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Learning from subsistence marketplaces and beyond: A cross-sectoral comparison in Benin

Paul Ingenbleek
Wageningen University, paul.ingenbleek@wur.nl

Souleimane A. Adekambi
University of Parakou, adeksoul@gmail.com

Hans C.M. van Trijp
Wageningen University, hans.vantrijp@wur.nl

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Cover Page Footnote

Learning From Subsistence Marketplaces and Beyond:

A Systematic Cross-Sectoral Comparison of Two Sectors in Benin

Abstract

Subsistence Marketplaces publishes studies that study consumers, entrepreneurs, and marketplaces from a broad range of low-income contexts in their own right, transcending the boundaries between sectors and disciplines to derive practically meaningful implications. This paper contributes to accomplishing the mission of the journal by contextualizing market learning theory to subsistence marketplaces. More specifically, the study links two modes of market learning (exploration and exploitation) with producers' livelihood performance. It hypothesizes that, within subsistence marketplaces, producers benefit the most from exploration but to seize a market opportunity beyond the subsistence context, producers should strengthen their exploitative learning processes. We use producer survey data from 389 producers from shrimp fishing and shea butter production, two sectors selected by the Beninese Government for their development potential. The sectors vary systematically in their level of high-income market integration. We employ emic and etic items to develop measures that allow to formally compare the two sectors while paying respect to their contextual differences. The results show partial support and imply that development policies and corporate procurement should support producers in strengthening the appropriate learning processes.

Keywords: Subsistence marketplaces, Subsistence producers, BoP producers, Marketplace literacy, Exploitative learning, Exploratory learning, Livelihood performance, sector development, cross-sector-comparison, Shrimp fishing, Shea butter production, Benin.

Introduction

Subsistence Marketplaces aims to publish studies that study consumers, entrepreneurs, and marketplaces from a broad range of low-income contexts in their own right, transcending the boundaries between sectors and disciplines to derive practically meaningful implications. With a rare availability of paid formal-sector jobs, affordable education, and consequently high dependence on self-employment, marketplaces are virtually the only social and economic platform where people living at or near subsistence levels can sustain and improve their livelihoods (cf. Viswanathan *et al.* 2012). Understanding how marketplaces function, so called marketplace literacy, and the process of learning it, marketplace learning, are therefore vital to cope with the challenges of everyday life and to find ways to improve livelihood performance (Viswanathan and Sridharan 2009; Teklehaimanot *et al.* 2017). The initial studies examined how subsistence marketplaces function and how consumers and producers develop literacy about marketplaces by learning through social contacts in concrete terms (Viswanathan et al. 2010a; 2010b). Convinced about the importance of learning through marketplace literacy they developed educational programs (and entities; www.marketplaceliteracy.org) for subsistence consumer merchants in urban and rural India (Viswanathan *et al.* 2009), rural East Africa (Teklehaimanot et al 2017; Viswanathan *et al.* 2021), and other countries.

Others have argued that such improvements in proficiency can also be used to seize opportunities beyond subsistence marketplaces (e.g. Adekambi *et al.* 2015; Gau *et al.* 2014; Venugopal *et al.* 2019). Subsistence marketplaces after all, don't exist in isolation, but are connected to other marketing systems, of which some have higher purchasing power and therefore offer opportunities for sellers in subsistence marketplaces to tap into. These may for example be middle class markets (Babah Daouda *et al.* 2019), supply chains for modern retailers (Minten *et al.* 2009), and export markets (Adekambi *et al.* 2015) (hereafter referred

to as high-income markets). Our study focuses on such sellers and we adopt the term base of the pyramid (BoP) producers (London *et al.* 2010). We refer to small-scale producers in primary or secondary production living at low-income levels, sometimes referred to as the base of the income pyramid (London *et al.* 2010) or as subsistence marketplaces. In their study on suppliers of middle-class juice-makers in Benin, Hounhouigan et al (2014) discover that learning from such opportunities can't be taken for granted. Ten years after they were established, most juice-makers were still dissatisfied with the quality and consistency of their supplies. The most logical explanation was that the many differences between the formal and informal marketing systems (type of customer, governance of transactions, demanded quality, etc.) posed a barrier for BoP producers to find the right learning mode to develop stable trade relations with the new customer group.

The literature has produced relevant insights on how BoP producers can overcome such learning barriers from several qualitative studies from highly different contexts. Taking a resource-advantage perspective and drawing on a case study on reforestation in Haiti and Mexico, Gau *et al.* (2014) emphasize the importance of the community level. Implying a learning process, they find that community-based initiatives can help to develop the innovative capacity to compete. Comparing four West African cases of agricultural sectors with different levels of market access, Adekambi *et al.* (2015) see the learning process as central, analyzing how information on export market opportunities flows into the community, is interpreted in shared learning processes, and translated into decision making about production practices that allow access to new markets. Venugopal *et al.* (2019) study a comparable process in the context of Indian fishing communities that managed to connect with markets offering higher revenues. Their central argument was that to bring modern technologies into the traditional practices, community members started to question the legitimacy of traditional practices that had to be unlearned.

Finally, Babah Daouda and colleagues (2019) look at the individual learning process of shop and restaurant owners in the North of Benin, concluding that the type of customer is at the basis of their strategies to move out of poverty through the market. They find a step-wise process in which entrepreneurs start small with easy-to access customers such as friends and family and when they get access to other customers they learn how to satisfy them, until the new customer group is considered as more interesting. They then start a risky process of sloughing old relationships and associated resources, to return at higher levels of quality and income. The process may then start again, reaching customers with ever increasing purchasing power. In sum, the findings from these studies imply that BoP producers learn from marketplaces by exploring opportunities to increase their income in their markets, and that once they discovered such opportunities, they strengthen essential competencies that give them actual access to higher-income markets.

While the existing literature has therefore produced valuable insights to understand the learning modes of BoP producers to access high-income markets, it has not yet formally stated and tested it. In this paper, we aim to fill this gap by showing that the learning mode to improve livelihoods differs between a sector where opportunities are scarce and BoP producers rely on selling to subsistence marketplace customers and a sector where the market opportunity is obvious to start selling to high-income markets. In order to seize such an opportunity, BoP producers usually should be able to comply with pre-specified quality standards (e.g., (Van Tilburg *et al.*, 2007). To formalize the theory, we draw on the concepts of exploratory and exploitative learning (cf. March, 1991) that have been widely applied in the business literature (e.g., Atuahene-Gima and Murray, 2007; Lisboa *et al.*, 2013), but not yet in the domain of subsistence marketplaces research. Exploration is a learning mode that focuses on the searching of opportunities, while exploitative learning focuses on the improvement of capabilities that help to seize opportunities (March, 1991).

This study contributes to the literature on learning in subsistence marketplaces by contextualizing exploration-exploitation theory to subsistence marketplaces. Second, we distinguish between two sectors, namely one in which opportunities are restricted to subsistence levels and one in which an opportunity to a high-income market has opened up. Third, the theory is tested in two different sectors in Benin selected by the Beninese government for their development and export potential, i.e. shrimp fishing and shea butter production (SCRP-Benin, 2011; PAG, 2017). These two sectors are in different stages of development. Shrimp fishing already has direct access to export markets, while such access is still to be created for shea butter (Adekambi *et al*., 2015). These sectors provide an interesting opportunity for systematic comparison to increase our understanding of learning by BoP producers. Systematic comparison of subsistence marketplace sectors is hindered by the numerous other differences between the sectors, such as perishability of the product, and the geographic, cultural and language differences that are almost inherent to the heterogeneous context of subsistence marketplaces (Ingenbleek et al 2013; Viswanathan et al. 2008; Viswanathan, 2013). Therefore, to compare the two sectors, we will use a combination of emic and etic items to measure the learning modes. This combination allows for comparison between sectors while still doing justice to contextual differences. The approach is also used in, among others, item-response theory (cf. Hambleton and Swaminathan, 1985).

The remainder of the paper is structured as follows. We first present the theoretical background, including the background on learning modes. We then formulate hypotheses, describe the study method and present the results and discussion. We conclude with implications for companies, policymakers, development projects, and academic research.

Producer Learning in Subsistence Marketplaces

Exploration and exploitation

Learning from markets is seen as a critical marketing capability for businesses and entrepreneurs since understanding markets is indispensable to create superior customer value and achieve business performance (e.g., Grant, 1996; March, 1991). The organizational learning literature distinguishes two fundamental learning modes: exploitative and exploratory learning (Levinthal and March, 1993; March, 1991). Exploitative learning is the tendency to learn about "the refinement and extension of existing competencies, technologies, and paradigms exhibiting returns that are positive, proximate, and predictable" (March, 1991, p. 85). Exploratory learning is a tendency to learn in terms of "experimentation with new alternatives having returns that are uncertain, distant, and often negative" (March, 1991, p. 85). Exploitative learning thus refers to "the use and development of things already known," whereas exploratory learning refers to "the pursuit of knowledge, of things that might come to be known" (Levinthal and March, 1993, p. 105). We note here that these two types of learning are consistent with bottom-up versus top-down approaches discussed in subsistence marketplaces (Viswanathan, 2016).

The effects of exploitative and exploratory learning have been extensively examined within strategic management (e.g., Auh and Menguc, 2005; Lavie and Rosenkopf, 2006), organization theory (e.g., He and Wong, 2004; Smith and Tushman, 2005), and marketing (Atuahene-Gima, 2005; Atuahene-Gima and Murray, 2007, Lisboa *et al*., 2013). The central argument of these studies is that to strengthen innovativeness and competitiveness, the learning modes have their own merits. Exploration helps to detect opportunities and threats in the environment whereas exploitation contributes to efficiency and routinized value creation. Whereas the learning mode that is most relevant may depend on environmental characteristics like the technological and market turbulence, companies are likely to need both to be adaptive to changes in their environment. For that reason, researchers have also often studied the

interaction effects of the two learning modes on outcomes like profitability and innovativeness (e.g. Atuahene-Gima and Murray, 2007, Lisboa *et al*., 2013).

Situated in a subsistence marketplaces context, our study differs in three ways from this general line of research. First, advanced economic sectors are characterized by bounded complex organizations in which members may store their individual lessons learnt in the collective memory of the organization to contribute to performance at the level of the organization (e.g., Moorman and Miner 1997). Subsistence marketplaces are typically characterized by micro businesses in which BoP producers are often self-employed (Viswanathan et al., 2010). These entrepreneurs may be embedded in communities in which information is shared and interpreted (Adekambi *et al.*, 2015), in what has been described as a 1-1 interactional marketplace (Viswanathan et al., 2012). At a community level, members may agree on which practices are deemed appropriate (Venugopal *et al.*, 2019) but the level of control may be lower than in formal organizations as BoP producers often remain responsible for making their own decisions. For this reason, we will take the level of the individual BoP producer as the relevant level where learning takes place. In that respect, we are consistent with the notion that exploration and exploitation are fundamental concepts that can be studied at different levels (Li, *et al*., 2008). These levels range from individuals where exploration and exploitation are rooted in cognitive psychology (e.g., Mom, *et al*., 2007; Spreng and Turner, 2021) to entire sectors or industries (Gilsing and Nooteboom, 2006; Guan and Liu, 2016).

Second, BoP producers in subsistence marketplaces usually evaluate their own performance in terms of impact on their livelihoods, thus including monetary and non-monetary achievements that can be both market and subsistence based (Ingenbleek et al. 2013). We therefore employ the term livelihood performance, which is used in the development literature to denote the desired living level (e.g., Bernard et *al*., 2008). We

depart from this argument and consider livelihood performance of BoP producers to be the dependent variable in the present study (cf. Ingenbleek *et al.*, 2013).

Third, whereas the existing literature aims at understanding the roles of the two learning modes on competitiveness of companies, our aim is to better understand development in subsistence marketplaces by comparing two sectors each associated with a particular type of learning. Our emphasis is therefore on comparison between the two situations rather than on a heterogenous sample of actors who may face market conditions comparable to either one of these sectors or both at the same time. The latter requires testing interaction effects of the two learning modes, while the first calls for testing the effects in separation.

Hypotheses

We argue that in sectors that have not (yet) connected with high-income markets, exploration will have a positive impact on livelihood performance. Because most buyers in subsistence marketplaces by definition have low levels of purchasing power, market opportunities of the level that they can significantly increase livelihood performance are scarce. Transactions typically are made under uncertainty as in the absence of standards and fixed prices, and prices are arrived at through negotiation, even for the smallest items. At an exchange level, these contexts have been described in terms of fluid transactions with constant customization (Viswanathan et al., 2012). Even then, uncertainty remains about whether one hasn't paid too much, or sold for too little. Trusted sources, like friends, family and self-help groups are most relied-on sources of information through 1-1 interactions (Viswanathan et al., 2012; Viswanathan et al. 2010b). Exploring connections for information will therefore augment the producers' chances to find opportunities that will help BoP producers to sustain or slightly improve their livelihoods. Producers also often sell their produce on credit. They then get paid after the buyers found revenues themselves and the

seller returns to put pressure on the buyer (e.g., Viswanathan et al. 2010a). Because traders may not return to pay back, either because they are opportunistic or because they encounter problems along the way (Wang and Yang, 2013), selling their produce on credit is a risky business for BoP producers. Exploring the buyer networks allows them to distribute their sales over different buyers, allows them to spread risks, and learn which traders are trustworthy (e.g., Fafchamps, 1992; Fafchamps and Lund, 2003). Hence, we expect that in a sector that is not (yet) connected to a high-income market, exploratory learning by BoP producers has a positive effect on their livelihood performance.

Exploitation implies that BoP producers strengthen their competence to comply with customers' requirements (Atuahene-Gima, 2005), such as an improvement of the quality of produce. This is a learning mode that BoP producers can in principle engage in in any sector with variations in product quality, but only in sectors where buyers are willing and able to pay for higher quality exploitation will lead to increased performance. In marketplaces where buyers reside at or near levels of subsistence, improving the quality of produce may therefore lead to relatively little returns because few buyers in subsistence marketplaces can afford such products. Even if customers have specific demands that require BoP producers to learn in an exploitative manner, they would run the risk of becoming too dependent on such buyers. Pervasive interdependence is an aspect of the larger context in 1-1 interactions with enduring relationships and responsive interactions. But the other side of this coin is being too dependent. Following a transaction cost logic, the effort of exploitation would be a specific investment, which would make BoP producers vulnerable for opportunistic behavior of traders (e.g., Wang and Yang, 2013). As such, we expect that exploitative learning has a negative effect on livelihood performance in a sector that is dependent buyers living at or near subsistence levels.

Once a sector becomes connected to a high-income market and producers thus face a clear opportunity to improve their livelihoods, the "rules" of the marketplace change. Such changes are not unlikely to happen: With population growth and growing middle classes, the demand for affordable food and input materials of reasonable and constant quality is pushing the development frontier to include more BoP producers. Such BoP producers who have always depended on buyers from subsistence marketplaces are then confronted with buyers who are willing and able to pay more for products that meet pre-determined quality standards (Van Tilburg *et al.*, 2007; Kambewa *et al.*, 2008). Such buyers may for example be trading agents of supermarkets, exporters or proficient manufacturers searching for supplies meeting specific quality criteria (e.g., Rueda and Lambin, 2013). Research in the development field has shown that when BoP producers get access to high-income markets, their livelihood performance increases (e.g., Arnould *et al.*, 2009; Maertens *et al.*, 2011; Van den Broeck and Maertens, 2017). According to exploration-exploitation learning theory, the underlying mechanism would be that BoP producers strengthen the competencies that are needed to meet the market standards. This is achieved by leveraging exploitation. In a sector that has access to high-income markets, exploitation is therefore expected to have a positive effect on livelihood performance.

Before they leverage their exploitative learning mode, BoP producers are unlikely to be capable of meeting the quality criteria. Facing scarcity, buyers will therefore make an extra effort to secure the relations with BoP producers that can offer the quality that buyers are looking for. In other words, buyers will explore the network looking for BoP producers who can offer them the right quality, thus making exploration by such producers redundant. Leveraging the exploration learning mode can even be harmful for the livelihood performance of BoP producers in this situation. The information that BoP producers acquire from their connections while exploring comes at a price, taking the form of a share of their produce

offered or other favors that negatively influence their own livelihood performance (Dubini and Aldrich, 1991; Yli-Renko *et al.*, 2001). We therefore expect that exploratory learning has a negative impact on livelihood performance in sectors connected to high-income markets.

Based on our line of reasoning, we present the following two hypotheses.

H₁: In a sector that has no access to high-income markets, (a) exploration will have a positive effect and (b) exploitation will have a negative effect on livelihood performance.

H₂: In a sector that has access to high-income markets, (a) exploration will have a negative effect and (b) exploitation will have a positive effect on livelihood performance.

In the language of the stream of subsistence marketplaces, we argue that BoP producers need to be top-down in learning about high-income markets, relying on what is

already known in these somewhat distant contexts. They have limited access and exposure to such markets, thus having to rely on what is already known. They need to be bottom-up in learning about low-income markets that are proximate to them. The stream of subsistence marketplaces is based on the foundational premise of external actors from resource-rich settings such as managers, educators, and researchers needing to be bottom-up in subsistence marketplaces. But when considered in reverse from the perspective of resource-poor subsistence producers, the need to rely on what is already known is important (i.e., exploitative rather than exploratory) is central in high-income markets. This is due to being resource-poor and having cognitive and affective constraints (Viswanathan et al., 2005) to

being exploratory.

Methods

Context of the study

The hypotheses are tested on samples of shrimp fishers and shea butter producers from Benin in West Africa. The economy of Benin is dominated by agriculture, which employs approximately 70% of the active population and contributes up to 80% to export revenues (SCRP-Benin, 2011). To diversify its agricultural economy, which is highly dependent on a single crop (cotton), the Beninese government has started promoting other agricultural sectors with high export potential, such as shrimps and shea butter. The shrimp sector generates substantial foreign exchange for the country already (STDF, 2008), and it has the potential for further export growth. The sector benefits from strong regulative institutions and control bodies. For the shea butter sector, access to export markets has become a key objective of policy makers and development organizations. The world demand for shea butter has significantly increased over the last decade, particularly because it is an important ingredient in confectionaries (Holtzman, 2004; Al-hassan, 2012). As a consequence, prices in international markets have also increased (Holtzman, 2004).

The two sectors differ in many ways. Shrimps are caught in the South of Benin, and shea butter is produced in the North. Shrimp catching is an activity almost exclusively conducted by males, whereas shea butter production is almost exclusively conducted by women. Shrimps are sold fresh and highly perishable especially in ambient temperatures, whereas shea butter is processed and can be stored easily. The two regions also differ in terms of ethnicity, culture, religion, and local languages. The South is mainly populated by Fon, Yoruba, Goun, Ouémé (or Wémée) people and is more Christian. The North is populated mainly by the Bariba, Peuhl (or Fulbe), and Dendi and is largely Muslim (Battle and Seely, 2010). In such heterogeneous contexts, measurement instruments that hold relevance in one

context may easily be interpreted differently in another despite that the two sectors are found in the same country on a relatively short distance from one another (Ingenbleek *et al.*, 2013).

Pre-study and measurement

Since it was not self-evident that the key concepts could be measured using the same items in each of the sectors where they apply, we conducted a pre-study. We started our data collection with qualitative research (Ingenbleek *et al.*, 2013), including individual interviews with experts and focus group discussions with BoP producers. For the shrimp sector, five experts were interviewed, and three focus group discussions were conducted with a total of 25 shrimp fishers. In the shea sector, seven individual interviews with experts and 8 focus group discussions with a total of 32 shea butter producers were realized. The experts included researchers, project managers, and agents from development organizations and government agencies.

We found that in the shea butter sector, customers are mostly informal-sector traders, typical for subsistence marketplaces. In the shrimp sector, one exporting company appeared to be the most important buyer for all shrimp fishers. The sector had a successful past in terms of exports but suffered from a ban because it couldn't secure food safety up to the levels demanded by export countries. The sector then again relied on informal markets and informal trading systems for its sales. In the years just before we conducted the study, the sector started to recover with one exporting company that opened its doors again. The information allowed us to develop an understanding of exploitation and exploration within the specific contexts of the two sectors in line with the aim of our study. As such, possible exploitation and exploration activities that go beyond the sector, are beyond the scope of our study.

In the shea butter sector, exploitative learning comes down to strengthening one's competencies in responding to the producer's main buyer. However, in the shrimp sector, it

refers more specifically to strengthening one's compliance with the quality standards requested by the collectors working on behalf of the shrimp exporting company. In that respect, some items for the two sectors thus were formulated slightly different. For example, some of the items in the shrimp sector tended to explicitly ask whether the collectors were satisfied, because the incentive to meet the quality criteria is stronger in that sector. In the shea butter sector, producers were less concerned with customer satisfaction. With respect to exploration, we found that the search for new opportunities takes the form of exploring one's socio-economic networks, hoping to discover new opportunities in the market. In the shrimp fishing sector, more emphasis was given to searching for information pertaining to the export channel. Because such a concrete opportunity is absent in the shea butter sector, the information search had to be worded in more general terms.

The findings from the pre-study challenged the comparative approach that is common practice to test measurement instruments across contexts (e.g., De Jong, *et al.*, 2009). Such comparisons require that the measurement instruments are cross-contextually invariant (e.g., Steenkamp and Baumgartner, 1998). Horn and McArdle (1992: 117) describe measurement invariance as "whether or not, under different conditions of observing and studying phenomena, measurement operations yield measures of the same attribute." To ensure measurement invariance, the common approach recommends to use items that approximately describe the constructs to be assessed and to adapt them to all of the contexts of the study (so-called *etic* items) (Steenkamp, 2005). Because researchers often end up with a small number of *etic* items, it has been argued that cross-context comparable (*etic)* items can be complemented by context-specific (*emic*) items, i.e., an emic-etic approach (Steenkamp, 2005; De Jong, *et al.*, 2009). With high levels of concrete thinking in subsistence marketplaces (Viswanathan, *et al.* 2009), the importance to use emic and ethic items increases further because respondents are less likely to understand abstractions that would apply to both

sectors. We therefore use both *emic* and *etic* items to measure exploration and exploitation in the two studied sectors. Livelihood performance was measured using only etic items because livelihood itself appeared to be consistent across the two contexts.

Main data collection

We designed one questionnaire per sector to collect data. The questionnaires were further improved using comments and suggestions from two experts from each sector and from the pre-test observations. The study adapted the traditional numeric scales to the context of our study. Rather than the typical (5-point) Likert-type scales, 5 pebbles with different sizes to accommodate pictographic thinking were used. The smallest pebble symbolized "the left-hand anchor" (i.e., "strongly disagree"), and proceeding in ascending level of magnitude, the biggest pebble represented "the right-hand anchor" (i.e., "strongly agree") and was five times the size of the smallest pebble (see Figure 1).

We applied a stratified sampling approach to select respondents for this study (Ingenbleek *et al.*, 2013). For each sector, the sampling is limited to the regions where its production is substantial. Lists of all villages in each production region that have contact with factory collectors and/or NGOs were identified with the help of experts. Next, these villages were differentiated into three categories based on their distance to the main road. Four to six villages were finally selected from each stratum in each production region. This procedure led to a total of 14 villages for the shrimp sector and 16 villages for the shea butter sector. A total sample of 183 respondents for the shrimp sector and 206 respondents for the shea butter sector were randomly selected in each of the surveyed villages.

Measurement validation

We validated our multi-item measures for exploitation and exploration using exploratory factor analysis, Cronbach's α, and confirmatory factor analysis (cf. Churchill,

1979). Based on these analyses we removed several items from the exploration and exploitation scales with low loadings or loading on two constructs. We entered the remaining items from the same dataset into the confirmatory factor analysis in LISREL 8.8. We ran a two-factor model per sector. The results show a relatively good fit model for each sector [(RMSEA = .035, CFI = .99, NNFI = .99) for the shrimp sector; (RMSEA = .069, CFI = .96, NNFI = .94) for the shea butter sector]. Whereas one item in the exploration scale of the shea butter sector had a relatively lower loading, we decided to retain this item because of its contribution to the face validity of the scale. Notably, the factor loading of this item, as well as all other items included in the measurement models, were significant.

The discriminant validity was assessed by running the two-factor model twice (cf. Anderson, 1987; Bagozzi and Phillips, 1982). In the first model, we did not constrain the correlation between the two constructs, whereas in the second model, the correlation between the two constructs was set to 1. The examination of the comparative fit index (CFI) as a recommended measure for fit in smaller samples (e.g., Byrne, 1998) showed poorer fit for all constrained models (.86 and .84, respectively, for the shrimp and shea butter sectors) than the overall unconstrained model (.99 and .96, respectively, for the shrimp and shea butter sectors).

BoP producers' livelihood performance was assessed through subjective measures. These livelihood performance items together constitute a formative scale on livelihood performance. Because the scale is formative, we did not compute Cronbach's alpha (e.g., Diamantopoulos and Winklhofer, 2001). Appendix 1 presents the final scale items.

Analyses And Results

Invariance testing

Following Vandenberg and Lance's (2000) recommendations, we conducted a series of measurement invariance tests (Table 1). We first tested configural invariance on a two-factor solution for exploration and exploitation. Thus, we first estimated a baseline model without imposing constraints on parameters across the two sectors, apart from the factor structure (Model 0). The estimated model shows good model fit (e.g., Hair *et al.*, 2006). The Comparative Fit Index (CFI) is 1. The Non-Normed Fit Index (NNFI) is 1.006. The Root Mean Square Error of Approximation (RMSEA) has a value of .0001, which falls inside the acceptable range of .05 or less. The chi-square statistic associated with the structure of the underlying relationship is not significant (chi-square = 7.329, p > .10). These results suggest that configural invariance is supported (Table 1).

Table 1: Results of nested measurement invariance tests

Model	Df	χ^2	$\Delta\chi^2$	RMSEA	90 Percent Confidence Interval for RMSEA	CFI	ΔCFI	NNFI
Configural invariance								
Model 0 (M0)	9	7.329		.0001	[.000; .0698]	1.000		1.006
Full metric invariance: Model 1 (M1)	12	107.309**		.201	[64.673; 130.594]	.850		.750
(M0 versus M1)	3		99.980**	-			.150	
Partial metric |invariance: Model 2 (M2)	11	18.948		.062	[.000; .108]	.987		.977
(M 0 versus M 2)	2		11.619				.013	
Partial scalar invariance: Model 3 (M3)	13	20.610		.058	[.000; .101]	.988		.982
(M2 versus M3)	2		1.662				-.001	

Note RMSEA = Root Mean Square Error of Approximation; CFI = Comparative Fit Index; NNFI = Non-Normed
Fit Index; ** p < .01

Model 0 (M0): Baseline model with no constrained parameters across the two groups.

Model 1 (M1): All factor loadings are constrained to be equal across the two groups.

Model 2 (M2): Not all of the factor loadings are constrained to be equal across the two groups.

Next, we tested metric invariance by examining whether the factor loadings are equal across the two sectors (Model 1). The constrained model shows a poor fit with data (chi-square = 107.309, p < .01; CFI = .850; NNFI = .750; RMSEA = .201). Compared with the baseline model (M0 vs M1), the significant chi-square difference (Δchi-square = 99.980, p < .01) implies that not all of the factor loadings were invariant across the two sectors. Thus, full metric invariance is not supported. We thus tested for partial metric invariance by releasing the equality constraint on one exploitative item (item # 3: I do not always fish for shrimps that

my collectors want (R); Model 2), as suggested by the modification indices. The estimated Model 2 shows good fit (Chi-square = 18.948, p > .10; CFI = .987; NNFI = .977; RMSEA = .062). Compared with the baseline model (M0 vs M2), the non-significant chi-square difference (Δchi-square = 11.619, p > .10) suggests partial metric invariance across sectors.

To test scalar invariance, we constrained the items' intercepts to be equal across sectors. Only items that satisfy metric invariance are considered for this test, suggesting a partial scalar invariance test. The estimated constrained model (Model 3) shows a good fit (Chi-square = 20.610, p > .10; CFI = .988; NNFI = .982; RMSEA = .058). The comparison of Model 0 and Model 3 shows a non-significant chi-square difference (Δchi-square = 1.662, p > .10). This finding suggests that partial scalar invariance is supported. Because our findings support configural, partial metric, and partial scalar invariances for at least two items per sector (e.g., De Jong *et al.*, 2009; Steenkamp and Baumgartner, 1998; Vandenberg and Lance, 2000), the necessary condition to obtain a valid interpretation of the observed mean differences between the two sectors is therefore met.

Hypotheses testing

An ordinary least squares regression (OLS) model was estimated to test our hypotheses, with livelihood performance as a function of the interactions between the sector dummy variable and exploration and exploitation (Table 2).

Table 2: Estimation results for the linear regression for the hypothesis models

	Full model	Sector			
	Beta (β)	**Shea butter**		**Shrimp**	
Exploration*Sector	-.158** (H1)				
Exploitation*Sector	.046† (H2)				
Exploration		.171** (H1a)	.192*** (H1a)	-.139** (H2a)	-.149** (H2a)
Exploitation		-.081* (H1b)	-.082** (H1b)	.027 (H2b)	.037 (H2ba)
Exploration* Exploitation			-.052		.095***
Asset holdings	.096**	.127**	.123***	.056*	.056*
Quality of infrastructure	.024	-.026	-.029	.075*	.078*
Microloan	.281**	.239*	.242**	.359*	.294*
Constant	2.252**	2.404**	2.414***	2.081**	2.055***
R-square	.135	.212	.220	.086	.108
F-Statistic	11.95**	11.89**	10.09***	3.72**	4.12***
Observations	389	206	206	183	183

Significance level: †: $p < 0.10$, *: $p < 0.05$, **: $p < 0.01$

The effect coding scheme was adopted for the sector variable (Bech and Gyrd-Hansen, 2005), coding the shrimp sector as +1 and the shea butter sector as -1. The latent scores on exploration and exploitation were computed following Bartlett's method in a series of separate exploratory factor analyses per sector. This method is argued to generate a good structural representation of the relationship between the latent variable and its observed items (Simpson *et al.*, 2003). The score of the latent livelihood performance variable was computed by averaging the numerical responses of all included items because they are operationalized as a formative scale and were not subjected to exploratory factor analysis.

As indicated in the conceptual framework, we further controlled for the effect of asset holdings, quality of infrastructure, and whether or not BoP producers had a microloan on livelihood performance, as prior studies have suggested (see, e.g., Barrett et al., 2006). The

number of livestock was used as a proxy for asset holdings (e.g., Barrett *et al.*, 2006). The microloan was assessed using a binary indicator of whether BoP producers had received a microloan during the last five years previous to the interviews, consistent with Abro *et al.*(2014). The distance from the village to the nearest main road was adopted as a proxy of quality of infrastructure (e.g., Shami, 2012).

Multicollinearity between the independent variables was tested through the variance inflation factor (VIF) (Hair *et al.*, 2010). The results revealed that the highest VIF were 1.184 (for exploitation on livelihood performance) and 1.102 (for exploration on livelihood performance) for the shrimp and shea butter sectors, respectively. Multicollinearity was therefore not a concern in our data. We first ran a full model with no distinction made between sectors. In addition to the full model, separate models were estimated for the shea butter and shrimp sectors to ease the interpretations of the direction effects of exploration and exploitation (Aiken and West, 1991).

Table 2 reports the results from the estimated models. The different estimated models are globally significant at the 1% level (3.72 < F-statistic< 11.95; p < .01), meaning that there is an effect of the independent variables in each estimated model. The findings show that the interaction effects of the variables sector and exploration (β = -.158, p < .01) on the one hand, and exploitation (β = .460, p < .10) on the other hand, are all significant and have different signs. This pattern indicates that improving BoP producers' livelihood in each agricultural sector requires different learning strategies. The results of the separate models in Table 2 show that the effect of exploration on livelihood performance, in the shea butter sector, a sector that is not yet connected to export markets, is positive and significant (β = .175, p < .01). The relationship is negative and also significant in the shrimp sector, a sector that is already connected to export markets (β = -.139, p < .01). These findings are consistent with the directions predicted in our Hypotheses 1a and 2a.

The effect of exploitation is negative and significant in the shea butter sector ($\beta = -.081$, $p < .05$), but not significant in the shrimp sector ($\beta = .027$, $p > .10$). Our finding of the effect of exploitation on livelihood in the shea butter sector is consistent with the predicted direction in Hypothesis 1b, but the effect in the shrimp sector is not. We therefore find support for Hypotheses 1a, 1b and 2a, but Hypothesis 2b is not supported.

As for the control variables, we find positive and significant effects of asset holdings on livelihood performance in both sectors ($\beta = .127$, $p < .01$ for the shea butter sector, and $\beta = .056$, $p < .05$ for the shrimp sector). These findings suggest that as the level of asset holdings increases, so does the livelihood performance of BoP producers. Quality of infrastructure had a positive and significant effect on livelihood performance only in the shrimp sector ($\beta = .075$, $p < .05$). Finally, the microloan had a positive and significant effect on livelihood performance ($\beta = .239$, $p < .05$ when sectors are not yet connected to export markets; $\beta = .359$, $p < .05$ when sectors are connected).

Our theory suggests that in subsistence marketplaces, opportunities to connect to high-income markets are scarce. As a consequence, a relatively sharp distinction can be made between sectors that witness such opportunities and sectors that don't. One implication is that an interaction effect of exploratory and exploitative learning is not adding to the model because the two learning modes are not needed at the same point in time. We test this assumption by testing the model again in two regression analyses for the two sectors separately, also including the interaction effect of exploration and exploitation. Both models show comparable simple effects as reported in Table 2. As expected, no significant interaction effect of exploration and exploitation on livelihood performance was found in the model tested on shea butter producers ($\beta = -.052$, NS). However, contrary to our expectation, a significant interaction effect of exploration and exploitation on livelihood performance was observed in the model tested on shrimp fishers ($\beta = .095$, $p < .01$).

Discussion

Extending the work on marketplace literacy in subsistence marketplaces, the present study examined the effects of exploitation and exploration on livelihood performance of BoP producers in two different sectors in Benin. The results show that the learning modes of exploitation and exploration have significant effects on BoP producers' livelihood performance. We obtained these findings using combinations of emic and etic items to enable a systematic, quantitative comparison between two highly different sectors. The results mostly supported our initial expectations, except for two unexpected findings that we return to below.

Contrary to our expectation, the results don't support the predicted positive effect of exploitation in the shrimp sector. Instead, we found an interaction effect between exploration and exploitation in this sector. As such, the predicted positive effect seems contingent on a minimum level of exploration. This result doesn't support our expectation that a combination of exploration and exploitation doesn't further increase livelihood performance of BoP producers in these two sectors. In a sector that is already connected to export markets like the shrimp sector, the combination of the two learning modes does further increase livelihood performance.

The most logical explanation is that shrimp fishers still struggle to connect to the traders that can connect them with the export market. Exploration through the exchange network to find a stable connection to the high-income market is then a prerequisite to bring exploitative learning, which helps to meet the quality standards of that market, to value. Another, related, explanation that may play a role is that many shrimp fishers still depend on local markets to a substantial degree. In such local markets, consistent with our findings in the shea butter sector, exploitation likely has a negative effect on livelihood performance (Adekambi et al, 2015). The simultaneous occurrence of a positive (for export market buyers) and negative (for subsistence market buyers) effects of exploitation may lead to a cumulative

non-significant effect. Once the export integration of the shrimp fishing sector has improved further, the positive effect of exploitation would then come out stronger.

Implications

Theoretical implications

Our findings extend existing exploration-exploitation literature in that they suggest that learning modes also vary depending on the stage of development, depending on the extent to which market opportunities are present. Starting with environments in which opportunities to improve livelihoods are mostly absent, exploration is the key learning process to strengthen livelihoods. Through these processes, people learn to know their market networks and which opportunities exist to maintain their livelihood standards, or to slightly improve them. This finding is mostly consistent with some fundamental insights on subsistence marketplaces, such as that livelihoods of consumer merchants depend on practices of providing credit, asking for credit, and collecting money in economically and socially intelligent manners in the network (Viswanathan et al., 2010; Viswanathan et al., 2012). Exploratory learning helps to develop such knowledge.

The status quo of these markets changes when a much bigger opportunity becomes accessible. To seize that opportunity, providing the quality that buyers demand and developing the associated skills are essential. Exploitative learning is the learning mode that enables producers to seize the opportunity. Research in the development field has shown that when BoP producers get access to high-income markets, their livelihood performance increases (e.g., Arnould *et al*., 2009; Maertens *et al*., 2011; Van den Broeck and Maertens, 2017). According to our results the underlying mechanism is likely to be that BoP producers exploitatively learn, resulting in more advanced competencies. In rural areas where producer communities may be more dispersed, creating access to the right channels is however an

essential requirement to seize the opportunity. Exploring the network to find accessible connections is therefore also important, making exploratory learning a complementary learning mode. This extends research findings in development research showing that while integration with high-income markets increases farmers' incomes, connections may be lost over time without a clear reason (Rao et al, 2011).

As a final stage, a market may emerge in which multiple opportunities exist simultaneously. Here, both learning modes are again essential to create and sustain competitive advantage. Existing research on exploration and exploitation in high-income contexts generally finds positive outcomes of both learning modes. This suggests that firms need both exploitation and exploration to build a sustainable competitive advantage in environments that are dynamic in terms of customer preferences, technologies, and competition (e.g., Atuahene-Gima, 2005).

Practical implications

The findings of this study have implications for public policy makers and development organizations. First, the two sectors in which we conducted the study are selected by the Beninese government for their development and export potential. The selection is based on natural resource endowments (such as climate suitable for shrimps and shea butter) as well as by longstanding production and fishing traditions in the two sectors respectively. Reaping the benefits of the export potential comes, however, inevitably with the need to foster exploitation. This may be a break with the ways in which BoP producers are used to learning. Instead of exploring the buyers that provide the best conditions in terms of price negotiations, payments, social capital, etc., they now should focus their attention on a single buyer for whom they may have to make specific investments that come with risks for their livelihoods and those of their families.

Such a profound switch can't be expected to be made automatically. Development organizations, policymakers and/or procurement agents should therefore generate the right learning modes through field schools, marketplace literacy education (Viswanathan et al., 2021), and other educational techniques that make the advantages of a switch clearly visible. In particular, farming field schools usually aim to incorporate new farmers in global production systems focusing on practices to improve quality, safety, and sustainability. When not evident to farmers as how to connect to the traders to export markets, such education should also focus on the exploration of trading networks.

In addition, our findings warrant attention of a much broader scope of development workers and business model designers that aim to include BoP producers or intend to improve their livelihoods. The findings imply that the choice for a target market is essential, because the target market determines the standards, and the standards determine the learning mode required by BoP producers to succeed. If the aim of a project is to empower BoP producers and provide them with resources to succeed in their own way, projects should not hinder exploratory ways of improving marketplace literacy. Such projects may provide BoP producers with resources to search for attractive buyers that may help them to improve their business and subsequently their livelihoods (Babah Daouda et al 2019). In such projects, entrepreneurship is therefore central. If the project aims however at improving the livelihoods of BoP producers by creating market access to a market with higher levels of purchasing power for them, acknowledging the switch of learning modes is essential. In that situation, BoP producers should be trained to become reliable and profound suppliers to the company that offers the market access. Many of the skills and perhaps even personality characteristics that are required for programs that foster entrepreneurship are probably not necessary for such projects and possibly create opposite outcomes of what is intended. Noteworthy here is the

bottom-up approach taken in marketplace literacy education that is in tune with the exploratory approach of learning (Viswanathan et al., 2008).

Limitations And Future Research

The present study has several limitations that can be addressed in future research. First, our study focused on two sectors while the theory could in principle be studied on a larger set of sectors. Future research may conduct such a wider study, thereby also further developing the application of sets of emic and etic items in the context of subsistence marketplaces. Second, our study is limited in that it uses cross-sectional data. Future research may add to the robustness of the findings by testing the hypotheses with the help of longitudinal data.

Systematic comparison of subsistence marketplace sectors is hindered by the numerous other differences between the sectors, such as perishability of the product, and the geographic, cultural and language differences that are almost inherent to the heterogeneous context of subsistence marketplaces (Ingenbleek et al 2013; Viswanathan et al. 2009). Perhaps as a consequence, much of the existing literature on subsistence marketplaces is either qualitative, thus allowing a more holistic approach to the research phenomena or examining impact within a particular sector. To overcome this methodological challenge, this study used item-response theory (Hambleton and Swaminathan, 1985) to compare the two sectors. Future research can conduct more quantitative sector-wise comparisons by employing this technique, thus developing more cross-sector development insights.

Another issue that may be worth investigating is the consequences of connecting BoP producers with high-income markets, other than their livelihood performance. One particular issue is how communities are affected when their best catch and qualities are sold rather than consumed locally. Qualitative research may investigate for example whether consumers

perceive changes in the food they consume and whether and how this is connected with culture and traditions.

Finally, development scholars see access to high-income markets as an antecedent of livelihood performance. Our study shows that the marketplace learning modes have direct effects on the livelihood performance of BoP producers. Future research may therefore complement this study by examining the mediating effects of exploration and exploitation in the relationship between market access and livelihood performance.

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Figure 1

A respondent indicates her answer to a statement on a 10-point scale visualized with pebbles

in a study related to the one reported in this article.

Appendix 1: Construct items, loadings, and alpha's

Shrimp		**Shea butter**	
Exploitation			
Alpha = 0.92, eigenvalue = 6.923	Loadings	Alpha = 0.76, eigenvalue = 3.45	Loadings
Etic items			
I always think of how I can obtain the shrimp characteristics that my collectors want (e.g., freshness, completeness, attractive color).	.88	I always think of how I can achieve butter characteristics that my main customers can praise (e.g., fat and acid content, color)	.77
I do nothing to improve the attributes of the shrimp (e.g., freshness, completeness, attractive color) that I offer to the market (R).	.81	I do nothing to improve the characteristics of the butter (e.g., fat and acid content, color) that I offer to the market (R).	.67
I do not always fish for shrimp that my collectors want (R).	.86	I do not always process butter that can be sold to my main customers (R).	.65
If the fishing materials I have do not lead me to meet the characteristics of shrimps demanded by collectors, I am fast at changing them	dropped	If the processing techniques and tools I have do not lead me to meet the characteristics of butter demanded by my main customers, I am fast at changing them	dropped
Emic items			
I always use the best fishing materials to respond to the quality demands of collectors.	.83	I always pursue the recommended processing techniques to meet the	.82

Shrimp		Shea butter	
		quality of butter that can be sold to my main customers.	
The shrimp that I catch generally comply with the characteristics that my collectors want.	.82	If I have an idea to better meet the demands of my main buyers, I discuss it with my peers	dropped
I regularly ask my collectors whether they are satisfied.	.75	I regularly check whether my butter corresponds with what my main customers can buy	dropped
I discuss with knowledgeable people (e.g., friends, family members) the characteristics of shrimps demanded by collectors	dropped		

Exploration

Alpha = 0.88, eigenvalue = 4.021		**Alpha = 0.78; eigenvalue = 2.08**	
Etic items			
I actively try to determine which shrimp characteristics collectors may be willing to pay for in the future.	.76	I actively try to find out which butter characteristics my clients may be willing to pay for in the future.	.90
I regularly ask collectors about the shrimp characteristics that they expect to want in the future.	.80	I regularly question my clients on the butter characteristics that they expect to want in the future.	.82

Shrimp		Shea butter	
Emic items			
I know the trends that other collectors (potential collectors) see for the future of shrimp fishing.	.96	I always try to find out which butter characteristics my clients may be willing to pay for in the future.	.91
I regularly check what other collectors can tell me about the development of the shrimp market.	.67	Whenever I meet business men, I do not miss any chance to ask for new opportunities for my butter.	.41
I want to know what opportunities collectors see so that I can anticipate them.	.75	I actively look for contacts to discover new opportunities for my butter	dropped
I always try to find out which shrimp size collectors may be willing to pay extra for in the future	dropped	I am always eager to take part in any sessions or workshop on butter in order to identify any new opportunities	dropped

Livelihood performance

[Over the last 5 years…]

My household felt very rich

I invested in my children's education

I invested in properties in a town (e.g., house, shop)

I invested in properties in my village (e.g., flour mill, new house)

I diversified my [shrimp fishing/shea butter production] by investing in different activities (e.g., petty trading)

I grew crops in addition to my [shrimp fishing/shea butter production]