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Eradicating Poverty by 2030: Implications for Income Inequality, Population Policies, Food Prices (and Faster Growth?)

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Eradicating Poverty by 2030:
Implications for Income Inequality, Population Policies, Food Prices
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by

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Abstract. The paper examines whether the planned eradication of poverty to the year 2030 part of the Sustainable Development Goals strategy is compatible with the trends expected over the next 15 years in key economic variables such as GDP growth, population growth, income inequality and food prices. To do so, the paper develops a comparative-static, poverty-accounting model that allows to simulate to 2030 the impact on SDG1 (poverty eradication) of the fastest improvements recorded for the above four variables during the last 30 years. Numerous model simulations show that – even under the most favorable assumptions – between 16 and 28 countries (mainly from Africa) out of the 78 analyzed will not reach the SDG1 target. Policy suggestions on how to improve on such results are presented at the end of the paper.

Key words: SDG1, poverty eradication, inequality, GDP growth, population growth, food prices, public policies.

JEL codes: D31, I32, J11, Q18

1. Introduction and motivation of the paper

The SDGs strategy is committed to 'leave no one behind' (LNOB). As stated in the Preamble to the Resolution on the SDGs adopted by the United Nations General Assembly 'We are resolved to free the human race from the tyranny of poverty and want to heal and secure our planet. As we embark on this collective journey, we pledge that no one will be left behind'. The SDGs aim at reaching 17 social and economic goals, and rely on the successful implementation of a large number of development policies. Some of them are sector-specific, while others impact not only a given target but facilitate reaching other SDGs that are closely interrelated with the specific sector targeted.

For instance, Iinequality in income, health and education are closely interconnected among each other, with asset concentration, food prices, Total Fertility Rates (TFR) by income decile, and the evolution of social norms that discriminate people belonging to marginal groups. Such inequalities are in most cases path-dependent and tend to reinforce each other. Most obviously, a high asset inequality raises income concentration. In turn, income and savings inequality affect long-term assets

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creation and inequality, as well as the ability of households to access education and health services. Such kind of examples can be multiplied *ad infinitum*.

Recent policies have been shown to affect markedly inequality in all its dimensions and to facilitate/hamper the achievement of LNOB targets. During the 1980s and 1990s, neoliberal reforms in the field of macroeconomics, taxation, social spending, labor market, foreign trade and finance raised in many cases income inequality and retarded improvements in average health and education. In contrast, the adoption of the MDG/SDG paradigms and of a distribution-sensitive structuralist macroeconomic approach (Cornia 2014) - like those followed during the 2000s and 2010s in Latin America and some South East Asian countries (Cornia and Martorano 2012) - generated positive effects on various dimensions of inequality, favoring in this way the achievement of the LNOB targets. Given all these interconnections, reaching all SDGs requires acting simultaneously on several fronts, keeping in mind that the measures to promote the achievement of SDG '*x*' will also affect reaching SDGs '*y', 'z*' and so on.

However, modelling accurately such web of interrelations would require building a complex simultaneous 17 equations system that, once transformed in reduced form, would help identifying the most effective policy changes needed to reach the 17 SDGs. This goes well beyond the scope of this paper that focuses only on the relation between the achievement of SDG1 (poverty eradication) and changes in four sets of policies concerning SDG 8 (economic growth), 9 (reduced inequality), 2 (food, food prices and hunger) and 3 (good health, including reproductive health and TFR). All these variables have been shown to have an important influence on SDG 1 but - as far as we know - no one has tested numerically whether developments in these four policy-dependent areas over 2015-2030 will be leading (or not) to the achievement of SDG1 in developing countries. Lakner, Negre and Prydz (2014) approached this problem by focusing on 'sharing prosperity and equity'. They did so by assigning a faster rate of growth to the bottom 40 per cent of the income distribution, but ignored the impact of other variables discussed in this study. In this paper we explore some of the interactions between variables for 78 developing countries with non-zero Poverty Headcount Ratio (PHR) in 2013 by means of a simple model that allows to simulate the impact on SDG1 of improvements in income inequality, population growth, Food Price Index (FPI) relative to the Consumer Price Index (CPI), and GDP growth. Part 2 of the paper describes the theory behind the model used for the simulation. Part 3 discusses the data sources and trends used for the variables included in the model, their evolution over the last 20-30 years, and alternative scenarios about their dynamics over the next 15 years. Part 4 presents the results of numerical simulations, while Part 5 discusses the policies that could reduce inequality and population growth, and contain the rise in food prices. It also assesses what would be the effect on SDG1 of a one per cent increase in the growth rate of GDP over 2015-2030.

We wish to conclude this introduction by noting that the model presented in the paper is not a forecasting tool. Rather, It is a pedagogical, comparative-static, poverty-accounting model based on a consistent framework. It aims at alerting the national and global policy-makers about the maximum achievable improvements to reach SDG1 by 2030 under the business as usual scenario, and about the policies that ought to be introduced to increase the probability of reaching such objective.

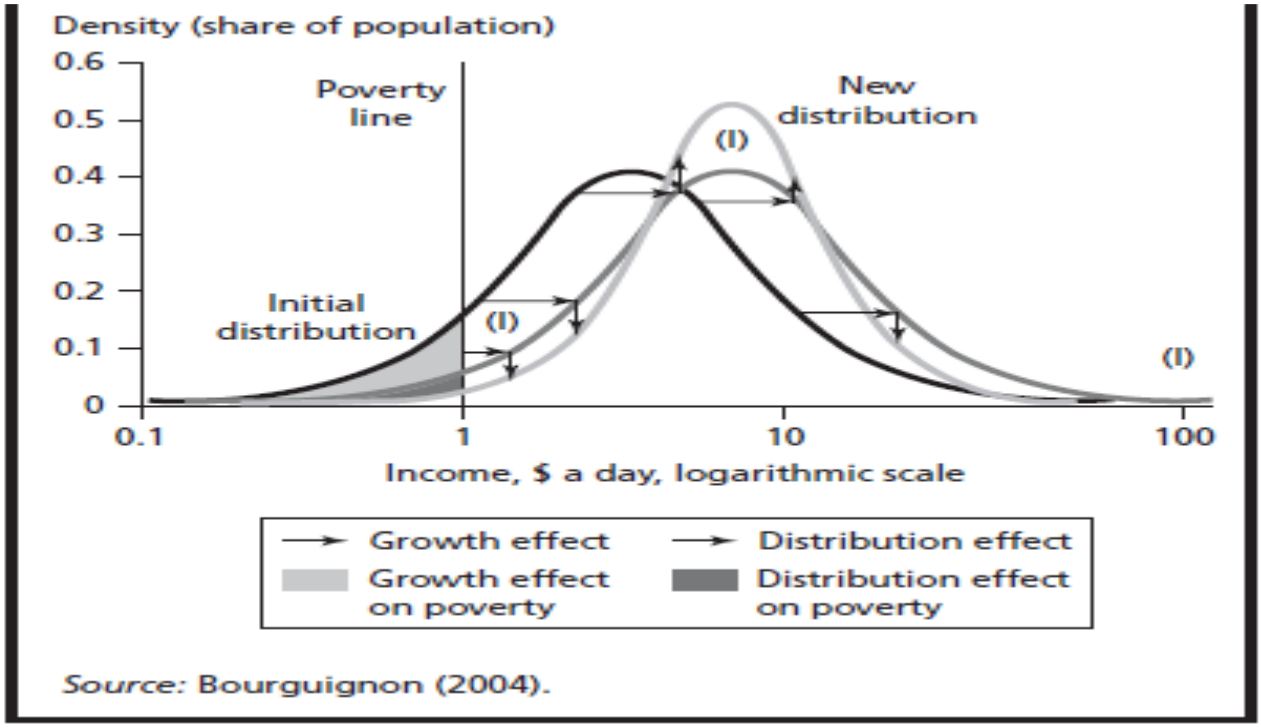
2. A simple model of the impact of immediately relevant factors on the achievement of SDG1.

As noted above, in the paper we focus on the factors that affect directly and immediately poverty reduction. In the past, some authors (Li, Squire, Zhou 1998) found that while decadal income inequality varied across regions, it remained broadly constant within each of them. They concluded that the percentage decline in the PHR therefore depended on the percentage change over time in the poverty line z and the growth of average income per capita $\Delta Yc/Yc_{-1}$, plus a negligible interaction term IT. In symbols:

$$\begin{matrix} & & + & - & +/- \\ (1) & \Delta PHR/PHR_{-1} = f\,[\,\Delta z/z_{-1}\,,\,\Delta Yc/Yc_{-1},\,IT] \end{matrix}$$

where the signs over the right-hand side variables are their partial derivatives. Yet, following Bourguignon (2004), and assuming lognormality of the distribution of income, it is possible separating the percentage change over time of the PHR into the 'growth effect' ($\Delta Yc/Yc_{-1}$) and the 'inequality effect', parametrized here for convenience by $\Delta Gini/Gini_{-1}$) (Figure 1), obtaining in this way:

Figure 1. Graphical decomposition of the change in PHR into 'growth effect' and 'inequality effect'



$$\begin{matrix} & & + & - & + & +/- \\ (2) & \Delta PHR/PHR_{-1} = f\,[\,\Delta z/z_{-1}\,,\,\Delta Yc/Yc_{-1}\,,\,\Delta Gini/Gini_{-1},\,IT\,] \end{matrix}$$

Next, following Chand (2005), we separate the impact on the PHR of the demographic factors that are included in the growth rate of GDP/c ($\Delta Yc/Yc_{-1}$). As the growth rate of a ratio is decomposable into the difference of the growth rate of the numerator minus that of the denominator, we split $\Delta Yc/Yc_{-1}$ into ($\Delta Y/Y_{-1}$ - n) where 'n' is the population growth rate. Policy-wise, it is in fact important to separate the impact on the PHR of 'GDP growth' and 'population growth'. In this regard, the evidence shows that between the 1970s and 2010s the population growth rate declined on average from 2.43 to 1.40 for the developing countries as a whole (United Nations Population Division 2017). Yet, as shown in Table

1, most of Sub-Saharan Africa, MENA and a few countries in South Asia (Afghanistan, Maldives and Pakistan) exhibit a still very high – and at time accelerating – Total Fertility Rate and population growth rate that are expected to decline only slowly in the future. In the context of equation (3) this will hamper the increase of Yc and retard the achievement of SDG1. In Niger, for instance, (the country with the highest TFR in the world), the rate of increase of the population rose from 2.94 in the 1960s to 4.02 over 2010-15, as a substantial decline in child mortality was not offset (after a decade or so) by a parallel TFR decline. In contrast, in Bangladesh, a rapid decline in population growth accounted for 36 and 22 percent of the increase in Yc in the 1980s and 1990s (Cornia 2017).

Table 1. Population growth rates in the main developing regions

	1980-85	1985-90	1900-95	1995-00	2000-05	2005-10	2010-15
SSA	2.83	2.81	2.71	2.66	2.67	2.74	2.74
MENA	1.84	2.52	2.29	2.07	2.12	2.47	2.07
South Asia	2.43	2.31	2.09	1.92	1.72	1.49	1.34
L. America	2.12	1.92	1.92	1.76	1.54	1.32	1.24
S.E. Asia	2.29	2.08	1.78	1.56	1.37	1.23	1.21
East Asia	1.41	1.65	1.05	0.66	0.56	0.52	0.49

Source: United Nations Population Division (2017)

In view of all this, we then split $\Delta Yc/Yc_{-1}$ into its economic and demographic components, obtaining a slightly enlarged model specification:

$$\Delta PHR/PHR_{-1} = f\,[\,\Delta z/z_{-1},\ \Delta Y/Y_{-1},\ n,\ \Delta Gini/Gini_{-1},\ IT\,] \qquad (3)$$

(+, -, +, +, +/-)

Finally, following Grimm and Gunther (2005) and Cornia and Martorano (2016), we assess the future impact on poverty reduction by 2030 of a common phenomenon that has affected consumption inequality in low-income countries during the last two decades, i.e. the rapid escalation of international and domestic FPI relative to CPI . A faster increase in FPI than CPI should affect the value of the poverty line z, as food is an important component of the average consumption basket. In practice, however, in most countries the poverty line is updated not by following the recommended methodological approach[2], but by simply multiplying its prior year's value for the increase in the CPI,

[2] The poverty line per capita z can be defined as $z = \Sigma p_i q_i$, where q_i are the normative quantities of food, clothing, heating, drugs, etc. necessary for survival and a minimal quality of life of an individual - which are included in the poverty basket, while p_i are their domestic prices. In developing countries depending on imports to cover the consumption of goods that enter the poverty basket (that is, food and drugs), a correct measurement of z must specify separately the quantity of imported q_{jf}, as their domestic price is equal to $p_{jf}\, e^{nc/\$}$ (where $e^{nc/\$}$ is the amount of national currency per US $). In such case, the poverty line becomes $z = \Sigma_i\, p_i\, q_{id} + \Sigma_j\, e^{nc/\$} p_{jf}\, q_{jf}$ where the first term on the right hand side is the domestic component of the poverty line and the second its foreign component. In such formulation it is evident that the poverty line increases in line with the increase in world prices and the devaluation of the exchange rate.

Lastly, where the 'law of one price' applies, the developing countries are a price takers, and there are no restrictions to the export of tradable consumed both in the domestic and international markets, a devaluation causes an increase of the poverty line due to the rise also of the prices of domestically produced tradable goods. In this case, the poverty line ought to be written as $z = \Sigma_i\, p_{iNT}\, q_{iNT} + \Sigma_j\, e^{nc/\$} p_{jT}\, q_{jT}$. As many items entering the poverty basket are tradables, under the three circumstances mentioned above the poverty line is highly dependent on changes in world prices. However, such effect does not arise (or only through the surge of the domestic price of imported inputs –that is, fertilizers) when the goods that enter the poverty line are exchanged only on local markets (as in the case of millet and sorghum in the Sahel).

without making adjustments for the differences in the consumption basket of the poor versus that of the rich.

But a faster FPI increase in relation to the CPI generates two negative effects: it penalizes disproportionately the poor, and worsens the distribution of real consumption across deciles. Indeed, the poorest assign up to 60-80 per cent of their total consumption to food while the top decile spends 20-30 per cent on it. This means that whenever the FPI and CPI diverge substantially (as observed during the food crises of the late 2000s and early 2010s), the calculation of the Gini-consumption at current prices is downward biased, as the real purchasing power of the poor is reduced more than proportionally. For instance, Grimm and Gunther (2005) show that between 1994 and 1998 the CPI rose in Burkina Faso by 23 per cent while the price of cereals increased more than 50 per cent. Thus – when taking into consideration the different dynamics of FPI and CPI - the percentage of the population living under the poverty line increased substantially, while consumption inequality worsened in relation to the estimates based on no divergence between FPI and CPI. Likewise, Arndt et al (2014) show on Mozambican data that income inequality worsened due to the sharp increase in world food prices over 2007–09, as the food consumption of poor households living in urban areas relied heavily on imported food. To take into account the impact of such un-equalizing phenomenon, in equation (4) we add an additional term 'ΔGini' (if in 2030 FPI/CPI is greater than 1.25). In symbols:

$$\begin{matrix} & & + & - & + & + & & + & +/- \\ (4) & \Delta PHR/PHR_{-1} = f\,[\,\Delta z/z_{-1},\ \Delta Y/Y_{-1},\ n,\ \Delta Gini/Gini_{-1},\ \Delta Gini\ (\text{if FPI/CPI rise} > 1.25),\ IT\,] \end{matrix}$$

Once discussed the variables that enter our simple model, we can write equations (3) and (4) in explicit linear terms. We assume that the distribution of income has a lognormal shape. We also assume, as usually done in comparisons over time, that the poverty line (i.e. $ 1.90 per person/day in constant 2011 prices) will not change (this does not exclude a change in FPI/CPI), and drop IT as negligible. We can now write equations (3) and (4) as follows:

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$$(3a) \quad \Delta PHR/PHR_{-1} = -\alpha\,\Delta Y/Y_{-1} + \alpha\, n + \beta\,\Delta Gini/Gini_{-1}$$

and in case of a large increase in FPI/CPI (that raises the Gini coefficient)

$$(4a) \quad \Delta PHR/PHR_{-1} = -\alpha\,\Delta Y/Y_{-1} + \alpha\, n + \beta\,\Delta Gini/Gini_{-1} + \omega Gini \text{ (if FPI/CPI rises by 2030 to 1.25)}$$

In equations (3a) and (4a) α and β are respectively the partial growth and inequality elasticities of poverty alleviation, i.e. the percentage change in the PHR due to a one per cent increase in GDP/c (decomposed in GDP growth and population growth, holding inequality constant), and the per cent change in PHR due to a one per cent increase in inequality (proxied by the Gini coefficient, holding the GDP /c level constant). In addition, in equation (4a), we increase the Gini coefficient by two points in the year 2030 in case FPI increases 25 percent faster than CPI.

The partial poverty alleviation elasticities of growth and inequality change across time and space and influence the contribution of growth of GDP/c and inequality reduction to poverty alleviation. For instance, Gasparini, Tornarolli and Gutierrez (2007) show that in six growth spells (three with

rising poverty and three with decreasing poverty) the growth effect and redistribution effect respectively explain on average 60 and 40 percent of the total poverty change (Table 2).

Table 2. Decomposition of changes in poverty alleviation into 'growth' and 'inequality' effects

Country	Period analyzed	Total % change in PHR	Due to 'growth' α (- $\Delta Y/Y_{-1}$ + n)	Due to 'inequality' + β ΔGini/Gini$_{-1}$
Argentina	1998-2002	+ 6.4	+3.2	+ 3.3
Dom. Rep.	2000-2004	+ 1.4	+3.6	- 2.1
Mexico	1992-2002	+ 2.4	- 0.5	+ 1.9
Average		+ 3.4	+ 2.1	+ 1.1
Argentina	2002-2004	- 3.8	- 2.7	-1.0
Brazil	1990-2003	- 3.6	-1.3	- 2.3
Chile	1990-2003	- 1.9	-1.6	- 0.4
Average		- 3.1	- 1.9	- 1.2

Source: excerpted from Gasparini, Gutierrez and Tornarolli (2007)

For our exercise, we derive the values of α and β from a study of Son and Kakwani (2002) that cross tabulates the partial poverty elasticities of growth (Table 3, left panel) and of inequality (Gini, right panel). In this regard, it is worth noting that such elasticities vary substantially in relation to the initial ratio between the poverty line z and the level of GDP/c, and the level of the Gini coefficient. For instance, as shown in Table 3, in middle income countries with a low z/GDP per capita and a high Gini (as those in Latin America or Southern Africa), PHR declines faster thanks to distributive improvements than GDP growth. In contrast, the opposite is true in the low-income West African rural economies with a high *z*/GDP/c and a low Gini. In these countries the PHR will decline little, or not at all, in the absence of economic growth.

Table 3. Poverty (PHR) elasticity in relation to the percentage growth rate of GDP/c and Gini index

	Poverty Elasticity of growth $\alpha = [\Delta PHR/PHR_{-1}] / [\Delta Y/Y_{-1}]$				*Poverty Elasticity of inequality* $\beta = [\Delta PHR/PHR_{-1}] / [\Delta Gini/Gini_{-1}]$			
Gini z/Yc	0.3	0.4	0.5	0.6	0.3	0.4	0.5	0.6
0.33	-3.9	-2.1	-1.3	-0.8	***5.2***	***3.3***	***2.4***	***2.0***
0.50	***-2.8***	-1.6	-1.0	-0.7	2.5	***1.7***	***1.3***	***1.2***
0.67	***-2.0***	***-1.2***	-0.8	-0.5	1.2	0.9	0.8	***0.8***
1.00	***-1.2***	***-0.8***	***-0.5***	-0.4	0.2	0.2	0.3	0.4

Source: Son e Kakwani (2003). Note: z is the absolute poverty line. A country with a z/GDP/c around 0.33-05 has a middle level of income, while one with values between 0.67 and 1 is very poor.

3. Recent and projected trends in 'immediately relevant factors' affecting SDG1.

In this section we discuss the recent trends in GDP, population growth, income inequality, and food prices – as well as the values plausibly assigned to 2030 to these variables on the basis of past trends and alternative policy scenarios. The favorable values assigned to these variables are selected based on the principle of 'best practices observed in real life during the last 30 years' in the 78 countries under analyses (see Annex I for their list).

3.1 Trends in GDP growth. Table A4 of the IMF World Economic Outlook 2017 presents real GDP growth data in constant 2010 US$ for 78 developing countries and the years 1999-2016, as well as projections for the years 2017-2022 that we then extended to 2030 (see later).

Economic performance during 1999-2008 was characterized by a rapid expansion of Asia (with a 8 per cent GDP growth a year on average) that was broadly unaffected by the 2008-9 crisis and sustained the same GDP growth rate until 2013-15, when it fell to 6-7 per cent. In contrast, Latin America recorded over 1999-2008 an average GDP growth of 3.3 per cent (5 per cent over 2002-8), a sharp contraction in 2009 due to the global financial crisis and the ensuing drop in world commodity prices, and then a steady growth slowdown that became zero or negative in 2015-6. Likewise the Middle East and North Africa (MENA) region and SSA recorded respectively a 5.3 and 5.6 per cent GDP growth over 1999-2008, a slowdown in 2009, and a recovery since 2010 that however lost momentum, as the growth rate of GDP fell by 2-3 percentage points due to the fall in world commodity prices. Based on such trends, the IMF's World Economic Outlook 2017 projects average 2017-22 regional GDP real growth of around 2 per cent for Latin America, 3.3 per cent a year for Sub-Saharan Africa and the MENA region (that includes Pakistan and Afghanistan), 2.1 per cent for the Commonwealth of Independent Countries (CIS) and a sustained 6.4 percent for the emerging and developing countries of Asia. Lacking any other systematic information about GDP growth for the post-2022 years, we assume that the growth rate of GDP for 2016-2022 will remain the same over the period 2022-2030. Obviously, this is a strong assumption, but given the unpredictability of long-term growth it is as plausible as any other.

3.2 Trends in Total Fertility Rate and population growth

Between 1970-75 and 2010-15 Sub-Saharan Africa did not experience a 'demographic transition', while all other developing regions cut into half their TFR (Table 4) and population growth (Table 1) while East Asia (including China) cut it to one third of their initial values.

Table 4. Trend in Total Fertility Rate for the main developing regions

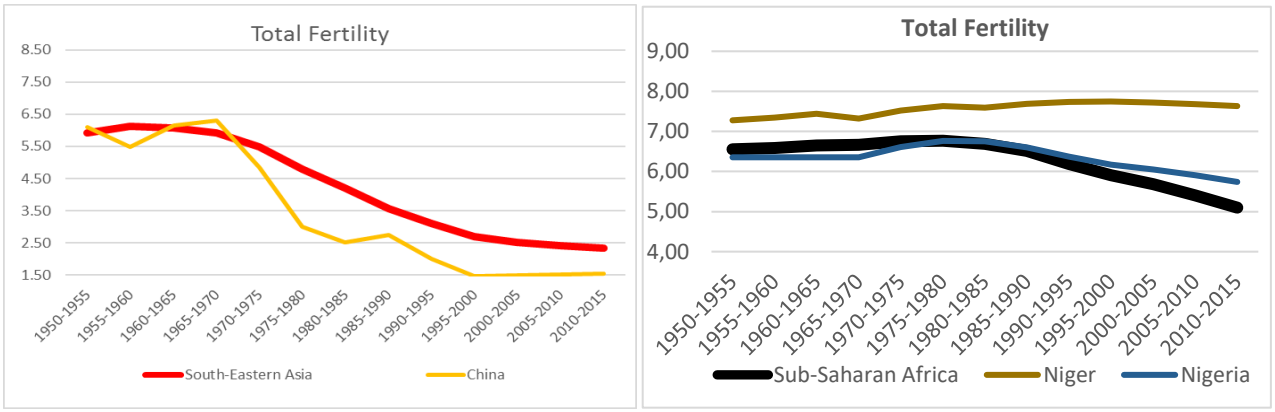
Regions	1970-75	1980-85	1990-95	2000-05	2010-15
Sub-Saharan Africa	6.77	6.70	6.16	5.75	5.10
Middle East	5.73	5.00	4.03	3.23	2.50
Latin America	5.03	3.96	3.06	2.48	2.14
South Asia	5.67	5.03	4.04	3.19	2.54
South East Asia	5.48	4.20	3.11	2.53	2.35
East Asia	4.36	2.48	1.87	1.52	1.59

Source: author's elaboration on United Nations Population Division (2017)

The growth rate of the population depends on two components, i.e. the Total Fertility Rate (TFR) and the share of women of fertile age in the total female population. The first step to lower population growth is therefore to reduce the TFR. In this regard, Figure 2 shows that while the TFR declined rapidly since the 1970s in South-East Asia, China as well Latin America (not shown), this was not the case in Sub-Saharan Africa as a whole, where it fell only from 6.76 to 5.10 between 1950-55 and 2010-15. While in Southern Africa and a few virtuous countries such as Ruanda and

Ethiopia, TFR fell as in other developing regions, in countries such as Niger it rose perceptibly and in Nigeria it declined negligibly (Figure 2, right panel).

Figure 2. Total Fertility Rate of selected regions and countries



Source: author's elaboration on United Nations Population Division (2017)

A high TFR and population growth reduce the chance of reaching SDG1 by 2030. For instance, in Niger even a GDP growth of 5 percent a year is mostly offset by a population growth of 4 percent. In addition, the long term effect of high population on economic growth tends to be – in most cases – negative due to qualitative or quantitative problems for human capital formation, pressure on natural resources and land/man ratios, and rising infrastructural deficits.

Given all this, the United Nations Population Division projects to 2030 an average population growth of 2.3 per cent a year for Sub-Saharan Africa, 0.7 per cent for Asia overall (with specific values for its three sub-regions) and 0.6 per cent for Latin America. In scenarios II to VII in Table 7 we simulate the impact of a policy aiming at slowing population growth, by assuming that it will grow by 2030 to a value 13 per cent lower in relation to the baseline scenario of no change in the population growth projected by the medium variant of the United Nations Population Division. Such 13 percent slower population growth between 2013 is and 2030 is 50 percent higher of the largest percentage population growth slowdown recorded during the last three decades, which was observed in China under stringent administrative controls. It assumes therefore very optimistic outcomes of national and international population policies, a sort of difficult-to-reach policy upper bound.

3.3 Trends in income Inequality. During the 1980s and 1990s there was a fairly general increase in income inequality in both developing and developed countries (Table 5, top panel), as 69 per cent of the 105 countries with data experienced an inequality increase. However, since the beginning of the new century domestic inequality trends have diverged markedly, with 47 per cent of the sample of 107 countries showing an inequality decline and 41 per cent an increase (Table 5, bottom panel).

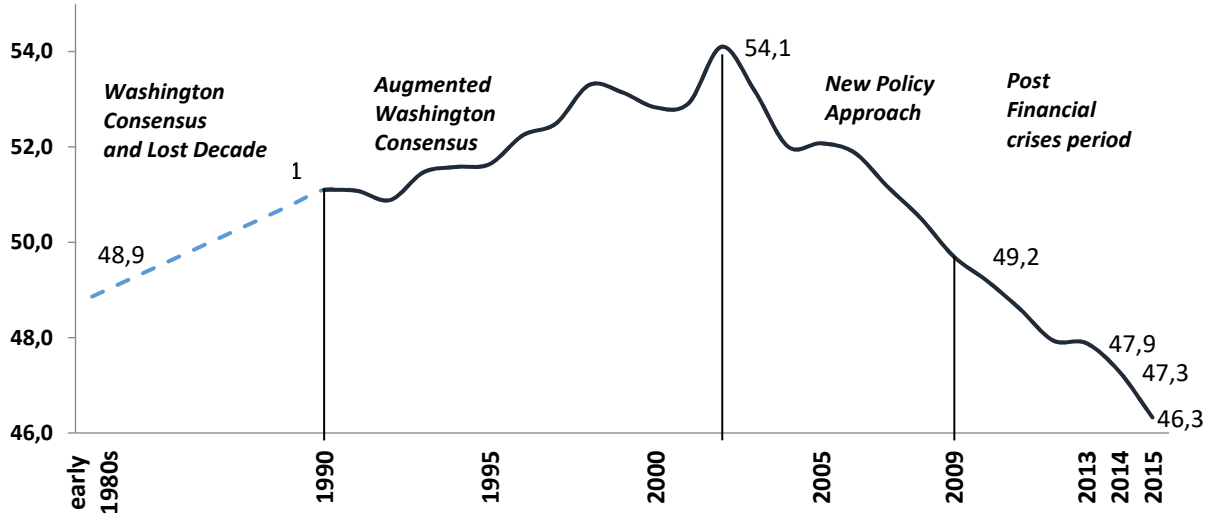
Table 5. Trends in income inequality by main regions, 1980-2000, and 2000-2010

	OECD	European Transition Economies	Asian Transition Economie	Latin America	MENA	South East Asia	South Asia	Sub-Saharan Africa	World	
1980s (or earlier available year) and **1990s**										
Specific period for each region[/3]	1980-2001	1990-1998	1980-2000	1980-2002	1980-2000	1980-1995	1980-2000	1980-1995		
Rising inequality	**14**	**24**	**2**	**14**	2	**5**	**3**	9	**73**	**(69%)**
Stable inequality	1	0	1	1	3	0	0	2	8	(8%)
Falling inequality	6	0	0	3	3	2	2	8	24	(23%)
Total	21	24	3	18	8	7	5	19	105	(100%)
2000-2010 (or similar period)										
Specific period for each region [/3]	2000-2010	1998-2010	2000 – 2009	2002-2010	2000-2007	1995-2009	2000-2010	1995-2007		
Rising inequality	**9**	**13**	**2**	**2**	**4**	**3**	**4**	**7**	**44**	**(41%)**
Stable inequality	4	5	1	1	0	0	1	1	13	(12%)
Falling inequality	8	6	0	**15**	**4**	**4**	0	**13**	50	(47%)
Total	21	24	3	18	8	7	5	21	107	(100%)

Source: Cornia and Martorano (2012) using mainly WIDER-WIID data. Note: Countries were assigned to the rising, no change or falling inequality categories on the basis of an analysis of time trends and of the difference between the initial and final Gini coefficients for each of the two sub-periods considered. The latter vary somewhat from region to region as a result of differences in economic circumstances. A red highlighting indicates a clear rise in inequality, a green a fall.

With the exception of South Asia, MENA and China, practically all Latin America (Figure 3), 13 of 21 Sub-Saharan African countries with data and some South East Asian countries recorded declining inequality. A lot is known about the endogenous and policy factors that drove such decline. This info can inspire the formulation of inequality-reducing measures between now and 2030, allowing in this way to reach more easily SDG1.

Figure 3. Average Gini coefficient of the distribution of income, Latin America, early 1980s -2015



Source: author's update on Cornia (2014)

As already noted, the inequality data used for simulating the impact of favorable inequality changes are not those of Table 5 (that for some regions are affected by large missing data problem) but have

been taken from the from the Global Consumption and Income Project (GCIP) (Jadaev et al 2015) that produces standardized consumption and income Gini data for 133 countries for the years 1960-2012. This ensures data comparability across countries, but often entails considerable differences between them on the one side, and the unadjusted national data and the WIDER-WIID Gini data on the other, as illustrate below in Table 6. In extreme cases, the (unavoidable) use of GICP more complete dataset can thus generate a systemic upper inequality bias that may delay the achievement of SDG1 in the countries affected when doing the numerical simulations (*ibid*).

Table 6. Differences between the Gini coefficients of the WIDER-WIID and GCIP databases, and impact on when (from scenarios I to never) these countries can reach SDG1

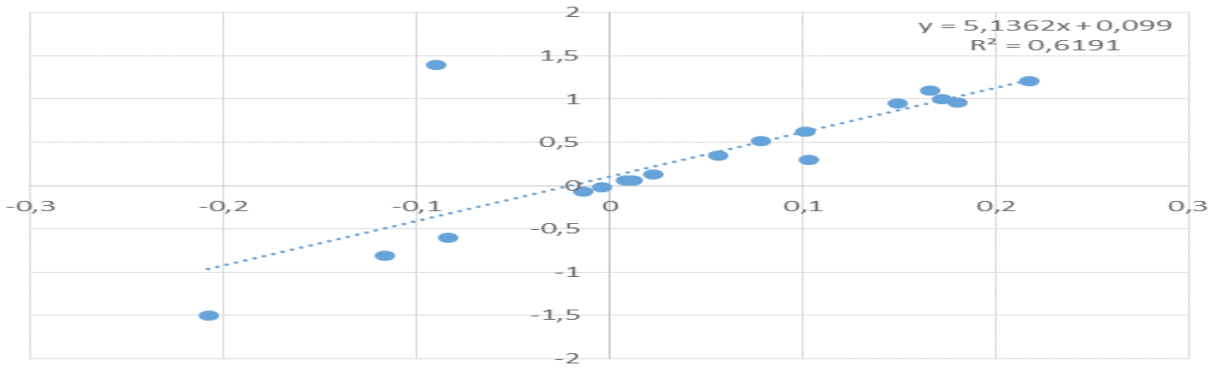
Country	Gini WIDER WIID	Gini GCIP	Difference	End of poverty Scenario (Gini WIID)	End of poverty Scenario (Gini GCIP)
Côte d'Ivoire	0,31	0,59	-0,28	I	II
Ethiopia	0,31	0,56	-0,25	I	I
Mauritius	0,39	0,56	-0,18	I	IV
Indonesia	0,39	0,52	-0,13	I	II
Congo, Republic of	0,48	0,58	-0,10	VII	Never

Source: own calculations

Indeed, the GICP data are at times interpolated and tend to have higher Gini values than other databases, in particular the real-life Gini included in the WIDER-WIID dataset. To assess the impact of such upward inequality bias – especially for countries reporting real life consumption inequality data - we compare for the five countries in Table 6 whether the use of GCIP data affects their chance or reaching SDG1 by 2030. Indeed, as shown in equation (4a), a higher Gini retards the decline of PHR. In addition, it reduces the beneficial effects of the endogenization of β (see later) when in the inequality-reducing scenarios IV to VII of Table 7 the Gini coefficients are assumed to decline in 2030 by 20 percent – a value similar to that observed in Brazil over 1998-2015.As shown by the last two columns of Table 6, except for Ethiopia, such bias appears to be non negligible as the countries in Table 6 reach SDG1 after more inequality-reducing measures are introduced in subsequent scenarios or they never reach it, as in the case of the Congo Republic.

3.4. Trends in FPI/CPI. Such ratio cannot be computed on global data for a sufficiently large number of countries, as complete data are available only for 2012-2014. The numerical simulations presented in part 5 make use of the results of Cornia and Martorano (2016) who estimated on a group of 18 Sub Saharan African countries with time series for CPI and FPI from 2000 to 2012. During this period FPI/CPI rose in the region by between 5 to 30 percent, while the Gini index rose by 1.54 points whenever FPI/CPI rose to 1.20. The relation seems stable (Figure 4) as suggested by an R2 of 0.62.

Figure 4. Relationship between the first differences over time of the FPI/CPI ratio (x axis) and of the Gini coefficient), 18 sub-Saharan African countries, 2000-2012



Source: Cornia and Martorano (2016)

As for the future of food and agricultural production in developing countries, FAO (2017) suggests that the situation remains challenging in view of a still rapid population growth in some regions, an expected 50 percent increase in the demand of agricultural goods between 2013 and 2050 due - *inter alia* - to the dietary transition in middle income countries, a slowdown in yields increase, and ever more frequent climatic shocks. In view of all this, we cannot exclude that between 2015 and 2030 the FPI may grow faster than the CPI.

In the first four scenarios of Table 7 (both panels) we assume that the FPI/CPI ratio will be equal to 1.25 due to the policy inability to control food prices and that, therefore, the Gini index will rise by 2 points in all 78 countries analyzed. In contrast, in scenarios V, VI and VII we assume that – following the stability of such ratio at 1 – there will not be additional distributive pressure on the PHR and Gini will fall by two points in 2030 in relation to scenarios I to III. This allows to assess the favorable impact of modest food price increases or stability on the number of countries reaching SDG1 by 2030.

3.5 Summing up. Based on the data sources and assumptions made above, over the years 2013-2030 Latin America will be characterized on average by a very slow GDP and population growth and still high inequality, despite the large decline recorded in the 2000s. In turn, the countries of Sub-Saharan Africa will experience a medium GDP growth, very high population growth, and medium-high inequality, i.e. data that make it difficult to reach SDG1 by 2030. Finally, the Asian countries are the best placed, as the IMF projected for them a high average GDP growth, while population growth is low and inequality intermediate. The variable FPI/CPI has tended to be higher in low-income, food dependent African countries, though we simulate it in the same way in all regions.

4. Numerical simulations

Hereafter we simulate the values that the PHR will take in 2030 on the basis of the model presented in Part 2 and the simulated values to 2030 discussed in Part 3 for the poverty target (zero or 3 per cent), IMF-projected GDP real growth rate, Gini index, population growth rate, and FPI/CPI ratio. To derive the 78 countries' PHR to the year 2000s, we simulate by means of equations (4a) seven policy scenarios to see how many of the 78 countries with a PHR greater than zero in 2013 will miss the

target of PHR equal to zero or smaller than 3 per cent. To compute the PHR we use for all countries a poverty line of 1.90$/person/day in 2011 PPP$. Note that for the 'target poverty rate' (SDG1) we estimate the number of countries that in 2030 do not reach a PHR of 0 or a more realistic target of 3 per cent, as also in in developing countries a number of people are poor due to discriminatory social norms, psychiatric problems and factors little sensitive to changes in income growth and distribution.

In table 7, we present the results of a set of simulations common to Panel A (PHR equal to 0) and B (PHR smaller than 3 per cent). The seven simulations are carried out in a stepwise mode, with each of the poverty-alleviating measures being added one at the time, so as to assess its marginal effect. To refresh the reader's memory we recall that the poverty alleviating factors are the projected IMF GDP growth, lower population growth and Gini, the endogenization of elasticities (see later), the stability in FPI/CPI, an additional one per cent growth of GDP over the IMF projections, or the growth rate recorded by each country over 2002-8 (as this may have been greater than one per cent). Each marginal improvement between successive scenarios is assigned to the last variable included in the simulation. The ordering of introduction of the poverty-reducing measures affects minimally their marginal contributions to the reduction of the PHR, and the total effect does not change with changes of the order of introduction of such measures.

Table 7: Numerical simulations on the number of countries missing SDG1 by 2030

Panel A: number of countries not reaching the goal of PHR = 0% by 2030

	Countries With PHR > 0 in 2013	Scenario I IMF GDP growth	Scenario II IMF GDP growth + 13% slower population growth	Scenario III IMF GDP growth + 20% lower Gini + 13% slower pop. growth	Scenario IV IMF GDP growth + 20% lower Gini + 13% slower pop. growth + endogenous of α, β	Scenario V As scenario IV + FPI/CPI=1	Scenario VI As scenario V + additional 1% GDP growth over IMF GDP growth	Scenario VII As Scenario V + average value of GDP growth recorded over 2002-2008
		FPI/CPI =1.25 by 2030				FPI/CPI =1.00 by 2030		
		No endogenization of α and β			With endogenization of α and β			
Sub-Saharan Africa	41	40	39	33	24	19	11	13
Latin America & C.	15	14	14	11	9	5	1	1
East Asia	6	2	2	1	1	1	1	0
South Asia	6	1	1	1	0	0	0	0
MENA	2	2	2	2	1	1	0	0
C. Asia & Eastern . Europe	5	2	2	0	0	0	0	0
Oceania	3	3	3	2	2	2	1	2
Total	78	64	63	50	37	28	14	16
Marginal effect: PHR decline over prior scenario	…	-14	-1	-13	-13	-9	-14	+2

Panel B: number of countries <u>not</u> reaching the goal of PHR < 3 % by 2030
(same scenarios as in panel A)

	Countries With PHR > 0 in 2013	Scenario I	Scenario II	Scenario III	Scenario IV	Scenario V	Scenario VI	Scenario VII
Sub Saharan Africa	38	35	33	26	17	14	9	12
Latin America & C.	9	7	7	4	3	2	1	1
East Asia	5	1	1	1	1	1	1	0
South Asia	5	1	1	1	0	0	0	0
MENA	0	0	0	0	0	0	0	0
Central Asia & Estern Europe	3	0	0	0	0	0	0	0
Oceania	3	2	2	2	2	2	0	1
Total	63	46	44	34	23	19	11	14
Marginal effect: PHR decline over prior scenario	….	-17	-2	-10	-11	-4	-8	+3

Source: own calculations

In Table 7 (both panels), the first column indicates the number of the 78 sample countries with PHR bigger than 0 in 2013. In scenario I, are reported the number of countries that will not be able to reach SDG1 thanks only to the GDP growth 2013-2030 projected by the IMF and discussed in Part 3.1. Table 7 shows that in 64 (Panel A) and 46 countries (Panel B) SDG1 will not be met if GDP grows at the anemic rates projected by the IMF. The improvements concern only the East Asian, South Asian and Central Asian and Eastern European countries (Table 7, scenario I). This is the only group of economies able to 'grow out of poverty'. But the remaining 46 countries (the majority from slow-growing commodity exporters of Sub-Saharan Africa and Latin America) would miss the SDG1 target.

Scenario II (Panel A and B) explores whether the number of countries not reaching SDG1 would decrease if we simulate that by 2030 the population level will be 13 per cent lower than in the baseline scenario (see Part 3). Table 7 show however that the impact of such population growth slowdown is minimal, as only 1 or 2 countries from Sub-Saharan Africa would 'exit poverty' by 2030 thanks to measures aiming at slowing population growth. This seems to suggest that such measures are slow in taking effect to facilitate reaching SDG1. It also suggests however that – given the nature of the demographic trends in these countries - the (optimistic) simulated 'best practice policy scenario' does not help much to reach the SDG1 objective by 2030. For instance, in Angola, the population growth to be realized over 2013-2030 is about 60 per cent of its initial 2013 value. Such increase becomes 52.6 per cent higher of the 2013 value if the simulated 13 per cent slower growth is simulated. This is still a very high population increase that is only modestly affected by the slower population increase we simulated.

One may argue that the beneficial effect of population policies is captured not only by the limited number of countries 'exiting poverty' by 2030, but also by a fall in the regional incidence of the PHR. Yet, here too we see (Annex 2) that – in fast population-growth countries, policies generate only a minimal effect by reducing by only 1.5 percentage points the regional unweighted average PHR in Sub-Saharan Africa and by close to zero in the other regions where the population problem is now much less relevant (ibid). As shown by the case of Angola, in countries with very high initial growth rates, population

policies need to be pursued over a longer period of time. For the moment, most of these countries do not make the SDG1 target but get a tiny bit closer to it.

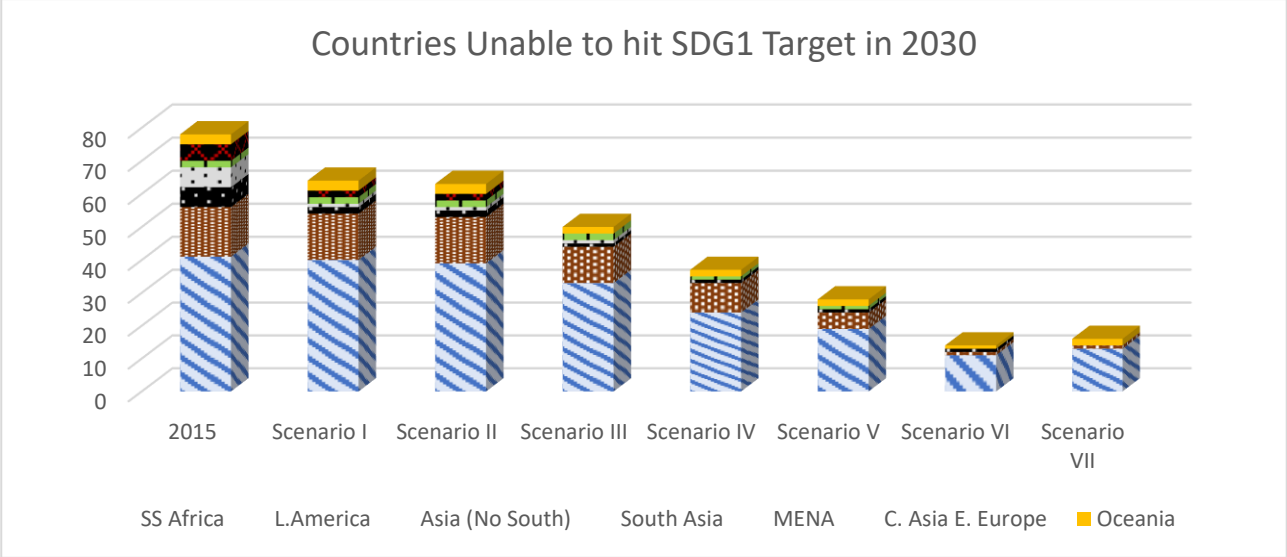
Scenario III illustrates the effect of a policy package simulating besides the IMF-projected GDP growth and population policies the effects of an ambitious 20 per cent decline in the Gini coefficient between 2013 and 2030. The impact of this measure is sizeable. Indeed, another 13 (Panel A) and 10 countries (Panel B) would eradicate poverty altogether despite a sluggish/moderate GDP growth. In these countries, better distributive policies (discussed in Part 6) would thus definitely facilitate reaching SDG10 and SDG1. Yet, combining the effect of the projected IMF GDP growth, population policies and inequality reduction of scenario III, 50 countries out of 78 (Panel A) and 36 out of 63 (Panel B) would not reach SDG1 by 2030.

This unsatisfactory situation is in part improved in Scenario IV where we take into account the endogenous effects of the simulated increase in GDP and decline of the Gini coefficient. This entails favorable change in the growth and inequality elasticities of poverty, α and β (Table 3). Indeed, the increase in GDP reduces z/GDP and changes its line of reference in Table 3, while the Gini fall changes the column of reference, thus leading to an increase in the values of the corresponding elasticities α and β. So, instead of using the initial elasticities of 2013, the simulated changes in the Gini and GDP entail their increase that – as shown in (4a) – contribute to reducing the PHR. Thus, the endogenization of α and β and their corresponding increase in Table 3 generates a further reduction in the number of countries that will not hit the SDG1 target. Scenario IV in Table 7 shows that this methodologically more accurate account of the impact of the simulated increase in GDP and decline in Gini makes that an additional 13 (Panel A) and 11 countries (Panel B) exit poverty. Thus, with the endogenization of α and β the number of countries not making the SDG1 target by 2030 falls from 50 to 37 in Panel A and from 34 to 23 in Panel B.

We now repeat in Scenario V the same exercise assuming however that by 2030 the FPI/CPI ratio falls from 1.25 (as it was in scenarios I to IV) to 1, implying a decrease of the 2030 Gini coefficient by 2 points. All other variables remain unchanged. This additional fall in Gini (which ignores for reasons of space any further endogenization of its effects) generates a further fall in the number of countries not making SDG1 by 2030 to 28 (in Panel A) and 19 (in Panel B), as the effect of faster rises in food prices relative to the CPI is being controlled by adequate policies (see later). Even after this improvement about a 36 per cent of the 78 countries of Panel A and 30 per cent of the 63 initial countries of panel B is still unable to reach SDG1 by 2030.

In scenarios VI and VII we repeat the simulation of Scenario V after adding another poverty-reducing effect i.e. a further increase in GDP growth of one per cent (in scenario VI) or, fearing that this was lower than that recorded during the stable years 2002-2008, in the average GDP growth each country recorded over such years. Scenario VII appears to be less favorable on average than VI, and thus we do not elaborate on it. Even the additional one per cent increase in the GDP growth rate over that projected by the IMF (Scenario VI) leads to a situation in which 11-14 countries (17-18 per cent of the initial 78 or 63 countries) still do not make SDG1 by 2030. Figure 5 (referring to Panel A) gives the geographical composition of the developing countries not making the SDG1 target by 2030. It confirms that the hardest problems will be met in Sub-Saharan Africa.

Figure 5. Geographical composition of the countries unable to hit the SDG1 target



Source: own calculations (see Panel A). Note: **the countries not reaching SDG1 by 2030 in Scenario VI include:** Angola; Burundi; Chad; Comoros; Congo (Democratic Republic); Congo (Republic of); Liberia; Nigeria; South Africa; Swaziland; Zambia; Suriname; Timor-Leste; Micronesia.

Before closing this section it is important to reiterate that the model used for the simulations is a pedagogical 'comparative-static, poverty-accounting exercise', and that its results (that are quite stable across the many simulations we carried out) should be taken with a pinch of salt. They are not forecasts but simulations of the impact of a set of poverty-reducing measures. Yet, the basic message is that - given the IMF growth projections - 18 percent of the developing countries with PHR greater than zero in 2013 will not meet SDG1 by 2030, even assuming important gains in inequality and population growth, no food price crises, and an additional one per cent GDP growth.

5. In conclusion

Scenario VI shows that 14 developing countries (11 from Sub-Saharan Africa) will not reach SDG1 by 2030 even assuming optimistic 'best practice improvements' concerning several 'immediately relevant factors' affecting SDG1 (Panel A). In Panel B such value drops to 11 with a basically unchanged geographical composition. If we exclude the additional simulated one per cent additional GDP growth over the iMF anemic projections such numbers rise to 28 out 78 (Panel A) and 19 out of 63 (Panel B). There seems therefore to be two key messages to bring home: first, not all countries will reach SDG1 by 2030 even assuming favorable 'best practice' policy changes aiming at pursuing the morally laudable but potentially elusive SDG1 objective, especially if this is placed in a real-life context where policy improvements often face a complicated political economy. Second, there remains – in relation to the IMF projections and to the average GDP recorded over the stable 2002-2008 - a need to accelerate in a sustainable and equitable way GDP growth - though there is no universal agreement on the strategies and macroeconomic policies needed to achieve it (Klasen 2003, Cornia 2005). This paper suggests therefore to re-open the debate about the 'nature of a growth process' consistent with the achievement of SDG1 and able to guide the world economy over the 15 years and beyond. In practice, there is a risk that the moral exhortations of Presidents and Foreign Ministers during the 2015 General Assembly may collide with the political economy difficulties of domestic policy making and of a long series of binding international agreements on trade and financial liberalization, WTO, TRIPS, national treatment of foreign investments, labor

policies, approaches to macroeconomic stabilization, and so on that – if they remain as they are - may retard or prevent a universal achievement of SDG1. While there is an ethically-binding obligation to move towards a world where no states and individual will be 'left out' or 'pushed behind' by global forces, we should be aware of the real-life difficulties that might be faced during the long journey to 2030, so as to promote appropriate action should these difficulties arise.

6. Which inequality, population and food price policies can help achieving SDG1 ?

Obviously, it is difficult to identify optimal universal policies in all these areas. The choice of policies depends on a long list of circumstances which include: whether the main development approach is 'growth driven' (as in Asia), 'radical' (relying on asset redistribution as in Bolivia in the 2000s), based on 'the growth with equity' model pursued in Taiwan and S.Korea in the 1960s), 'social democratic' (relying on a tax-and-transfers based redistribution and labor market reforms, as observed in some Latin American countries in the 2000s), or 'structuralist' (focusing also on changes in economic structure and the degree of external trade and financial integration). Yet, some policies do apply to all regions and – for this reason – are discussed below.

6.1 Reducing Inequality

Income inequality is due to a variety of factors the importance of which changes over time and from country to country. In an agrarian society a key factor is an equitable access to the land, while in an industrializing country reducing the 'skill premium' may be more relevant. And in other societies inequality derives from 'social norms' that discriminate against women and given caste, ethnic, and religious minorities. Given the diversity of inequality drivers, we are forced to present a long list of policies that could be summarized as follows:

(i) Pre-market changes in path-dependent 'social norms'. Even before discussing economic discrimination, inequality depends on path-dependent social and religious norms that define the culture of a nation. For instance, minority discrimination affects the access of women, and other marginal groups to land, education, certain professions, credit, public employment, social transfers and so on. Such discrimination applies in particular to women who suffer a longstanding 'gender discrimination', including lower pay for the same job. Note that these discrimination persists after controlling for education, location, sector of employment, etc. Note also that the effects of gender and minority discrimination reinforce each other, as in the case of Indian women belonging to low castes.

Reducing this source of inequality is difficult, as it is deeply engrained in the national culture and religion. To do so, it is important to promote the election of inclusive political regimes (democracy is necessary but may not be sufficient). Revolutions (like the Soviet and Chinese ones, or the fight against Apartheid) equalized in an important way the rights of minorities, but entailed decade-long turmoil. The promotion of new political coalitions (e.g. between industrial workers and industrialists against the agrarians, as in Chile) may be another channel to free the exploited *campesinos*. Affirmative action (establishing 'quotas' or 'reservations' for the groups marginalized in Government jobs, schools, etc.) has also been attempted with mixed results. Finally, cultural policies (as universal, compulsory and free education) may help breaking down prejudice and barriers between groups while equalizing the distribution of human capital. As well, the Peace and Reconciliation Commissions established in South Africa and Rwanda in the aftermath of civil wars

are an example on how to increase social and inter-racial integration and reduce inequality. International initiatives such as the MDGs, SDGs, and Human Rights Conventions may also have an effect in a culturally globalized world. In the industrialized countries, the aim of equalizing initial conditions among different social classes was pursued with a steep inheritance tax (up to 90%) immediately after World War II and was – *inter alia* - revisited recently by Atkinson (2015).

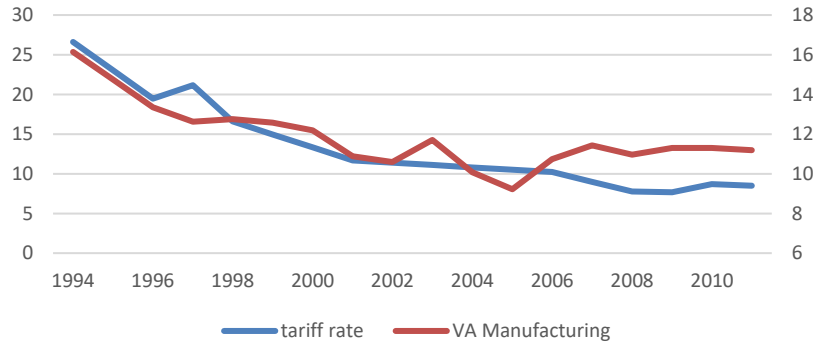
(ii) Changes in the primary distribution of income. The first task is to correct an unequal distribution of assets, i.e. land, physical, financial and human capital. A high asset concentration is in many cases 'path dependent', i.e. due to a colonial or feudal legacy of high concentration of land and other primary resources. An assets redistribution that favors the poor, women and marginal groups is often made difficult by the transformation of agrarian elites into industrial, commercial o financial elites, a tendency that is exacerbated by the selective lending of financial institutions. The distribution of human capital is also unequal due to low public expenditure on education and health and the inability of the poor to fund these expenditures. In turn, weak and asymmetrically informed financial institutions perpetuate the unequal access of the poor to credit, a precondition for raising their incomes and improving, if in part, the distribution of industrial capital. In brief, to correct these sources of inequality the policy maker should promote an equitable redistribution of land (as observed in 40 countries in the 1950s and 1960s), human capital (as recorded in the 2000s in most of Latin America), and access to credit.

A second way to reduce inequality is to improve the functioning of factors market. These are very often dualistic, and in this way affect the level of skilled and unskilled wages, land rents, and interest rates. These returns to assets often differ from their actual contribution to value creation, due to asset market imperfections (as in the case of missing, oligopolistic or monopolistic markets), discriminatory gender/social norms, inadequate investments in education, the impact of changes in technology and demographic trends, and the asymmetric distribution of bargaining power between informal workers and employers. Policy must thus improve the functioning of the land market (by developing a cadaster and land registration system, and improving access to credit), reform the financial sector so as to reduce the gap in interest rates between poor and rich, and introduce labor policies that permit unionization, collective bargaining, increases in minimum wages, and job formalization, as observed in the 2000s in Latin America's Southern Cone. In case of chronic 'surplus labor', the policy maker should intervene by means of active/passive policies to soak up the excess labor supply by means of public works, and subsidies for the creation of Small and Medium Enterprises.

Third, distribution-sensitive macro-policies can help reduce inequality. A countercyclical fiscal and monetary policy and low real interest rate are key, together with an active tax policy allowing adequate levels of public expenditure on growth-promoting items (see later). The choice of the exchange rate affects massively the distribution of income. While there is no unique solution, a stable and competitive real exchange rate that promotes employment in the tradeable sector, where often the poor are employed, kick-starts growth, generates equitable effects and strengthens the current account balance (Rodrik 2003).

More complex is the choice of the trade regime. Export liberalization improved income distribution in South East Asia in the 1960s but it likely worsened it in Sub-Saharan Africa during the last 20 years (Figure 6), as the decline in import tariff rates was accompanied by a drop of the value added share of (generally unskilled labour-intensive) manufacturing. In view of this finding one wonders whether trade liberalization should be accompanied by a compensation for the losers.

Figure 6. Malawi: Average import tariff rate (left scale) & manufacturing value added share (right scale)



Source: Cornia and Martorano (2017). A similar relation is obtained on a panel of SSA countries.

Finally, the prudential regulation of domestic banks (as done in Latin America in the 2000s), some control of the capital acctount, a lowering of external indebtedness, and reserves accumulation are also needed to avoid the highly-disequalizing effects of unregulated finance.

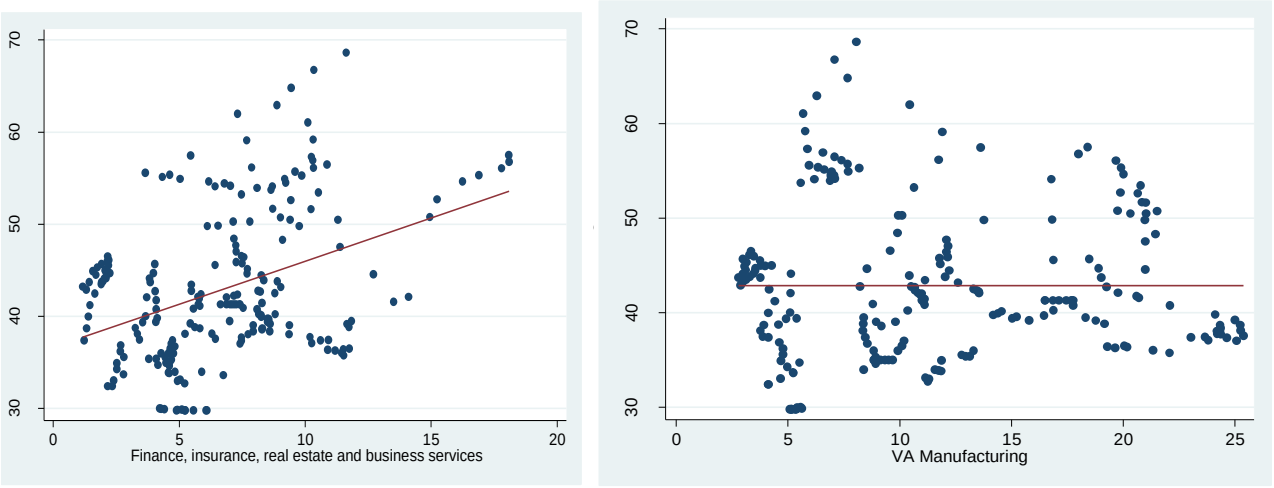
Economic policy should deal also with the impact of technological and demographic change that raise the skill premium, displaces labor and raise the capital share in total income. In developing countries, the import of capital/skill intensive equipment increases inequality but is often promoted to acquire 'state of the art technology' and improve long term efficiency. A way to deal with such impact is to increase the supply of skilled labor (to avoid scarcity rents) via greater investments in secondary, technical and higher education, as happened in Latin America during the 2000s. Gradually distributing in an egalitarian way the total number of work hours demanded by the economy (that may become increasingly more capital/robot intensive) may also be needed.

As discussed in section 4, persistently high TFRs affect adversely the skilled/unskilled wage ratio, dependency rates, activity rates and income/capita, as the poor have high TFR and dependency rates, and low activity rates. High TFR and population growth rates also raise pressure on land, forest and water resources, and the demand for public services. In all these cases, while the availability of such resources worsens overall, the poor are the most affected. Also, countries do not benefit from the 'demographic dividend' unless they experience a 20-25 years long TFR decline (see section 6.2).

Finally, economic policies may try to influence the pattern of growth (i.e. its sectoral structure, and rural-urban and geographical distribution of production) that in many cases (as in China and parts of Africa) has markedly contributed to rising inequality. The pattern of growth is to a large extent endogenous over the short-medium term. Yet, policy makers aiming at reducing inequality and reaching SDG1 should be aware that specialization in capital and skilled labor-intensive sectors

entail potentially adverse distributive and poverty implications. Inequality rises if the share of value added grows in high-inequality sectors (finance insurance and real estates, mining, etc.) (Figure 7). The same applies to the situation of countries where growth is concentrated mainly in the coastal regions, or in the urban sector.

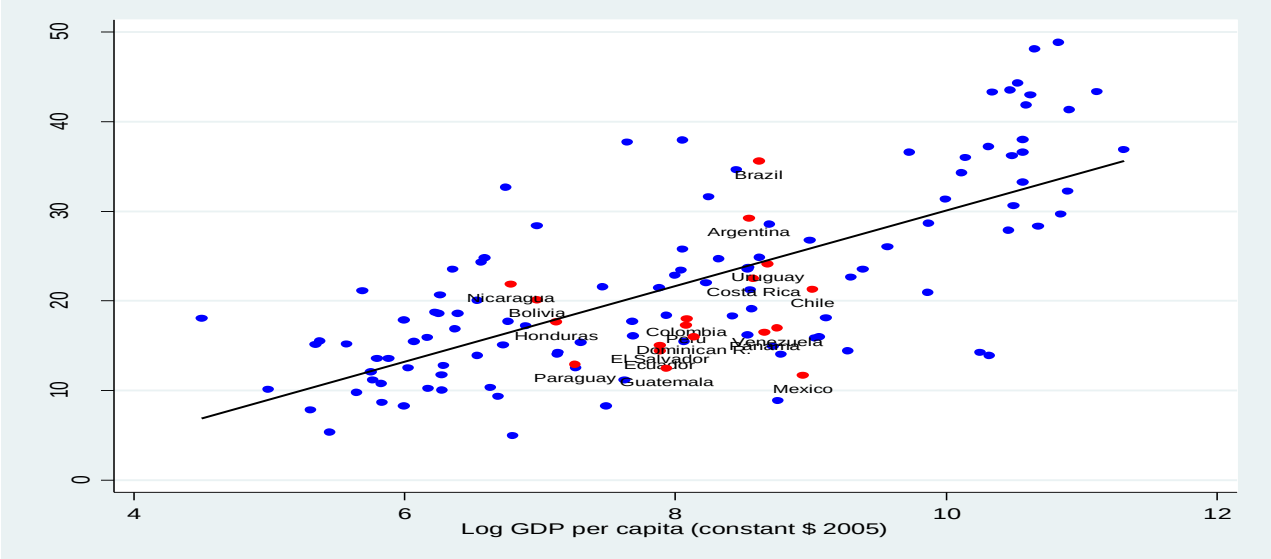
Figure 7. Relation between the share of valued added in FIRE and manufacturing, and the Gini index



Source: Cornia (2016) using data for Sub-Saharan African countries

(iii) Redistributive policies. The distributive effect of improvements in social norms and market reforms are generally insufficient to generate a socially acceptable income distribution and will in any case take a long time. Redistributive social policies are also needed. For instance, the OECD countries have a high market income inequality but low-medium disposable income inequality, as redistributive policies began to be introduced in the late 19th century. Broadly defined, social policies aim at redistributing human capital, ensure against shocks (disease, old age, injury) and reduce poverty/inequality. To be effective redistributive policies should count on an adequate revenue generation to fund their costs. While during the last decade tax/GDP ratios have risen on average by 2-3 points of GDP in Sub-Saharan Africa and Latin America, there still are several countries (those below the interpolated line in Figure 8) with a tax/GDP ratio below an econometrically determined 'global norm'.

Figure 8. Relation between log of GDP/c and tax/GDP ratio



Source: author's elaboration

Values below such global norm may be due to the dominance of difficult-to-tax subsistence agriculture and informal sector, élites resistance to taxation, excessive exemptions, the use of low-yielding flat taxes, and weak tax administration. The incidence of taxes ought also to be considered, as it affects the distribution of disposable income. High reliance on regressive indirect, trade taxes and excises also worsens the distribution of final income. SDG1-compatible policies should therefore focus on a sustainably higher tax/GDP ratio, an increase in progressive direct and indirect taxation, and a more efficient tax administration.

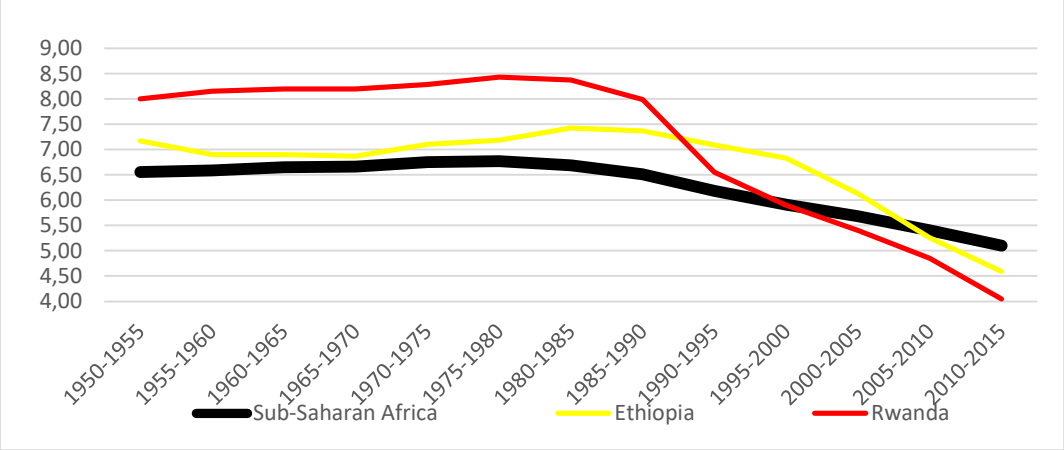
Once sufficient revenue is available, the policy maker should focus on increasing the volume of public expenditure on education, health, nutrition, in particularly that part targeted to the poor, to avoid that public transfers further skew the distribution of total income. It should also extend the coverage of social insurance (through the formalization of employment, or reducing the number of years of pension contributions for people who worked in the informal sector or were unvoluntarily unemployed), or introducing non-contributory pensions (as in Brazil, Bolivia, Southern Africa, aand other countries). Other kinds of social assistance transfers that have been shown to be in many cases progessive are conditional and non-conditional cash transfers, that is targeted anti poverty programs that are very common now in Latin America, Africa, and even China and India. Their main objective is to reduce current poverty and its integenerational tansmission that would affect achieving SDG1 by 2030. Overall, the distributional effects of taxation and – much more so – of social expenditure can reduce substantially inequality even in highly unequal countries such as South Africa.

6.2 Controlling population growth

The contrasting experience of Sub-Saharan Africa countries during the last 20 years provides useful suggestions on the policies that help to reduce TFR and population growth and facilitate the long term achievement of SDG1. Despite their low income per capita, Rwanda and Ethiopia offer positive examples of such policies while others, as Uganda, show how fast population growth can hamper

poverty eradication (Klasen 2004). Rwanda has an extremely high population density (461 people per sq. km), and little arable land (0.10 ha per person in 2015). Land scarcity, over-population, undernourishment, low schooling, soil erosion and environmental problems were evident already in the past, but measures to tackle them were introduced only in 2000-1 with strong government support (Westoff, 2013). These included encouragement to migrate, increasing the 'demand' for family planning through massive awareness campaigns generating a spontaneous fall of the desired family size, a strong increase in female education and the elimination of gender bias in all economic, social and political areas. At the same time, the supply of contraceptive services increased together with the creation of a community-level health insurance that facilitated the access to medical care and birth control. Substantial public and aid funds were allocated to the purchase of contraceptives. Between 2005 and 2010 their use (that correlates closely with the TFR) rose from 10 to 45 per cent, with the ambitious target of reaching 70 per cent within a few years. As a result, the TFR fell by 4 points (Figure 9) between 2000 and 2015, the fastest drop ever recorded in Sub-Saharan Africa in 25 years.

Figure 9. TFR in Rwanda, Ethiopia and SSA as a whole



Source: author's elaboration on Population Division (2017) data

In Ethiopia, effective birth control measures were introduced in 1993 (Hailemariam et al 2011) in a context of falling land/man ratios (0.15 ha per capita in 2014), degradation of the soils of the plateau, insufficient food production, recurring famines, and low levels of education. As in Rwanda, the new regime recognized that rapid population growth was a fundamental cause of underdevelopment and poverty. The main measures introduced included: a promotion of family planning and of a reduced desired family size (see above), and workshops with the beneficiaries of reproductive services to inform families of the advantages of responsible motherhood; an increase of the minimum age of marriage from 15 to 18 years, the compulsory registration of births, increased school enrolment of girls and women, reduction of their school drop-out; removing restrictions on their participation to economic activities; a greater supply of contraceptives whose utilization rose from 2.9 per cent in 1990 to 33.9 per cent in 2014; and the promotion of collection and analysis of demographic data. Following the introduction of these measures, the fertility rate fell from 7.4 in 1990 to 4.6 in 2015, while population growth fell from 3.3 to 2.5 per cent. All state agencies, NGOs and universities were encouraged to deal with the over-population problem. Yet, in both Rwanda and Ethiopia

overpopulation remains an urgent problem, and TFR needs to be reduced further, by increasing the secondary education of women that remains around 20 percent.

6.3. Controlling food prices

The sharp increase in food prices that started in 2007 and lasted until 2014 affected the nutrition of the poor. Between 2000—a year of low prices— and 2008 world wheat and maize prices more than tripled and doubled. Other foods also experienced price hikes, with serious consequences for the purchasing power of the poor and the achievements of SDG1.

Food prices depend on a host of factors, including high energy prices (that may cause a shift in producing biofuel rather than food, and make agricultural production more expensive by raising the cost of diesel, fertilizers, pesticides and transport. Meanwhile a growing world population and rising income per capita increase the demand for food, often away from traditional staples and toward higher-value foods like meat and milk, and a 'dietary shift' that entailed an increase in the demand for grains to feed livestock. Poor weather and speculative capital also played a role in the rise of food prices (von Braun 2008). The possible main (global and local) responses to such price increases can be summarized as follows:

- Global interventions. The food shocks of the late 2000s were generated inter alia by systemic problems affecting the financial markets of the advanced economies. Thus, there is a need of new rules for effective global and national regulations of financial markets, including restrictions on speculative investments and hedge and future contracts based on food items, agreements to set clear limits on the production of bio-fuels, and a new overall emphasis on investing in agriculture, including by bringing under production large swathes of fertile land – as in Russia, Ukraine, Argentina, and Angola. Developed countries should also take this opportunity to eliminate agricultural trade barriers.

- Greater emphasis on agriculture at the national level. Many developing countries are net food importers. To achieve long-term food self-reliance, their governments should increase their medium- and long-term investments in agricultural research and extension, rural infrastructure, and market access for small farmers. Food demand will continue growing in many developing countries at 4-5 percent a year due to rising incomes and population that will likely exert an upward pressure on food prices.

- Macroeconomic measures. These long-term measures will need to be accompanied by short term macro measures such as setting caps on food prices and reducing restrictions on food imports. In the African context, an increase in the incomes of the rural poor may mean higher food prices accompanied by subsidies to shelter the urban poor and food-deficient farmers. While useful in the short term, such policies may backfire in the medium term and any long-term strategy to stabilize food prices will need to include measures to emphasize food production. In addition, such measures benefit also rich consumers.

- Targeted food subsidies. Access to food can also be enhanced by means of targeted food subsidies (as in the case of India's extensive Public Distribution System), temporary price caps, public

procurement agreements with wholesalers, and the prior creation of national and regional buffer stocks. The choice of specific measures will depend on local administrative strength.

6.4 Accelerating GDP growth? And rethinking the development paradigm?

As noted earlier, the basic conclusions of our 'comparative-static poverty accounting model' are that - given the IMF growth projections 2016-2022 that we extended to 2030 – about a quarter of the 78 initial developing countries analyzed, especially from Sub-Saharan Africa, will not meet SDG1 even assuming 'best practice' improvements in income inequality and total fertility rates, and no food price crises. Barring exceptional events, further improvements in PHR due to these factors seem implausible. In a World Bank study on ending extreme poverty, Cruz et al (2015) also emphasize the need for a faster income growth for the poor and on average.

Thus, if these countries are not to be left behind, meeting SDG1 by 2030 requires an acceleration of GDP growth in relation to the IMF projections 2016-2030. This is somewhat justified by the very anemic GDP growth values projected by the IMF for 2016-2030 for Latin America (2 per cent) and SSA (3.3 per cent), values that were likely influenced by the pessimistic outlook of the recession year (2016) during which they were formulated. The problem is that we have no clue what a realistic rate of growth of GDP can we project to 2030 for Latin America and Sub-Saharan Africa, as – contrary to the Gini and population growth – there is no information on a 'plausible range of variation' of GDP growth . This is much wider than the range of variation of Gini, n, and FPI/CPI. For instance, in 2015 GDP growth ranged between -21 per cent in Sierra Leone and -10.0 in Ukraine on the one side and + 8 per cent in Uzbekistan and + 10.2 per cent in Ethiopia.

So, poverty eradication to 2030 seems to require going back to the monumental, controversial and very complex task of promoting also a somewhat faster and sustainable GDP growth in poor countries. One may wonder therefore if more expansionary growth policies are needed in Sub-Saharan Africa and Latin America. One may wonder also if changes are needed in the structure of output and in the current 'foreign-financed, commodity export-lead' development model dominating these two regions. Indeed, growth based on oil extraction, mining and FIRE activities is dis-equalizing and unstable, while growth based on manufacturing, construction and the Green Revolution is progressive and less dependent on the world business cycle. Yet, as noted by Ocampo (2012), in both these regions the trend of the last decade has been towards a 'reprimarization of output'. A more balanced growth pattern is nowhere in sight.

The second issue, is that – in view of the heterogeneity of the poor countries, it is almost impossible to come up with a common list of pro-growth/pro-poor policies. Cornia and Scognamillo (2016) offer policy suggestions for six groups of LDCs (many of them not reaching SDG1 by 2030), while Klasen (2003), Cornia (2005) and Klasen et al (2018) discuss in general terms the nature of expansionary but sustainable pro-growth policies applicable to various kinds of developing countries. But concrete agreement on pro-growth and pro-poor policies remains elusive. And so may remain an agreement on a comprehensive policy framework supporting the achievement of SDG1.

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Annex I .List of the 78 countries with PHR greater than 0 in 2013:

Sub Saharan Africa: Angola; Benin; Botswana; Burkina Faso; Burundi; Cabo Verde; Cameroon; Central African Republic; Chad; Comoros; Congo (Democratic Republic); Congo (Republic of); Côte d'Ivoire; Djibouti; Ethiopia; Gabon; Guinea; Guinea-Bissau; Kenya; Lesotho; Liberia; Madagascar; Malawi; Mali; Mauritania; Mauritius; Mozambique; Namibia; Niger; Nigeria; Rwanda; São Tomé and Príncipe; Senegal; Sierra Leone; South Africa; Sudan; Swaziland; Tanzania; Togo; Uganda; Zambia

Latin America and Caribbean: Barbados; Belize; Bolivia; Brazil; Colombia; Guatemala; Guyana; Haiti; Honduras; Mexico; Nicaragua; Panama; St. Lucia; Suriname; Uruguay

East Asia: Cambodia; China; Indonesia; Myanmar; Philippines; Timor-Leste

South Asia: Afghanistan; Bangladesh; India; Nepal; Pakistan; Sri Lanka

Middle East and North Africa: Algeria; Morocco

Central Asia and Eastern Europe: Armenia; Georgia; Tajikistan; Turkmenistan; Uzbekistan

Oceania: Fiji; Micronesia; Papua New Guinea

Annex II. Average regional PHR (%) in 2030 under the seven scenarios of Panels A and B (in the case of PHR goal **< 3 %** by 2030**)**

	Countries With PHR > 0 in 2013	Scenario I	Scenario II	Scenario III	Scenario IV	Scenario V	Scenario VI	Scenario VII
Sub Saharan Africa	**38.6**	**26.3**	**24.9**	**16.4**	**12.7**	**10.5**	**6.1**	**8.9**
Latin America & C.	**10.7**	**8.4**	**8.2**	**4.5**	**2.2**	**1.3**	**0.4**	**1.6**
East Asia	**25.2**	**9.0**	**8.7**	**6.4**	**6.4**	**7.5**	**6.7**	**0.0**
South Asia	**13.1**	**2.2**	**1.9**	**0.7**	**0.0**	**0.0**	**0.0**	**0.0**
MENA	**0.7**	**0.5**	**0.5**	**0.2**	**0.1**	**0.02**	**0.0**	**0.0**
Central Asia & Estern Europe	**12.3**	**0.2**	**0.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Oceania	**16.9**	**15.7**	**15.4**	**8.52**	**6.6**	**3.9**	**0.8**	**4.5**
Total	**32.8**	**16.9**	**16.1**	**10.39**	**7.9**	**6.5**	**3.8**	**5.2**
% PHR points decline over prior scenario	**…**	**-15.9**	**-0.8**	**-5.7**	**-2.5**	**-1.3**	**-2.7**	**+1.4**