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Dairy Farmer Policy Preferences

Christopher A. Wolf and Glynn T. Tonsor

Dairy policy often becomes a contentious topic during U.S. farm bill negotiations. The dairy subtitle of the 2012 farm bill has been debated and discussed since 2009. This research uses best-worst scenario methods to analyze dairy farmer preferences for policy options, including eliminating existing dairy policies, implementing new dairy policies related to income support and growth management, and ending ethanol subsidies. Results indicate that large and small dairy herd operators have differing preferences. Large herd operators prefer to end ethanol subsidies rather than specific dairy policy changes, while small herd operators most preferred support for income over feed-cost margins.

Key words: best-worst scaling, dairy policy, farm bill, farmer preferences, herd size

Introduction

The U.S. government has a long history of involvement in domestic dairy policy. Chaotic milk marketing at the beginning of the twentieth century and the financial consequences of the Great Depression led to a set of policies that enabled collective bargaining, pooled milk revenues based on minimum prices, and direct support of milk prices (Manchester, 1983). Additional policies were later added to promote dairy product consumption and exports, limit dairy imports, and make milk deficiency payments. The dairy subtitle of recent farm bills has been particularly contentious, as dairy interests have been split based on regional interests, farm size, and processor versus cooperative perspectives.

Discussion on the dairy subtitle of the next 2012 Farm Bill began in 2009, spurred by a disastrous year in which dairy farmers nationwide lost large amounts of equity as a result of historically high feed prices and low farm milk prices.[1] The desperate financial situation of 2009, coupled with the realization that the volatility of feed and milk prices had fundamentally changed the risk situation for dairy farms, led dairy producer groups, cooperatives, and processors to propose significant changes for the next farm bill. These proposals have included government protection of income over feed margins, supply control, ending ethanol subsidies, and changing the method for deriving minimum prices in federal milk marketing orders.

The recognition that existing U.S. dairy policies might be insufficient to deal with current economic realities was further brought into focus by two recent developments. First, feed grain prices became increasingly linked to world energy prices, causing higher feed price levels and volatility. In particular, the Renewable Fuels Standard and ethanol blending credits led to a connection between corn and oil prices (Tyner, 2010). As a result, corn and other feed product prices increasingly reflect the high average and volatility of recent energy prices. Since corn is the primary feed for supplying dairy cows with energy and corn planting decisions affect the production

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[1] Throughout out this discussion we refer to the bill whose official title was the Agriculture Reform, Food, and Jobs Act originally scheduled for 2012 as the 2012 Farm Bill but recognize that it was not passed into law in that year.

and value of other feedstuffs, the cost of producing milk has reflected this higher input price and greater volatility.

Second, export markets for U.S. dairy products expanded. Historically, the United States has not been a major player in world dairy markets, exporting only about 5% of its production—mostly bulk commodities (Dobson, Wagner, and Hintz, 2001). Since 2005, a confluence of factors including supply difficulties in other major dairy exporting countries, rapid demand growth in export markets (especially Asia), and efficient U.S. milk production have expanded export market opportunities for U.S. dairy products. These exports have grown steadily as a result, totaling 11% of milk production in 2008 and, following a drop during the worldwide economic troubles of 2009, 13% of total milk production in 2011 (U.S. Dairy Export Council, 2012).

One aspect that has not changed in the policy debate surrounding the 2012 Farm Bill is the animosity and disparate views across dairy farmers, cooperatives, and processors. While the internet and dairy industry press are rife with opinions, the preferences of dairy farmers regarding alternative policies have not been examined in any objective or representative way. This research aims to fill that gap and facilitate a broader policy discussion.

Agricultural policy affects consumers and taxpayers through its effects on food prices and tax revenues used in agricultural programs (Barkley and Flinchbaugh, 1990). Farm groups such as dairy farm organizations take an active role in lobbying for their own interests. To the extent that dairy farm organizations are representative of the dairy farm population, operator views of policies are made public. However, first-hand input from farm operators (the persons most directly affected by the policies) is rare during policy formation (Barkley and Flinchbaugh, 1990; Orazem, Otto, and Edelman, 1989). This study adds to the literature by assessing the preferences of Michigan dairy farmers on major dairy-related policies debated in the lead-up to the 2012 Farm Bill. We consider factors related to these preferences and demonstrate the application of best-worst analysis to understanding farmer preferences.

Several studies in the 1980s and 1990s considered farmers' policy preferences. Zulauf, Guither, and Henderson (1987) examined Illinois and Ohio farm and agribusiness association farm policy views in 1984 and compared those responses to the provisions in the Food Security Act of 1985. Zulauf, Guither, and Henderson concluded that the 1985 Farm Bill aligned more closely with the views of farm operators of medium-to-large farms than those of small-to-medium farms. Orazem, Otto, and Edelman (1989) examined Iowa farmers' policy preferences for continuing current programs, imposing supply controls, moving to a market-oriented system, and targeting support to financially stressed farmers. Results indicated that financial situation, farms size and type, and operator education and experience influenced preferences. Kastens and Goodwin (1994) examined Kansas farmer preferences for free trade. They found that support for free trade decreased with education, experience, and government payments received by the operation and increased with higher levels of rented land and total farm wealth. Barkley and Flinchbaugh (1990) surveyed Kansas farm operators about their opinions on farm policy, including the then-current commodity programs, conservation and environmental policies, production risk and crop insurance, and international trade and found that operator and operation characteristics were related to policy views. Self-interest was a primary determinant of operator opinion; large farm operator favored the current programs that benefited them directly and opposed programs targeting smaller farms. Livestock producers were opposed to commodity programs that increased the cost of feed.

These previous studies used traditional methods such as approve/disapprove or Likert-scale-type questions to assess farmers' policy preferences. These methods do not allow for cardinal ranking of policy preferences or trade-offs that exist in policy questions, especially in the current budget constrained environment. More recently, a method called best-worst scaling has been used to examine preferences and values (Finn and Louviere, 1992; Marley and Louviere, 2005; Lusk and Briggeman, 2009; Lusk and Parker, 2009). In this research, best-worst methods are used to examine the preferences of Michigan dairy farmers during the debate and discussions leading up to the 2012 Farm Bill using a survey conducted in May and June of 2011.

Best-Worst Scenario Analysis

Best-worst scaling presents respondents with sets of three or more options and asks them to select one option as "best" and another as "worst." Using the responses from several sets of these scenarios, the results can be analyzed to reveal cardinal rankings and respondent characteristics associated with those rankings. Best-worst questions are relatively easy for respondents to understand, free of scale bias (since the responses involve choices rather than strength of preference), and require trade-offs not facilitated by traditional ratings-based questions where respondents rate the importance of each option independently (Lusk and Briggeman, 2009). Often, little information can be derived from ratings-based questions because respondents can simply indicate that all options are important or preferred. Another problem with ratings-based methods is that the scale is subjective; that is, what is a "5" to one person is a "4" to another (Lusk and Briggeman, 2009; Lusk and Parker, 2009). Best-worst scaling forces respondents to make trade-offs and choose which options are best and worst. Because of these potential benefits, best-worst scaling has increasingly been applied by economists as an alternative to traditional questions that evaluate preferences. For example, Lusk and Briggeman (2009) examined food values and Flynn et al. (2007) examined health care preferences using scenario methods similar to those used in the current study. While the use of best-worst scaling is increasing, existing applications have been almost entirely focused on consumer views and preferences.

Best-worst scaling assumes that respondents evaluate all possible pairs of items within the displayed subset and choose the pair that reflects the maximum difference in preference or importance (Louviere, 1993). If a choice has J items (in this case, policies), then there are $J(J-1)$ possible best-worst combinations. The pair of policies chosen represents the one that maximizes the difference in importance. Following Lusk and Briggeman (2009), let τ_j represent the location of policy j on the underlying preference scale and let the true (latent) unobserved level of importance for individual i be given by $I_{ij} = \tau_j + \varepsilon_{ij}$, where ε_{ij} is a random error term. The probability that a farmer chooses policy j and policy k as the best and worst out of J policies is the probability that the difference in I_{ij} and I_{ik} is greater than all the other $J(J-1)-1$ possible differences in the choice set. If the ε_{ij} are distributed *i.i.d.* type I extreme value, then this probability takes the familiar multinomial logit (MNL) form:

$$\text{Prob}(j \text{ is chosen best and } k \text{ chosen worst}) = \frac{e^{\tau_j - \tau_k}}{\sum_{l=1}^{J}\sum_{m=1}^{J} e^{\tau_l - \tau_m} - J}. \tag{1}$$

The parameters τ_j can be estimated by maximizing the log-likelihood function based on the probability statement in equation (1). The dependent variable takes the value 1 for the pair of policies chosen by the farmer as best and worst, and 0 for the remaining $J(J-1)-1$ pairs of policies not chosen. The estimated τ_j represents the importance of policy j relative to some policy that was normalized to 0 to prevent the dummy variable trap.

Given the diverse views underlying the ongoing dairy policy debate, we anticipated preference heterogeneity to underlie the best-worst scenario responses. Therefore, we explored the existence and possible drivers of dairy-producer heterogeneity regarding direction of dairy policy. Latent class models specify that preference heterogeneity occurs discretely (Train, 2003). Characterization of discrete heterogeneity is appealing in our application, as the preferences and membership size of groups likely to exert differing political desires is core to the underlying situation. That is, the level of consensus regarding alternative policy options is conveniently identified.

Latent class models assume that individuals can be intrinsically sorted into a number of classes (also called segments or clusters) characterized by homogeneous preferences within each class, while preferences are heterogeneous across classes (Boxall and Adamowicz, 2002). Latent class model estimation simultaneously assigns individuals to latent classes probabilistically while also identifying parameters for each class (Swait, 1994). Within a class, individual choices from one policy to another are assumed to be independent and choice probabilities are assumed to be generated

by the logit model (Greene and Hensher, 2003). The conditional probability of selections given a respondent belonging to latent class s is

$$\text{Prob}(j \text{ is chosen best and } k \text{ chosen worst } |s) = \frac{e^{\tau_{js}-\tau_{ks}}}{\sum_{l=1}^{J}\sum_{m=1}^{J} e^{\tau_{ls}-\tau_{ms}} - J}, \tag{2}$$

where the parameters τ_{js} are now class-specific (Ouma, Abdulai, and Drucker, 2007). Since the classes are not observable, the probability of class membership is specified in the typical multinomial logit format

$$\text{Prob}(s) = \frac{e^{(\theta sZk)}}{\sum_{s=1}^{S} e^{(\theta sZk)}}, \tag{3}$$

where Zk is a set of observable characteristics that enter the model as candidate drivers of class membership and θs is a parameter vector, normalized to 0, describing the impact of these characteristics on the probability of a respondent belonging to a given class (Ouma, Abdulai, and Drucker, 2007). Using latent class modeling, we are able to derive a maximum-likelihood-based statistical model that allows us to classify subtypes of related cases based on unobserved (latent) heterogeneity and include exogenous variables to enable simultaneous segment classification and description (Coltman, Devinney, and Keating, 2011).

Given the need to convey results in a more intuitive format than that provided solely by coefficient estimates, we calculate a "share of preference" for each policy for both the multinomial logit and latent class models. The preference share is the forecasted probability that each policy is picked as most important:

$$\text{share of preference for policy } j = \frac{e^{\hat{\tau}_j}}{\sum_{k=1}^{J} e^{\hat{\tau}_k}}. \tag{4}$$

The shares of preferences must sum to 1 across all seven policy options in our application. Equation (4) calculates the importance of the policy j on a ratio scale, meaning that if one policy has a share twice that of another policy, it can be said that the former policy is twice as preferred as the latter. The share of preference conveys the probability that a policy is picked as more important than another. Thus, the calculated share of preference for a policy reflects both the true importance of the policy as well as the relative uncertainty in the importance that farmers place on the policy.

In this application, dairy farmer respondents were shown sets of policies and asked to indicate which potential policy action would be most and least important to their dairy farm business.[2] Respondents were shown eight sets of best-worst choices with varying policy options. The scenarios were derived using a main-effects, fractional design consistent with more common, discrete-choice conjoint analyses. With seven policy options considered, the best-worst scenario analysis in the survey included seven sets of three policy options and one set of seven options. Responses to the best-worst questions were used to measure each policy's position on a continuum of preferences. With these methods in mind, we turn to U.S. dairy policy and apply these methods to rank dairy farmers' policy preferences.

Current U.S. Dairy Policies and Proposals

U.S. federal dairy policy has its origins in the farm bills of the 1930s, which were part of the New Deal (Chouinard et al., 2010). While there are many policies that relate to the dairy industry, the current policies that most directly affect U.S. dairy farms include federal milk marketing orders,

[2] The method is called "best-worst," but many synonyms for choosing only one option at either extreme of a preference scale are used in the literature. We used "most" and "least important," which (Lusk and Briggeman, 2009) used to examine food values.

dairy price support program, and the Milk Income Loss Contract program (MILC)—a deficiency payment for dairy farms—as well as trade instruments such as export incentives and import restrictions.

Milk marketing orders define minimum farm prices that processors must pay for grade A milk (fluid quality) based on end use. In federal milk marketing orders, wholesale cheese, butter, nonfat dry milk, and dry whey prices less an allowance for manufacturing costs are used to set protein and fat prices for four classes of milk at the farm level. The relative use of milk by class in each of the ten federal orders is used to weight a minimum blend price that must be paid to all farmers marketing milk in that order. In 2010, about 66% of total U.S. milk production was marketed through federal orders, with a significant portion of the balance marketed through state orders (as in California, for example) (U.S. Department of Agriculture, Agricultural Marketing Service, 2011). The use of wholesale product prices to derive minimum farm prices has been controversial in recent years; cash wholesale markets are thin, creating potential for price manipulation (Dairy Industry Advisory Committee, 2011). One of the proposals on the table for the 2012 policy discussion was to end the use of product prices in setting farm prices and instead move to, for example, a survey of plant pay prices in areas that are not under a milk marketing order.

The Dairy Price Support Program (DPSP) has existed in some form since 1949.[3] For many years, particularly in the early 1980s, the support price was set above market-clearing levels, resulting in a surplus of milk production (Helmberger and Chen, 1994). Since that time, the support price has been brought down to a level where it rarely interferes directly with market clearing. In the 2008 Farm Bill the program was retitled the Dairy Product Price Support Program. The DPSP is an open offer from the Commodity Credit Corporation (a governmental agency) to purchase butter, cheese, and nonfat dry milk at set product prices. The formal intention of the DPSP is to support farm milk prices at a floor ($9.80 per hundredweight for 3.5% butterfat milk in recent years). Cox and Chavas (2001) determined that eliminating the DPSP would lower farm-blend milk prices, reducing producer surplus and increasing consumer surplus. Chavas and Kim (2004) concluded that the DPSP reduced milk price volatility and affected milk price levels, even during periods when support prices were not binding. The DPSP has been criticized in recent years for curbing product diversity and innovation, supporting world dairy product prices, and being generally insufficient for U.S. farm prices at current feed costs (Shields, 2011; Dairy Policy Analysis Alliance, 2010).

The Milk Income Loss Contract (MILC) program originated with the 2002 Farm Security and Rural Investment Act (2002 Farm Bill). The MILC program is a counter-cyclical dairy income support that pays producers a proportion of the difference between reference and actual milk prices (i.e., a milk deficiency payment). The MILC program was renewed in the 2008 Farm Bill and a feed-cost adjuster was added to increase payments when feed costs were above a trigger level. MILC payments to farms were capped at 2.4 million (equivalent to the production of about 120 cows) and 2.985 million pounds (about 150 cows) per fiscal year in various periods over the life of the program. It has been argued that the MILC program disproportionately assisted smaller herds, as they could receive payments on most (or all) of their production. Meanwhile, payments were capped at a smaller portion of larger herd's production, and total production would not decline as much when milk prices were depressed, as all herds would have less incentive to cut back production (Jesse, 2005). However, Bryant, Outlaw, and Anderson (2007) were unable to discern a significant supply response as a result of the MILC program.

Dairy-related trade policies include, but are not limited to, import restrictions (varying across countries and trade agreements) as well as the Dairy Export Incentive Program (DEIP), which subsidizes exports of dairy products. In past decades, these export subsidies were used to export excess dairy products, but U.S. product prices have been very competitive recently, making the

[3] The Dairy Price Support Program was changed to the Dairy Product Price Support Program in 2008, but we refer to the program by its original name (DPSP) throughout. The name change was accompanied by a program change that broke the explicit link to farm prices. However, the program still aims to support dairy product prices with the intention that farm milk prices are directly related.

DEIP program less relevant. Dairy programs also include the promotion and research programs, where dairy producers pay fifteen cents for each hundredweight of milk produced to be used for advertising and other activities.

While not specifically dairy policy, the existence of ethanol subsidies—defined here as blending credits and import tariffs on ethanol—has been opposed by all dairy and livestock groups.[4] The extent to which these policies have increased feed price levels and volatility is debatable, but the direction of their effect on cost has had an unambiguously negative impact on profitability for farms that use more corn than they produce.

Some of these policies, such as the MILC program, have an explicit size bias (Jesse, 2005). Others are perceived to be biased toward large herds. The negative cost consequences of renewable fuel policies have been felt more directly by owners of larger dairy herds, who tend to purchase more of their feed needs. Historically, the traditional dairy producing states in the Northeast and Upper Midwest have had smaller, older herds, while the Southwest and Pacific states have had newer and much larger herds (Sumner and Wolf, 2002). While average herd sizes have converged to an extent in recent years, that pattern still influences regional attitudes toward policies.

Dairy proposals for the 2012 Farm Bill began in earnest with the release of a set of policies released in 2009 by the National Milk Producers Federation (NMPF), a national organization composed of dairy cooperative members, entitled "Foundation for the Future" (National Milk Producers Federation, 2010). The proposal included four main components: a government-subsidized margin-protection program, a supply-control program (called growth management and market stabilization), revisions to price discovery mechanisms in federal milk marketing orders, and elimination of the Price Support (DPSP) and MILC programs (National Milk Producers Federation, 2010; Schnepf, 2012; American Farm Bureau Federation Economic Analysis Department, 2010; Dairy Policy Analysis Alliance, 2010). The proposal reflected a diversity of opinions from across the country and recognized that budget constraints would require some trade-offs (Milk Producers Council, 2011). The dairy policy debate has evolved since then, but the "Foundation for the Future" plan still underpins the conversation. The supply-control program, called the Dairy Market Stabilization program, proposes withholding a portion of the milk check from farmers when the milk-feed margin falls below trigger levels, unless producers curb milk production relative to the base period. The program attempts to shift supply back to maintain the margin between milk and feed price above some target level (e.g., $6/cwt). This program in particular has been controversial and was recently blamed for holding up the entire farm bill (Dickrell, 2013). Analyses have revealed that it might indeed result in more milk price stability, but it is likely to come at the cost of a lower average milk price (Nicholson and Stephenson, 2010; Food and Agricultural Policy Research Institute (FAPRI), 2010). Recently, many of the dairy policy proposals examined in this research have been formally introduced in the Dairy Security Act in September 2011 and were included in the draft 2012 Farm Bill.[5]

[4] The principal policy instrument used by the U.S. government to encourage the production and use of ethanol was the Volumetric Ethanol Excise Tax Credit (VEETC). For every gallon of ethanol that was blended with gasoline, the position holder received a tax credit (Bullock, 2007). Ethanol subsidies here refer to the combination of the VEETC as well as the Import Duty for Fuel Ethanol, which taxed imported ethanol (Bullock, 2007). Both existed at the time the survey was administered, but the Import Duty expired in December 2011 and the VEETC expired in December 2012. The Renewable Fuel Standard—which defines renewable fuels (including, for example, cellulosic ethanol) and sets a phase-in and minimum amount of renewable fuel use (e.g., 7.5 billion gallons in 2012)—remains in effect (Congressional Budget Office, 2010).

[5] The Dairy Security Act of 2011, which formed the core of the dairy subtitle, included many of the proposals examined in this research, with a few noteworthy modifications made after our survey was conducted. One major difference was making the growth-management program (called the stabilization program in the legislation) voluntary. However, farmers participating in the margin-protection program were to be automatically enrolled in the growth-management program. Coupling these programs was intended to offset government costs associated with the margin-protection program. Some lawmakers favored an amendment to decouple the programs. The Dairy Security Act as introduced also proposed ending the Dairy Export Incentive Program.

Table 1. Summary Statistics of Survey Respondents (N=226)

Variable	Unit	Mean	St Dev	Min	Max
Operator Age	Years	51.4	10.4	22	84
Operator Education	Years	13.1	1.7	6	20
Herd Size	Milk Cows	297	561	8	5,400
Acres Operated	Acres	728	843	25	9,000
Homegrown feed	%	74	22	0	100
Dairy Coop Member	% respondents	94	25		
Sole Proprietor	% respondents	53	50		

Table 2. Dairy Policy Options and Descriptions

Option Name	Policy Description
Eliminate DPSP	End the open government offer to purchase butter, nonfat dry milk and cheese.
Eliminate MILC	End deficiency payments triggered by Class I Boston milk prices and feed prices.
Implement Margin Protection	Implement a program that pays farmers when milk-feed margin is below trigger.
Implement Growth Management	Implement a program that withholds payment on portion of milk if milk-feed margin is below trigger.
Implement Competitive Pay Price	Replace wholesale product prices used to set minimum milk class prices with a competitive pay price.
Eliminate Ethanol Subsidies	Eliminate ethanol blending credits and tariffs on imported ethanol.
Eliminate All Dairy Policies	Eliminate all dairy policies (e.g., marketing orders, price support, DEIP, MILC, promotion).

Survey

A list of operations with a license to ship Grade A milk was obtained from the Michigan Department of Agriculture in April 2011. The list contained the names and addresses of 2,156 dairy farm operations, from which 1,128 (50%) were randomly selected. The survey followed Dillman's method (Dillman, Smyth, and Christian, 2009): surveys were mailed in May, a reminder postcard was mailed three weeks later, and a second survey was sent to nonrespondents three weeks after the postcard. Nine surveys were returned as undeliverable and seventeen responded that they were no longer farming, for an adjusted sample of 1,102 operations. Ultimately 226 useable surveys were returned for a 20.5% response rate.

The survey collected information about the operator and operation, including acres operated; the size of crop, livestock, and dairy enterprises; operator age, education and experience; farm business organization; farm sales; and whether they were currently (or previously had been) members of a dairy cooperative. Table 1 presents a brief summary of relevant statistics. Herd size varied from 8 to 5,400 milk cows. Average herd size was approximately 300 milk cows, which was larger than the average Michigan operation with milk cows according to NASS but consistent with the typical size of a commercial dairy farm in Michigan.

Finally, the survey solicited opinions about the major dairy policy proposals that were being discussed as potential parts of the 2012 Farm Bill. As described earlier, respondents were presented with eight sets of best-worst scenario choices with varying combinations from the set of seven policy changes. The policy options considered and the description provided to respondents are displayed in table 2. Figure 1 offers an example scenario.

The seven policy options ranged from eliminating existing policies—such as the DPSP and MILC programs—to implementing new policies such as a margin-protection program and supply management (called a "stabilization program" in the legislation). Another policy was to change the way minimum class prices are set in milk marketing orders to use a competitive price rather than wholesale prices (implementing competitive pay price). We included a policy option to end ethanol

Which of the following policy actions is most important and which is least important for your dairy farm business? (check only one as the most important and one as the least important)

Most Important		Least Important
☐	Implement government margin over feed cost program	☐
☐	Replace product pricing in Federal Milk Marketing Orders	☐
☐	End all US government dairy policies	☐

Figure 1. Example Best-Worst Scenario Presented to Dairy Farmer Respondents

subsidies. Ending all dairy programs was included as a benchmark to reflect the desire of some within the industry to let the free market prevail. The set of policies used in this survey was informed by existing legislation and proposals by the National Milk Producers Federation (NMPF) and other dairy producer groups. The choice of these policy options reflected the major policy proposals at the time of the survey as well as the reality that each additional option increases the required number of choice sets for respondents. We expected that some of the policies would potentially produce bifurcated responses based on factors such as herd size (e.g., eliminating MILC, which is targeted at smaller herds) and feed purchasing situations (e.g., eliminating ethanol subsidies).

Farmer Preferences for Policy Proposals

Estimations were performed in NLOGIT (Greene, 2002). Table 3 presents coefficient and share results of the multinomial logit (MNL) and latent class (LCM) models. Preferences for dairy policy best-worst options were initially analyzed using an MNL model as presented in equation (1). The LCM as described in equation (2) was also examined with consideration of two to five classes or segments. Based upon the Bayesian information criterion that is widely used to evaluate fit of these models, a three-class model would have been selected (Boxall and Adamowicz, 2002). However, in the three-class model, one of the classes was very small (3.3% of respondents) and the membership probability functions were imprecisely identified. Coupling this with a likelihood ratio test that indicated that the two-segment model provided a substantial improvement over the base MNL model led to choosing the two-class model as most appropriate.

Several covariates were introduced into the segmentation analysis as candidates to characterize the class domains. The variables considered included: (1) milking herd size, (2) acres operated, (3) percentage of feed purchased, (4) operator age, (5) operator education, (6) solvency position, and (7) business organization. Only herd size accounted for significant differences across segments. Examining the estimated class-membership coefficients and segment-size estimates (table 3), class 1 could be characterized as being composed of larger herd operations (53% of respondents) while class 2 was composed of smaller herd operations (47% of respondents).[6] We refer to the classes henceforth as "smaller" and "larger" herds but recognize that herd size (and other underlying characteristics) varies within each class.

In order to test whether preference shares differed from one another (rather than just from the omitted policy), a distribution of each coefficient was generated using a bootstrapping procedure proposed by Krinsky and Robb (1986). Subsequently, the complete combinational test was conducted on all pairwise combinations of preference shares (Poe, Giraud, and Loomis, 2005). Specifically, 1,000 observations were drawn from a multivariate normal distribution parameterized

[6] The classes here are the portion of dairy producer respondents rather than the portion of cows or milk. The implication is that the near-even split shown may characterize heterogeneity in terms of operations or producers (or votes for farm bill options), but a different story might emerge using a milk-volume-based approach.

Table 3. Coefficient Estimates and Preference Shares

	Coefficients			Share of Preference		
	MNL	LCM	LCM		Class 1	Class 2
Policy Option	All Herds	Class 1	Class 2	All Herds	"Larger Herds"	"Smaller Herds"
Eliminate DPSP	0.272***	0.099	0.530***	0.138	0.090	0.133
	(0.001)	(0.122)	(0.084)			
Eliminate MILC	0.134*	−0.090	0.416***	0.120	0.075	0.118
	(0.080)	(0.122)	(0.073)			
Implement Margin Protection	0.496***	−0.012	1.195***	0.172	0.081	0.258
	(0.081)	(0.122)	(0.070)			
Implement Growth Management	0.191**	−0.343***	0.816***	0.127	0.058	0.176
	(0.003)	(0.129)	(0.070)			
Implement Competitive Pay Price	0.297***	−0.090	0.795***	0.141	0.075	0.173
	(0.080)	(0.122)	(0.075)			
Eliminate Ethanol Subsidies	0.628***	1.884***	−0.199***	0.197	0.539	0.064
	(0.082)	(0.186)	(0.076)			
Eliminate All Dairy Policies	0.000	0.000	0.000	0.105	0.082	0.078
Class Membership Coefficients						
Constant		−0.107				
		(0.229)				
Herd Size		0.001*				
		(0.0006)				
Class Probability		0.532	0.468			

Notes: Single (*), double (**), and triple (***) asterisks indicate that the mean coefficient is statistically different from "Eliminate All Dairy Policies" at the 10%, 5% and 1% level. Values in parentheses are standard errors.

Table 4. Tests of Share Preference Statistical Differences (p-values)

	Eliminate DPSP	Eliminate MILC	Implement Margin Protection	Implement Growth Management	Implement Competitive Pay Price	Eliminate Ethanol Subsidies
MNL: All Herds						
Eliminate MILC	0.26	-	-	-	-	-
Implement Margin Protection	0.01	0.05	-	-	-	-
Implement Growth Management	0.36	0.42	0.09	-	-	-
Implement Competitive Pay Price	0.41	0.23	0.02	0.32	-	-
Eliminate Ethanol Subsidies	< 0.01	0.02	0.08	0.02	< 0.01	-
Eliminate All Dairy Policies	< 0.01	0.30	< 0.01	0.20	< 0.01	< 0.01
LCM: Class 1						
Eliminate MILC	0.12	-	-	-	-	-
Implement Margin Protection	0.24	0.32	-	-	-	-
Implement Growth Management	< 0.01	0.08	0.03	-	-	-
Implement Competitive Pay Price	0.12	0.50	0.32	0.08	-	-
Eliminate Ethanol Subsidies	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-
Eliminate All Dairy Policies	0.29	0.29	0.47	0.02	0.29	< 0.01
LCM: Class 2						
Eliminate MILC	0.01	-	-	-	-	-
Implement Margin Protection	< 0.01	< 0.01	-	-	-	-
Implement Growth Management	< 0.01	< 0.01	< 0.01	-	-	-
Implement Competitive Pay Price	< 0.01	< 0.01	< 0.01	0.37	-	-
Eliminate Ethanol Subsidies	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	-
Eliminate All Dairy Policies	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Notes: p-values were derived using non-parametric combinatorial tests following Poe, Giraud, and Loomis (2005). A low p-value indicates that the column policy has either a significantly smaller or significantly larger share of preference than the row policy.

by using the coefficients and variance terms estimated by the MNL and LCM models. The simulated coefficients from each model were used to empirically test for differences in share preferences (table 4).

When using the MNL and imposing an assumption of homogeneous preferences (i.e., across all farms), the estimated preference shares were fairly uniform, ranging from the least important option among farm business managers (10.5%) being to eliminate all dairy policies to the most important option (19.7%) of eliminating ethanol subsidies (table 3). Considering the pairwise tests for all farms, eliminating ethanol subsidies had a statistically larger share than all the other options except implementing margin protection (at p=0.05 level of significance) (table 4). At the bottom of the policy option preferences, eliminating all dairy policies had a significantly smaller share than all other options except eliminating MILC and implementing growth management. Still, it is apparent that across all farms, there are a lot of policies with similar preference shares (e.g., fail to reject equivalence). Given the dynamic and apparently divisive views on dairy policy, this level of suggested indifference was surprising. This observation highlights the likely inappropriate assumption of homogeneous preferences imposed by the MNL model and further motivates the latent class logit estimation.

Considering the LCM results, "larger" herd operators (class 1) rated eliminating ethanol subsidies more important to their farm business than all other options combined, with a preference share of about 54%. Given the normalization facilitated by focusing on preference shares, we can express the magnitude of this preference in another context. This preference among class 1 respondents to end ethanol subsidies was estimated to be six times the magnitude of the next most important option of eliminating the DPSP (top choice of 9%). Larger dairy herds across the country

grow a relatively smaller portion of feed needs (i.e., purchase more feed per unit of milk produced) than smaller herds (MacDonald et al., 2007). That general relationship holds in Michigan. For these Michigan farm respondents, 70% of herds with less than 300 cows grew 75% of more of their feed needs, while only 52% of those herds with 300 or greater cows did so. With the U.S. Congress ending the Volumetric Ethanol Excise Tax Credit in December 2011 (Shephardson, 2011), these producers may have gotten at least part of their most important policy change. Implementing growth management was significantly less preferred than most of the other policy options among these larger herd operators.

The "smaller" herd operator (class 2) ratings diverged from the larger herd operator preference shares. Implementing margin protection was the most preferred option for these operators, with about a 26% share. Volatile feed costs in recent years have led dairy farmers to become acutely aware that simply supporting or protecting milk prices may not be adequate to ensure adequate income. Dairy farmers can use futures contracts or options to protect the margin between Class III milk price and energy and protein feed prices as captured by corn and soybean (or soybean meal) contracts. However, these contracts may be too large for some producers to use, particularly for producers with smaller herds. Dairy producers can also use forward contracts for milk or feed through their milk marketing cooperative or local elevator. Many dairy farm managers consider these tools too complex or expensive or the basis (futures price relation to cash price) too variable to use (Wolf, 2012).

Smaller herd operators (class 2) ranked implementing growth management and implementing competitive pay price as the next most important options (and not significantly different than each other). Eliminating the DPSP and eliminating MILC were the fourth and fifth largest share preferences among smaller herd operators. All five of these policy actions are contained in the National Milk Producers Federation "Foundation for the Future" plan underlying the pending farm bill legislation. Thus, producers in class 2 were more supportive of the major proposals from "Foundation for the Future," while class 1 were focused on eliminating ethanol subsidies—and the resulting feed cost implications—rather than any dairy-specific policy proposal. This difference in producer preferences is consistent with observed variations in views expressed in the media regarding dairy policy and underscores the importance of this and future research to evaluate heterogeneity of producer situations and preferences. Eliminating ethanol subsidies was a significantly less preferable policy option for these smaller herd operators.

We also tested whether the preference shares were significantly different for each policy option between class 1 and class 2 respondents.[7] Preference shares differed across classes for all policy options, with the exception of eliminating all dairy policies, highlighting that the preference heterogeneity underlying our preference for the LCM over the MNL model is driven not by diverging views on a single policy option but more broadly by a nearly entirely different preference structure across options.

These results considered dairy farmer preferences but did not consider the broader benefit-cost aspects of the evaluated proposals. For example, in the current climate of federal budgetary uncertainties and considerations, one may increasingly argue whether new expenditures on policies that subsidize dairy production will be feasible. The unique contribution of this study is the provision of insights on the relative attractiveness of alterative policy actions among dairy farmers. Given that the policy options under discussion may not be politically or economically feasible to implement, the suggested willingness of producers to "trade away" different policy options could be assessed with methods used here. The insights provided by this study regarding benefits that producers may see in alternative policy adjustments warrant consideration in broader benefit-cost assessments. With this in mind, and with ethanol blender tax credits (but not the renewable fuels standard) eliminated, the most preferred option among Michigan dairy farmers was to implement a program to protect the margin over feed cost. The current DPSP support price is low relative to current market-clearing

[7] These results are not displayed in table 4 but are available upon request.

levels and does not reflect volatile feed costs. The MILC deficiency payment program reflects cash feed costs to some extent, but the payment limit makes it less financially impactful for large herds as reflected by the preference heterogeneity underlying our latent class model. By skewing benefits to small producers and by reducing market prices, the MILC program penalizes larger herds (Balagtas and Sumner, 2012). In contrast, the margin-protection proposal would be available to all herds with no production cap and offer the option to buy more coverage at a subsidized rate. Smaller Michigan herds that benefit from MILC rated implementing margin protection as more important than eliminating the DPSP or eliminating MILC but rated the current combination more important than the income-margin-protection program.

Summary and Conclusions

This study examined Michigan dairy farmers' preferences for policy options at a time of great change, as discussions related to the 2012 U.S. Farm Bill considered ending long-standing policies and implementing novel alternatives. Dairy farm managers were surveyed in the spring of 2011. Using best-worst scaling respondents we examined seven policy options that have the potential to affect dairy farmers. Unlike, for example, Likert-scale-type questions, best-worst scaling is cardinal and allowed us to determine how important policies were to the farm business, in addition to the ordering. The most important option across all respondents was eliminating ethanol subsidies. This policy change was accomplished to some extent in December 2011. The next most important option was implementing a program that would pay dairy farmers when the margin between milk price and feed price falls below a trigger level (implementing margin protection). The least important option was to eliminate all dairy policies.

Estimating a latent class model allowed us to determine that preferences were split based on herd size. Larger herd operators overwhelmingly preferred to eliminate ethanol subsidies and were largely indifferent among the other options. Smaller herd operators rated the implementation of margin protection as the most important policy for their farm business but also rated all other options as more important than eliminating all dairy policies or eliminating ethanol subsidies. If these results are representative of the broader U.S. dairy farmer population, then the long-standing disagreement on dairy policy across herd size certainly remained in 2011. The cardinal nature of the preference shares facilitates not only ranking of policy proposals but assessment of trade-offs.

Future work should expand this analysis to more states and regions to check representativeness, as past research has shown that regional differences in policy preferences can be important (Miller, Barnett, and Coble, 2003). With ethanol subsidies eliminated, it would be useful to reconsider the preferences of these large herd operators without this policy option in the set. These techniques could also be used to examine the preferences of dairy cooperative and processor leadership, as they are often more directly involved in policy formation. Finally, this analysis did not consider federal budget constraints or equity or welfare effects, which would further enhance the policy relevance. This work can be leveraged both in future research and in ongoing farm-policy debates to enhance our understanding of agricultural policy appeal to impacted producers and ultimately the economic welfare impacts of considered policies.

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