Factors Affecting Participation in the Milk Diversion Program in the U.S. and New York

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Participation in the 1984—85 Milk Diversion Program (MDP) is examined through the analysis of aggregate state level data for the U.S. and county level data from New York. Linear probability, logit and probit models of participation are estimated. The empirical results are highly similar across models and identify the important determinants of farmer participation in the MDP. Models explaining contracted diversion levels are also estimated but do not have the explanatory power of the participation models. The implications of the results for the analysis of U.S. dairy policy alternatives are discussed.

In response to rapidly mounting stocks of surplus dairy products, Congress enacted the Dairy Production Stabilization Act in late 1983. A key component of this legislation was an attempt to curb milk production nationwide through a voluntary Milk Diversion Program (MDP). Though temporary, extending only from January 1984 through March 1985, the establishment of the MDP represented an important change in national dairy policy. Paid diversion programs have been common in the past to curb excess production of wheat, feed grains and cotton, but this represented the first attempt to extend the program to dairy production.

The novelty of the paid diversion approach to reducing dairy surpluses initially created considerable uncertainty about the likely extent of participation in the program and its ultimate effectiveness in reducing dairy production. With the program recently having been terminated in March 1985, a final evaluation of the program's long-term effectiveness would be premature. However, some information on participation in the MDP and its short-term impact on production is available which may be used to gain an understanding of the reasons influencing farmers' participation (or non-participation). Understanding the determinants of participation in the MDP is important to policymakers involved in the ongoing debate concerning alternative measures to deal with surplus dairy production. The issue is of particular significance given the current discussion over dairy legislation as part of the 1985 Farm Bill and the consideration of legislation for a standby dairy diversion program. Both participation in voluntary farm programs and the implications of the participation decision for aggregate supply response have been examined in previous research (Chambers and Foster; Kramer and Pope; Lee and Helmberger). When available, farm-level data may be used to address the economic issues surrounding participation. Barring their availability, macro or grouped data can be used to gain a preliminary idea of the factors influencing the participation decision at a more aggregative level. In this paper, three models, a linear probability model and models incorporating logit and probit transformations, are estimated to explain aggregate participation rates by state. These national results are compared with those from similar models used to explain county participation rates in New York. As a second step in the analysis, other models are estimated to identify factors influencing contracted diversion levels at both the national and state levels. The empirical results are discussed in view of their relevance to the goals of the MDP and national dairy policy.

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The Milk Diversion Program

Detailed descriptions of the MDP are available elsewhere (e.g., Boynton and Novakovic, I984a), but to place the study into proper perspective, the program's main provisions are summarized here. The MDP applied to milk sold between January 1, 1984 and March 31, 1985. Participating producers were eligible for payments of $10 per hundredweight on the difference between their "base period" sales and actual sales provided their actual sales were between 5 and 30% below base. The base was denned by farm sales in 1982 or the average of 1981-82 sales (with producers expected to select the larger of the two). Producers had until February 1, 1984 to enroll in the program, indicating at that time their planned production cutbacks and how those cutbacks were expected to be achieved (e.g., reducing herd size, changing feed rations, etc.). The program also placed restrictions on the transfer of a producer's base to another farmer, the maximum differential between actual sales and contracted sales (±3%), etc. Penalties were stipulated for participants who failed to fulfill their contracts.

Dairy producers had to consider a number of factors in deciding whether or not to participate in this voluntary program. Among the most important was the producer's intended production over the 15 months of the program relative to base production. The higher the intended (and recent) production, the more difficult it would be to achieve the required production cutbacks to a level 5 to 30% below base. Further, the temporary nature of the program meant that producers had to balance the short-term gains from cutting back production and receiving diversion payments against any potential future gains from rebuilding after termination of the program and/or planned long-term expansion which would require maintaining herd size aijd the current scale of operation.

The extent to which production cutbacks induced by program participation would result in expected savings in production costs was also a factor influencing the participation decision. Management ability and operator control over the dairy operation played a role in several respects, among them, in determining the extent to which the operator was likely to avoid penalties resulting from not meeting planned cutbacks due to circumstances beyond his control (Boynton and Novakovic, 1984b). Finally, such factors as a farmer's age and probability of near-term retirement, size of operation, and attitude toward government programs probably played a role as well, although the effects of these factors on the participation decision are less definitive, *a priori.*

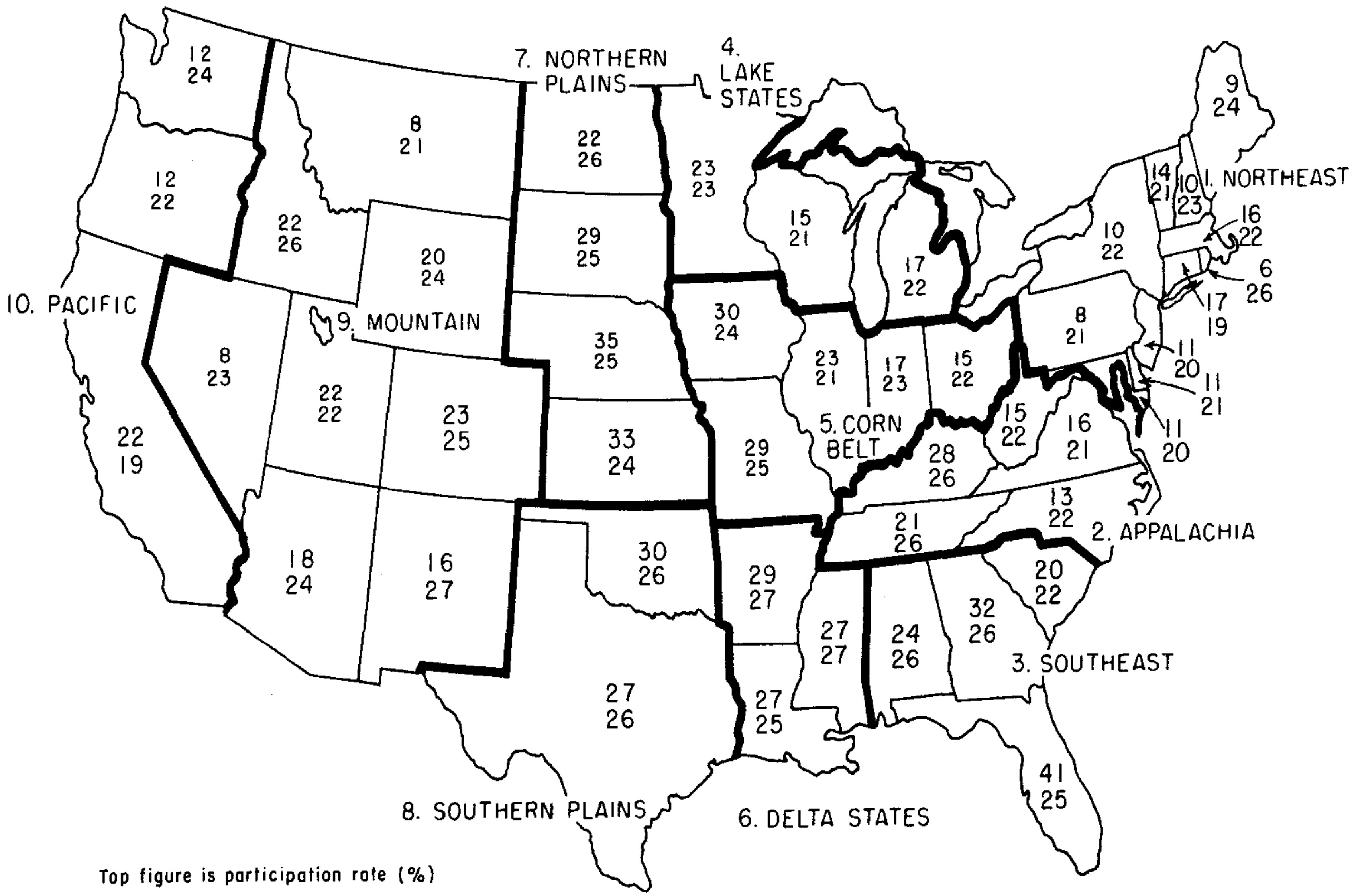
Actual state and county level data on MDP participation and diversion levels are summarized for the U.S. and New York State in table 1 and figure 1. Of the nearly 200,000 farms in the U.S. selling dairy products (based on 1982 Census of Agriculture figures), an estimated 19.0% or nearly 38,000 farms chose to participate in the MDP. By state, participation ranged from a low of 6.0% in Rhode Island to a high of 41.1% in Florida; 20 states had participation rates between 10 and 209&, while in another 18, the rate was between 20 and 30%. In contrast, New York was one of the six states where less than 10% of dairy farms participated in the MDP. This rate is well below the national average; in fact, MDP participation rates in one-half of New York's counties were less than 10%. In only one New York county did more than 20% of dairy farms participate in the program.

Despite the fact that the participation rate in the MDP in New York was relatively low, the average contracted diversion level on those farms participating in New York was 22.0% of

Table 1. Participation in the National Milk Diversion Program, 1984-85

	New York (50 Upstate Counties)	U.S. (48 States)
Participation Rate*		
Average	9.9%	19.0%
Range	4.8-25.3%	6.0-41.1%
Distribution:		
4.8-9.9%	25/50	6/48
10-19.9%	24/50	20/48
20-29.9%	1/50	18/48
30-39.9%	—	3/48
40-49.9%	—	1/48
Diversion Rate**		
Average	22.0%	22.9%
Range	17.2-26.5%	19.0-27.3%
Distribution:		
17.2-19.9%	6/50	4/48
20.0-24.9%	40/50	28/48
25.0-29.9%	4/50	16/48

Source: Boynton and Novakovic (1984c,d); Census of Agriculture, 1982.
* Participating farms as a percentage of all farms selling dairy products (based on 1982 Census).
** Contracted diversion levels as a percentage of participants' base marketings.



Top figure is participation rate (%)
Bottom figure is diversion rate (%)
Delineates USDA Farm Production Regions

Figure 1. U.S. MDP Participation and Contracted Diversion Rates by State

base marketings. This was less than a single percentage point below the national average. At the county level in New York, there is little apparent correlation between participation levels and contracted diversion levels (simple correlation coefficient = —0.07). Nationally, the relationship is much stronger, with a correlation coefficient of 0.53.

The Participation Decision

For the individual farmer, the decision to participate or not participate in the MDP can be formulated as a binary choice model. If, following Chambers and Foster, one assumes that individual behavior is based on a well-defined utility function, then the decision to participate in the program is made by comparing the utility of non-participation with that of participation. One can represent the utility of non-participation for the *\ih* individual by ui° = F(yi°, Xi) where yi° is a vector of attributes (such as those discussed in the previous section) related to the farm business which are associated with non-participation in the program; Xi is a vector of socio-economic characteristics and other things that affect utility. Similarly, the utility of participation is given by Ui^1 — $F(y_i^1, Xi)$ where yt^1 are the farm business characteristics measured at their values under participation in the MDP. Thus, the utility maximizing farmer will participate in the program only if *F(yi* xO - F(yi°, xO ^ 0.

If farm level data were available, then this equation could be re-expressed in a form appropriate for estimation. After making the required assumptions about the distribution of the error term, the discrete (0/1) participation decision could be analyzed for a cross-section of producers using logit or probit analysis. Similar general approaches have been commonly applied to discrete choice problems in consumer demand (Domencich and McFadden; Amemiya) and, to a more limited extent, to production-related decisions such as farmer participation in the farmer-owned reserve program (Chambers and Foster) and the adoption of reduced tillage practices (Rahm and Huffman).

When all that are available are data on the behavior of a given population subgroup, then an alternate approach is to use each subgroup as an individual observation in an aggressive analysis (Maddala, 1983; Pindyck and Rubinfeld). In such an approach, the central research question becomes, not the explanation of individuals' discrete choice decisions, but rather the use of qualitative choice models to estimate the *probability* of a given choice for individual groups, each assumed to be comprised of identical individuals. For sufficiently large samples, the estimated parameters of the regression equation are unbiased and consistent (Pindyck and Rubinfeld, p. 290).

In this paper, two separate analyses are considered, one dealing with national participation in the MDP, by state, and the other with participation in New York, by county. Thus, if mi is the number of producers in the state i or county i subgroup to participate in the MDP, respectively, and n_t is the total number of eligible dairy farmers in state or county i, respectively, then PI = nii/ni is the proportion of participants in the MDP. Pt can then be estimated in a linear regression equation as a function of a number of exogenous variables which are expected, *a priori,* to influence the participation decision.[1]

However, use of the untransformed PI as the dependent variable in a simple linear probability analysis is problematic because, for a given sample, the predicted values P_{i5} may lie outside of the permissible [0, 1] range. To avoid this problem, two transformations of PI may be used, a logit transformation

$$L_i = \log \frac{P_i}{1 - P_i}$$

based on the cumulative logistic probability function (and which gives the logarithm of the "odds" of participation), or a probit transformation, which assumes that the estimated probabilities can be computed from the cumulative normal probability function,

$$P_i = F(Z_i) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{Z} e^{-s^2/2} ds$$

where s is a standard normally distributed random variable. Both transformations ensure that the estimated probabilities lie between 0 and 1.

Model Specification and Data

In the current analysis, linear probability, logit, and probit models were estimated to ex-

[1] The assumption that all farms within each state or county within New York are identical is clearly problematic. However, this assumption is central to the grouped-data approach and represents no more unrealistic an assumption here than in many similar empirical analyses using aggregate data.

plain state-level MDP participation rates across the U.S. and county participation for the state of New York. The dependent variables in these equations were estimates of the proportion of dairy producers participating in the MDP, and their respective logit and probit transformations. The numbers of farms participating in the program are reported by Boynton and Novakovic (1984c,d). However, in constructing the participation rates, estimates of the total number of dairy producers by state and county in New York are also needed. Two alternatives from the Census of Agriculture were examined. In the first, the number of farms selling dairy products was considered, but due to a relative lack of other socioeconomic data for this classification of farms, the analysis used those farms classified by Census SIC as dairy operations for this purpose. The number of farms participating in the program was then adjusted by the ratio of SIC dairy farms to farms selling dairy products. This procedure avoids overestimation of the degree of program participation, but assume s that participation rates among SIC dairy farms and other farms selling dairy products are the same.

A second set of regression models was also estimated to explain variation in the level of participation (e.g., contracted diversion levels) across states and New York counties. In these models, the dependent variables were the average state or county contracted diversion levels as a percentage of the maximum diversion level (30% of participants' base marketings) and their respective logit and probit transformations. One would expect a greater degree of difficulty in explaining diversion levels compared to participation rates due to the much lower degree of variation in diversion levels.

Participation and diversion rates were estimated as functions of several variables which were considered to have an important impact on the participation decision. Intended production relative to base production was likely to have an important impact on participation. However, data on "intended production'" were unavailable and 1983 state and county milk production relative to base (calculated as the higher of 1981 and 1981-82 state or county production) was used as a proxy. *A priori,* one would expect an increase in this variable (INCBASE) to reduce participation, due to the greater degree of difficulty in cutting back production to required levels for farms which had experienced recent expansion above base production levels.

A second measure of the rate of farm expansion, the percentage change in milk production per farm over the 1978—82 period (CHPROFM), was also included as a regressor, based on the same reasoning and with the same expected negative relationship to participation rates as INCBASE. It was believed that this second measure might more accurately measure differential trends toward farm expansion and thus might better reflect the extent to which the probability of MDP participation was influenced by longer-run factors.

Another major factor likely related to MDP participation was the extent to which producers could realize savings in production costs by participating in the program and cutting back production. The measure used here, variable costs of production as a percent of dairy sales (VCPDSAL), is expected to be positively related to participation rates as higher variable production costs presumably lead to a greater likelihood of participation by producers striving to reduce those costs by participating in the program.

The opportunity cost of resources used in dairy production was also a likely determinant of participation in the MDP. The availability of alternative farm enterprises in which those resources may be used reduces the dairy farmer's dependence on cash flow from the dairy operation, and is likely to increase the probability of that farmer participating in the program. Accordingly, a proxy for the availability of these non-dairy alternatives, the value of dairy sales as a percentage of total farm sales (DSPCTSAL), was included in the model estimation. The coefficient is expected to be negatively signed.

Other characteristics of the farm operation were also hypothesized to affect the program participation decision. The average age of the farm operator (AVEAGE), as a proxy for less measurable farm characteristics, may affect participation although the direction of the effect is difficult to ascertain *a priori.* One hypothesis, commonly encountered during the MDP sign-up period, is that older farm operators are likely to be those most likely to be considering retirement or disinvestment in the dairy operation and thus are those most likely to participate in a paid diversion program as a first step toward terminating production altogether. This would suggest a positive relationship between average age (across states or counties) and participation rates. An alternative hypothesis is that older farm operators are least likely to agree to participate in a totally new type of farm program. Younger, innovative farmers, who are more likely to participate in new programs, may also be better at using the new programs to enhance the profitability of their farm businesses. Under this hypothesis, average age and participation rates would be negatively related.

Farm size, as measured by average crop acres per farm (SIZFARM), is also included as a possible determinant of participation rates, under the same reasoning as applied to VCPDSAL (variable costs as a percent of dairy sales). Specifically, it is expected that farms with greater crop acreages produce a higher proportion of feed inputs on the farm, are less likely to experience reduced production costs under the participation option and therefore are less likely to participate in the diversion program. Thus, SIZFARM is expected to be negatively related to MDP participation.

Finally, in estimating the national model, it was thought that the likelihood of substantial geographic variations in types of dairy production enterprises across the nation, apart from those explained by the variables described above, warranted the inclusion of regional dummy variables to capture unique regional attributes as intercept shifters. Accordingly, dummy variables representing nine of the ten USDA Farm Production Regions (see figure 1) were included in the estimated regression equations. The excluded region was the Northeast, which had the lowest average participation rates in the nation.

Data for the analysis come from a variety of sources. U.S. and New York MDP sign-up data come from the Agricultural Stabilization and Conservation Service, as cited in Boynton and Novakovic (I984c,d). State and county dairy production statistics for 1983 come from *Milk Production Disposition and Income* (USDA Crop Reporting Board) and *New York Agricultural Statistics* (New York Crop Reporting Service), respectively. The remaining data on farm and farmer characteristics are from the 1978 and 1982 Agricultural Censuses.[2]

Because both the numbers of MDP participants and total dairy farms were different in each state and each New York county, weighted least squares estimation procedures were used in the analysis. Weighted least squares generates efficient coefficient estimates by weighting each observation in direct proportion to its relative contribution to the total sample (Hndyck and Rubinfeld, p. 143). The U.S. and New York equations were weighted by the number of SIC dairy farms in each state or county, respectively.

Empirical Results

In estimating the participation models, all of the explanatory variables identified above were included in the initial specification of both state and county equations. Those variables which, based on standard statistical criteria, added little explanatory power to the estimated equations were removed and the equations reestimated.

Results from the three final forms of the U.S. and New York models of MDP participation are given in tables 2 and 3, respectively. In the case of the logit and probit models, the coefficient estimates presented have been transformed using the procedures outlined in Maddala (1983, p. 23) to reflect the change in Pi due to a unit change in the variable. These transformed coefficients have the same interpretation as the coefficients from the linear probability model.

U.S. Participation

In general, the estimated coefficients of the explanatory variables in these models have the expected signs; many of the t-ratios are quite large, while others are just slightly under two. In comparing the three estimated forms of the participation equation, the results appear generally satisfactory and robust. The three formulations each explained over 75% of the

[2] Though data from 1983, the year prior to the MDP signup, would have been preferable to 1982 data in the construction of a number of variables, the relative stability of variables such as average age of farmers and average size of farm in succeeding years suggests that the Census data are reasonable proxies.

As noted previously, the availability of state Census data at the disaggregated SIC level for dairy farms meant that with the national models, all independent variables in the estimated equations were able to be calculated based on data specific to the dairy farm (SIC-024) sector. In the case of the New York county-level equations, however, dairy farm-specific data were only available in the calculation of the CHPROFM variable. Thus, calculation of the remaining variables necessarily required the use of aggregate county-level farm Census data.

Table 2. U.S. Milk Diversion Program Participation Models

	Model		
Variable	Linear Probability	Logit	Probit
INTERCEPT	.465	.466	.472
	(1.H5)	(.047)	(.044)
INCBASE	-.090	-.249	-.207
	(-.337)	(-.544)	(-.507)
AVEAGE	-.012	-.017	-.016
	(-1.969)	(-1.569)	(-1.664)
VCPDSAL	1.067	1.888	1.677
	(7.689)	(7.935)	(7.932)
DSPCTSAL	-.267	-.484	-.429
	(-1.807)	(-1.905)	(-1.901)
CHPROFM	-.187	-.324	-.288
	(-2.242)	(-2.268)	(-2.267)
D2	.052	.091	.081
	(1.896)	(1.939)	(1.943)
D3	.089	.124	.116
	(1.806)	(1.457)	(1.532)
D4	.093	.193	.166
	(5.066)	(6.113)	(5.935)
R^2	.770	.775	.776

Note: Coefficients for the logit and probit models are transformed using procedures in Maddala to yield estimates with the same interpretation as the linear probability model's coefficients. Numbers in parentheses are t-ratios; for the logit and probit models, the t-ratios are for the untransformed coefficients. Sample size equals 48.

variation in participation rates, a very satisfactory result for a cross-sectional analysis.

In examining specific coefficient estimates, to participation; as average age of farm operators increases by one year, the probability of participation decreases by 1.2 to 1.7%. Furthermore, the results suggest that the potential for reducing variable costs of production (as measured by VCPDSAL) and the availability of alternative uses for resources currently devoted to dairy production (as measured by DSPCTSAL) are both significant determinants of participation rates. A 10% increase in VCPDSAL leads to a 10.7 to 18.9% increase in participation, depending on the specific model, while a 10% increase in DSPCTSAL results in a 2.7 to 4.8% decline in participation. Of the two measures of growth in milk production, only CHPROFM, measuring the change in production per farm from 1978-82, appears to be important. A 10% increase in production per farm over the 1978-82 period, as expected, results in a decline in the probability of participation of between — 0.19 and —0.32. The coefficient on INCBASE, representing the increase in 1983 production over base, has the expected negative sign but the t-ratios in all cases are unexpectedly low. Finally, of the regional dummy variables, only those representing the Appalachian (D2), Southeastern (D3), and Lake States (D4) regions are consistently important across all equation specifications and have the expected positively signed coefficients.[3]

New York Participation

The results from estimation of the participation equations for New York counties are somewhat different from the national models. To begin, the explanatory variables explained a much lower proportion of variation in New York MDP participation rates than in the national model. Among other reasons, this may have been due to the greater potential for measurement error in several of the independent variables and/or the much lower degree of variation in MDP participation rates in New York compared with the nation. However, the estimated coefficients still generally have the expected signs, nine of the 12 t-ratios are above two, and across the sets of linear prob-

Table 3. New York Milk Diversion Program Participation Models

	Model		
Variable	Linear Probability	Logit	Probit
INTERCEPT	-.282	-1.039	-.832
	(-1.607)	(-3.380)	(-3.544)
INCBASE	-.039	-.117	-.095
	(-2.102)	(-2.408)	(-2.362)
AVEAGE	.009	.024	.020
	(2.705)	(2.710)	(2.717)
VCPDSAL	.200	-.003	-.0018
	(.018)	(-0.093)	(-.070)
SIZFARM	-.0002	-.0006	-.0005
	(-2.483)	(-2.373)	(-2.407)
R^2	.395	.398	.399

Note: Logit and probit model coefficients transformed as described in table 2. T-ratios in parentheses. Sample size equals 50.

[3] Based on a standard F-test of the unrestricted versus restricted regression models (Maddala, 1977, p. 197), the joint hypothesis that the coefficients of the remaining dummy variables are equal to zero is not rejected in each of the three models- For the linear probability, logit, and probit models, the calculated F-statistics are .976, 1.642, and 1.475, respectively.

ability, logit and probit estimates, the coefficients are similar in magnitude.

In all three formulations estimated, an increase in production over base (INCBASE) is negatively related to and, in contrast to the results from the national model, is a significant determinant of county participation rates. For each 10% increase in the level of 1983 production relative to base, the proportion of county farmers participating in the MDP program decreased from between 0.40 and 1.17%, depending on the model. For each additional year in average age of county farmers (AVEAGE), the probability of participation increases from between 0.90 to 2.4%. This was the opposite effect of that estimated for the national model, suggesting that the use of the diversion program as a first step toward retirement or disinvestment for older farmers may have been particularly relevant in the case of New York.[4]

With regard to the other explanatory variables in the analysis of New York State participation, farm size (SIZFARM) proved to be an important determinant of county participation; for each additional 10 acres in average farm size, the proportion of participating producers decreased as expected, between 0.2 and 0.6%. Variable costs as a percentage of the value of milk marketings (VCPDSAL) yielded the expected positive sign on the estimated coefficient; however, the t-ratio was unexpectedly low.

Explaining Diversion Levels

The second step of the empirical analysis involved the estimation of regression equations to explain variation in contracted diversion levels across states and New York counties. Because of the interplay of a multitude of factors influencing diversion levels on participating farms, it was not possible *a priori* to hypothesize which specific factors, outside of those reviewed above, might influence diversion levels, nor the direction of their influence. As a result, the aforementioned variables, important in the participation decision, were included as explanatory variables in the diversion equations as possible determinants of diversion levels in New York and the U.S. In addition, under the hypothesis that participation levels themselves might have been important determinants of diversion levels, the predicted values of participation levels resulting from the first set of equations were included as regressors in the diversion equations.[5] Use of the predicted participation rates as regressors is based on the underlying assumption that the participation/diversion decision resulted from a recursive process in which the producer first chose whether or not to participate and, if so, then at what level.

The empirical analysis of factors influencing diversion levels proved less successful than the analysis of participation rates. In the national model, average diversion levels (as a percent of maximum diversion) were regressed on the predicted participation rates from the preceding analysis (PARTIC) and the other exogenous variables identified previously. The final estimated results appear in table 4. Only the predicted participation rate and variable costs as a^percentage of dairy sales (VCPDSAL) proved to be significant determinants of diversion levels.[6] The results show that a 10% increase in the MDP participation rate was associated with a 4.1 to 5.6% increase in average diversion levels, while a 10% increase in VCPDSAL led to a 4.5 to 7.2% increase in diversion levels. Thus, farmers were more likely to participate at a higher level (i.e., to have a higher contracted diversion level) if they were located in states with high MDP participation rates and as the poten-

[4] Alternatively, the available data on average age of county farmers may be an inaccurate proxy for dairy farmers' average age.

[5] In the logit and probit models, predicted values of participation rates were transformed back into simple percentage terms for use in the estimated diversion equations.

[6] The lack of explanatory power of the other exogenous variables may be due to the fact that their effects are already captured in the predicted participation variable.

Table 4. U.S. Milk Diversion Rate Models

	Model		
Variable	Linear Probability	Logit	Probit
INTERCEPT	.426	.284	.320
	(7.619)	(2.533)	(2.316)
PARTIC	.413	.562	.532
	(3.23)	(3.022)	(3.088)
VCPDSAL	.445	.717	.648
	(3.75)	(4.024)	(3.970)
R^2	.548	.542	.545

Note: Logit and probit model coefficients transformed as described in table 2. T-ratios in parentheses. Sample size equals 48.

tial savings in variable production costs increased relative to the value of dairy sales. These two variables explained nearly 55% of the variation in diversion levels across states. Similar models were also estimated to explain variation in contracted diversion levels across New York counties. None of the formulations tested, including those using predicted participation rates, was able to explain satisfactorily the variation in county diversion rates. One likely reason for this result is the little variation exhibited in diversion levels across New York counties compared to the nation as a whole (see table 1). For example, 40 of the 50 counties studied had average diversion levels between 20 and 25%. In Federal Order No. 2, which covers milk produced primarily in New York, New Jersey, and eastern Pennsylvania, roughly 60% of farmers participating in the Milk Diversion Program diverted at a level of between 25 and 30% below base {*The Marketing Administrator's Bulletin,* Federal Order No. 2). Thus, most farmers who participated in the Program did so at a high level, and the resulting aggregate diversion rates were apparently not explainable through predicted participation rates nor the models used to explain farmers[1] participation in the MDP.

Implications

The empirical results from these models that attempt to explain participation in the MDP by state and by county within New York are of methodological interest, but have policy implications as well. Methodologically, the similarity of the estimated coefficients makes it difficult to choose among the three model specifications, although both the logit and probit models are preferred from a theoretical point of view when compared with the linear probability model. This robustness in the logit and probit cases supports, for an application using aggregate data, the findings from a recent household level study of participation in the Food Stamp Program, in which Capps and Kramer concluded that logit and probit estimates were "strikingly similar" (p, 20). Neither the logit nor probit results appear markedly superior here, despite different assumptions about the underlying density functions of the two models.

The results of this study offer some promise regarding the usefulness of incorporating grouped data in empirical models of farm program participation. Important insights into voluntary farm program participation may be gained without necessarily incurring the time and monetary costs of collecting farm level survey data.

From the policy perspective, the results of this study clarify some of the uncertainty surrounding the determinants of participation in the MDP across states and within one major dairy producing state, New York. Nationally, variables measuring variable production costs as a percent of dairy sales, dairy sales as a proportion of total farm sales, changes in production per farm, average farmers' age, and geographic location are shown to be important determinants of MDP participation rates and to explain jointly a high proportion of variation in participation rates across states. Although contracted diversion rates proved more difficult to explain, the evidence suggests a strong relationship between program participation rates and diversion rates nationally.

With respect to participation in the MDP within New York State, a much smaller proportion of the variation in county participation rates was explainable than with the national model. However, variables measuring the increase in 1983 milk production over base levels, average crop acreage, and average farmers' age were significant determinants of county participation rates. In addition, the coefficient on farmers' age, while important in both models, had a different sign in the state and national models, suggesting the presence of different influences on participation rates in New York than across the nation as a whole.[7] The difficulty in obtaining dairy-sector specific data at the county level in New York was no doubt at least partially responsible for the less satisfactory results obtained in the New York model compared with the national model.

The ability to explain dairy diversion program participation and diversion rates would be extremely useful in the event of a future standby diversion program. Many of the critical questions not answerable at the beginning of the 1984—85 program can now be addressed. The empirical results provide an initial indication of the relative importance of cash flow considerations, the availability of production

[7] The reasons for this differential effect are uncertain, but may be due to the different structure of agriculture in New York versus the rest of the U.S., the relative profitability of dairying in New York compared to other regions, and/or the different types of data used in the analysis.

alternatives, recent expansion in dairy production, and geographical location on the probability of participating in a dairy diversion program. This type of analysis is a useful first step in estimating program costs, in evaluating the program's potential for reducing dairy surpluses, and in identifying the regional impacts of the program on dairy production.

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