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Featured Article

Local Food Market Orientation and Labor Intensity

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Abstract *This research uses descriptive analysis to provide a preliminary examination of the role of human capital in farms and ranches that sell through local food markets. We first provide an in-depth review of previous research investigating the role of human capital in local food markets. Then, we use U.S. Department of Agriculture Agricultural Resource Management Survey data to provide national descriptive statistics to investigate if the repositioning of food and agricultural supply chains towards more localized markets affects the role of human capital in the business model (in terms of the share of business activities spent on human capital), and secondly the returns to human capital (in terms of wages). Given the place-based nature of these strategies, we also investigate how these human capital investments vary across the rural urban continuum. We find that local food producers devote a larger share of total variable expenses to labor, and have significantly higher average estimated wages; this is especially true for operations with intermediated-only or intermediated and direct sales, as opposed to direct-only sales. We also find that wages are higher for local food producers in more urban locations.*

Key words: Human capital, Labor, Local food, Wage.

JEL codes: E24, Q1, P25.

Introduction

Agricultural enterprises focused on differentiated, local food markets (defined as both direct-to-consumer markets such as farmers' markets, roadside stands, and u-pick, and intermediated channels such as direct to restaurants, institutions, or to regional aggregators) are increasingly promoted through public policy and programming investments as a diversification strategy that supports improved profitability outcomes for small

and midscale farms and positive regional economic development outcomes (Low et al. 2015; Thilmany McFadden et al. 2016). For example, the Agriculture Improvement Act of 2018 (the 2018 Farm Bill) included provisions for local and regional foods in six of its titles (IV, VI, VII, X, XI, and XII). One new program created through the Act, the Local Agriculture Market Program (LAMP), made funding permanent and mandatory for several existing programs that prioritize direct and intermediated marketing projects and created a new Regional Partnership Program intended to facilitate foodshed-level approaches to developing regional food economies (NSAC 2019)[1].

Part of the rationale for supporting local and regional food policies is that market access may be more challenging for certain segments of agricultural producers, including socially disadvantaged, small, and beginning farmers and ranchers. Over the last six decades, production has shifted to larger farms (Hoppe and MacDonald 2016) that increasingly rely on capital-intensive investments in machinery and inputs (Wang et al. 2015), and standardized marketing and production contracts (MacDonald et al. 2004; MacDonald and Korb 2011). Increased efficiency within agricultural production and marketing systems has driven economies of scale in farming; thus, there are concerns that limited access to capital and/or markets serve as barriers to entry and financial viability among some U.S. farms and ranches (Hoppe 2014). For farms and ranches that cannot take advantage of scale economies, a growing number[2] are shifting their business model to reflect their varying endowments of skills and assets, including additional marketing and supply chain functions (Low et al. 2015). Fortunately, the business models to which some farms are shifting align with emerging buyer preferences (Low et al. 2015). Consumer demand and willingness to pay a premium for differentiated products, such as organic (Bond, Thilmany, and Keeling Bond 2008; Greene et al. 2009; Lusk and Briggeman 2009), local (Thilmany, Bond, and Bond 2008; Onozaka and Thilmany McFadden 2011; Low et al. 2015) or those containing no genetically modified materials (Lusk et al. 2005), is well documented in the literature.

The production of differentiated agricultural products is often associated with management strategies that impact farm and ranch's technical and scale efficiency. For example, Greene et al. (2009) report the additional land and labor required by pasture-based organic dairy operations are likely covered by the premium for organic milk, but premia are insufficient to cover the unpaid labor such farms are willing to invest. Similarly, preliminary evidence from small case studies shows that, on average, local food operations devote a higher share of their total variable expenditures to labor (Jablonski and Schmit 2016; Jablonski, Schmit, and Kay 2016; Schmit, Jablonski, and Mansury 2016; Rossi, Johnson, and Hendrickson 2017), and that even with these additional labor expenses, these strategies can be profitable for the highest-performing farms (Low et al. 2015; Bauman, McFadden, and Jablonski 2018; Burns and MacDonald 2018; Bauman, McFadden, and Jablonski 2019). In short, the heightened role of labor, and uneven patterns for how it is tracked in terms of farm finances, are an important dimension to consider for the local foods sector.

[1]*LAMP is projected to include $465 million in mandatory outlays between 2019 and 2028 (CRS 2019).*
[2]*In 2017, 130,056 farms (6.4% of all operations) sold food directly to consumers, and 28,958 (1.4%) sold through intermediated markets (USDA NASS n.d.).*

To the extent that farms and ranches using differentiated business strategies employ human capital differently, it may also be interesting to explore how workforce compensation directly and indirectly impacts the broader regional economy within which farms operate. Given concerns about consolidated market power in agriculture, including detrimental impacts to rural communities (*e.g.*, Sexton 2000)[3], understanding differential economic outcomes is timely and relevant. Previous research evaluating the economic impacts of local food systems has primarily focused on economic growth (Brown et al. 2014; Stickel and Deller 2020), employment and output multipliers (Hughes et al. 2008; Gunter and Thilmany 2012; Hughes and Isengildina-Massa 2015; Jablonski, Schmit, and Kay 2016; Schmit, Jablonski, and Mansury 2016; Thilmany McFadden et al. 2016) or rural wealth creation (Jablonski 2014; Schmit et al. 2017). However, we could not identify any previous work that examined either the relative importance of human capital in agricultural enterprises nationally, or how returns to human capital vary among agricultural and food business enterprises using different channels with different marketing strategies.

This research uses a descriptive analysis to provide a preliminary examination of the role of human capital in farms and ranches that sell through local food markets. We first provide an in-depth review of previous research investigating the role of human capital in local food markets. Then, we utilize U.S. Department of Agriculture (USDA) Agricultural Resource Management Survey (ARMS) data to provide national descriptive statistics to investigate if the repositioning of food and agricultural supply chains towards more localized markets affects the role of human capital in the business model (in terms of the share of business activities spent on human capital), and secondly the returns to human capital (in terms of wages). Given the place-based nature of these strategies, we also investigate how these human capital investments vary across the rural urban continuum. This article uses descriptive analysis to provide one line of justification for policies framed to address potential positive externalities, by more carefully accounting for the differential role of human capital in local food markets.

Previous Research

Whereas there is a body of case study evidence examining human capital use in local food markets, we could not identify any research examining the role of wages. There are two studies that look at variable costs or expenditures of farms selling through local food markets compared to those that do not. Both find that local food producers have higher average labor expenses as a share of total expenses (King et al. 2010; Jablonski and Schmit 2016). King et al. (2010) analyzed fifteen case studies and found that higher prices in local chains were aligned with higher costs of production, in large part due to the additional supply chain functions required to capture revenue that would otherwise have gone to a third party these farms post farmgate. Jablonski and Schmit (2016) utilized primary data of New York State producers with direct sales and compared it to subsamples within the USDA ARMS data, finding that farms selling through local food markets have differential

[3]*Carolan (2016) provides a summary of 51 studies that examine the effects of industrialized farming on community well-being.*

expenditure patterns relative to farms that sold through mainstream channels, particularly labor.

Several additional case studies - in Oklahoma, California, Colorado, and New York - demonstrate high labor needs among local food producers, without comparison to nonlocal food producers (Biermacher et al. 2007; Hardesty and Leff 2010; LeRoux et al. 2010; Jablonski, Sullins, and Thilmany McFadden 2019). LeRoux et al. (2010), Jablonski, Sullins, and Thilmany McFadden (2019), and Hardesty and Leff (2010) additionally compared expenditures and labor expenditures across types of local food markets.

Most recently, Bauman, McFadden, and Jablonski (2018, 2019) use expenditure pattern data of local food producers from the ARMS to understand heterogenous financial performance across local food channels. Bauman, McFadden, and Jablonski (2018) investigate the relationship between financial characteristics and profitability for farms selling through local markets. Across sales classes, each of the quartile groups are significantly different at the 1% level. They generally do not find statistically significant differences across quartiles without sales classes. Bauman, McFadden, and Jablonski (2019) first examine the expenditure patterns of farms selling through local markets, noting that labor expense as a portion of total expense increases with scale. Additionally, they looked at if the increased reliance on labor impacted the financial efficiency of local food operations finding that variable expenses (not including labor) had the largest impact on profit efficiency, followed by labor expense, suggesting that managing variable and labor expenses are key for local food producers. Neither paper compares the results of its analysis to farms without local food sales or provides any information on wages.

Empirical Approach

To support a national analysis of the role of human capital in farms and ranches, decomposing those who do and do not sell through local food markets, we use data from the 2013–16 USDA ARMS. The ARMS is a nationally representative survey that targets about 30,000 farms annually and utilizes a complex survey design (*i.e.*, complex stratified, multiple-frame, and probability-weighted). Since 2008, ARMS data includes questions about farm sales through local food channels and provides a sufficiently large sample of producers participating in these markets (Low and Vogel 2011). We do not weight our samples. Given the ARMS design, if the purpose of the analysis is to describe the population, then the estimates must be weighted. If the purpose is to describe a sample (in our case, farmers and ranchers participating in local food marketing channels), we follow Bauman, McFadden, and Jablonski (2018) and determine that weighting the sample will distort the results by forcing this sample to align with the average farmer-respondent[4]. Although the focus of the ARMS

[4]*By not using the jackknife weighting scheme to standardize the sample analyzed (recommended by the USDA ERS when working with ARMS), this paper assumes that: (1) local food producers would not be shown as representative using the criteria commonly used to create more representative farms in the ARMS sampling scheme; and, (2) the ARMS sampling scheme is representative of all farms, so comparisons of our targeted set of producers to the sample still offers some important inferences. In short, we did not modify the targeted sample to normalize it to a representative U.S. farm population because we expect it is those farms' variance from being "representative" that is interesting for comparison.*

survey is on farm-level financial data and not on farm labor, it is the best available resource of national farm-level financial data that includes information on both hired labor and marketing channel. The USDA National Agricultural Statistics Service conducts a farm labor survey each quarter with detailed data on wages, but lacks detailed data on farm marketing practices, such as participation in local food marketing channels.

We focus on two human capital variables, labor expenditures as a percentage of total variable expense and estimated wage[5]. We use different variables within ARMS (variable name as labeled in that data provided in parentheses for those familiar with that data; more detail also available in Appendix 1) to calculate our samples with positive labor expenditures and positive wages. Labor expenditures (evlabor), a variable calculated in ARMS, includes hired labor expense (v22), contract labor expense (v23), and labor fringe benefit (cash only) expense (v24)[6]. We take this number and divide it by total variable expenditures (evtot) to get labor expense as a percent of total variable expense A1. For more information on the ARMS variables and calculations. Of our initial sample of 78,559, 98% (77,090) reported positive labor expenditures. In fact, the percent with positive labor expenditures is so large we cannot report the local sample with nonpositive expenditures due to USDA disclosure policies. To calculate wage, we divided hired labor expense (v22) by hired labor hours (hiredhours)[7]. Of our initial sample of 78,559, 36% (28,263) had both positive hired labor expense and hired labor hours: note, we could only calculate a wage variable for the set of observations where both are available. Accordingly, it is likely that the positive wage sample is a subsample of the sample with positive labor expenditures, given that most farms have positive labor expenditures. Sample sizes for our sample with positive labor expenditures and wage rates broken out by primary commodity, scale, and location can be found in A2 and A3. As there are concerns with the accuracy of the hired labor hours variable in ARMS[8], our emphasis here is on the

[5]*Given the USDA's definition of a farm, all observations with gross cash farm income less than $1,000 were dropped (Hoppe 2014). We also dropped nonfamily farms, defined as any farm where the principal operator and persons related to the principal operator do not own a majority of the business.*

[6]*Hired labor represents 73% of total labor expenditures within the ARMS data.*

[7]*To mitigate potential bias from outliers, wages are Winsorized whereby observations with wages below the 1st percentile and above the 99th percentile are given the wage at the 1st and 99th percentile, respectively (Hastings Jr. et al. 1947). We also Winsorize wages at the 5th and 95th percentiles as a robustness check and find significant differences in results.*

[8]*While hired labor expense is a reliable metric in ARMS, hired labor hours is often more of an estimate made by producers. For most producers, expenses such as hired labor are recorded for tax purposes, whereas hired labor hours are not necessarily reported with the same level of accuracy. For this reason, our 'wage' variable is useful to for our purposes of comparing wage differences between local and nonlocal producers but is not necessarily reflective of effective agricultural wage rates.*

[9]*There are two challenges with our approach. First, we are unable to effectively compare farm wages (for local and nonlocal producers) across nonfarming industries given our emphasis on relative differences in wage rates and not on the rate itself. However, if part of the intent of new Farm Bill policies to nurture local and regional food systems is to foster opportunities for economic development, understanding differences across industry sectors is likely more important than gaps within agricultural marketing regimes alone. This type of comparison remains a key issue for future research, though data gaps remain. Second, there may be selection bias in comparing producers that sell through local and nonlocal channels; thus differences cannot be fully attributed to their choice of marketing channel (Ratcliffe, McKernan, and Zhang 2011). Using techniques that account for the endogeneity problem when evaluating the effect of market channel choice on wages and labor expenditures is an important next step for future research.*

[10]*We also deflate wage using the CPI as a robustness check and find no significant differences.*

Table 1 Descriptive Statistics for U.S. Producers, by Local and Nonlocal Sales

	Sample with positive labor expenditures		Sample with positive wage		Sample with nonpositive labor expenditures	Sample with nonpositive wages	
	Nonlocal producers (n = 73,191)	**Local producers (n = 3,899)**	**Nonlocal producers (n = 26,694)**	**Local producers (n = 1,569)**	**Nonlocal producers (n = 1,460)**	**Nonlocal producers (n = 47,957)**	**Local producers (n = 2,339)**
Market channel							
Direct-to-consumer only sales	—	0.64	—	0.50	—	—	0.73
Intermediated only sales	—	0.15	—	0.20	—	—	0.12
Both	—	0.21	—	0.30	—	—	0.15
Ruralness							
Metro	0.36	0.54	0.39	0.55	0.21	0.35	0.53
Metro adjacent	0.36	0.30	0.36	0.31	0.30	0.35	0.30
Rural	0.28	0.16	0.26	0.14	0.48	0.30	0.18
Sales (gross cash farm income)							
$1,000 to $74,999	0.35	0.54	0.13	0.27	0.94	0.49	0.73
$75,000 to $249,999	0.29	0.22	0.25	0.27	0.06	0.31	0.19
$350,000 to $1 M	0.20	0.13	0.29	0.23	0.002	0.14	0.06
$1 M and higher	0.16	0.11	0.34	0.23	0.001	0.05	0.03
Beginning farmer	0.10	0.17	0.08	0.12	0.12	0.11	0.20
U.S. Region							
Region 1: West	0.08	0.14	0.10	0.17	0.04	0.06	0.11
Region 2: Northeast	0.04	0.14	0.05	0.15	0.01	0.04	0.13
Region 3: Mountain west	0.07	0.15	0.09	0.16	0.08	0.06	0.14
Region 4: Midwest	0.28	0.14	0.22	0.09	0.56	0.33	0.17
Region 5: Deep south	0.17	0.07	0.20	0.05	0.10	0.16	0.07
Region 6: Southeast	0.16	0.18	0.18	0.18	0.05	0.15	0.17

(Continues)

Table 1 Continued

	Sample with positive labor expenditures		Sample with positive wage		Sample with nonpositive labor expenditures	Sample with nonpositive wages	
	Nonlocal producers (n = 73,191)	**Local producers (n = 3,899)**	**Nonlocal producers (n = 26,694)**	**Local producers (n = 1,569)**	**Nonlocal producers (n = 1,460)**	**Nonlocal producers (n = 47,957)**	**Local producers (n = 2,339)**
Region 7: Northern Midwest	0.19	0.20	0.17	0.19	0.17	0.20	0.21
Primary commodity							
Fruit or vegetable	0.06	0.33	0.08	0.41	0.004	0.05	0.27
Livestock/dairy	0.47	0.42	0.44	0.30	0.06	0.47	0.50
Field crop	0.34	0.09	0.36	0.10	0.01	0.32	0.08
Other crop	0.14	0.16	0.12	0.19	0.92	0.17	0.15
Education							
Less than high school	0.06	0.08	0.04	0.05	0.03	0.06	0.10
Completed high school	0.40	0.25	0.35	0.23	0.51	0.43	0.26
Some college	0.28	0.27	0.29	0.25	0.21	0.27	0.28
Completed 4 years of college or more	0.27	0.41	0.33	0.47	0.26	0.24	0.37

Note: *Data are from the 2013–16 USDA's Agricultural Resources Management Survey.*
Frequencies for all variables (0/1).
We exclude the local food producers sample with nonpositive labor expenditures due to disclosure issues; the sample is very small.

relative differences in the wage rates between local and nonlocal food market participants and not on the rate itself[9]. We adjust labor expenditures and wages for regional price differences using Bureau of Economic Analysis 2016 regional price parities by state (US BEA 2016)[10]. Table 1 includes descriptive statistics for the sample of local and nonlocal producers, including those with positive and nonpositive labor expenditures, and positive and nonprofit wage.

Following Low et al. (2015) and Low and Vogel (2011), we interpreted farms that did not report local food sales as zero local food sales (*i.e.*, missing values were changed to zero) and defined local food participants as those who reported positive sales through at least one local food marketing channel (as opposed to simply those who replied affirmatively regarding the use of local food marketing channels).

We provide descriptive statistics comparing local and nonlocal producers are in table 1. Note that we divide all descriptive statistics into our sample with positive labor expenditures, and our sample with positive wages, given that we have different sample sizes across these two variables. Our samples include 73,191 (positive labor expenditure) and 26,694 (positive wage) producers without local sales and 3,899 (positive labor expenditure) and 1,569 (positive wage) producers without local food sales. Average labor expenditures for the sample with positive labor expenditures is $70,706 for nonlocal farms and $164,106 for local farms. Average hired labor hours for the sample with a wage variable (*i.e.*, positive hired labor hours and hired labor expense) is 13,853 per year for nonlocal farms and 36,110 for local farms per year. Further, we divide our sample of farms with local food sales by market channel: direct-to-consumer only, intermediated only, and both. In our sample with positive labor expenditures, 64% of farms with local sales use direct-to-consumer-only markets, 15% report intermediated-only sales, and 21% report using both types of markets. In our sample of producers with local food sales that report positive wages, 50% use direct-to-consumer-only outlets, 20% use intermediated-only channels, and 30% of respondents use both.

We use gross cash farm income to define farm scale, following Hoppe (2014). Gross cash farm income represents the revenue received by a farm business including sales of crops and livestock, receipts of government payments, and other farm-related income. We divide gross cash farm income into four categories: $1,000 to $74,999; $75,000 to $349,999; $350,000 to $1 M; and, $1 M and higher, following Hoppe (2014), except we add an additional break at $75,000 following Low et al. (2015) and Bauman, McFadden, and Jablonski (2019)[11].

We used the rural urban continuum code (RUCC) to allocate producers into three categories of ruralness—metro (RUCC 1–3), metro-adjacent (RUCC 4–6), and nonmetro (RUCC 7–9)—to account for the degree of urbanization and adjacency to a metro area (Parker 2016; Low et al. 2020). Within our samples with positive labor expenditures and positive wages, local food producers are more common in metro areas than nonlocal producers; 54% (positive labor) and 55% (positive wage) and 36% (positive labor) 39% (positive wage), respectively. Nonlocal producers are more common in rural areas; 28% (positive labor) and 26% (positive wage) of nonlocal compared to 16% (positive labor) and 14% (positive wage) of local producers.

[11] *Average gross cash farm income for local food producers is on the low end of the second category ($75,000 to $349,999) whereas nonlocal food producers are on the high end of the same category.*

Table 2 Labor Expenditures and Wage Rate for U.S. Producers, by Local and Nonlocal Sales

	Labor expenditures as a % of total variable expense	Wage ($)
Nonlocal	8.71 (15.34)	19.91 (34.85)
Local	15.70 (22.23)	23.64 (44.73)

Note: *Data are from the 2013–16 USDA's Agricultural Resources Management Survey. Standard errors in parentheses. When pairwise tests of mean wages and labor expenditures were conducted, both were found to be statistically significantly different across market channel.*

A higher proportion of local producers are in the West and Northeast, whereas a higher proportion of nonlocal producers are in the Midwest and Deep South. The most prevalent primary commodity for producers that sell through local food markets is livestock and dairy in the sample with positive labor expenditures (42%) and fruit and vegetable for the sample with positive wages (41%). The most prevalent primary commodity for nonlocal food producers is livestock and dairy in both samples (47% and 44%, respectively).

Descriptive Results

When looking at the entire sample of producers with and without local food sales (table 2), we see that total share of labor expenditures are statistically significantly higher for local than nonlocal producers, accounting for 15.70% and 8.71% of total variable expenses, respectively. Wages are also statistically significantly higher, on average, for producers with local sales relative to those without, $23.64 and $19.91, respectively.

When we divide the sample by commodity (table 3), we see a more nuanced story. When pairwise tests of mean wages and labor expenditures were conducted, wages are only statistically significant across market channels for field crop ($20.09 for farms without local sales, and $27.69 for those with local sales). There is, however, a very small sample of field crop producers with local food sales (352 for labor expenditure, and 156 for wage, which is the smallest sample for any commodity, scale, or rurality category; see Appendix 2a for additional information). Labor expenditures, however, are statistically significantly different across market channels for all commodities except livestock and dairy. Field crop and other crop producers selling through local food markets have a higher share, on average, of labor expenditures compared to those without local food sales (7.71% compared to 4.99% for field crop, and 19.29% compared to 12.11% for other crop). Interestingly, fruit and vegetable growers without local food sales have significantly higher labor expenditures compared to those growers without local food sales (32.69% compared to 27.25%, respectively).

Next, we divide our sample by scale (table 3). We find that labor expenditures and wages are statistically significantly different across market channels for all scales (except $350,000–$1,000,000 for wage). Labor expenditures as a percent of total variable expense consistently represent a larger share of total variable expense for those producers that sell through local food markets. In fact, across all scales, local labor expenditures are over double the share for farms that do not sell through local food markets, except for the lowest sales category (4.21% to 7.56%, 8.68% to 19.05%, 11.27% to 27.67%, and 15.54% to 35.51%, nonlocal to local, for scale from lowest to highest, respectively). For

Table 3 Labor Expenditures and Wage Rate for U.S. Producers, by Local and Nonlocal Sales, Commodity, Scale, and Rurality

	Labor expenditures as a % of total variable expense		Wage ($)	
	Nonlocal	**Local**	**Nonlocal**	**Local**
Commodity				
Livestock and dairy	7.42 (12.93)	6.93 (14.24)	22.96 (105.14)	24.05 (66.33)
Field crop	4.99 (8.41)	7.71 (11.57)	20.09 (65.11)	27.69 (51.15)
Fruit and vegetable	32.69 (24.65)	27.25 (25.96)	35.97 (156.28)	33.26 (139.49)
Other crop	12.11 (20.48)	19.39 (23.80)	30.70 (136.33)	26.67 (59.93)
Scale (GCFI)				
$1,000 - $74,999	4.21 (12.30)	7.56 (16.33)	9.23 (21.55)	7.59 (14.49)
$75,000 - $349,999	8.68 (15.95)	19.05 (23.01)	14.25 (26.34)	16.00 (27.30)
$350,000 - $1,000,000	11.27 (15.69)	27.67 (23.76)	19.70 (31.97)	23.34 (33.43)
Over $1,000,000	15.54 (16.53)	35.51 (23.76)	28.22 (43.68)	51.63 (72.68)
Rurality				
Metro	12.07 (18.85)	18.16 (23.85)	21.55 (38.47)	24.26 (46.61)
Metro adjacent	7.50 (13.32)	14.01 (20.60)	18.96 (32.46)	23.75 (43.93)
Rural	5.91 (11.36)	10.62 (18.02)	18.76 (32.18)	20.96 (38.50)

Note: *Data are from the 2013–16 USDA's Agricultural Resources Management Survey.*
Standard errors in parentheses.
When pairwise tests of mean wages and labor expenditures were conducted across commodity, wages are only statistically significant across market channels for field crop. Labor expenditures are statistically significant across market channels for field crop, fruit and vegetable and other crop.
When pairwise tests of mean wages and labor expenditures were conducted across scale, wages are statistically significant across market channels for all scales except $350-$1 M. Labor expenditures are statistically significant across market channels for all sales categories.
When pairwise tests of mean wages and labor expenditures were conducted across rurality, wages are statistically significant across market channels for metro and metro adjacent (with metro being significant at the 10% level). Labor expenditures are statistically significant across all locations.

Table 4 Labor Expenditures and Wage Rate for U.S. Producers, by Type of Local Sales, Commodity, Scale, and Rurality

	Labor expenditures as a % of total variable expense			Wage ($)		
	Direct-to-consumer only	Intermediated only	Both	Direct-to-consumer only	Intermediated only	Both
Commodity						
Livestock and dairy	5.00 (11.58)	12.13 (18.43)	12.90 (19.51)	14.62 (27.33)	41.15 (69.43)	22.84 (43.80)
Field crop	6.19 (9.96)	13.33 (13.03)	12.41 (15.94)	21.35 (33.40)	36.08 (64.98)	39.73 (57.97)
Fruit and vegetable	19.73 (24.06)	33.79 (25.69)	34.77 (25.72)	16.71 (34.30)	32.33 (54.57)	28.18 (52.23)
Other crop	13.39 (20.50)	34.66 (26.90)	23.87 (23.82)	19.83 (44.61)	31.64 (48.99)	25.79 (37.30)
Scale						
$1,000 - $74,999	5.65 (13.62)	13.21 (21.12)	13.75 (22.22)	7.34 (16.03)	7.25 (9.23)	8.58 (11.28)
$75,000 - $349,999	14.93 (20.90)	24.97 (25.97)	24.16 (23.76)	14.48 (27.62)	18.21 (26.64)	17.19 (27.19)
$350,000 - $1,000,000	19.69 (21.22)	33.71 (25.39)	35.42 (22.68)	18.66 (24.34)	28.53 (41.66)	26.37 (37.62)
Over $1,000,000	26.12 (23.19)	38.43 (22.57)	45.07 (21.50)	40.46 (60.30)	55.26 (76.14)	62.70 (82.06)
Rurality						
Metro	11.66 (19.87)	30.28 (26.05)	28.61 (25.78)	18.03 (37.59)	32.52 (56.03)	28.05 (50.58)
Metro adjacent	8.92 (16.03)	21.39 (23.50)	22.90 (24.63)	16.28 (31.44)	40.44 (64.06)	27.59 (46.58)
Rural	7.19 (14.13)	16.95 (23.11)	18.63 (22.43)	16.03 (26.47)	33.94 (57.00)	22.98 (43.75)

Note: *Data are from the 2013–16 USDA's Agricultural Resources Management Survey.*
Standard errors in parentheses.

wages paid in the lowest sales class ($1,000–$74,999), farms without local food sales report higher average wages than farms with local sales ($9.23 compared to $7.59, respectively). For the middle two sales classes ($75,000–$349,999 and $350,000–$1,000,000), we see small or insignificant differences across wages ($14.25 to $16.00 and $19.70 to $23.34, for nonlocal and local operations, respectively). However, for the largest producers in our sample (>$1,000,000), we see that wages for producers selling through local food markets are almost double that of farms without local food sales ($51.63 to $28.22, respectively).

As an additional exploration of labor expense and wage by commodity, we divide our sample of producers selling through local food markets by the type of market channel (table 4). Interestingly, across all commodities and size classes, producers that report direct-to-consumer only sales have the lowest share of labor expenditure as a percent of total variable expenses; producers that report both direct-to-consumer and intermediated only sales look much more similar in this respect. Other than for fruit and vegetable growers, we see that all commodities of growers using direct-to-consumer only channels have labor expenditure shares less than half that of producers in the same commodity using intermediated only or both channels. For fruit and vegetable growers, we see similar differences in their labor expenditure by market channel, but not quite as extreme (19.73% for direct-to-consumer only, 33.79% for intermediated only, and 34.77% for those marketing in both). Across scale we find that, on average as the operation gets larger, they devote larger shares of total variable expenses to labor. This finding holds across all market channels. For example, for operations that utilize both channels, they devote 13.75%, 24.16%, 35.42%, and 45.07% of total expenditure to labor across sales classes $1,000–$74,999, $75,000–$349,999, $350,000–$1,000,000, and > $1,000,000, respectively.

Though differences in wages are not as profound as those found for labor expenditures within local food markets, we see that wages are lower across all commodities and scales for producers with direct-to-consumer only sales. Again, producers that use intermediated only or both channels look more similar than operations with direct-to consumer only sales. Exceptions by commodity are livestock and dairy and other crop, where average direct-to-consumer-only, intermediated-only, and both wages are $14.62, $41.15, and $22.84, and $19.82, $31.64, and $25.79, respectively. The only exception by scale is for the lowest sales class, where average wages are very similar across market channel ($7.34, $7.25, and $8.58). Further, we find that the larger the operation, regardless of market channel, the higher their average wages. For example, for operations that use only direct-to-consumer channels, average wage rates are $7.34, $14.48, $18.66, and $40.46 across sales classes $1,000 - $74,999, $75,000 - $349,999, $350,000 - $1,000,000, and > $1,000,000, respectively.

Lastly, we divide our samples by rural urban continuum code to understand if the rural-ness of the producer impacts utilization of human capital (tables 3 and 4). We find that labor expenditures are statistically significantly different across all locations—metro, metro-adjacent, and rural—for farms selling through local markets and those that do not. Regardless of market channel, the labor expense as a percent of total variable expense is lowest in rural locations. For local food participants, labor expenditures as a percent of total variable expense are 10.62%, 14.01%, and 16.16% for rural, metro-adjacent, and metro, respectively. Wages are statistically significantly

different across market channel for metro and metro-adjacent locations (though metro is significant at the 10% level only).

Within local food markets, again we see that for labor expenditure as a percent of total variable expense, farms that use intermediated-only or both channels look similar compared to those operations with direct-to-consumer-only sales. Here we see some variation within each of these channels across ruralness, with rural operations using less paid labor as a percent of total variable expenses compared to metro and metro-adjacent locations. For example, for farms that utilize both channels, we find that labor expenditure as a percent of total variable expense is 18.62%, 22.90%, and 28.61% for rural, metro-adjacent, and metro, respectively. When looking at wages, we see that farms with direct-to-consumer only sales have lower average wages compared to farms that utilized either intermediated only or both channels. Here, however, we find that farms with intermediated only sales have the highest average wages across all categories of ruralness—much higher than operations with sales through both channels. As an example, for metro regions we find that average wages are $18.02, $32.52, and $28.05 for metro, metro-adjacent, and rural regions, respectively.

Conclusions and Policy Implications

This research provides the first empirical, national evidence of the heightened importance of human capital in local food business models, validating previous case study findings (*e.g.*, LeRoux et al. 2010; Jablonski and Schmit 2016). We find that, on average, local food producers devote 15.70% of total expenditures to labor, compared to 8.71% for those without local food sales. We demonstrate that, on average, the case study findings are reflective of local food enterprises nationally, confirming the conclusions of King et al. (2010) that locally oriented businesses integrate more customer service into their operations by taking on additional supply chain functions (*e.g.*, brokering, distribution) that necessitate higher skilled labor investment than those operations that hire mostly production labor. Subsequently, we provide the first evidence that average estimated wages are also statistically significantly higher for producers with local food sales relative to those that do not operate within these channels, $23.66 and $19.91, respectively.

In addition, by dividing our results by commodity, scale, and ruralness, we provided more nuanced results than have been previously reported. We find fewer significant differences across market channel when we divide our sample by commodity. The most interesting and surprising finding was that fruit and vegetable growers without local food sales have significantly higher labor expenditures compared to those growers with local food sales. Fruit and vegetable producers have always reported the highest share of labor costs (except for nursery and greenhouse operations). Since 2013, those costs have trended upward, seemingly hand-in-hand with the use of H2-A labor crews (that have wages tied to adverse wage requirements by states, and rates have increased substantially in recent years) (USDA ERS 2020). This may help to explain why fruit and vegetable growers without local food sales have higher labor expenditures than those that do. Additionally, there is anecdotal evidence that fruit and vegetable growers using local markets often have alternative labor hiring methods (*e.g.*, apprenticeships) that may help to subsidize labor costs.

Looking at differences across scale provides some of the most interesting results. As farms selling through local markets get larger, they both invest a higher portion of total variable expense on labor and pay significantly higher wage rates. In fact, at the highest sales class we see local food producers reporting average wage rates of $51.63! In light of Low et al.'s (2020) findings in this issue, it is not likely the increased reliance on labor in these enterprises is a "push" of farms feeling a need to provide employment to underutilized workers within their operation. Instead, farms are likely responding to a perceived "pull" from the market, requiring growers to pay a premium to employees for the business knowledge and experience required to effectively target differentiated, customer-driven markets. There are expected tradeoffs of farms choosing between efficiency and "equity" as less efficient supply chain processes may be needed to offer buyers the customer service and product assurances needed to secure the prices producers seek if they believe their products or farm are not fairly treated within more efficiency-oriented, conventional markets. As an extension of the local food markets examined here, similar market forces may be guiding farms and surrounding food enterprises to pivot into more artisan, locally focused value added food enterprises (Low et al. 2020; O'Hara, Castillo, and Thilmany McFadden 2020).

Additionally, we find that when we divide local food producers by market channel, those with intermediated-only sales or using both channels devote larger shares of their total variable expense to human capital and pay higher average wages. Again, this may reflect the higher skills and capacity needed to navigate increasingly complex regulatory systems and navigate downstream activities required within the food supply chain. For example, farms that have less than $500,000 in annual gross income and sell the majority of food directly to consumers are exempt from the food safety modernization act's produce rule (NSAC n.d.), whereas those who are selling through intermediaries would need an on-farm food safety plan aligned with heightened regulatory guidelines.

Taking the rurality of producers into consideration, there are significant differences in the share of operating costs dedicated to labor among locally marketing producers in metro, metro adjacent, and rural areas. The higher investments in labor as an input may be positive news, particularly for more rural areas in need of employment opportunities beyond low-skill, seasonal production tasks. In contrast, wage rates are higher for local food producers only in metro and metro adjacent areas. However, rural wages are not significantly different. Perhaps only local food producers in metro and metro adjacent areas are influenced by interactions and intellectual spillovers their workers gain from food industry peers, requiring firms to offer higher returns to a more educated, skilled workforce (Glaeser and Maré 2001; Gould 2007).

Moreover, there are important policy implications given efforts to target entrepreneurship and job creation in rural areas, and the fact that higher labor expenditures have spillover contributions to regional economies (*e.g.*, Jablonski, Schmit, and Kay 2016; Schmit, Jablonski, and Mansury 2016; Thilmany McFadden et al. 2016; Christensen et al. 2019). As more rural areas may see entrepreneurship and "bottom-up" economic development as part of the solution for rural economies (Goetz, Partridge, and Stephens 2018), our paper provides a nice complement to O'Hara, Castillo, and Thilmany McFadden's (2020) findings on the role of cottage food laws and Low et al.'s (2020) discussion connecting areas with local foods and food manufacturing startups. If, together with increased investments in the

workforce needed to support more customer-oriented food markets, the farms in our sample are also aligning with startup food manufacturers engaging consumers to better target business incubation activities using similar marketplaces (*e.g.*, farmers markets, food hubs), the food sector may continue to see growth in the local, artisan, and craft niche that can be impactful to its surrounding community and economy.

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Appendix 1

Table A1 ARMS and Calculated Variable Names and Descriptions Used to Calculate Labor Expenditure and Wage Variables

ARMS variable name	Variable description
hiredhours	Hired labor hours
v22	Hired labor expense
v23	Contract labor expense
v24	Labor fringe benefit (cash only) expense
evlabor	V22 + V23 + V24
evtot	Total variable expense
Calculated variables	
labor market participation	if v22==0 or hired hours==0, then 0, otherwise 1
wage	v22/hired hours
labor expenditures as a percent of total variable expense	evlabor/evtot

Appendix 2

Table A2 Sample Sizes for Labor Expenditures and Wage Rate for All US Producers, by Primary Commodity, Scale, and Location

	Labor expenditures as a % of total variable expense		Wage ($)	
	Nonlocal	Local	Nonlocal	Local
Livestock and dairy	34,012	1,630	11,686	464
Field crop	25,008	352	9,660	156
Fruit and vegetable	4,326	1,279	2,155	650
Other crop	9,845	638	3,193	299
$1,000–$74,999	25,693	2,116	3,370	426
$75,000–$349,999	21,338	862	6,553	425
$350,000–$1,000,000	14,604	498	7,785	354
Over $1,000,000	11,556	423	8,986	364
Metro	26,561	2,101	10,277	870
Metro-adjacent	25,980	1,170	9,590	479
Rural	20,650	628	6,827	220
All	73,191	3,899	26,694	1,569

Table A3 Sample Sizes for Labor Expenditures and Wage Rate for Local U.S. Producers, by Primary Commodity, Scale, and Location

	Labor expenditures as a % of total variable expense			**Wage ($)**		
	Direct-to-consumer only	**Intermediated only**	**Both**	**Direct-to-consumer only**	**Intermediated only**	**Both**
Livestock and dairy	1,215	184	231	289	78	97
Field crop	271	32	49	108	20	28
Fruit and vegetable	622	272	385	248	146	256
Other crop	377	101	160	147	66	86
$1,000–$74,999	1,605	201	310	289	48	89
$75,000–$349,999	489	131	242	211	67	147
$350,000–$1,000,000	234	96	168	156	60	138
Over $1,000,000	157	161	105	136	135	93
Metro	1,330	353	418	416	194	260
Metro adjacent	728	149	293	249	76	154
Rural	427	87	114	127	40	53
All	2,485	589	825	792	310	467