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Financial Access of Midstream Agricultural Firms in Africa
Evidence from the LSMS-ISA and World Bank Enterprise Surveys

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Abstract

The midstream of agricultural value chains are rapidly changing in response to shifting domestic and international demand. While the performance of this segment may have important implications for the entire sector, evidence on midstream actors and their financial needs remain thin. We use data from both the Living Standards Measurement Study – Integrated Surveys on Agriculture and the World Bank Enterprise Survey from seven African countries to identify these agricultural midstream firms and assess their access to formal credit, comparing them to other, non-agricultural midstream firms. We find that the identified agricultural midstream firms are larger and more productive than their non-agricultural midstream counterparts and are less likely to report barriers to accessing credit, though overall access levels remain low. Among agricultural midstream firms, those owned or managed by women are more likely to report barriers to accessing credit. Taken together, these findings help build our understanding about the financial needs of micro-, small-, and medium-size enterprises in the agricultural midstream.

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Introduction and Motivation

Three linked trends have characterized the economies of many low- and middle-income countries (LMICs) during the first part of the 21st century: urbanization, economic growth, and the resulting structural transformation (Hanlon, 2015; Barrett et al., 2022; Otsuka and Fan, 2021). These three factors have led to a substantial change in the way many people source their food. Whereas largely rural populations in LMICs tend to produce at least some of what they consume, urban residents purchase nearly everything in formal or informal markets. These end markets often include products that have been at least lightly processed (Snyder et al., 2015; Minten et al., 2016). Some LMICs rely on agricultural exports for foreign exchange, as a main source of employment, or to drive economic growth (Barrett et al., 2022). As a result, agricultural value chains and markets have been developing to satisfy the evolving needs and patterns of both domestic and international demand. Yet the process by which this transformation has taken place is not fully understood (Reardon, 2015). In particular, it is not clear whether this transformation is leading to improved outcomes in terms of farmer incomes and poverty reduction, the incomes of midstream actors, or in terms of product availability to consumers.

One major area of uncertainty are the changes taking place in the middle of agricultural value chains between producers and consumers: the agricultural “midstream.” Given rapidly changing opportunities within agriculture and the lengthening of most agricultural value chains, midstream activities must be changing and likely expanding. Recent research suggests that in early stages of value chain development the midstream is dominated by micro, small, and medium enterprises (MSMEs) (Barrett et al., 2022). Many argue that these MSMEs have considerable potential to catalyze growth in the agricultural sector, with benefits accruing throughout the midstream and extending to both smallholder farmers and end retailers and consumers (Dolislager et al., 2021; Reardon et al., 2021). If MSMEs face meaningful constraints in growing their businesses, it can hinder employment opportunities, increase consumer food prices, depress agricultural producer prices, or constrain growth more broadly.

A second important question concerns the role of formal finance in facilitating development of the midstream. If available, working capital or loans from formal lenders at competitive rates can help firms take advantage of emerging opportunities. Farmers in LMICs often have limited access to finance (World Bank, 2007), and MSMEs outside of agriculture frequently face their own financial constraints (Beck and Demirguc-Kunt, 2006; Olawale and Garwe, 2010). While it is likely that midstream MSMEs in the agricultural sector face constraints accessing finance, evidence examining the financial capabilities of and constraints facing agricultural midstream actors is limited (Ambler et al., 2022). A broader description of MSMEs operating in the agricultural midstream and their use of finance could help us understand their general access to finance, inform policy advice to target financial services towards areas of need, or potentially inform innovations in financial services to better serve this subsector.

To address this evidence gap, we use two publicly available data sources, the Living Standards Measurement Surveys - Integrated Surveys on Agriculture (LSMS-ISA) and the World Bank Enterprise Surveys (WBES) from seven African countries to explore these questions. The LSMS-ISA data include information on small household enterprises which are predominantly microenterprises, while the WBES data constitute a sample of SMEs with at least five employees. In both data sources, we first identify enterprises in the midstream of value chains, then distinguish further whether they are in the agricultural

midstream or conducting similar midstream activities outside of agriculture. Using this categorization, we then conduct descriptive analysis comparing midstream agricultural and non-agricultural MSMEs.

The analysis suggests that midstream microenterprises from the LSMS-ISA data and SMEs in the WBES data are bigger and relatively more productive than their midstream counterparts outside of the agricultural sector. Although low on average, midstream agricultural microenterprises do not appear to have especially low access to credit, but do have slightly higher availability of cell phone and mobile money use, suggesting a potential opportunity for digital financial services to reach this population. Midstream agricultural SMEs have similar use of mobile phones and digital services but report considerably more usage of formal loans and are less likely to report access to credit as a key constraint. We also find some evidence that among agricultural midstream firms, those with female owners and, to a lesser extent, managers are more likely to report barriers to credit access.

These patterns run counter to some prevailing beliefs that restrictions on access to finance are pronounced in the agricultural sector. However, we caution against over-interpretation of these patterns for several reasons. First, searching over thousands of households and enterprises, the datasets contain relatively few midstream agricultural MSMEs. In some countries we rely on only a handful of identified observations. However, we cannot determine if these low numbers accurately represent low totals of the full population or if the low counts are a result of survey and sampling methods that were not intended for this purpose of locating and identifying this segment. Second, the MSMEs that we do identify, in particular in the WBES data, are “winners”, having managed to grow to at least five employees (satisfying the sampling criteria). Data from the LSMS-ISA on micro-enterprises was less conclusive about whether these needs are better or worse for agricultural actors.

Identification of Midstream MSMEs and Summary Statistics

To identify MSMEs in the midstream of different value chains using the LSMS-ISA surveys, we use the household enterprise module from the LSMS-ISA to identify household enterprises. We identify SMEs using the WBES, as the sampling frame for the WBES requires at least 5 employees before firms are included. For the remainder of this paper, when describing the separate samples, we use the terms “household enterprises” and “microenterprises” in reference to the enterprises identified in the LSMS-ISA data with the understanding that very few larger firms show up in the LSMS-ISA data. We use “SMEs” when referring to the larger firms contained in the WBES data. We use “MSMEs”, “enterprises”, or “firms” to describe observations across both data sources.

Since the LSMS-ISA has been collected in seven African countries: Ethiopia, Malawi, Mali, Niger, Nigeria, Tanzania, and Uganda, we limit the WBES sample to the same countries. These countries represent a wide range of development levels and have sufficient details on types of firm activity needed for the analysis. The LSMS-ISA is designed to be representative of households at the national level and, across these seven countries, consists of 12,858 households with 15,966 family enterprises. The WBES surveys are nationwide surveys covering firms with at least five employees and, across the seven countries in our sample, include data on 5,958 firms. Of those firms, 190 have more than 250 employees, so we drop them from our analysis, leaving us with 5,768 firms that can be characterized as SMEs. While neither of these data sources were explicitly designed to capture the positioning of firms within value chains or with respect to the

agricultural sector, they do include characterizations of firm activities in the form of either written descriptions entered by enumerators or as International Standard of Industrial Classification (ISIC) industry codes.

Using these descriptions and codes we first identified midstream firms and then determined whether they were focused on agriculture or not. We identified midstream firms by determining if the firm was linked to a set of common midstream activities identified in the literature: trading, processing/manufacturing, storage, wholesaling, or exporting. Then, again using the descriptions and industry codes, we determined whether these enterprises were linked to the agricultural sector. Further details of this process are contained in Appendix B.

The first observation from our data is that midstream, and especially agricultural midstream, MSMEs are difficult to find. Out of 21,727 MSMEs across all countries and both data sources, 5,651 are identified as participating in midstream activities. 23.6 percent of those firms are identifiable as being in agriculture-linked industries. Table 1 shows the results of this effort across countries, splitting by agricultural and non-agricultural MSMEs. As can be seen in the table, some of the countries have very few eligible observations for the analysis. In particular, Mali and Niger each have sample sizes of fewer than 200 firms in the WBES, and we can identify just 21 and 25 agricultural midstream firms, respectively. The table further highlights that certain midstream activities are well covered in the data, in particular trading and processing, while firms that work in storage and exporting are found much less frequently. Given the structure of the data collection, we cannot distinguish whether these numbers are due to actual low numbers of these types of firms, inappropriate sampling methods to locate these firms, misclassification of these firms, or a combination. Additionally, activities may appear frequently in some countries but not in others. While this may reflect meaningful differences in the incidence and composition of midstream MSMEs across different countries, it also could reflect differences in the application of industry codes or levels of detail in recorded descriptions of these MSMEs across independent survey efforts.

While trading is often found among household enterprises in the LSMS-ISA data, it is less frequently identified among SMEs in the WBES data. This finding may also suggest that most traders operate at a small scale and thus do not satisfy the five employee criteria of the WBES. It is also consistent with larger firms involved in buying and selling being more likely to be classified as wholesalers than as traders.

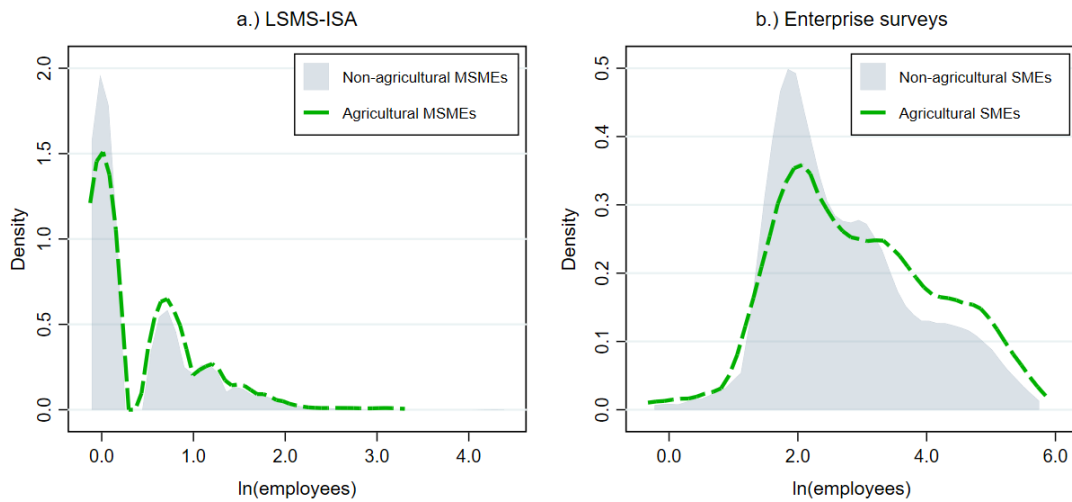
Table 1. Midstream firms by sector and activity

	A. LSMS-ISA (Microenterprises)								B. Enterprise Surveys (SMEs)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	All	Ethiopia	Malawi	Mali	Niger	Nigeria	Tanzania	Uganda	All	Ethiopia	Malawi	Mali	Niger	Nigeria	Tanzania	Uganda
Wave year	-	2018	2016	2017	2014	2018	2018	2019	-	2015	2014	2016	2017	2014	2013	2013
Firms (all)	15,959	1734	3693	952	2885	3919	1305	1471	5768	783	503	179	146	2628	789	740
Midstream firms	2,629	302	434	251	432	815	118	277	3022	434	186	109	71	1384	442	396
A. Agricultural midstream																
Firms	822	39	203	104	137	197	70	72	510	122	42	21	25	137	83	80
Trading (%)	45.7	71.8	91.6	0.0	49.6	0.0	85.7	47.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Processing/Manufacturing (%)	40.8	20.5	7.9	85.6	48.9	68.5	11.4	16.7	68.4	51.6	76.2	71.4	16.0	75.2	77.1	85.0
Storage (%)	0.6	2.6	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wholesaling (%)	12.5	5.1	0.5	14.4	0.0	29.4	2.9	34.7	31.6	48.4	23.8	28.6	84.0	24.8	22.9	15.0
Exporting (%)	0.4	0.0	0.0	0.0	1.5	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
B. Non-agricultural midstream																
Firms	1,807	263	231	147	295	618	48	205	2512	312	144	88	46	1247	359	316
Trading (%)	15.3	36.1	28.6	21.1	12.2	0.0	66.7	7.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Processing/Manufacturing (%)	60.4	63.9	71.4	78.9	87.5	30.7	33.3	86.8	88.3	79.2	85.4	86.4	63.0	90.5	93.6	88.3
Storage (%)	0.1	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wholesaling (%)	24.2	0.0	0.0	0.0	0.0	68.9	0.0	5.4	11.7	20.8	14.6	13.6	37.0	9.5	6.4	11.7
Exporting (%)	0.1	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Notes: This table shows the number of firms in the LSMS-ISA and Enterprise Surveys data; the number of midstream firms by "agricultural" and "non-agricultural" activities; and the percentage of firms by five mutually exclusive midstream activities: "trading", "processing", "storage", "wholesaling", and "exporting". Microenterprises in the LSMS are categorized based on the written description of the firm's main activity. For the Enterprise Surveys, the categorization is based on the firm's industry code. 7 microenterprises in the LSMS and 190 SMEs in the Enterprise Surveys with over 250 employees are omitted from the analysis. The LSMS-ISA data from Mali and Nigeria do not include a written description of the firm's main activity/product, hence, we use the industry code to categorize microenterprises in these two countries.

Figure 1 shows firm size by number of employees in agricultural versus non-agricultural midstream MSMEs. The microenterprises in the LSMS-ISA data are substantially smaller than those in the WBES data, as expected given the WBES inclusion criteria. The figures also suggest that midstream firms in the agricultural sector are slightly larger than those outside of agriculture, though this pattern is more pronounced in the WBES data and the distributions for both data sources largely overlap. The choice of sector is likely related to other factors impacting employee levels and types of activities across countries. We return to this point in the next section using a regression-based approach.

Figure 1. Distributions of Number of Employees in Agricultural and Non-Agricultural Midstream Firms



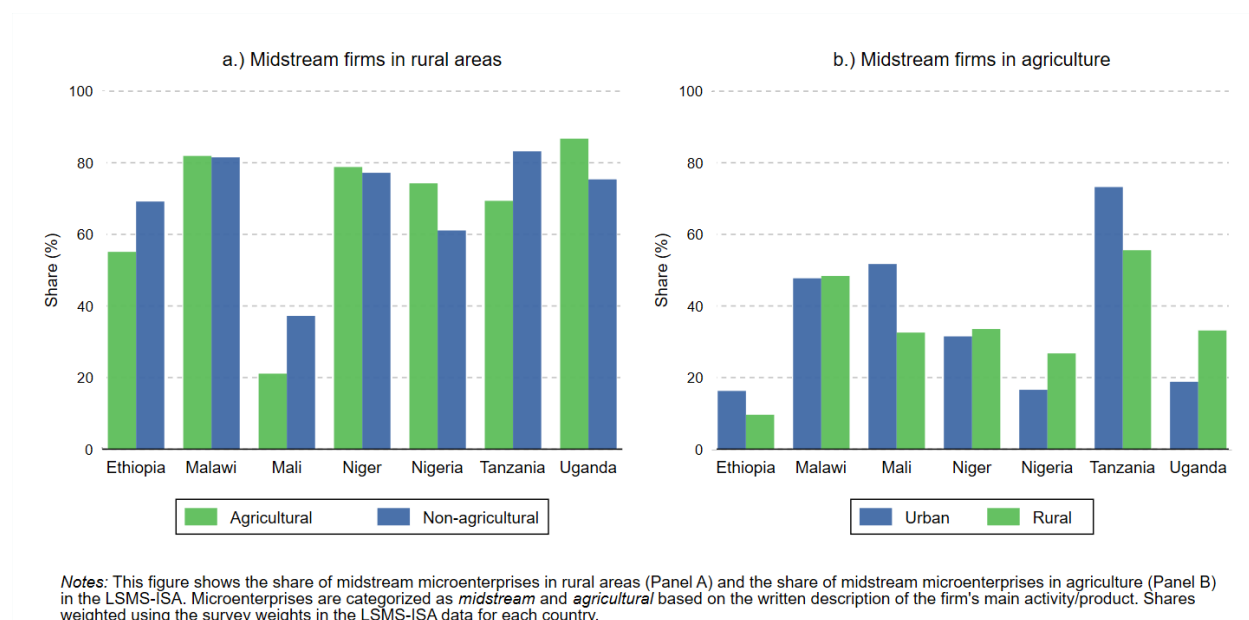
Notes: This figure shows the distribution of employees of midstream microenterprises in the LSMS-ISA (Panel A) and SMEs in the Enterprise Surveys (Panel B). Microenterprises in the LSMS are categorized based on the written description of the firm's main activity. For the Enterprise Surveys, the categorization is based on the firm's industry code. 7 microenterprises in the LSMS and 190 SMEs in the Enterprise Surveys with over 250 employees are omitted from the analysis.

Finally, we examine where these firms are located. The WBES are nationwide surveys with areas and firms chosen systematically, with stratification by sector, firm size, and location. Less than one percent of the sample of firms are reported to be in towns or cities with under 50,000 people. As such there are almost no firms in this data from small urban, peri-urban, or rural areas. This indicates that the WBES sampling strategy is unlikely to include smaller cities and towns, that firms in these areas are less likely to appear on official lists used for sampling, and that firms in these areas are less likely to meet the five-employee criterion for sample inclusion.

By comparison, the LSMS-ISA data has broader geographic coverage. Panel A of Figure 2 shows the percentage of household enterprises situated in rural areas, by whether firms are agricultural or not. Perhaps most notable is that the majority of midstream microenterprises in all countries but Mali is located in rural areas. The relative likelihood of an agricultural midstream microenterprise being in a rural area to those outside of agriculture does show some variation across countries. In Nigeria and Uganda, agricultural microenterprises are more than eleven percentage points more likely to be based in rural areas than non-agricultural firms. But this pattern is reversed in Ethiopia, Mali, and Tanzania, whereas

levels are nearly even in Malawi and Niger. Across all countries the lowest share of agricultural midstream firms in rural areas is 21 percent in Mali, while the highest rate is around 87 percent in Uganda, suggesting that midstream micro enterprises can be found in a wide range of settings in all sampled countries.

Figure 2. Midstream Microenterprises by Country, Sector, and Rural/Urban Location



Using the same set of midstream microenterprises, Panel B of Figure 2 shows the share of firms in the agricultural sector, by urban and rural location. The figure shows bigger differences across countries than across location within countries. In Ethiopia, a very small share of midstream microenterprises is in agriculture regardless of location type, just 16.3 percent in urban areas and under 10 percent in rural areas. Data for Tanzania, on the other hand, 73.2 percent of urban microenterprises and two thirds of rural microenterprises work in agriculture. The relative shares also vary across countries. In Mali, Tanzania, and to a lesser extent Ethiopia a larger share of agricultural microenterprises is located in urban areas. This pattern is reversed for Nigeria and Uganda, while the shares are balanced in Malawi and Niger.

To provide more information about both midstream microenterprises and SMEs using the two data sources, we present summary statistics by sector, type of work, and country in Tables 2 and 3 for LSMS-ISA and WBES, respectively. A wide range of differences are shown, both across sectors and across data sources. The SMEs in the WBES are substantially older, have considerably higher levels of sales, and are much more likely to have gotten formal bank loans. We test for differences across sector using a regression framework in the next section.

Table 2. Characteristics of midstream firms (LSMS-ISA)

	Agricultural microenterprises								Non-agricultural microenterprises							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	All	Ethiopia	Malawi	Mali	Niger	Nigeria	Tanzania	Uganda	All	Ethiopia	Malawi	Mali	Niger	Nigeria	Tanzania	Uganda
A. General																
Age of the firm (years)	7.3	11.1	5.1	7.0	9.9	8.3	4.0	7.7	11.1	11.9	9.7	11.3	12.7	9.5	6.7	15.1
Months operating/year	9.3	7.9	-	9.6	9.7	-	8.6	9.5	9.3	7.6	-	9.9	9.9	-	8.7	10.2
Firm formally registered (%)	7.4	30.8	3.0	-	3.6	7.6	15.7	5.6	6.4	7.6	1.3	-	1.7	11.3	10.4	1.5
Full-time employees (mean)	1.6	0.7	1.6	3.5	1.4	1.8	0.1	0.8	1.4	0.5	1.6	3.0	1.2	1.6	0.4	0.9
Full-time employees (median)	1.0	0.0	1.0	2.0	1.0	1.0	0.0	0.0	1.0	0.0	1.0	2.0	1.0	1.0	0.0	0.0
Female employees (%)	35.1	-	6.5	58.0	25.0	47.7	-	-	24.1	-	17.5	11.1	8.3	30.9	-	-
Firm/owner uses mobile money (%)	58.7	16.7	-	-	-	-	86.4	50.7	29.7	9.7	-	-	-	-	78.3	34.0
B. Firms performance																
Monthly sales (median, USD)	74.8	36.5	43.2	42.2	119.3	65.3	176.7	175.5	55.7	43.7	30.6	25.8	60.8	82.2	99.4	43.2
Monthly operating costs (median, USD)	41.4	63.4	30.6	43.1	63.3	33.3	5.7	94.5	20.9	18.2	15.9	10.3	22.3	31.0	0.0	18.9
Monthly profits (median, USD)	21.6	-	13.9	-	-	24.8	53.0	-	27.8	-	10.4	-	-	45.7	50.9	-
C. Finance and credit																
Firm/owner has bank account (%)	38.0	56.4	35.0	56.7	-	39.1	30.0	14.1	40.9	51.3	31.6	44.2	-	51.3	12.5	11.2
Firm has a credit/loan (%)	34.1	25.6	42.9	13.5	-	18.2	18.6	62.0	29.6	19.8	37.2	12.2	-	15.0	16.7	52.0
Applied to credit last year (%)	9.6	-	-	17.3	-	5.6	-	-	8.0	-	-	14.3	-	6.5	-	-
Credit application rejected (%)	7.9	5.1	8.4	-	-	-	-	-	5.5	3.4	7.8	-	-	-	-	-
Bank/fin. institution as credit source (%)	7.6	40.0	2.0	50.0	-	100.0	4.3	11.9	7.5	11.5	1.7	31.8	-	55.6	2.1	11.4
Number of outstanding loans	1.1	1.0	1.1	-	-	-	1.2	-	1.1	1.0	1.1	-	-	-	1.0	-
Credit amount (median, USD)	29.2	54.7	20.9	301.4	-	490.1	88.3	-	27.9	36.5	20.2	258.3	-	816.8	99.4	-
<i>N</i>	822	39	203	104	137	197	70	72	1,807	263	231	147	295	618	48	205

Notes: This table shows average and median characteristics of midstream microenterprises in the LSMS-ISA. Microenterprises are categorized as "midstream" and "agricultural" based on the written description of the firm's main activity/product. Monetary values are expressed in US dollars based on the World Bank's official exchange rate in LCU, using each country's period average in the year in which the data was collected. 7 microenterprises reporting over 250 employees are omitted from the analysis. The LSMS-ISA data from Mali and Nigeria do not include a written description of the firm's main activity/product, hence, we use the industry code to categorize microenterprises in these two countries.

Table 3. Characteristics of midstream firms (Enterprise Surveys)

	Agricultural SMEs								Non-agricultural SMEs							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	All	Ethiopia	Malawi	Mali	Niger	Nigeria	Tanzania	Uganda	All	Ethiopia	Malawi	Mali	Niger	Nigeria	Tanzania	Uganda
A. General																
Age of the firm (years)	15.9	14.5	16.2	19.3	15.2	16.1	15.9	16.9	16.1	13.2	20.5	19.3	15.0	16.5	16.3	15.0
Firm formally registered (%)	76.2	94.3	85.7	94.4	88.0	64.5	68.3	60.8	62.1	94.9	88.8	80.0	93.3	51.0	55.7	55.5
Full-time employees (mean)	36.5	40.0	57.5	58.2	29.5	35.3	30.2	26.0	27.8	45.6	44.5	43.6	23.3	21.8	26.9	22.8
Full-time employees (median)	15.0	15.0	26.5	50.0	14.0	18.5	10.0	10.0	11.0	20.0	19.5	25.0	15.5	10.0	9.0	10.0
Female employees (%)	25.6	19.0	39.0	12.3	3.5	25.2	72.2	33.4	19.1	26.9	26.9	22.7	8.1	14.4	52.5	42.3
Firm with a female manager (%)	11.0	6.6	23.8	4.8	4.0	14.6	9.6	10.0	10.0	10.6	14.1	3.5	13.0	8.6	9.8	14.6
Firm with a female owner (%)	26.7	25.4	38.5	25.0	16.0	23.9	23.2	35.5	20.2	35.7	27.3	14.9	11.1	13.7	20.8	28.8
Manager's experience (years)	14.3	16.3	15.3	20.5	19.0	11.9	11.2	14.5	14.4	15.6	15.6	20.3	17.1	13.3	14.4	15.2
B. Firms performance																
Monthly sales (median, thousands of USD)	7.2	36.4	19.3	79.2	100.5	1.1	4.2	3.2	1.9	27.5	7.8	11.2	23.2	0.8	1.5	3.2
Annual sales growth (%)	-0.7	6.2	8.6	0.5	2.1	2.1	-16.9	-12.5	-1.8	10.7	7.6	8.4	-1.7	-1.6	-15.2	-13.4
Monthly costs (median, thousands of USD)	0.9	4.9	2.8	33.8	2.3	0.3	0.9	0.5	0.5	5.0	2.3	2.3	2.9	0.2	0.2	0.5
C. Finance and credit																
<i>Sources of working capital</i>																
Internal funds/retained earnings	71.7	74.8	74.2	83.3	64.6	65.7	76.3	71.9	69.1	80.8	63.2	81.6	75.8	62.9	72.1	75.5
Banks (private and state-owned)	8.7	-	9.6	11.4	22.5	3.7	6.6	13.4	6.4	-	13.3	10.8	11.1	4.5	5.6	9.4
Other financial institutions	2.3	0.2	1.9	0.6	0.0	4.3	2.8	3.6	3.6	1.8	1.8	0.3	0.0	4.7	1.8	4.9
Credit from suppliers/customers	6.6	1.1	12.5	4.7	7.5	8.1	10.9	7.4	8.7	2.8	13.9	5.6	12.5	10.3	10.2	6.2
Other (moneylenders, friends/relatives)	6.4	0.2	1.9	0.0	5.4	18.1	1.8	3.7	10.9	1.3	7.2	1.6	0.6	17.5	8.6	4.1
Firm has bank account (%)	85.2	95.9	80.0	95.2	95.7	72.4	81.0	91.3	72.5	92.9	87.9	85.2	87.0	62.3	67.5	84.7
Firm has a credit/loan (%)	29.4	54.5	28.9	22.2	43.5	6.2	22.1	34.2	17.3	40.1	26.6	31.7	28.6	7.7	19.0	19.5
Applied to credit last year (%)	20.2	36.4	21.1	52.9	29.2	3.9	13.5	17.1	12.2	28.8	27.1	26.8	9.1	5.0	15.6	7.9
Credit application rejected (%)	8.3	4.9	25.0	12.5	0.0	50.0	0.0	0.0	18.8	10.6	27.8	15.8	0.0	50.0	14.3	10.5
Bank/fin. institution as credit source (%)	76.4	69.2	72.7	50.0	100.0	55.6	76.5	100.0	78.2	72.8	86.1	84.0	100.0	83.5	74.2	73.2
Number of outstanding loans	2.3	1.4	12.0	4.5	1.0	2.0	1.0	1.3	2.1	1.5	3.1	1.9	1.3	4.3	1.4	1.2
Credit requiring collateral	88.8	89.4	88.9	100.0	100.0	88.9	93.8	77.3	85.2	86.4	88.9	81.8	90.9	78.9	95.4	78.4
Credit amount (median, USD)	194.4	240.6	23.5	-	258.3	24.9	250.4	19.3	92.3	157.9	70.6	143.4	258.3	1.3	250.4	7.7
<i>N</i>	510	122	42	21	25	137	83	80	2,512	312	144	88	46	1,247	359	316

Notes: This table shows average and median characteristics of midstream firms in the World Bank Enterprise Surveys. SMEs are categorized as "midstream" and "agricultural" based on the firm's industry code. Operating costs defined as the sum of labor costs (wages, salaries, bonuses, social security payments), costs of raw material, and cost of electricity. Formulae for the annual sales growth based on the "Enterprise Surveys Indicators Description guide", available in the Enterprise Surveys website (pp. 193-194). Monetary values expressed in thousands of US dollars based on the World Bank's official exchange rate in LCU, using each country's period average in the year in which the data was collected. 190 SMEs reporting over 250 employees are omitted from the analysis.

Empirical Approach

To develop further insights on midstream MSMEs in the agricultural sector relative to other midstream MSMEs, we switch to a regression approach testing for differences by sector. To do so, we use the following estimating equation:

$$Y_{iac} = \beta_0 + \beta_1 agricultural_{iac} + \eta_c \times \psi_a + \eta_c \times \ln(employees)_{iac} + \eta_c \times \ln(sales)_{iac} + \epsilon_{iac}$$

Y_{ic} represents an outcome of interest, including a wide range of firm characteristics and measures of access to finance, with i indexing firms, a classes of activities (trading, processing, wholesaling, etc.), and c countries. β_1 is our coefficient of primary interest, testing for differences in these firm characteristics between agricultural and non-agricultural firms. We then include three types of controls, each interacted with country fixed effects to allow for differences across countries (that also include differences in data collection approach across survey efforts), η_c : a set of midstream activity-type fixed effects ψ_a , the logarithm of the enterprise's number of employees, and the log of the enterprise's sales. These controls allow us to examine differences in firm characteristics across sectors, controlling for differences in firm size and the pattern of activity types for each country. The estimates presented are not causal, but indicate characteristics with significant differences between agricultural and non-agricultural SMEs in this sample, controlling for the variables indicated above.

Although the LSMS-ISA and the WBES are both national surveys with sample weights designed to represent larger populations, we do not use any weighting in the analysis. First, there is substantial selection into the final sample, as firms that are not in the midstream are screened out before the analysis, as are firms for which we cannot determine whether they are in the midstream or not. Second, as observed in the previous section, there appear to be systematic differences by country (and survey) in how firms were characterized in the original data and then categorized by the research team (shown in Table 1). And third, the population of midstream firms in each country is unknown, so it is not clear how one would weight the seven sample countries. These factors inhibit our ability to use weights to recover a well-defined population when pooling data across all seven countries. We instead let the data speak for itself as a set of identified midstream firms when conducting the analysis.

Regression Analysis

Table 4 shows our primary results. Panel A uses the microenterprises in the LSMS-ISA data, while Panel B shows results using the SMEs contained in the WBES data. Column 1 suggests that, after controlling for country by activity-type fixed effects, microenterprises in agriculture have 12 percent more employees than non-agricultural microenterprises on average.¹ Columns 2 and 3 examine sales where, again we see sharp differences across sectors among microenterprises whose sales are more than 140 percent larger on average in agriculture than in non-agricultural microenterprises. Furthermore, including country by firm size (employees) controls in column three and this measure of sales persists in significance and a large magnitude of nearly 125 percent, suggesting that microenterprise productivity in the agricultural

¹ Note that we convert the coefficients, β , in the first three columns to percent differences by calculating $100 \times (e^\beta - 1)$.

sector may be higher than non-agricultural microenterprises. These differences are similarly sharp in the sample of midstream SMEs that are 21 percent larger in terms of employees, and have 143 percent higher sales after adjusting for employment.

Table 4. Differences between agricultural and non-agricultural firms

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Employees (ln)	Sales (ln)	Sales (ln)	Has bank account	Has loan/ credit	Finance as obstacle	Transport as obstacle	Land as obstacle	Electricity as obstacle	Has mobile phone	Uses mobile money
A. LSMS-ISA											
Agricultural firm (0/1)	0.11*** (0.02)	0.89*** (0.09)	0.81*** (0.09)	-0.01 (0.02)	0.04 (0.03)	- -	- -	- -	- -	0.09*** (0.02)	0.20*** (0.04)
Mean outcome variable	0.72	10.07	10.07	0.41	0.30	-	-	-	-	0.71	0.30
<i>N</i>	2,610	2,531	2,515	2,089	1,338	-	-	-	-	2,322	558
<i>R</i> -squared	0.02	0.09	0.13	0.04	0.02	-	-	-	-	0.13	0.19
B. Enterprise Surveys											
Agricultural firm (0/1)	0.19*** (0.06)	0.87*** (0.18)	0.89*** (0.17)	0.09*** (0.03)	0.11*** (0.03)	-0.13*** (0.03)	0.02 (0.01)	-0.01 (0.01)	0.07** (0.03)	-0.05 (0.04)	-0.07 (0.05)
Mean outcome variable	2.67	16.00	16.00	0.73	0.17	0.28	0.05	0.05	0.29	0.86	0.40
<i>N</i>	1,906	1,543	1,516	1,509	1,478	1,456	1,456	1,456	1,456	486	545
<i>R</i> -squared	0.04	0.05	0.23	0.06	0.05	0.03	0.00	0.02	0.03	0.03	0.07
Country × Type of actor	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country × Firm's employees (ln)	-	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country × Firm's sales (ln)	N	-	-	Y	Y	Y	Y	Y	Y	Y	Y

Notes: This table shows differences between agricultural and non-agricultural midstream firms in the LSMS-ISA and the Enterprise Surveys. Microenterprises in the LSMS are categorized based on the written description of the firm's main activity. For the Enterprise Surveys, the categorization is based on the firm's industry code. 7 microenterprises in the LSMS and 190 SMEs in the Enterprise Surveys with over 250 employees are omitted from the analysis. Outcome variables in columns 6-9 exclusive to the Enterprise Surveys. Coefficients correspond to OLS estimations and (depending on the outcome) country by type of actor, country by firm's size, and country by firm's sales fixed effects. "Mean outcome variable" is the mean of the dependent variable among the "comparison" group (i.e., non-agricultural firms). Standard errors in parentheses. Significance levels at 10% (*), 5% (**), and 1% (***).

The following three columns examine variables related to finance, and all control for number of employees, firm sales, and activity type by country (columns 4-6). Access to bank accounts is relatively low among microenterprises, as only 42 percent report having a bank account, but this number is substantially higher among SMEs (78 percent). Although there is no difference among agricultural microenterprises, among SMEs, agricultural midstream firms are even more likely to have a bank account (9 percentage points). Among both non-agricultural microenterprises and SMEs, current credit use is very low. Only 30 percent of microenterprises and 17 percent of SMEs report active use of a loan. As with bank account access, there is no difference between agricultural and non-agricultural microenterprises after controlling for other factors, but agricultural SMEs are 11 percentage points more likely to have a loan or credit.

Columns 6-9 of Panel B look for differences in stated obstacles for the firm, only asked in the WBES data. The only obstacle showing significant differences is access to finance. Consistent with having a bank account (though not reflected in having a loan), agricultural firms are much less likely to report finance as a main obstacle, by 13 percentage points. These responses run counter to the notion that the agricultural sector is disproportionately constrained by lack of credit access, even if loan access is still low for

agricultural firms. Appendix Table 1 examines other outcomes only available in the WBES related to experience applying for credit and types of credit. The only significant difference is similar to those observed above: agricultural SMEs are roughly 7 percentage points more likely to have applied for credit but no more or less likely to have been rejected. There are no statistical differences in the number of outstanding loans, collateral requirements, use of banks, or reliance on personal loans. These figures combine to suggest that finance might be less of a constraint for agricultural midstream SMEs than non-agricultural midstream SMEs, even though the majority of firms, regardless of sector, are not currently using bank loans or credit, suggesting that credit constraints are widespread in the midstream.

The final two columns examine mobile phone access and usage (columns 10-11). Among microenterprises in Panel A, agricultural microenterprises are about 9 percentage points more likely to have a mobile phone—with a mean of 71% for non-agricultural MSMEs—and 20 percentage points more likely to use mobile money—with a mean of 30% for non-agricultural MSMEs. There are no statistically significant differences for the SMEs in Panel B, where overall mobile phone and mobile money use is higher on average.

Finally, in Table 5 we examine how firms that report female ownership or female management in the WBES differ from those that do not. Out of the sample of 3,022 midstream firms in the Enterprise Surveys, 632 have at least one female amongst the owners (21.3 percent), compared to 304 with a female manager (10.2 percent). That said, not every firm owned by a woman is managed by a woman, nor vice versa. When comparing both features simultaneously, 74.7 percent are neither owned nor managed by women, whereas 7.6 percent of all firms have both a female manager and owner. We split the sample of firms into agricultural and non-agricultural and examine how the presence of a female owner (Panels A and B) or female manager (Panels C and D) is correlated with the same outcomes examined in Table 4.

We note that female ownership is associated with firms being significantly larger, both in number of employees and sales. While the correlations are more robustly statistically significant for non-agricultural firms, the magnitudes of the coefficients are similar across sectors. The key difference that we note is that, only in the agricultural sector, firms with female owners are more likely to report finance as an obstacle, despite the fact that they tend to be bigger, though less likely to report land as an obstacle.

Examining female management in Panels C and D, fewer significant patterns are identified, likely because the smaller number of firms with female managers reduces power to identify correlations. However, for both agricultural and non-agricultural firms the coefficients suggest that firms with female managers are smaller than those without. This contrasts with the ownership results and suggests that having a female among the owners (perhaps due to marriage) indicates a different type of firm than those actively managed by women which may be smaller. Again, the coefficient is indicative that agricultural and female-managed SMEs are more likely to see finance as an obstacle, but the correlation is not statistically significant at traditional levels (p -value = 0.14). Overall these patterns suggest that firms with women in ownership or management may have more difficulty accessing needed credit than those without.

Table 5. Female Management and Ownership

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Employees (ln)	Sales (ln)	Sales (ln)	Has bank account	Has loan/ credit	Finance as obstacle	Transport as obstacle	Land as obstacle	Electricity as obstacle	Has mobile phone	Uses mobile money
A. Female owner in agricultural firms											
Firm has a female owner (0/1)	0.11 (0.14)	0.65* (0.38)	0.50 (0.36)	-0.02 (0.04)	0.03 (0.06)	0.11** (0.05)	0.01 (0.03)	-0.07** (0.03)	-0.01 (0.06)	0.10 (0.08)	0.15 (0.10)
Female = 0 outcome mean	2.87	16.84	16.84	0.85	0.27	0.18	0.06	0.04	0.32	0.80	0.31
N	353	294	287	286	276	273	273	273	273	93	104
R-squared	0.04	0.04	0.16	0.01	0.05	0.04	0.00	0.03	0.06	0.12	0.14
B. Female owner in non-agricultural firms											
Firm has a female owner (0/1)	0.24*** (0.07)	0.85*** (0.19)	0.79*** (0.17)	0.03 (0.03)	0.14*** (0.03)	-0.01 (0.03)	-0.02 (0.01)	0.03** (0.02)	-0.03 (0.03)	0.01 (0.04)	-0.02 (0.06)
Female = 0 outcome mean	2.61	15.82	15.82	0.71	0.15	0.28	0.05	0.04	0.30	0.87	0.39
N	1,525	1,235	1,216	1,210	1,191	1,170	1,170	1,170	1,170	389	436
R-squared	0.05	0.07	0.25	0.06	0.06	0.03	0.00	0.02	0.03	0.02	0.06
C. Female manager in agricultural firms											
Firm has a female manager (0/1)	-0.10 (0.21)	-0.52 (0.55)	-0.37 (0.51)	-0.05 (0.06)	-0.08 (0.09)	0.11 (0.07)	-0.02 (0.04)	-0.06 (0.04)	-0.03 (0.09)	0.14 (0.12)	0.09 (0.16)
Female = 0 outcome mean	2.93	17.09	17.09	0.86	0.30	0.19	0.07	0.04	0.32	0.83	0.33
N	363	297	290	289	279	276	276	276	276	94	105
R-squared	0.03	0.03	0.16	0.02	0.05	0.03	0.00	0.02	0.05	0.12	0.13
D. Female manager in non-agricultural firms											
Firm has a female manager (0/1)	-0.09 (0.09)	-0.33 (0.26)	-0.21 (0.23)	-0.08** (0.04)	-0.05 (0.04)	-0.01 (0.04)	-0.02 (0.02)	-0.00 (0.02)	-0.01 (0.04)	-0.04 (0.05)	-0.09 (0.08)
Female = 0 outcome mean	2.68	16.00	16.00	0.73	0.18	0.28	0.05	0.05	0.29	0.88	0.41
N	1,538	1,244	1,224	1,219	1,198	1,179	1,179	1,179	1,179	392	439
R-squared	0.04	0.05	0.24	0.06	0.04	0.03	0.00	0.02	0.02	0.02	0.06
Country × Type of actor	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country × Firm's employees (ln)	-	N	-	Y	Y	Y	Y	Y	Y	Y	Y
Country × Firm's sales (ln)	N	-	Y	Y	Y	Y	Y	Y	Y	Y	Y

Notes: This table shows differences between midstream firms by female management/ownership and by agricultural/non-agricultural midstream firms in the Enterprise Surveys. SMEs are categorized as "midstream" and "agricultural" based on the firm's industry code. Type of midstream actor consists of five mutually exclusive midstream activities: "trading", "processing", "storage", "wholesaling", and "exporting". Coefficients correspond to OLS estimations and (depending on the outcome) country by type of actor, country by firm's size, and country by firm's sales fixed effects. "Mean outcome variable" is the mean of the dependent variable among the "comparison" group. Standard errors in parentheses. Significance levels at 10% (*), 5% (**), and 1% (***).

Conclusion

In this paper, we study MSMEs working in the midstream of value chains, with a focus on learning about differences in access to finance among agricultural and non-agricultural firms. To do so, we use the more recent rounds of the LSMS-ISA data sets to learn about microenterprises, and the WBES surveys in the same countries to learn about SMEs. We further explore whether female management or ownership differentiates firm performance or financial access. The analysis is not causal, but descriptive, as there are at least two important levels of selection present in the data. First, firm owners choose the type of business they operate; the selection of working in agriculture or not is not random. As such, owners or managers of agricultural firms may have different, unobservable characteristics than owners or managers of non-agricultural firms. Second, in particular the sample of SMEs may reflect winners; e.g. firms that have already succeeded in growing to their current size. There could be important differences we cannot observe between the type of agricultural firm that survives and the type of non-agricultural midstream firm that does the same.

Our analysis suggests that both in terms the number of employees and sales, household microenterprises and SMEs in agriculture may be bigger and more productive than those outside of agriculture, showing higher sales even conditional on activity type. However, agricultural microenterprises do not seem to have differential bank account access or current loan usage; both are relatively rare among sample firms. However, they do have significantly better access to mobile phones and are more likely to use mobile money than non-agricultural microenterprises in the midstream.

Perhaps contrary to prevailing narratives, agricultural SMEs are more likely to have access to bank accounts and are more likely to have credit availability than non-agricultural SMEs. However, very few SMEs have access to credit in general, so the majority of agricultural SMEs still face credit constraints. Similarly, while agricultural midstream firms were less likely to identify finance as one of their main obstacles than their non-agricultural counterparts, finance was the second most common obstacle to growth identified by sample firms, after electricity. Expanding to explore differences by female leadership, we find suggestive evidence the agricultural firms with female owners or managers may have more difficulty accessing credit than male owned or managed firms. However, these firms also report relatively higher use of mobile phones and money, suggesting mobile technologies may be an avenue for improved inclusive access to finance.

Finally, we acknowledge that while the LSMS-ISA and WBES surveys are among the best publicly available surveys to study firms in the midstream, they were not designed with the explicit intention of identifying midstream firms or of situating them in relation to the agricultural sector or within their specific value chains. To improve our collective knowledge of the impediments to growth for firms in the agricultural midstream, taking into account their type of business and size, different types of surveys are necessary that focus specifically on understanding the businesses and business needs of these actors.

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Appendix A. Additional Tables and Figures

Appendix Table 1. Additional Measures from the Enterprise Surveys

	(1)	(2)	(3)	(4)	(5)	(6)
	Applied to credit	Application rejected	# outstanding loans	Credit had collateral	Bank as credit source	Personal loan for the firm
Agricultural firm (0/1)	0.07*** (0.02)	-0.06 (0.06)	-0.23 (0.54)	0.01 (0.04)	-0.01 (0.05)	-0.00 (0.02)
Mean outcome variable	0.12	0.19	2.08	0.85	0.78	0.11
<i>N</i>	1,463	219	274	347	353	1,440
<i>R</i> -squared	0.05	0.01	0.00	0.02	0.01	0.00
Country × Type of actor	Y	Y	Y	Y	Y	Y
Country × Firm's employees (ln)	Y	Y	Y	Y	Y	Y
Country × Firm's sales (ln)	Y	Y	Y	Y	Y	Y

Notes: This table shows differences between agricultural and non-agricultural midstream firms in the Enterprise Surveys. SMEs are categorized as "midstream" and "agricultural" based on the firm's industry code. Type of midstream actor consists of five mutually exclusive midstream activities: "trading", "processing", "storage", "wholesaling", and "exporting". Coefficients correspond to OLS estimations and country by type of actor, country by firm's size, and country by firm's sales fixed effects. "Mean outcome variable" is the mean of the dependent variable among the "comparison" group. Standard errors in parentheses. Significance levels at 10% (*), 5% (**), and 1% (***).

Appendix B. Categorization of midstream firms/employees in the LSMS-ISA and Enterprise Surveys data

Both the LSMS-ISA and Enterprise Surveys collect data on the firm's main activity using two different approaches:

1. A written description of the main activity/product
2. The industry code of said activity/product, usually based on the International Standard Industrial Classification of All Economic Activities (ISIC) framework.^{2 3}

For the written descriptions, we review each instance in the data and determine if the activity/product belongs to (i) the midstream/non-midstream of a given value chain, and (ii) an agricultural or non-agricultural industry. For example, a firm described as "cement manufacturing" is categorized as *non-agricultural midstream*, as its main activity is on the midstream of a non-agricultural value chain. Conversely, a firm described as "cashew processing factory" is categorized as *agricultural midstream*, since the input transformed by the firm in this case is an agricultural commodity.

For the industry codes, we define those relevant to midstream in Appendix Table B1 and those signifying participation in and agricultural/non-agricultural activities in Appendix Table B2 below. Within these midstream firms, we also identify five mutually exclusive categories of midstream activities, including trading, storage, transporting, wholesaling, and exporting. The process to identify these subgroups is also done using the written descriptions and industry codes, as described above.

We can compare whether an approach reliant on codes agrees with one dependent on short written descriptions in our determination of whether firms are involved in agriculture. Appendix Table B3 shows that, where both data sources are available, the degree of agreement is very high, 97%. This increases our confidence that when only one or the other type of description is available, we can be confident that we are making a similar determination.

² Some countries in the LSMS-ISA do not collect the written description and/or the industry codes for each firm.

³ <https://unstats.un.org/unsd/statcom/doc02/isic.pdf>

Appendix Table B1. Industry codes of midstream activities

Activity description	Industry code (ISIC Revision 3.1)
Manufacture of food products and beverages	Division 15 (all codes)
Manufacture of tobacco products	Division 16 (all codes)
Manufacture of textiles	Division 17 (all codes)
Manufacture of wearing apparel; dressing and dyeing of fur	Division 18 (all codes)
Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	Division 19 (all codes)
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	Division 20 (all codes)
Manufacture of paper and paper products	Division 21 (all codes)
Manufacture of coke, refined petroleum products and nuclear fuel	Division 23 (all codes)
Manufacture of chemicals and chemical products	Division 24 (all codes)
Manufacture of rubber and plastics products	Division 25 (all codes)
Manufacture of other non-metallic mineral products	Division 26 (all codes)
Manufacture of basic metals	Division 27 (all codes)
Manufacture of fabricated metal products, except machinery and equipment	Division 28 (all codes)
Manufacture of machinery and equipment n.e.c.	Division 29 (all codes)
Manufacture of office, accounting, and computing machinery	Division 30 (all codes)
Manufacture of electrical machinery and apparatus n.e.c.	Division 31 (all codes)
Manufacture of radio, television and communication equipment and apparatus	Division 32 (all codes)
Manufacture of medical, precision and optical instruments, watches and clocks	Division 33 (all codes)
Manufacture of motor vehicles, trailers and semi-trailers	Division 34 (all codes)
Manufacture of other transport equipment	Division 35 (all codes)
Manufacture of furniture; manufacturing n.e.c.	Division 36 (all codes)
Manufacture of gas; distribution of gaseous fuels through mains	4020
Collection, purification, and distribution of water	Division 41 (all codes)
Packaging activities	7495
Storage and warehousing	6302
Wholesale of agricultural raw materials and live animals	5121
Wholesale of food, beverages, and tobacco	5122
Wholesale of textiles, clothing and footwear	5131
Wholesale of other household goods	5139
Wholesale of solid, liquid and gaseous fuels and related products	5141
Wholesale of metals and metal ores	5142
Wholesale of construction materials, hardware, plumbing and heating equipment and supplies	5143
Wholesale of other intermediate products, waste, and scrap	5149
Wholesale of computers, computer peripheral equipment and software	5151
Wholesale of electronic and telecommunications parts and equipment	5152
Wholesale of electronic and telecommunications parts and equipment	5159
Other wholesale	5190

Appendix Table B2. Industry codes of agricultural activities

Activity description	Industry code (ISIC Revision 3.1)
Production, processing and preserving of meat and meat products	1511
Processing and preserving of fish and fish products	1512
Processing and preserving of fruit and vegetables	1513
Manufacture of vegetable and animal oils and fats	1514
Manufacture of dairy products	1520
Manufacture of grain mill products	1531
Manufacture of starches and starch products	1532
Manufacture of cocoa, chocolate, and sugar confectionery	1543
Manufacture of macaroni, noodles, couscous, and similar farinaceous products	1544
Manufacture of other food products n.e.c.	1549
Wholesale of agricultural raw materials and live animals	5121
Wholesale of food, beverages, and tobacco	5122

Appendix Table B3. Agreement by firm categorization method (Enterprise Surveys)

a.) Agricultural vs. non-agricultural midstream firms

<i>Written description</i>	<i>Industry codes</i>			Total
	Non-ag. firms	Ag. firms	Other	
Non-ag. firms	1,551	18	56	1,625
Ag. firms	41	360	7	408
Other	920	132	2,683	3,735
Total	2,512	510	2,746	5,768

Notes: This table shows the number of midstream SMEs in the Enterprise Surveys by the type of method used to categorize firms as "agricultural" and "non-agricultural". The category "Other" includes not midstream SMEs, non-value-chain SMEs, or SMEs where we cannot establish the firm's main activity based on the written description or the industry code.

b.) Agreement by type of midstream actor

<i>Written description</i>	<i>Industry code</i>						Total
	Trading	Processing	Storage	Wholesaling	Exporting	Other	
Trading	0	6	0	8	0	11	25
Processing	0	1,758	0	6	0	47	1,811
Storage	0	2	0	3	0	1	6
Wholesaling	0	4	0	162	0	4	170
Exporting	0	2	0	19	0	0	21
Other	0	796	0	256	0	2,683	3,735
Total	0	2,568	0	454	0	2,746	5,768

Notes: This table shows the number of midstream SMEs in the Enterprise Surveys by the type of method used to categorize firm as "trading", "processing", "storage", "wholesaling", and "exporting". The category "Other" includes not midstream SMEs, non-value-chain SMEs, or SMEs where we cannot establish the firm's main activity based on the written description or the industry code.

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