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Who Works Here? Contingent Labor, Nonfamily Labor, and Immigrant Labor on U.S. Dairy Farms

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Abstract

Using a survey of dairy farmers in Michigan, Pennsylvania, and Florida, this study examines labor patterns on U.S. dairy farms by analyzing employment of nonfamily and immigrant labor, as well as labor precarity and contingency. We build upon and connect two divergent theoretical frames: first, the contradictory class location of family farmers, and second, the neoliberal rise of precarious and contingent labor. We move beyond the family/nonfamily farm binary often found in examinations of the class location of family farmers, including the interplay of family and nonfamily labor, demonstrating that farm size is an equally important component of labor relations to farm ownership structure. Farms' labor relations more accurately exist on a continuum between "family" and "industrial" that reflects both ownership structure and farm size. Extending the study of precarious and contingent labor into the agricultural sector, we suggest that high rates of overtime work may be a unique form of labor precarity in agriculture, not just part-time work. Scholars must acknowledge that labor precarity and contingency may take different forms across diverse sectors.

Keywords

labor, immigrant labor, contingent labor, agriculture

Introduction

The role of immigrant and nonfamily labor in agriculture touches on issues at the core of several sociological theories concerning contradictory class locations (Mooney 1986, 1988; Wright 1976), immigration and labor markets (Burawoy 1976; Massey 1995; McCall 2001; Myers and Cranford 1998; Phillips and Massey 1999; Restifo, Roscigno, and Qian 2013), and neoliberalization, specifically the rise of precarious and contingent labor (Hudson 2007; Kalleberg 2001, 2009). In this article, we examine nonfamily and immigrant labor on U.S. dairy farms to extend and connect these theories through a study of a unique commodity system with distinct labor patterns. We extend the literature on the contradictory class location of farmers as family-business owners by moving beyond a largely binary focus on family farms versus other forms of ownership (Brookfield 2008; Jackson-Smith 1999; Mooney 1988) to examine the important role of farm size in shaping the organization of work on farms. This examination offers insight into how capital structure (i.e.,

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ownership) and other structural features (i.e., firm size) interact to shape labor relations in agriculture and perhaps other sectors. We extend theories of precarious and contingent labor by examining distinctive forms that contingency and precarity may take in agricultural work, particularly high rates of overtime work, highlighting the importance of industry context in shaping precarious work conditions.

Through our study of nonfamily and immigrant labor on dairy farms in Michigan, Pennsylvania, and Florida, we examine labor on dairy farms of diverse sizes and ownership structures, moving beyond the binary of family farm versus nonfamily farm and examining new forms of labor precarity. Through this study, we seek to answer three research questions:

> **Research Question 1 (RQ1):** How extensive is the employment of nonfamily and immigrant labor on U.S. dairy farms?
> **Research Question 2 (RQ2):** How does the likelihood of employing nonfamily and immigrant labor vary by farm size and farm capital ownership (distinctly and together)?
> **Research Question 3 (RQ3):** How does the frequency of contingent and precarious work, that is, part-time work, overtime work, and employee turnover, vary by farm size, farm capital ownership, and employment of immigrant labor (distinctly and together)?

Together, these questions help us move beyond a family farm/nonfamily farm[1] binary and examine labor patterns on a more nuanced continuum that reflects the complex interplay of ownership structure and size and precarious and contingent labor.

The legal and social status of agricultural workers in the United States has long been ambiguous and contradictory. Agricultural production continues to rely heavily on combinations of unpaid and paid family labor (MacDonald et al. 2007; Short 2004), complex contract relationships (Ashwood, Diamond, and Thu 2014; Hamilton 1994; Wells 1984b; Welsh 1997), and contradictory class locations in which farmers own some, but not all, of the means of production, and may employ nonfamily labor while still maintaining the mythology of the "independent family farmer" (Mooney 1983, 1988; Wright 1976). This combination of family and nonfamily work and complicated class location confounds agricultural labor relations in ways that are largely distinct from labor relations in industrial and service sectors. In addition, agricultural workers are exempted from many legal labor protections in the United States, including the right to overtime pay and minimum wage for many workers (see Note 1; U.S. Department of Labor, Wage and Hour Division 2008). Currently, nonfamily employees make up a third of all agricultural workers in the United States; as concentration continues, projections estimate increasing rates of nonfamily labor (U.S. Department of Agriculture [USDA], Economic Research Service 2015).

However, the literature concerning farm structure and agricultural labor has almost exclusively focused on a binary between "family farms" and other ownership structures (Friedmann 1978; Mooney 1986, 1988; Newby 1983). With Marxian theoretical foundations, this work has highlighted ownership and/or the contribution of family labor as key structural determinants, often ignoring farm size as an independent issue or conflating size and ownership structure. In this study, we examine the impact of family farm ownership and farm size separately and together, extending existing theories of the contradictory class location of family farmers in which they are neither strictly capitalist nor proletarian.

Within the sociology of work and labor, a growing body of research has demonstrated increasing rates of contingent and precarious work, meaning unpredictable work with high rates of part-time work and low employment stability, and associated costs (Bandelj, Shorette, and Sowers 2011; Kalleberg 2009; Kalleberg, Reskin, and Hudson 2000). However, this literature has largely ignored agricultural labor while research examining agricultural labor has conversely largely ignored debates about contingent or unstable labor. In this study, we extend both bodies of work by examining potentially unique forms of precarious and/or contingent labor in agriculture.

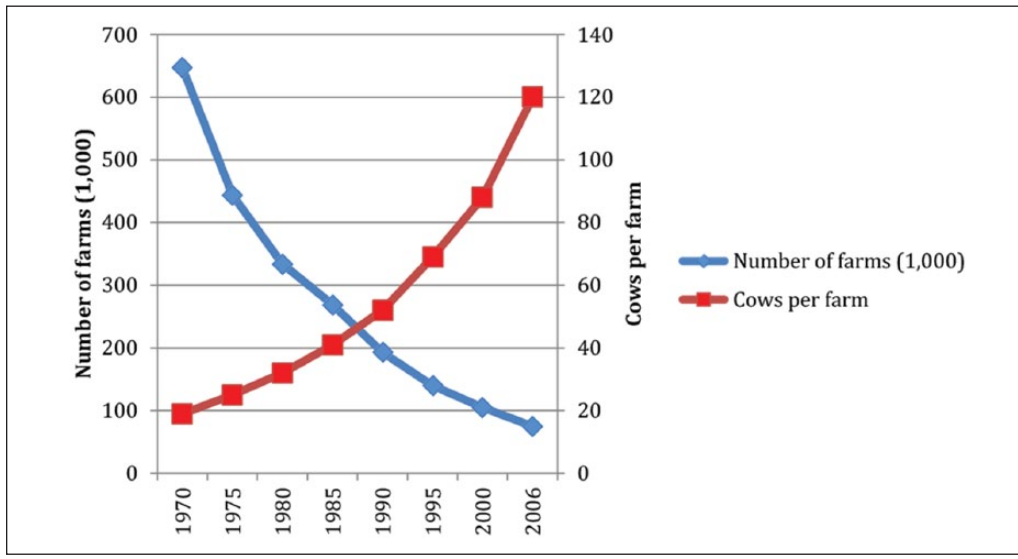

Figure 1. Decline in number of farms, increase in average herd size.
Source. Data from MacDonald et al. (2007:3).

This article also makes a key empirical contribution to the study of nonfamily labor and immigrant labor in agriculture broadly, and dairy farming specifically. This study attempts to address an empirical gap through an analysis of nonfamily and immigrant labor using a stratified sample of Grade A dairy farms in Michigan, Pennsylvania, and Florida. Together, our findings suggest that employment is shaped not just by farm ownership structure but also by farm size, labor precarity takes a unique form in dairy farming, with high rates of overtime rather than part-time employment, and farms employing immigrant dairy workers have distinct employment patterns that may create unique labor vulnerabilities. This study contributes to the study of labor relationships broadly, and to the study of agricultural labor, immigrant labor, and contingent labor specifically.

Literature Review

Structural Change and Nonfamily Employees in Agriculture

Our RQ1 extends an empirical literature on structural change and employees on U.S. dairy farms. Recent decades have seen considerable change in the U.S. dairy industry in the size of milking herds, new production technologies and management practices, and mixing livestock and cropping industries (Cross 2006; Jackson-Smith and Barham 2000; MacDonald et al. 2007). Like other sectors of the agrifood system, the U.S. dairy sector has undergone a shift toward fewer but larger farms (see Figure 1; Cross 2006; Jackson-Smith and Barham 2000; MacDonald et al. 2007; Short 2004). Despite these changes, the majority of dairy farms still rely on unpaid family labor and are owned as sole proprietorships or family partnerships. Farms with less than 50 cows are still the largest proportion of U.S. dairy farms (approximately 47 percent of farms), but larger farms are accounting for an increasing share of national milk production (MacDonald et al. 2007).

According to the Bureau of Labor Statistics, in 2012, there were roughly 94,327 workers on 6,813 dairy farms in the United States (U.S. Department of Labor, Bureau of Labor Statistics 2014). A 2009 survey of 2,000 U.S. farms found that at least 41 percent of dairy workers were foreign-born and that 50 percent of dairy farms employ immigrants (National Milk Producers Federation 2009). However,

there is a disproportionate impact of immigrant labor as 62 percent of the U.S. milk supply comes from farms using immigrant labor (National Milk Producers Federation 2009). Importantly, this 2009 study excluded farms with less than 50 cows from their study, making their survey unrepresentative of the national industry.

Similarly, a 2008 survey of dairy farms in Wisconsin found that while

> less than 5% of farms with 49 or fewer cows hire non-family workers; only 14% of farms with 50 to 99 cows hire workers; 42% of farms with 100–199 cows hire workers; 90% of farms with 200–499 cows hire workers; and all farms over 500 cows report hired labor. (Harrison, Lloyd, and O'Kane 2009:1)

Approximately 40 percent of employees were foreign-born, with 88.5 percent of foreign-born workers being from Mexico (Harrison and Lloyd 2013; Harrison et al. 2009). In the same Wisconsin study, Harrison and Lloyd (2013) report significant occupational segregation by immigrant status and race, with immigrant workers concentrated in entry-level and nonmanagerial positions. Our study is an extension of both of these surveys, offering a nationally representative sample of dairy farms in which to examine labor relations.

Although the mythology of the "family farm" holds powerful sway in the United States, the role of nonfamily labor and immigrant labor in U.S. agriculture is long-standing. Southern agriculture was built on a foundation of enslaved African labor (Conrad and Meyer 1958; Parker 1970; Ransom and Sutch 1975) and sharecropping (Reid 1973; Royce 2010; Shlomowitz 1979). Sharecropping also continues to play a large role in Western agriculture, particularly in California (Wells 1984a, 1984b, 1987, 1996). Throughout the United States, farms of virtually all types, even small-scale agricultural producers, have long relied on combinations of nonfamily and family labor (Friedmann 1978; Lobao and Meyer 2001; Newby 1983). Overall, immigrant farmworkers have reflected broader U.S. immigration trends and policies, with different ethnic, racial, and national groups of workers being more or less common at different points of American history and in different regions (Wells 1996). The importance of nonfamily and immigrant labor is, therefore, not a new phenomenon in U.S. agriculture, although several scholars argue that the proportional impact of immigrant farm labor is increasing (Thompson and Wiggins 2002).

Contradictory Class Location and the Persistence of Family Farms

Our RQ2 engages a broad range of scholarship that has examined family farm capital structure and its relationship with nonfamily labor in agriculture. Early Marxians debated where the "peasantry" fit into capitalism: are farmers proletarians, capitalists, or neither? If they rely on their own labor, but also the labor of others, where does that place them in the class system? Mooney (1983, 1986, 1988) and others (Calus and Lauwers 2009; Friedmann 1978, 1980; Kingston-Mann 1983; Lehmann 1982) have carried these debates of Kautsky (1988) and Lenin (1982) forward into contemporary analysis of "family farming."[2]

Rural sociologists and theorists exploring the persistence of family farming and/or peasant agriculture within capitalism (Newby 1983) have highlighted the potential for "self-exploitation" of family labor (Friedmann 1978), a commitment to central farm goals (Reinhardt and Barlett 1989), and other appealing features of family labor as compared with nonfamily employees. They have argued that agriculture has a distinct biophysical (Mann and Dickinson 1978) and capital structure that differentiates it from industrial production. Mooney (1983, 1986, 1988), particularly, has built on the work of Erik Olin Wright (1976) to argue that family farmers occupy an ambiguous and contradictory class location in which they own some, but not all, of the means of production and in which they are both laborers and rely on the wage labor of others. This contradictory class location complicates agricultural labor relations, but the key variable of interest in this theoretical tradition is farm capital structure, that is, family versus nonfamily ownership and the contribution of family labor. In this study,

we extend this literature by focusing explicitly on farm size as both distinct from and linked with farm ownership to examine their relative and combined effects on labor relations.

Precarious and Contingent Labor

Our RQ3 focuses on the extent and form of precarious and contingent labor relations in the U.S. dairy industry and how that may relate to the structural features of capital ownership and farm size, as well as the employment of immigrant labor. A growing literature demonstrates increasing reliance on contingent, temporary, or otherwise precarious workers in the global economy (Bandelj et al. 2011; Burgard, Brand, and House 2009; Chen and Brudney 2009; Fullerton and Wallace 2007; Kalleberg 2009; Kalleberg et al. 2000; Nollen 1996; Pedulla 2013).

The theory of dual labor market segmentation (Averitt 1968; Beck, Horan, and Tolbert 1978; Kalleberg et al. 2000) has argued that the labor market is increasingly stratified into "good" jobs in the primary market that carry a bundle of benefits including high wages, employment stability, good working conditions, and other benefits and "bad" jobs in the secondary market that offer low wages, high turnover, poor working conditions, and little chance of advancement (Hudson 2007). Relevant to this study, Catanzarite (2000, 2002) and others have argued that this labor market stratification is common along lines of national citizenship and immigration status (Funkhouser and Trejo 1995; Hondagneu-Sotelo 2001; Phillips and Massey 1999), with large numbers of recent immigrants concentrated in the secondary labor market.

Other scholars have focused on the related rise in "non-standard work arrangements" dominated by precarious and contingent work. Nonstandard, precarious, and/or contingent work have been conceptualized and operationalized in a wide range of ways, all of which highlight "a fundamental restructuring of the employer-employee relationship" (Hudson 2007:289). Contingent labor has been defined most commonly as "those who do not have an implicit or explicit contract for ongoing employment" (Chen and Brudney 2009:315), including independent contractors, on-call workers, workers from temporary agencies ("temps"), and other short-term or seasonal contract workers. A key feature of contingent work is the lack of expectation of long-term employment. Precarious work, in contrast, has typically been defined more broadly to mean any "employment that is uncertain, unpredictable, and risky from the point of view of the worker" (Kalleberg 2009:2). Defining features of precarious work are high employee turnover and a lack of employment stability. An increase in part-time work, often involuntary part-time work, has been variously defined as both contingent and precarious (Amoore 2004; Kalleberg 2001; Kalleberg et al. 2000). Again, relevant to this study, the high concentration of immigrant workers in precarious employment has been widely demonstrated (Gordon 2007; Hondagneu-Sotelo 1994; Hudson 2007; López-Garza 2002; Ramirez and Hondagneu-Sotelo 2009; Valenzuela 2003; Zlolniski 2006).

However, this literature examining precarious work has almost completely ignored agricultural employment, while the rural sociological literature focused on agricultural employment has conversely ignored this new sociology of precarious work. In this study, we examine many of the same issues considered in the sociology of precarious work—part-time and overtime employment, immigrant labor, and labor stability—within the context of agricultural employment. Examining these issues within the complex agricultural labor market in which family labor is still foundational and which offers limited legal protections for workers is a fruitful combination of divergent theoretical literatures. Our findings suggest that there is great potential for further studies of labor precarity within agricultural employment and that rural sociologists should consider broad questions of changing work and labor in their examination of agricultural workers.

Method

Survey

The data for this study were collected as part of a larger USDA AFRI funded project[3] focused on improving milk quality and reducing antibiotic

Table 1. Stratified Sample.

	Florida	Michigan		Pennsylvania	
		Large farm strata (>500 cows)	General farm strata	Large farm strata (>250 cows)	General farm strata
Population	134	105	1,652	130	5,968
Sample	134	105	641	130	690
Probability weight	1	1	2.55	1	8.42
Response rate	21%	39%		45%	

use in the U.S. dairy industry. The survey data were collected as the first wave of the project, with the aim of providing basic information on dairy farm structure, practices, and attitudes as well as self-reported milk quality measures and antibiotic use.

In February of 2013, a mail survey was sent to a stratified random sample of 1,700 USDA Grade A dairy farms in Michigan, Pennsylvania, and Florida. Limiting the sample to Grade A farms eliminates "hobby farms" or farms that fall outside the primary commercial market. Michigan, Pennsylvania, and Florida were selected as study sites using maximum variation sampling (Coyne 1997) to represent the spectrum of dairy farm size in the United States. Pennsylvania is dominated by very small, family-owned and operated dairy farms, with an average herd size of 72 cows (USDA 2007) and 85 percent of farms with less than 100 cows (USDA 2007). Michigan represents the midsize farms common in the Midwest, with an average herd size of 130 cows (USDA 2007) and 68 percent of farms with less than 100 cows (USDA 2007). In contrast, Florida is dominated by very large dairy farms, with an average herd size of 850 cows (USDA 2007) and 58 percent of farms with more than 500 cows (USDA 2007). Together, these states represent the wide variety of dairy farm sizes and organizations common in the United States. The sample was limited to USDA Grade A dairy farms to capture the majority, conventional dairy farming population.

In each state, the sampling frame was obtained through the state departments of agriculture and environmental quality, and/or university extension services. To ensure an adequate number of large farms in each state, the samples in Michigan and Pennsylvania were stratified by farm size. Strata were defined based upon the herd size distribution of each state: in Michigan, large farms were defined as those with more than 500 cows, in Pennsylvania large farms were defined as those with more than 200 cows. Due to the small number of farms in Florida, all 128 farms in the state were sampled. All analysis was conducted using weights to account for different strata size and sampling rates, using Stata statistical software (StataCorp 2013) and the survey analysis prefix, which produces unbiased estimates for survey-weighted data (McDowell and Pitblado 2002). Table 1 below summarizes the sample strata, analytical weights, and response rates by state.

The survey included 71 questions, totaling 20 pages with an additional lined page for comments (full text of survey available at http://qualitymilkalliance.com/wp-content/uploads/2015/01/133813108-A-Survey-of-Mastitis-on-Dairy-Farms.pdf). Questions covered seven categories: (1) sociodemographics and farm characteristics (age, education, race, Mennonite or Amish, native English speaking, herd size, etc.); (2) milking proficiency (pre- and postmilking teat disinfection, wearing gloves during milking, etc.); (3) milking systems (parlor type, maintenance patterns, etc.); (4) cow environment (housing, grouping, bedding, etc.); (5) infected cow monitoring and treatment (record keeping, use of cultures, and etc.); (6) farm labor (number of workers, employee management strategies, etc.); and (7) attitudes toward mastitis and related antimicrobial agent use (farm goals, belief in causes of mastitis, sources of information about mastitis and antimicrobials, etc.). The survey was

pretested by investigators and extension agents, followed by face-to-face pretests with dairy farmers in Michigan. Pretests indicated average time to completion was less than 15 minutes and helped revise questions for clarity.

The survey was administered with the services of the Wolfgang Freese Survey Research Laboratory, including consultation, graphic design, printing and mailing, and data entry. Survey administration used methods recommended by Dillman and colleagues (Dillman 2007; Dillman et al. 2009), including custom-designed full-color envelopes and covers, personalized addresses, first-class postage, five points of contact, and a $2 incentive in the first mailing. On January 17, 2013, the first mailing was sent including a cover letter, survey, and $2 incentive. On February 1, 2013, a full-color personalized reminder postcard was sent to nonrespondents. A second copy of the cover letter and survey was sent to nonrespondents on February 8, 2013. A second copy of the reminder postcard was sent to nonrespondents on February 15, 2013. A final copy of the cover letter and survey was sent to nonrespondents on February 25, 2013.

Of the 1,700 sampled dairy farms, 79 (4.6 percent) had an incorrect address or were no longer working dairy farms. Of the remaining 1,621 valid farms, 41 percent (660 farms) responded to the survey. Of the 660 respondents, 32 failed to complete at least 50 percent of the survey and were excluded from analysis. Thus, a total of 628 cases were used in analysis. A total of 270 responses were received after the first mailing, an additional 132 after the second, an additional 159 after the third mailing, an additional 66 after the fourth mailing, and the final 33 after the fifth mailing.

To confirm the representativeness of our respondents, we compared our sample with USDA-reported state averages for herd size, milk production, and bulk tank somatic cell count.[4] This confirmed that our sample was largely representative. Herd size did not differ from USDA-reported averages (Norman, Cooper, and Ross 2011). Only Michigan respondents reported a slightly lower production average ($p < .0001$) than the USDA-reported average production (73 lbs./day in the sample, 78 lbs./day USDA average), and Pennsylvania respondents reported a slightly lower somatic cell count ($p < .05$) than the USDA-reported average (202,000 cells/mL in the sample, 212,000 cells/mL USDA average; Norman et al. 2011).

Analysis: Operationalizing Nonfamily Labor and Immigrant Labor

To answer RQ1, we performed univariate analysis of two dependent variables. The presence of nonfamily labor was operationalized as a binary variable coded as 1 if the respondent answered "1" or greater to the question: "How many people work on this farm: number of non-family paid employees?" The presence of immigrant employees was operationalized as a binary variable coded as 1 if the respondent answered yes to the question: "Are there any cultural/language barriers to communicating with employees?"

There are limitations to this proxy that may lead to an under or overestimate of the number of immigrant employees, as language barriers may not exist with all immigrant employees, and cultural barriers may be present for nonimmigrant employees. In particular, it is possible that Amish and Mennonite farmers may report cultural or language barriers with employees, regardless of the immigrant status of employees. Therefore, Amish and Mennonite respondents were excluded from the analysis for this part of RQ1, and Amish and Mennonite status was controlled for in later research questions. We did not directly ask whether farms employed immigrant labor because of a significant concern about response bias (i.e., dishonest answers from respondents due to the politically loaded nature of the question), which was confirmed during pilot testing. Despite the limitations of our proxy, we feel that it provides a reasonable estimate of the employment of immigrant labor.

Analysis: Family Farms and Farm Size

To answer RQ2, we performed bivariate and multivariate analyses of two dependent variables: the presence of nonfamily employees and immigrant labor. For bivariate analysis, cross-tabulations were performed with two

independent variables: family farm status and farm size.

Family farm status was operationalized as a binary variable coded as 1 if the respondent answered that their farm operated as either a sole proprietorship or a joint-owner with family (other possible responses included: leasing, nonfamily partnership, manager, or other). Throughout the article, we will use the term "family farm" to refer to those respondents who reported being either "sole proprietors" or "joint owners with family." In our sample, 86 percent of farms were classified as "family farms," and 14 percent of farms used some other form of organization. Farm size was operationalized as the number of adult milking cows (for bivariate analysis, this was coded into a six-category categorical variable representing key size categories in the dairy industry).

For multivariate analysis, we performed logistic regression for both dependent variables (presence of nonfamily employees and presence of immigrant labor). Models included the two independent variables of interest, family farm and farm size, as well as controlling for what state the farm was in, whether the respondent was part of an Amish or Mennonite community, and the potential interaction between family farm status and farm size. For the regression estimating whether a farm employs immigrant labor, farm size was operationalized as a series of binary variables for herd-size quintiles, as bivariate analysis demonstrated a nonlinear relationship between farm size and having cultural/language barriers with employees.

Analysis: Precarious and Contingent Labor

To answer RQ3, we performed multivariate analysis of three dependent variables: percent of nonfamily employees working part-time, percent of nonfamily employees working overtime, and percent of both full- and part-time nonfamily employees who have been employed at the farm for less than 12 months (employee turnover). Part-time employees are defined as those working less than 20 hours per week, drawing from the literature on precarious work in which increasing reliance on part-time employees has been identified as a key feature of precarious work (Kalleberg 2009). Overtime employees are defined as those working more than 40 hours per week. Overtime work may be a unique indicator of precarious work, and has been demonstrated to increase the likelihood of workplace accidents (Dembe et al. 2005). Overtime work is a form of potential labor exploitation governed by the Fair Labor Standards Act (U.S. Department of Labor 2016) for nonagricultural employees (U.S. Department of Labor, Wage and Hour Division 2008). Within the literature on precarious and/or contingent work, employee turnover is often an indicator of precarious/contingent work in which employment is short-term and/or unstable (Hudson 2007; Kalleberg 2009; Kalleberg et al. 2000; Pedulla 2013). However, employees may leave positions for a variety of reasons, both voluntary and involuntary, and it is an important limitation that we are unable to differentiate these causes of employee turnover.

For multivariate analysis, we performed linear regression with endogenous treatment effects (LRETE). LRETE models are appropriate when one of the independent variables in a regression is endogenous with other independent variables (Vella and Verbeek 1999). In this case, previous bivariate and multivariate analysis (conducted to answer RQ2) confirmed that employing immigrant labor is strongly associated with farm size. LRETE models allow us to estimate the effect (average treatment effect [ATE]) of employing immigrant labor on our dependent variables while simultaneously acknowledging that employing immigrant labor is associated with farm size.[5] In addition to our three independent variables of interest—whether farms employed immigrant labor, family farm status, and farm size—we controlled for what state the farm was in, whether the respondent was part of an Amish or Mennonite community, and the potential interaction between family farm status and farm size.

In these models estimating percent part-time, overtime, and employee turnover, farm size is operationalized as the total number of nonfamily employees (rather than herd size, as

in other models). This controls for the denominator of total employees, which is important in comparing percentages of employees, and also because herd size and number of nonfamily employees are strongly correlated (Pearson's correlation coefficient = 0.82).

Statistical Significance and Weighting

Statistical significance is defined as a p value of <.05. Bivariate tests of significance included Pearson's chi squared for cross-tabulations and adjusted Wald tests for comparison of means. When appropriate, analysis was limited to include only those respondents who indicated that they employed nonfamily labor. All analysis was performed using Stata's survey prefix and weights to account for the stratified sampling design. When possible, standardized coefficients are presented to allow for comparison of effect sizes. Standardized effect sizes standardize both the X and Y variables with a mean of 0 and a standard deviation of 1 (Long and Freese 2014:179).

Findings

First, to answer RQ1, we examine overall rates of nonfamily employment and the extent of language and cultural barriers with employees as a proxy for immigrant labor. To answer RQ2, we examine these patterns by farm size and structure, determining the relative and combined effects of family farm status and farm size. Finally, to answer RQ3, we examine the percentage of part-time and overtime employment as well as percentage of employees who have been employed for less than 12 months, focusing on the relative and combined effects of family farm status, farm size, and employment of immigrant labor.

Extent of Nonfamily and Immigrant Labor

Overall, 38 percent of respondents report employing nonfamily employees, and the average number of nonfamily employees is four. Overall, 14.2 percent of those farms with nonfamily employees report having language and/or cultural barriers with employees (our proxy for immigrant labor), excluding Amish and Mennonite producers who may have cultural and/or language barriers with employees for other reasons. This is lower than the percentages reported in the National Milk Producers study (National Milk Producers Federation 2009) and the study of Wisconsin dairy farms (Harrison et al. 2009), and is likely due to the fact that the first study excluded farms with less than 50 cows (which make up the largest number of U.S. dairy farms).

Variation by Farm Size and Family Farm Status

Next, we examined nonfamily employment by farm size. In our sample, 46 percent of farms had less than 50 cows, 33 percent had 50 to 99 cows, 15 percent had 100 to 250 cows, 3 percent had 250 to 499 cows, 2 percent had 500 to 999 cows, and 2 percent had 1,000 or more cows.[6] Table 2 summarizes labor patterns by farm size and ownership structure.

Only 18 percent of farms with less than 50 cows employed any nonfamily labor, while 97 percent of farms with 250 to 499 or 500 to 999, and 100 percent of farms with 1,000 or more cows employed nonfamily labor. The largest farms were more than five times as likely to employ nonfamily labor as the smallest farms. The average number of nonfamily workers also increases significantly as farm size increases. Of those who employ nonfamily workers, farms with less than 50 cows employ, on average, between one and two workers, while farms with at least 1,000 employ an average of 28 workers.

Examining immigrant labor by farm size (see Table 2), virtually no farms with less than 50 cows employ immigrant labor, while 66 percent of farms with 500 to 999 cows do, and 35 percent of farms with 1,000+ cows employ immigrant labor. The lower likelihood of immigrant labor on the largest farms (1,000+ cows) as compared with those in the 500 to 999 cow category is somewhat surprising. Key informant interviews with industry experts

Table 2. Nonfamily Employees and Immigrant Labor by Family Farm Structure and Farm Size.

	Herd Size							
	<50	50–99	100–249	250–499	500–999	1,000+		
Yes: nonfamily employees (%)	18%	40%	64%	97%	97%	100%	Pearson's uncorrected chi squared	130.28***
Avg. # of nonfamily employees[a]	2	2	3	7	11	28	Adj. Wald Test[b]	50.18***
Yes: cultural/language barriers with employees[a,c] (%)	0%	5%	9%	10%	66%	35%	Pearson's uncorrected chi squared	124.86***
	Other			Family farm[d]				
Yes: nonfamily employees (%)	35%			38%			Pearson's uncorrected chi squared	0.36
Yes: cultural/language barriers with employees[a,c]	47%			10%			Pearson's uncorrected chi squared	57.21***

[a]Only including subpopulation with nonfamily employees.
[b]Adjusted Wald test comparing category 1 (<50 cows) to category 6 (1,000+ cows).
[c]Excluding Amish and Mennonite respondents.
[d]1 = sole proprietorship or family partnership; 0 = all others (other categories include: leasing, nonfamily partnership, manager, or other).
*$p < .05$. **$p < .01$. ***$p < .001$.

Table 3. Logistic Regression of Presence of Nonfamily Employees.

	Presence of nonfamily employees	
	β (unstandardized)	Odds ratio
Family farm[a]	−0.155	0.856
Herd size	0.013*	1.013*
Herd is in state of Michigan	0.47*	1.601*
Respondent is a member of an Amish or Mennonite community	−0.78**	0.458**
Interaction: Herd size × Family farm	0.004	1.004
Constant	−1.447*	0.235*
Degrees of freedom	531	
F	11.44	
Prob > *F*	0.000	

[a]1 = sole proprietorship or family partnership; 0 = all others (other categories include: leasing, nonfamily partnership, manager, or other).
*$p < .05$. **$p < .01$. ***$p < .001$.

suggest that this may be due to the organizational complexity of the largest farms and that those largest farms may employ bilingual managers, or could be related to limitations of our proxy variable.

Comparing family farms and other farm structures (see Table 2), bivariate analysis shows there is no significant difference in the likelihood of employing nonfamily labor. However, nonfamily farms are nearly five times as likely to employ immigrant labor as family farms.

Multivariate results (see Table 3) confirm that there is no significant relationship between family farm status and the likelihood of employing nonfamily labor, but that that likelihood increases as herd size increases. Respondents from the state of Michigan are slightly more likely to employ nonfamily labor, and Amish and Mennonite respondents are significantly less likely to employ nonfamily labor, even when controlling for herd size and family farm status.

Table 4. Logistic Regression of Having Cultural or Language Barriers with Employees.

	Cultural or language barriers with employees[a]
	β (unstandardized)
Family farm[b]	−1.489
Herd size (quintiles)[c]	
Second quintile	14.869***
Third quintile	15.309***
Fourth quintile	15.886***
Fifth quintile	16.922***
Herd is in state of Michigan	0.455
Respondent is a member of an Amish or Mennonite community	0.993
Interaction: Herd size × Family farm	0.001
Constant (unstandardized)	−17.172***
Degrees of freedom	516
F	14.25
Prob > *F*	0.000

[a]Subpopulation including only farms with nonfamily employees.
[b]1 = sole proprietorship or family partnership; 0 = all others (other categories include: leasing, nonfamily partnership, manager, or other).
[c]Herd size is analyzed by quintile as bivariate tests demonstrated a nonlinear relationship between herd size and having language or cultural barriers with employees.
*$p < .05$. **$p < .01$. ***$p < .001$.

Multivariate results of the likelihood of employing immigrant labor (see Table 4) show that there is no significant relationship between family farm status and the likelihood of having cultural or language barriers with employees, but that larger farms are more likely to employ immigrant labor.

Labor Precarity and Contingency

First, examining the extent of part-time employment (see Table 5), multivariate results show that there is no significant relationship between family farm status and percentage of nonfamily employees who work part-time, but that larger farms (here operationalized as the total number of nonfamily employees) have a larger proportion of part-time nonfamily employees. Respondents that employ immigrant labor have a substantially lower percentage of nonfamily employees working part-time.

Examining the percentage of overtime workers (see Table 5), multivariate results show that family farms employ a substantially lower proportion of nonfamily overtime workers than nonfamily farms, while there is no significant relationship between farm size and proportion of nonfamily overtime workers. Respondents who employ immigrant labor have a substantially higher percentage of nonfamily overtime workers. In interpreting these results, it is important to remember that these data do not represent individual employees' experiences, but pooled farm-level data as reported by owners and managers. In other words, these comparisons are between farms that employ immigrant labor and those that do not, rather than between immigrant employees and nonimmigrant employees.

Examining employee turnover, we performed multivariate regressions for the percentage of full-time and part-time nonfamily employees employed for less than 12 months (see Table 6). Multivariate regressions for percentage of full-time nonfamily employees employed for less than 12 months show that

Table 5. Linear Regression with Endogenous Treatment (Immigrant Employee as Treatment), Percent of Employees Working Part-time and Overtime.

	Percentage of employees working part-time[a]	Percentage of employees working overtime[a]
	β (unstandardized)	β (unstandardized)
Family farm[b]	8.719	−21.472**
Herd is in state of Michigan	−11.436***	−0.146
Respondent is a member of an Amish or Mennonite community	−5.195	−3.896
Number of nonfamily employees	0.785*	−0.063
Interaction: Herd size × Family farm	−0.009	0.009
Have language or cultural barriers with employees (ATE)[c]	−53.869***	41.363***
Constant (unstandardized)	29.412**	55.152***
Degrees of freedom	324	324
F		16.47
Prob > *F*		0.000

Note. ATE = average treatment effect.
[a]Subpopulation including only farms with nonfamily employees.
[b]1 = sole proprietorship or family partnership; 0 = all others (other categories include: leasing, nonfamily partnership, manager, or other).
[c]The linear regression with endogenous treatment effects model reflects the fact that there is endogeneity among the independent variables in the model. In this case, having immigrant employees is the treatment with herd size as the predictor of having immigrant employees, as these variables have been previously demonstrated to be related. Presented here is the ATE for having language or cultural barriers with employees.
*$p < .05$. **$p < .01$. ***$p < .001$.

the only significant predictor is that respondents that employ immigrant labor have substantially higher turnover than those that do not. Multivariate regressions for percentage of part-time nonfamily employees employed for less than 12 months show no significant predictors. Again, to interpret these results, we must remember that these are pooled farm-level data, not data on specific employees' length of employment.

Discussion

Our findings from a survey of a stratified sample of USDA Grade A dairy farms in Michigan, Pennsylvania, and Florida reveal a number of key patterns in the employment of nonfamily labor on dairy farms. First, to answer RQ1, we find that 38 percent of our respondents overall report employing some nonfamily labor, and 14 percent of our respondents report having cultural or language barriers with their employees (our proxy for immigrant labor). These may be an underestimate of the national rates, as Pennsylvania—and Michigan to a lesser extent—has a higher percentage of small farms than the national dairy industry. Overall, these rates demonstrate that while nonfamily and immigrant labor do play important roles in the industry, a disproportionately large role due to the higher production of larger farms (MacDonald et al. 2007), there are still many farms that rely solely or primarily on unpaid family labor.

We also find significant differences between large and small dairy farms in the extent of nonfamily and immigrant labor, while finding little evidence of difference between family farms and other ownership models. Larger farms are more likely to have nonfamily employees, and the number of nonfamily employees also increases with farm size.

Table 6. Linear Regression with Endogenous Treatment (Immigrant Employee as Treatment), Percent of Full-time and Part-time Employees Employed for <12 Months.

	Percentage of full-time employees employed <12 months[a]	Percentage of part-time employees employed <12 months[a]
	β (unstandardized)	β (unstandardized)
Family farm[b]	−11.108	−28.037
Herd is in state of Michigan	3.830	11.578
Respondent is a member of an Amish or Mennonite community	−4.069	5.669
Number of nonfamily employees	−0.261	−0.864
Interaction: Herd size × Family farm	−0.0004	0.024
Have language or cultural barriers with employees (ATE)[c]	29.971*	−1.973
Constant (unstandardized)	13.032	46.932
Degrees of freedom	454	324
F	6.00	16.47
Prob > *F*	0.000	0.000

Note. ATE = average treatment effect.
[a]Subpopulation including only farms with nonfamily employees.
[b]1 = sole proprietorship or family partnership; 0 = all others (other categories include: leasing, nonfamily partnership, manager, or other).
[c]The linear regression with endogenous treatment effects model reflects the fact that there is endogeneity among the independent variables in the model. In this case, having immigrant employees is the treatment with herd size as the predictor of having immigrant employees, as these variables have been previously demonstrated to be related. Presented here is the ATE for having language or cultural barriers with employees.
*$p < .05$. **$p < .01$. ***$p < .001$.

Larger farms are also more likely to have immigrant labor, and while bivariate results suggest a difference between family farms and others, this effect is not significant in multivariate results once we control for other key variables. This suggests that farm size is perhaps a more important factor in shaping nonfamily and immigrant employment than farm capital structure.

Finally, we find high rates of some types of labor precarity and/or contingency as well as significant variation by farm size, capital structure, and whether those farms employ immigrant labor. Overall, 32 percent of employees work for less than 20 hours per week. After controlling for other variables, larger farms have a higher proportion of employees working part-time, and farms that employ immigrant labor have a substantially lower proportion of employees working part-time. This indicates that part-time employment, an important indicator of precarious and/or contingent work, is more common on large farms but that immigrant employees may be less exposed to this form of labor contingency. On farms that employ nonfamily labor, 39 percent of nonfamily employees work for more than 40 hours per week. Given this high proportion of overtime employment and the unique labor demands of agriculture, we examined overtime work as a potential form of labor exploitation. Family farms have a lower proportion of overtime workers, while there is no significant variation by farm size, illustrating the importance of considering both farm size and farm capital structure in understanding labor relations. While they have a lower proportion of part-time workers, farms that employ immigrant labor have a higher proportion of overtime workers. These findings reflect the results of a study conducted by the National Agricultural and Rural Development Policy Center that found that

while hired help was only 33 percent of the people employed on farms, they performed 60 percent of the work done on farms (Martin 2013). This indicates that overtime employment is a significant pattern in agricultural labor and that immigrant employees may be more vulnerable to overtime work.

Examining employee turnover, another important measure of labor precarity and contingency, there appears to be a relatively high level of longevity in dairy employment, with 65 percent of all employees having been employed for more than two years. However, part-time employees are more likely to have been employed for less than one year, and farms that employ immigrant labor have a higher percentage of their full-time workers who have been employed for less than one year, indicating that these populations might be more vulnerable to labor instability. Given the limitations of our proxy for immigrant labor—having language or cultural barriers with employees—it is also possible that those barriers may cause workers to seek other jobs.

Overall, our findings demonstrate that nonfamily labor on dairy farms varies significantly by farm size and structure (nonfamily versus family) and that immigrant labor may have distinct patterns of employment and labor stability. A significant limitation of this study is its focus solely on the reports of farm owners and managers, rather than employees themselves. Our findings suggest that further study should be conducted with employees themselves to confirm or dispute overall trends reported by owners and managers and to further explore the diversity of labor experiences, particularly for immigrant workers. To this end, we are currently conducting a longitudinal study of dairy farms in the same three states in which we are collecting data from owners, managers, and employees directly (in combination with a number of production measures and biophysical data). Those data will allow further exploration of both family and nonfamily labor on dairy farms.

Conclusion

Returning to the questions at the heart of this study, our results help to address and extend debates concerning immigration and labor markets, complex and contradictory class locations in agriculture, and the rise of precarious and contingent labor.

Extending debates on the persistence of family farming and the contradictory class location of family farmers (Mooney 1983, 1986, 1988; Wright 1976), our findings demonstrate that there is, indeed, considerable variation in labor relations on U.S. dairy farms, and farm size is a key driver of that variation. In other words, a key factor shaping labor patterns and relations on dairy farms might not be their capital structure alone—whether they are a "family farm"—but also farm size. Although much theoretical and empirical work has focused on a binary between family and nonfamily ownership, our findings suggest that when structure is considered as a distinct characteristic, in combination with size rather than conflating the two, farm size may be a more important determinant of farm labor relations. However, family farm capital structure remains important in shaping some labor relations, particularly the likelihood of employing overtime workers.

Rather than focusing solely on farms' capital structure, or conflating size and structure, scholars should consider them as distinct continuums, related but not synonymous. The existing literature on family farms focuses on several distinctive features of family farms, primarily the ability to "self-exploit" (Friedmann 1978), more closely supervise and coerce family labor than nonfamily (Reinhardt and Barlett 1989), and a commitment of family labor to central farm goals (Friedmann 1978). But these key features may, ultimately, be more representative of small farm size than family ownership itself. Large, family-owned farms simply cannot function without nonfamily labor, severing them from key features used to delineate family farms in the theoretical literature. Whether dairy farms employ nonfamily labor, immigrant labor, overtime labor, and precarious labor are also more closely tied with farm size than with their capital structure alone.

Indeed, farms exist on a continuum between "family" and "industrial" that is a function of

both size and capital structure, rather than either independently. This has significant implications for understanding labor relations in agriculture, and perhaps labor relations more broadly. It implies that ownership structure (i.e., capitalist or not, family-owned or not) is not the ultimate structural determination of labor relations, but that ownership structure intersects with firm (farm) size to shape how labor is hired, fired, and treated. In particular, that firm (farm) size plays an important role in the precarity and potential exploitation of workers, distinct from but tied to firm (farm) capital structure. Further study is needed to determine if these findings about the importance of firm (farm) size as distinct from capital structure are generalizable to other agricultural sectors and perhaps beyond agriculture into other labor-intensive sectors. Outside of agriculture, Barrett and Rainnie (2002) argue that studies of industrial relations often fall into a trope similar to the mythologizing of family farms: the "small is beautiful" stereotype. Studies of firm size and industrial labor relations often uncritically idealize small firms, while Barrett and Rainnie (2002) suggest that small firms are diverse and that labor relations are shaped not solely by firm size, but by a host of other factors, including ownership (family versus nonfamily). This suggests that the complex interplay between firm size and ownership may be important to labor relations more broadly.

Issues of precarious, contingent, and/or nonstandard work are increasingly common in the contemporary economy (Kalleberg 2009). Although there has been widespread scholarly attention paid to labor precarity and contingency, as well as some countermovement to the increasing precarity of labor including unions and social movement actors (Bandelj et al. 2011), agricultural workers have not been a major focus in this countermovement or the sociology of precarious labor. Our findings suggest that overtime employment should be considered as an important issue in labor precarity in agriculture, emphasizing the importance of recognizing the distinctive forms that precarity and/or contingency may take in different industries. Our findings also demonstrate that farms employing immigrant labor have less labor stability and that immigrant workers may experience a unique vulnerability to precarity and contingency. Increasing rates of nonfamily employment and immigrant labor in the U.S. dairy industry raise concerns regarding potential labor exploitation that may mirror the costs ascribed to labor precarity broadly, and agricultural labor is a fertile area for future studies of contingent and precarious labor. Both the sociology of work and the sociology of agrifood systems would benefit from the systematic examination of labor relations, precarious/contingent labor, and immigrant labor in agriculture.

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Notes

1. The Fair Labor Standards Act was expanded to include many agricultural workers in the requirement for minimum wage compliance; however, livestock production is still exempted (Farmworker Justice 2016). The legal status of the dairy industry as "livestock production" is currently contested.
2. A complementary vast literature has examined these questions within the context of peasant studies (see Akram-Lodhi and Kay 2010a, 2010b for reviews).
3. Removed to conceal author identity.
4. Bulk tank somatic cell count is an indication of white blood cell concentration in milk and used as a measure of milk quality and a sign of potential problems with underlying mastitis infection in a herd (Blowey and Edmondson 2010).
5. We performed linear regression with endogenous treatment effects using the etregress

command in Stata (StataCorp 2015), which is compatible with survey-weighted data.

6. For context, the Environmental Protection Agency and state environmental quality departments currently define any dairy farm with more than 700 milking and dry cows as a Confined Animal Feeding Operation (CAFO). CAFOs are subject to manure and nutrient management regulations to minimize water and land contamination from manure (PennFuture 2011). A total of 2.5 percent of our respondents met the CAFO threshold.

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