



# Research Program on Forecasting

## **Evaluating a Long-run Forecast: The World Bank Poverty Forecasts**

**Jin Ho Kim**

Department of Economics  
The George Washington University  
Washington, DC 20052 USA  
[jkim12@gwu.edu](mailto:jkim12@gwu.edu)

**Herman O. Stekler**

Department of Economics  
The George Washington University  
Washington, DC 20052 USA  
[hstekler@gwu.edu](mailto:hstekler@gwu.edu)

RPF Working Paper No. 2016-009  
<http://www.gwu.edu/~forcpgm/2016-009.pdf>

September 16, 2016

RESEARCH PROGRAM ON FORECASTING  
Center of Economic Research  
Department of Economics  
The George Washington University  
Washington, DC 20052  
<http://www.gwu.edu/~forcpgm>

# Evaluating a Long-run Forecast: The World Bank Poverty Forecasts

Jin Ho Kim and Herman Stekler

George Washington University

## **Abstract**

This paper examines an issue in long-run forecasting, evaluating a forecast for which the actual data are not yet available. In this case, we analyze the World Bank's forecasts of the poverty headcount made in 2002, but the actual data for the terminal date will not be available for some time. The methodology requires one to infer a forecast for an intermediate date for which the data are available. We show that the long-run projections were extremely accurate because they are consistent with the trends that are observed in the latest available data.

## An Evaluation of World Bank Poverty Forecasts

This paper examines an issue in long-run forecasting: How to evaluate a projection made for a distant date that has not yet occurred. For example, climate forecasts are made for decades in the future; similarly, projections of the Social Security Trust Fund are made 75 years in advance; there are estimates of the number of people living in poverty 10 or more years in the future, etc. These outcomes won't be known for many years in the future, but, at some point in time, we would like to determine whether these projections are on a trajectory to reach their predicted values. This paper presents a method for making this determination.

While this approach can be used to evaluate any long- term projections, we examine the World Bank's targets (goals) for the level of poverty for 2015. Starting in 1990, these projections have been made every year, but the *actual* aggregated poverty headcount numbers were only available in 2002, 2005 and 2008. We, therefore, examine the projections that were made in those years. The 2015 poverty headcount estimates will not be available until 2017 or 2018. Nevertheless, the actual data for intervening years can be used to determine whether the projections in those years were feasible achievable goals.

The conventional techniques that are used to evaluate macroeconomic forecasts are not applicable in this analysis for a number of reasons. First, as we have already indicated, the poverty estimates for 2015 are not yet available and won't be available for some time . Consequently, we must use the currently available *intermediate year estimates* of actual poverty head counts in a procedure that determines whether these long-run projections are on a path that can reach the target levels. Second, the estimates of the levels of poverty that existed at the time

when the forecasts were prepared do not coincide with the current estimates of the poverty levels that prevailed in those base years. We must, therefore, adjust the forecasts of the number of people living in poverty to take into account the revisions in the base year estimates that were made after the forecast was issued. In other words, the vintage of the data that are used does matter and we must take this into account.

The next section discusses the issues involved in poverty forecasting. This is followed by a discussion of the methodology used to evaluate these forecasts. The data, the results and the conclusions constitute the final sections.

## 1. Long-run poverty forecasting

Long-run poverty forecasts are subject to all of the issues that plague all long-run projections. It is necessary to construct scenarios based on assumptions and there are revisions in the data that require evaluations to be based on growth rates rather than on the magnitude of the errors. Poverty forecasts have an additional problem. Customarily, when the forecasts and the actual values of a variable are compared, there is no dispute about what constitutes the observed number. However, the definition of poverty has changed over time and the data that were used when the forecasts were made cannot be directly compared with the currently estimated number of people living in poverty.

The generally accepted definition of poverty is that the poor are those individuals whose income is equal or less than a threshold called the poverty line. We are evaluating the Bank's forecasts that were based on a threshold of \$1 / day using 1993 Purchasing Power Parities (PPP).

However, the actual estimates which are now available in PovcalNet<sup>1</sup> for 2011 use a \$1.25 threshold and 2005 PPP.<sup>2</sup> Consequently, it is not possible to use the **level** of the headcount estimates as the actual values and the forecasts referring to the same years are not comparable. (See Chen and Ravallion, 2009).<sup>3</sup> This problem is illustrated in Table 1 which presents two vintages of the estimates of the poverty level that existed in 1999. One is the real-time estimate made in 2002 and the other is from the 2016 vintage. We, therefore, ask how well the **changes** in poverty that actually occurred were predicted. Consequently, our analysis will be based on growth rates or percent changes.<sup>4</sup>

## 2. Poverty Forecast Evaluation Methodology

### 2.1 Inferring a Forecast

The poverty forecasts that are being evaluated are the headcount numbers for 2015. We use the latest available data (for 2011 with 2005 PPP) as the actual numbers to determine whether the projections that were made for 2015 are achievable. To be achievable the 2011 values of the headcounts should be on the trajectory of that variable between the date of the forecast and 2015.<sup>5</sup> This means that the actual and forecast changes should be similar. Because none of the projections provide estimates of the poverty headcount for the intervening years between the dates of the forecast and 2015, our methodology must thus *infer* a value of that variable for 2011.

---

<sup>1</sup> PovcalNet is an interactive tool located at the World Bank. It allows everyone to calculate the level of poverty using Bank Methodology.

<sup>2</sup> Forecasts made after 2010, that we are not evaluating, use 2005 PPP and the \$1.25 poverty line.

<sup>3</sup> Using the 2005 PPP and the \$1.25 poverty line rather than the old \$1 poverty line with 1993 PPP increased the estimate of the number of people living in poverty.

<sup>4</sup> We assume that the rates of change using the two sets of poverty estimates are comparable.

<sup>5</sup> With a different starting date, the trajectories would differ because the poverty headcount estimates at the starting dates differ.

This inferred forecast should be on the trajectory from the date when the forecast was made and 2015. We, therefore, assume that the annual change in the poverty head count that was forecast between the starting date and 2011 was identical to the annual forecast change to the target date, 2015. The inferred forecast *change* can then be compared with the actual *change* that occurred between the starting date and 2011. The actual change can be calculated from the data in PovcalNet. The forecast error is the difference between the actual and forecast rates of change.

## 2.2. Procedures for Inferring Forecasts

Regardless when the Bank made its projections for 2015, it showed only two points—the poverty estimate at the time when the forecast was made and the value for 2015. It did not make any projections for intermediate years over the forecast horizon.<sup>6</sup> In order to obtain a “forecast” for 2011, we must assume the methodology that was used to generate the 2015 number and then back out the 2011 number.

One possible procedure for inferring intermediate “forecasts” is to assume that the projection is based on a long-term growth rate and a constant elasticity of poverty reduction with respect to the inequality-adjusted income growth. Specifically, the constant elasticity of poverty reduction,  $P$ , can be estimated from (Equations 1 and 2). (See Ravallion, 2007).

$$P = AY^{-\beta(1-I)} \quad (5)$$

where  $I$  represents the Gini coefficient, and  $Y$  represents income growth. Taking logs yields

---

<sup>6</sup> Even though we do not know the specific details of the methodology the World Bank used to generate poverty forecast for 2015 each year, we know that there are two major components in the forecasts: long-term growth scenarios and an assumption about distribution, such as a constant elasticity of headcount poverty reduction relative to the growth rate.

$$\ln P = \ln A - \beta(1 - I)\ln Y \quad (2)$$

from which we estimate  $\beta$  and then can use the coefficient to forecast the poverty headcount for 2011.<sup>7</sup>

We did not have the data to utilize this approach and instead adopted two simple procedures which served as approximations to the model and could have generated the poverty numbers for 2015. One was linear; the other was non-linear. The simplest procedure is to assume that the trajectory of poverty between the date of the forecast and 2015 is linear.

As an example, we use the World Bank forecast made in 2002. That forecast used the latest available (i.e. 1999) data to make a projected poverty headcount for 2015. Using a linear trend, it is possible to calculate the yearly change in the headcount from Equation 3:

$$HC^f_{2015} = HC^{e1999} - b^{e1999}t, \quad (3)$$

where  $b^{e1999}$  measures the predicted change per year of the poverty headcount between the initial year (1999) and forecast year (2015); and  $t=16$  measures the number of years between 1999 and 2015. Consequently,  $b = (HC^f_{2015} - HC^{e1999}) / 16$ . The changes between 2011 and 2005 (2008) using 2002 (2005) data would be calculated in a similar manner.

The second approach for inferring the forecast for 2011 is non-linear in nature. In this case, the headcount declines exponentially. Equation (4) was then used to derive the yearly percentage poverty headcount change between 1999 and 2015

---

<sup>7</sup> The forecast made in 2002 used the headcount for 1999, which is denoted as,  $HC_{1999}$ , to calculate the forecasted poverty headcount for 2011,  $HC^f_{2011}$ . The percentage decline in the poverty headcount between 1999 for the forecast made in 2002,  $r_{2002}$ , is  $r_{2002} = \frac{HC^f_{2011}}{HC_{1999}} - 1$

$$HC^{f2015} = HC^{e1999}(1+r^{e1999})^{16} \quad (4)$$

The inferred forecast for 2011 would be,  $HC^{2011} = HC^{e1999}(1+r^{e1999})^{12}$ . The inferred forecasts for 2011 made in the other years would be calculated similarly.

### 3. Data

We evaluate the World Bank poverty headcount projections that were made for the year 2015. They were made in 2002, 2005, and 2008 based on the available data for 1999, 2002, and 2005, respectively. Each set of forecasts consists of headcount projections for six regions: Africa, East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, and South Asia. These projections were published in Global Economic Prospects. The actual data are for 2011, the last year for which data are available with the 2005 PPP version, and were obtained from PovcalNet.

### 4. Results

As we have indicated, both the inferred forecasts and the actual estimates were the yearly changes in the headcount numbers. The projected and actual average yearly changes in the poverty headcount in each region are presented in Table 1. Figure 1 illustrates the actual and linear trends in the poverty headcount for each region. There are too few observations to undertake a formal quantitative evaluation, but we note that the inferred forecasts obtained from the non-linear method have the smaller errors. However, even the errors of the linear estimates are all less than 2/3 of the actual change observed between 1999 and 2011. Moreover, Figure 1 shows that, in most cases, the linear forecast and the actual changes show similar trends.

These results indicate that the actual changes are on trajectories that are consistent with the actual forecasts for the distant date. This is a quite striking result given that these were inferred forecasts for 2011 made three to nine years in advance based on data that were even three years older. The main differences are in the East Asia and Pacific and the South Asia regions. The actual decline in the headcount in those regions is substantially greater than had been projected. This discrepancy can be attributed to the change in the headcount as reflected in the redefinitions and revisions of the 1999 data in those regions. (See Table 2). From the World Bank's perspective, it is doubtful whether a reduction in poverty which was greater than it had projected would be a cause for concern. *An overall qualitative evaluation indicates that these long-run poverty forecasts were extremely accurate.*

## 5. Conclusions

This paper has made two contributions. First, we have developed a methodology that permits one to evaluate any long-run forecast before the actual data for the target date are available. The methodology generates an inferred forecast for an intermediate date and determines whether the forecast is on a trajectory that is consistent with the actual forecast for the distant date. The methodology was then applied to the World Bank's poverty projections. The results show that those projections for 2015 were consistent with the trends that have been observed in the latest data, which are only available through 2011.

## References

Chen, Shaohua, and Ravallion, Martin, 2009. "Dollar a Day Revisited." World Bank Economic Review, World Bank Group, vol.23(2), pages 163-184

World Bank 2000, "Global Economic Prospects 2000", Washington, DC: World Bank

World Bank 2001, "Global Economic Prospects 2001", Washington, DC: World Bank

World Bank 2002, "Global Economic Prospects 2002: Making Trade Work for the World's Poor", Washington, DC: World Bank

World Bank 2003, "Global Economic Prospects 2003: Investing to Unlock Global Opportunities", Washington, DC: World Bank

World Bank 2004, "Global Economic Prospects 2004: Realizing the Development Promise of the Doha Agenda", Washington, DC: World Bank

World Bank 2005, "Global Economic Prospects 2005: Trade, Regionalism, and Development", Washington, DC: World Bank

World Bank 2006, "Global Economic Prospects 2006: Economic Implications of Remittances and Migration", Washington, DC: World Bank

World Bank 2007, "Global Economic Prospects 2007: Managing the Next Wave of Globalization", Washington, DC: World Bank

World Bank 2008, "Global Economic Prospects 2008: Technological Diffusion in the Developing World", Washington, DC: World Bank

World Bank 2009, "Global Economic Prospects 2009: Commodities at the Crossroads", Washington, DC: World Bank

World Bank 2010, "Global Economic Prospects 2010: Crisis, Finance and Growth.", Washington, DC: World Bank

World Bank 2015, PovcalNet, available at: <http://iresearch.worldbank.org/PovcalNet>

Table 1

Actual and Predicted Changes, Linear and Non-Linear Methods, 2002, 2005, and 2008

	2002				2005				2008			
	Linear		Non-Linear		Linear		Non-Linear		Linear		Non-Linear	
	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted
<b>EAP</b>	-41.7	-12.4	-8.5	-7.5	-39.7	-15.4	-12.2	-18.9	-26.8	-19.7	-10.9	-9.2
<b>ECA</b>	-1.3	-1.1	12	-7.4	-0.8	-0.5	-14.9	-6.8	-0.6	-0.9	-14.3	-7.9
<b>LAC</b>	-2.3	-0.6	-4.3	-1.2	-2.9	-1	-7.2	-2.8	-2.1	-1.5	-6.1	-4
<b>MENA</b>	-0.6	0.1	-5.1	1.8	-0.6	-0.2	-7.2	-3.8	-0.6	-0.5	-7.6	-5.9
<b>SA</b>	-18.2	-14	-2.7	-3.8	-26.5	-15.8	-5.1	-4.8	-32.8	-20.7	-6.5	-4.2
<b>SSA</b>	2.5	5.6	-0.5	1.6	1.7	2.5	0.4	0.8	2.8	-2.1	0.7	0.6

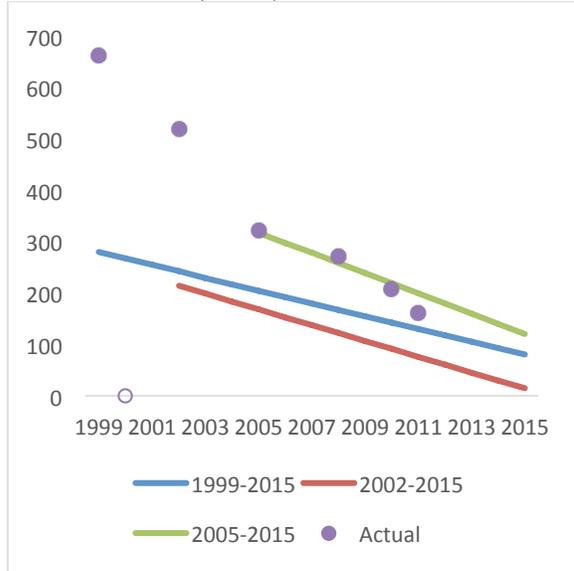
Table 2

Poverty Head Count for 1999, based on 2002 and 2016 Vintage Data

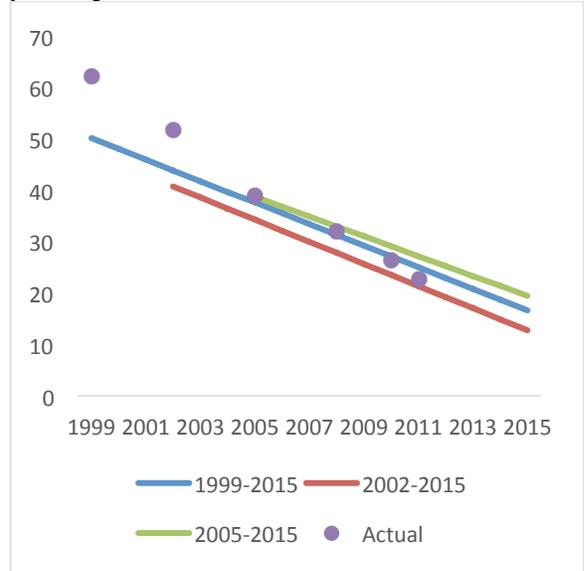
	<b>1999 Poverty Head Count (2002 Vintage)</b>	<b>1999 Poverty Head Count (2016 Vintage)</b>
<b>EAP</b>	279	661.3
<b>ECA</b>	24	18.01
<b>LAC</b>	57	55.49
<b>MENA</b>	6	13.04
<b>SA</b>	36.6	44.96
<b>SSA</b>	315	385.76

## East Asia and Pacific

**\$1/\$1.25 Poverty Headcount**  
Headcount number (million)



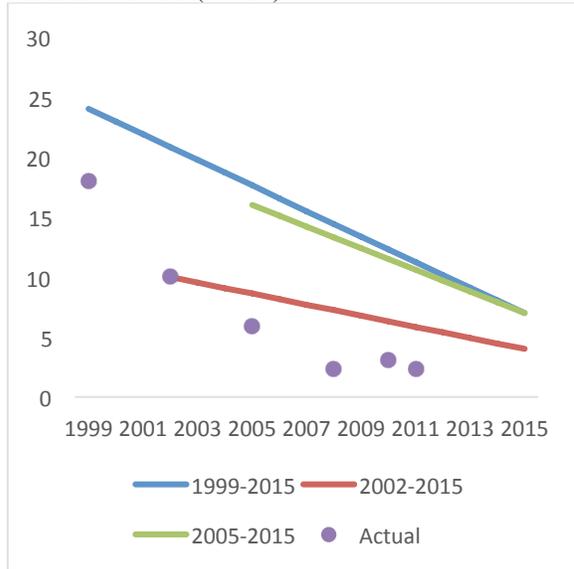
**\$1/\$1.25 Poverty headcount ratio**  
percentage



## Europe and Central Asia

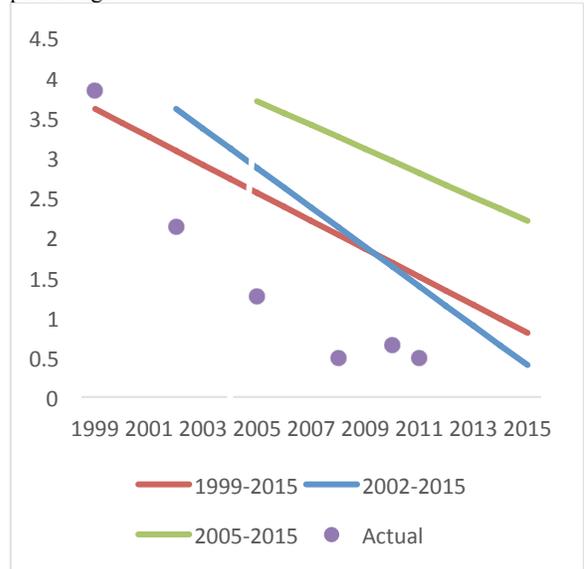
**\$1/\$1.25 Poverty Headcount**

Headcount number (million)



**\$1/\$1.25 Poverty headcount ratio**

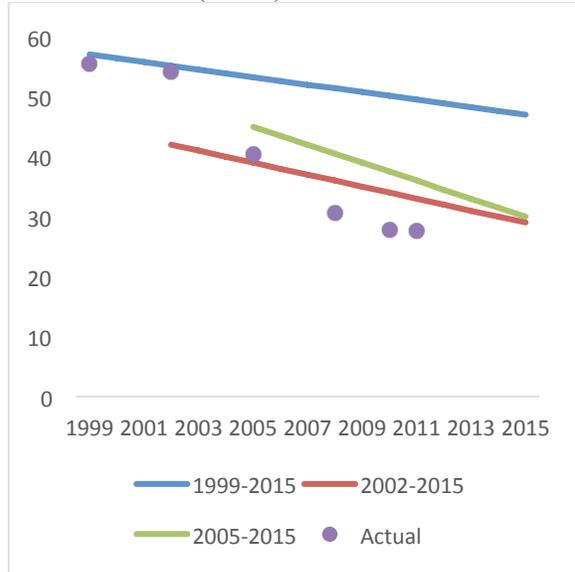
percentage



## Latin America and Caribbean

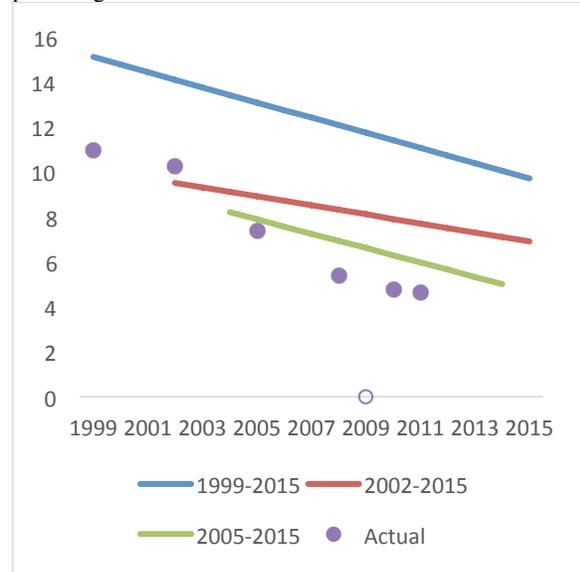
### \$1/\$1.25 Poverty Headcount

Headcount number (million)



### \$1/\$1.25 Poverty headcount ratio

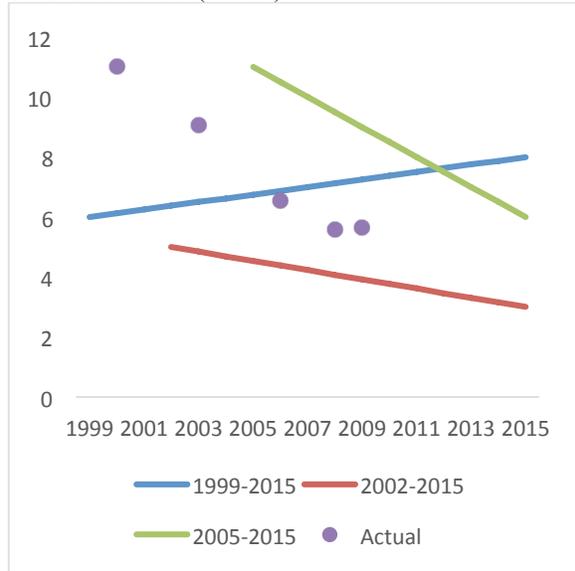
percentage



## Middle East and North America

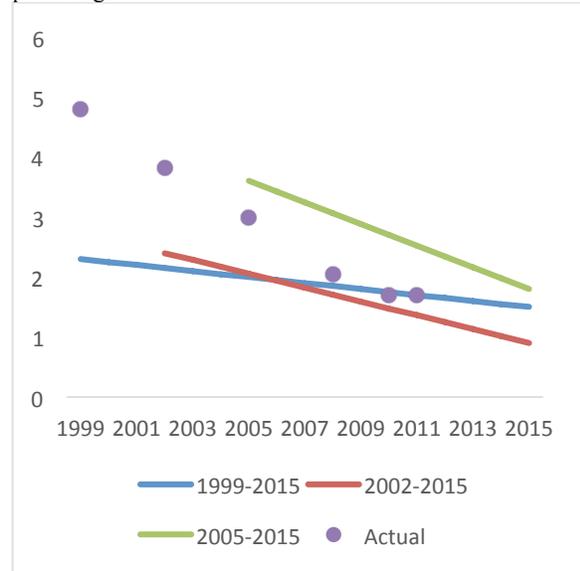
### \$1/\$1.25 Poverty Headcount

Headcount number (million)



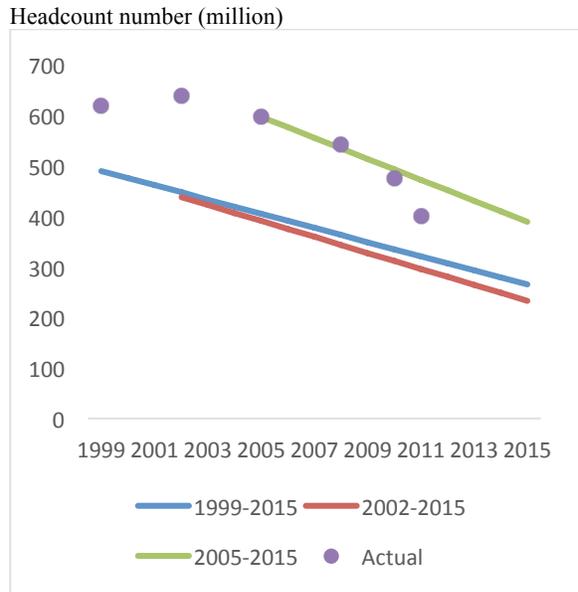
### \$1/\$1.25 Poverty headcount ratio

percentage

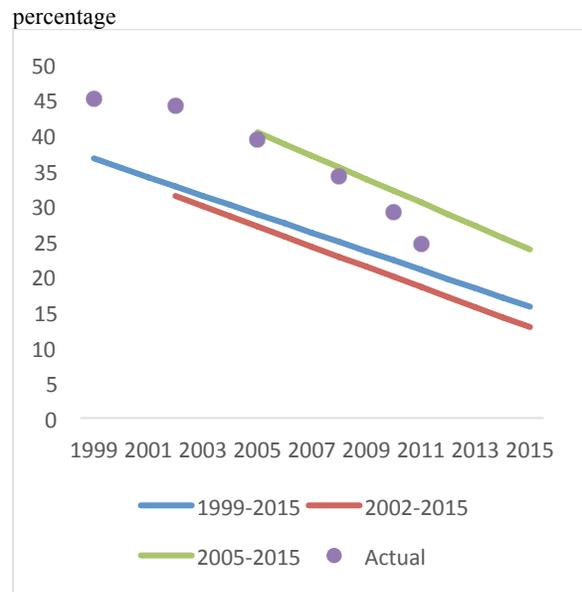


## South Asia

**\$1/\$1.25 Poverty Headcount**

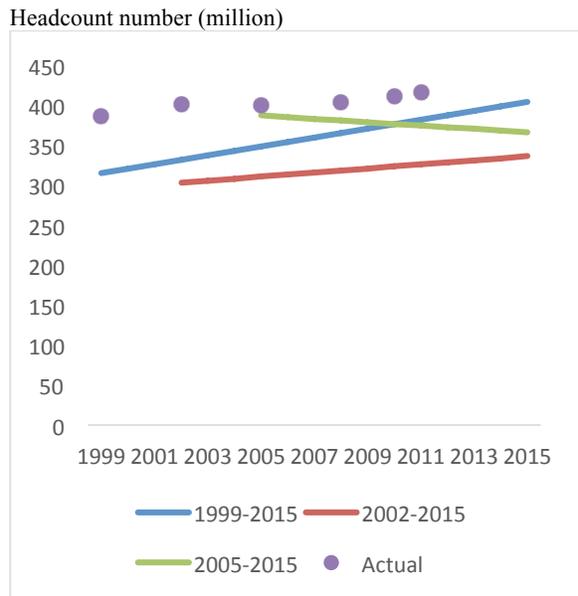


**\$1/\$1.25 Poverty headcount ratio**



## Sub-Sahara Africa

**\$1/\$1.25 Poverty Headcount**



**\$1/\$1.25 Poverty headcount ratio**

