



# Effects of transitory shocks to aggregate output on consumption in poor countries<sup>☆</sup>



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## ABSTRACT

This paper provides instrumental variables estimates of the response of aggregate private consumption to transitory output shocks in poor countries. To identify exogenous, unanticipated, idiosyncratic and transitory variations in national output we use year-to-year variations in rainfall as an instrumental variable in a panel of 39 sub-Saharan African countries during the period 1980–2009. Our estimates yield a marginal propensity to consume out of transitory output of around 0.2. To explain this result we show, using instrumental variables techniques, that there is a significant negative effect of transitory output shocks on net current transfers and a significant positive and quantitatively large effect on the trade balance. An important implication is that frictions to private financial flows do not necessarily imply large effects of transitory shocks to aggregate output on private consumption in poor countries.

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## 1. Introduction

Empirical studies of saving rates across countries typically find that these are positively correlated with economic growth and that, especially in developing countries, financial frictions play an important role for savings behavior (see, for example, Edwards, 1996, and Loayza et al., 2000). These results, in turn, may suggest limits to consumption smoothing in developing countries, thus challenging the permanent income theory of consumption (Friedman, 1957; Hall, 1978); evidence for the effect of financial frictions on consumption smoothing is presented in, for example, Japelli and Pagano, 1989, 1994. Specifically, Japelli and Pagano (1989) find that consumption tends to be less smooth in countries with strong financial frictions. Further, there is mounting evidence that private

financial flows to poor countries are quite limited, particularly because of institutional rigidities, see Alfaro et al., 2007, 2008, and Papaioannou, 2009. While this should impede private financial flows, inhibiting the opportunities for consumption smoothing, net transfers in poor countries that ultimately affect their current account, including aid and remittances, may theoretically make up for such impediments. It is, therefore, important when studying consumption smoothing in poor countries, to specifically explore the net current transfer channel in this regard.

This paper's point of departure is that existing empirical macroeconomic studies of consumption smoothing have had difficulty in disentangling transitory (and unanticipated) from permanent shocks and using strictly exogenous variations in aggregate output. In particular, from a theoretical point of view, consumption responses should differ depending on the transitory nature of the shock. In this paper, therefore, we seek to complement the existing empirical studies of aggregate consumption responses by focusing on the effects of transitory output shocks on private consumption in the context of poor and largely agrarian sub-Saharan African countries. We focus on the group of sub-Saharan African countries because this enables us to build on prior literature that has established a robust effect of year-to-year rainfall variations on aggregate output (Miguel et al., 2004; Brückner and Ciccone, 2011). In particular, because rainfall is exogenous, unanticipated, and

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has a transitory effect on aggregate output only, we can use rainfall as an instrumental variable to study the aggregate consumption response to transitory output shocks.<sup>1</sup>

While there is a substantial within-country correlation in the data between output and consumption, our instrumental variables estimates reveal a quantitatively small response of consumption to transitory output shocks: controlling for country and year fixed effects as well as country-specific linear time trends, the estimated marginal propensity to consume out of transitory output is around 0.2. The IV estimate of the marginal propensity to consume out of transitory output is thus positive, significantly different from one, but not significantly different from zero. This result may seem surprising because the countries in the sample are among the world's poorest, with much institutional rigidity (see Alfaro et al., 2007, 2008, and Papaioannou, 2009, where such rigidity appears to be a major obstacle for private financial flows to poor countries).

In contrast to the instrumental variables estimates, the least squares estimates of the marginal propensity to consume are in all specifications large and significantly different from zero at the 1% significance level. Quantitatively, the least squares estimates of the MPC are around 0.5, thus more than twice the size of the IV estimates. The significant difference between least squares and IV estimates suggests that it is not simply measurement error in aggregate consumption data that is driving the quantitatively small IV estimate of the MPC. Instead, the estimation strategy is crucial for correctly identifying the response of aggregate consumption to transitory output shocks. In particular, the least squares estimates capture the response of consumption to (a weighted average of) transitory and permanent output shocks. The least squares estimates are, therefore, not informative about the response of aggregate consumption to a transitory output shock.<sup>2</sup>

It is important to realize that, despite frictions to private financial flows, international trade is not negligible for the group of sub-Saharan African countries: the sample average ratio of exports plus imports over PPP GDP exceeds 60%. When we examine the response of the trade balance to transitory output shocks, we find that it is strongly procyclical. Our instrumental variables regressions yield that a one percent decrease in GDP per capita decreases the net exports to GDP ratio by around 1 percentage point. This suggests that the effects of transitory aggregate output shocks on private consumption in sub-Saharan African countries are dampened significantly because of pro-cyclical changes in net exports. International trade is thus a vehicle for keeping consumption smooth in the presence of transitory aggregate output shocks in sub-Saharan African countries. It is interesting to note that when we look at foreign direct investment and portfolio investment we find quantitatively small and statistically insignificant effects, which is consistent with the view of significant frictions in developing countries to private capital flows.

An important characteristic of the group of sub-Saharan African economies that is relevant when examining the response of consumption to transitory output shocks is the size of net current transfers. As

<sup>1</sup> Japelli and Pistaferri (2010), view distinguishing between insurance against unanticipated shocks and precautionary behavior with anticipated shocks as driving forces of consumption smoothing a main challenge for empirical research; this paper contributes to this issue by focusing on clearly transitory shocks.

<sup>2</sup> To see this formally, suppose the true model is  $C = a_1 Y^{\text{Trans}} + a_2 Y^{\text{Perm}} + u$ , where  $a_1$  is the response of consumption,  $C$ , to a transitory shock to output,  $Y^{\text{Trans}}$ ;  $a_2$  is the response of consumption to a permanent shock to output,  $Y^{\text{Perm}}$ .  $C$  and  $Y$  may be measured with some error, i.e.  $C^* = C + e_1$ ;  $Y^* = Y + e_2$ . An IV regression of  $C^*$  on  $Y^*$  which uses the observed data on consumption,  $C^*$ , and output,  $Y^*$ , and rainfall as an instrument yields:  $a^{\text{IV}} = \text{cov}(\text{Rain}, C^*) / \text{cov}(\text{Rain}, Y^*) = \text{cov}(\text{Rain}, a_1 Y^{\text{Trans}} + a_2 Y^{\text{Perm}} + u + e_1) / \text{cov}(\text{Rain}, Y + e_2)$ . Since year-to-year variations in rainfall have a transitory effect on output, they, by definition, do not affect  $Y^{\text{Perm}}$  (i.e.  $\text{cov}(\text{Rain}, Y^{\text{Perm}}) = 0$ ). It follows that  $a^{\text{IV}} = a_1$ , if and only if, year-to-year variations in the instrument (rainfall) do not affect systematically the errors made in the national account statistics (i.e.  $\text{cov}(\text{Rain}, e_1) = \text{cov}(\text{Rain}, e_2) = 0$ ); and  $\text{cov}(\text{Rain}, u) = 0$ . By contrast, the least squares estimate is  $a^{\text{LS}} = \text{cov}(C^*, Y^*) / \text{Var}(Y^*) = \text{cov}(a_1 Y^{\text{Trans}} + a_2 Y^{\text{Perm}} + u + e_1, Y + e_2) / \text{Var}(Y + e_2)$ . Thus, the weights on  $a_1$  and  $a_2$  depend on the variances (and covariances) of  $Y^{\text{Trans}}$  and  $Y^{\text{Perm}}$ . The measurement error bias depends on the signal-to-noise ratio and the covariances of the two measurement errors,  $e_1$  and  $e_2$ .

a ratio of PPP GDP net current transfers comprise nearly 4%. We argue that, when motivated by altruism, such transfers may help poor, credit-constrained countries to keep consumption smooth in the presence of transitory shocks to aggregate output. In fact, rich countries may find it in their best interest to use such transfers to achieve this goal. We find empirical support for this view, whereby transfers are strongly countercyclical with respect to transitory output shocks. Our instrumental variables regressions yield that a one dollar decrease in GDP per capita increases net current transfers by around 0.2 dollars. Thus, about one-quarter of the consumption smoothing in sub-Saharan African countries that occurs due to transitory rainfall-induced output shocks is financed via net current transfers.

It should be noted that this consumption smoothing mechanism of net current transfers, which comprise mostly aid and migrant remittances, is distinct from the private financial flow mechanism that Alfaro et al. (2007, 2008) and Papaioannou (2009) focus on. This is because net current transfers, in contrast to private financial flows, are international transactions of economic value that do not have a quid pro quo.

The rest of the paper proceeds as follows. The next section contains some theoretical background and literature review. Section 3 describes the data. In Section 4 we discuss the estimation strategy. In Section 5 the main results are presented. In Section 6 we present further empirical results to demonstrate the robustness and quality of our instrumental variables estimates. Section 7 concludes with brief remarks. A supplementary online appendix contains additional results.<sup>3</sup>

## 2. Theoretical background and related literature

### 2.1. Theoretical background

Standard neoclassical theories of consumption stipulate that consumption should mostly respond to unpredictable and permanent income changes (Friedman, 1957; Deaton, 1991; Hall, 1978). While these insights were originally formulated in the context of a closed economy, they have also been extended to the open economy context. In particular, the basic textbook model of the intertemporal approach to the current account, see e.g. Obstfeld and Rogoff (1995, 1996), predicts that, in the absence of frictions to international capital flows, a transitory shock to a countries' aggregate income has: (i) negligible effects on current private consumption; and (ii) intertemporal consumption smoothing occurring via changes in the countries' net exports which implies that there needs to be a change in the current account. To clarify the essence of these two predictions it is useful to recall the national income accounting identity:

$$Y_t = C_t + I_t + G_t + NX_t. \quad (1)$$

Eq. (1) makes it clear that if private consumption,  $C$ , does not respond to a shock that changes aggregate income,  $Y$ , then other components have to move. The basic textbook model predicts that for a small open economy with perfect integration in world financial markets it is net exports,  $NX$ , that change. In other words, consumption smoothing is achieved by exporting goods if a positive shock hits aggregate output and by importing goods if a negative shock hits.

In the textbook model, however, such a change in net exports entails changes in intertemporal obligations between countries. For example, in chapter 1 of Obstfeld and Rogoff (1996), one finds the following formula for the current account:

$$CA_t \equiv B_{t+1} - B_t = Y_t - C_t - G_t - I_t + r_t B_t = NX_t + r_t B_t \quad (2)$$

Eq. (2) makes it clear that the current account captures changes in intertemporal obligations, i.e. changes in countries' net foreign assets,

<sup>3</sup> The supplementary online appendix can be downloaded from <https://sites.google.com/site/markusbruecknerresearch/research-papers>

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