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Forum

Markets carefully interpreted: a reply to Kaburu and Newton-Fisher (2016)

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In our recently published essay (Sánchez-Amaro & Amici, 2015) we aimed to discuss the literature on primate biological markets (BMs) by drawing attention to the problems that, in our view, affect most primate studies endorsing the existence of BMs. In this way, we aimed not only to warn of conclusions based on dubious methodological approaches, but also to provide some possible new avenues to more efficiently test biological market theory (BMT) in primates. Finally, we hoped to stimulate debate with experts in BMT, including primatologists working in the field, to critically discuss the points we raised in our essay and find new ways to collaboratively improve empirical work on primate BMs.

In this respect, we are very happy about the Forum article by Kaburu and Newton-Fisher (2016, in this issue), which clearly supports our view that BMT is an essential theory explaining exchanges of commodities among individuals, whose details are still highly debated. Although we clearly disagree with most of the issues raised by the authors, we appreciate the opportunity to better explain some of the points raised in our essay. Furthermore, we hope that our answer to their Forum article will further contribute to the debate on how to best test BMT in primates. Given that some of the issues we raised are also more generally relevant to the study of exchanges among individuals, regardless of whether these are explicitly framed in a BMT, we hope that our response will also provide some useful hints to researchers working in fields other than BMT.

In our response, we first remark on the importance of some of the issues raised in our essay, whose relevance, we believe, Kaburu and Newton-Fisher (2016, in this issue) have failed to recognize. Subsequently we proceed with a discussion of some studies on primate BMs considered by Kaburu and Newton-Fisher (2016, in this issue) as convincing evidence in support of primate BMs, by specifically warning against a posteriori interpretations of results. Finally, we defend our personal view of the general methodological approach that should be used to study primate BMs by explicitly highlighting the way our view differs from that discussed by Kaburu and Newton-Fisher (2016, in this issue), and advancing some ideas to further improve the study of primate BMs.

TAKING OUR CRITIQUES FOR WHAT THEY ARE: CRITIQUES

In their Forum article, Kaburu and Newton-Fisher (2016, in this issue) tried to reduce most of the problems raised in our essay to

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our failure to understand BMT. Here, we try to clarify why we believe that the issues we raised are indeed fundamental for the study of BMs in primates, and how Kaburu and Newton-Fisher (2016, in this issue) misinterpreted most parts of our essay (and failed to acknowledge the soundness of the rest).

First of all, Kaburu and Newton-Fisher (2016, in this issue) state that we 'misunderstand BMT in suggesting that it predicts only 'short and finite relationships between different classes of individuals''. In our essay, however, we never state that BMT only predicts short and finite relationships. Indeed, we strongly criticize the fact that this approach has often been used with primates (e.g. Barrett, Gaynor, & Henzi, 2002; Barrett & Henzi, 2002, 2006; Barrett, Henzi, Weingrill, Lycett, & Hill, 1999; Chancellor & Isbell, 2009; Gumert, 2007; Henzi, Lycett & Weingrill, 1997; Payne, Lawes, & Henzi, 2003) without conducting any preliminary analyses as to what the time frame of exchanges really is. Although determining the real time frame over which primates exchange commodities may be no easy task, there are surely creative ways to address this problem (see below).

Kaburu and Newton-Fisher (2016, in this issue) first attribute to us an assumption that we never made (i.e. primates exchange commodities on a very short-term basis), then criticize us for making this assumption, and a few lines later end up defending this assumption themselves (i.e. exchanges happen within bouts), as 'a practical solution to a lack of a priori knowledge of the relevant time frame for reciprocation'. As clearly discussed in our essay, analysing only exchanges happening within the same bout (e.g. Barrett et al., 2002; Barrett & Henzi, 2002, 2006; Barrett et al., 1999; Gumert, 2007; Henzi et al., 1997; Payne et al., 2003) can lead to up to 82% of bouts being completely dismissed from analyses (e.g. Chancellor & Isbell, 2009). The arbitrary selection of different time frames of interaction and the dismissal of large parts of the data set can lead to too few grounded conclusions (see e.g. Campennì & Schino, 2014; Manson, Navarrete, Silk, & Perry, 2004, for an interesting discussion). When reviewing the literature for our essay (Sanchez-Amaro & Amici, 2015), we found it puzzling that some researchers claimed to have found evidence of BMT by disregarding all exchanges that did not happen in the very same bout (Barrett et al., 2002, 1999; Chancellor & Isbell, 2009; Gumert, 2007), while others made exactly the same claim for exchanges that happened not only in different bouts, but also over long periods of time (Manson et al., 2004; Schino, di Giuseppe, & Visalberghi, 2009; Schino, Polizzi di Sorrentino, & Tiddi, 2007). As BMT sensibly makes no general prediction as to the time frame of exchanges (plausibly because it can vary depending on the species and other contextual factors), a convincing test of BMT should imply that researchers, among other things, first try to determine the plausible time frame of exchanges through exhaustive observations (e.g. combining traditional sampling methods with video-camera recordings), and only then test whether these exchanges happen according to the laws of supply and demand, carefully avoiding circular arguments (see below).

Second, Kaburu and Newton-Fisher (2016, in this issue) claim that 'by definition, grooming that is traded for some other commodity is not reciprocated in kind'. However, we fear that the authors missed our main point: the fact that grooming is traded either for grooming or for other commodities is a hypothesis that should be tested, and not an assumption that should be taken for granted. Especially problematic, in our opinion, is the fact that taking this assumption for granted has allowed researchers to talk about evidence of BMs even when such evidence was missing. Kaburu and Newton-Fisher (2015), for instance, tested the hypothesis that grooming is traded for another commodity, found no evidence for that and then concluded that maybe grooming is after all simply reciprocated with grooming, still providing support to BMT. If we want to test whether primates exchange grooming for other commodities, we think we should have a priori a set of clear predictions, as to which commodities should be taken into account, and why in a certain population grooming might still be mainly traded for grooming, regardless of other commodities being available (see below for further discussion).

Third, according to Kaburu and Newton-Fisher (2016, in this issue), we would 'imply that only exchanges based on economic considerations (as proposed by BMT) are contingent', thus neglecting 'to recognize that those driven by 'bonds' or 'relationships' (under a relationship model) would also be contingent'. Once more, Kaburu and Newton-Fisher attribute to us a statement that we instead aimed to criticize. As repeatedly stated throughout our essay, we think that bonds and relationships might play an important role in BMs: if different dyads trade over different time frames depending on the quality of their relationships (as some studies would suggest: e.g. de Waal, 1997), for instance, this variability needs to be taken into account. In this respect, the approach used in many studies appears over-simplistic, by reducing analyses to within-bound exchanges (and thus disregarding notable amounts of data: e.g. Barrett et al., 2002, 1999; Chancellor & Isbell, 2009; Payne et al., 2003; Gumert, 2007), or increasing the hours of observations (until resources exchanged may randomly tend to balance: see Campennì & Schino, 2014, for a discussion) without a clear rationale. Surely, 'the time frame over which the value of commodities changes' is essential for a market model, as Kaburu and Newton-Fisher (2016, in this issue) state. But before we can test 'whether behavioural strategies are sensitive to shifts in market conditions', we also need to know the time frame over which these strategies should be assessed. Do we need to observe animals for 2 h or 6 months, to detect these shifts? Or should we observe them until we find significant evidence that any two commodities are exchanged and thus be able to provide some positive evidence for BMs? Different studies have used very different approaches, and the reason why usually remains unclear, at least in our opinion. As we have discussed in our essay, some authors have discarded exchanges happening in different bouts (e.g. Barrett et al., 2002, 1999; Chancellor & Isbell, 2009; Gumert, 2007), others have calculated complex indexes, whose rationale is not always evident (e.g. Barrett et al., 2002; Henzi et al., 2003; Kaburu & Newton-Fisher, 2015). This variety of approaches does not help to objectively test BMT, and calls for a more standardized approach to the study of primate BMs. Although the theoretical predictions of the BMT are 'clear and explicit' (and we do indeed applaud them, and especially their application to other taxa: e.g. Barclay, 2013; Cowden & Peterson, 2009; Schwartz & Hoeksema, 1998), we think that the methodological approach that has been used to test these predictions in primates has often been unclear.

The issue is not as trivial as it seems. The following example might better explain why we disagree with Kaburu and Newton-Fisher (2016, in this issue) when they suggest that detecting a shift in primate exchanges (according to the laws of supply and demand) is enough to support BMT, even if we do not know the time frame over which these exchanges happen. Consider this example: if I want to buy a car, the price I will pay might depend on how demand and offer change through time. If you are an external observer willing to assess whether this is the case, it might be useful to know the price I am paying for the car. If I am paying 20 monthly rates of 1000 euros each, but you only observe me for 1 month, you might wrongly conclude that the car cost me just 1000 euros. According to Kaburu and Newton-Fisher (2016, in this issue), instead, there would be no need to conduct observations for the whole time of exchanges (e.g. 20 months): shifts in the monthly rates alone will be informative of the existence of a market (e.g. single rates will decrease when the demand decreases) regardless