operates through the demand for investment goods in high-growth economies. If we take Doblin's (1991) estimate of the capital-output ratio of around 2.5 and assume a depreciation rate of 5 percent, then maintaining the capital stock at its initial level will require an investment rate of 12.5% of GDP. If, consistent with Kaldor's (1957) stylized facts of economic growth, the capital-output ratio is to stay constant, an economy growing at 5 percent per year needs an investment rate of 25 percent of GDP and one growing at 10 percent per year needs an investment rate of 37.5% of GDP. The dramatic increase in average growth rates in developing

countries in the past 15 years was associated with sharp increases in the prices of investment and energy products, particularly in the 2008-10 period.

1.1 *Recent projections*

The outlook for economic growth and poverty reduction in developing countries appears to have deteriorated in recent years. Growth in a number of major developing countries has decelerated sharply and the outlook appears less optimistic (The Economist 2016). In this section, we review the different inputs based on the IMF World Economic Outlook 2012 and 2015 and identify key drivers and narratives for our scenarios. The IMF projections are probably the most comprehensive and carefully-scrutinized set of economic projections available. They provide estimates of growth in national GDP, savings rates, and changes in the current account balances. The changes in current account balances, given developments in savings rates, reflect changes in investment rates of the type considered in the previous section.

It appears from the projections that the difficulties of high income countries in rebounding from the financial crisis and the slowdown of emerging markets, in particular the rebalancing of the Chinese economy, will have important consequences on global growth, commodity prices and global investment dynamics.

1.1.1 *GDP dynamics*

The main measurement of economic growth is the evolution of GDP at constant prices. The current slowdown has led to significant revision of projections for future growth at national and global levels. Since we consider no change in population dynamics, an increase of one percentage point in real GDP will imply an identical change in GDP per capita. Two important factors are important to keep in mind, especially when looking forward and considering the 2030 targets (for the SDGs):

- The current projections involve lower **growth rates for the future (e.g. 2016-2017 growth rates)**;
- The **actual starting point** is lower today (i.e. 2015 GDP level) than expected a few years ago.

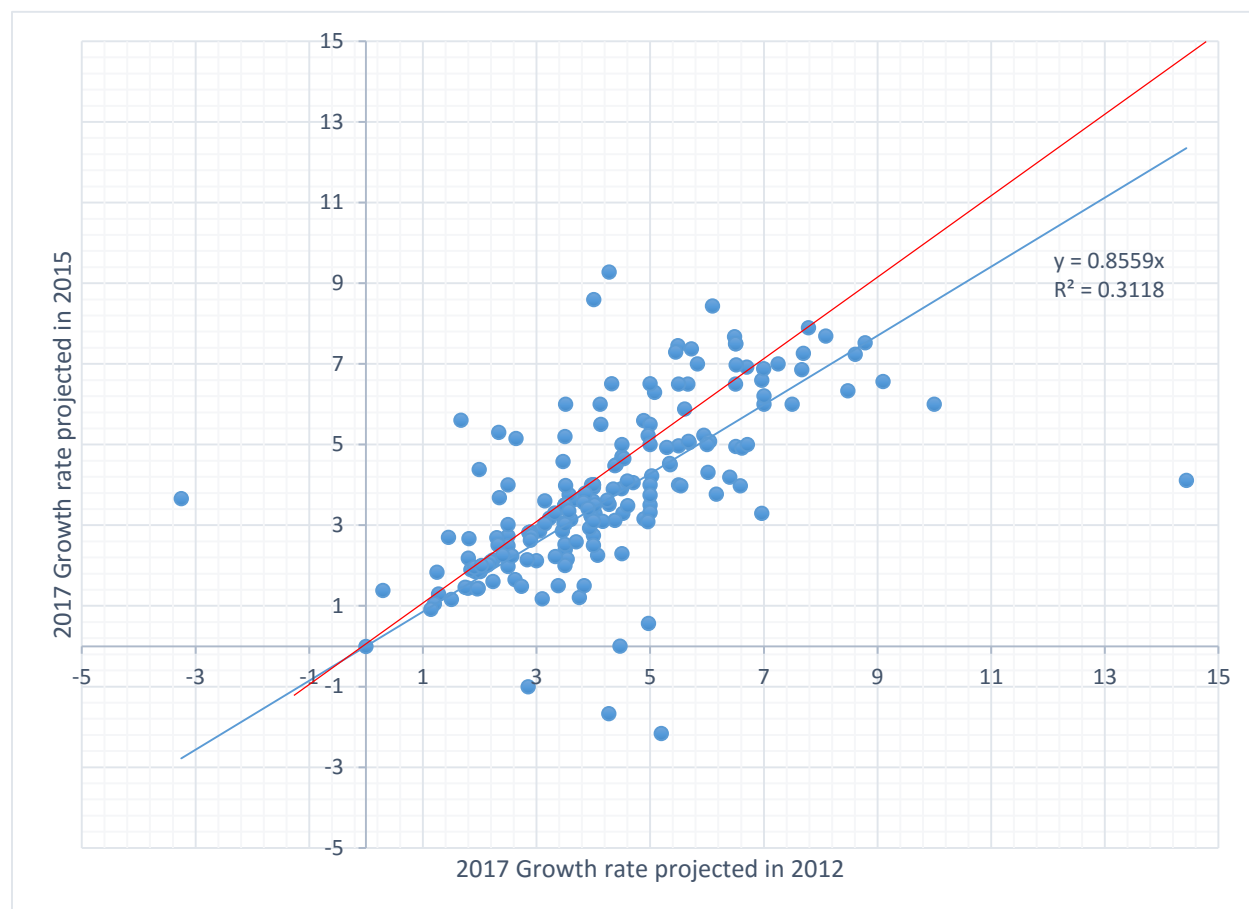
Therefore comparing 2012 projections for the future with 2015 projections, it is critical to see that both the slope and the level of the GDP trajectories have been affected.

For instance, global income growth between 2011 and 2015 was expected to be 17.5% in 2012 but turned out to be only 13.9%. By 2017, the GDP growth rate gap reaches 5% (the 2017 GDP growth rate as projected in 2012 is 5% above the 2015 projection for the same year) and the growth gap (the GDP growth not achieved) reaches 22%. A simple extrapolation shows that global GDP in 2030 will be 15% lower than initially expected. Our objective is to assess the implications of this substantial decline in anticipated output for achieving the SDGs.

The growth projections have been reduced for 134 countries out of a total of 189, and an overview is displayed in the following figure for the 2017 growth rate. Looking at global GDP,

the growth rate was revised from 4.66% to 3.80% (minus .86 points or 19%). For the country sample, the median growth rate moved from 4% to 3.6% (minus .4 points or 10%).

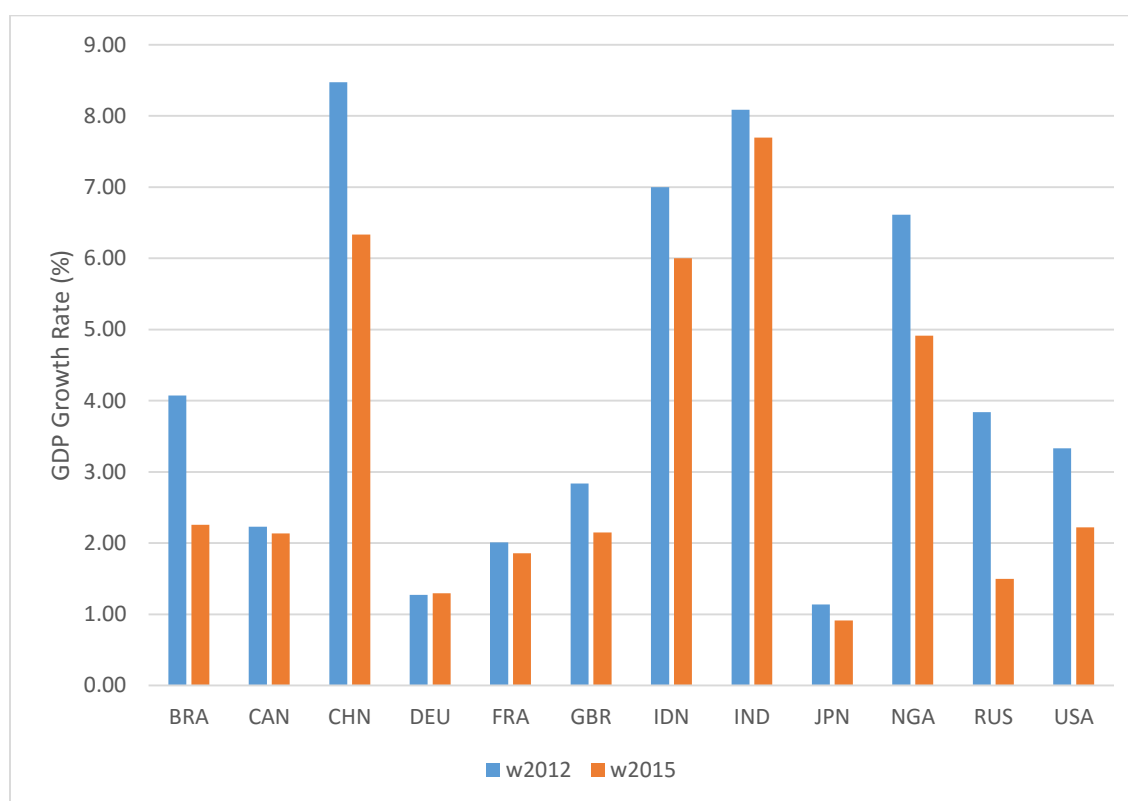
Figure 5. Comparison of 2012 and 2015 country GDP growth projections for 2017



Source: *World Economic Outlook (2015 and 2012) - IMF*

In these projections, not all countries are affected in the same way, exporters of raw commodities and crude oil are among the most affected (Gulf countries, but also Angola, Equatorial Guinea, Democratic Republic of Congo) but also some key emerging economies: Brazil and first of all, China with a decline from 8.5% to 6.3%. China plays a very critical role due to of its size, its growth and its specific impact on world markets. In advanced economies, recovery is slow but still expected for the most open economies (see Japan). The US case is also here very relevant since its growth rate, among the highest among developed economies, is cut by one-third.

Figure 6. Comparison of 2012 and 2015 GDP growth projections for 2017 (selection of countries)



Source: World Economic Outlook (2015 and 2012) - IMF

1.1.2 Savings Rates

Saving rates are another important feature of the projections. Savings rates have an impact on long term growth by conditioning the feasible level of investment. The latter can be funded domestically or externally with implications for current account balances. We will discuss the evolution of the current account (and the capacity to provide/require savings to/from the rest of the world) in the next sub-section.

Long run saving rates are also impacted by demographic changes (such as the share of the population in retirement or in their peak earning and saving years), but since demographic patterns are constant across the scenarios, we focus on short and medium run variations in the WEO projections. Three main features appear to be:

- An **increase** in the saving rates of some advanced economies facing significant public and private debt challenges that require macroeconomic adjustment (Ireland, Hungary etc.);
- An **increase** or **decrease** in the savings rates of some oil exporting countries that face large income shocks and may cut their savings rates to stabilize consumption (most of them), or increase saving rates to support investment (Qatar, Equatorial Guinea)

- The **specific case of China** where the saving rate has declined sharply from the 50% observed in 2011 and was expected to stay at this level in the WEO 2012 projections, while it has now started to fall and, in the latest projections, reaches 39% by 2020.

1.3. Current Account Dynamics

An important driver for the world economy is the evolution of current account surplus/deficits which, as noted above, reflect changes in both savings and investment rates. Indeed, they are key drivers of the dynamics of world trade.

In *Mirage*, they are exogenous (but not fixed) indicators that allow us to define the evolution of the real exchange rate. Therefore, the current account surplus/deficit may need to be adjusted in the scenarios to be dynamically consistent with our narrative (internal vs external adjustment, real exchange rate appreciation/depreciation). The following table summarizes the WEO projections (2012 and 2015) for Current Account Balances (CAB) in billion USD for selected economies (those with the largest surplus/deficit in 2012):

Table 1. Comparison of 2012 and 2015 Current Account Balance Projections (selection of countries with larger current account imbalances)

	WEO 2012			WEO 2015			
Country	2013	2015	2017	2013	2015	2017	2018
Australia	-84	-105	-118	-52	-50	-44	-46
Brazil	-80	-97	-112	-91	-73	-67	-70
Switzerland	72	70	65	49	48	52	54
China	229	356	540	348	267	150	95
Germany	175	162	138	286	271	271	270
Great Britain	-30	-12	-17	-136	-114	-83	-86
India	-58	-64	-69	-30	-52	-78	-87
Japan	166	151	129	124	131	132	131
Korea	19	13	12	98	92	91	89
Kuwait	84	73	75	11	13	17	17
Netherlands	64	59	53	72	73	75	78
Norway	70	59	53	28	26	30	28
Qatar	58	36	20	10	-6	1	1
Russia	44	-19	-59	62	75	84	81
Saudi Arabia	152	113	107	-22	-13	4	-2
Singapore	60	61	62	61	55	54	54
Turkey	-72	-79	-100	-33	-39	-49	-50
Taiwan, China	44	53	64	64	63	61	62
USA	-499	-561	-696	-461	-629	-710	-747
South Africa	-24	-27	-33	-14	-15	-16	-16
Total	390	241	114	376	122	-24	-144

Source: World Economic Outlook (2015 and 2012) - IMF

A few remarks can be drawn from the previous table:

- In both WEO projections, we see significant declines in global imbalances. The overall surplus for the selected “leading” economies declines in both projections. This decline is much larger in the 2015 version-- which includes the global slowdown. In this case, we see that the surplus (that will finance the rest of the world here) disappears by 2017 and a sizeable deficit emerges in 2018.
- Important differences (but not at the aggregate level) exist for the first year, 2013, (see Qatar, Norway, Germany, China, Great Britain, Australia)
- Differences in trends are also noticeable especially China, Russia, Brazil

We consider three main drivers and outcomes when building our scenarios:

- The reduction in oil (and related commodity) prices. It leads to a significant change in the initial (2013) trade balance of oil exporters/importers (very important for Qatar, Saudi Arabia and countries in a similar situation).
- Shrinking of Chinese external savings (part of the rebalancing dynamics)
- Increase in US requirements for foreign savings

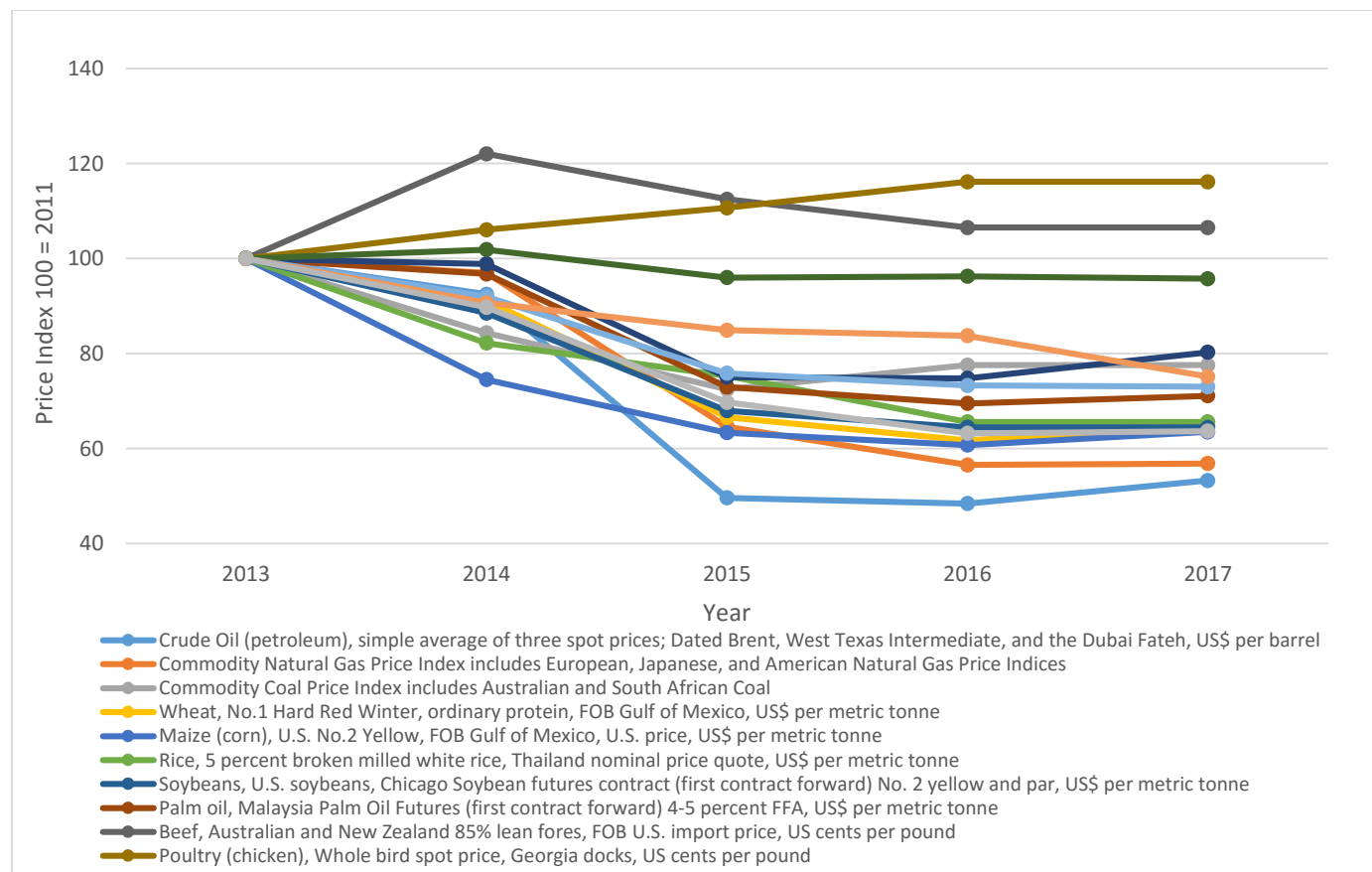
The combination of these three drivers will lead to a significant reduction in the amount of foreign savings available for middle and low income countries, leading to a reduction in their investment and growth.

1.4. Commodity prices

Even though commodity prices are endogenous to our model, we are interested to see how some prices evolve in the IMF forecasts for two reasons:

- To see whether the CGE generates a time paths consistent with the commodity price forecasts, especially in terms of price dynamics and cross price correlation;
- To assess whether there is a need to add some specific supply shocks, especially on the oil and energy markets, to represent both OPEC supplies and supplies from non-conventional sources

Figure 7. World Commodity Price Projections (2015)



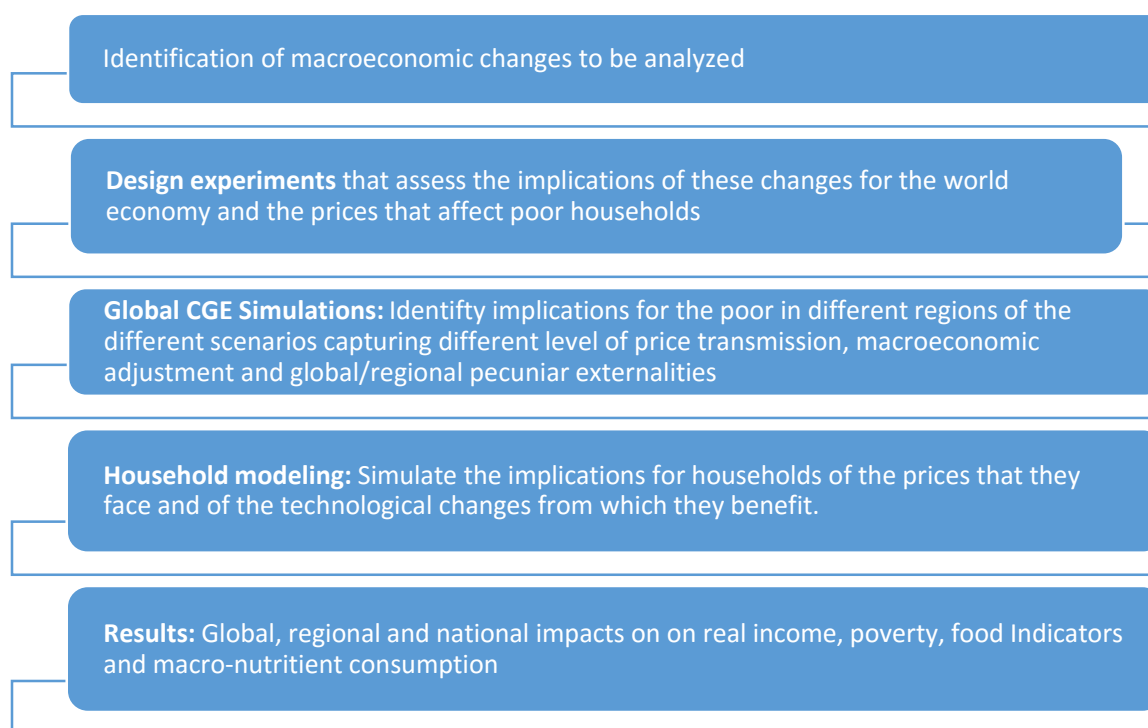
Source: World Economic Outlook (2015) - IMF

There were some major changes between the WEO projections (2015) for world commodity prices and the 2012 forecasts, with the most striking being a sharp fall in oil prices, followed by a slow recovery. In Figure 7, we see that the 2015 forecasts involve price declines of between 25% and 40% for most commodities. Cereal prices decline by 36% on average and palm oil prices by 45%. Agricultural raw materials, decline sharply, with cotton and wool prices falling by 45%. Finally, meat prices are supported by higher demand.

2 Methodology

Regarding poverty outcomes, it is worthwhile to look at both short and long run effects. Key impacts will be on commodity prices in the short run (affecting directly both the incomes and the costs of living for households). In the longer run, changes in wage rates for unskilled workers, will dominate. In order to disentangle the short and long term impacts of these changes, the MIRAGRODEP approach is coupled with country-specific household models following Ivanic and Martin (2014). This top-down approach, starting from broad macroeconomic changes and fine tuning the analysis through the identification of key impacts is essential to be able to combine the ambition of this project with the very tight constraints on time and resources. Figure 8 summarizes our analytical steps starting from the macroeconomic scenario definitions (based on the IMF outlook), their translation in the structural CGE model and the poverty and farm analysis.

Figure 8. Analytical Steps



2.1 Analyzing macroeconomic changes at the household level

The impacts of macroeconomic changes on the incomes of the poor are more complex than is commonly realized. These impacts are perhaps simplest when a decline in productivity lowers the efficiency of production within an unincorporated firm (such as a family farm) managed by their household. Another relatively simple case arises with a shock that results in a sizeable change in a commodity price for which a poor household is a net seller or net buyer. In the short run, the effect of this shock on real income can be identified with knowledge of the net seller or net buyer status of the household (although recent evidence from household surveys suggests that our knowledge of these net trade shares may be less reliable than we had formerly thought (Headey

and Martin 2016). The longer-term impact takes into account impacts of productivity changes on the real wages obtained by household members from their sales of labor (and other factors) sold outside any family-owned firm. It also needs to take into account the potential for changes in the output and consumption patterns of the household, which may move from being a net seller of a good whose price has fallen, to a net buyer. Major changes in income in different countries may also be expected to result in changes in remittances from family members working abroad. So, macroeconomic shocks can be expected to affect the real income of households through different channels with macro and micro-economic implications:

- i The direct impacts on the incomes of producers;
- ii Through changes in the cost of living, and;
- iii Through impacts on factor returns, particularly wage rates for unskilled labor sold outside the household's business activities.
- iv Changes in remittances;

The methodology can be understood using the following approach. The impact of an external shock on the real income of a household can be obtained using a money measure of household welfare W at a given utility level, u , given by:

$$(1) \quad W = \pi(\mathbf{p}^*, w, \tau) - e(\mathbf{p}, w, u),$$

Where $\pi(\mathbf{p}^*, w, \tau)$ is a profit function representing the profits generated by any unincorporated household enterprise, such as a farm firm, specified as a function of effective commodity prices ($\mathbf{p}^*$), factor prices (w), and technology (τ); $e(\mathbf{p}, w, u)$ is a full cost function of the type used by Deaton and Muellbauer (1981) for a household that consumes goods and supplies factors at a given vector of commodity and factor prices, $\mathbf{p}$, factor prices, w , and utility level, u . The distinction between actual and effective output is discussed in Martin and Alston (1997). From the point of view of the firm, quantity q^* of effective output now translates into a larger quantity, q , of output, where $q = q^* \tau$. The increase in the actual output from any given effective output results in an increase in the effective price of output at any actual price, where the effective price is defined as $p^* = p\tau$

Note that the prices of goods and factors are frequently endogenous in the macro model but are always exogenous at the household level. Therefore, we need a large scale CGE, here the MIRAGRODEP model, to be able to provide the right information regarding price changes to the household modeling component. Since a macroeconomic slowdown can include differentiated evolution of technology (productivity) between agriculture, industry and services, this framework allows us to tackle such heterogeneity at the household level.

The right side of equation (1) may usefully be rewritten as $\mathbf{z}(\mathbf{p}, w, \tau, u)$. With this simplification, a second-order approximation of the welfare impact of changes in $\mathbf{p}$, w and τ is given by:

$$(2) \quad \Delta W = [z_p z_w \pi_\tau] \begin{bmatrix} \Delta \mathbf{p} \\ \Delta w \\ \Delta \tau \end{bmatrix} + \frac{1}{2} [\Delta \mathbf{p} \quad \Delta w \quad \Delta \tau] \begin{bmatrix} z_{pp} & z_{pw} & \pi_{p\tau} \\ z_{wp} & z_{ww} & \pi_{w\tau} \\ \pi_{\tau p} & \pi_{\tau w} & \pi_{\tau\tau} \end{bmatrix} \begin{bmatrix} \Delta \mathbf{p} \\ \Delta w \\ \Delta \tau \end{bmatrix},$$

This quadratic form takes into account both the nonlinear (in this case quadratic) relationship between prices, technological change and output levels in equation (2). The first term in (2) includes the net sales of the household times the change in the price of the commodity, $z_p \Delta p$, the measure of welfare change emphasized by Deaton (1989) for analysis of commodity price changes. It also takes into account the impact of changes in factor prices, and especially wage rates, times the net sales of the household outside any family-owned firm, $z_w \Delta w$. Finally, it takes into account the direct impact of changes in technology on the profits generated by the family farm given a change in technology, $\pi_\tau \Delta \tau$. As shown in Ivanic and Martin (2016), the second order terms generalize these familiar first-order impacts taking into account the changes in the output of farm firms and changes in sales of labor off-farm when changes in prices and productivity are large.

Assessing impacts at the household level, for both rural and urban households, is much more complicated than assessing aggregate impacts since household impacts depend not only on the characteristics of the household as producers, but also impacts on the cost of living and on household members' participation in labor markets. Fortunately, a vast amount of work has been done by Ivanic and Martin (2014) to collect data including income from agriculture and expenditures on agricultural products (particularly food), and on household income received from labor markets. We do not form "representative" households using these data, which necessarily aggregates away a great deal of valuable information. Rather, we retain and use directly all of the information available from household surveys on the income sources and expenditure patterns in each of our 315,000 sample households.

These two-tiered approaches have already been implemented in both Bouet et al. (2011) and Ivanic and Martin (2014) with some differences and strong complementarities. Merging these approaches will generate significantly value added. The overall modeling framework is explained in Figure 1. While Bouet et al (2011) use the MIRAGE model and Ivanic and Martin (2014) use the GTAP model to determine the price changes that are fed to the household models, the differences between these two models are relatively minor.

The second order effects identified in equation (2) are likely to be much more important when looking at price changes than when the primary shock is, as in this study, changes in productivity. However, even in this situation, Ivanic and Martin (2014) found that second order impacts were considerably less important than the first-order impacts—which include both effects resulting directly from price changes and those resulting from the impacts of price changes on wage rates for unskilled labor. Since the primary impact of a productivity change is through first-order impacts on income of producers and resulting changes in factor prices, we decided not to incorporate second-order impacts resulting from induced price changes in our empirical analysis at this stage.

2.2 *Moving to Broader Country Groupings*

Our sample of countries is widely-spread geographically and includes 76% of the world's poor people (Ivanic and Martin 2014) so it seems reasonable to assume that it can generate realistic estimates of the global poverty impacts of changes such as the macroeconomic shocks under consideration.

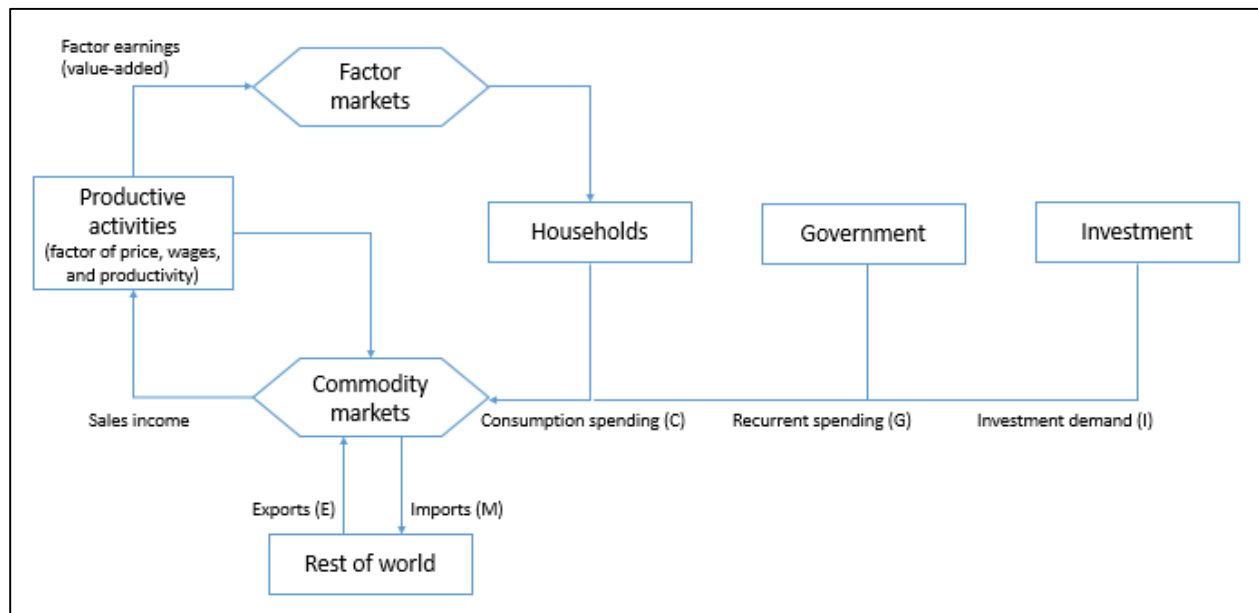
We are interested to obtain estimates of poverty changes at the global level, and for meaningful groupings of countries. To do this, we used clustering based on four variables: the poverty headcount rate at \$1.90 a day, the rural population ratio, the adjusted net national income per capita (constant 2005 US\$), and cereal yields (kg per hectare). If the income measure or the poverty headcount ratio at \$1.90 were not available, we used GDP per capita and PovcalNet's 2005 PPP data respectively. Apart from the 2005 PPP PovcalNet data, these measures were available in the World Bank's World Development Indicators collection. Using these four variables, we used a partitioning method - assigning each country to the group with the nearest mean values while maximizing differences between each country clustersⁱ.

Using this method, 5 country clusters were created, which were then divided by region while making sure that each group contained at least 1 of the countries in the Ivanic and Martin (2014) household data set. We then used the change in the poverty rate calculated by Ivanic and Martin (2015) for the 31 countries, and applied it to the remaining countries in their respective groups, allowing us to generate estimates of changes in worldwide poverty rates.

2.3 Implementing alternative macroeconomic scenarios in the CGE

This assessment utilizes a recursive dynamic multi-region, multi-sector model CGE model: the MIRAGRODEP model. MIRAGRODEP (Laborde and al. 2013) is a Computable General Equilibrium (CGE) model based on MIRAGE (Modelling International Relations under Applied General Equilibrium, Decreux and Valin, 2007).

Figure 9. Analytical Framework



The multi country CGE model that we use allows a detailed and consistent representation of the economic and trade relations between countries. International economic linkages are captured through in international trade of goods and services, and capital flows. A dynamic, recursive solution is obtained by solving the model sequentially and moving the equilibrium from one year to another. In our study we assume perfect competition in all sectors which allows us to have a

detailed geographic and sector decomposition. Refer to Figure 9 for a more detailed analytical framework.

In each country a representative consumer maximizes a CES-LES (Constant Elasticity of Substitution – Linear Expenditure System (LES))¹ utility function under a budget constraint to allocate expenditures across goods. The LES system allows for different income elasticities of demand, with those for food typically lower than those for manufactures and services. Once total consumption of each good has been determined in the top level, the origin of the goods consumed is determined by another CES (Constant Elasticity of Substitution) nested structure following the Armington assumption.

On the production side, value added and intermediate goods are complements under the Leontief hypothesis that intermediate inputs are needed in fixed proportion to output. Total value added is represented as a CES function of unskilled labor and a composite of skilled labor and capital: this allows us to specify a lower degree of substitutability between the last two production factors. In agriculture and mining, production also depends on land and natural resources. New capital is perfectly mobile across sectors while installed capital is immobile. Skilled labor is perfectly mobile across sectors while unskilled labor is imperfectly mobile between agricultural sectors and non-agricultural sectors. Investment is savings-driven and the real exchange rate adjusts endogenously such that the current account is constant in terms of world Gross Domestic Product (GDP). In some scenarios, we exogenously decrease (increase) the current account of some countries, and restore global balance by proportional increases (decreases) to the current account balances of other countries with initial imbalances. As is common in modeling long term productivity growth or trade reform, the supply of labor is treated as exogenous. While the supply of labor clearly adjusts to changes in wages in complex ways (Blundell and Macurdy 1998; Keane and Rogerson 2012), any resulting welfare gains are second-order once the transitional dynamics have died down, coming at the cost of reductions in leisure.

By contrast with MIRAGE and most global general equilibrium models, the government is explicitly modelled as a different agent from the private agent in MIRAGRODEP. The income of the government consists of taxes collected on production, on factors of production, on exports, on imports, on consumption, and on households' income. The government is assumed to maximize a Cobb-Douglas utility function: government so that spending on each commodity remains a fixed value share of total public expenditure on goods and services. The model structure ensures that both domestic and external constraints are respected in each country.

As in Lakatos et al (2015), we begin our global macroeconomic analysis with an assessment of the key macroeconomic adjustments under review. This builds on the analyses of the macroeconomic situation by the IMF, comparing projections made in 2012 with the latest 2015 release. New trends are identified at the global, regional and national level. A very important task is to identify in these new scenarios the drivers at play in the OECD economies, in the BRICs and in other low and middle income countries. The case of China is particularly relevant for poor

¹ The CES-LES is a variant of a CES function where minimal consumptions are introduced. It is equivalent to replacing the Cobb-Douglas structure of the Stone-Geary function (i.e. LES) by a CES structure.

countries in Africa, Asia and Latin America and considers the direct impacts of the economic slowdown in China but also the rebalancing of its economy between domestic and foreign demand, final consumers and investments. An important element of this scenario is changes in the opportunities for other countries to take up opportunities for production of labor intensive goods currently produced in China, but expected to migrate to other developing countries. The turning point in China's labor force growth from growth to decline in 2015 reduces China's overall growth rate, and also reduces China's ability to continue to expand exports of labor-intensive goods. These elements of the projections will affect demand and supply on world markets in heterogeneous ways.

For the purposes of this project, we consider 3 scenarios between 2011 and 2030:

- **Scenario 0, our baseline**, is based on the old, “optimistic” projections. We consider the growth trajectory from the WEO 2012. Starting from our base year (dataset 2011) we implement the growth trajectory from **WEO 2012 for 2012 to 2017**. Demographic projections are taken from the UN and the change in the economically active population is used to define the growth of the labor force. TFP is computed at the country/regional level to match the GDP trajectories. In order to build the growth trajectory to 2030, we assume that the average annual TFP growth rate achieved in the 2015-2017 period is maintained between 2017 and 2030.

- **Scenario 1** is our “first” change scenario looking at the reduced growth projections. Starting from the base year, we implement the actual growth rate from 2011 to 2014 **for all countries**, and the WEO 2015 projections from 2014 to 2020 for our group of “leading” economies defined as high income countries + Russia + Brazil + China. For the group of leading economies, we assume that the average annual TFP growth rate for the 2017-2020 period is maintained between 2020 and 2030. For the middle and low income countries, we maintain the TFP growth rates computed in Scenario 0 between 2014 and 2030. In addition, we implement structural reforms in China leading to a “rebalancing” of its economy through an increase in domestic consumption and a decrease in domestic savings, leading to a reduction in domestic investment but also a reduction in the current account surplus. Other changes from Scenario 0 include a reduction in energy prices (savings rates in oil exporting countries, current account, natural resource endowments for energy products).

- **Scenario 2**, includes all the elements of scenario 1 but considers additional drivers for the LIC and MICs. Particularly, the TFP growth rate for these countries between 2014 and 2030 are readjusted to the new WEO scenario for these countries as well as for the “driver” economies.

Table 2 provides additional details regarding our implementation strategy.

Table 2. Scenario Summary Table

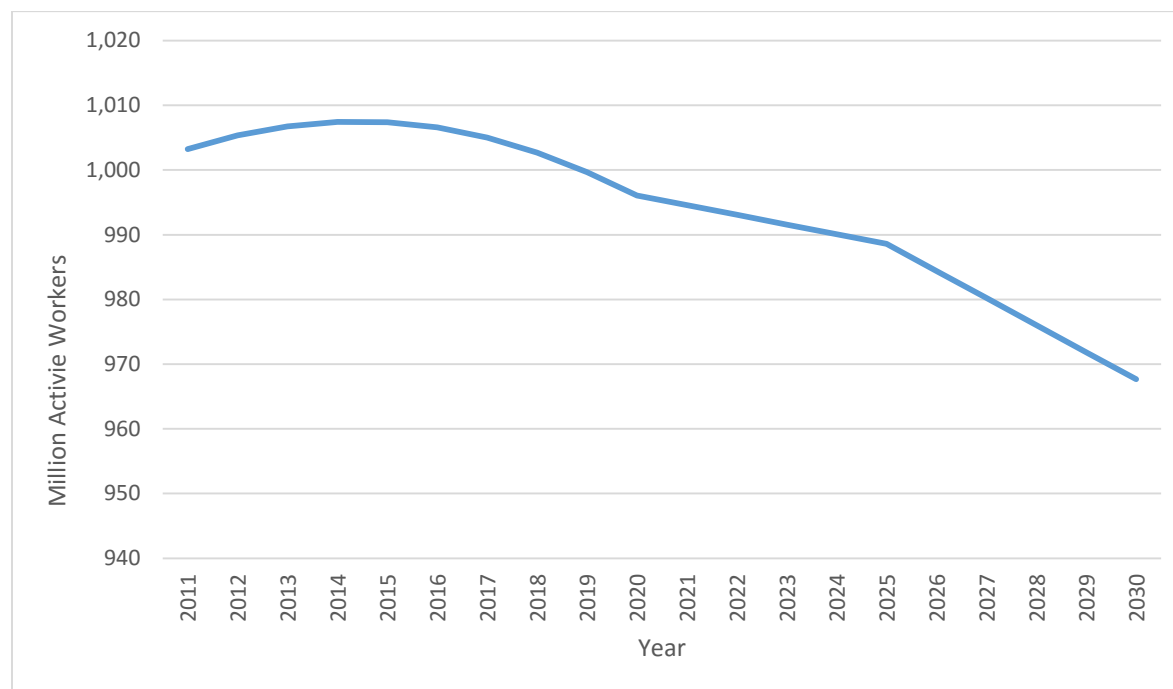
	Scenario 0	Scenario 1	Scenario 2
<i>GDP Trajectory – Leading economies (HIC+Russia+Brazil+China)</i>	Exogenous	Exogenous	Exogenous
<i>GDP Trajectory – MIC + LIC</i>	Exogenous	Endogenous (unconstrained)	Exogenous
<i>TFP – Leading economies</i>	Calibrated (WEO 2012)	Calibrated (WEO 2015)	Calibrated (WEO 2015)
<i>TFP – MIC + LIC</i>	Calibrated (WEO 2012)	Same value as in Scenario 0	Calibrated (WEO 2015)
<i>Agricultural TFP</i>	Same dynamics as national TFP	Same dynamics as national TFP	Same dynamics as national TFP
<i>Savings rate</i>	Unchanged	Exogenous change in China 50% to 40% by 2020, 40% to 35% by 2030 Adjusted for oil producing countries to stabilize consumption	As in Scenario 1
<i>Current Account Balance</i>	Unchanged	Surplus Reduction in China Strong Surplus Reduction in oil exporting countries Increase deficit in the US	As in scenario 1
<i>Remittances</i>	Endogenous , expressed as a percentage of national (source country) unskilled labor payments	Endogenous , expressed as a percentage of national (source country) unskilled labor payments	Endogenous , expressed as a percentage of national (source country) unskilled labor payments
<i>Natural Resource endowments</i>	Unchanged	Calibrated for Gulf countries, US, Russia, Australia, China to target oil, gas and coal prices	As in scenario 1
<i>Labor Force</i>	Exogenous, follow medium UN projections for active population.	As in Scenario 0.	As in Scenario 0.

Population and active population growth rates follow the UN projections (central scenario). This implies increases and decreases in the labor forces in particular countries. The case of China is particularly interesting, with the workforce peaking in 2015, and declining by four percent over the period to 2030. The labor force evolves over time but is constant across scenarios, so differences between scenarios are unaffected by the projections.

Overall, the main exogenous driver of differences between the scenarios is TFP. It captures both changes in per unit productivity at a constant utilization rate, or changes in the utilization rate

of productive factors (i.e. for the same population, a reduced number of effective working hours or underutilization of the physical capital stock, etc.). The latter interpretation is particularly relevant when addressing downturns in a macroeconomic cycle, with both having the same effects on income per capita outcomes when considering homogenous changes in utilization rate across factors and agents.

Figure 10. China's Labor Force, 15-64 years



Source: MIRAGRODEP baseline dataset, based on UN demographic projections

2.4 Datasets

The main source of data for the economy-wide projections is the GTAP 9 database. For the household simulations we rely on the dataset developed by Martin and Ivanic (2014) that includes 31 countries, representing about 80% of the world's poor. This dataset covers large emerging economies, including exporters and importers of food products (e.g. Brazil, China, India, Indonesia, Nigeria, Pakistan, Cote d'Ivoire), and smaller or more vulnerable economies (e.g. Tanzania, Uganda, Rwanda, Zambia, Malawi, Niger, Yemen, Albania, Moldova, Georgia, Bangladesh, Nepal, Mongolia, Vietnam, Cambodia, Peru, Ecuador, Guatemala, Belize, Nicaragua, Costa Rica). The consolidated dataset includes more than 300,000 representative households and provides a basis for assessing the global impacts of price and productivity changes on poverty. The individual countries for which household survey data are available and used are also identified in appendix 6.2.

2.5 Regional and sectoral disaggregation

Table 3 and Table 4 summarize the regional and sectoral aggregations used in our analysis. For the country aggregation, we proceed in two steps to address properly some numerical constraints. First, we operate with the 22 key regions and countries, as listed above, to calibrate global and leading economies trajectories as well as global commodity prices. Then we run specific simulations where we single out key middle and low income countries needed for the poverty analysis.

Table 3. Country Nomenclature

Region Code	Region Label	GTAP Regions
Oceania	Oceania	AUS, NZL, XOC,
CHN	China	CHN, HKG,
HICAsia	High Income Asia	JPN, KOR, TWN, XEA,
Easia	East Asia	KHM, IDN, LAO, MYS, PHL, SGP, THA, VNM, XSE,
Sasia	South Asia	BGD, PAK, LKA, NPL, XSA,
India	India	IND,
NAFTA	USA and Canada	CAN, USA, XNA,
MEXICO	Mexico	MEX,
LAC	LAC wo Brazil and Mexico	ARG, BOL, CHL, COL, ECU, PRY, PER, URY, VEN,XSM,
BRA	Brazil	BRA,
CAM	Central America	CRI, GTM, NIC, PAN, SLV, HND, XCA, DOM, JAM, PRI, TTO, XCB,
EFTA	European Free Trade Association	AUT, BEL, CYP, CZE, DNK, EST, FIN, FRA, DEU, GRC, HUN, IRL, ITA, LVA, LTU, LUX, MLT, NLD, POL, PRT, SVK, SVN, ESP, SWE, GBR, CHE, NOR, XEF, BGR, HRV, ROU, XTW,
CIS	CIS countries wo Russia	ALB, BLR, UKR, XEE, XER, KAZ, KGZ, MNG, XSU, ARM, AZE, GEO,
Russia	Russia	RUS,
Gulf	Gulf Countries	IRN, ARE, BHR, KWT, OMN, QAT, SAU, XNF,
MENA	MENA countries	TUR, ISR, JOR, XWS, EGY, TUN,
MAR	Morocco	MAR,
NGA	Nigeria	NGA,
WAF	West Africa	SEN, BEN, BFA, CIV, GHA, GIN, TGO, XWF,
CAF	Central Africa	CMR, XCF, XAC,
EAC	Eastern Africa	ETH, KEN, MDG, MWI, MUS, MOZ, RWA, TZA, UGA, ZMB, ZWE, XEC,
SACU	SACU	BWA, NAM, XSC,
ZAF	South Africa	ZAF

Table 4. Sectoral Nomenclature

Sector Code	Sector Label	GTAP Sectors
rice	Rice	PDR, PCR,
wheat	Wheat	WHT,
ocereals	Other Cereals	GRO,
v_f	Vegetable and Fruits	V_F,
osd	Oilseeds	OSD,
sug	Sugar	C_B, SGR,
pfb	Plant Fibers	PFB,
ocr	Other Crops	OCR,
cattle	Cattle	CTL, RMK,
otherAni	Other Animal	OAP,
wol	Wool	WOL,
forest	Forestry	FRS,
fish	Fisheries	FSH,
enepr	Extraction - Energy	COA, OIL, GAS,
miner	Minerals	OMN, NMM,
meatc	Red Meat	CMT,
meato	White Meat	OMT,
vol	Vegetable Oil	VOL,
dairy	Dairy products	MIL,
ofd	Other Food	OFD,
bevtob	Beverage and Tobacco	B_T,
tex	Textile	TEX
wap	Wearing Apparel and Leather products	WAP, LEA
paper	Paper Products	PPP, LUM
ffl	Fossil Fuels	P_C,
crp	Chemicals	CRP,
metal	Other Mineral	I_S, NFM, FMP,
TransEq	Transport Equip.	MVH, OTN,
electronics	Electronics	ELE,
capgoods	Capital Goods	OME,
omanuf	Other Industries	OMF,
utilities	Utilities	ELY, GDT, WTR,
construction	Construction	CNS,
trade	Trade	TRD,
trans	Transportation	OTP, WTP, ATP,
services	Services	CMN, OFI, ISR, OBS, ROS, OSG, DWE,

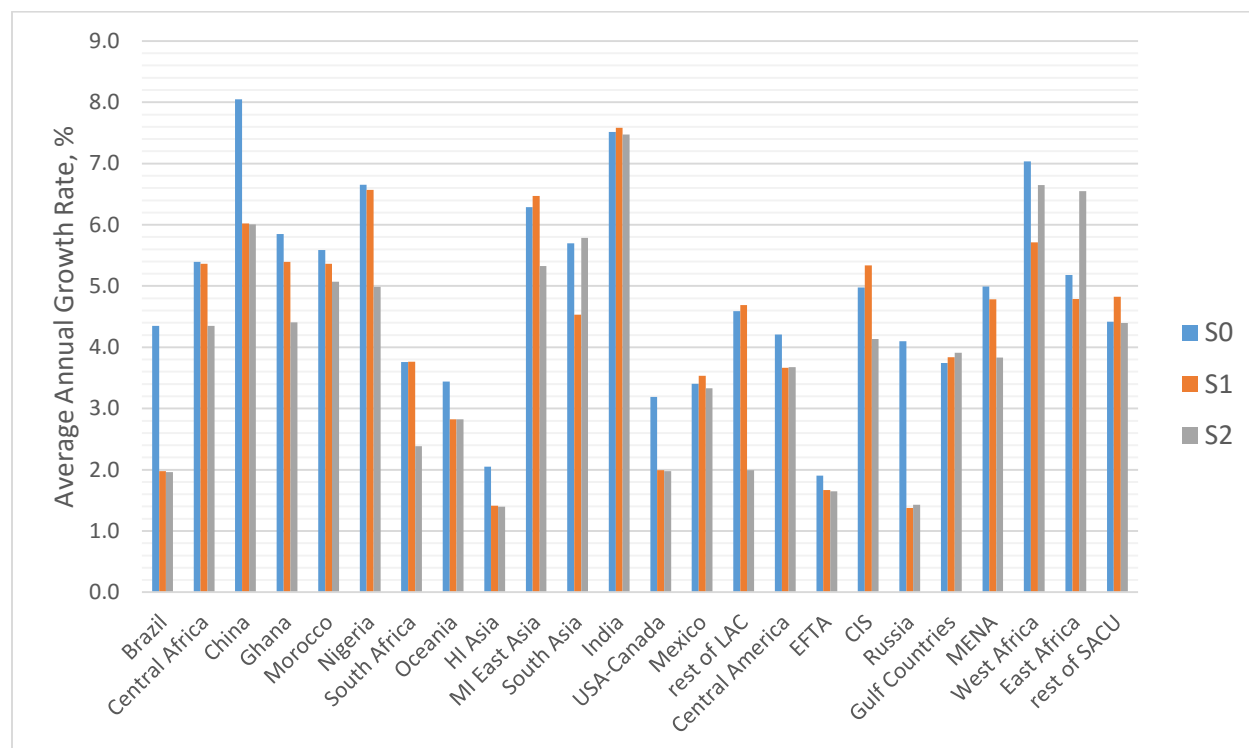
3 Macroeconomic projections to 2030

This section provides findings regarding the implications of our three scenarios.

3.1 GDP projections

The simplest indicator to illustrate our different growth trajectory is the real GDP growth rate between 2011 and 2030. Figure 11 shows the annual average over the period and illustrates the very substantial slowdown faced by emerging economies: from 8% to 6% in China, from 4.4% to 2% in Brazil and from 4 to 1.5% in Russia. Growth remains slow in advanced economies (EFTA about 1.6%) or is reduced by one-third in some of the more dynamic OECD economies (eg the USA, Canada, Japan, Korea). Middle income countries are less impacted (e.g. a reduction equal to one tenth in the initial growth rate for Morocco). For West and Eastern African countries, the projections are more optimistic today than three years ago and they manage (S2) to more than compensate for the global slowdown (S1). When we consider the implications of the slowdown in the leading economies (comparing S1 to S0), we find that the negative impacts are more pronounced in West Africa (annual growth rate decline from 7% to 5.7%) and South Asia than in East Africa and India, showing clearly different trade and investment linkages and regional dynamics.

Figure 11. Average annual growth rates for real GDP 2011-2030



Source: MIRAGRODEP model projections

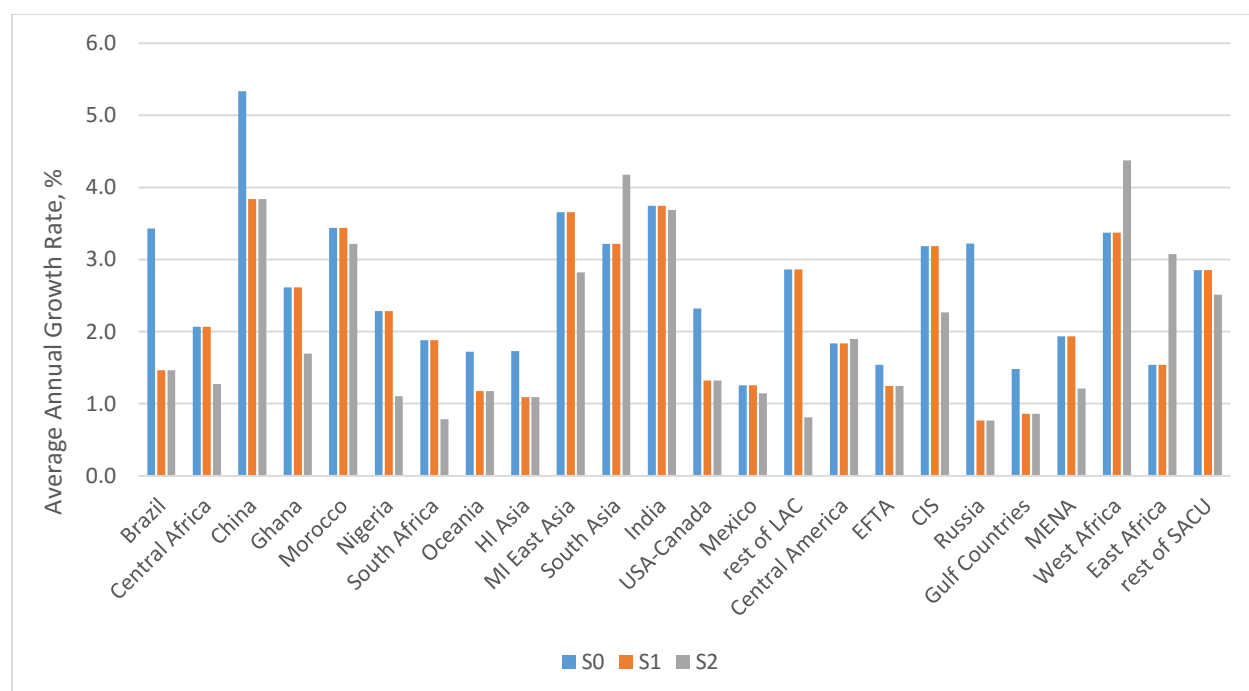
3.2 Total Factor Productivity projections

Total Factor Productivity (TFP) is a key element in our analytical framework. Indeed, it is the main driver of our calibration exercise to reproduce the GDP trajectories in the WEO scenarios since the growth rates of factor endowments are defined either exogenously (labor) or endogenously (capital) in response to income growth. At the same time, TFP is an essential driver in the evolution of productivity for poor workers and opportunities to achieve real income increases. Given the Solow-type framework that we use, changes in TFP are the primary exogenous source of long term growth in any country. Other, relatively minor, changes in endowments include declines in land per person and changes in endowments of natural resources.

Figure 12 displays the annual average growth rate of TFP for the different regions under our different scenarios. They are lower than the GDP growth discussed in the previous section since labor and capital accumulation also contribute to increases in the GDP growth rate. Of course the gap between TFP and the GDP growth rate is very important for economies with rapidly increasing workforces (demographics) and investment (e.g. Nigeria, extensive growth) and of more limited importance when looking at mature economies where intensive growth (productivity) is the main driver (e.g. EFTA).

By construction, TFP is identical between S1 and S2 for the leading economies, and S0 and S1 for the others. Overall, low income countries achieve significant productivity gains in all scenarios, especially in S2, with an average annual increase of 3% or more. Middle income economies are the most impacted by the reduction in average productivity gains.

Figure 12. Average annual growth rate for Total Factor Productivity between 2011 and 2030

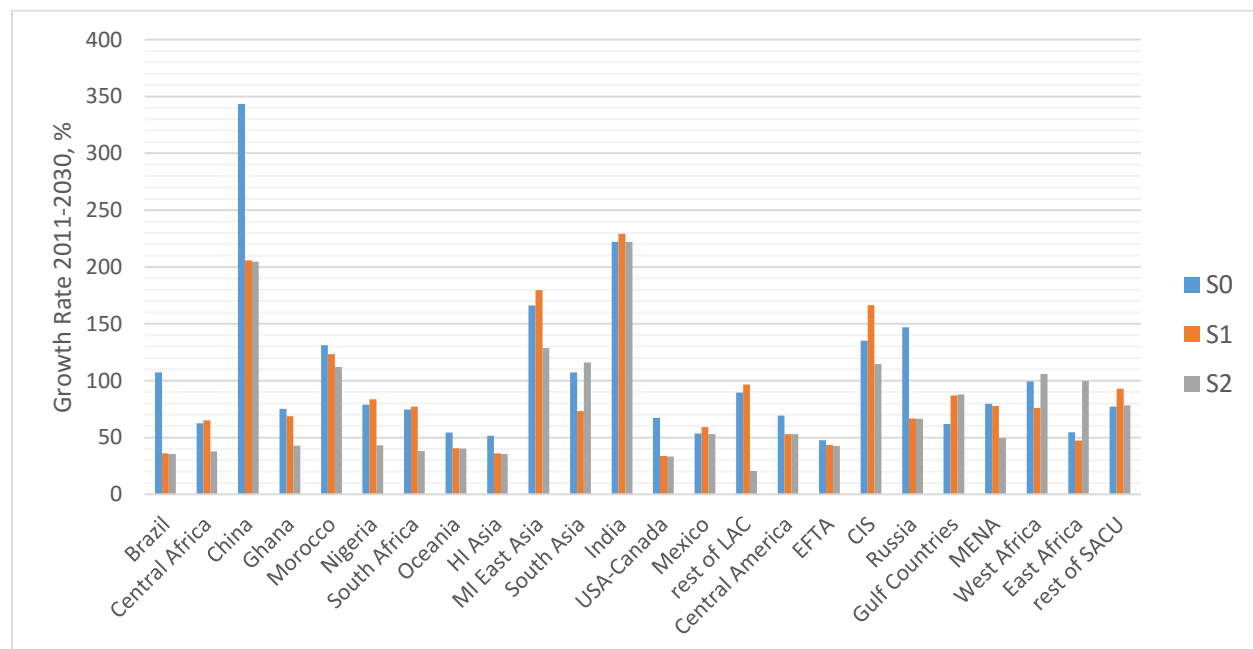


Source: MIRAGRODEP model projections

3.3 Real Unskilled Wages

A first proxy for the impact of these alternative growth paths on the poor is the evolution on the real unskilled wage, a major source of income for poor households. Results are displayed in Figure 13 showing the increase between 2011 and 2030. In our initial scenario (S0), the projections were quite optimistic ranging from +47% in East Africa to +343% in China. The most rapid growth was expected to take place in Asia (South and East), Brazil and West Africa with a doubling or more in the real incomes of unskilled workers. Less optimistic scenarios display highly heterogeneous outcomes with countries being strongly impacted but having still impressive performance (e.g. China); weakly affected but still improving the situation of their poor (e.g India); those negatively impacted by the global slowdown (S1) but benefiting from positive domestic dynamics (for example S2 is better than S1 for South Asia and West Africa as a bloc). For individual and still poor countries such as Ghana, the improvement in unskilled wages is very significantly impacted +43% in S2 vs + 75% in S0.

Figure 13. Real Unskilled Wage Rates from 2011 to 2030



Source: MIRAGRODEP model projections

4 Results

The first step in our analysis is to use the global model to estimate the implications of the growth slowdown for key prices; for aggregate income and for key outcomes such as agricultural incomes and unskilled wages. We first consider the impacts on world prices, and then turn to the other variables.

4.1 Evolution of world prices

Key results for price changes relative to the US CPI are shown in Table 5.

Table 5. World Prices - Changes in 2030 compared to the Baseline

	S1	S2
Agricultural World Prices		
Vegetable and Fruits	2.22	3.53
Oilseeds	4.81	6.32
Plant Fibers	2.18	1.72
Other Crops	2.88	2.88
Wool	0.17	1.14
Vegetable Oils	1.57	4.05
Processed Food	1.97	2.67
Rice	1.88	2.96
Wheat	3.75	4.00
Other Cereals	2.52	3.90
Sugar	5.36	5.89
Cattle	2.77	2.71
Other Animal Products	3.01	3.36
Fisheries	1.48	2.30
Red Meat	2.59	3.16
White Meat	3.16	3.45
Dairy	1.51	1.79
Non Agricultural World Prices (Selected)		
Energy Commodities	-26.96	-24.36
Mineral Products	-9.30	-8.20
Metal Products	-0.52	0.24
Capital Goods	1.65	1.79
Aggregate World Prices		
Agriculture	2.39	3.19
Manufacturing goods	0.77	1.16
Services	0.82	1.00
Extraction	-22.34	-20.04

Source: MIRAGRODEP model projections

The most striking change in Table 5 is the sharp fall in the prices of mineral products. This reflects the constraints on output of these products created by mineral and oil resource constraints, and their consequent price volatility in response to substantial changes in demand. The situation for agricultural products is quite different. In this case, the impact of lower productivity is to increase prices. The reason for this seemingly paradoxical result is that we are assuming a homogenous reduction in productivity across all sectors as a key driver of growth changes. When agricultural productivity rises in line with productivity in other sectors, the increase in national income results in a smaller-than-proportional increase in demand for agricultural products simply because of Engel's Law. With equal productivity growth across sectors, higher income results in a decline in

the relative price of agricultural products. Thus, a slowdown in the rate of growth results in a modest increase in agricultural prices relative to the S0 baseline, the effects being stronger for staple foods (low income elasticity compared to high value products such as meat and dairy products)

The prices of manufactures rise slightly relative to the numeraire. The slowdown in growth reduces the demand for these goods more than for agricultural products, tending to push their prices up more than for agricultural products, but the decline in the prices of minerals and fuels helps to hold them down. The average price of services rises under the lower productivity scenario for a similar reason.

Therefore, we see that the global commodity price effects of the economic slowdown captured in scenarios 1 and 2 have contrasting outcomes for the poor. Agricultural prices are more resilient to the crisis and will generate higher incomes for farmers; however they also mean higher costs for food consumers. However, we are going to see that these price effects can be dominated by the consequences of the different scenarios on poor people of declines in productivity.

4.2 Impacts on income

The key variables presented in Table 6 show a wide range of responses to the slowdown. The most direct effect is a sharp decline in real income in the countries most seriously affected by the slowdown. Thus, under the S1 scenario, output declines sharply in leading economies such as Brazil, China, Russia, the US and Canada. The impacts of this scenario on other economies tend to be small, and to depend upon whether they are suppliers of minerals or agriculture, with suppliers of minerals, such as Morocco, tending to lose while suppliers of agricultural products tend to gain.

Regions depending on global demand and still oriented to OECD markets are particularly negatively affected by these pecuniary externalities are located in: West Africa WAEMU countries (-18 percent of real income compared to the baseline in 2030), Ghana (-8 percent), South Asia (-18 percent except India that is very resilient to the external shock) and Central America (-9 percent). It is also important to underline that these countries are also affected by a reduction in availability of global savings to fund their growth as they were used to do. Under scenario 2, real incomes fall in a wider range of countries where growth prospects have been marked down, such as Ghana (-23 percent), Nigeria (-26 percent), South Africa (-21 percent) and South America. Economies such as East Africa, where prospects have been upgraded, experience an increase in real income, while India sees essentially no change in income growth rates. For most of the regions already negatively affected the outcome is worse (except for West Africa that benefits from updated productivity gains), especially for South American countries (up to -38 percent of projected real income) and the MENA region (-18.5 percent)

Table 6. Key Macroeconomic Results

	Real Income		Agriculture VA		Unskilled Wages		Unskilled Wages - Rural		Real Government Income		Real Inbound Remittances	
	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
Brazil	-35	-35.1	-27.3	-27	-34.4	-34.7	-28.8	-28.7	-35.9	-36.2	-12.1	-17.8
China	-30.5	-30.7	-18.4	-18.5	-31.1	-31.3	-24.8	-24.9	-27.5	-27.7	-21.2	-24
Russia	-38.2	-37.8	-32.1	-32	-32.5	-32.6	-33.1	-33.1	-42.1	-41.1	-2.2	-17.5
Oceania	-10.4	-10.5	-1.2	-2.3	-8.9	-9.2	-3.8	-4.7	-10.4	-10.5	-9.1	-10.5
High Income Asia	-10.4	-10.7	-4.9	-5.1	-10.2	-10.5	-5.8	-6.1	-11.5	-11.9	-16.6	-17.7
USA and Canada	-19.4	-19.6	-6.8	-7	-19.9	-20.2	-10.9	-11.2	-20.2	-20.5	-5.3	-9
EFTA (inc. EU28)	-3.2	-3.7	1.3	1.1	-2.9	-3.4	0.6	0.5	-4.3	-4.8	-6.6	-9.6
Ghana	-8	-23.1	4.4	-11	-3.6	-18.4	2.5	-12.6	-11	-25.9	-3.2	-9
Morocco	-3.2	-8.4	1.9	-2.7	-3.4	-8.3	0.4	-4.1	-5.8	-10.9	-1.5	-4.5
Nigeria	-1.5	-26.3	3	-17.7	2.7	-20	2.8	-18.2	0.3	-24.7	-9.8	-8.6
South Africa	1.1	-21.8	6.8	-11.5	1.4	-21	7.1	-12.1	-0.2	-22.4	-5.5	-2.1
Central Africa	-1	-17.8	19	0.4	1.5	-15.2	10.4	-6.7	2.7	-14.5	-5.4	-15.1
East Asia (exc. leaders)	3.9	-15.5	4.8	-11.3	5.1	-14.1	4.8	-12.4	2.9	-16.1	-4.7	-11.2
Rest of South Asia	-18.8	2.1	-9.2	8.8	-16.5	4.1	-12.8	6.2	-23.1	-4.3	5.4	8.3
India	2.1	0	2.9	1.1	2.2	0	2.7	0.9	-2.1	-4.2	4.4	7.2
Mexico	3.1	-1	4.8	1.9	3.8	-0.2	5.9	2.8	0.2	-2.5	-17.7	-18.6
South America (ex. Brazil)	2.3	-38	5.6	-27.3	3.7	-36.4	5.4	-29.5	1.8	-38.3	-6.9	-22.6
Central America (ex. Mexico)	-8.9	-8.8	-0.2	-2.8	-9.6	-9.7	-3.2	-3.3	-11.8	-11.8	-16.2	-16.4
CIS	8.5	-12.9	11.2	-7.6	13.2	-8.8	11.5	-8.1	8	-14.1	-11.8	-17.8
MENA	-2.9	-18.5	3.3	-10.2	-1.2	-16.7	2.4	-11.8	-4.8	-20	8.3	4
West Africa	-18.8	-3.6	-7.8	7.3	-11.6	3.3	-7.4	7.4	-27.5	-15.2	-7.1	-1.7
East Africa	-6.6	28.6	-1.5	30.1	-4.7	29.2	-2.2	28.5	-8.8	24.9	-2.4	11.3
Rest of SACU	8.4	0.1	7.9	0.7	8.9	0.6	7.9	0.5	7.6	-0.2	-1.7	-18.1

Source: MIRAGRODEP model projections

Under Scenario 1, real agricultural value added falls in the countries directly affected by the shock (leading economies), even despite the rise in real agricultural prices. In the countries not directly affected by the productivity shock, however, agricultural prices and incomes rise modestly. For these economies, the situation depends on their exact specialization. If they mainly sell products to advanced economies and are not in competition with the products originating in these countries (e.g. cocoa), they are net losers with shrinking markets and stable or declining prices. On the other side, if they produce similar products, they benefit from the deceleration of productivity in developed economies that pushes prices up. Gains are substantial in middle income countries such as Ghana (+4.4 percent), South Africa (+6.8 percent), Mexico (+4.8 percent) and South East Asia (+4.8 percent) and South American countries (+5.6 percent). A few countries, such as West Africa and South Asia (except India), have net losses in real agricultural value added, but these results are mainly driven by the overall macroeconomic crisis. In all cases, Agriculture remains more resilient to the crisis and its value added much less affected than national income. For instance in Central America, real value added in agriculture remains stable (-0.2 percent) while national income falls by 8.9 percent.

Once the adverse shocks are extended to a broader set of countries in Scenario 2, real agricultural value added also falls there. The productivity effects dominate and the gains are reduced or losses increased (e.g. from +5.6 to -27 percent between Scenario 1 and 2 for South America). Only in regions with upgraded productivity projections are farmers better off (West Africa, East Africa). But in all cases, agriculture appears to be more resistant to the crisis, with much lower losses than the economy as a whole.

The third variable presented in Table 6 is the average unskilled wage rate, which is a weighted average of the rural and urban wage rates distinguished in the model. Average real wages follow a similar pattern to real incomes, declining sharply when productivity falls. In scenario 1, the average unskilled wage rate is strongly negatively impacted in West Africa (-11.6 percent in average for WAEMU countries, -3.6 percent in Ghana), in South Asia (except India, -16.5 percent) and Central America (-9.6 percent) limiting the opportunity for poverty reduction. Other poor countries are not as strongly impacted and some even experience higher real wages (South East Asia, SACU countries).

In rural areas, the same pattern appears but with better outcomes: losses are smaller (-7.4 in WAEMU, -12 percent in South Asia, -3.2 in Central America) or substantive gains emerge (+7 percent in SACU, +2.5 percent in Ghana, + 5.4 percent in South America, 2.4 percent in MENA, +10 percent in Central Africa). When the updated productivity projections are applied to all countries, these positive effects tend to vanish (except in WAEMU countries, South Asia and East Africa where productivity is updated upward). Real rural unskilled wages are cut by more than 10 percent – and up to 30 percent in South America—in many middle income economies such as Ghana, Nigeria, South Africa, and MENA.

Another important source of income for many poor households in developing countries is remittances from people working in other countries. These tend to respond heavily to changes in income in the originating countries. As a consequence, inbound remittances to Mexico decline by almost 18 percent under S1, even though real domestic income rises by 3.1 percent under this

scenario. For smaller economies more dependent on this resource in Central America, real inbound remittances fall by 16 percent in S1, affecting more several families depending on them and contribute to the average fall of income nation-wide (-8.8%).

For other regions, the fall of remittances becomes very significant (between 10 and 20 percent) when the productivity reduction affects the developing countries too (S2). The crisis in South Africa, Nigeria and Brazil leads to reduction of 18 percent of this source of income for other SACU countries, of 15 percent in Central Africa, and 23 percent for the rest of South America.

4.3 Fiscal space for developing countries

Many potential responses to economic downturns involve government spending so it is important to examine their impact on government revenues, for which results are given in the fifth column of Table 6. In most cases, the decline in real income is strongly linked with the decline in the real value of GDP. However, there are some cases, such as Russia, where the decline in government revenues is greater than the decline in real income, because of the strong dependence of Russian real income on revenues from energy.

For lower income countries, governments in small countries in Central America will face some of the strongest constraints on their investment and social policies requiring government spending, with government revenues 12 percent lower than initially expected in all scenarios. For other poor countries, the situation is challenging—see, for example, West Africa in scenario 1 (-27.5 percent). However, for most of the low income countries the main challenges appear in scenario 2, when declines in productivity growth rates occur in these countries too. Africa, except East Africa, will face declines in public resources relative to initial projections (-26 percent in Ghana, -25 percent in Nigeria, -22 percent in South Africa) leading to difficult trade-offs in a situation where needs will be increasing (see previous section). This illustrates the key role of maintaining long term reform and structural investment policies to maintain productivity improvements in these countries.

In this context, it also important to discuss the fiscal situation of leading economies where fiscal resources will also be scarcer and foreign aid money might decline relative to the 2012 income projections. While the European fiscal revenues are relatively stable (-4.5 percent on average), North America is more impacted (-20 percent) and newer players such as China, may become less likely to emerge as key donors (-27 percent).

4.4 Impacts at the Household Level

Figure 14 shows the estimated global poverty rate in 2030 under each of our three scenarios. In each case, the real income of each household changes over time in response to: changes in business incomes (driven by productivity growth); to changes in wage rates for households selling labor; to changes in the cost of living and the evolution of income from household business activities. Because our long-run scenarios include substantial economic growth over the period to 2030, the

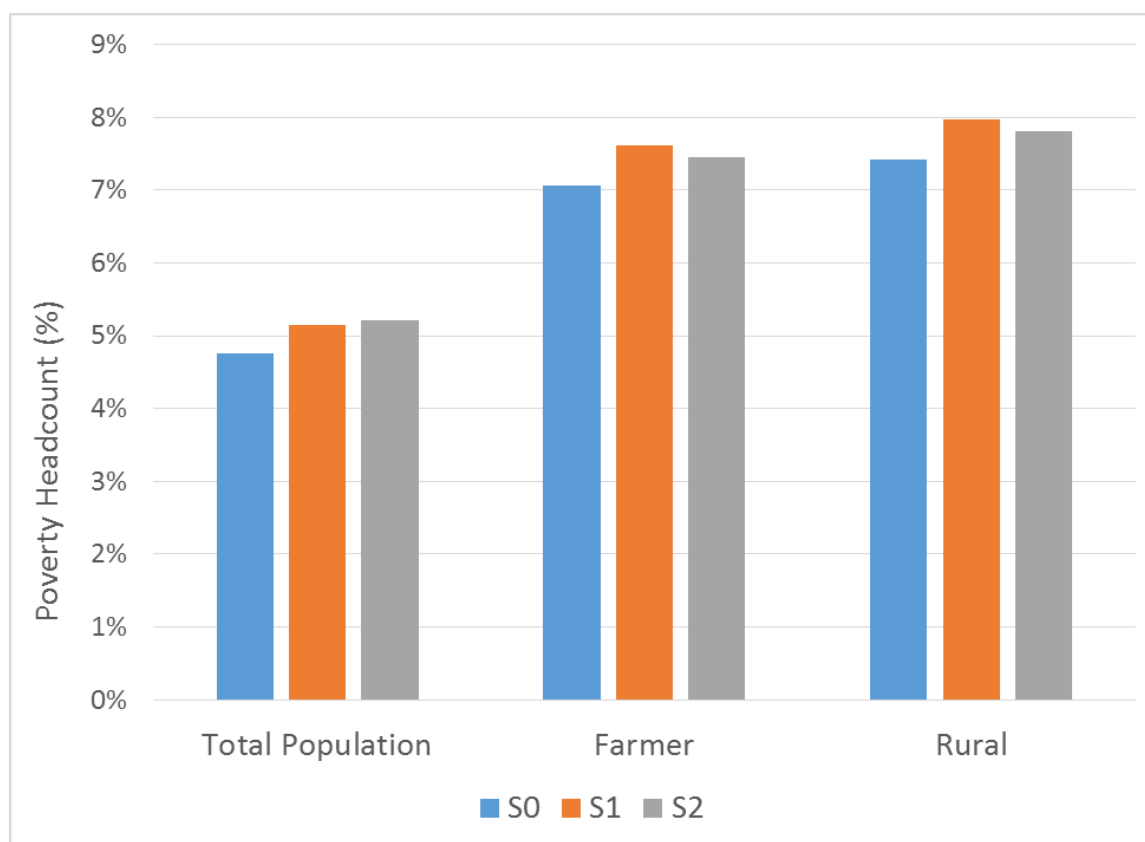
poverty rates under all of these scenarios are substantially below current levels.² The first bar in each set of three shows the poverty rate, defined as the share of the population below the 1.90 dollar, a day, using the 2011 PPP, definition, under the baseline assumptions. As expected the poverty rate among farmers is higher than the rate among the population at large. Interestingly, however, the poverty rate is higher among the rural population more broadly than among farmers—with higher poverty rates amongst groups such as the landless poor outweighing lower poverty rates among groups like teachers working in rural areas.

Net Global Poverty Impacts

Turning to our comparison of the scenarios, we see that Scenario 1 involves a sizeable increase in global poverty—with the poverty headcount rising from 4.79 percent to 5.21 percent, or by 8 percent of its initial level, representing 34 million people reverting to extreme poverty. For farmers, the increase is larger in absolute terms, but slightly smaller as a share of the initial poverty level. For the rural group, dominated by farmers, the increase is from 7.15 percent to 7.74 percent. When we turn to Scenario 2, the overall poverty rate goes up slightly at the whole-country level (38 million people, reverting to extreme poverty compared to the baseline), but declines slightly for the farmer-headed and rural groups. This decline reflects the improvements in the growth outlook in a number of African and South Asian countries noted in Figure 12, which contribute to stronger employment growth and poverty reduction in these countries, together with the modest increases in agricultural prices presented in Table 5.

² If we keep constant the poverty rate for each country, but factor in the heterogeneous demographic growth pattern, the global average poverty headcount in 2030, without considering economic growth, would reach 20 percent, compared to the current level of 13%. This illustrates the importance of rapid population growth in the poorest areas of the planet. However, economic growth reduces this global rate to 4.79% with no update in the poverty line definition.

Figure 14. Global Poverty Headcount under alternative scenarios, Percentage



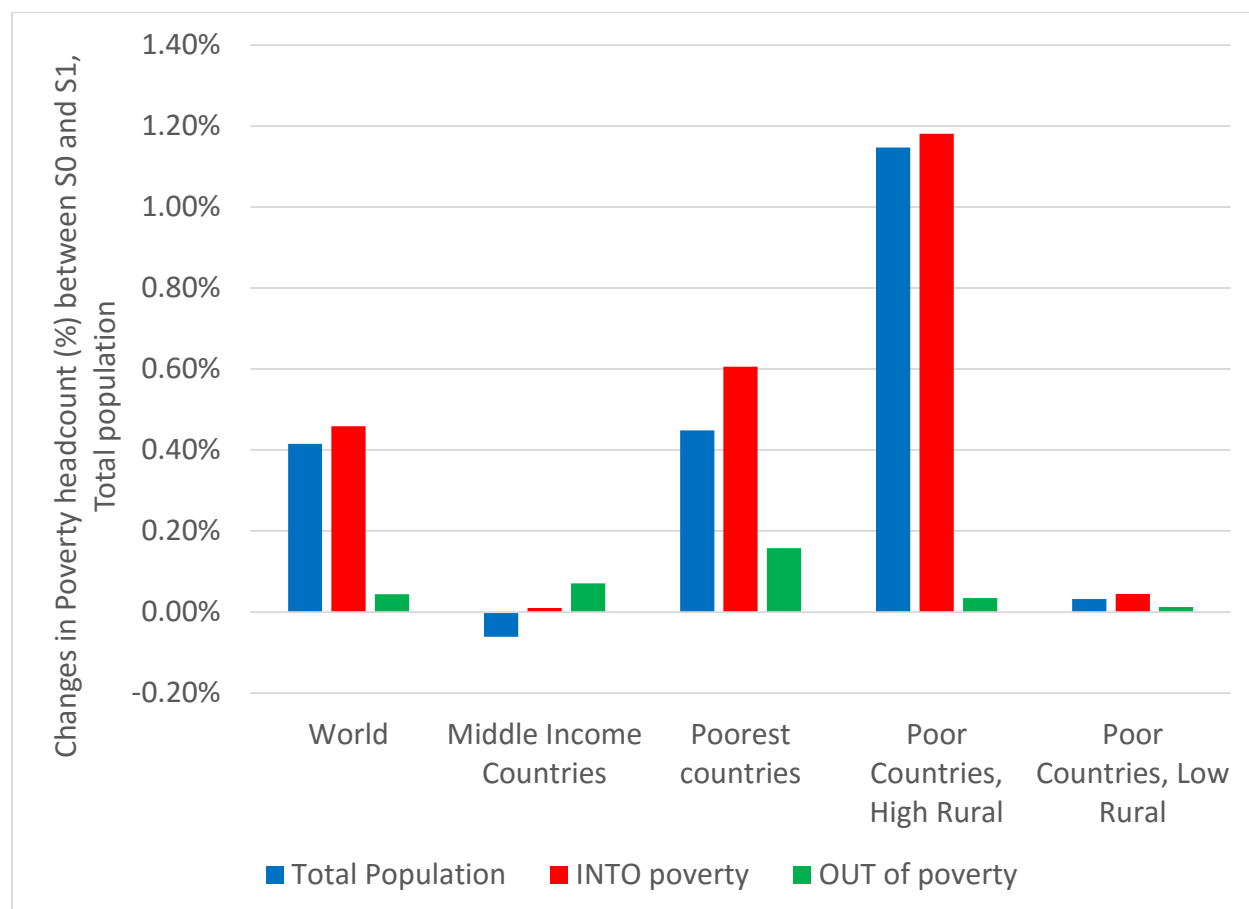
Source: Authors' calculations.

Note: Poverty is defined by the \$1.90 PPP 2011 threshold.

Gross Global Poverty Impacts

Figure 15 presents the net changes in overall poverty between the original forecast values and Scenario 1, both at the global level and for four regions that were found useful in organizing the data. It contrast these net changes with the gross movements into and out of poverty for the same regional groups. While economists tend to focus on the net movement of people into or out of poverty, policy makers may—given the well-known tendency for people (and voters) to focus more on losses than on gains—be more concerned with the gross movements of people into poverty than with the net changes. A key finding is that, for the world and for three of the four groups, the net change in poverty is very similar to the gross flow, with few people rising out of poverty. However, for poorest country group, there are important offsetting changes, with 0.61 percent of the population falling into poverty and 0.16 percent rising above the poverty line for a net increase of 0.45 percentage points.

Figure 15. Net and gross movements into and out of poverty, Scenario 1, Percentage points, Total Population.



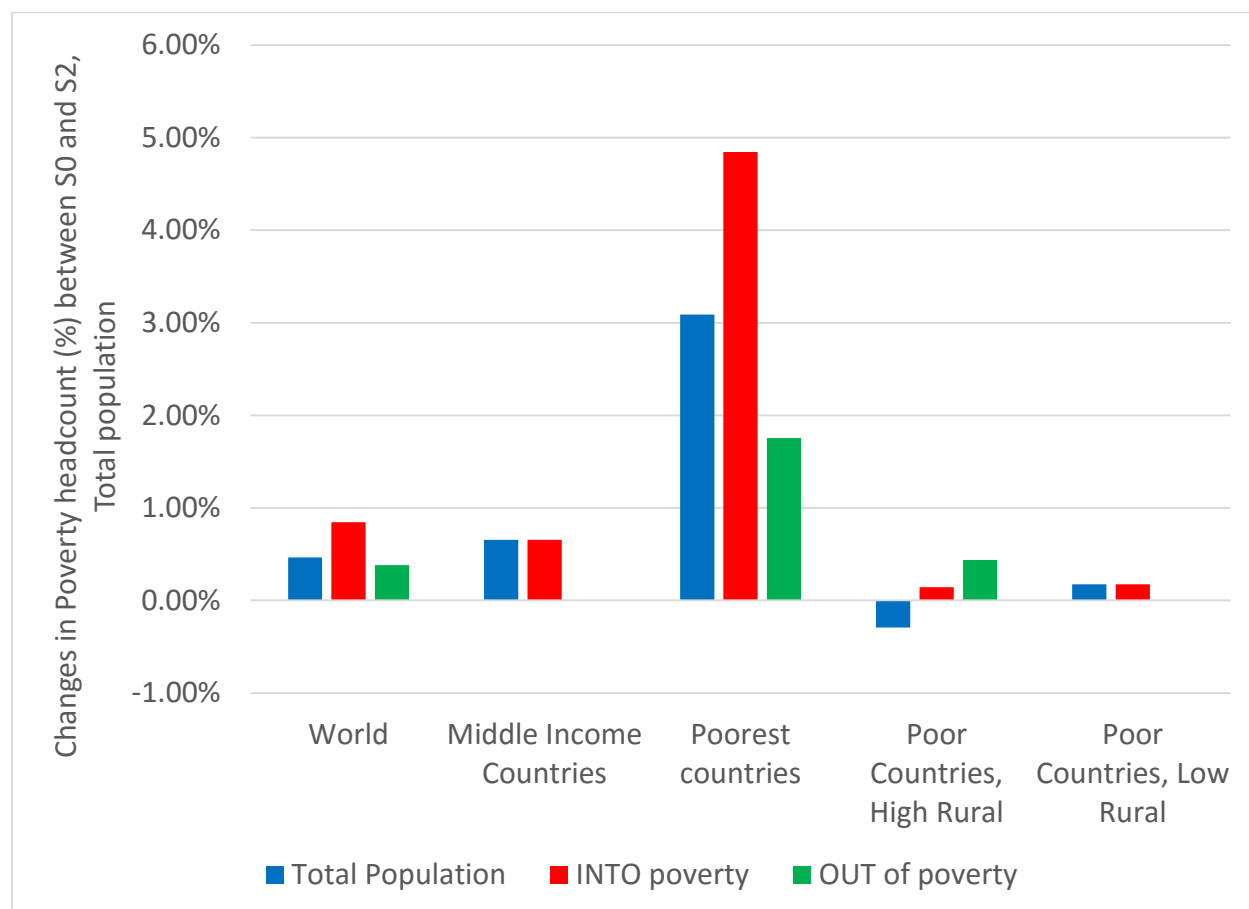
Source: Authors' calculations.

Note: Poverty is defined by the \$1.90 PPP 2011 threshold.

Country grouping refers to our cluster analysis. See details in Appendix.

When we consider changes in the broader set of countries covered by Scenario 2, in Figure 16, we find a strikingly different picture. While the change in the overall poverty rate is in the same order of magnitude for the population as a whole (0.47 vs 0.42 percent), some of the gross flows into poverty are substantially larger. In particular, the movement into poverty in the poorest countries is, at 4.85 percentage points, much larger than anything seen in previous analyses. This is offset by a 1.76 percentage point gross movement out of poverty, but the result is still a net increase in poverty in this country group of over 3 percentage points.

Figure 16. Net and gross movements into and out of poverty, Scenario 2, Percentage points, Total Population



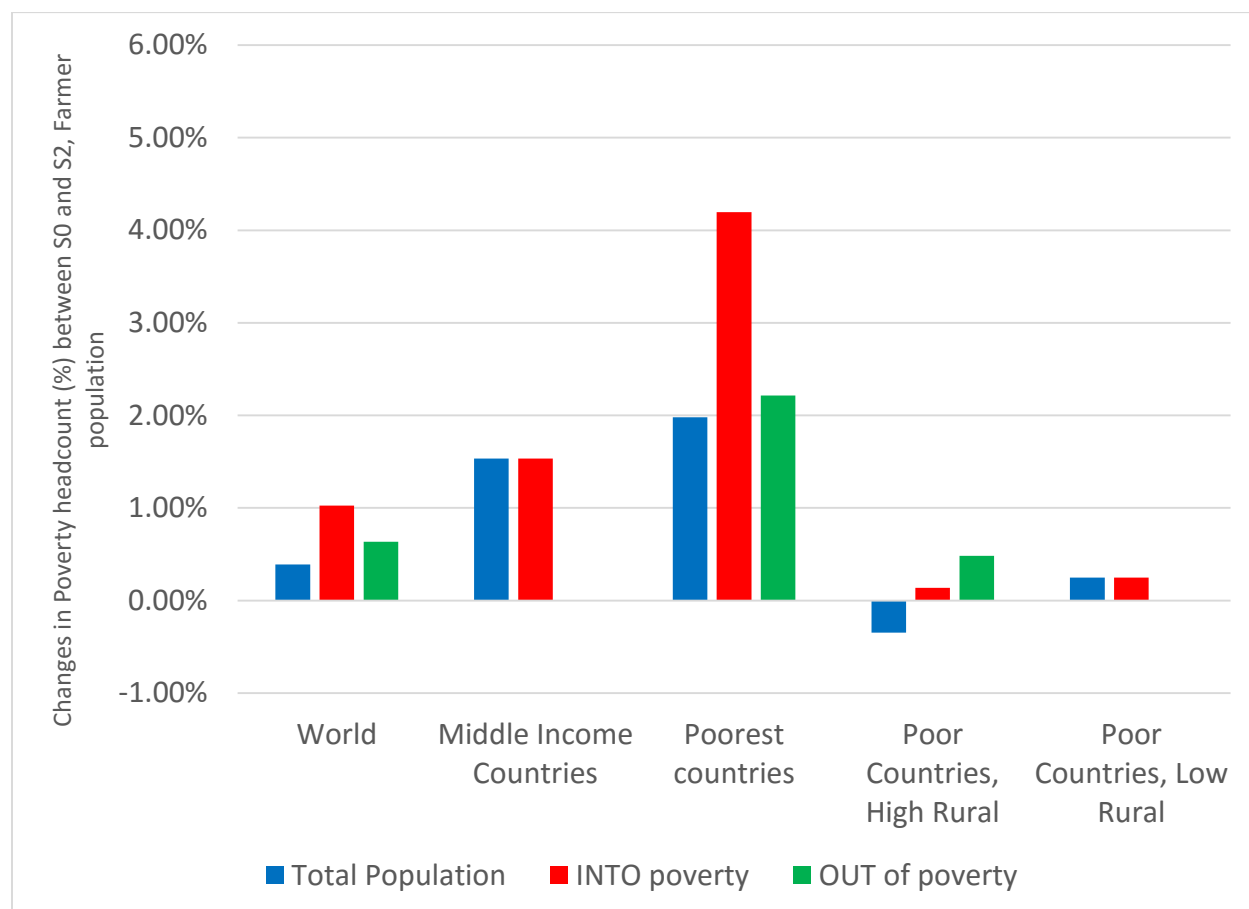
Source: Authors' calculations.

Note: Poverty is defined by the \$1.90 PPP 2011 threshold.

Country grouping refers to our cluster analysis. See details in Appendix 6.2

When we focus on households headed by farmers, in Figure 17, we see a broadly similar picture, with the biggest impacts on poverty in the poorest countries, and the (substantial) net increase in poverty being a consequence of a large gross movement into poverty (over 4 percentage points) and a substantial group (over 2 percentage points) moving out of poverty. In middle income countries, there is a substantial increase in the net poverty rate (1.5 percentage points) with almost no farm families moving out of poverty.

Figure 17. Net and gross movements into and out of poverty, Scenario 2, Percentage points, Farmer population



Source: Authors' calculations.

Note: Poverty is defined by the \$1.90 PPP 2011 threshold.

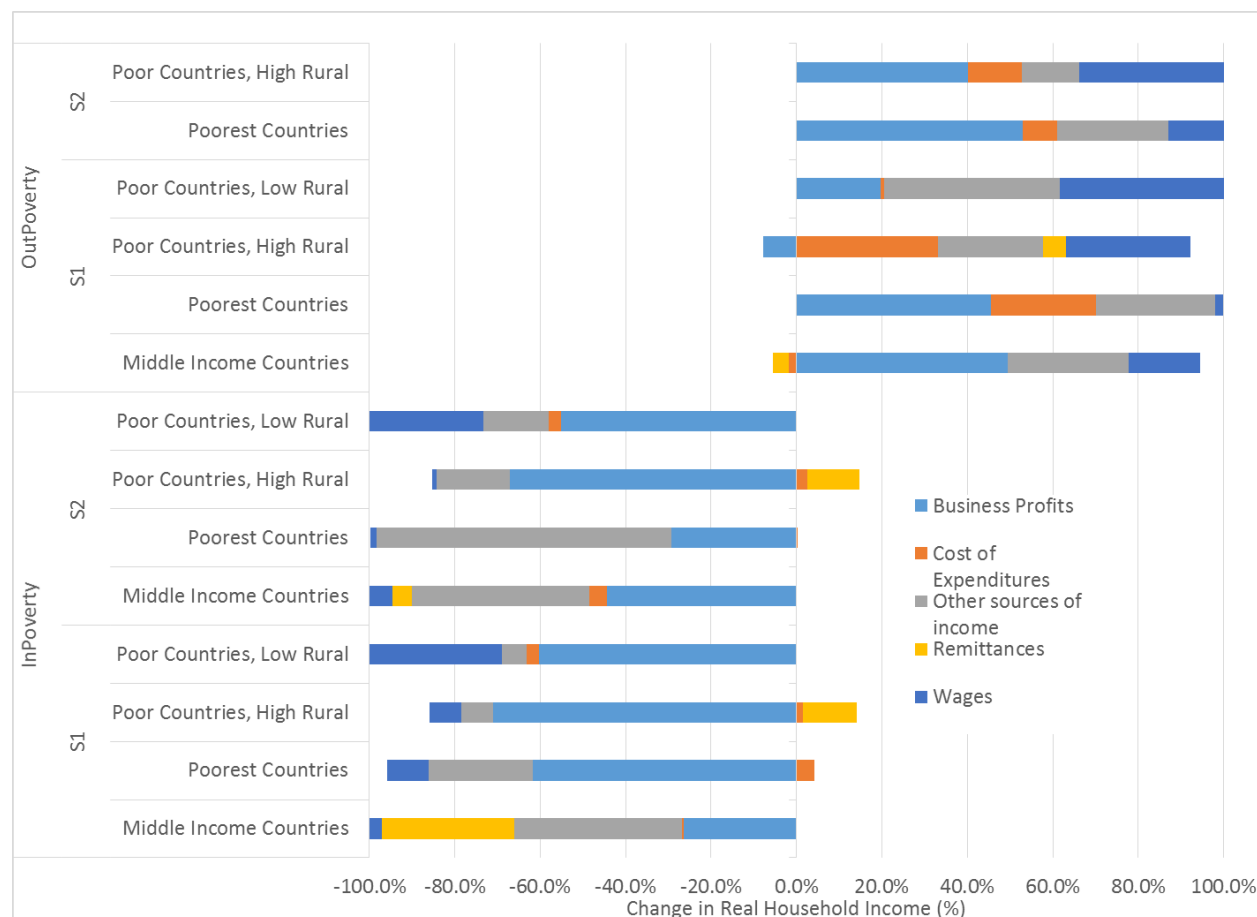
Country grouping refers to our cluster analysis. See details in Appendix 6.1.

Heterogenous drivers

To help understand the cause of the large movements into and out of poverty it is useful to look at the sources of the changes in income that resulted in households moving the way that they did. In Figure 18, we first examine the changes in income that helped households move out of poverty, and then turn to the changes in income that resulted in households initially above the poverty line falling into poverty. For the sizeable group rising out of poverty in the poorest countries, the most important change was an increase in the business profits of smallholders. In some cases, this would have resulted from households increasing their sales on the market. However, another element of this rise in income would be from households reducing their net purchases from the market because of the increase in their farm output. In the other group of countries in which lifting households out of poverty made an important contribution to the global poverty outcome—the low income countries, rising farm incomes and wages for labor sold outside the farm firm were important.

When we turn to the households falling into poverty, the largest change is in the poorest countries, and the largest identifiable contributor to this decline is a reduction in sales by smallholders.

Figure 18. Relative contributions of different drivers in the change of household real income, breakdown by poverty movement, Scenarios 1 and 2

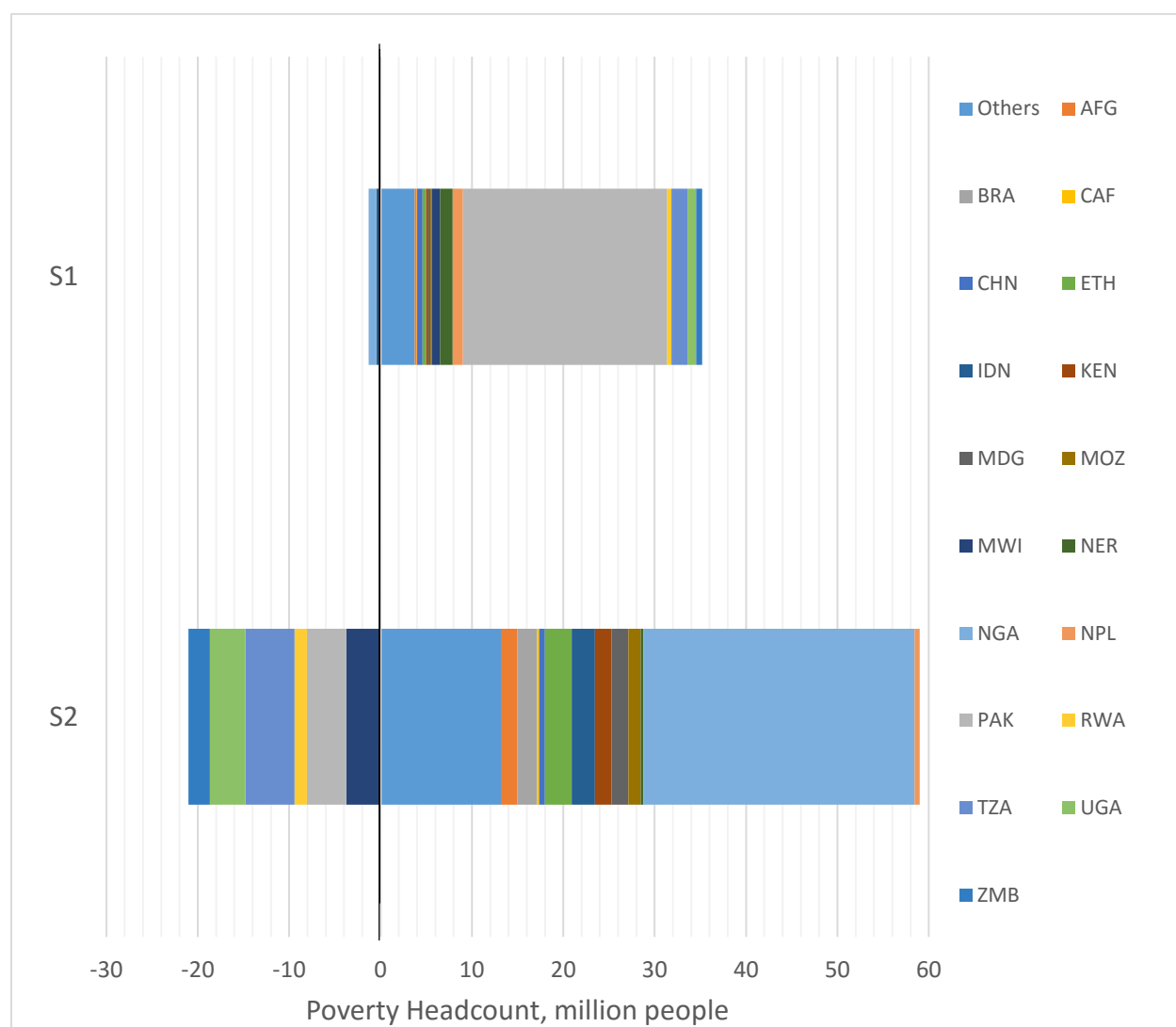


Source: Authors' calculations

Main countries contributing to global poverty changes

Figure 19 shows that in scenario 1, the country with the most people falling into poverty is Pakistan with over 22 million people, while the country with the most people escaping from poverty is Nigeria. However, due to its population size, the size of the shock, and the vulnerability of many Nigerians to poverty (see Table 6), Nigeria is the country with the most people moving into poverty in scenario 2 with 29 million people moving into poverty. Ethiopia, Indonesia and Kenya are also hit hard under this scenario. By contrast, poverty falls substantially in Pakistan, Tanzania, Uganda and Zambia. Detailed country level results are available in Appendix 6.2

Figure 19. Changes in the number of poor people by country, thousands, compared to the 2030 baseline (S0)



Source: Authors' calculations

Note: 3 letters ISO codes are used to identify key countries

Changes in the Poverty Line

All of the results presented to this point have retained the internationally-standard benchmark of \$1.90 per person per day at 2011 prices currently used by the World Bank. This means that poverty rates fall to very low levels in many countries by the end of the simulation period. Since this poverty rate is based on the poverty rates chosen by fifteen poor countries (Ferreira, Jolliffe and Pryoz 2015), it seems likely that this internationally-accepted poverty rate will change as the incomes of the poorest countries rise from today's levels. To assess whether our results are

sensitive to the choice of poverty line, we considered a poverty line double the current international standard. The resulting poverty lines and poverty rates are presented in Table 7.

These results show that the poverty rate is strongly affected by the poverty line. The 2030 levels of poverty are roughly double those at the current poverty line. The effects of the productivity growth slowdown (in percentage point terms) also roughly double when we move to the higher poverty line. However, there are no changes in the qualitative nature of the impacts.

Table 7. Effects of Different Poverty Lines in S0, S1, and S2 on Global Poverty Rate in 2030

Scenarios	\$1.90 Poverty line	2030 poverty line defined at \$3.8
Total Population		
S0	4.79%	10.19%
S1	5.21%	11.02%
S2	5.26%	11.29%
Farmer Population		
S0	6.79%	13.63%
S1	7.38%	14.82%
S2	7.18%	14.76%
Rural Population		
S0	7.15%	14.72%
S1	7.74%	15.85%
S2	7.52%	15.77%

Source: Authors' calculations

5 Conclusions

The recent sharp downward revisions in the prospects for global economic growth, and for growth in many developing countries, add up to a substantial long-term deterioration of the outlook for many developing countries. Even countries that are not directly affected by productivity changes are likely to be affected by the changes in commodity prices and in current account balances associated with this productivity slowdown.

To assess the likely consequences of this growth slowdown for the achievement of SDG 1 by 2030, we compare the most recent IMF forecasts for economic growth to 2017 with those from an earlier and more benign environment—in 2012—and assume that the changes in projected growth rates over that period are continued to 2030. The resulting changes in the level of GDP are very substantial. They point to sharply reduced growth prospects for many developing countries, particularly relative to the period of more rapid economic growth in developing countries and of income convergence between poor and rich countries experienced since the 1990s.

In this paper, we assess the implications of these changes for the poor—and particularly the rural poor, who tend to be the poorest of the poor—of this sharp slowdown in economic prospects. We do this by first projecting the implications of the global growth slowdown at a national level—including reductions in productivity growth rates and the consequential shifts in economic balances and changes in relative prices. Then, we use household models for over 300,000 households to assess the implications of these changes for the poor. These models let us assess the impacts of productivity changes within households' farm firms, and the real income changes associated with changes in real wage rates for labor sold by households and changes in the prices received and paid for food.

We find that the changes in poverty rates associated with this growth slowdown are particularly sharp in the poorest countries. In these countries, there are also very substantial gross changes in poverty, with over 5 percent of the population falling into poverty, while another 2 percent are able to rise out of poverty. When we focus on the households headed by farmers, the most striking change is a substantial increase in poverty in middle income countries, with over 1.5 percent of the farm population at serious risk of falling into absolute poverty as a consequence of this growth slowdown.

This analysis highlights the potential power of the framework utilized for this analysis to capture the implications for the poor of a wide range of shocks, such as changes in economic growth, changes in weather and climatic conditions, changes in food prices, and changes in technology. By using economy-wide models to capture the implications of the original shocks for key variables affecting households—such as changes in productivity, changes in commodity prices and changes in factor prices—and then passing these changes to household simulation models, this modeling approach allows us to capture the impacts on poor people at national and global scales, rather than to focus only on national aggregates which are likely to be of little interest to policy makers.

We should emphasize that the growth of TFP plays an important role in driving key results since it impacts both incomes and relative prices. Our results should be looked at keeping in mind that we assume a uniform changes across sectors. In general, we think it sufficiently likely that a

productivity slowdown will affect all sectors to use this as our base case. If, for instance, the cause of the slowdown is a rise in interest rates, it is likely to raise production costs in all sectors. Similarly, a decision to raise import barriers is likely to reduce innovation by restricting access to imported inputs.

However, there are also potential reasons for interest in differential rates of productivity growth. If, for instance, the extent of adoption of available innovations differs between sectors, then productivity may be growing at different rates. Since productivity growth in agriculture may be influenced by increased investments in public research and development following the recent food price crisis, agricultural growth may prove more robust. Since, agricultural growth is known to have strong impacts on poverty, estimates of the effects of changes in agricultural productivity growth may also be policy relevant. Lower productivity in agriculture compared with the rest of the economy will lead to higher relative prices for agricultural products but lower quantities produced, and weaker wages. So, lower productivity has a negative outcome for the poor in most cases, but some farmers may still be better off if the price effects dominate. In our setting, we can also identify what happens if the asymmetric shock (across sectors) happens only in leading economies (scenario 1) or if it happens globally (scenario 2).

The adverse impacts of slower growth on the poor highlight the need for careful analysis of the sources of this slowdown at the country level and for policies to ameliorate the impacts on the poor. If the slowdown reflects shocks such as adjustment to a decline in the terms of trade, and if the country then fiscal stimulus might be appropriate. If there are opportunities to raise agricultural productivity, then this is likely to have particularly strong favorable impacts on poverty in both urban and rural areas, but particularly in rural areas, over the medium to long term (Ivanic and Martin 2016; Loayza and Raddatz 2010). Development and enhancement of social safety nets remains important to help poor and vulnerable households to deal with short term shocks from a variety of sources.

6 Appendix

6.1 Country grouping

Table 8. Cluster Composition (ISO Country Code)

Cluster 1: Middle Income Countries	ABW, ARG, ATG, BRA, BRB, BRN, COL, CRI, CUB, DJI, DMA, DOM, DZA, ECU , GRD, GUY, IRN, IRQ, JOR, KNA, LBY, MAR, MEX, MHL, MNG , MYS, OMN, PAN , PER , SLV, SYR, TTO, TUN, VEN, WBG
Cluster 2: Poorest countries	AFG, BDI, BEN, BFA, BGD , CAF, COM, ERI, ETH, GIN, GNB, HTI, KEN, LAO, LBR, LSO, MDG, MDV, MLI, MOZ, NGA , PNG, SEN, SLE , SWZ, TCD, TGO, TLS , TZA , UGA , ZAR, ZMB , ZWE
Cluster 3: Countries with no significant poverty level	ADO, ARE, AUS, AUT, BEL, BHR, BHS, BMU, CAN, CHE, CHL, CYP, CZE, DEU, DNK, ESP, EST, FIN, FRA, GBR, GRC, GRL, HKG, HRV, HUN, IMY, IRL, ISL, ISR, ITA, JPN, KOR, KSV, KWT, LBN, LTU, LUX, LVA, MAC, MCO, MLT, NLD, NOR, NZL, PLW, POL, PRI, PRT, QAT, SAU, SGP, SMR, SWE, TUR, URY, USA
Cluster 4: Poor Countries, High Rural	AGO, BIH, BTN, BWA, CHI, CIV , CMR, COG, CPV, EGY, FSM, GAB, GHA, GMB, GNQ, IND , KGZ, KHM , LIE, LKA , MRT, MUS, MWI , NAM, NER , NPL , PAK , RWA , SDN, STP, SYC, TJK , TON, UZB, VNM , VUT, WSM, YEM , ZAF
Cluster 5: Poor Countries, Low Rural	ALB , ARM , AZE, BGR, BLR, BLZ , BOL, CHN , FJI, GEO, GTM , HND, IDN , JAM, KAZ, KIR, MDA , MKD, MNE, NIC , PHL, PRY, ROM, RUS, SRB, SUR, SVK, SVN, THA, TKM, TUV, UKR

Source: Authors' calculations.

Note. These clusters were created using the method described in Section 2.2. Specifically, we used STATA's *kmeans* command. In bold are the countries used in household survey analysis.

6.2 Country level results

ISO	Country	Poverty Rate, Total Population			Poverty Rate, Farmer Population			Poverty Rate, Rural Population			Changes in number of poor people (1000)	
		S0	S1	S2	S0	S1	S2	S0	S1	S2	S1	S2
ABW	Aruba	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.1%	0.1%	0.2%	-0.01	0.06
AFG	Afghanistan	23.7%	24.1%	27.1%	22.7%	23.2%	24.6%	23.6%	24.1%	25.5%	226.46	1,810.94
AGO	Angola	9.8%	11.5%	8.9%	8.6%	10.6%	8.0%	9.3%	11.4%	8.7%	524.43	-292.80
ALB	Albania	0.3%	0.3%	0.4%	0.4%	0.4%	0.5%	0.3%	0.3%	0.3%	0.00	3.20
ARG	Argentina	0.2%	0.2%	0.3%	0.3%	0.3%	0.7%	0.3%	0.3%	0.6%	-6.84	67.34
ARM	Armenia	0.3%	0.3%	0.4%	0.4%	0.3%	0.4%	0.3%	0.3%	0.4%	-1.16	2.76
ATG	Antigua and Barbuda	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.1%	0.1%	0.2%	0.00	0.04
AZE	Azerbaijan	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.10	0.78
BDI	Burundi	36.2%	36.8%	41.4%	34.6%	35.4%	37.6%	36.0%	36.7%	38.9%	74.28	593.96
BEN	Benin	21.1%	21.4%	24.1%	20.2%	20.6%	21.9%	21.0%	21.4%	22.7%	55.28	442.05
BFA	Burkina Faso	19.8%	20.2%	22.7%	19.0%	19.4%	20.6%	19.7%	20.1%	21.4%	103.65	828.90
BGD	Bangladesh	1.0%	0.9%	1.2%	0.3%	0.3%	0.5%	1.1%	1.1%	1.4%	-80.91	424.81
BIH	Bosnia and Herzeg.	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.04	-0.02
BLR	Belarus	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.02	0.15
BLZ	Belize	6.5%	7.0%	6.7%	8.7%	9.3%	8.7%	7.1%	7.6%	7.1%	2.02	0.57
BOL	Bolivia	0.6%	0.6%	0.8%	0.6%	0.6%	0.9%	0.6%	0.6%	0.8%	4.49	34.92
BRA	Brazil	1.3%	1.2%	2.2%	2.0%	1.9%	4.4%	1.8%	1.7%	3.9%	-215.1	2,119.05
BRB	Barbados	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.1%	0.1%	0.2%	-0.02	0.15
BRN	Brunei Darussalam	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.1%	0.1%	0.2%	-0.03	0.28
BTN	Bhutan	1.8%	2.2%	1.7%	1.6%	2.0%	1.5%	1.8%	2.1%	1.6%	2.88	-1.61
BWA	Botswana	5.6%	6.6%	5.1%	4.9%	6.1%	4.6%	5.4%	6.6%	5.0%	22.95	-12.82
CAF	Central African Rep.	28.0%	28.5%	32.0%	26.8%	27.4%	29.0%	27.8%	28.4%	30.1%	31.93	255.30
CHN	China	0.0%	0.1%	0.1%	0.0%	0.1%	0.1%	0.0%	0.1%	0.1%	601.56	601.56
CIV	Cote d'Ivoire	7.7%	10.1%	8.0%	11.2%	14.0%	11.1%	10.2%	12.6%	10.2%	710.61	78.40
CMR	Cameroon	1.7%	2.0%	1.6%	1.5%	1.9%	1.4%	1.6%	2.0%	1.5%	86.35	-48.21
COG	Congo, Rep.	9.8%	11.5%	8.8%	8.5%	10.5%	7.9%	9.3%	11.4%	8.7%	104.63	-58.42
COL	Colombia	1.7%	1.5%	3.0%	2.7%	2.6%	5.8%	2.4%	2.3%	5.2%	-73.73	726.18
COM	Comoros	20.5%	20.9%	23.5%	19.6%	20.1%	21.3%	20.4%	20.8%	22.1%	4.27	34.15
CPV	Cabo Verde	3.8%	4.5%	3.4%	3.3%	4.1%	3.1%	3.6%	4.4%	3.4%	3.88	-2.16
CRI	Costa Rica	0.6%	0.6%	1.1%	1.0%	1.0%	2.2%	0.9%	0.9%	2.0%	-2.82	27.80
CUB	Cuba	0.4%	0.4%	0.8%	0.7%	0.7%	1.5%	0.6%	0.6%	1.4%	-3.72	36.62
DJI	Djibouti	3.9%	3.6%	6.8%	6.2%	6.0%	13.4%	5.5%	5.3%	12.0%	-3.78	37.24
DMA	Dominica	0.3%	0.3%	0.5%	0.5%	0.5%	1.0%	0.4%	0.4%	0.9%	-0.02	0.15
DOM	Dominican Republic	0.5%	0.4%	0.8%	0.7%	0.7%	1.6%	0.7%	0.6%	1.4%	-4.29	42.28
DZA	Algeria	1.4%	1.3%	2.5%	2.2%	2.2%	4.8%	2.0%	1.9%	4.3%	-46.91	462.05
ECU	Ecuador	0.8%	0.8%	2.3%	2.9%	2.8%	7.5%	2.0%	1.9%	5.3%	-7.53	275.40

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		Poverty Rate, Total Population			Poverty Rate, Farmer Population			Poverty Rate, Rural Population			Changes in number of poor people (1000)	
<i>ISO</i>	<i>Country</i>	<i>S0</i>	<i>S1</i>	<i>S2</i>	<i>S0</i>	<i>S1</i>	<i>S2</i>	<i>S0</i>	<i>S1</i>	<i>S2</i>	<i>S1</i>	<i>S2</i>
EGY	Egypt, Arab Rep.	0.3%	0.4%	0.3%	0.3%	0.3%	0.2%	0.3%	0.4%	0.3%	56.43	-31.50
ERI	Eritrea	18.9%	19.3%	21.6%	18.1%	18.5%	19.7%	18.8%	19.2%	20.4%	28.51	228.00
ETH	Ethiopia	17.3%	17.6%	19.8%	16.6%	17.0%	18.0%	17.2%	17.6%	18.7%	368.61	2,947.73
FJI	Fiji	0.2%	0.2%	0.3%	0.2%	0.2%	0.3%	0.2%	0.2%	0.3%	0.12	0.94
FSM	Micronesia, Fed. Sts.	5.6%	6.6%	5.1%	4.9%	6.1%	4.6%	5.4%	6.5%	5.0%	1.26	-0.70
GAB	Gabon	0.9%	1.0%	0.8%	0.8%	0.9%	0.7%	0.8%	1.0%	0.8%	3.26	-1.82
GEO	Georgia	0.6%	0.6%	0.8%	0.6%	0.6%	0.8%	0.5%	0.6%	0.8%	1.23	9.59
GHA	Ghana	5.2%	6.1%	4.7%	4.5%	5.6%	4.2%	4.9%	6.0%	4.6%	327.49	-182.85
GIN	Guinea	19.3%	19.6%	22.1%	18.5%	18.9%	20.0%	19.2%	19.6%	20.8%	55.17	441.19
GMB	Gambia, The	6.1%	7.1%	5.5%	5.3%	6.5%	4.9%	5.8%	7.1%	5.4%	29.71	-16.59
GNB	Guinea-Bissau	21.8%	22.1%	24.9%	20.8%	21.3%	22.6%	21.6%	22.1%	23.4%	8.83	70.63
GNQ	Equatorial Guinea	0.0%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.1%	0.0%	0.09	-0.05
GRD	Grenada	0.3%	0.3%	0.6%	0.5%	0.5%	1.1%	0.5%	0.4%	1.0%	-0.03	0.26
GTM	Guatemala	2.8%	3.7%	3.3%	2.8%	3.7%	3.3%	5.0%	6.3%	5.8%	195.32	119.09
GUY	Guyana	1.8%	1.6%	3.1%	2.8%	2.8%	6.2%	2.6%	2.5%	5.5%	-1.10	10.82
HND	Honduras	0.7%	0.7%	1.0%	0.6%	0.7%	1.0%	0.6%	0.7%	0.9%	4.10	31.91
HTI	Haiti	27.5%	28.0%	31.4%	26.3%	26.9%	28.5%	27.3%	27.9%	29.6%	61.72	493.56
IDN	Indonesia	2.0%	1.9%	2.9%	2.5%	2.4%	3.8%	2.3%	2.1%	3.3%	-236.4	2,530.64
IND	India	3.9%	3.9%	4.0%	4.2%	4.2%	4.2%	4.7%	4.7%	4.8%	-350.7	1,034.82
IRN	Iran, Islamic Rep.	0.3%	0.3%	0.5%	0.5%	0.5%	1.0%	0.4%	0.4%	0.9%	-19.46	191.64
IRQ	Iraq	0.6%	0.5%	1.0%	0.9%	0.9%	2.0%	0.8%	0.8%	1.8%	-24.76	243.90
JAM	Jamaica	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.01	0.10
JOR	Jordan	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.1%	-0.16	1.58
KAZ	Kazakhstan	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.04	0.35
KEN	Kenya	19.3%	19.6%	22.1%	18.5%	18.9%	20.0%	19.2%	19.6%	20.8%	228.27	1,825.39
KGZ	Kyrgyz Republic	1.1%	1.3%	1.0%	1.0%	1.2%	0.9%	1.1%	1.3%	1.0%	13.02	-7.27
KHM	Cambodia	0.2%	0.2%	0.4%	0.1%	0.1%	0.3%	0.2%	0.2%	0.5%	-1.78	46.02
KIR	Kiribati	0.5%	0.5%	0.8%	0.5%	0.6%	0.8%	0.5%	0.5%	0.7%	0.04	0.31
KNA	St. Kitts and Nevis	0.1%	0.1%	0.1%	0.1%	0.1%	0.2%	0.1%	0.1%	0.2%	0.00	0.03
LAO	Lao PDR	15.1%	15.3%	17.2%	14.4%	14.8%	15.6%	15.0%	15.3%	16.2%	20.97	167.70
LBR	Liberia	37.3%	37.9%	42.6%	35.7%	36.5%	38.7%	37.1%	37.8%	40.1%	43.68	349.33
LBY	Libya	3.9%	3.6%	6.9%	6.2%	6.1%	13.5%	5.6%	5.4%	12.2%	-23.59	232.31
LKA	Sri Lanka	0.3%	0.6%	0.4%	0.5%	0.8%	0.6%	0.4%	0.7%	0.4%	63.91	13.22
LSO	Lesotho	19.3%	19.7%	22.1%	18.5%	18.9%	20.1%	19.2%	19.6%	20.8%	8.89	71.11
MAR	Morocco	0.5%	0.5%	0.9%	0.8%	0.8%	1.8%	0.7%	0.7%	1.6%	-15.02	147.92
MDA	Moldova	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.00	0.15

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ISO	Country	Poverty Rate, Total Population			Poverty Rate, Farmer			Poverty Rate, Rural			Changes in number of poor people (1000)	
		S0	S1	S2	S0	S1	S2	S0	S1	S2	S1	S2
MDG	Madagascar	36.2%	36.8%	41.4%	34.6%	35.4%	37.5%	36.0%	36.7%	38.9%	229.30	1,833.64
MDV	Maldives	2.5%	2.5%	2.8%	2.4%	2.4%	2.6%	2.5%	2.5%	2.7%	0.17	1.37
MEX	Mexico	0.2%	0.2%	0.4%	0.4%	0.4%	0.8%	0.3%	0.3%	0.7%	-24.75	243.72
MHL	Marshall Islands	0.2%	0.1%	0.3%	0.3%	0.2%	0.5%	0.2%	0.2%	0.5%	-0.01	0.08
MLI	Mali	22.4%	22.8%	25.7%	21.5%	22.0%	23.3%	22.3%	22.8%	24.2%	107.83	862.31
MNE	Montenegro	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.00	0.01
MNG	Mongolia	4.5%	3.9%	6.3%	4.2%	3.1%	6.3%	5.6%	4.6%	7.9%	-21.22	61.84
MOZ	Mozambique	26.5%	27.0%	30.3%	25.4%	25.9%	27.5%	26.4%	26.9%	28.5%	170.79	1,365.75
MRT	Mauritania	4.2%	5.0%	3.8%	3.7%	4.6%	3.4%	4.0%	4.9%	3.8%	38.19	-21.32
MUS	Mauritius	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.23	-0.13
MWI	Malawi	44.6%	47.8%	31.3%	50.1%	53.3%	35.3%	48.1%	51.3%	33.9%	899.22	-3,734.74
NAM	Namibia	5.8%	6.8%	5.2%	5.0%	6.2%	4.7%	5.5%	6.7%	5.1%	30.44	-16.99
NER	Niger	9.4%	13.8%	10.4%	9.0%	13.1%	9.7%	10.9%	16.0%	12.0%	1,370.40	305.66
NGA	Nigeria	29.1%	28.8%	40.6%	31.4%	31.1%	44.2%	33.8%	33.4%	46.5%	-861.66	29,679.82
NIC	Nicaragua	3.7%	4.8%	4.4%	6.9%	8.9%	8.0%	7.6%	9.6%	8.9%	77.61	50.42
NPL	Nepal	3.8%	6.7%	5.2%	3.7%	6.6%	5.0%	2.9%	5.8%	4.2%	1,141.53	535.01
OMN	Oman	0.2%	0.2%	0.4%	0.4%	0.4%	0.8%	0.3%	0.3%	0.7%	-0.66	6.48
PAK	Pakistan	5.1%	14.6%	3.2%	5.1%	14.6%	3.2%	5.7%	15.5%	3.4%	22,359.31	-4,331.48
PAN	Panama	2.7%	2.9%	2.9%	8.2%	8.9%	8.6%	5.3%	5.8%	5.6%	11.24	7.59
PER	Peru	0.9%	0.8%	2.2%	1.6%	1.5%	4.6%	2.1%	2.0%	5.5%	-14.43	465.71
PHL	Philippines	0.7%	0.7%	1.0%	0.7%	0.7%	1.0%	0.6%	0.7%	0.9%	50.01	388.75
PNG	Papua New Guinea	15.9%	16.2%	18.2%	15.2%	15.6%	16.5%	15.8%	16.2%	17.1%	29.10	232.71
PRY	Paraguay	0.3%	0.3%	0.4%	0.3%	0.3%	0.4%	0.3%	0.3%	0.4%	1.33	10.37
RWA	Rwanda	38.1%	40.7%	30.5%	41.0%	43.8%	32.7%	42.8%	45.6%	34.4%	456.40	-1,338.99
SDN	Sudan	3.6%	4.2%	3.2%	3.1%	3.9%	2.9%	3.4%	4.2%	3.2%	415.00	-231.71
SEN	Senegal	14.9%	15.2%	17.0%	14.3%	14.6%	15.5%	14.8%	15.1%	16.0%	53.39	426.94
SLE	Sierra Leone	12.8%	20.6%	13.7%	14.4%	21.6%	15.1%	14.7%	22.2%	15.3%	663.28	82.07
SLV	El Salvador	1.8%	1.7%	3.2%	2.9%	2.8%	6.4%	2.6%	2.5%	5.7%	-10.11	99.58
SRB	Serbia	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.05	0.41
STP	Sao Tome and Principe	5.1%	6.0%	4.6%	4.4%	5.5%	4.1%	4.8%	5.9%	4.5%	2.07	-1.16
SUR	Suriname	0.6%	0.6%	0.8%	0.6%	0.6%	0.9%	0.5%	0.6%	0.8%	0.20	1.56
SVN	Slovenia	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.00	0.02
SWZ	Swaziland	18.1%	18.4%	20.7%	17.3%	17.7%	18.8%	18.0%	18.4%	19.5%	4.74	37.92
SYC	Seychelles	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.01	0.00

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ISO	Country	Poverty Rate, Total Population			Poverty Rate, Farmer Population			Poverty Rate, Rural Population			Changes in number of poor people (1000)	
		S0	S1	S2	S0	S1	S2	S0	S1	S2	S1	S2
SYR	Syrian Arab Republic	0.4%	0.3%	0.6%	0.6%	0.5%	1.2%	0.5%	0.5%	1.1%	-7.57	74.57
TCD	Chad	27.6%	28.1%	31.5%	26.4%	27.0%	28.6%	27.4%	28.0%	29.7%	91.17	729.06
TGO	Togo	17.2%	17.5%	19.7%	16.5%	16.8%	17.9%	17.1%	17.5%	18.5%	26.82	214.45
THA	Thailand	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.58	4.53
TJK	Tajikistan	0.9%	0.8%	1.2%	1.0%	0.8%	1.6%	1.1%	0.9%	1.4%	-10.60	28.30
TKM	Turkmenistan	0.9%	1.0%	1.3%	0.9%	1.0%	1.4%	0.9%	0.9%	1.3%	3.29	25.56
TLS	Timor-Leste	9.2%	7.1%	5.9%	10.7%	8.2%	7.0%	11.6%	9.1%	7.7%	-40.64	-64.51
TON	Tonga	0.3%	0.4%	0.3%	0.3%	0.4%	0.3%	0.3%	0.4%	0.3%	0.07	-0.04
TTO	Trinidad and Tobago	0.9%	0.8%	1.5%	1.4%	1.3%	2.9%	1.2%	1.2%	2.7%	-0.90	8.82
TUN	Tunisia	0.3%	0.3%	0.5%	0.4%	0.4%	1.0%	0.4%	0.4%	0.9%	-2.62	25.81
TUV	Tuvalu	0.2%	0.2%	0.3%	0.2%	0.2%	0.3%	0.2%	0.2%	0.3%	0.00	0.01
TZA	Tanzania	53.7%	55.8%	47.1%	60.6%	62.5%	53.4%	60.5%	62.4%	53.5%	1,741.17	-5,395
UGA	Uganda	18.3%	19.9%	11.8%	20.5%	22.3%	13.4%	20.6%	22.5%	13.3%	965.96	-3,880
UKR	Ukraine	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.05	0.41
UZB	Uzbekistan	0.1%	0.2%	0.1%	0.1%	0.2%	0.1%	0.1%	0.2%	0.1%	8.37	-4.67
VEN	Venezuela, RB	1.4%	1.3%	2.4%	2.2%	2.1%	4.7%	1.9%	1.9%	4.2%	-39.03	384.39
VNM	Vietnam	0.6%	0.5%	1.0%	0.7%	0.6%	1.2%	0.8%	0.7%	1.4%	-70.80	423.86
VUT	Vanuatu	2.8%	3.3%	2.5%	2.4%	3.0%	2.3%	2.6%	3.2%	2.5%	1.79	-1.00
WSM	Samoa	0.1%	0.2%	0.1%	0.1%	0.2%	0.1%	0.1%	0.2%	0.1%	0.05	-0.03
YEM	Yemen, Rep.	2.2%	2.4%	3.8%	2.0%	2.3%	3.9%	2.6%	2.9%	4.6%	100.35	699.00
ZAF	South Africa	2.5%	2.9%	2.2%	2.2%	2.7%	2.0%	2.4%	2.9%	2.2%	236.19	-131.8
ZMB	Zambia	51.5%	54.1%	42.0%	70.4%	72.9%	59.4%	67.3%	69.7%	56.6%	640.75	-2,337
ZWE	Zimbabwe	27.1%	27.6%	31.0%	25.9%	26.5%	28.1%	26.9%	27.5%	29.1%	85.64	684.81

Source: Authors' calculations.

Note: Poverty is defined by the \$1.90 PPP 2011 threshold.

Countries for which detailed household survey information is available. These countries are used as representative for their respective clusters.

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