Thinking beyond collateral in value chain lending: access to bank credit for smallholder Vietnamese bamboo and cinnamon farmers

RESEARCH ARTICLE

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Abstract

Using case studies of the bamboo and cinnamon value chains in rural areas of northern Vietnam, this paper contributes to the existing literature by analyzing barriers and suggests conditions under which value chain lending would be an effective tool for improving smallholder farmers' access to credit. A mixed method using both in-depth interviews with relevant stakeholders and a two-stage Heckman model is employed to explain the existing credit gap. Findings show that in both chains, bank decision-making on lending is typically limited to individual chain actors instead of considering the whole chain. Commercial banks predominately use conventional lending approaches heavily dependent on collateral which typically results in a shortage of credit available to the chain actors. Value chain lending is constrained by weak chain linkages and limited ownership of private bank accounts. Drawing from these cases in Vietnam, the article concludes by arguing that *status quo* value chain lending in lower-income countries merits considerable rethinking. The lending approaches of banks require innovation to 'think beyond collateral' in improving chain cohesion. Multi-stakeholder partnerships are important for successful value chain lending. In addition, farmer-based unions have the potential to address issues of information asymmetry in the credit market.

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1. Introduction

Credit is a vital component of rural economic development in lower-income and transitioning economies. It can facilitate increases in investment, improve product quality, and enhance smallholder farmer's capacities to adapt to social, economic, and environmental change. As such, the availability of credit also directly correlates to more sustainable systems that promote food security (Navas-Alemán *et al.*, 2012). Credit enhances financial capacity, promotes innovation, and improves the performance of a value chain (USAID, 2012). Nonetheless, smallholder farmers and other key actors in agricultural value chains remain constrained by lower rates of access to credit. In turn, this limits their ability to invest in production and results in lower overall levels of food security (Devaux *et al.*, 2018; Weber, 2014).

The lack of collateral to secure loans explains credit access constraints (Bonnet and Cressy, 2016; Chandio *et al.*, 2017; Cowan *et al.*, 2015; Grant and MacNamara, 1996; Karlan and Morduch, 2010; Khoi and Gan, 2017; Ljumović *et al.*, 2015; Mwirigi *et al.*, 2019). This raises questions of how to design innovative approaches to replace requirements of hard collateral and link smallholder farmers to formal credit institutions. In a number of agricultural credit interventions, the application of the value chain approach in lending to smallholder farmers is seen as an efficient tool to improve their credit accessibility (Caniato *et al.*, 2016). Theoretically, this approach examines transactions along the entire chain to identify risks, assess the creditworthiness of actors, and analyze the flow of cash, products, and information to offer an appropriate set of financial products. Value chain lending involves farmers, companies, and banks in assessing credit need, and the repayment capacity of each actor and stage along a chain (Booker *et al.*, 2015). Wuyts and Wuyts-Fivavo (2007) showed that value chain lending considers the whole network with the participation of farmers, companies, and other non-market institutions to provide both credit and a comprehensive set of business services to better fulfill the demand of farmers. The lending approach supports farmers in easing access paths to credit and other complementary services, which theoretically in turn increases investment, productivity, and the quality and value of agricultural products (Dao The Anh *et al.*, 2016). Value chain development allows banks to increase the number of customers, reduce risks and transaction costs, and provide loans with lower interest rates (Ang, 2012). Additionally, value chain lending facilitates the collaboration between farmers and companies to attract financial capital from banks (Middelberg, 2017). In a value chain, companies not only purchase primary agricultural products, but also serve as guarantor to assists smallholder farmers in accessing formal credit (Joshi *et al.*, 2017). Although value chain lending has been pursued in a number of geographic contexts globally, evidence on barriers in value chain lending and the necessary conditions for successful value chain lending in similar situations in developing and emerging economies remains scarce (Marak and Pillai, 2019).

This gap is particularly relevant to Vietnam, where agriculture remains a dominant economic activity and production is largely operationalized by smallholder farmers. Furthermore, the country is currently transforming its farming sector from a subsistence to a more market-oriented system. In this regard, value chain development has been deemed an integral part of the national strategies that aim to link smallholder farmers to new markets and create opportunities for value-added farm products. However, smallholder farmers and attributed value chains in Vietnam are hindered by a limited access to credit, a lack of markets for their products, and inadequate risk management products and services (Marks, 2019). According to the GSO (2017), while agriculture remains a key economic activity and employs almost 40% of the population, only approximately 18% of bank lending goes to this sector. In terms of financial inclusion, only 14.6% of adults in Vietnam have savings, 31% have taken a loan, and 27% own a bank account.

In response to the shortage of finance for farming investment, the national government of Vietnam has issued a series of polices targeting farming credit. For example, Decree 116/2018/ND-CP regulates two main criteria for applied value chain lending: (1) companies and farmers in a value chain need to sign a coordination contract which will be submitted to banks for evaluation; and (2) both companies and farmers agree to open a common bank account and commit to collaborative financial transactions. As the government aims to expand credit lines, the analysis and evaluation of bottlenecks in value chain lending assumes tantamount importance.

This paper draws on both qualitative and quantitative methods to provide a detailed analysis of the prospects and barriers of value chain lending in the bamboo and cinnamon chains in Vietnam. As integral components of the Vietnamese medicinal plant and food industries, in theory the development of the bamboo and cinnamon sectors are expected to be boosted by access to credit. If this is the case, then there are potentially economic gains through value-added creation by smallholder farmers. As such, our analysis is guided by the following research questions:

1. What is the quality of linkages between farmers and companies in regard to contract farming and credit guarantee?
2. What are the financial issues and credit access barriers that key chain actors face?
3. Are banks actively participating in the value chain as collaborative actors to explore the flow of products, information, and finance to assist them in lending decisions?
4. How does credit expansion facilitate investment and improve value-adding for agricultural products?

Structurally, this paper is organized as follows. Following this introduction, the theoretical framework explores factors affecting access to credit at the farm level with an emphasis on the demand side, supply side, and the role of government in bridging the credit gap. The section also clarifies indicators reflecting the degree of linkages in the chain in product marketing and credit guarantee. It then describes the mixed analytical methods employed in this study that combined in-depth interviews and econometric modeling and to increase the reliability of results. Following this, the results and discussion situate the study in the context of two value chains in northwestern Vietnam. The paper concludes with specific points for targeted policy interventions to improve value chain lending in Vietnam and other developing economies.

2. Theoretical framework

2.1 Smallholder farmers' borrowing motivation to access credit

According to the UNIDO (2009), a value chain is defined as a series of activities through which stakeholders along the chain collaborate to produce and deliver products and services to the end customer. When farmers, companies, and other chain actors collaborate, the risks facing each individual actor is minimized. The development of sustainable value chains often starts with final consumers determining the chains existence and manifestation. Additionally, leading companies also require that products and services obtained from their suppliers exceed specific quality and quantity parameters. However, limited access to credit services is a substantial barrier for smallholder farmers, and limits their ability to supply these leading companies with products that meet those parameters (Hewitt *et al.*, 2018). For this reason, the improvement of access for smallholder farmers to reliable and reasonable credit is crucial. Indeed, value chain development is seen as an efficient method to economically intervene to improve the value-adding of agricultural products and income for farmers (Devaux *et al.*, 2018; Pietrobelli and Staritz, 2018).

2.2 Access to credit from the perspective of the supply side

Although value chain development supports banks in expanding their market, the provision of credit lines depends heavily on chain innovations and the lending approaches of banks (Oberholster *et al.,* 2015; Swinnen and Kuijpers, 2017). The role of banks is to design suitable credit packages that satisfy the financial need of chain actors. However, the competitive pressure in capital mobilization might force banks to raise deposit rates. To be profitable, banks require higher lending rates, implying greater costs for borrowers. Kopparthi and Kagabo (2012) suggest that the credit supply for agricultural value chains depends on the availability of collateral and reliable information on borrowers as well as the level of transaction costs. Generally, commercial banks prefer lending to smallholder farmers associated with the value chains of companies and cooperatives as these tend to strengthen the financial situation of farmers, and by inference, their ability to satisfy loan repayment obligations (Birthal *et al.*, 2017). Furthermore, lending decisions also depend on business strategy, the banking administrative system, and the bank's capacity to assess the borrowers' creditworthiness.

2.3 Access to credit from the perspective of the demand side

Typically, actors along a chain use collateral such as their assets in forms of land, machinery, and facilities to secure loans (Cowan *et al.*, 2015). In Vietnam, forest land is also an important asset in securing bank loans, generating income, and maintaining the livelihoods of rural households (Trædal and Vedeld, 2018). Kemper *et al.* (2015) concluded that property rights on forest land link households in Vietnam with access to credit. More specifically, it constructs a form of collateral, which encourages banks to lend as they would have a means to recuperate their losses in the case of default.

Other factors considered by lending institutions include the education level, business qualifications, farm size, amount of income, and the feasibility of credit use plans of the borrower (Cole and Sokolyk, 2016; Nikaido *et al.*, 2015; Shete and Garcia, 2011) Although borrowers often demand larger credit amounts to meet investment needs and reduce costs per loan, a credit gap exists when credit institutions apply credit limiting policies (i.e. the lending amount is worth less than the value of collateral). Credit rationing, according to Lee *et al.* (2015), is caused by the fragmentation of farm land, poor infrastructure, high transaction costs, and the lack of insurance products. Although collateral is needed to secure a loan, the risk of default may occur due to the problems of information asymmetry in credit markets (Niinimäki, 2018).

Considering the chain as a whole, the trust between actors and the degree of certainty regarding beneficial outcomes might replace hard collateral and facilitate credit access. When reputable buyers serve as a guarantor, even small producers might become attractive customers for credit institutions (Kopparthi and Kagabo, 2012). The duration of a business relationship between actors might be relevant to the trust and the level of information sharing which are crucial in enhancing the bank's assessment of value chain performance. Long-term relationships often reflect trust which serves as a precondition for lowering transaction costs. In a value chain, sales contracts and products can also be used as collateral to secure loans. Huong *et al.* (2017) emphasized the role of leading companies in improving the performance of agricultural value chains. If companies collaborate with farmers through contract farming, market risks can be reduced while farming investment increased. Another form of linkage are prepayments made to farmers, which strengthens chain linkages and reflects the ability of the chain's leading company to access and capture the cash flow of farmers (Hermes *et al.*, 2016).

2.4 Access to credit from the perspective of the government

Government serves an important role in providing market information and upgrading the rural infrastructure crucial to relaxing barriers to investment (Zander, 2016). Government can also guarantee unsecured loans and disburse subsidized credit to low-income farmers through farmer-based organizations (Trienekens, 2011). It may also help to construct the platform needed to capture reliable information regarding production and business performance which are essential to assessing loan applications (Hung, 2017). Governmental actions on monetary policy, credit guarantee, regulations on lending procedures, credit subsidies, and re-insurance all affect value chain lending. Furthermore, top-down provisioning of collateral-free credit can pressure banks to improve their capacity in assessing the creditworthiness of chain actors.

In summary, the literature confirms the vital role of credit in developing value chains and identifying barriers affecting access to it. Studies have illustrated that access to credit on the farm level depends on factors such as its endowments, the extent of chain linkages, government policies, and the lending approaches of banks.

The conceptual framework for this study is depicted in Figure 1. It is based on an assumption that credit fulfills financial needs and improves farming efficiency and quality of chain products. In turn, this increases income for farmers and promotes the development of rural communities.
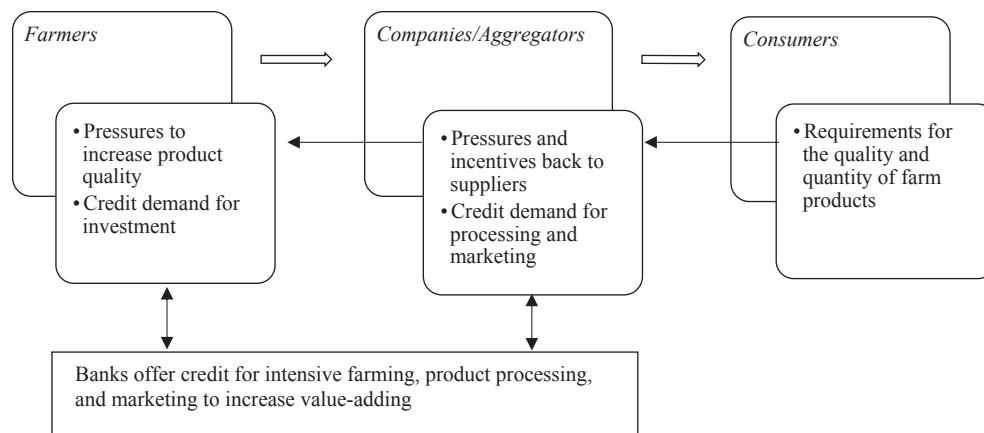
Figure 1. Conceptual framework of the study (adapted from Seuring and Müller, 2008).

The development of agricultural value chains also encourages credit institutions to develop appropriate credit lines to meet the financial needs of the actors along the chain. As a result, agricultural credit can be expanded and a more sustainable development of the farming sector achieved.

3. A multi-stage sampling method and in-depth interviews applied to collect primary data

Northwestern Vietnam is the poorest region of the country with a poverty rate of 31.24% (GSO, 2017). Of the country's 54 officially recognized ethnic minority groups, 30 are primarily located in the region. Ethnic minority communities have tended to benefit less from the national socio-economic development compared with the Kinh (i.e. Vietnamese) ethnic communities (Cuong *et al.*, 2015). The high rates of regional poverty are partially explained by a lack of capital, the difficult mountainous terrain, and limited access to markets (Lua *et al.*, 2013). Although farming comprises a main livelihood, the small and fragmented nature of fields limits larger-scale specialization or agglomeration. Yen *et al.* (2013) argue that a lack of financial capital, land degradation and fragmentation, and limited technological applications combine to limit productivity in the region. As such, connecting smallholder farmers to the market through value chain development is seen as a potential new approach for reducing poverty and promoting regional sustainable agricultural and community development.

Local government has recognized the contribution of bamboo shoots and cinnamon products in the development of the pharmaceutical and food industries. Booker *et al.* (2012) indicated that the safe supply of herbal medicines is valuable to human healthcare. Products made from cinnamon such as oil and bark are used as spices and in traditional medicines to control blood pressure, inhibit tumor growth, combat diabetes, improve inflammation, and reduce symptoms of rheumatoid arthritis (Shishehbor *et al.*, in press). The nutritional composition of cinnamon products contains a number of vitamins and minerals widely used in the food industry. Bamboo shoots provide precious food sources to treat obesity, digestion, and remove sputum (Nirmala *et al.*, 2018). In the context of northwestern Vietnam, the planting of Bat Do bamboo shoots helps increase vegetation coverage, mitigate natural disasters, prevent soil erosion, promote economic development, and reduce poverty for the ethnic minority populations (Tinh, 2017). The value chains of bamboo and cinnamon were selected as comparative case studies to examine the consistency of value chain lending barriers across different socio-economic regions.

Primary data for this study was collected between August 2017 and March 2018. A multistage sampling procedure was applied to a farm survey. In the first stage, the four districts of Van Yen, Van Chan, Tran Yen, and Luc Yen of Yen Bai Province (Figure 2) were intentionally selected due to their main production of bamboo and cinnamon under relatively favorable climatic conditions. The three districts of Van Yen,
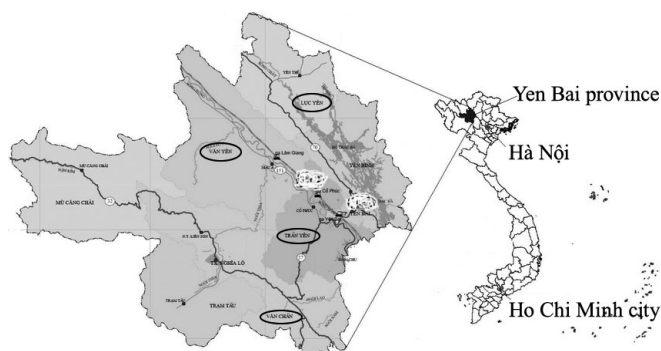
Figure 2. Map of the research area.

Van Chan, and Tran Yen cover 27,600 hectares, which comprise 92% of Yen Bai Province's total cinnamon production area (GSO, 2017). Luc Yen has 620.80 hectares under Bat Do bamboo, or nearly 25% of the province's total bamboo area.

In the second stage, 54 villages from 18 communes with highly varying ecological conditions and levels of market accessibility, but still with high densities of bamboo and cinnamon production, were selected. Finally, approximately 8-16 farmers in each village were randomly selected for interviews, contributing to a representative total of 163 bamboo and 548 cinnamon farmers. Prior to the interviews, the enumerators were trained and a pre-test was conducted to increase the appropriateness of the questionnaires and the consistency of data regarding farmers' endowments and access to formal credit.

In order to explore the credit supply constraints, this study further conducted in-depth interviews with leaders of district branches in four locations of the Bank for Agriculture and Rural Development and the Social Policy Bank. The content of these interviews focused on three main issues: (1) the availability of credit lines and lending conditions; (2) the empirical application of value chain lending; and (3) the recommendation of those banks for improving lending in local value chains. In order to investigate the role of governmental agencies in bridging gaps in the supply and demand for credit, in-depth interviews with leaders of the district Agricultural Service Centers, women's unions, farmer's unions, and the People's Committees at local communes were also conducted. Finally, additional interviews with companies and cooperatives further explored the chain performance and linkages between contract farming and credit guarantee. These interviews added qualitative depth, nuance, and interpretation to the results of the quantitative analysis. Table 1 shows an overview of the interviewed actors.

Table 1. Types of value chain actors that were interviewed and sample sizes.

Key actors	Value chain		Sample size
	Bamboo	**Cinnamon**	
Total interviews	177	615	792
Smallholder farmers	163	548	711
Companies	1	9	10
Cooperatives	1	4	5
Vietnam Bank for Agriculture and Rural Development	1	3	4
Vietnam Bank for Social Policy	1	3	4
Center of Agricultural Services	1	3	4
Women's Unions	3	15	18
Farmer's Unions	3	15	18
Commune People's Committees	3	15	18

4. Results

4.1. A brief description of the two value chains

The value chain in the production of bamboo shoots and cinnamon includes various stages (Figures 3 and 4). Smallholder farmers are the first actors and produce the primary farm products sold on to aggregators and companies. Farm sizes average 0.34 ha for bamboo and 2.08 ha for cinnamon. The source of varieties cultivated is mainly from materials developed on farm or supplied by local firms certified by the Department of Agriculture and Rural Development. Family and paid local labor conduct the majority of the farm activities. One characteristic common to both value chains is the use of labor-intensive technology in the form of simple hand-operated machines at the farm level. For example, compost made from the by-products of livestock production are used in combination with chemical fertilizers. Commodity prices are determined by verbal agreement between farmers and collectors and transactions are made in cash without receipts. The cash payments limit the control and documentation of the transaction, and reduce more formalized financial linkages between farmers and firms.

It was observed that the flow of the product in the cinnamon value chain is less complicated than the bamboo chain as it initially occurs in a specialized area with a large annual production harvested in March and August. Nonetheless, with the mountainous terrain and inconvenient transportation networks, aggregators are needed to collect and transport the cinnamon products for primary processing at factories. Depending on the product quality, the price of bark ranges from US\$[1]1.59 to \$1.72/kg and the price of fresh leaves ranges from \$0.095 to 0.112/kg. At present, dried cinnamon bark and crude oil are mainly exported to India, Sri Lanka, and China. To export directly to the more lucrative markets of Japan, the EU, and the USA, improvements in the processing technologies are essential to meet the higher demanded quality parameters.

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[1] Vietnamese dong were converted to \$ at a rate of 1 VND to 0.00004 USD.
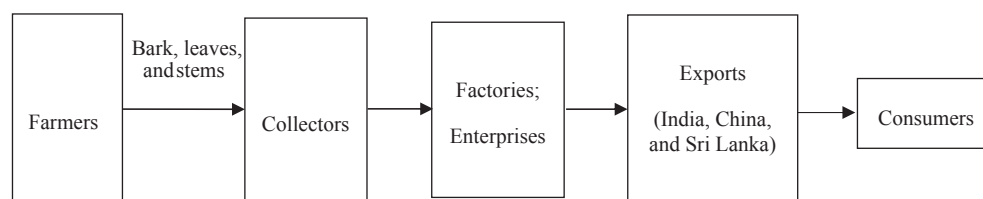

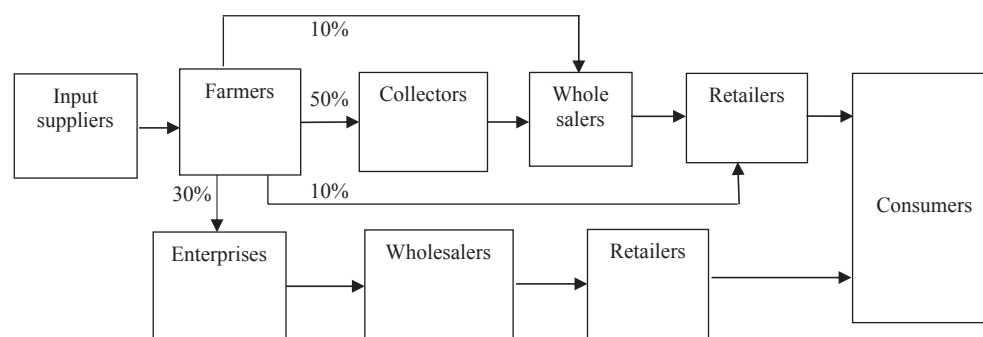**Figure 3.** Cinnamon value chain.

Figure 4. Bamboo value chain.

The bamboo chain is much more diversified than the cinnamon chain. Bat Do bamboo shoots are harvested annually between July and September. The average productivity of fresh bamboo shoots reaches around 40 kg/cluster (and 500 clusters/ha). The majority of bamboo products are collected by aggregators with verbal agreements with farmers as to the quantity and price. The average selling price of bamboo shoots ranges from $0.151 to $0.172/kg depending on the season. There are currently three channels of bamboo distribution. Collectors comprise 50% of the total output, the Yen Thanh Ltd. and Minh Son cooperatives represent 30% (which they then process and export to Japan and Taiwan), and remaining 20% is sold in local markets. Table 2 depicts the income for farmers by value chain.

According to Ahearn *et al.* (2018), smallholder farmers in a food value chain need to be profitable to sustain the overall performance of the chain. In the case of farming efficiency in the production of cinnamon, after the initial 4-year pre-harvest stage, farmers are able to harvest bark from the fifth to the twentieth year. Taking the entire cycle and all harvested productions into consideration, the total average income is estimated at $411/month/ha. Similarly, after the initial 2-year pre-harvest stage, bamboo farmers can harvest shoots from the third year to the tenth year with an average income of $85/month/ha, or only about 20% that of cinnamon. From the 10th year, farmers remove old trees and retain some seedlings to maintain income for the family. Such sources of income are crucial for smallholders to continue to participate in value chains.

Aggregators and associated companies maintain quality requirements for bamboo and cinnamon products. For example, bamboo shoots should not be crushed and their length should be greater than 35 centimeters and with a diameter greater than 5 cm. Cinnamon bark should have a yellow color, be thick, spicy, and neither moldy nor oily. Fresh leaves should be green with no pest damage or chemical residues. Dried leaves need to be yellow in color. High quality cinnamon stems need to be large, straight, and without stem borer or other insect damage. This myriad of requirements pressures farmers to increase investment to meet the quality and quantity requirements of bamboo and cinnamon demanded by the market.

4.2. Main characteristics of smallholder farmers in the two value chains

The farmers in this study were generally of working age and with a secondary school education. Around 70% were ethnic minorities belonging to groups such as the Dao, Nung, and Tay peoples. A very small percentage of these farmers belonged to a cooperative, reflecting the limited role of these organizations in connecting smallholder farmers to market through contract farming. Additionally, the lower coverage of cooperatives increases the difficulty of organizing training courses and disseminating knowledge to farmers. Although some farmers received technical training on farming activities, no training courses are available on financial management, cash flow management, or the preparation of loan use planning for using credit and business accounting. A summary of the main characteristics of farmers is included in Table 3.

Table 2. Income for farmers per ha.

Type of value chain Product	Yield	Unit price (US$)	Revenue (US$)	Income (US$) Cycle[1]	1 year	1 month
Cinnamon						
Leaves (1000 kg)	410	0.086	35,260	-	-	-
Stem (m^3)	300	120.68	36,204	-	-	-
Bark (1000 kg)	40	0.689	27,560	-	-	-
Total			99,024 (-5,625)[2]	93,399	4,669.95	389.16
Bamboo						
Fresh bamboo shoots (1000 kg)	129	0.172	22,188 (-12,671.4)[3]	9,516.6	951.66	73.31

[1] 20 years for cinnamon and 10 years for bamboo.

[2] Total costs (20 years).

[3] Total costs (10 years).

Table 3. Main characteristics of farmers in this study (based on household surveys and in-depth interviews with agricultural extension station staff).

Variables	Variable code	Measurement unit	Value chains	
			Cinnamon	**Bamboo**
1. Farmer's characteristics				
Age of the household heads	AGEHH	years	44.43	47.18
Education of the household head	EDUHH	(years of schooling)	6.53	6.77
Ethnicity of household head (1 = the Kinh majority; 0 = ethnic minorities)	ETHNICITY	%	0.71	0.63
Share of farmers using a mobile phone	-	%	100	99
Share of farmers using a smart phone	-	%	80	70
2. Farm household's characteristics				
Average family size	SIZEHH	Persons	4.64	4.85
Average laborers	LABOHH	Laborers	2.70	2.82
Household's ownership of a bank account (1 = yes)	ACCOUNT	%	13	3.75
Households with access to agricultural insurance (1 = yes)	-	%	0	0
Share of households need credit	-	%	78.10	86.89
Household's membership in a cooperative (1 = yes)	-	%	2	0
Share of households with access to agricultural training programs (1 = yes)	TRAINNING	%	17	19
Households' membership in a women's union or farmer's union	UNION	%	23	47
Share of households with organic farming certificate (1 = yes)	ORGANIC	%	9	0
Share of households with contract farming	-	%	0	0
Share of households which receive prepayment from buyers	PREPAYMENT	%	33	3
Distance from households to the district center	DISTANCE	km	21.80	21.13
Share of farm income in total family income	-	%	55	21.57
Average farm size	FARMSIZE	hectares	2.08	0.34
Average age of the cinnamon or bamboo hills	TREEAGE	years	Not available	4.29

Descriptive statistics also indicate that 23% of cinnamon and 47% of bamboo farmers hold memberships in women's or farmer's unions which act as trustees for banks in providing credit to smallholder farmers. These local unions are able to evaluate the creditworthiness of farmers and address the problems of asymmetric information in credit markets. Membership in such social groups also assists farmers in developing social capital, thereby promoting their access to credit information.

4.3 Motivation and barriers to credit access by key chain actors

■ *The current financial situation and demand for investment of smallholder farmers*

The average investment cost of 1 ha for Bat Do bamboo shoots in the pre-harvest stage is $2,122.67 and $2,909.25 for cinnamon. In both value chains, the personal capital investment of farmers met less than 50% of the total investment needs. Farmers require credit to purchase fertilizer and seedlings, employ workers for harvest, and process bamboo shoots and dry cinnamon barks to fulfill the quality requirements of aggregators and companies. These investment costs are summarized in Table 4.

Table 4. Investment costs per ha in the pre-harvest stage at farm level (based on interviews with farmers and extension centers).

Investment content	Bamboo		Cinnamon	
	Amount (US$)	Share (%)	Amount (US$)	Share (%)
Total costs in the pre-harvest stage[1]	2,122.67	100	2,909.25	100
Of which:				
Personal capital	1,011.13	47.63	1,569.27	53.94
Credit	996.90	46.97	1,339.98	46.06
Government subsidies in terms of seedlings and fertilizer	114.64	5.40	0	0

[1] 3 years for bamboo and 4 years for cinnamon.

■ *Actual access to credit by key chain actors and loan characteristics*

In both chains, although around 80% of farmers needed credit, but only 53% of bamboo and 51.64% of cinnamon producers were successfully able to apply for it. In contrast, all cooperatives and businesses surveyed successfully applied for credit. The Vietnam Bank for Social Policies (VBSP) and the Vietnam Bank for Agriculture and Rural Development (VBARD) are the two main formal credit suppliers in the research area. While the VBARD is a commercial bank which charges a market interest rate, VBSP receives subsidies from the government to provide low-income farmers with a discounted rate. VBARD relies heavily on collateral assets and feasible credit use plans to assess a loan application. Their loan officers typically visit farms, companies, and cooperatives to evaluate their creditworthiness before loans are provided. On the other hand, VBSP provides collateral-free loans disbursed through local women's unions with the guarantee of the Commune People's Committee. Farmers in these groups monitor credit use to ensure timely repayment by their members. The demand and actual access to credit by value chain are shown in Table 5.

In terms of credit use, companies and cooperatives need short-term loans to bridge the temporal mismatch between the high expense for buying the products of farmers at the time of harvest and the returns from their later sale. Credit is also needed to improve processing machines which help to extract cinnamon oil for direct export to Japan, the EU, and the USA. Bamboo companies require credit to build warehousing and purchase cold storage facilities to generate more robust and regular cash flows. Due to the longer cycles typical of forestry production, farmers need longer-term credit. Table 6 lists various credit characteristics by value chain.

One common characteristic is that credit amounts are smaller than the amount requested by borrowers. VBARD applied a credit rationing policy that limits the amount of credit to be less than 70% of the value of fixed assets. On the other hand, the subsided VBSP limits the maximum amount of credit to be less than

Table 5. Demand and actual access to credit by value chain.[1]

Credit status	Bamboo			Cinnamon		
	Households (n=163)	Companies (n=1)	Cooperatives (n=1)	Households (n=548)	Companies (n=9)	Cooperatives (n=4)
1. Applied and received credit	87 (53)	1 (100)	1 (100)	283 (51.64)	9 (100)	4 (100)
2. No demand for credit	33 (20)	0 (0)	0 (0)	120 (21.90)	0 (0)	0 (0)
3. Discouraged applicants	53 (27)	0 (0)	0 (0)	139 (25.36)	0 (0)	0 (0)

[1] The numbers in brackets represent the share of total surveyed households, cooperatives, and enterprises (%).

Table 6. Credit characteristics by value chain.

Credit characteristics	Bamboo			Cinnamon		
	Farmers (n=87)	Companies (n=1)	Cooperative (n=1)	Farmers (n=283)	Companies (n=9)	Cooperatives (n=1)
1. Number of loans	1	1	1	1	1	1
2. Credit amount (US$)	1,868.81	172,440.01	21,555	2,044.27	222,447.60	153,040.50
3. Monthly interest rate (%)	0.67	0.82	0.75	0.72	0.82	0.75
4. Duration (years)	4.02	0.5	3.0	3.58	1.13	2.0
5. Collateral requirement (% of credit recipients)	37	100	100	19	100	100
6. Loan guaranteed by the commune level of the People's Committees (% of credit recipients)	59.77	-	-	77.73	-	-
7. Waiting duration for credit (days)	7.89	-	-	7.78	-	-
8. Fulfillment of the credit amount demanded (%)	63.19	40	50	80.01	44.28	43.03
9. Share of credit amount in total farm income or firms' revenue (%)[2]	34.45	8.01	3.33	56.45	10.32	25.80
10. Credit sources	VBSP, VBARD	VBARD	VBARD	VBSP, VBARD	VBARD	VBARD

[1] VBSP: Vietnam Bank for Social Policies, VBARD: Vietnam Bank for Agriculture and Rural Development.

[2] Calculated by taking the credit amount received divided by the credit amount registered.

$2,155.50 per loan due to the limited governmental budget. Another barrier to expanding credit is the lack of effective credit use plans in order to convince banks to approve loan applications.

4.4. Chain linkages and other barriers to value chain lending

■ *The extent of chain linkages*

According to Gramzow *et al.* (2018), the linkage between farmers and cooperatives creates trust which improves the selling power for smallholder farmers. As such, contract-farming with leading enterprises enhances formal quality control systems and reduces risks. However, this study found the relationship between companies and farmers regarding the selling of products was more opportunistic rather than long-term collaborative in nature. In both chains, aggregators and companies buy products from farmers through verbal agreements. Contract farming and risk sharing are not available for farmers to be used as collateral to secure loans from banks. The weak long-termer relationship between actors makes it difficult to gain awareness of their needs. Products in the chain such as bamboo shoots and cinnamon leaves, stem, or bark are not accepted by the bank as collateral due to the difficulty in their liquidation in the case of default. Bamboo farmers have almost no prepayment from buyers, but a portion of cinnamon farmers receives prepayment from aggregators and companies (Table 7).

This study found no formalized channel of information distribution for the discussion of farm credit issues (e.g. regular meetings or a digital platform). Banks are not actively participating in either chain as actors nor exploring the flow of products and information within value chains to expand lending opportunities.

Table 7. Trust indicators within the value chain (based on household surveys and in-depth interviews with cooperatives and firms).

Trust indicators	Value chains	
	Bamboo	**Cinnamon**
Duration of the business relation between farmers and known aggregators or companies (years)	3.42	4.39
Number of collectors farmers know and can sell their products	2.28	4.64
Share of farmers with the guarantee from companies to borrow from banks (% of farmers)	0	0
Share of farmers with prepayment from aggregators or companies (%)	0	33
Share of farmers with contract farming (%)	0	0
Share of farmers who offer products, contracts, and bills to banks as collateral (%)	0	0
Share of payment modes in cash between farmers and firms (% payments)	100	86.81

■ *Other barriers for value chain lending and expected policy interventions*

In addition to lack of credit, farmers mentioned the uncertainty of the output market as a major obstacle in their agribusiness development. To this, the local terrain makes it difficult for farmers and companies to use machines to harvest agricultural products. Poor transportation networks also result in the difficulty of collecting and transporting production. Instead, intermediaries are required and the flow of products and information in the value chains become more complex. This, in turn, leads to higher transaction costs.

Agricultural risks remain a formable challenge for smallholder farmers in both chains. Pests, drought, and plant necrosis affect the return on investment. Although agricultural insurance activities have been piloted in 12 of 64 Vietnamese provinces, including in Yen Bai Province, intended results are constrained due to high intensity of risks and the mismatch between the insurance demand and supply. In addition, a policy of loan re-insurance to encourage banks to disburse full credit that is backed by government is unavailable.

In order to improve farm efficiency, a more supporting role adapted by the government is crucial to enhancing farmers' capacity. Farmers need training in cash flow management, accounting skills, and accessing market information. Credit amounts should be expanded to meet the investment needs, while reducing the administrative procedures and interest rates. Asante-Addo *et al.* (2017) suggest that equipping farmers with technical knowledge, financial management, and the capacity building of farmer-based organizations helps smallholder farmers access and use credit more effectively. The results of this study support those conclusions. Table 8 compares the expected policy interventions of smallholder farmers in the two value chains.

Table 8. Expected policy interventions of smallholder farmers (based on farm surveys).

Expected assistance by smallholder farmers	Bamboo (n=163)		Cinnamon (n=548)	
	Share (%)	**Rank**	**Share (%)**	**Rank**
Cash flow management	100	1	100	1
Profit estimation knowledge	100	1	100	1
Output market information	97.76	2	95.26	2
Expanded credit lines	89.38	3	90.10	3
Timely loan disbursement	78.16	4	80.27	4
Discounted interest rates	71.26	5	80.21	5

4.5. Relaxing credit access constraints to improve value-adding for products at the farm level

■ *A Heckman two-stage model*

To analyze credit access barriers and the association between credit amounts and value-adding at the farm level, a Heckman two-stage model was applied. The first stage used a Probit model to examine determinants of smallholder farmers' access to credit. Theoretically, farmers' access to credit is a function of their endowments and is written as follows:

$$E_{ij} = f(\text{farmers' endowments}) = Z_{ij}\gamma_{ij} + u_{ij} \tag{1}$$

In which E_{ij} is the ability to access to credit; Z_{ij} are the variables representing the endowments; γ_{ij} are the coefficients to be estimated to reflect the association between endowments and access to credit; and u_{ij} is the random error of the estimated model (1).

Empirically, farmers decide to borrow if their expected benefits from using credit outweigh the costs and risks. E_{ij}^* is the expected benefit of using a loan.

$$E_{ij}^* = B_{ij} - C_{ij} \tag{2}$$

In which B_{ij} is the credit use benefit and C_{ij} is the cost of credit access. In fact, E_{ij}^* is expressed through the actual borrowing of households and is defined through the E_{ij} index as follows:

$$E_{ij} = 1 \text{ if } E_{ij}^* > 0 \text{ farm households have access to credit, 0 otherwise} \tag{3}$$

The dependent variable in model (1) is therefore a binary variable, and the estimation of this model should be executed by the Probit model using a maximum livelihood method (Norton and Dowd, 2018).

The second stage used an OLS model to examine the effect of credit amounts on the value-adding of agricultural products. This relationship can be written in model (4) as follows:

$$VA_{ij} = \beta X_{ij} + \alpha L_{ij} + \varepsilon_{ij} \tag{4}$$

Where VA_{ij} is the value-adding of farm products, X_{ij} are observed variables relating to the i'th farmers' endowments, L_{ij} represents loan amount, and ε_{ij} is an error term.

The key problem in this regression model (4) relates to a sample selection bias due to two issues: (1) it is impossible to observe all characteristics for farmers with access to credit for the population as a whole; and (2) farmers with access to credit may have more incentives to invest and improve the value for products than those not in the credit market would have. To solve this bias, the Inverse Mills Ratio estimated from model (1) is included (Heckman and Vytlacil, 2001; Wang and Hanna, 2018). Technically, the ratio is computed using the following equation:

$$\text{Mills Ratio } (\lambda_{ij}) = \frac{\Psi(Z_{ij}\gamma' / \sigma_0)}{\Phi(Z_{ij}\gamma' / \sigma_0)} \tag{5}$$

Where: $\Psi(.)$ is the probability density function of a standard normal distribution and $\Phi(.)$ is the relevant cumulative distribution.

Model (4) is later developed in model (6) as follows:

$$VA_{ij} = \beta X_{ij} + \alpha L_{ij} + \delta_{ij}\lambda_{ij} + \varepsilon_{ij} \tag{6}$$

To support the explanation of estimated coefficients, in-depth interviews with relevant stakeholders such as farmers, firms, banks, and governmental agencies were conducted.

■ *The factors affecting smallholder farmers' access to credit and the effect of credit expansion on value-adding*

This section presents the results of the two-stage Heckman model estimation. As seen in Table 9, statistics such Wald Chi^2 (8), Wald Chi^2 (9) show that the full models are more appropriate compared to models with only the intercept. Selection bias problems are present in both bamboo and cinnamon value-added models because Inverse Mill's Ratios (λ) are statistically significant at 5%.

The estimation results show that farmers' membership in women's or farmer's unions is significant in explaining access to credit by both bamboo and cinnamon smallholder farmers. This result is explained by the fact that local unions support banks in screening borrowers and assist farmers in preparing credit use plans. Unions also assist banks in supervising actual credit use by farmers and in collecting principals and determining interest rates. This collaboration benefits banks by reducing administrative procedures and minimizing transaction costs. This result is also supported by the findings of Tra and Lensink (2008), who indicate that membership in local associations support smallholder farmers access to credit.

The distance from the farm to the district center is also meaningful in explaining access to credit. In the bamboo production region for example, the bank branches and market points are mainly concentrated in the district center. The further a farm is located from that center, the lower the possibility its owners have access to credit. In the case of cinnamon farmers, in-depth interviews revealed that local banks prefer lending to borrowers with a bank account to better control the cash flow of borrowers. In addition, studies elsewhere have shown that financial transactions through the banking system can improve the well-being of smallholder farmers (Dupas *et al.*, 2017). Another, perhaps simpler explanation is also feasible. A cinnamon farmer who owns a bank account likely has a higher income, an important indicator of creditworthiness.

In the second stage of the Heckman two-stage model the variable of most interest is the credit amounts, which is included with control variables representing farm endowments. Cinnamon farming provides the main income for farmers and most of the farms' endowments are used for the cinnamon agribusiness. It is therefore variables such as age of household head, family size, number of laborers, farmer's education, and farm size that all have a positive impact on adding value to the harvest. In case of the bamboo, farm size and bamboo age were important factors explaining the value-adding of shoots.

Regression results further show that the credit amounts have a positive impact on the value-adding of both bamboo and cinnamon products. However, only the coefficient of this variable in the case of bamboo shoot chains is statistically significant at the 10% level. In-depth interviews conducted with farmers show that the credit amount better fulfills the needs of bamboo farmers compared to those of cinnamon. The investment cost per hectare for the bamboo pre-harvest stage is lower than that of cinnamon. According to farmers, credit amounts in case of cinnamon production are insufficient to make a substantial influence on its farming.

On the supply side, banks have not engaged with the chains in a manner sufficient to explore the creditworthiness of farmers to provide full credit. Banks mainly rely on the value of collateral in form of residential land and fixed assets to decide the maximum amount of credit disbursed. Due to the shortage of credit, about 33% of farmers received prepayment from companies to finance cultivation and harvesting activities. However, the financial dependence on companies makes smallholder farmers less able to decide cinnamon prices. This conclusion is in line with findings of Bauchet and Morduch (2013), who showed that small loans do not have a significant impact on agricultural returns. For this reason, increasing access to credit also means its expansion to the highest possible amounts. Another factor to explain the limited role of credit is due to the poor transportation network, which imposes higher costs of using credit.

Table 9. Effects of formal credit on the value-adding of bamboo and cinnamon products at the farm household level (Heckman model).[1,2,3]

Explanatory variables	Bamboo				Cinnamon			
	Credit access		Value-added		Credit access		Value-added	
	Coef.	Z	Coef.	Z	Coef.	Z	Coef.	Z
EDUHH	-0.1590 (0.22391)	-0.71	0.0023 (0.08652)	0.03	0.0085 (0.08852)	0.10	0.1800*** 0.05614	3.21
AGEHH	0.2492 (0.60813)	0.41	-0.0395 (0.22763)	-0.17	-0.3388 (0.27520)	-1.23	0.55059*** 0.1701	3.24
SIZEHH	0.0582 (0.46173)	0.13	0.2053 (0.17130)	1.20	0.3325 (0.23752)	1.40	-0.2976** 0.14061	-2.12
ETHNICITY	0.0852 (0.30258)	0.28	0.0423 (0.12865)	0.33			-0.1772* 0.09472	-1.87
LABOHH	-0.1496 (0.36961)	-0.40	0.0779 (0.15218)	0.51	-0.3475 0.21112	-1.65	0.4459*** 0.12609	3.54
TREEAGE	-	-	0.2350* (0.12134)	1.94	-	-	-	-
FARMSIZE	-	-	0.3600*** (0.04934)	7.30	-	-	0.1483*** 0.04973	2.98
DISTANCE	-1.6865*** (0.50286)	-3.35	-	-	-0.0438 0.11042	-0.40		
ACCOUNT	1.0318 (0.78211)	1.32	-	-	0.8578*** 0.19176	4.47	0.5567 (0.10652)	5.23
TRAINNING	-0.6116 (0.39815)	-1.54	-	-	0.1389 0.17660	0.79	-	-
UNION	2.2461*** (0.29837)	7.53	-	-	2.8268*** (0.38883)	7.27	-	-
PREPAYMENT	-	-	-	-	-0.1600 (0.13803)	-1.16	-	-
OGANIC	-	-	-	-	-	-	-0.0781 (0.13887)	-0.56
CREDIT AMOUNT	-	-	0.1790* (0.09351)	1.91	-	-	0.0231 (0.04951)	0.47
Intercept	3.7642 (3.24362)	1.16	0.7052 (0.95292)	0.74	0.8930 (1.16663)	0.77	-	-
IMR or λ	-	-2.01	-0.20992** (0.10466)	-2.01	-	-	0.1551** (0.07790)	1.99
Number of observations	162	-	-	-	-	548	-	-
Wald Chi^2 (8)	72.79							
Wald Chi^2 (9)						88.48		
Prob>Chi^2	0.0000					0.0000		
Rho			-0.4390				0.2379	
Sigma			0.4781				0.6517	

[1] Based on household surveys with the support of Stata statistical software. Explanatory variables: abbreviations see Table 3.

[2] Robust standard error in bracket; ***$P<0.001$; **$P<0.05$; *$P<0.1$.

[3] All continuous variables are taken natural logarithm (ln).

5. Discussion

The results in this study have important policy implications. The two cases illustrate barriers and conditions for value chain lending in Vietnam and allow for the positing of recommendations for industries in similar situations in other lower-income economies. A lack of basic collateral speaks to the necessity of revising the legal system to allow small farmers to use their assets on land as collateral. Poulton *et al.* (2010) highlight that the lack of secure land tenure makes it difficult to access credit. Another constraint of value chain lending is due to weak coordination between smallholders and companies. In this study, companies and cooperatives were found not to guarantee farmers for taking credit from banks because they also lacked credit. As a result, credit rationing persists due to overarching patterns of a lack of collateral and guarantor (Sackey, 2018). It is therefore crucial for the government to certify land use rights and assets on land to ease the securing of credit. Policies markers should further facilitate contract farming and the development of farm specialization areas which are preconditions for successful value chain lending.

The result of previous studies reveals that membership in cooperatives and farmer groups can improve yield and technical efficiency at the farm level (Abdul-Rahaman and Abdulai, 2018). Cooperatives can empower smallholder farmers by procuring higher quality inputs, equipping them with cultivation technical skills, providing access to market information, and improving their negotiating power with companies in a value chain. Membership in cooperatives also facilitates training in entrepreneurial and financial practices which are crucial to building linkages between smallholder farmers and credit (Ebata and Hernandez, 2017). Cooperatives may also promote more efficient usage of production inputs including credit among members (Wanglin *et al.*, 2018). Unfortunately, agricultural cooperatives were found to be largely underdeveloped in the study area. In this case, expanding the role of government in establishing farmers' associations could provide a key remedy to the farmer's credit problems.

Indeed, some issues faced by smallholder farmers of raw agricultural commodities arise from their smaller scales of production, something which leaves them vulnerable in dealing with larger aggregators and companies. The establishment of stronger cooperatives would help to increase the market power of smallholder farmers against buyers and achieve collaborative economies of scale. Cooperatives would increase farmers' bargaining power against buyers and achieve some scale advantages in storage and transport. Membership in cooperatives also helps to reduce risk, share knowledge among members, and coordinate relations with aggregators and companies. Capacity building of farmer-based unions is essential to address information asymmetries in credit transactions (Zegarra, 2018).

Financial inclusion through facilitating access to bank accounts can help to reduce poverty (Kim *et al.*, 2018). However, in this study the percentage of farmers using bank accounts in financial transactions was low. It is vital to mitigate any risks associated with cash handling though bank accounts. Transactions through bank accounts among actors in the chain can help commercial banks control the cash flow of the chain, thereby possibly even considering the approval of loans without a collateral requirement. With a bank account, loans can also be disbursed directly to and loan payments taken directly from the customer's bank account.

This study also found that while small farmers typically did not use bank accounts, they did own cellular phones. As such, banks should consider expanding their mobile banking services for smallholder farmers. According to Shaikh and Karjaluoto (2015), mobile banking applications via smartphones benefit smallholder farmers with expanded access to markets, information, and credit. Banking services based on information technology could help save transaction costs and build bridges between banks and customers. Mobile technology might also help to identify eligible customers and perform cash flow analysis to reduce loan errors and turn-around time in loan processing. In the research area in this study, as most of smallholder farmers used smartphones, the potential to apply mobile banking and lower transaction costs is considerable.

In the context of banking competition, banks need to be more active in value chains to assess the demand and creditworthiness of key chain actors as a basis for lending decisions. Banks should consider the whole

network of value chains to identify and satisfy a specific credit demand and develop longer-term relationships with chain actors. In other words, it is essential for banks to make lending decisions based more on the strength of the buyer-seller relationship. There is a need for banks capable of addressing the constraints faced by each chain actor and at each stage to design more appropriate banking services. When done correctly, value chain lending enables banks to properly align the delivery of customized and low-risk credit products.

This study has also shown the tantamount importance of adequate transportation networks to farming activities. Conversely, a poor network results in problems across the value chain. Underdeveloped road systems also limit the access of farmers to credit. This discourages purchasing the machinery, processing equipment, and storage facilities to improve product quality and meet the standards necessary to export at higher prices. The particular risk of agricultural production, combined with limited infrastructure and a complex topography increases intermediate costs during the harvesting, collecting, transporting, and the processing of products. This limits efficiency and bank credit supply. Therefore, this study recommends increasing investment in such networks to reduce the transaction costs of accessing credit and markets. A policy of reinsurance for banks is also needed to facilitate lending to actors along the value chains.

Finally, it is important to recognize that credit alone is not sufficient to completely alter the economic situation of smallholder farmers. The necessary requirements for production, including agrochemicals, farm machinery, credit, training, processing techniques, marketing, and infrastructure are provided by different stakeholders. Multi-stakeholder partnerships that include the participation of different agencies and institutions could facilitate the role of value chain lending (Rabbi *et al.*, 2017). One method to facilitate collaboration among stakeholders could be frequent meetings to discuss and address credit issues. According to Agyekumhene *et al.* (2018), digital platforms may also enhance trust building, and enable new connectivity and cooperation particularly for coordinated value chains. Ngenoh *et al.* (2019) also indicated that the promotion and implementation of a well-founded mobile phone-based information access platforms can support smallholder farmers in accessing credit and actively participating in high-value agro-food chains.

6. Conclusions

Although smallholder farmers serve an important role in sustaining food security, they face a number of constraints. Agricultural value chain development is seen as an important economic intervention to connect small farmers to the market, improve the value-adding of agricultural products, and increase farm incomes. A number of resources are needed for value chain development, but bank credit is crucial to facilitate chain investment and efficiency. However, barriers to accessing credit by key chain actors remain, particularly for smallholder farmers. Issues related to a lack of collateral, the main reason for limited access to formal credit, raise questions of how to design more innovative ways to link farmers to credit. In this regard, value chain lending has been applied in many developing countries and showed both potential and constraints. Its use is relatively new within the context of Vietnam, and understanding its potential and shortcomings crucial.

Overall, this study analyzed barriers of access to credit by smallholder farmers in the perspective of value chain lending in Vietnam. It constructed a theoretical framework with its application on analyzing two value chains, bamboo and cinnamon. Data was collected from direct interviews with farmers, banks, companies, cooperatives, and governmental agencies with the support of a Heckman two-stage model.

The study concludes that the application of value chain lending in connecting smallholder farmers to formal credit face a number of barriers. Credit rationing, that is, when the amount of credit received is smaller than demand, remains the biggest financial hurdle in value chain development. On the demand side, a lack of valuable fixed assets and weak chain linkages were found as constraints for actors wishing access to full credit amount. Companies and cooperatives without readily available capital (i.e. cash) also lacked access to formal credit and could not guarantee for farmers who borrow from banks. Products in the chain such as bamboo shoots and cinnamon oil are not accepted as collateral because banks find them difficult to manage and liquidate. On the credit supply side, banks evaluate creditworthiness based on individual farmer's

capacity instead of the farmer's location along the value chain. Banks mainly relied on collateral and lacked the expertise and reliable data to adequately assess credit needs and analyze product and income flows in the chain to make effective lending decisions. Subsidized loans depend strictly on government subsidies and fail to meet the needs of farmers. In addition, a lack of market information, limited access to know-how and technology, poor transportation networks, and the high risks associated with agriculture represent considerable constraints to value chain lending.

Despite the encouraging results, this study is subject to certain limitations that in turn, provide insights for further directions of research. Subsequent studies should collect panel data to analyze the dynamic barriers of value chain lending. A future study on mobile banking and the application of information technology in financial transactions could be helpful to improve smallholder farmers' access to credit. Moreover, studies which provide detailed analysis on creating the conditions and operating collaborative channels among stakeholders (including the strengthening of cooperatives) that address existing barriers of value chain lending are necessary.

In summary, an overall lack of optimal conditions represents a challenge for successful value chain lending. To address these barriers, value chain lending must endorse a comprehensive solution with the participation of all relevant stakeholders including farmers, companies, cooperatives, banks, scientists, and government. Indeed, this building of multi-stakeholder networks to collaboratively improve value chains and value chain lending is recommended across countries with similar levels of economic development.

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