

Moatsos, Michail

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# The devil in the details: The core disadvantage of the International Poverty Line

Michail Moatsos\*

## Abstract

Our appreciation of global poverty almost exclusively relies on the official statistics published by the World Bank. Yet, these official global poverty estimates, based on the standard dollar-a-day approach, fall short in their prime objective of observing a constant standard of living across countries and over time. This paper discusses in brief the core methodological problem of the method, that is the idea that a single poverty line can be used for all country and all years consistently.

## 1. Introduction

For investigating the issue of poverty in economic terms one is typically bound to use a monetary yardstick with which to distinguish the poor from the remaining population.<sup>1</sup> The flagship of iPLs is the methodology used by The World Bank and its researchers, deriving the famous dollar-a-day poverty line. This section dissects all the steps involved in the original RDV methodology and its RCS update.<sup>2</sup> In the reading of this literature that follows, I argue that the application of the dollar-a-day (hereafter also DAD) method in the global poverty literature entails a principal source of concern.

## 2. The dollar-a-day method

The RDV framework builds on the premise that national poverty lines consist of two components. One absolute, fixed in all countries, and one relative component connected with the income or consumption level in each country. This relationship in RDV is expressed as follows:

$$\ln(z_i) = \beta_0 + \beta_1 c_i + \beta_2 c_i^2 + \epsilon_i, \quad i \in [\text{set of countries}] \quad (1)$$

where  $z_i$  is the poverty line of country  $i$ , and  $c_i$  is the average consumption in that same country. The obvious concern with this formula, as already pointed by Srinivasan (2010), is that the absolute minimum poverty line implied obtains for 0 (zero) mean

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\* Author's Affiliation: Department of History and Art History – Economic and Social History, Utrecht University, e-mail: m.moatsos@uu.nl

<sup>1</sup>For a promising alternative see Anderson et al. (2014).

<sup>2</sup>RDV stands for Ravallion et al. (1991a), and RCS for Ravallion et al. (2009).

consumption. Therefore the theoretical foundation of this model is limited, although the fit of the regression is fine ( $R^2 = .9$  for the small sample of 33 countries). Their model predicts a \$0.76-a-day line (95% Confidence Interval: 0.49,0.84) as a point estimate of absolute poverty line, but the eyeballing approach was found by the authors preferable to the model<sup>3</sup> giving a 1.02\$a-day (95% CI: 0.92, 1.29) for a group of poor countries that appear to cluster around the dollar-a-day level. Allen (2013) revisited the RDV data set and finds that many of the World Bank’s reports for those poverty lines were either unavailable, or not enough information was provided in order to be useful for an independent assessment. In several counts, from the reports that were available, as Allen finds, several of the NPLs in the data were set in a more or less arbitrary manner, such as the cases of Pakistan and China.<sup>4</sup>

Responding to the criticism about obtaining the absolute poverty line at the level of 0 consumption, Chen and Ravallion (2001) redefined the formula in a way that tries to address this point. This is done in a rather technical manner, without providing any further theoretical support:

$$\ln(z_i) = \beta_0 + \beta_1(c_i - c_{min}) + \beta_2(c_i - c_{min})^2 + \epsilon_i, \quad i \in [\text{set of countries}] \quad (2)$$

where  $c_{min}$  represents the minimum mean consumption in the set of countries. This method gave an estimate of \$1.05-a-day (95% CI: 0.88, 1.24), but the median of the ten poorer countries of \$1.08-a-day (95% CI: undisclosed/not estimated) was given preference on defining the 1993 PPP based poverty line (same sample of countries as in RDV). Ravallion et al. (2009) recast their previous econometric approach, and take on a different specification:

$$z_i = z^*I_i + f(C_i)(1 - I_i) + \epsilon_i, \quad i \in [\text{set of countries}] \quad (3)$$

where  $z^*$  is the mean NPL of the countries in their sample with mean consumption less than \$60-a-month (dubbed “the reference group”),  $I_i$  takes the value of 1 if country  $i$  belongs to the reference group and zero otherwise, and  $f(C_i) \equiv E[z|c = c_i]$ , while  $E[\epsilon_i|c = c_i] = 0$ . To be able to identify the methodological continuity one has to visit the working paper version in Ravallion et al. (2008, table 1), where the  $f(C_i)$  is identified fully. Their preferred specification is the linear one,  $z_i = \beta_0 + \beta_1c_i + \epsilon_i$ , without reporting most of the typical regression results of the other specifications. Again the criticism that their methodology implies that average poverty line obtains at mean consumption 0, remains valid, although this takes place in a background formula. Nevertheless, what all this empirical jargon says is that the iPL is taken to be the average of NPL of the countries in their sample with mean consumption less than \$60-a-month from the 74 NPL data set the authors used. This econometric approach despite its elegance, is difficult to

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<sup>3</sup>As characterized in a followup publication by Ravallion (2010, p.89): “The 1990 WDR \$1 a day line had been picked by eyeballing the scatter of points in the relationship between national poverty lines and national mean consumption”

<sup>4</sup>Similarly, for a large group of these NPLs, although the World Bank was been involved in their construction in cooperation with local authorities, there is no investigation of the actual composition of the each NPL. All that is reported in a followup article (Chen and Ravallion, 2010) is that about 80% of the NPLs use a version of the “cost of basic needs” approach, having a country specific food component and some allowance for non-food expenditure. Not exploiting this information appears rather sub-optimal.

interpret as a sufficient theoretical and methodological framework able to isolate the absolute from the relative component within each NPL (which is what the foundation of this methodological tradition –initially stated in Ravallion et al. (1991a)– aims at doing).

The iPL estimate of Ravallion et al. (2009) is \$1.25-a-day, however the confidence intervals are not reported.<sup>5</sup> As Pogge (2013) points out, this average obtains from a group of the “fifteen poorest countries, thirteen of which are small states in Africa”, along with Nepal and Tajikistan, rendering the iPL substantially SSA-oriented.

As before, RCS provide no detailed discussion concerning what were the underlying goals in terms of living standards considered in each NPL within their data set; or what methodological problems were addressed, and how, before the final figure of each NPL was estimated. Thus the authors consider each NPL of equal quality, and taken at face value, and an opportunity to dissect the NPLs in search for the absolute poverty component remained unexploited.<sup>6</sup>

Most recently, Ferreira et al. (2016) re-use the group of countries selected by Ravallion et al. (2009) and estimate the present day official value for the World Bank DAD iPL poverty line at \$1.9/day.<sup>7</sup> Therefore, by implication, the current iPL preserves the aforementioned methodological issues.

### 3. The averaging nature of iPL

Considering that the goal of the DAD method is the estimation of an iPL that traces absolute poverty globally, there is another issue to touch upon. To this end, the dollar-a-day method implicitly assumes that all NPLs of countries in the reference group either: (1) contain no relative component, or (2) the relative component within the group of reference countries has an average of zero.

The first assumption if true it would in all likelihood falsify the underlying premise according to which the absolute component in the NPLs is fixed across all countries,<sup>8</sup> simply because the values of the NPLs vary considerably in the reference group.<sup>9</sup> Naturally, some variation should be allowed to account for the various measurement errors in the estimation procedure of each NPL, but one should not simply assume that their average would cancel out measurement error as those underlying poverty lines are not created with the same goals in mind, and therefore they are not expected to measure the same definition of poverty. If that was the case then one would be excused, in that regard, to take the average in pursue of the mean value of a international poverty line, similarly to the repeated lab results of a experiment designed to measure exactly the same phenomenon.

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<sup>5</sup>Assuming normality one gets a 95% confidence interval of (0.48, 2.01) from the Ravallion et al. (2008) data.

<sup>6</sup>A detailed investigation of NPLs composition, could substantiate the absolute and relative components decomposition approach in favor of their approach; or it could lead to empirically refute the assumption that the absolute poverty component is fixed for every country.

<sup>7</sup>See below for additional information.

<sup>8</sup>Another way of seeing this is that if this assumption was well founded it could become the fixed point around which to adjust the PPP rates so that all absolute components in NPLs among all countries were equal in those new “PPP for the absolute poor” terms.

<sup>9</sup>See table A-1 in Ravallion et al. (2009) and table 6 in Ferreira et al. (2015) for their exact values (in 2005 and 2011 PPPs respectively).

The second assumption cannot hold outside of a rather unique coincidental arrangement of values. Thus, the joint result of these assumptions brings the methodological underpinnings of the RDV & RCS methodology to contradiction, and it does not follow that the absolute component of the NPLs is necessarily identified at any step of the process, despite that being the penultimate methodological goal.

Overall, two main concerns stem out of this averaging step taken in the RCS approach. First, the iPL as derived is more appropriate for some countries, and less for others.<sup>10</sup> And second, the exclusion of the confidence intervals from the analysis paints a beautifying picture in terms of how well this method defines the levels of the global poverty rate.<sup>11</sup>

The following thought experiment is helpful in clarifying the first point. Imagine in a future year, rather far from today, that all countries in the world are at least middle income countries, and no poor developing countries exist any more. If one applies this method then what it will capture would be an average poverty line of group of the least rich countries. This poverty line would, by and large, be dictated by the relative component of those NPLs. Therefore, even if one agrees that at present this method delivers an iPL that captures properly absolute poverty, as a product of time the RDV & RCS methodology would not be able to predict an absolute poverty line due to the evermore rare existence of countries with NPLs that track absolute poverty.

The same conclusion is corroborated by Ravallion et al.'s observation that with higher income the poverty line increases as well. From this one can conclude that as the poor countries grow the poverty lines will rise as well and the methodology applied by the authors will no longer be able to capture an absolute poverty level. Therefore the possibility that the methodology may produce absolute poverty lines is not an essential part of it, but is based on circumstances. This implies that the dollar-a-day method is essentially a mixed absolute and relative one. Thereby, giving more substance to the argument posed by Srinivasan (2010, p.149), that the dollar-a-day approach entails a "varying notion of absolute poverty".

Moreover, the general concern regarding the fixity of any absolute poverty notion has been discussed in Ravallion (2010) where it is mentioned that "[b]y treating absolutely poor people similarly to relatively poor people [...] the resulting measures would lose meaning as measures of absolute poverty". This is precisely the problem with the averaging nature of the dollar-a-day approach, that for some countries the iPL would correspond to a rather relative poverty line, and for others to an absolute (Moatsos, 2017). By how much it is absolute or relative for each country its not clear without a detailed decomposition of the NPLs. However having countries with NPL smaller than the iPL arguably shows that those countries, and the residents of those countries, are not treated as the others in the developing world.<sup>12</sup> It could not be convincingly argued, in an attempt to defend the RDV & RCS method, that those countries have failed to define NPLs that meet the absolute poverty requirement, since if that was the case, those NPLs should have been dropped from the analysis in RDV & RCS, as failing to meet the basic assumptions of their methodology since each NPL is at least absolute *plus* some relative

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<sup>10</sup>As implied by Pogge (2013), and by Ravallion and Chen (1997) as well.

<sup>11</sup>Keep in mind the substantial confidence interval from the initial estimation of the DAD value by Ravallion et al. (1991a) mentioned above.

<sup>12</sup>Unless one assumes that all deviations from iPL are due to measurement error (as the DAD literature does). Such an assumption would be a rather strong one on its own.

part.<sup>13</sup>

Turning now to the second of the main concerns related with the averaging nature of DAD: using a single one-size-fits-all iPL, and with the particular derivation of the dollar-a-day poverty line, we are bound to cope with large degree of uncertainty. This uncertainty stems from two issues. First, from the loose representation of the absolute poverty component in the NPL of each country, and its unknown variation. And second, from the uncertainty implied by confidence intervals of the iPL estimate as mentioned above. Given the relatively high density of around the poverty line,<sup>14</sup> this results into large variation in poverty rate estimates. This last type of uncertainty is amplified if one considers the issues around the estimation procedure of PPP rates.<sup>15</sup>

An important implication of the above is pointed out by Deaton (2010, p.12). He demonstrates how India has become “poorer”, when measured with the iPL, exactly because it had less poor people. As a product of growth in India, the country is not in the reference group of countries that is used to estimate the iPL. However the NPL of India is lower than the latest iPL. Excluding India from the group of countries that define the iPL, implies an important *discontinuity* for the poverty estimates in this country. Finally, it is not obvious or clear why RDV & RCS choose a country level average, and not a population average of the countries in their reference groups. Or why they do not follow within their framework the suggestion of Deaton to use all the NPLs in their dataset and weigh them with population to derive the iPL. This would be perhaps more reasonable within their framework of pin pointing the most typical PL for the average poor *individual*, but instead Ravallion et al., and more recently Ferreira et al. (2016), average as if they are interested for the average poor *country*.

## 4. Concluding remarks

The world would have been a much simpler place if one was able to consistently measure poverty in all countries and all years with the same poverty line. The Dollar-A-Day approach is a handy method to roughly gauge for the level of extreme poverty on a global scale, if one is not interested in the particulars of each country separately, and in the size of the uncertainty produced. The World Banks Commission on Global Poverty implicitly recognizing this shortcoming recommends the Cost of Basic Needs method, which is immune to the drawback of the standard approach (Atkinson, 2016). Recent attempts such as Allen (2017) and Moatsos (2020) may provide inspiration for useful alternatives.

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<sup>13</sup>Again an assumption that would attribute all deviations to measurement error would be necessary to support the dollar-a-day approach. Such an assumption would require some at least some indications that would convince an observer that it should be in principle considered.

<sup>14</sup>Meaning that a small change in the value of the poverty line would change more than proportionally the corresponding poverty rate.

<sup>15</sup>As mentioned above, Deaton (2012) argues that 2005 PPPs for China contain a 25% error margin. For a discussion of the World Bank’s approach to the issue of error terms see Moatsos (2018).

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