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The fungibility of health aid reconsidered

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Abstract:

This paper draws further attention to the importance of taking into account off-budget aid when estimating the degree of foreign aid fungibility. It does so by re-evaluating the results of a recent, influential paper which concluded that health aid is fully fungible in the long run. Allowing for the presence of off-budget aid indicates that the degree of fungibility of health aid is much more uncertain than at first blush appears. Under plausible assumptions about the role of off-budget aid, the conclusion of full fungibility is overturned and at most only a limited degree of fungibility is found.

Keywords: foreign health aid; fungibility; public health expenditure.

JEL classification codes: E62, F35, H51, I18, O23.

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1 Introduction

Donors often earmark foreign aid for specific sectors, such as health or education. Recipient governments, however, may choose to either directly divert earmarked aid to other sectors or to reduce their own spending in the sector receiving earmarked aid. In both cases, earmarked aid is effectively funding something different than what it was intended for, and we say that aid is fungible. The degree of fungibility of foreign aid has long been an object of interest in the aid effectiveness literature, and its estimation goes back at least to Heller's (1975) seminal paper on the fiscal response to aid. The increased availability in recent years of data that record the intended purpose of aid has led to renewed interest in the question of aid fungibility. After all, knowing the intended purpose of aid with some degree of certainty is crucial to obtain reliable estimates of the degree of fungibility.

Among a recent crop of papers studying aid fungibility, none have been as influential as a 2010 piece by Lu, Schneider, Gubbins, Leach-Kemon, Jamison, and Murray (2010) published in the *Lancet*.¹ In their paper, Lu et al conclude that foreign aid for health is mostly fungible. Their headline estimate is that, for every dollar of health aid, a recipient government's own health spending is reduced by \$0.43 in the short run and up to \$1.14 in the long run.² This paper argues that the conclusion that health aid is mostly fungible does not necessarily follow, because their estimates do not account for the fact that a lot of health aid is off budget (i.e. not recorded on recipient governments' budgets). Reinterpreting Lu et al's results by taking off-budget aid into account reveals a much greater degree of uncertainty about the fungibility of health aid than Lu et al allow for. In fact, under plausible assumptions about the role of off-budget aid, the full fungibility of health aid can strongly be rejected and only limited or even zero fungibility is found. The broader lesson is that allowing for the presence of off-budget aid has a marked effect on how we evaluate the degree of fungibility on the basis of cross-country regressions.

The next section, drawing heavily on Van de Sijpe (2013), discusses how the presence of off-budget aid changes how we should infer the degree of fungibility from cross-country regressions of public health expenditure on health aid. Section 3 argues that Lu et al's main measure of health aid is likely to contain a substantial amount of off-budget aid. Section 4 calculates the degree of fungibility suggested by Lu et al's fixed effects results under varying assumptions about the role of off-budget aid. Section 5 concludes.

¹This paper was discussed on a number of well-known blogs, was picked up by several newspapers and has, as of 03/05/2013, already been cited 130 times according to Google scholar.

²Roodman (2012) casts doubt over the causal interpretation of these results. In his response, Murray (2012) challenges Roodman's conclusion and asserts that "our finding remains remarkably robust both to new data and the testing of an extremely wide range of models".

2 Fungibility and off-budget aid

To see how the presence of off-budget health aid changes how we should interpret the coefficients estimated by Lu et al, consider the following equation, which is a simplified version of the models estimated by Lu et al:

$$\text{GHE-S} = \alpha + \beta \text{DAH-Gov} + u, \quad (1)$$

where DAH-Gov is health aid to government and GHE-S measures recipient governments' health expenditure from domestic resources. GHE-S is not directly observable, and is calculated by subtracting DAH-Gov from total government health expenditure, which is financed from both domestic and external resources (this is what Lu et al call GHE-A, government health expenditure as agent):³

$$\text{GHE-S} = \text{GHE-A} - \text{DAH-Gov}. \quad (2)$$

Both GHE-S and DAH-Gov are expressed as a share of GDP. β measures the average change in government spending on health from own resources in response to a change in donors' health aid. A value of 0 implies there is no displacement of government health expenditure by health aid, whereas a value of -1 indicates full displacement and full fungibility: with every dollar of health aid received, the recipient government reduces its health spending from domestic resources by \$1 and, as a result, the total amount of resources spent in the health sector remains unchanged.

This simple interpretation of β is, however, no longer correct once we allow for the possibility of off-budget health aid. DAH-Gov is reported by donors and, as a result, consists of a mix of on- and off-budget aid: $\text{DAH-Gov} = \text{DAH-Gov-on} + \text{DAH-Gov-off}$, where off-budget aid is aid that is not recorded on a recipient government's budget, for instance because donors directly pay health consultants or contractors without channelling resources via the recipient government. Replacing DAH-Gov in (1) by DAH-Gov-on and DAH-Gov-off, the OLS estimate of β can be expressed as a weighted average of the OLS estimates of β_{ON} and β_{OFF} , the coefficients of on- and off-budget health aid respectively (see e.g. Lichtenberg, 1990):

$$\hat{\beta} = \hat{\beta}_{ON} \frac{\sigma_{ON}^2 + \sigma_{ON,OFF}}{\sigma^2} + \hat{\beta}_{OFF} \frac{\sigma_{OFF}^2 + \sigma_{ON,OFF}}{\sigma^2} \quad (3)$$

The weights depend on the variances of on- and off-budget health aid (σ_{ON}^2 and σ_{OFF}^2 ; σ^2 is the variance of total health aid) and on the covariance between on- and off-budget health aid ($\sigma_{ON,OFF}$).

³Lu et al include health aid to non-governmental organisations (DAH-NonGov) as a separate regressor alongside DAH-Gov. In this paper, I focus only on DAH-Gov, for two reasons. Firstly, DAH-Gov is almost 4 times as large as DAH-NonGov, so the fungibility of total health aid primarily depends on the fungibility of DAH-Gov. Secondly, it is the negative effect of DAH-Gov on GHE-S found by Lu et al that has received most attention.

Since off-budget health aid is not counted as part of GHE-A, $\hat{\beta}_{OFF}$ will be close to -1, rather than 0, when there is no fungibility. Suppose donors use off-budget health aid to build a hospital and there is no fungibility. In that case, recipient government health expenditure GHE-A is unchanged: the money used to build the hospital is not counted as part of public health expenditure, nor does the recipient government reduce its health expenditure in response to the inflow of off-budget health aid. Since GHE-S is calculated as $GHE-A - DAH-Gov$, GHE-S falls by the same amount that DAH-Gov increases, and a regression of GHE-S on DAH-Gov will yield a coefficient close to -1. In contrast, without fungibility, $\hat{\beta}_{ON}$ will be close to 0. The inflow of on-budget health aid leads to a one-for-one increase in government health expenditure GHE-A, so that GHE-S remains unchanged.

Similarly, when there is full fungibility, $\hat{\beta}_{OFF}$ will be close to -2, rather than -1. Off-budget health aid is not counted as part of health expenditure GHE-A and an increase in off-budget health aid now leads the recipient government to reduce its health expenditure one-for-one. Hence, $GHE-S = GHE-A - DAH-Gov$ decreases by \$2 when DAH-Gov increases by \$1 because GHE-A is also reduced by \$1. $\hat{\beta}_{ON}$ is instead expected to be close to -1 under full fungibility: on-budget health aid has no effect on the recipient government's health expenditure GHE-A (on-budget health aid increases public health expenditure but this is offset by the recipient government reducing health expenditure by an equal amount), so GHE-S falls by \$1 for every dollar increase in on-budget health aid.

More generally, if on- and off-budget health aid are equally fungible, we see that $\hat{\beta}_{OFF} = \hat{\beta}_{ON} - 1$. As a result, the presence of off-budget aid in DAH-Gov lowers the estimated value of β , leading to an overestimation of the degree of fungibility. Contrary to Lu et al's interpretation, a marginal effect of DAH-Gov smaller than 0 does not necessarily mean aid is fungible; it could simply indicate that not all health aid is recorded on budget.

3 The magnitude of the problem

Equation (3) shows that this error in the assessment of the degree of fungibility is larger if the variance of off-budget aid is large relative to the variance of on-budget aid. Comprehensive cross-country data that distinguish between the off-budget and on-budget components of aggregate aid, let alone health aid, are scarce, but the available data indicate that much aid is off budget, suggesting that σ_{OFF}^2 is unlikely to be small relative to σ_{ON}^2 . The share of off-budget aid in aggregate aid has been found to be as large as 40% in Malawi (Fagernäs and Schurich, 2004), 50% in Senegal (Ouattara, 2006), 70% in Fiji and Vanuatu (Feeny, 2007), and 75% in Liberia (Republic of Liberia Ministry of Finance, 2009) while, for Papua New Guinea and the Solomon Islands, Feeny (2007) reports only a negligible share of off-budget aid. Fagernäs and Roberts (2004a) show that donor-reported OECD DAC figures for Uganda exceed the external financing recorded by the government by substantial margins (in some years, in excess of 10% of GDP). In Zambia, the gap is as wide as 20-40%

of GDP in some years (Fagernäs and Roberts, 2004b). More specifically for health aid, Van de Sijpe (2013) argues that technical assistance is mostly off budget and makes up about 40% of health aid on average in a large sample of developing countries.

Even though Lu et al label DAH-Gov as health aid to government (as opposed to DAH-NonGov, which captures health aid to non-governmental organisations) there is nothing specific about the construction of DAH-Gov that guarantees that it consists of only on-budget aid. The disaggregation of health aid into DAH-Gov and DAH-NonGov is based mainly on the channel of delivery variable in the OECD's Creditor Reporting System (CRS), as made clear in the paper that constructs the health aid data used by Lu et al (Ravishankar, Gubbins, Cooley, Leach-Kemon, Michaud, Jamison, and Murray, 2009, p. 2118): "We used the channel of delivery code in the CRS to separate bilateral assistance from members of the Development Assistance Committee into funds going to recipient governments versus other civil society and private agencies." The channel of delivery is meant to capture the implementing agency of an aid project or programme.⁴ Five channels of delivery can be distinguished (OECD, 2007, pp. 23):

- public sector (donor government/extending agency, recipient government).
- NGOs and civil society (NGOs in donor, recipient, third country, international NGOs).
- public private partnerships.
- multilateral organisations (UN, WB/IMF/regional banks).
- other.

It is not clear how Ravishankar et al use the channel of delivery in CRS to identify aid going to recipient governments. In CRS, before 2010, no channel of delivery exists that can be used for this purpose. The closest channel of delivery code is "public sector", but this code includes donor governments as well as recipient governments as the implementing agency, so it is by no means a measure of on-budget aid. Only since 2010 has the CRS channel of delivery variable been further refined so that "recipient government" can be isolated as a channel of delivery in the data (OECD, 2010).

As a result, there is nothing in particular about the construction of DAH-Gov that captures on-budget health aid. Hence, a large part of DAH-Gov is likely to be off-budget, as discussed earlier. The importance of off-budget health aid is potentially exacerbated by the choice to exclude loans (Lu et al, 2010, p. 1378), which are more likely to be captured on recipient governments' budgets. In addition, Lu et al (2010, p. 1378) write that "[f]or disbursements that lacked any information about the channel of delivery, we assumed DAH went

⁴The CRS Directives (OECD, 2007, pp. 23) state that "The Channel of delivery is the implementing agency. When several levels of implementation are involved, e.g. when the extending agency hires a national implementer which in turn may hire a local implementer, report the first level of implementation as channel of delivery. The Channel of delivery is normally linked to the Extending agency by a contract, and is directly responsible to it."

to government”. A large fraction of aid data does not have a channel of delivery code, so this again increases the risk that DAH-Gov contains a large amount of off-budget health aid. In an appendix, Lu et al remove health aid with an unspecified channel of delivery from DAH-Gov and include it as a separate variable (DAH-Unspecified). However, these additional results in fact further raise doubts about whether the CRS channel of delivery can be used to identify on-budget aid. If the channel of delivery is useful to isolate on-budget aid, then DAH-Gov should provide a more accurate measure of on-budget aid after DAH-Unspecified has been removed and included as a separate variable; i.e. DAH-Gov should now contain less off-budget aid. As a result, in line with equation (3), we would now expect DAH-Gov to have a less negative effect on government health expenditure from domestic resources, and expect DAH-Unspecified to have a more negative effect than DAH-Gov, since DAH-Unspecified should contain a greater share of off-budget aid. Instead, the opposite happens: the estimated coefficient of DAH-Gov becomes more negative when DAH-Unspecified is included as a separate variable, and the estimated coefficient for DAH-Unspecified is much closer to zero than the coefficient for DAH-Gov. These results are difficult to square with the notion that removing DAH-Unspecified from DAH-Gov removes a lot of off-budget aid from DAH-Gov and leaves behind a good measure of on-budget aid. Hence, these results further undermine the implicit assumption made by Lu et al that DAH-Gov is completely on budget.

The discussion so far suggests that, because of their implicit assumption that DAH-Gov is completely captured on recipient governments’ budgets, Lu et al have overestimated the degree of fungibility of health aid. This problem may be severe, as available data point to large fractions of aid being off budget and there is nothing particular about Lu et al’s measure of health aid to government that identifies the on-budget component of health aid. The aim of the next section is to illustrate more concretely to what extent taking into account off-budget aid changes Lu et al’s conclusions.

4 Re-evaluating the degree of fungibility suggested by Lu et al’s results

To do so, I re-evaluate the degree of fungibility suggested by Lu et al’s results under different assumptions about the role of off-budget health aid. If we set the degree of fungibility of on- and off-budget health aid to be equal ($\hat{\beta}_{OFF} = \hat{\beta}_{ON} - 1$), we can rearrange equation (3) to express $\hat{\beta}_{ON}$ as a function of $\hat{\beta}$ (Van de Sijpe, 2013):

$$\hat{\beta}_{ON} = \hat{\beta} + 1 - \frac{1 + \rho\sqrt{\delta}}{1 + \delta + 2\rho\sqrt{\delta}} \quad (4)$$

with $\rho = \frac{\sigma_{ON,OFF}}{\sigma_{ON}\sigma_{OFF}}$ the correlation between on- and off-budget health aid, and $\delta = \frac{\sigma_{OFF}^2}{\sigma_{ON}^2}$ the relative variance of off- versus on-budget health aid.

Equation (4) shows how, for given values of ρ and δ , the estimate of β can be transformed into an estimate

$\hat{\beta}_{ON}$ that can be used to determine the degree of fungibility: $\hat{\beta}_{ON}$ close to 0 means there is little or no fungibility, whereas a value closer to -1 suggests a greater degree of fungibility. Table 1a carries out this computation starting from the fixed effects (FE) estimate of -0.44 for the coefficient on DAH-Gov reported in Lu et al's appendix for the IMF data (results using the WHO data are virtually identical and are available on request).⁵ Table 1b shows the corresponding long-run coefficients, found by multiplying the entries in table 1a with $1/(1 - \hat{\gamma})$, where $\hat{\gamma} = 0.55$ is the estimate of the coefficient on the lagged dependent variable. Throughout table 1, a bold entry indicates that the null hypothesis of full fungibility, $H_0: \hat{\beta}_{ON} \leq -1$, is rejected at a 5% significance level. An underlined entry indicates that the null of no fungibility, $H_0: \hat{\beta}_{ON} \geq 0$, is rejected.

Table 1: Fungibility of DAH-Gov, fixed effects estimator (IMF data)

(a) Short-run fungibility								(b) Long-run fungibility							
	-3/4	-1/2	-1/4	ρ 0	1/4	1/2	3/4		-3/4	-1/2	-1/4	ρ 0	1/4	1/2	3/4
1/4	-0.69	-0.44	-0.31	-0.24	-0.19	-0.15	-0.12	1/4	-1.53	-0.97	-0.70	-0.53	-0.42	-0.34	-0.28
1/2	-0.51	-0.25	-0.16	-0.10	-0.07	-0.05	-0.03	1/2	-1.13	-0.56	-0.35	-0.23	-0.16	-0.11	-0.08
3/4	-0.21	-0.08	-0.03	-0.01	0.01	0.02	0.02	3/4	-0.48	-0.17	-0.07	-0.02	0.01	0.03	0.05
δ 1	0.06	0.06	0.06	0.06	0.06	0.06	0.06	δ 1	0.14	0.14	0.14	0.14	0.14	0.14	0.14
3/2	0.44	0.26	0.20	0.16	0.14	0.13	0.12	3/2	0.98	0.58	0.44	0.36	0.32	0.29	0.27
2	0.63	0.38	0.28	0.23	0.20	0.18	0.16	2	1.41	0.84	0.63	0.51	0.44	0.39	0.36
4	0.81	0.56	0.44	0.36	0.31	0.28	0.25	4	1.81	1.25	0.98	0.81	0.70	0.62	0.56

Note: The entries in panel 1a are the values of $\hat{\beta}_{ON}$ computed according to equation (4), starting from Lu et al's FE results for the IMF data. Panel 1b shows the corresponding long-run coefficients. ρ is the correlation between the on- and off-budget components of DAH-Gov, δ the relative variance of the off- versus on-budget component. Bold (underlined) entries indicate that the null of full (no) fungibility is rejected at a 5% significance level.

Van de Sijpe (2013) calculates that the correlations between different aid modalities in health (roughly from most to least off-budget: technical assistance, investment projects, other (unassigned) aid, sector programme aid), after FE and control variables have been partialled out, lie between -0.15 and 0.06, suggesting values of ρ close to 0 are the most plausible.

Table 1 shows that, if the variance of off-budget aid is at least as large as the variance of on-budget aid ($\delta \geq 1$), which is not at all implausible, the FE results in Lu et al actually imply DAH-Gov *increases* recipient governments' own health expenditure, as might be the case if donor involvement in the health sector, by making complementary investments or providing technical assistance, spurs governments to spend more. Even for lower values of δ , with ρ close to 0, any displacement of recipient governments' own health expenditure found is small, both in the short run and in the long run. The null hypothesis of no fungibility is rejected infrequently at a 5% significance level, whereas the null of full fungibility can almost always be rejected, even in the long

⁵In a model with FE and control variables, the variables in equation (1) and, as a result, the variances and covariance in equations (3) and (4) can be interpreted as the values after the FE and control variables have been partialled out. I focus on the FE results for simplicity, but the issue discussed in this paper also plagues the GMM results reported by Lu et al. In GMM, the relevant weights depend on the strength of the relationship between the instruments and on- and off-budget aid, respectively. The main advantage of focusing on the FE results is that the transformation of $\hat{\beta}$ into $\hat{\beta}_{ON}$ depends on two parameters that are easily interpretable and for which we can form some appraisal as to what plausible values would look like. In Lu et al, the FE and system GMM results are similar.

run. Full displacement mainly occurs when ρ is negative and fairly large in absolute value, and δ is very small. The latter implies that the variance of the off-budget component in DAH-Gov is much smaller than the variance of the on-budget component, which does not seem particularly likely in light of the discussion in section 3. At the very least, table 1 indicates that the degree of fungibility of health aid suggested by Lu et al's results is much more uncertain than they allow for.

It is well-known that, in a dynamic panel data model, the FE estimator of the coefficient on the lagged dependent variable tends to be downward biased (Nickell, 1981). As a consequence, the long-run coefficients in table 1b may be biased towards zero. To check to what extent this affects the conclusions drawn from table 1, I re-estimate Lu et al's models using a bias-corrected FE estimator (Kiviet, 1995; Bruno, 2005) and carry out the same computations as in table 1.⁶ These results are shown in table 2. The larger estimate for the coefficient on the lagged dependent variable pushes the long-run coefficients away from zero to some extent, but the results are broadly similar to those in table 1. Little or no displacement of health expenditure from own resources is found, even in the long run, except for combinations of low δ and negative ρ .

Table 2: Fungibility of DAH-Gov, bias-corrected fixed effects estimator (IMF data)

(a) Short-run fungibility								(b) Long-run fungibility							
	-3/4	-1/2	-1/4	ρ 0	1/4	1/2	3/4		-3/4	-1/2	-1/4	ρ 0	1/4	1/2	3/4
1/4	-0.66	-0.41	-0.28	-0.21	-0.16	-0.12	-0.10	1/4	-2.30	-1.42	-0.99	-0.73	-0.55	-0.43	-0.33
1/2	-0.48	-0.22	-0.13	-0.08	-0.04	-0.02	-0.01	1/2	-1.66	-0.78	-0.44	-0.26	-0.15	-0.08	-0.02
3/4	-0.19	-0.05	-0.00	0.02	0.03	0.04	0.05	3/4	<u>-0.65</u>	-0.17	-0.01	0.07	0.12	0.15	0.18
δ 1	0.09	0.09	0.09	0.09	0.09	0.09	0.09	δ 1	0.32	0.32	0.32	0.32	0.32	0.32	0.32
3/2	0.47	0.29	0.22	0.19	0.17	0.16	0.15	3/2	1.63	1.00	0.78	0.67	0.60	0.55	0.52
2	0.66	0.41	0.31	0.26	0.23	0.20	0.19	2	2.30	1.42	1.08	0.90	0.79	0.71	0.66
4	0.84	0.59	0.47	0.39	0.34	0.31	0.28	4	2.93	2.06	1.63	1.37	1.19	1.07	0.97

Note: The entries in panel 2a are the values of $\hat{\beta}_{ON}$ computed according to equation (4), starting from a bias-corrected FE estimator applied to the IMF data. Panel 2b shows the corresponding long-run coefficients. ρ is the correlation between the on- and off-budget components of DAH-Gov, δ the relative variance of the off- versus on-budget component. Bold (underlined) entries indicate that the null of full (no) fungibility is rejected at a 5% significance level.

5 Conclusion

In an influential study, Lu, Schneider, Gubbins, Leach-Kemon, Jamison, and Murray (2010) conclude that health aid to government is mostly fungible. By re-evaluating the results of Lu et al's paper, this paper has sought to draw further attention to the importance of taking into account off-budget aid when estimating the degree of fungibility from cross-country data. Various sources suggests that off-budget aid is pervasive, and there is nothing particular about the construction of Lu et al's measure of health aid to government that isolates

⁶System GMM is chosen as the initial estimator to operationalise the bias correction. Bootstrapped standard errors are obtained on the basis of 100 repetitions. The coefficient on the lagged dependent variable is now 0.71, compared to 0.55 in the FE regressions. I only report results using the IMF data, but the WHO data again yield very similar results (available on request).

on-budget aid and purges off-budget aid. Re-evaluating Lu et al's results by allowing for the presence of off-budget aid suggests that the degree of fungibility of health aid is much more uncertain than Lu et al allow for. In fact, under plausible assumptions about the role of off-budget aid, at most only limited displacement of recipient governments' health expenditure by health aid is found, even in the long run.

From a normative perspective, a finding of fungibility of earmarked aid may be interpreted in several ways (see e.g. McGillivray and Morrissey, 2000). One interpretation is that fungibility is the result of a welfare-optimising response of a rational recipient government to an inflow of earmarked aid, in which case a finding of full fungibility of health aid may not be a cause for concern. However, even if one takes the view that health spending is one of the most useful ways to employ public resources (Lu et al, p. 1385, finish their paper by arguing that actions to increase public health expenditure are a "moral imperative"), the analysis in this paper indicates that there may be less reason for concern than Lu et al's results at first blush suggest.

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