Inter-temporal macroeconomic trade-offs and payoffs of human development strategies:

An economy-wide modelling analysis

Marco V. Sánchez

(UN-DESA/DPAD)

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Outline

- Introduction: MDGs' achievement and outlook: what do we (not) know?

- Key questions, how to answer?

- Modelling methodology: MAMS (***Ma**quette* for **M**DG **S**imulations)

- New MAMS applications for four countries: analysis of results

- Conclusions (and policy implications)

What do we know about MDGs' achievement and outlook?

- Much progress has been made since 2000
  – uneven across and within countries (United Nations, 2012)
  – slowed down owing to the global financial crisis (United Nations, 2011)
- Studies for 27 developing countries provide evidence on financing strategies to achieve MDGs by 2015
  – Conducted in the framework of UN-DESA's capacity development projects (use MAMS model; see next slides)
  – Sánchez and Vos (2013): Africa, Asia and Middle East
  – Sánchez and others (2010): Latin America & the Caribbean
  – Various working papers (updates) on the effects of the global financial crisis on the MDGs and financing

Financing strategies to achieve MDGs by 2015
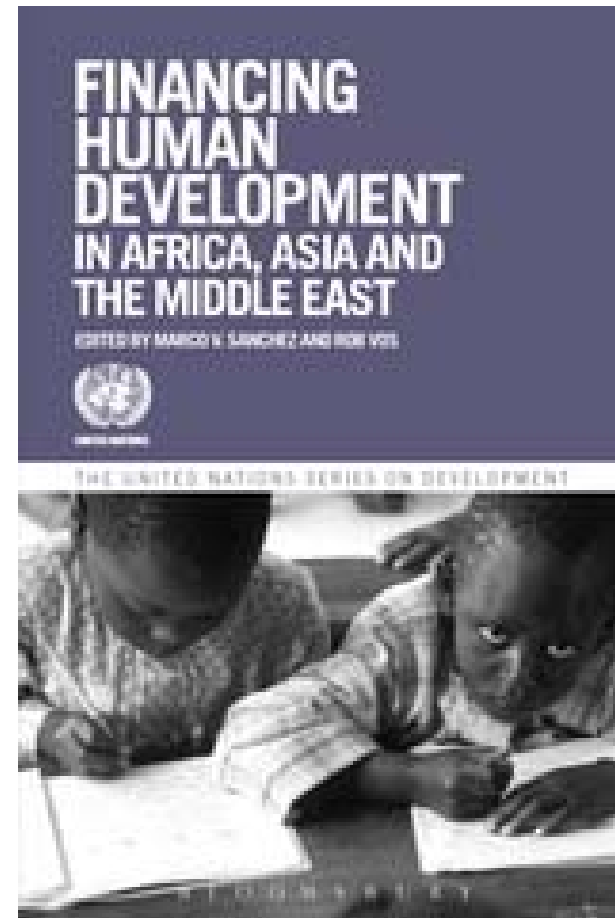
What do we know…? – cont.

- Key findings of these studies
  - business as usual is not enough to achieve the pace of MDG progress necessary in most 27 countries.
  - meeting the MDGs by 2015 will imply significantly stepping up public spending and demand more rapid and sustained economic growth
    - achieving economic growth in the midst of a depressed world economy is proving a significant challenge
    - given existing financing constrains, estimated spending requirements would overstretch public finances with potential short-term macroeconomic hardships
      - macroeconomic hardships might paradoxically jeopardize economic growth (see next slides)
      - how to finance?

What do we <u>not</u> know about MDGs' achievement and outlook?

- How short-term financial costs and macroeconomic trade-offs of human development interventions compare with potential long-term rewards.

- Gains from investing in human development take time to materialize. It takes time for:

  - capital to accumulate

  - better education and health outcomes to translate into social outcomes and human capital that produces higher labour productivity (and economic growth)

    - children need to go through one or more educational cycles
    - healthier students and workers several years from now

What do we <u>not</u> know…? – cont.

- Estimations of how soon long-term rewards of human development interventions can materialize and the degree of their significance are less known.
- Policies that can give coherence to the <u>multiple tasks</u> of ensuring such long-term rewards can materialize need to be identified.
  - sustaining human development levels (and spending), economic growth, employment creation and macroeconomic balances.
- Critical issues to inform the process of defining the post-2015 UN development agenda.

Key questions

- Should countries realistically expect after 2015 additional social gains and more capital accumulation and labour productivity (and the resulting economic growth) associated with past MDG investments?

- What additional policy interventions would contribute to ensure that such social gains and economic payoffs effectively materialize?

How to answer?

- Policy efforts to meet human development goals are not restricted to the social policy arena and involve the entire economy through a number of transmission mechanisms.
  - Interventions require financing by the government
  - Adjustments in taxes and public and private credit demand to finance spending will have repercussions throughout the economy.
    - Affects households (consumers) and investors (producers), and so on
    - Crowding out of private spending (domestic resource mobilization)
    - Real exchange rate appreciation (foreign resource mobilization)
  - Better education and health outcomes are expected to yield, over time, positive spinoffs on productivity and incomes → through factors market.
- Finding coherent and rigorous answers requires the use of an **economy-wide modelling tool**.

MAMS
(_Maquette_ for MDG Simulations)

- Dynamic-Recursive Computable General Equilibrium (CGE) model
  - simultaneous equation system that is square (# of variables = # of equations)
  - _dynamic_: includes more than one period/year
  - _recursive_: solution of period t+1 depends on solution of periods t-1 and t
  - _computable_: it can be solved numerically
  - _general_: it usually applies to the whole economy
  - _equilibrium_: it considers the constraints under which the economy operates
    - budget constraints of institutions and producers
    - macro balances
    - market constraints for factors and commodities
  - MDG determinants module; innovative feature of model

MAMS – cont.

- Developed at the World Bank to analyze
  - strategies for achieving MDGs
  - country-level, medium-to-long-run policy analysis
- +65 MAMS applications in 45 countries; most of them through UN-DESA's capacity development projects, leading to further model improvements.
- Most applications have focused on assessing financing strategies to achieve MDGs <u>by 2015</u>.
- For this presentation:
  - the analysis looks <u>beyond 2015</u>
  - MAMS has been extended to include direct impact of human capital on productivity (see next slides)
  - MAMS has been applied to four developing countries: Bolivia, Costa Rica, Uganda and Yemen.

MAMS – cont.

What MDG indicators?

•**mdg1**: percentage of the population living on less than an income per capita level below one or more poverty lines

•**mdg2**: net (on-time) primary school completion rate

  – estimated using student behaviour

•**mdg4**: under-five mortality rate per 1,000 live births

•**mdg5**: maternal mortality ratio per 100,000 live births

•**mdg7w**: proportion of people with sustainable access to safe drinking water

•**mdg7s**: proportion of people with sustainable access to basic sanitation

MAMS – cont.
Determinants of MDG Outcomes

| MDG	Service per capita or student	Consump-tion per capita	Wage incen-tives	Public infra-structure	Other MDGs
2–Student behaviour	X	X	X	X	4
4-Under-five mortality	X	X		X	7w,7s
5-Maternal mortality	X	X		X	7w,7s
7w-Water	X	X		X	
7s-Sanitation	X	X		X	

MAMS – cont.

MDG module

•Logistic functions for the "production" of the different MDG-related services (education, health and water and sanitation) and student behaviour.

•MDG-related services may be provided publicly or privately; but only new government expenditures lead to a policy-driven increase in the supply of MDG-related services.

•Targeting: the government is presumably able to mobilize sufficient domestic or foreign resources to finance such expenditures and meet targets.

•Effectiveness of the determinants of MDG achievement follows a non-linear pattern: each determinant becomes relatively less effective as progress towards a predefined target is made.

MAMS – cont.

- Example: logistic student behaviour
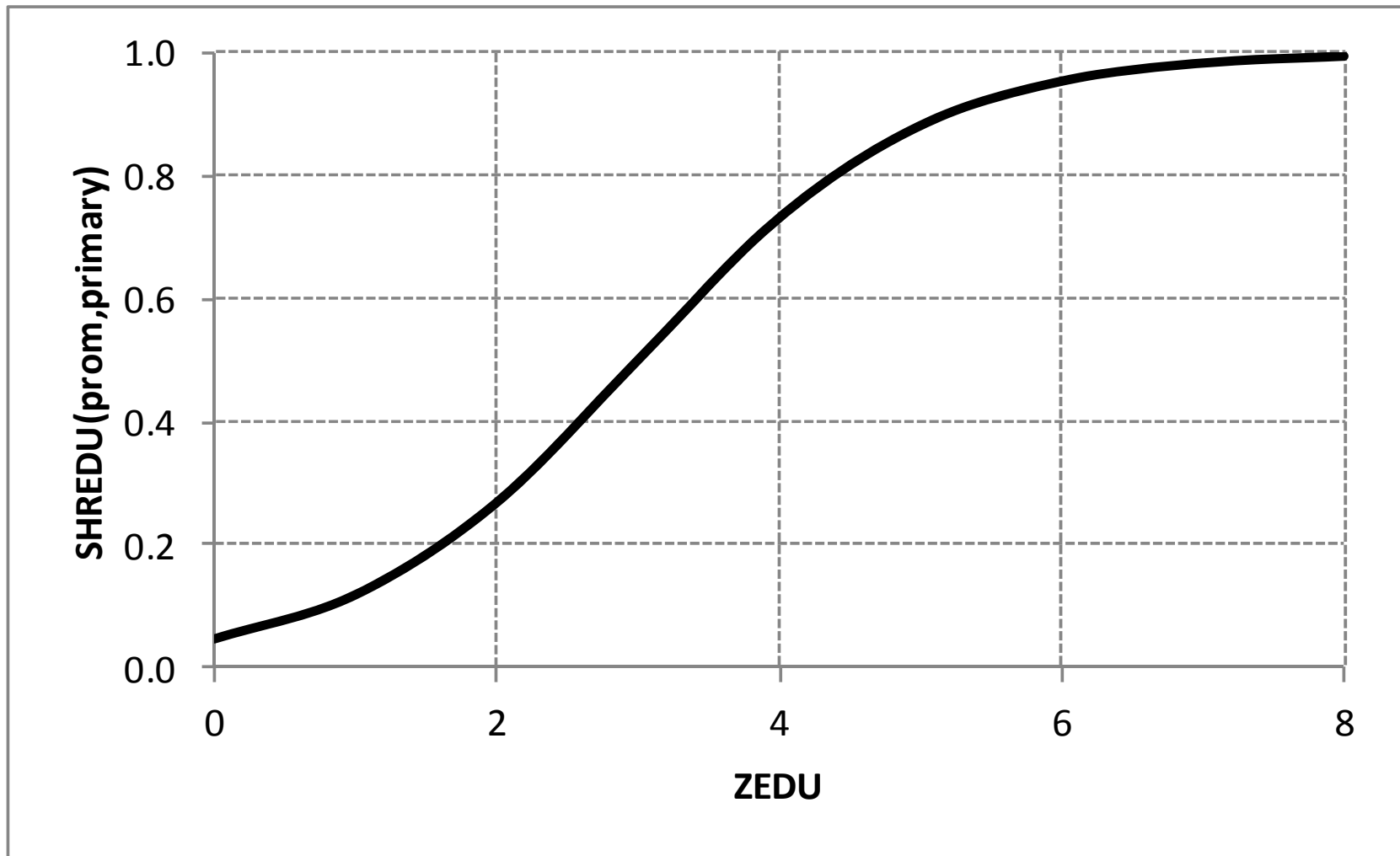
MAMS – cont.

Goal of reducing extreme poverty (MDG 1)

•Not targeted;

- – no single policy tool to reduce poverty
- – economy-wide effects affect poverty

•CGE models typically fail to specify the income distribution detail required to estimate poverty; "representative households".

•Simple approach to compute poverty:

- – the initial distribution of per-capita welfare (income/consumption) within the model representative households follows a log-normal distribution
- – changes in welfare per capita of the representative households w.r.t the initial situation are used to estimate the counterfactual (log-normal) distribution of per capita welfare
- – poverty and inequality indicators are calculated.

MAMS – cont.

Output growth

•It is a function of: (i) the accumulation of production factors and (ii) changes in factor productivity.

•Originally, factor productivity is influenced by: (i) accumulation of government capital stocks and (ii) openness to foreign trade.

•MAMS has been extended to incorporate the direct impact of (iii) the stock of human capital on factor productivity.

– stock of skilled labour: number of workers who have at least completed secondary education and are effectively employed

MAMS – cont.

MAMS Scenarios

•*Baseline*: projects expected path of economic growth and existing public spending priorities and budget financing policies.

- – more realistic benchmark for assessing whether countries would be "on/off track" towards MDG targets vis-à-vis studies that essentially project past trends linearly.
- – non-linearities in the effectiveness of social spending in achieving the targets are considered.

•*MDG-financing scenarios*:

- – goals are not fully met under the baseline; public spending stepped up as much as needed to meet targets by 2015
- – the government uses a financing option (domestic or foreign borrowing, taxation, foreign aid) or reallocates spending.

MAMS – cont.

How is MAMS applied?

• "Coded" as a "standard" model: model's theory separated from data for calibration

- – Model's theory: set of files written in GAMS that is not explicitly associated with a country; multiple functional choices

- – Excel files: data (numbers + modelling choices) and simulations; typically specified for a country

- – Code written to "capture" what it finds in the Excel files

  - • Data (statistics, Social Accounting Matrix, elasticities, other initial parameters, etc.)

  - • Disaggregations (sectors, factors, households, etc.)

  - • Closures and rules

New MAMS applications for four countries: analysis of results

- Base year (byr) & countries
  - 2004 - Yemen
  - 2005 - Costa Rica
  - 2006 - Bolivia
  - 2009/2010 - Uganda
- Baseline: replicates actual economic performance under existing policies implemented in recent years (until around 2011/2012) and then projects it up to 2030.
  - Observed GDP growth imposed; from 2013 onwards GDP grows steadily at the rate observed around 2011/2012
  - Use of closure and rules (i.e. observed GDP shares)
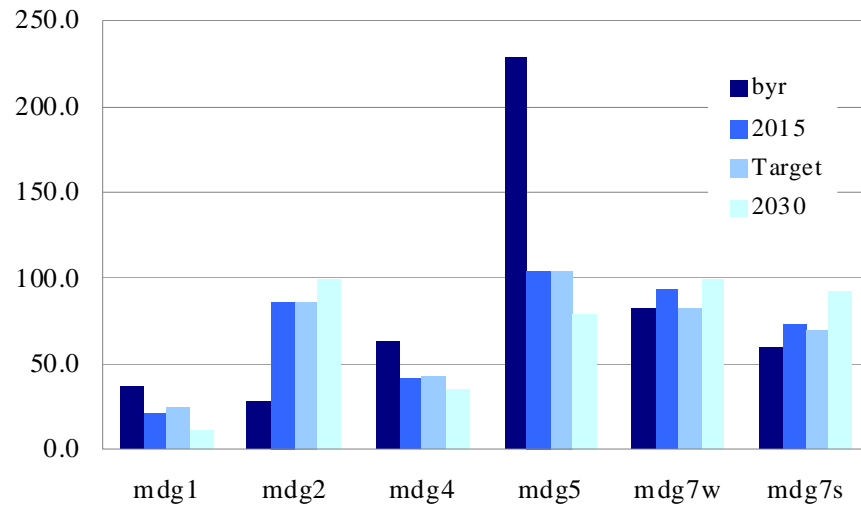
MDG indicators in the baseline
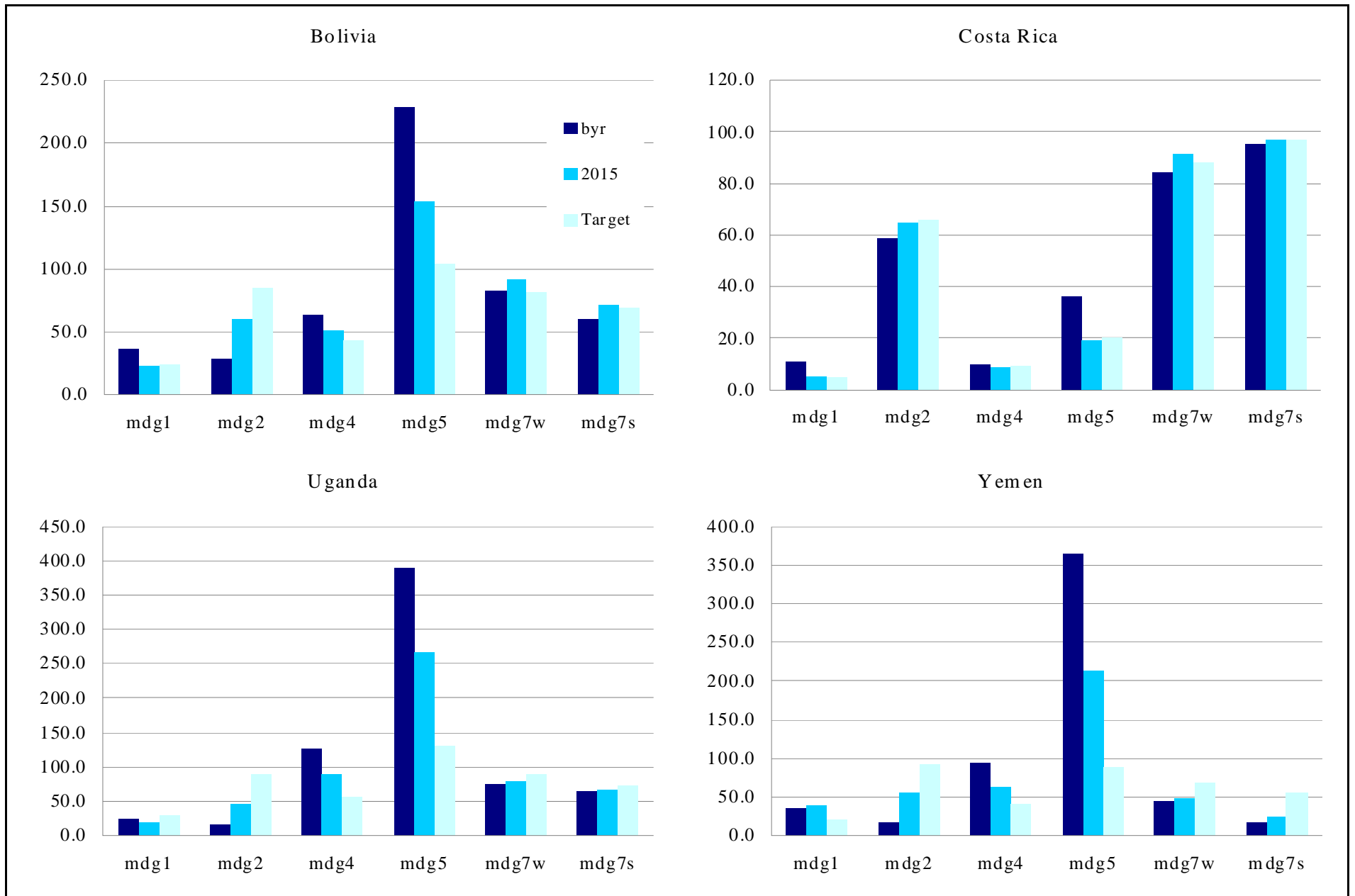
Policy scenarios and analysis

- 4 MDG-achieving scenarios: delineate a path towards fully meeting non-poverty targets.

Assumptions	Sim1	Sim2	Sim3	Sim4
Public spending scaled up until targets are met by 2015	x	x	x	x
"MDG-achieving GDP shares" unchanged after 2015	x	x	x	x
Financing through foreign sources, byr-2015	x	x	x	x
Financing through foreign sources, 2016-30	x		x	x
Financing through direct taxation, 2016-30		x		
Net (on time) primary completion rate (mdg2) continues to improve after 2015 (*why*?; see next slide)	x	x		
Net (on time) primary completion rate (mdg2) achieved in 2015 is kept unchanged in 2016-30 (by assumption)			x	x
New spending in secondary and tertiary education			x	
New spending in public infrastructure (roads, bridges, etc.)				x

MDG indicators in **Sim1** and targets
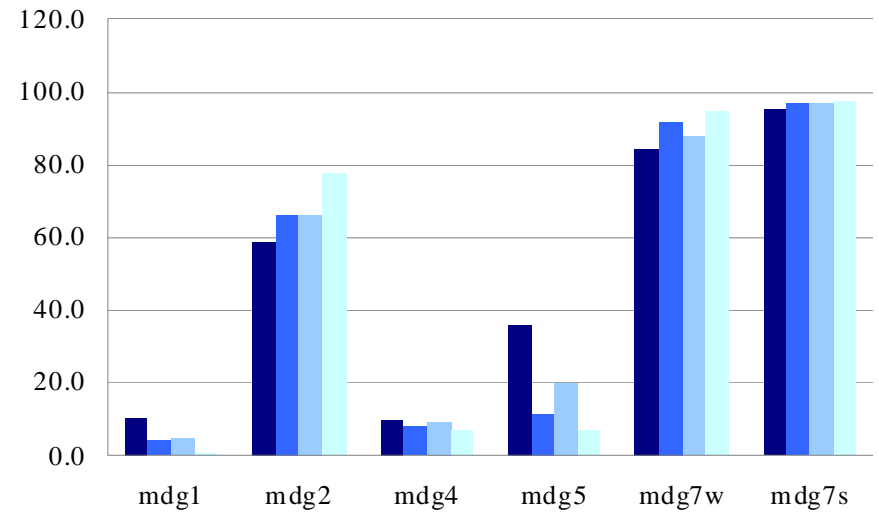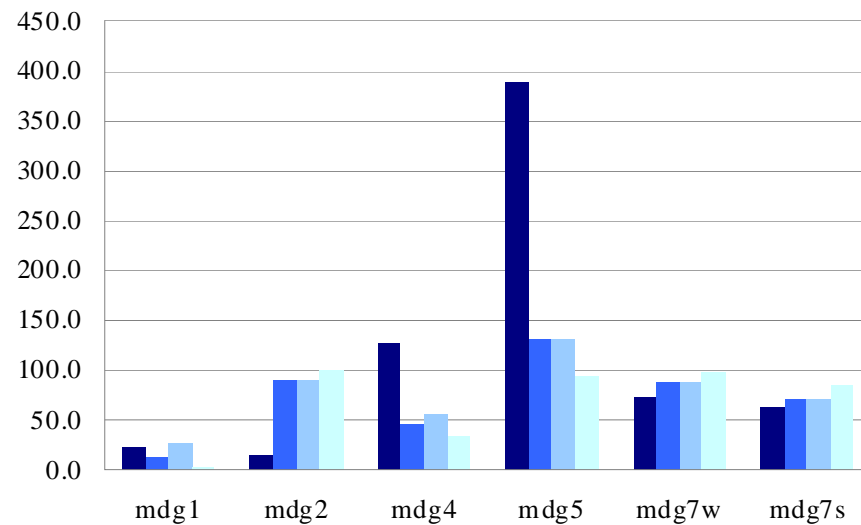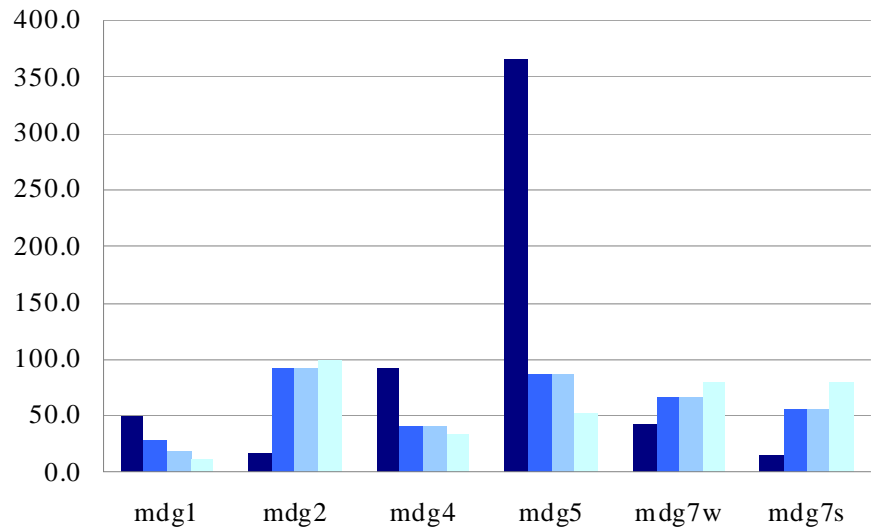
MDG-related public spending in the baseline scenario and additional requirements in MDG-achieving scenarios (per cent of GDP, period annual averages)

	BOL: Pre-2015	BOL: Post-2015	CRI: Pre-2015	CRI: Post-2015	UGA: Pre-2015	UGA: Post-2015	YEM: Pre-2015	YEM: Post-2015
Sim2	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.7
Sim1	3.6	10.9	4.1	9.2	8.5	14.8	8.5	16.2
Baseline	7.1	7.0	10.3	11.4	3.3	3.4	5.4	5.0
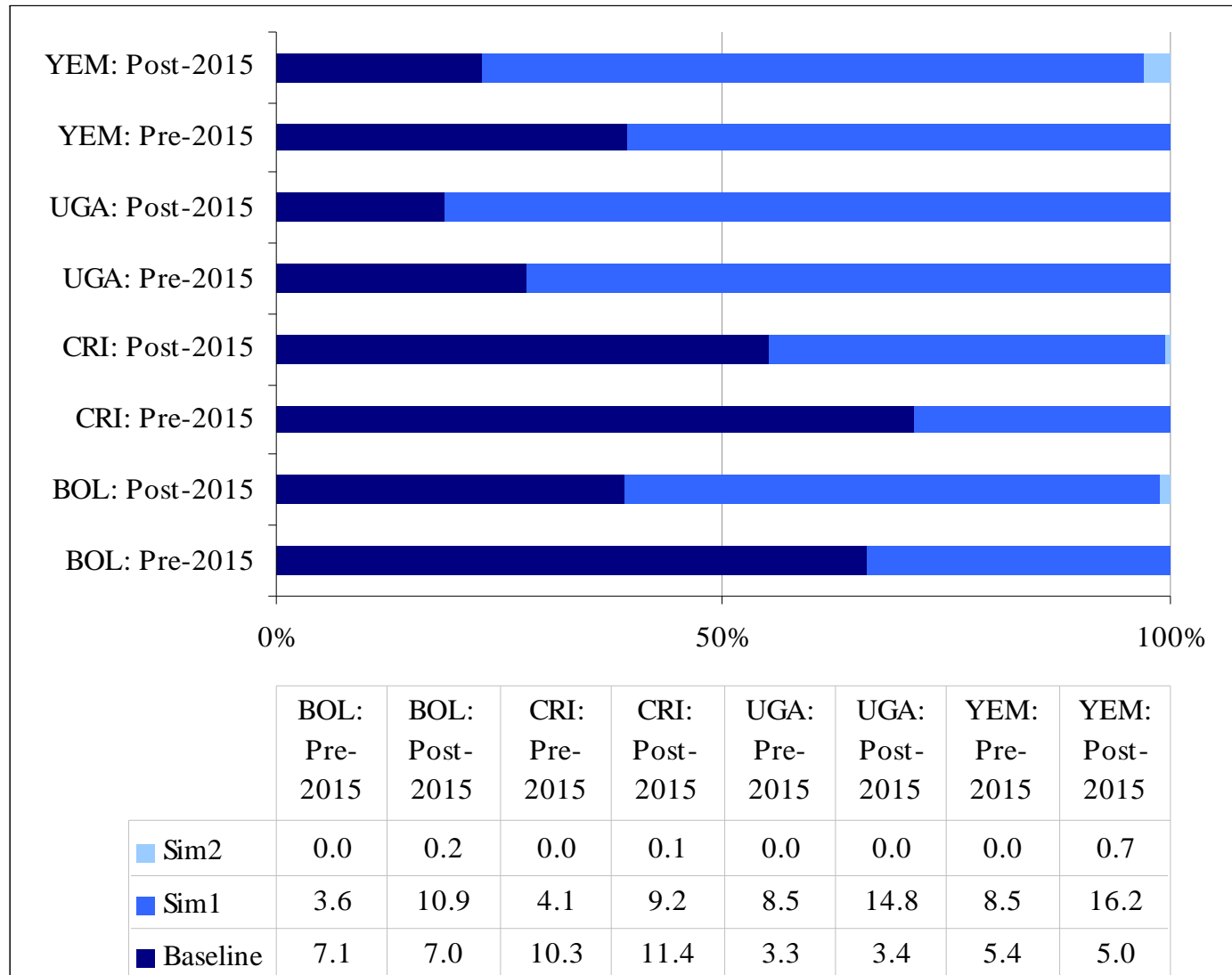
Real macroeconomic indicators and headcount poverty rate in simulations **Sim1** and **Sim2**
(period annual averages, deviation from the baseline)

|		Bolivia		Costa Rica		Uganda		Yemen	
		Pre-2015	Post-2015	Pre-2015	Post-2015	Pre-2015	Post-2015	Pre-2015	Post-2015
Sim1	**GDP growth (per cent)**	**-0.6**	**0.2**	**0.9**	**0.9**	**1.8**	**0.7**	**0.6**	**1.6**
	Total factor employment (index)	-0.6	0.2	0.8	0.4	1.1	0.5	0.4	1.2
	Total factor productivity (index)	0.0	0.1	0.1	0.5	0.6	0.2	0.1	0.5
	- most skilful labour employment	-0.0502	0.0516	0.1486	0.4432	0.6279	0.2396	0.1466	0.4432
	- public infrastructure	0.0000	-0.0014	0.0000	0.0118	0.0000	0.0056	0.0000	0.0118
	- trade openness	0.0017	0.0029	0.0000	0.0000	-0.0047	0.0004	0.0000	0.0000
	Real exchange rate (index)	-4.9	0.2	-3.6	0.1	-6.2	1.0	-4.4	1.3
	Headcount poverty rate (per cent)	-1.4	-1.7	-1.0	-0.9	-4.8	-1.7	-6.0	-12.1
Sim2	**GDP growth (per cent)**	**-0.6**	**0.0**	**0.9**	**0.0**	**1.8**	**-0.4**	**0.6**	**0.0**
	Total factor employment (index)	-0.6	0.0	0.8	-0.3	1.1	-0.3	0.4	-0.3
	Total factor productivity (index)	0.0	0.0	0.1	0.3	0.6	0.0	0.1	0.3
	- most skilful labour employment	-0.0502	0.0285	0.1486	0.3637	0.6279	-0.0142	0.1466	0.3637
	- public infrastructure	0.0000	-0.0197	0.0000	-0.0441	0.0000	-0.0333	0.0000	-0.0441
	- trade openness	0.0017	-0.0035	0.0000	0.0000	-0.0047	-0.0004	0.0000	0.0000
	Real exchange rate (index)	-4.9	3.1	-3.6	2.2	-6.2	3.5	-4.4	4.0
	Headcount poverty rate (per cent)	-1.4	4.2	-1.0	0.4	-4.8	0.9	-6.0	8.1

Real macroeconomic indicators and headcount poverty rate in simulations **Sim1**, **Sim2**, **Sim3**
(period annual averages, deviation from the baseline)

		Bolivia		Costa Rica		Uganda		Yemen	
		Pre-2015	Post-2015	Pre-2015	Post-2015	Pre-2015	Post-2015	Pre-2015	Post-2015
Sim1	**GDP growth (per cent)**	**-0.6**	**0.2**	**0.9**	**0.9**	**1.8**	**0.7**	**0.6**	**1.6**
	Total factor employment (index)	-0.6	0.2	0.8	0.4	1.1	0.5	0.4	1.2
	Total factor productivity (index)	0.0	0.1	0.1	0.5	0.6	0.2	0.1	0.5
	- most skilful labour employment	-0.0502	0.0516	0.1486	0.4432	0.6279	0.2396	0.1466	0.4432
	- public infrastructure	0.0000	-0.0014	0.0000	0.0118	0.0000	0.0056	0.0000	0.0118
	- trade openness	0.0017	0.0029	0.0000	0.0000	-0.0047	0.0004	0.0000	0.0000
	Real exchange rate (index)	-4.9	0.2	-3.6	0.1	-6.2	1.0	-4.4	1.3
	Headcount poverty rate (per cent)	-1.4	-1.7	-1.0	-0.9	-4.8	-1.7	-6.0	-12.1
Sim3	**GDP growth (per cent)**	**-0.6**	**0.5**	**0.9**	**1.0**	**1.8**	**0.9**	**0.6**	**1.9**
	Total factor employment (index)	-0.6	0.4	0.8	0.3	1.1	0.5	0.4	1.3
	Total factor productivity (index)	0.0	0.0	0.1	0.6	0.6	0.4	0.1	0.6
	- most skilful labour employment	-0.0502	0.0222	0.1486	0.6067	0.6279	0.3586	0.1466	0.6067
	- public infrastructure	0.0000	-0.0002	0.0000	0.0125	0.0000	0.0061	0.0000	0.0125
	- trade openness	0.0017	0.0027	0.0000	0.0000	-0.0047	0.0004	0.0000	0.0000
	Real exchange rate (index)	-4.9	0.3	-3.6	0.0	-6.2	1.2	-4.4	1.4
	Headcount poverty rate (per cent)	-1.4	-1.9	-1.0	-0.9	-4.8	-1.8	-6.0	-12.3
Sim4	**GDP growth (per cent)**	**-0.6**	**0.7**	**0.9**	**0.9**	**1.8**	**0.7**	**0.6**	**2.0**
	Total factor employment (index)	-0.6	0.3	0.8	0.2	1.1	0.3	0.4	1.2
	Total factor productivity (index)	0.0	0.3	0.1	0.8	0.6	0.4	0.1	0.8
	- most skilful labour employment	-0.0502	0.0578	0.1486	0.4677	0.6279	0.2096	0.1466	0.4677
	- public infrastructure	0.0000	0.2739	0.0000	0.3006	0.0000	0.1781	0.0000	0.3006
	- trade openness	0.0017	0.0023	0.0000	0.0000	-0.0047	0.0008	0.0000	0.0000
	Real exchange rate (index)	-4.9	0.5	-3.6	0.2	-6.2	1.3	-4.4	1.7
	Headcount poverty rate (per cent)	-1.4	-2.3	-1.0	-0.9	-4.8	-1.8	-6.0	-11.4

Unemployment rate of the most highly skilful workers under the baseline scenario and **Sim1** (per cent)
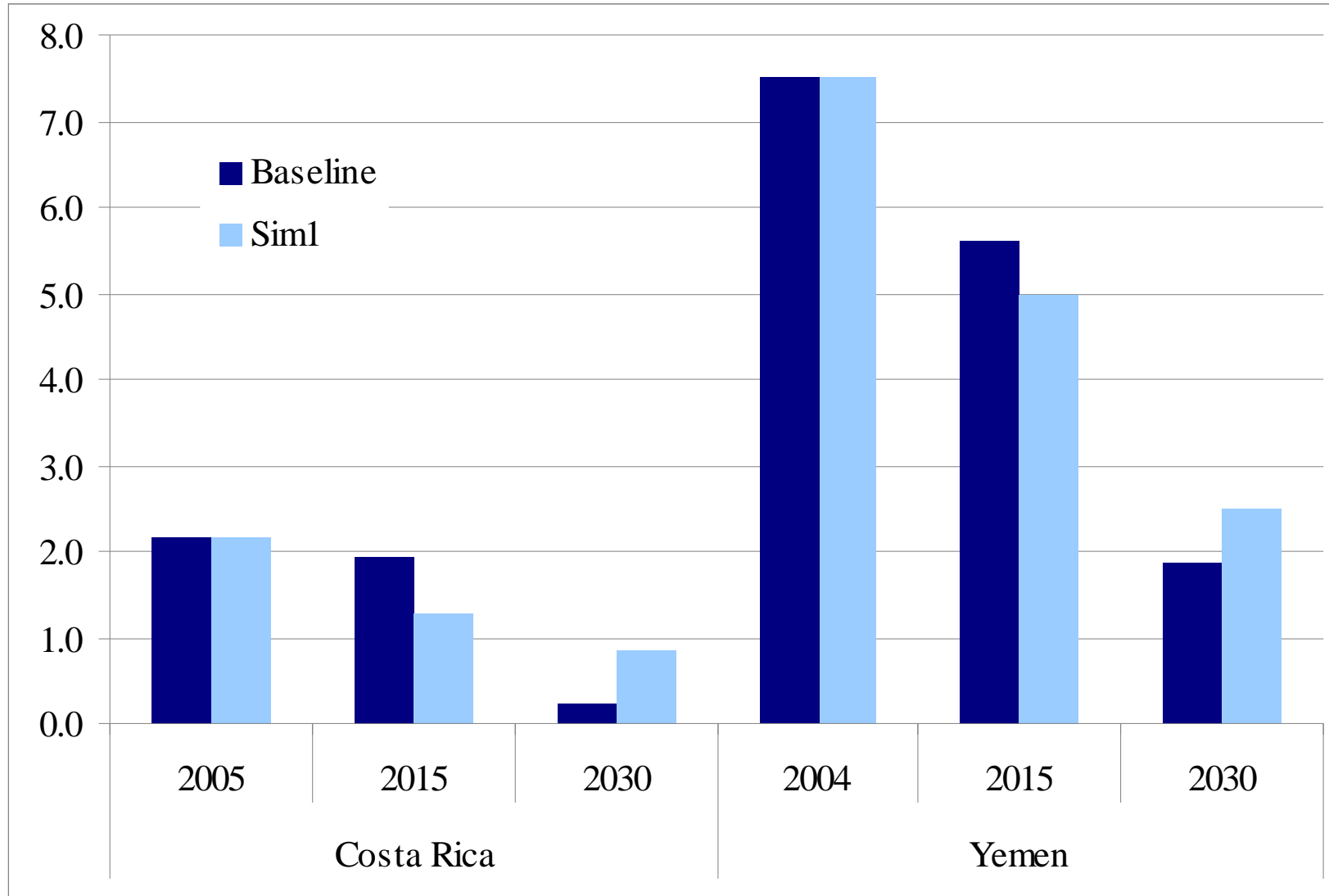
Conclusion 1: Decreasing marginal returns to highly costly interventions

- Aspiring to higher levels of human development may turn out to be unreasonably costly to achieve after 2015 because of decreasing marginal returns to public spending interventions.

- Countries need to find ways to enhance the efficiency of service delivery in order to contain costs.

- Example on Costa Rica:

  – Costa Rica's spending in education represents nearly 8% of GDP; yet net primary school completion rate has not shown progress

  – because nearly 11% of students enrolled in first grade repeat

  – In this case, reforms to the teaching, learning and evaluation system may be more cost-effective than just raising expenditures.

- Are some of the internationally agreed targets overly ambitious in terms of magnitude and timing?

Conclusion 2: Domestic resource mobilization and macroeconomic trade-offs

- The financing mechanism matters for the estimates of additional MDG-related spending requirements.

- Higher direct-tax revenues somewhat raises the total costs of pursing human development goals in most cases as compared with the external resources scenario → crowding out of private demand for social services → the government steps up efforts to compensate for less private spending.

- Such macroeconomic trade-offs would need to be taken into consideration should governments pursue domestic resource mobilization (also in the long run; see next slide).

Conclusion 3: Growth and productivity bonuses of achieving MDGs

- Where do GDP growth come from pre-2015:
  - government spending → more hiring of teachers, doctors, and so on and more demand for capital → factor employment.
  - larger number of skilled workers employed spurs TFP growth.
  - offset by macroeconomic trade-offs of financing (i.e. real exchange rate appreciation, crowding out of private spending)
- Where do GDP growth come from post-2015:
  - economic dynamism and capital accumulation carry on
  - increased stock of healthier and better-educated workers translates into more human capital, the employment of which produces higher labour productivity growth
  - offset by macroeconomic trade-offs of financing

Conclusion 4: Alternative investments that reap additional productivity gains

- In view of fiscal constraints and human development gaps in other areas, governments may need to identify spending requirements that allow them to meet MDG targets without necessarily over-achieving them.

- Resources may be channelled to other key social or economic sectors to expand the scope of human development while, at the same time, intensifying productivity gains from past human development investments
  - Investing in secondary and tertiary education or increasing the stock of public infrastructure (roads, bridges, and so on) seem to be good examples

Conclusion 5: Economic structure and labour market constraints

- The economy's structure should adjust commensurately to absorb the increased stock of better-educated workers that forms as education targets are met. If not:
  - the skill premium may fall, providing a disincentive to invest in education
  - high rates of (youth) unemployment and skill mismatches in the labour market
- The environment for stimulating a structural change in the economy towards technologies and activities that can absorb larger amounts of skilled labour needs to be improved.

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