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Research Report:
**Coordinating Intermediaries and Scaling Up Local and Regional
Food Systems: An Organizational Species Approach to
Understanding the Roles of Food Hubs**

Jason Scott Entsminger^aⓈ

^a*Research Associate, McQuinn Center for Entrepreneurial Leadership,
College of Agriculture, Food, and Natural Resources,
University of Missouri, 142 Mumford Hall
Columbia, MO, 65211, USA*

Abstract

Food hubs are one strategy identified for scaling up local and regional food systems. They act as coordinating intermediaries, aggregating, assorting, distributing, and transforming source-identified food products in short food supply chains. As a newly emergent form, the population of these organizations is characterized by heterogeneity. New taxonomic work aims to classify these organizations using an organizational species concept. This report extends that, identifying the roles different food hub species play within distribution channels, especially those which are likely to increase scale. Results indicate that there may be a trade-off between scaling up and behaviors enacting a “commitment to place.”

Keywords: distribution strategies, food hubs, food systems, local foods, organizational form, organizational species

ⓈCorresponding author:

Tel: (573) 882-7740
Email: jse9t5@mail.missouri.edu

Introduction

Scaling-up local and regional food systems (LRFS) is a central topic in food distribution policy (Clancy and Ruhf, 2010; Mount, 2012; Wittman, Beckie, and Hergesheimer, 2012; Nost, 2014; Clark and Inwood, 2016). Food hub organizations (FHO) are one avenue for achieving this goal. Key to the ability of FHOs to scale up is that they “coordinate” food distribution networks while transmitting information key to proximal transactions. As intermediaries, FHOs reduce transaction costs, increase economies of size and scope, and fulfill (or stimulate) latent demand for food products that are source-identified or have other attributes of social embeddedness. FHOs exist within a dynamic agri-food sector and as a nascent organizational form exhibit a degree of heterogeneity. However, assuming absolute heterogeneity does a disservice to managing food distribution networks and public policy goals. Applying an organizational species concept (OSC) to classify FHOs provides an escape from this trap.

The OSC and resulting FHO species was published in a working paper by Entsminger and Westgren (2019). The underlying conceptual framework integrates the notion of *natural kinds* taken from philosophers of science with allegory to the *ecological niche*—a well-developed allusion in the management literature (Cattani, Porac, and Thomas, 2017; Popielarz and Neal, 2007; Astley, 1985; Astley and Van de Ven, 1983). Using data from the 2015 National Food Hub Survey, Entsminger and Westgren (2019) propose six species of FHOs. Here, I provide a supplement, discussing implications for LRFS policy, management, and scaling up. I investigate differences in key performance, financial, and supplier elements via means testing using analysis of variance (ANOVA) and independent samples *t*-tests (ISTT). I use regression analysis to investigate performance differences while accounting for exogenous elements. Results indicate that different species of FHOs suit different contexts and goals.

Species Morphology and Strategic Orientations

Table 1 summarizes key attributes of FHO species. These are based on observations for morphological and strategic orientation variables from mean profiles, reported in Entsminger and Westgren (2019), and ISTT results, reported here in Table 2. Small-Scale Startups have a morphological profile that implies under-capitalization. This matches their strategic niche, which is highly reliant on direct-to-consumer (DTC) channels despite having the second-highest product reliance on meat and poultry (which generally have higher relative asset needs for cold chains). Conversely, Community Service Providers (CSPs) have many capital-intensive features, but their footprint is small overall. Based on their strategic orientation, CSPs likely use these assets for intensive community engagement programs, while the product and channel strategy of the CSP is highly diversified. Coops are consistently below average for community service offerings, implying that Coops FHOs enact the social consciousness sought by the local foods movement solely by serving the economic and social needs of producers.

Heavy reliance on fresh produce and DTC and direct-to-retail (DTR) channels raises substantial questions about the performance of FHOs in scaling up LRFSs through product diversification and by targeting high-volume buyers. Implicated in the strategic orientations of these species is that

Table 1. Summary of Food Hub Organization Species ($N = 151$)

Species	Freq.	% Overall	% Samp.	Strategic Orientation	Product	Channel	Comm. Services
1. Average Joes	32	21.2	31.1	Highly dependent on fresh produce (65.3%) supplemented by meat and poultry (14.36%). Most sales to DTR channels (52.98%) with some DTC (28.98%) and DTI (13.35%). Offer roughly the sample-average number of Community Services (4.97).	Fresh produce + meat and poultry	DTR + (DTC & DTI)	Average
2. Small-Scale Startups	14	9.3	13.6	Predominately fresh produce (53.86%) with a higher share in meat and poultry (24.8%) to supplement. Most sales go to DTC channels (64.14%) with some DTR (20.05%). Offer few Community Services (3.71), especially those focused on community food systems issues.	Fresh produce + meat and poultry	DTC + DTR	Fewer
3. Processors	19	12.6	18.4	Greatest reliance on processed products [Processed Produce (12.84%) and Other Value-aded (9.89%)], largest of any group. Fresh Produce still a plurality at 46.01%. Sales channels are diversified, with roughly half (49.04%) to DTC and the remained relatively evenly split between DTR, DTM, and DTI. Offer slightly more Community Services than average at 5.95.	Fresh produce + processed	DTC	Slightly more
4. Community Service Providers (CSPs)	9	6.0	8.7	Take a market-basket approach to product coverage, with only 34.17% of sales from Fresh Produce, 17.00% of sales from Milk and Dairy (the highest for any group and more than 3-times the sample average) and some Processed Produce, Meat and Poultry, and Eggs. Rely on the DTC-DTR channel combo (45.13% and 29.4%, respectively) with some DTI sales supplementing (17.47%). Offer the greatest number of Community Services at 7.33.	Market basket	(DTC & DTR) + DTI	Many
5. Coops	17	11.3	16.5	Greatest reliance on Meat and Poultry (30.33%) the largest of any group, along with Fresh Produce (50.92%) and double the sample-average of Unclassified Sales (at 4.13%). Rely on the DTC-DTR channel combo (46.34% and 39.42%, respectively) with some DTM sales supplementing (13.58%). Offer the lowest number of Community Services at 3.06.	Fresh produce + meat and poultry	(DTC & DTR) + DTM	Lowest
6. Traditional Produce Warehouseurs (TPWs)	12	7.9	11.7	Highly dependent on fresh produce (67.66%) supplemented by small amounts of other products. Most sales go to DTR channels (50.57%) with some DTC (37.28%). Offer roughly the sample-average number of Community Services (5.08).	Fresh produce	DTR + DTC	Average
Missing data	48	31.8					

Note: Based on findings from Entsminger and Westgren (2019).

Table 2. ISTT Results for Morphological and Strategic Profile Variables

	Mean Difference					
	1	2	3	4	5	6
Profit motivated	-0.44	0.57	0.57	-0.02	-0.01	0.04
Co-operative form	0.28	0.08	0.13	-0.24	-0.88	0.06
Firm age (ln)	0.12	0.49	0.13	-0.67	-0.45	-0.40
Acts as broker	0.28	-0.16	-0.15	-0.89	-0.36	0.45
Nonsales percentage of revenue	0.08	0.08	-0.19	-0.26	0.09	0.07
Total warehouse space in square feet (in '000s)	6.41	8.32	-7.10	-12.48	2.93	-13.95
Number of delivery vehicles on hand	0.68	2.53	-2.73	1.42	1.47	-5.64
Offer transport services to producers	-0.39	0.78	-0.35	0.15	-0.01	-0.15
Add. packaging involv.	0.10	-0.21	-0.83	-0.18	0.78	0.15
Processing facilities	0.34	0.13	-0.73	-0.43	0.30	0.10
Rental space for other businesses	0.24	0.21	0.09	-0.87	0.21	-0.89
Retail space for the hub	-0.08	0.09	0.01	-0.83	0.25	0.24
Licensed shared use kitchen	0.15	0.08	-0.14	-0.56	0.16	0.16
Fresh produce and herbs	-11.25	3.74	13.39	24.26	7.32	-11.77
Processed produce (e.g., canned, frozen, dried)	3.43	1.51	-10.38	-4.36	2.16	3.11
Meat and poultry	2.84	-9.56	1.32	8.90	-16.36	10.37
Fish	0.02	-0.15	-0.01	0.29	0.51	-1.27
Milk and other dairy products	-1.65	3.14	2.68	-12.52	2.82	-2.56
Baked goods/bread	0.08	-0.57	-0.40	0.11	-0.57	1.32
Coffee/tea	0.04	0.26	0.14	-0.79	-0.36	0.42
Other processed or value-added food products	1.83	3.90	-6.46	1.69	3.32	-0.98
Nonfood items	-0.45	0.31	0.41	-0.41	-0.44	0.44
All unclassified sales	1.17	0.36	0.89	-1.68	-2.81	-0.97
DTC total percent of sales to consumer	20.50	-23.26	-6.08	-1.27	-2.88	7.49
DTR total percent of sales to retail	-21.14	20.16	23.33	8.57	-2.20	-14.64
DTM total percent of sales to intermediaries	3.47	1.33	-4.92	-1.18	-7.98	6.68
DTI total percent of sales to institutions	-3.45	1.14	-9.63	-6.96	12.13	1.25
UNC total percent of sales to unclassified	0.53	0.56	-2.76	0.77	0.87	-0.27
Total community services offered	-0.26	1.16	-1.35	-2.73	1.93	-0.34
Paid employment opportunities for youth	0.04	0.35	-0.30	-0.14	0.09	-0.29
Accepting SNAP benefits	-0.04	0.10	-0.32	-0.38	0.10	-0.14
Accepting WIC or FMNP benefits	0.08	0.11	-0.12	-0.29	0.10	0.07
Matching programs for SNAP benefits	-0.20	0.21	-0.11	-0.04	0.02	-0.16
Nutrition or cooking education	0.09	0.09	-0.08	-0.52	0.37	0.10
Health screenings	0.04	0.07	-0.05	-0.17	0.07	-0.02
Transportation services for consumers to access your operation	-0.02	0.01	-0.21	-0.14	0.01	0.10
Operating a mobile market	-0.15	0.02	-0.26	-0.19	0.29	0.05
Subsidized farm shares	-0.01	0.11	-0.11	0.08	0.02	-0.16
Education about community and food systems issues	-0.07	-0.15	0.06	-0.22	0.36	-0.05
Education for programs in community or school gardening	0.05	-0.02	0.01	-0.32	0.21	0.07
Food donation to local food pantries/banks	-0.17	0.13	-0.13	0.06	0.01	-0.09
Other community services or activities	0.01	0.28	-0.12	-0.22	0.24	0.02

Note: Boldface indicates statistical significance at or above the 10% level.

some fill specific roles in food distribution systems. Coops, for example, have the highest mean reliance on meat and poultry products, which fits neatly with the theoretical expectation that cooperative organizations arise in situations with thin markets. Were data available, it would not be surprising if CSPs showed tendency to exist in urban settings and food deserts, filling roles as food social work organizations. Unfortunately, detailed geographic data were not be provided by the primary data collectors at Michigan State University. (See Hardy, Hamm, Pirog, et al., 2016, for more information on this data set.)

Suppliers

The makeup of FHO suppliers is relevant to increasing scale, transaction cost regimes, and equity of distribution arrangements. Figure 1 presents mean profiles for dichotomous variables on the types of suppliers, and Figure 2 presents demographics. Across species, over 80% of FHOs source from farms. The overall mix of supplier types across species varies some. Small-Scale Startups primarily source from farms and food processors. CSPs have approximately the same proportion of cases utilizing food processors as farms and are most likely to purchase from nonfood and unclassified businesses. Traditional Produce Warehouse (TPWs) are most likely to purchase from other distributors. CSPs and TPWs are engaged in extended (less proximal) transactions. On average, FHOs in the sample are doing poorly at inclusion of suppliers owned by females (30% of suppliers) and people of color (20%). There is divergence among species for suppliers of color; Coops have the lowest average (10%) rate and CSPs have the highest (60%). On average, there are a maximum of 78 different suppliers for each organization, but as Table 3 shows, these numbers change dramatically within species. Therefore, FHOs of a given species may have a differing impact on the number and types of suppliers they are able to connect to markets for proximal, source-identified products.

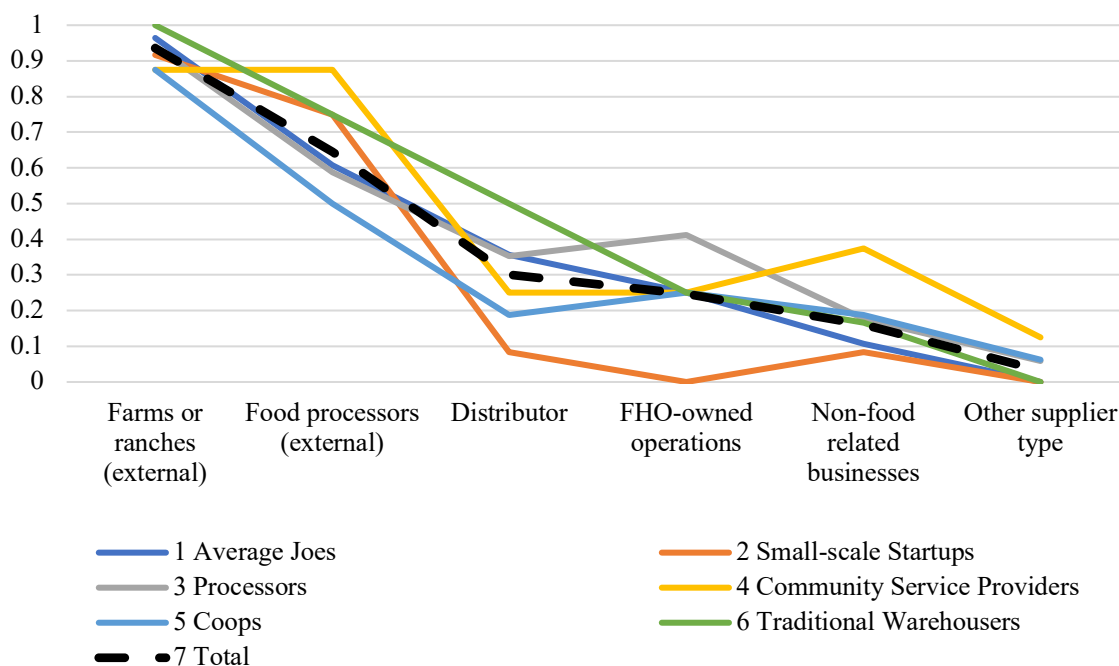


Figure 1. Mean Profiles: Types of Suppliers Used

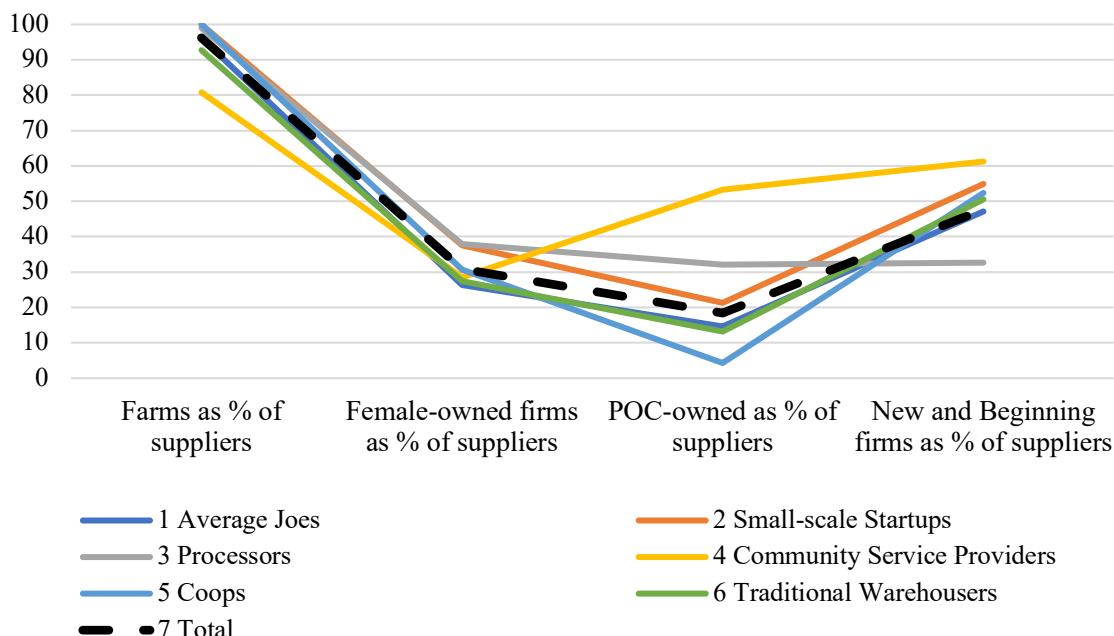


Figure 2. Mean Profiles: Supplier Demographics

Table 3. ISTT Results for Supplier and Managerial Variables

	Mean Difference					
	1	2	3	4	5	6
Farms or ranches not owned or managed by the food hub	-0.07	-0.01	-0.04	0.04	0.04	-0.10
Food processors not owned or managed by the food hub	0.00	-0.16	0.02	-0.29	0.12	-0.16
A different food distributor	-0.06	0.26	-0.04	0.07	0.15	-0.21
The food hub’s own farms, ranches and/or other enterprises	0.00	0.28	-0.19	0.00	0.00	0.00
Nonfood related businesses	0.06	0.08	-0.03	-0.24	-0.04	-0.02
Other (specify)	0.08	0.07	0.01	-0.07	0.00	0.07
Total number of supplying enterprises - all types	25.86	57.83	-25.91	60.05	44.38	-210.21
Number of supplying enterprises - Farms or ranches only	-1.40	15.38	-0.86	22.31	-1.31	-41.93
Estimated max number of suppliers (maximum of 6.4 and 6.9)	26.38	46.33	-24.58	48.26	27.86	-160.61
Percent of suppliers who are farms or ranches	-0.02	-0.05	-0.02	-0.09	0.03	0.07
Female-owned firms (% of suppliers)	6.38	-7.46	-7.85	2.68	0.41	4.21
People of color-owned firms (% of suppliers)	6.63	-2.07	-14.62	-35.29	17.67	7.47
Firms in operation less than 10 years (% of suppliers)	4.05	-5.41	20.84	-11.97	-2.72	-0.56
Age of most senior manager	-2.94	3.33	1.01	-6.47	0.81	-0.22
Education level of most senior manager	0.21	-0.34	-0.42	0.73	0.50	-0.46
Warehousing/distribution of food	-0.70	0.94	0.07	-0.41	0.36	-0.85
Management, including financial and capital planning	-0.77	1.15	-0.42	-0.52	0.68	-0.49
Strategic planning	-0.71	0.44	-0.42	0.29	0.59	-0.75
Food processing	0.25	0.11	-0.74	-0.18	0.58	-0.31
Food marketing and sales	-0.26	0.44	0.38	-0.41	0.36	-0.39
Food retail	-0.09	0.03	0.87	-0.63	0.65	-0.12
Agricultural production	-0.01	-0.32	-1.27	-0.84	0.50	0.87
Utilizing other, food hub related skills	-0.33	0.20	-0.74	0.20	1.22	-1.31

Note: Boldface indicates statistical significance at or above the 10% level.

Managerial and Financial Elements

Coops senior managers consistently have fewer years of experience in each of the key functional areas, despite Coops being older organizations and their senior managers having similar ages and education levels as those of other species. CSP managers are most experienced. Processors have the highest average experience in agricultural production, while TPW managers have the highest average experience in warehousing, strategy, and other, unclassified managerial skills.

Results indicate a number of realms for potential policy interventions (Figure 3). FHO managers across species have low levels of experience in processing functions, which are key elements of value addition. Coops managers are at an experiential disadvantage and are a key group to target with training and mentorship programs. Small-Scale Startup managers substantially lack experience in warehousing and management; programs for new FHOs should prioritize these aspects. TPW managers lack experience in agricultural production; given their high reliance on fresh produce and new food safety regulations, this will be a critical need.

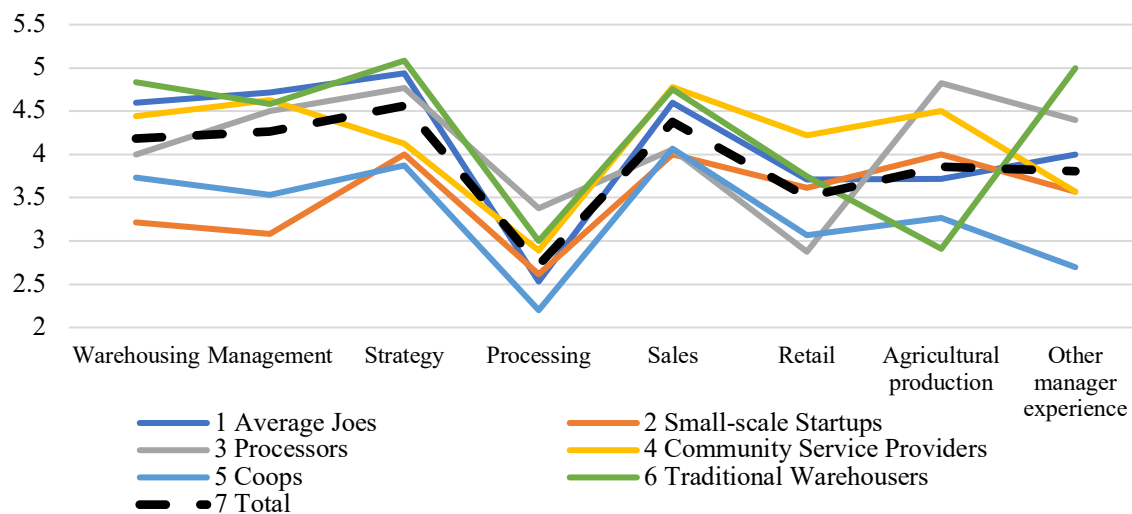


Figure 3. Mean Profiles: Manager Experience in Key Functions

Coops are the most likely to have relied on membership fees at founding (Figure 4 and Table 4). TPWs have the most diversified startup sources (mean 4.33), predominately program transfers, foundation grants, individual donations, and founder capital. Average Joes, Small-Scale Startups, and CSPs all sit near averages of three total sources. The most likely sources are membership fees for Coops; founder capital for Processors, Average Joes, and CSPs; and membership fees or individual donations for Small-Scale Startups. CSPs reported no use of local government funds and only moderate use of federal and state funds and foundation grants. Founder capital is the only source with majority use across all. Coops have the lowest revenue from nonsales and grant-dependency measures, indicating they are financially autonomous. CSPs and Processors have the highest average reliance on nonsales revenues. However, CSPs' dependence on grants is below the sample average, while Processors have the second highest dependence. This borders on the counterintuitive. Striking, and worthy of future investigation, is the source of nonsales revenues for the different species, if it is not grants.

Table 4. ISTT Results for Financial and Performance Variables

	Mean Difference					
	1	2	3	4	5	6
Income from other programs of the organization	0.05	-0.11	-0.18	0.19	0.20	-0.51
Business loans	-0.13	0.01	-0.08	0.10	0.11	0.10
Federal government funding	0.18	0.06	-0.12	-0.09	0.08	-0.01
State government funding	0.06	0.17	-0.22	0.04	-0.02	-0.10
Local government funding	-0.01	0.00	0.02	0.19	-0.08	-0.16
Foundation grants	0.02	-0.02	0.02	0.16	-0.03	-0.68
In-kind support	0.00	0.07	0.10	-0.07	-0.05	0.00
Donations from organizations	0.01	-0.14	-0.02	0.16	0.03	0.16
Donations from individuals	0.15	-0.13	0.00	-0.16	0.00	-0.43
Infrastructure provided by a government entity	-0.04	0.08	0.08	-0.14	-0.06	0.07
Membership fees	0.16	-0.18	0.15	0.01	-0.47	0.22
Bank loans	-0.07	0.16	-0.03	-0.07	-0.27	0.14
Private investors	-0.21	0.06	-0.03	0.15	0.16	0.14
Organization's and/or founder's own capital	-0.21	0.24	-0.13	-0.14	0.11	-0.20
Other (specify)	0.07	0.11	0.02	0.10	-0.03	0.10
Total number of startup funding sources	0.04	0.37	-0.43	0.45	-0.31	-1.16
Grant dependency rating	0.08	-0.08	-0.07	0.08	0.24	-0.05
Food and/or product purchases from producers/suppliers	-0.03	0.04	-0.03	0.22	-0.01	-0.06
Packaging equipment and supplies	-0.01	0.01	-0.02	0.01	0.01	0.00
Payments toward facilities	-0.01	-0.03	0.00	-0.06	0.03	0.02
Payments toward trucks or other automotive equipment	-0.01	0.02	-0.01	-0.07	0.02	0.01
Gasoline and tolls	0.00	0.01	0.00	-0.03	0.00	-0.01
Repair/maintenance	0.00	0.01	-0.01	-0.03	0.00	0.01
Utilities	0.00	0.01	-0.01	-0.06	0.01	0.00
Advertising and promotional materials	0.01	-0.02	0.01	-0.01	0.00	0.00
Credit card and bank service charges	0.02	-0.03	0.02	-0.01	0.01	0.01
Employee salary and benefits	0.02	0.05	-0.04	-0.02	-0.03	-0.02
Other administrative expenses (e.g., office supplies)	0.01	0.01	0.01	-0.01	-0.02	0.01
Data and computer services	0.01	-0.03	0.01	-0.01	0.00	0.01
All types of insurance	-0.01	0.01	0.01	-0.02	0.01	0.01
Consulting services	0.01	-0.04	0.02	0.02	-0.02	0.02
Telecommunications	0.00	0.00	0.00	0.00	0.00	0.00
Other	-0.01	-0.02	0.03	0.09	0.00	-0.01
Total expenses (in '000,000s)	1.75	2.28	-2.70	1.98	1.06	-6.26
Total value of product moved (in '000,000s)	2.78	3.18	-0.39	2.79	-5.39	-6.38
Profit (in '000,000s)	1.70	1.62	1.00	1.46	-7.17	1.70

Note: Boldface indicates statistical significance at or above the 10% level.

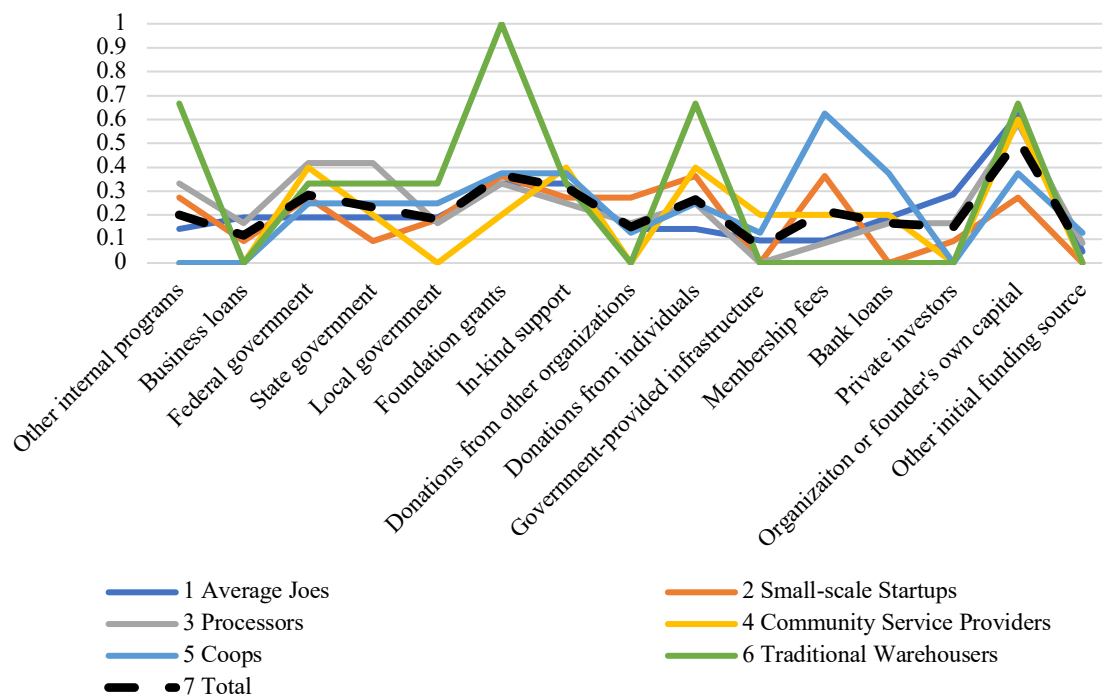


Figure 4. Mean Profiles: Startup Funding

Performance

Firm performance is examined via total value of product moved through the FHO, revenue, and profit. TPWs, Coops, and Processors have substantially greater economic impact in terms of TVPM and revenue. Average Joes, CSPs, and Small-Scale Startups are all within a \$1 million ceiling. Coops are the most profitable, in large part due to low expense levels. Only Average Joes show statistically significant mean differences for the core performance variables of TVPM and profit (see Table 4), with \$2.78 million less profit than all other cases. Results from regression analyses on these variables (Table 5) are consistent with Entsminger and Westgren (2019): (i) The only species showing a statistically significant coefficient is Coops; (ii) only Region 3 has a statistically significant environmental effect;¹ (iii) offering more types of community services has a positive and significant impact on profit; and (iv) for both TVPM and profit greater reliance on meat and poultry is positive and significant, while greater reliance on eggs has a negative and significant impact.

Discussion

Results here indicate that different species of FHOs play distinct roles in food distribution systems, coordinating actors at different levels, with different backgrounds, in different ways, and with different impacts. For example, Coops are consistently below population averages for most variables and yet are the only species consistently indicated as having high impact through the total value of product moved and profitability. Other results indicate that there may be efficiency or financial concerns for the species with the largest overall scale (TPWs). Within decisions of

¹ Region 3 includes AK, ID, MT, OR, WA, and WY.

Table 5. Regression Results for Performance Variables

		Total Value of Product Moved ('000,000s)								Profit ('000,000s)							
		B	p-Value	B	p-Value	B	p-Value	B	p-Value	B	p-Value	B	p-Value	B	p-Value	B	p-Value
Species	Intercept	1.07	0.70	2.52	0.50	-2.64	0.40	-13.24	0.12	0.23	0.91	0.03	0.99	-0.68	0.82	-12.19	0.12
	[2.00]	-0.91	0.86	-5.10	0.37	-4.78	0.33	-3.06	0.64	-0.21	0.96	-5.03	0.23	-5.69	0.23	-4.37	0.48
	[3.00]	2.72	0.56	1.34	0.79	3.37	0.40	0.93	0.85	0.38	0.92	-0.85	0.81	-0.63	0.87	-5.10	0.27
	[4.00]	-0.52	0.93	-2.17	0.74	-0.47	0.93	-1.96	0.78	-0.14	0.98	-2.23	0.64	-1.87	0.71	-3.85	0.56
	[5.00]	7.44	0.10	6.81	0.14	7.60	0.06	9.27	0.09	7.15	0.04	6.44	0.06	6.64	0.08	8.72	0.10
	[6.00]	6.35	0.21	4.19	0.42	-3.92	0.36	-3.02	0.51	-0.26	0.95	-2.61	0.49	-3.72	0.37	-3.02	0.49
Region	[1.00]			-1.04	0.84	0.98	0.83	2.82	0.61			2.09	0.57	2.41	0.58	4.20	0.42
	[3.00]			10.36	0.08	14.46	0.00	18.82	0.00			13.68	0.00	14.50	0.00	17.73	0.00
	[4.00]			-3.96	0.47	-0.31	0.94	3.65	0.47			-0.90	0.82	-0.43	0.92	2.98	0.53
	[5.00]			-0.89	0.91	0.90	0.89	10.09	0.36			2.05	0.71	1.46	0.82	7.93	0.45
	[6.00]			0.40	0.94	4.56	0.28	5.93	0.21			0.85	0.82	1.49	0.71	3.35	0.45
	[7.00]			-4.32	0.39	-1.79	0.66	-5.13	0.26			-1.08	0.77	-0.84	0.83	-4.49	0.29
Total number of suppliers (estimated max)						0.05	0.00	0.07	0.01					0.01	0.35	0.03	0.19
Total community service types								1.19	0.15							1.43	0.07
DTR % sales								0.06	0.27							0.04	0.41
DTM % sales								0.11	0.31							0.06	0.53
DTI % sales								-0.08	0.49							-0.08	0.47
Strategic Orientation	Processed produce							-0.02	0.88							0.07	0.51
	Meat							0.11	0.08							0.14	0.02
	Fish							-1.69	0.44							-2.33	0.26
	Milk and dairy							0.01	0.94							0.03	0.85
	Eggs							-0.58	0.07							-0.54	0.08
	Dry goods							0.06	0.63							0.06	0.61
	Baked goods							0.97	0.26							0.87	0.28
	Coffee and tea							-0.78	0.73							-1.11	0.60
	Other value added							0.12	0.33							0.14	0.22
	Non-food							-3.24	0.11							-2.90	0.13
Unclassified products							0.24	0.48							0.20	0.54	
Adj. R ²		-0.01		-0.01		0.41		0.43		0.01		0.08		0.07		0.14	

Note: Boldface indicates statistical significance at or above the 10% level.

organizational form, trade-offs may be made between profit-maximizing behavior and producing social welfare goods and services. Organizational species of larger scale had the lowest numbers of community service provision, inclusion of under-represented minorities, and in some cases more extended upstream transactional arrangements. Also of note is that the majority of FHOs still operate at small scales. Across species of FHOs, no single organizational form appears to have broken off into a *radically* divergent product and/or channel strategy. Most movement by FHOs is to increase scale through retail and restaurant markets. None of the species prioritize intermediated or institutional markets.

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