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ORIGINAL PAPER

Deceiving Our Minds: A Qualitative Exploration of the Money Illusion in Post-redenomination Ghana

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Abstract The current study is a qualitative exploration of the presence of the money illusion in the lived experiences of Ghanaian adult consumers after a currency redenomination. The results indicated that a switch from the old currency to the new currency had implications for self-worth determination, trivialization of price increases, changes in spending behaviour, and changes in the extent of benevolence. All these changes were related to the tendency to make judgments based on the nominal value of an amount of money, rather than its real value; the judgment bias is known as the money illusion.

Keywords Money illusion · Redenomination · Ghana · Currency

Introduction

In the last century, economic psychologists have identified several irrational money-related beliefs and behaviours exhibited by consumers (Furnham and Argyle 1998). Fischer (1928) discovered a tendency to make biased transactional judgments by thinking in terms of

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nominal values rather than real monetary values. For example, an individual earning a salary of $50000 in Central North Carolina might consider a job in Washington DC that pays $75000.00 a year very attractive (an increase of 50%) even though life in Washington DC is 100% more expensive than life in Central North Carolina. Since then, research by Gamble et al. (2002), Modigliani (1986), Pantikin (1965), and Shaffir et al. (1997), among others, have demonstrated the persistence of this behavioural bias—known as the money illusion—in various contexts including currency redenominations.

Mostly conducted in reaction to excessive inflation or currency devaluations, redenominations involve a withdrawal of a nation's currency and replacement with a recalibrated one. Because of the recalibration, there exists a nominal difference between the old and new currencies, setting the stage for the money illusion. Gamble et al. (2002) found that in many Euro nations, prices in Euro were assessed differently from prices in pre-Euro currencies, due to the differences in nominal values of the currencies. This was dubbed the "Euroillusion," an example of the money illusion.

Money illusion or its other derivation has been proposed to account for the typical reactions by consumers to currency redenomination including perceived increases in the prices of goods and services (Brachinger 2006; Hobijn et al. 2006; Ranyard 2007), errors in the monitoring of personal expenditures (Ranyard 2007; Routh and Burgoyne 1989, 1990), and some increases in the giving of money at church (see Cannon and Cipriani 2006).

An examination of money illusion as it affects the giving of money in a collectivistic society like Ghana is important because giving is a means of connecting with others, and serves to promote social cohesion and the welfare of the group (Raeff et al. 2000; Triandis 1989). Whereas some people give in kind, cash donations are popular in contemporary Ghana. Van der Geest (1995) points out that donations in Ghanaian culture often occur in the form of public performances, for which reason secret gifts do not benefit the donor. Many people give money to individuals or families at social occasions such as weddings, outdooring (baby naming) ceremonies, funerals, engagement ceremonies, and birthday parties, and to organizations such as schools, voluntary organizations, hospitals, and orphanages. While there is no rule of thumb about donation sizes, the usual implicit expectation from the perspective of many a recipient is that it will be "sizeable." Often, especially at funerals, donations made at social occasions are publicly announced, which results in a motivation to give as large an amount of money as possible due to the positive relationship between the size of the donation and the perceived benevolence (and therefore social status) of the donor. Deciding on the size of a public monetary funerary donation, for instance, may involve an intricate web of reciprocity, or shameless downright ostentation (Gott 2007).

Other common giving behaviours in Ghana are tipping and church offerings. Afrane (1997) indicates that the size and frequency of church donations can be used as a financial indicator in Ghana. While tipping and church donations are not mandatory, there is an implicit demand for them that bestows on Ghanaians an inevitable societal obligation, one that it would be uncouth to ignore. The complexity of this situation is compounded by the need to be mindful of the magnitude of the gift—in Ghana, *size matters*. Not to give can be considered socially unacceptable, while giving a tip that is too small might be interpreted as an insult.

A study of church offerings before and after the transition to the Euro in several European countries by Cannon and Cipriani (2006) revealed a varying degree of influence from money illusion in different countries. The study produced mixed findings, with some countries reporting increases in church offertory, and a decline in others. Given the cultural importance of giving in the Ghanaian context, it is important to examine the potential effect of redenomination on generosity in the society as a whole.

In their examination of the phenomenon of money illusion, Jonas et al. (2002) found that the nominal value of currency biases its subjective value in a number of ways. Currency with lower nominal value than the familiar currency was perceived to be of lesser value, thus leading to an increase in consumer prices so as to be compatible with the nominal value of prices in the familiar currency. Raghubir and Srivastava (2002) also demonstrated that participants in their experiment were more willing to underspend when the unfamiliar currency had a higher nominal value than a familiar currency, but systematically overspent when the currency had lower nominal value as compared with the familiar currency. They further reported that participants' willingness to pay (WTP) for consumer products in the unfamiliar currency decreased the larger the nominal value in relation to the home currency, whereas it increased when the foreign currency was a fraction of the familiar currency. The conclusion from their study was that the nominal or face value of the unfamiliar currency influenced participants' WTP for consumer products.

Raghubir and Srivastava (2002) interpreted their findings on the basis of the anchoring and adjustment heuristic (see Tversky and Kahneman 1974). Under this heuristic, when people estimate the prices of goods in an unfamiliar currency, the nominal value of the reference price in the familiar currency is used as an anchor for the evaluation of the prices of goods in the unfamiliar currency. An inadequate adjustment of the exchange rate yields a reference price in the familiar currency that is then adjusted toward the anchor value. Uncertainty in the price estimation in the unfamiliar currency leads to anchoring bias (see Mussweiler and Englich 2003).

Soman et al. (2002) argued that economic literature had focused on understanding possible macro-economic implications of money illusion without much attention to the psychological mechanism behind that illusion. They stated that there had been little explanation of the money illusion beyond the argument that it is easier for people to think in nominal rather than real terms (see Shaffir et al. 1997). They showed, through a number of experiments, that consumer evaluation of transactions is motivated by the numerosity of the nominal difference between prices and reference standards that are salient in the evaluation context. Although consumers evaluate transactions in the context of budgetary constraints, they do assess their purchasing power by using the numerosity heuristic. That is, they judge the numerosity of the nominal difference between prices and the number of units into which the difference can be divided. Soman et al. found that the numerosity heuristic, more so than the anchoring and adjustment heuristic, offered a better explanation of money illusion.

The numerosity heuristic (see, for example, Pelham et al. 1994; Showers 1992; Pelham and Swann 1989; Wilder 1978, 1977)—the tendency among animals and humans to overinfer quantity from numerosity—tends to be activated when people's cognitive resources are taxed or they are unable to make use of higher order cues for inferring quantity. Under such circumstances, people rely disproportionately on numbers as cues for inferring quantity. Although Pelham et al. argued that the numerosity heuristic was a strategy of last resort when individuals are cognitively taxed, they were open to the interpretation that the strategy could also be one of first resort. When the making of highly systematic judgment requires the use of correct decision rule and the available cognitive resources to apply the systematic decision rule, finding out the real price of goods and services that requires one to calculate it by adjusting inflation over the period of years can hardly be accomplished without access to economic data (see Ramoniene and Brazys 2007). In these circumstances, it is not surprising for people to rely on some form of numerosity heuristic as a first resort (Pelham et al. 1994). Pelham et al. argue that if inferring quantity from numerosity is less cognitively demanding than the engagement of

more systematic reasoning, then it is possible numerosity is a "default" strategy people rely on in making spontaneous judgments in their daily lives.

The growing body of redenomination research, most of it focusing on the Euro, includes data collected through surveys (e.g., Gamble et al. 2002, study 1), observation (e.g., Hobijn et al. 2006; Kühberger and Keul 2003) , and experiments (e.g., Amado et al. 2007; Marques and Dehaene 2004; Mussweiler and Englich 2003; Tyszka and Przybyszewski 2006). The least popular mode of investigation so far has been qualitative research, which can serve as a means to explore individual experiences, adaptation processes, and meaning-making mechanisms related to currency change. For instance, the European Commission (2002) conducted a qualitative 12-country study to explore the difficulties encountered and adjustment strategies used during and after transitioning from national currencies to the Euro. Ranyard et al. (2007) explored individual experiences of transitioning from the Irish punt to the Euro using semi-structured interviews conducted between 10 and 13 months after the currency switch. Their results indicated that most Irish people considered themselves to be adapting well to the new currency, and reported a decline in price comparisons between prices in Euros and punts. However, some respondents reported still thinking in Irish punts, and many people reported sparse knowledge of prices in the new currency. Furthermore, some respondents reported getting confused about notes and coins, and making errors. Hence, qualitative research can serve as a rich source of information about the lived experiences after a currency redenomination.

Collectively, the redenomination literature suggests that adjusting to a new currency is a process that takes time (Ranyard et al. 2007), involves a switch in cognitive strategies (Marques and Dehaene 2004), and can be subject to cultural and historical contexts (Jonas and Frey 2003; Mussweiler and Englich 2003). The impact of cultural and historical contexts on adjustments to new currencies suggests that instances of currency redenominations in different geographical locations may have unique characteristics that require investigation.

Ghana's currency was redenominated in July 2007. The conversion rate was 1 New Ghana Cedi to 10000 units of the old currency (the Cedi). The redenomination was preceded by a public education campaign, which included a song (broadcast in English and 13 local languages on radio and television), that bore the phrase "There is no change in value; the value is the same" repeated 10 times, a multi-hourly reminder that rescaling by dropping four zeroes was evaluatively inconsequential, and suggesting the absence of a numerosity bias in the adjustment process. However, casual observation of life in Ghana suggests a discrepancy between actual and subjective values of money in everyday life post-redenomination. For example, a relative of one of the co-authors expressed extreme dissatisfaction with the timing of the redenomination exercise, stating that just when his income had finally reached the millions after several decades of work, it had decreased again, depriving him of the satisfaction of being a millionaire. An observed consequence of the redenomination and evidence of money illusion was price increase trivialization. While price increases for low-cost items were triggered by unavailability of coins, rounding prices up to the nearest 5p, 25p, 50p, or 1 Ghana cedi was often considered as trivial, whereas equivalent price increases in the old currency would have been considered outrageous.

The goal of the current study was to explore through qualitative research methodology, the money illusion in post-redenomination Ghana. This qualitative approach was deemed useful for understanding the individual experience of adjusting to a new currency, and the contextual factors that made the Ghanaian case unique.

Method

Participants for the study were recruited through a combination of personal contacts and active recruiting in public spaces (markets, malls, offices, and sidewalks) in different suburbs of Accra (Ghana's capital city). Interviews were conducted 2 years after the introduction of the new currency. A total of 25 male and 15 female adults gave verbal consent to be interviewed and tape-recorded, while 10% of our potential interviewee sample declined to be interviewed. Interviews were conducted in a variety of locations (markets, malls, offices, and sidewalks) by the first author and a trained female research assistant. The ages of respondents ranged from 19 to 71, and levels of education ranged from elementary school to professional degrees. The demographic information of the participants is summarized in Table 1.

Each interview consisted of semi-structured, open-ended questions about the participant's currency preferences (old vs. new currency), experiences with the currency transition process, and an overall evaluation of life using the new currency (e.g., easier or harder) at the time of the interview as compared with times preceding and immediately following redenomination. The average duration of the interviews was 25 min. All the questions were asked in English, but participants were allowed to respond in whichever language they felt comfortable. As a result, a third of the respondents answered the questions in a local Ghanaian language, or switched back and forth between English and another language of choice. Most of the non-English interviews were conducted in Twi, while two respondents spoke Ga.

Data Analysis

English interviews were transcribed by research assistants and checked for accuracy by the third author. Twi and mixed-language interviews were translated by the third author and checked for accuracy by the first author (both are native speakers). Finally, two interviews in Ga were translated by an independent consultant.

Table 1 Participant demographics

Age	No. of interviewees	Gender	No. of interviewees	Occupation	No. of interviewees
<20	6	Female	16	Unemployed	2
21–40	19	Male	24	Student	1
41–60	10			Farmer	1
61–80	5			Lecturer	3
				Trader[a]	8
				Business[b]	2
				White collar[c]	8
				Doctor/pharmacist	4
				Retired	2
				Other[d]	9

[a] Hawkers, hairdresser, day labourer

[b] Privately owned small business owner

[c] Accountant, banker, civil servant

[d] Cleaner, missionary, consultant

Transcribed interviews were subjected to a thematic analysis by the first author using NVivo, and following a procedure outlined by Braun and Clarke (2006). The first step was familiarization with the data by repeatedly reading interview transcripts, listening to the actual interviews, and jotting down initial observations. Next, initial codes were generated from meaningful units of text (words, phrases, or sentences), ensuring equal attention to the various data items. While the process of code generation was largely inductive, pre-existing theory and research findings on numerosity and the money illusion were utilized: Specifically, codable units of text that directly referred to differences in nominal value between the old and new currencies, as well as those that did so indirectly (such as behaviour changes), met criteria for the money illusion super-category. Third, the generated codes were collated into themes, which were named, and reviewed to minimize overlap and maximize fit with the data set.

The reliability of the coding process was checked using an intra-coder reliability test (randomly selected transcripts were coded by the same rater at two different times). This procedure yielded 100% agreement between the two codes generated. Two additional interpretive validity checks were conducted. First, two trained research assistants selected and independently coded a random sample of transcripts, resulting in a 97% agreement, with disagreements occurring as a result of overlapping categories. In addition, a modification of the member checking technique was conducted; a summary of the interpretations was subjected to a validity check by a sample of Ghanaians whose demographic information was similar to that of our sample.

The subset of data that addresses the money illusion was analysed and is discussed in the subsequent sections of this paper; other results are presented elsewhere.

Results

At the time of redenomination, the largest available note in circulation in Ghana was equivalent to US $2. Due to redenomination, the new Ghana cedi was almost equivalent to the US dollar. Conversion from the old currency to the new Ghana cedi involved dropping four zeroes in the case of currency notes (e.g., 10000 old cedis=1 New Ghana Cedi) and two zeroes in the case of coins (5000 old cedis=50p). We found recurring themes in many of the experiences reported by our interviewees. These have been categorized as follows: self-worth determination, trivialization of price increases, changes in spending behaviour, and changes in the nature of generosity. Each of these is discussed below, with supporting emblematic quotes from the interview transcripts.

Change in Self-worth

A frequently cited impact of the redenomination was a change in self-evaluations of financial worth. Income, bank balances, and other measures of worth were four zeroes fewer than previous reckoning as a result of the currency change. Even though there was ostensibly no change in the purchasing power of the amount of money that people had, many people reported experiencing temporary shock after checking their bank balances for the first time after redenomination. Similar experiences were reported by individuals receiving their first monthly salaries post-redenomination. For example, a 44-year-old employee of a private firm stated:

> And then you know when the new cedi came, because at the time it was almost equivalent to the dollar, you could equate your salary or whatever to the dollar you

> know; when you say the dollar you have an idea; so your salary is just about 100 dollars of something and it didn't look so impressive but when you convert it then aha the amount sounds bigger.

Similarly, a 70-year-old male retiree put it this way:

> I like thinking in the old Ghana cedi. It is easier in the new Ghana cedis but it is more pleasing to me in the old Ghana cedi. It makes me feel good knowing that I am an instant millionaire (in the old currency). Now I am a "thousandaire."

The above quotations suggest that for some, self-worth was linked to net wealth, and the more the merrier, all things being equal. Clearly, the numerosity effect impacted the experience of self-worth, resulting in a preference for communicating self-worth in the old currency since the salary in the new currency appeared smaller.

Trivialization of Price Increases

Prior to the currency change, critics of Ghana's redenomination had predicted that prices of goods and services would increase as a consequence of changing the nation's currency. In contrast, the Bank of Ghana (BOG) anticipated that some price rounding would occur, but expected it to be negligible. According to BOG's technical guidelines on the redenomination of the cedi, it was anticipated that:

> In translating prices from the existing cedi to the Ghana cedi (GH¢) and Ghana pesewa (Gp), prices below fifty cedis, or lower than half the Ghana pesewa (Gh¢ 0.0049) shall be disregarded while prices higher than or equal to fifty cedis or half Ghana pesewa (Gh¢0.0050) shall be rounded upwards to one Ghana pesewa. Prices currently prevailing are already generally rounded off to the nearest 100 cedis (or equivalent to Gp1) and it is expected that the rounding off will not significantly affect price levels.

However, our results indicated that our respondents perceived significant price increases after the redenomination, of a magnitude significantly larger than those predicted by the BOG. For example, a 38-year-old female interviewee described her experience this way:

> We are completely being desensitized because you know that when you put a frog in boiling water it will jump out but if you put it in cold water and you put it on heat it won't notice that it is being boiled alive. ...Because in the past if you went to buy something at 320,000 cedis and the next time you came it is 350,000 you will react. You will be like 'what now?' But now if you go and buy and it's like 32 Ghana cedis and the next time its 35, you don't even think about it.

Price increase trivialization as referenced in the statements above occurred to a large extent in low-priced purchases involving loose change. While the nominal amounts in question tended to be considered trivial, these price increases were found to be as large as 50% of the original price. This trivialization makes sense given that, as economic theory suggests, consumer price sensitivity is expected to be higher for "big ticket" items as opposed to goods that take a relatively smaller proportion of one's income.

It must be noted that actual price increases, as well as perceived ones, have been associated with currency redenominations in some European countries (European Central Bank 2003). Ghanaian inflation indices indicate a significant change in prices after

redenomination. Prior to redenomination, Ghana's official inflation rate averaged 10.5% in 2006 and 10.7% in 2007. As a result of strong inflationary pressure, the rate of inflation grew to an estimated 16.5% in 2008. By the start of 2009, the economy had realized about 20% growth in prices. Tighter monetary and fiscal policies have currently eased the rate of price growth to 18%. While we by no means argue that changes in inflation rates were entirely due to the redenomination, a recurring factor in our data was participant reports of decreased purchasing power of their income post-redenomination, clearly indicating the perception of significant price increases in the aftermath of the currency change.

Change in Spending Behaviour

Participants reported spending more post-redenomination than previously due to the perceived smaller amounts of the new currency. For example, spending 10 new Ghana cedis did not seem like a lot of money, when spending its equivalent in the old currency (100 000.00) did. While price rounding due to unavailability of coins, and price increases due to inflation are important factors that over time decreased the purchasing power of the new currency in comparison to its predecessor, we argue that the money illusion played an important role in spending behaviour post-redenomination. As a 36-year-old male respondent indicated:

> Mathematically it (the value of the old currency compared to the new) is the same but practically may be not. I think I may be spending more now than I would have before because the figure doesn't seem so alarming. I buy newspapers every day, half of the time I don't read it because the newspapers is 70 pesewas ok, and may be if I thought about 7,000 a day and multiply it I would be more...the larger a number the more I would be more alarmed but the small numbers, they don't really ring any alarm bells. So you can feel free to spend and not really go ... you say oh its 5 cedis. You buy a Take-away [fast food] pack and its 5 cedis, but that is 50,000 cedis. ... You may think that now if you pay 5 cedis for something, it is not much but you say nothing but sometimes past you were paying may be less, 10,000 or 12,000. So it is a deception... You take about 100 cedis (from the ATM) ... that is about 1million. If you don't take care you spend it; because sometimes you don't see it.... It is a deception that is how I see it: deceives our minds.

The dialog above highlights the fact that the consumer's WTP was relatively higher when product prices were quoted in the new currency (Ghana cedi), reportedly causing a surge in consumer expenditure. This tendency was driven by the difference in the nominal values of the old and new currencies such that prices quotes in the new currency were perceived less expensive than in the old currency. We surmise that the awareness of this illusion also contributed to the hike in price rounding by sellers which might have influenced the upward pressure on prices, especially during the 6-month transition period when both the new and old currencies were in circulation. The fact that the nominal value biases the subjective value of money which ultimately leads to increased expenditure cannot be overemphasized.

Increased Generosity

Some participants noted that the redenomination resulted in an increase in their donations. Due to the nominal differences between the two currency systems, gifting an amount to

someone in the new currency felt subjectively less than gifting its equivalent in the new currency. One interviewee stated:

> You know in the past if I am giving somebody a tip and I give 10,000 I was like that will be a lot; now you give them 1cedi note because 10,000 will be like a couple of notes or something. You give them one note and it has 1 written on it and you feel that you haven't tipped them enough and then you give them 2 but that is 20,000. My collection or my giving in church have, I am sure, quadrupled or something because I just take one 10 Ghana cedi note and go and put it there. But I never used to give a 100,000 a week in offering. I mean I would have taken 20,000 or 50,000 now it's like one note and it has a 10 on it and I throw it in there. So even I am deceiving myself.

The fact that amounts less than 10000 old Ghana cedis converted to coins in the new currency played an important role in this process of "self-deception." People did not perceive coins as valuable even though they were a legal medium of exchange. In the transcript below, our interviewee echoed sentiments similar to those expressed in the previous paragraph, but highlighted the issue of coins.

> You know, if I give someone 1cedi now I feel like I am not giving much but the more I do the conversions then I say that am giving him 10,000 so he should be a little more appreciative of what I am giving him. Otherwise most people if you are giving someone something you tend to give coins. The other application is, maybe I will think of is in church offerings. Like you are giving an offering at church, now when you say one cedi it doesn't look impressive so you want to give more but the moment you start thinking about it that I am giving 10,000 or 20,000 then it makes more sense. Actually you will realize that you may have moved up because you don't want to give the coin, which whereas if you were giving the old cedi you probably would be giving the... what is now coins; let's say 10,000. But maybe now you are giving maybe a minimum of 2 cedis which is 20,000; or 5 cedis; or even the 10 cedis.

Our data suggest that tip and gift recipients, as well as religious organizations, may have benefited from the numerosity effect. Many Ghanaians increased the size of their donations post-redenomination because the amounts "felt small" in the new currency, even though their equivalents in the old currency were considered appropriate. Despite the campaign slogan of "the value is the same" used to educate the public, redenomination appeared to have forced an increase in altruistic behaviour. Ghanaians increased their giving to avoid being perceived as stingy or of belonging to the lower social class. Increased giving appeared to offset potential threats of negative emotions (such as guilt, embarrassment, and dissatisfaction) in the donor.

Discussion

The goal of the current study was the qualitative exploration of the money illusion in post-redenomination Ghana through the analysis of interviews of people's day-to-day experiences adjusting to the new currency. The data reviewed in this paper revealed four main post-redenomination experiences. Because the nominal value of salaries was larger in the old currency as compared with the new, a diminished sense of self-worth ("thousandaire" rather than millionaire) was experienced. Price increases for small ticket items in the new currency were experienced as less painful than an equivalent (absolute value) increase would have felt in the old currency. An increase in spending was reported

and attributed to the scale of the new currency. Finally, people who gave tips and church offerings felt obliged to give more than they would have in the old currency.

Each of these findings makes conceptual sense from the perspective of the numerosity heuristic. Since financial behaviour occurs within the confines of a currency scale, a change in the numerosity of the scale can and does result in changes in spending behaviour and total spending (Soman et al. 2002). The Ghanaian redenomination involved a change from a currency with a large nominal scale (the average financial transaction involved dealing with a minimum of four zeros) to a currency with a smaller scale (eliminating four zeros). The subjective value of salaries, price increases, tips, and money spent on small purchases was perceived as smaller in the new currency than in the old, even though the absolute values were the same. The result was a change in financial behaviours: an increase in spending (on small purchases), trivialization of price increases, and an increase in the absolute value of donations and tips, and a decrease in income-based self-worth.

The existence of these behaviours 2 years after a currency redenomination suggests that the numerosity-driven money illusion is not simply a powerful cognitive bias, but one that can persist over time, even in people who consider themselves well-adjusted to a new currency. Although Ghanaian consumers accurately assessed the net worth of the new Ghana cedi, the reported experiences indicated a tension between the real and subjective values. On the one hand, Ghanaian respondents clearly demonstrated a good understanding of the difference between the new and the old currencies. On the other hand, they felt compelled to change their behaviour because the value of prices in the new currency did not *feel* the same, a bias driven by the nominal difference between the old and new currencies.

The themes in our data were generally consistent with redenomination literature. Similar to reports in various European countries (European Commission 2002), Ghanaians reported the perception of post-redenomination price increases that exceeded price adjustments due to rounding. Again, parallel to the Euro literature, the general processes of adapting to the currency redenominations indicate a transition over time (Ranyard et al. 2007), a switch in cognitive strategies (Marques and Dehaene 2004), and subjectivity to cultural and historical contexts (Jonas and Frey 2003; Mussweiler and Englich 2003).

Our findings on donations are consistent with Cannon and Cipriani's (2006) observation of the impact of currency redenomination on church offerings. Unfortunately, the European data were mixed, with Italians giving 11% more post- redenomination (vis-à-vis a 3% growth in GDP, income, and personal expenditure) while giving per capita fell in France, Germany and Belgium. Though our data are not quantitative, our interviews reported increases both in giving in church and to others. Our data suggest that the numerosity heuristic probably explains this increase.

A major difference between the Ghanaian experience and that of most Euro countries was the exchange rate. Adjusting to the new currency in Ghana meant dropping four zeros in the case of notes. A slightly more complicated procedure involving division was required if dealing with coins in the new currency. In contrast, the value of the Irish Punt, for instance, was greater than the Euro, with a conversion rate of 1 IRP to 1.27 Euro, which meant that conversions involved multiplication. (As such, the process of conversion in Ghana would be more similar to the Turkish currency change (see Amado et al. 2007), which involved dropping six zeros, than to the Irish experience. However, due to money conventions, dropping six zeros is easier than dropping four). Ghanaian respondents reported doing their conversions mentally, and using charts. In contrast, Euro countries had free Euro converters available to their citizens, and respondents reported using them immediately after the transition, and later for larger purchases (Ranyard et al. 2007).

The Ghanaian data also demonstrate how the process of currency redenomination can be influenced by the cultural context. The redenomination process in Ghana was more than simply a matter of converting from the old currency to the new and relearning prices. Since coins had not been in circulation for some time in Ghana, the process of adjusting to the new currency was made more complex by having to include the coin into the internalized currency schema. In the case of Ireland, many respondents reported making money manipulation errors with coins, partly because the coins looked similar (Ranyard et al. 2007). In the case of Ghana, respondents reported different difficulties with coins, namely general unavailability of coins, and difficulty understanding the value of the coins, which could be partly attributable to low familiarity with coins as a form of money.

The Ghanaian experience is also consistent with "denomination effect"—the tendency to spend more money when the money is in lower denominations, compared with the equivalent amount of money in a single larger denomination (Raghubir and Srivastava 2009). In the case of Ghana, the format of the money seemed to matter. The interview data suggest that respondents observed themselves spending the one and five new currency notes at a faster rate than they would have spent the equivalent amount in the old currency. However, we speculate that because of the problem with coin familiarity, individuals would be less likely to spend an equivalent amount of money if presented or available in the form of coins.

We propose that the change in the nature of the notes impacted the money illusion in post-redenomination Ghana. The redenomination introduced 1, 5, 10, 20, and 50 Ghana cedi notes as well as 1, 5, 10, 20, and 50 pesewa coins, which were initially used with the old 1, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, 10000, and 20000 Cedis and pesewa coins. (A 2 cedi note was added later.) As a result, using the new currency did involve not only thinking on a different nominal scale but also using different physical means of exchange. In other words, not only did the new currency involve fewer zeros but it also involved fewer notes. For instance, a single 50 New Ghana Cedi note replaced a bundle of fifty 10000 cedi notes in the old currency. Hence, literally as well as nominally, the new currency involved "less" money: fewer notes and fewer digits.

Beyond the money illusion at the individual level, Fehr and Tyran (2001) note that the money illusion effect has both direct and indirect aggregated economic effects. For example, Dusansky and Kalman (1974) observed that in addition to changes in purchasing behaviour (supported by our results), disturbances in commodity prices can influence consumer utility. It is also important to note that the random open-marketing pricing which occurred in the face of the redenomination did not follow with corresponding salary increases, which has implications for utility maximization (Benassy 1995).

One finding from this study, which can be considered unique, is the change in self-worth perceived by many who experienced temporary shock at their bank account balances and monthly salaries following the redenomination exercise. Other studies conducted in Europe and elsewhere, some of which have been reviewed in this paper, have not reported this kind of emotional reaction to currency redenomination. It is thus important to speculate what the reasons may be for this reaction in Ghana. Indeed, it begs the question whether the numerosity heuristic that presumably accounts for money illusion is particularly prevalent in a less economically advanced society like Ghana as compared with many of the more economically advanced societies where similar monetary policies have been implemented. To test such a hypothesis would require comparisons between the emotional reactions to currency redenomination in Ghana and those in other similarly less sophisticated economies. There is reason to expect, however, that even the numerosity heuristic, were it to be the definite psychological mechanism for money illusion, would have its limits.

Specifically, it would make little sense for one with billions of worthless money to assume a great sense of personal wealth just because of the number of zeros attached to their currency, especially if all that amount of money can purchase is a dozen eggs. Such a scenario was, until 2009, the situation in Zimbabwe, which, at the height of its hyperinflation, experienced a year-to-year rate of 231 000 000%, where a dozen eggs sold for 600 000 000 000 Zimbabwe dollars. It is doubtful that Zimbabweans who have largely arrested hyperinflation with the adoption of a multicurrency regime considered themselves wealthy in terms of the billions of Zimbabwean dollars they were paid in wages or the money they had saved prior to the abandonment of the practically worthless Zimbabwean dollar. The reasons for the strong emotional reactions of Ghanaians to the currency redenomination require further investigation.

Policy Implications and Conclusion

Typically, the objectives of currency reformation policies have been targeted at the macro-level to combat inflation, establish confidence in the economy, and the like. Subsequently, in analysing and evaluating the impact of such policies, we often gloss over the micro-level impacts on individual households. Our analysis thus far reveals that while the macro-concerns and objectives are legitimate and necessary, they could generate a narrow purview of the real economic implications of the currency modification especially when it does not account for the policy impact at the micro-level. The negligence of the impact of a new currency on individual household financial decisions and the limited attention given to the lag in adopting the new currency has the potential of dampening the efficacy of the currency change policy and may aggravate an already bad economic situation. For instance, the views expressed by respondents in this study regarding the change in consumer behaviour, price trivialization, and change in self-worth are worth considering. Post-redenomination assessments are therefore necessary and recommended in devising strategies, which would facilitate familiarity with the new currency and its subsequent adoption. It may be inferred from the results of our study that while it is important to consider the macro-implications of such a reform, the micro-impact of the birth of a new currency at the individual level is equally necessary to ensure that all the necessary and sufficient conditions are met to allow for a smooth and a relatively faster transition to the new currency.

The expectation that increases in the nominal values of the currency would be matched by increases in spending whereas decreases in the nominal value would be equally matched by decreases in spending (see Soman et al. 2002) was not found in this study. Indeed, the decrease in the nominal value of the cedi was accompanied by increases in spending and increases in the amount of money donated at social functions like weddings, funerals, and at church services. The increased spending of money in order to keep up with the nominal values of the previous currency suggests that the numerosity effect played a role in the spending errors made by many consumers. The adoption of a simple slogan by policymakers and its repetition by the mass media did little to prepare the citizens for the practical consequences of the currency redenomination on the daily lives of Ghanaians. A much sophisticated and practical implementation programme would have to be considered by others contemplating currency redenomination.

One of the goals of Ghana's redenomination was to curb inflation. Considering the progression of the rate of inflation from 10.7% before redenomination to 20% after redenomination, the currency change clearly did not achieve this goal. It is our view that if

policymakers ensured that the fundamentals of the economy were sound, and the right mechanisms were put in place to eliminate the causes of hyperinflation prior to the implementation of the currency change, anticipated inflationary pressure associated with this phenomenon may have been dampened or eliminated. In other words, prior to the introduction of the new currency, policymakers ought to reflect carefully on the rationale for the change and the existing economic conditions.

An important reality is the inability of policymakers to bring large sectors of the Ghanaian economy into the mainstream where alternate monetary instruments like checks, credit cards, money orders, etc. are used for business transactions. Thus, there was little control over the amount of cash in circulation at any specific time. Such situations enabled ruthless cash speculators looking for avenues to increase their margins and take advantage of the huge demand for foreign currencies exploit the system and eventually bring inflationary pressures on the new currency.

Related to the problem outlined above is the lack of adequate production of goods and services in the economy, and the overreliance on imported commodities. The lack of production means that changes in the prices of imported goods and services were dictated by price fluctuations in the exporting countries. In addition, increases in tariffs and excise duties imposed by policymakers interested in taxing imported goods to fund local budgetary needs, all contributed to price increases. Most importers of foreign goods pass these extra costs onto consumers, further fuelling increases in the prices of goods and services generally.

Another related factor to the failure of the redenomination policy to arrest inflation is the reliance of the central government on deficit financing. Budgetary deficits in Ghana and many other developing countries are financed through the selling of treasury bills and the printing of currency. To successfully implement redenomination and stabilize the economy requires the elimination of deficit financing by governments and increases in the production of local goods and services.

A final point from the Ghana redenomination programme worth noting is that 2 years after the exercise, many Ghanaians were still struggling to deal with the new currency. This experience stands in marked contrast to that which occurred in Turkey in January 2005, which incidentally also slashed a number of zeros from the old currency similar to what was implemented in Ghana. As reported by Amado et al. (2007), most Turks had adjusted well to the redenomination barely 6 months after the new currency was introduced. The question that begs for answers is why there are markedly different reactions to the same exercise in Ghana and Turkey. It can only be speculated that the different levels of economic sophistication in the two countries probably accounted for the differences in adjustments to the redenomination programmes. The nearly total formal banking system in Turkey combined with the availability of various monetary transaction instruments made the new Turkish Lira instantaneously ubiquitous, thus necessitating quicker adjustments to the new currency. In Ghana by contrast, nearly an estimated 70–75% of the currency in circulation is outside the formal economy and the banking system. The holding of such large amounts of money by individuals suggests that they would develop stronger emotional attachment to the old currency (see Tyszka and Przybyszewski 2006).

Policy planners contemplating currency redenomination exercises in other developing economies would be well served to draw some lessons from the exercise in Ghana. In particular, as West African countries contemplate a transition to a common currency, a conscious effort should be made to eliminate or at least reduce the effect of the nominal value of the new but unitary currency on consumer decisions, since such a drastic measure would have a great impact on the lived experiences of people in the sub region. Potential

benefits associated with redenomination such as the ease for automation and the restoration of confidence in the currency may be eroded if these recommendations are ignored.

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