

January, 2011

Regional and Farm Level Impacts of the Foundation for the Future's Dairy Market Stabilization Program

Prepared for

International Dairy Foods Association



Dairy Group

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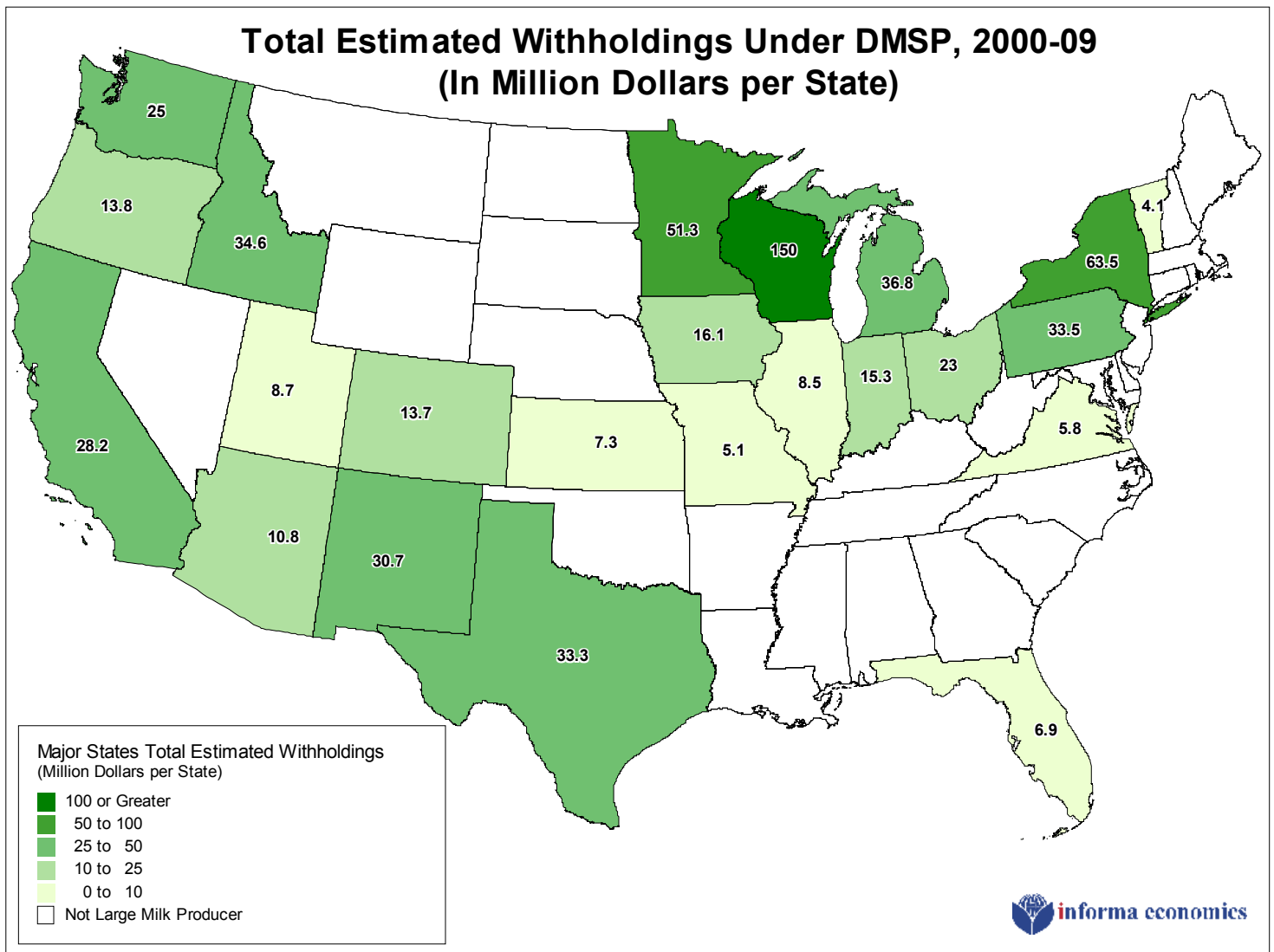
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Highlights

- If the Dairy Market Stabilization Program (DMSP) had been in place between 2000 and 2009, we estimate \$626 million in milk payments would have been withheld from dairy farmers when their margins were the lowest.
- More than half of the total withholdings would have come from five states; Wisconsin, New York, Minnesota, Pennsylvania, and Michigan. Relatively higher withholdings from traditional dairy states are due to structural differences in feed purchases compared to other regions.
- Payments could be withheld from farms of all sizes. By reducing revenue during periods of already low margins, the program will hit higher cost farms harder than lower cost farms.
- Individual milk check reductions would range between 0-8% when the program is activated. From 2000 - 2009, the program would have been activated four times for 18 out of 120 months, or 15% of the time.
- Since milk production is price inelastic, the DMSP may not have much overall impact on milk production.

Executive Summary

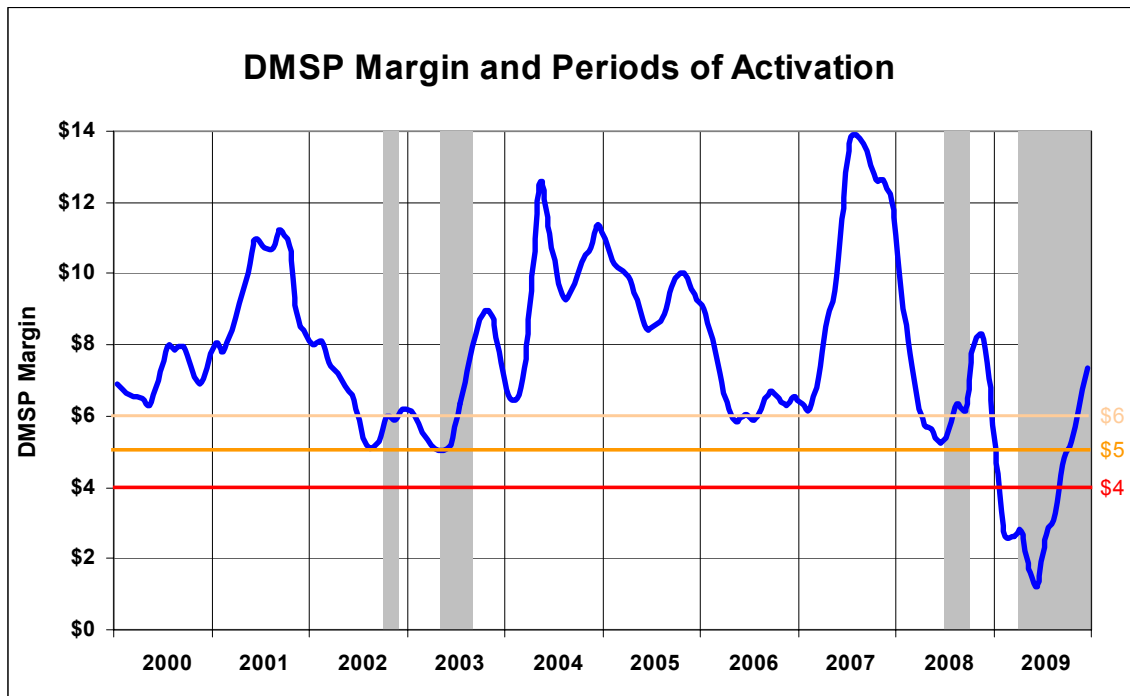
The Dairy Market Stabilization Program (DMSP) proposed by the National Milk Producers Federation would withhold payments from farmers who deliver milk in excess of their “base” level when milk prices are low relative to feed costs. The money withheld from the farmers would be used to encourage the consumption and exports of U.S. dairy products. The program was designed with the goal of reducing margin volatility. The potential withholdings from dairy farmers varies greatly by state, depending on the number, size, and growth of dairy farms and milk production. If the program had been in place from 2000 to 2009, we estimate that it would have withheld \$626 million from dairy farmers during periods when they were already under significant financial pressure. In 2009, the worst financial year on record for dairy farmers, \$390 would have been withheld, with the majority of it, \$236 million, coming from just five states; Wisconsin, New York, Minnesota, Pennsylvania, and Michigan.



During the first half of 2008, feed prices spiked higher, putting serious pressure on margins for dairy farmers who purchased most or all of their feed in states like California, Arizona, New Mexico, and Texas. Those farmers responded to the compressed margins by cutting back on production, and consequently would have had relatively little withheld under the DMSP in 2008 and 2009. Dairy farmers in the Upper Midwest and Northeast regions who primarily grow their own feed did not feel the pinch of higher feed costs as quickly, and consequently, production was expanding during 2009 in those regions. The result would have been relatively large withholdings from the traditional dairy belt. Abnormally hot weather in 2008 in the Upper Midwest, and near ideal weather in 2009 also played a roll in the strong year over year milk production growth during 2009. But given the structural differences in feed purchases between the regions, we would expect those who purchase most of their feed (Western and Southwestern regions) to react faster to changes in margins than farmers who grow most

of their feed in the UMW and Northeast. The slower reaction to changes in margins could result in relatively higher withholdings for the traditional dairy states under the DMSP.

If the program had been in place between 2000 and 2009, it would have been activated four times. As proposed, the program would be activated when a national benchmark margin, the difference between the price of milk and the cost of feed, drops below \$6.00 for two consecutive months. The potential withholdings from farmers increase if the benchmark margin falls below \$5.00, and they increase again if the margin is below \$4.00. The program would have been activated in 2002, 2003, 2008, and 2009 shown by gray shading in the chart below. By the time the program would have been activated, margins had already started to improve in all instances except 2009.



Sources: USDA, CME Group, Informa Calculations

Using data from the Census of Agriculture and the United States Department of Agriculture (USDA), we estimated the average production per farm for five size classes of dairy farms in all 50 states. The average farm size is increasing in all size categories, except the very smallest farms with 1-49 head.* With milk production growing year to year on farms of all sizes, farms of all sizes face the potential of having payments withheld under DMSP. By reducing the average price paid to farmers for their milk, the DMSP will hurt high cost and least efficient farms the most.

* The decline in average production on the smallest farms may be the result of changes in sampling and adjustment methodology used to calculate the number of farms, see Appendix A.

I. The Dairy Market Stabilization Program (DMSP)

The proposed Dairy Market Stabilization Program (DMSP) limits the amount of milk a farmer can be paid for when milk prices are low relative to feed costs. The stated goal is to “address and prevent extreme margin volatility.”¹ Each month, the USDA would use data on prices that it already collects to calculate a benchmark margin (milk price minus feed cost). When that margin falls below certain trigger levels for two consecutive months, the DMSP would go into effect. Farmers will still legally be allowed to produce as much milk as they like, but milk buyers will only legally be able to pay them for a certain percentage of their “base” production level. If a farmer produces and delivers more than his base, he simply won’t get paid for it. The milk buyer will still have to pay for the milk, but instead of sending the money to the farmer who produced the milk, the money will be sent to the Agricultural Marketing Service (AMS) branch of the United States Department of Agriculture (USDA). A new DMSP Board, consisting of representative farmers and cooperative representatives, would be formed with the task of using the withheld monies to “effectively stimulate the consumption of dairy products both domestically and internationally.”¹ Once the benchmark margin moves back above the trigger level for two consecutive months, the program would deactivate and allow full payment to the farmer for all of the milk he delivers.

Calculating the Margin

The benchmark margin is the average milk price received by farmers, minus the estimated cost of feed needed to produce the milk and feed the replacement cows and heifers on a theoretical dairy farm. The feed ration consists of four ingredients; shelled corn, corn silage, soybean meal (SBM) and alfalfa hay. While there are reliable and publicly available prices for three of the ingredients, the cost of corn silage has to be derived from the shelled corn price. The milk price used in the calculation is for all grades of milk at the farm gate, which is also publicly available and reported monthly.

Exhibit 1: Feed Cost Price Sources Table

Item	Source
Shelled Corn	CME Group Futures
Corn Silage	Derived from Corn Futures
Soybean Meal	CME Group Futures
Alfalfa Hay	Agricultural Prices Report, USDA-NASS
All Milk Price	Agricultural Prices Report, USDA-NASS

The formula used to calculate feed cost is¹:

$$\text{Feed Cost} = 1.192 \times \text{Corn Price (\$/bu.)} + 0.00817 \times \text{SBM Price (\$/ton)} + 0.0152 \times \text{Alfalfa Price (\$/ton)}$$

Data Revisions

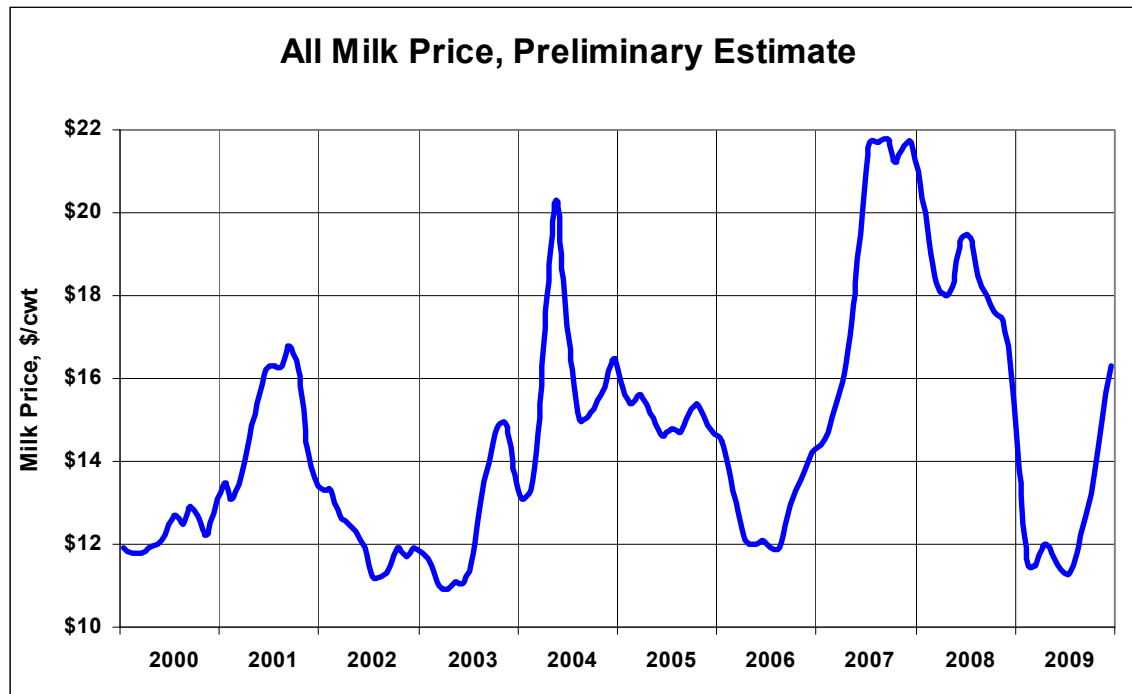
While the corn, corn silage and SBM prices are never revised, the alfalfa hay price and all milk price are from the *Agricultural Prices* report released near the end of each month by the National Agricultural Statistics Service. The milk price can potentially be revised up to four times spread across a period of two years while the alfalfa price can potentially be revised three times. For example, at the end of August 2009, the *Agricultural Prices* report estimated the all milk price for the month at \$11.80/cwt. At the end of September, the initial August estimate was revised up to \$12.00/cwt. A year later in August of 2010, the estimate for August of 2009 was revised up again to \$12.10/cwt., and the estimate made in 2009 can be revised again in August of 2011 before it will be finalized.

Using the initial, revised, or final estimates does not materially change our results. The effective difference between the data sets is the initial data would have kept the program running two months longer when triggered in 2003, and the program would not have been activated in 2006. We used the initial data for our estimates.

The DMSP was designed to “act swiftly”¹, and given the small differences in when the program would have been in effect, it doesn’t seem practical to wait an extra month for revised data before triggering the program. For that reason, we have used the initial prices reported for calculating when the program would have been in effect between 2000 and 2009.

Price and Margin History, 2000-2009

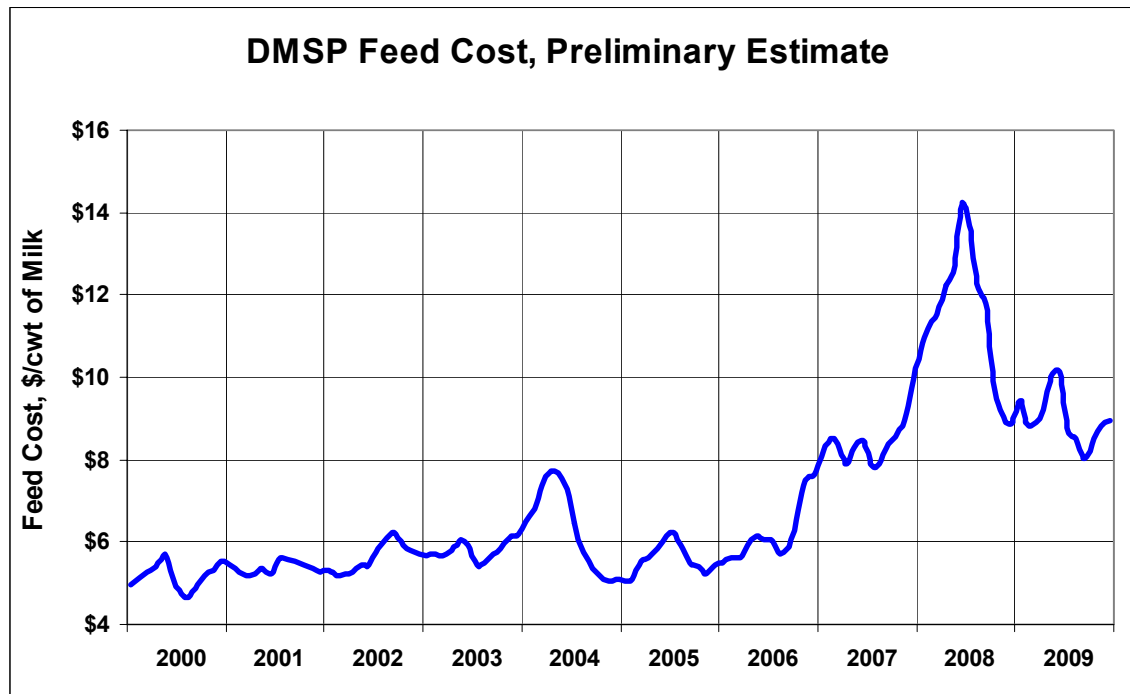
Exhibit 2: All Milk Price Graph



Source: NASS *Agricultural Prices*

The price of milk has gone through three distinct cycles between 2000 and 2009, hitting significant lows in 2002/2003, 2006, and 2009. The government price support program has helped to keep farm gate milk prices from falling below \$11.00/cwt, but prices have become more volatile and generally higher as growing world demand and production short-falls in other major exporting countries have sent US prices to new record highs during 2007 and 2008.

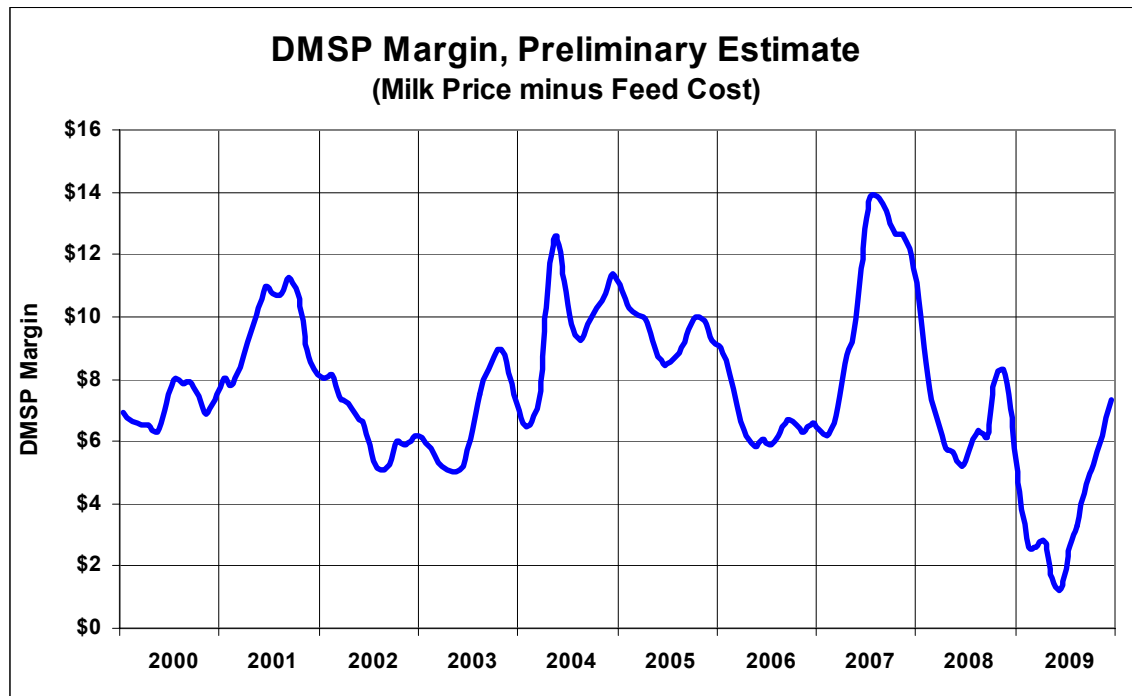
Exhibit 3: DMSP Feed Cost Graph



Source: NASS *Agricultural Prices*, CME Group

The benchmark ration cost used in the DMSP was relatively steady from 2000 through 2006 except for a blip higher in early 2004. Historically, spikes in feed costs have been driven by production shortfalls, but the persistent shift higher starting in late 2006 is being driven by increased demand, particularly from biofuels.

Exhibit 4: DMSP Margin Graph



Source: NASS *Agricultural Prices*, CME Group

The benchmark margin, milk price minus feed cost, looks similar to the milk price graph, except for the exceptionally low margin during 2009. Milk prices had fallen to government support levels in 2009, as they have in other down-cycles, but with feed costs still relatively high, the margin between the milk price and feed cost hit new historic lows.

Trigger Levels

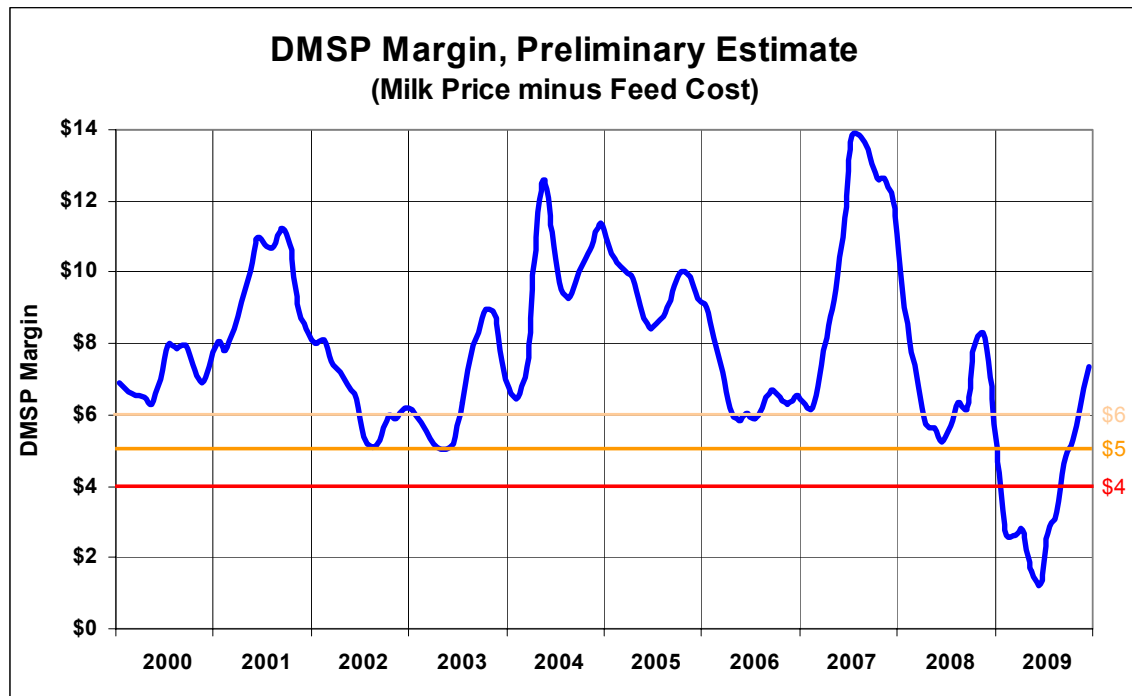
The DMSP would be activated if the margin falls below \$6.00 for two consecutive months, and it would progressively increase withholdings from farmers' milk checks if the margin falls further.

Exhibit 5: Trigger Level Withholdings Table

Trigger Level	Reduction From Base	Max. Reduction
\$6.00	2%	6%
\$5.00	3%	7%
\$4.00	4%	8%

From 2000 through 2009, the margin has been between \$5.00 and \$6.00 for 17 of the 120 months, between \$4.00 and \$5.00 for 2 months and below \$4.00 for 7 of the months.

Exhibit 6: DMSP Margin with Trigger Levels Graph



Source: NASS *Agricultural Prices*, CME Group

Exhibit 7: Month Spent Below Trigger Levels by Year Table

Months with Margins Below Trigger Levels			
	\$6-\$5	\$5-\$4	Below \$4
2000			
2001			
2002	5		
2003	5		
2004			
2005			
2006	2		
2007			
2008	4		
2009	1	2	7

Source: Informa Economics Calculations

While the margin was below the \$6 trigger level for two months in 2006, the program would not have triggered since the months were not consecutive.

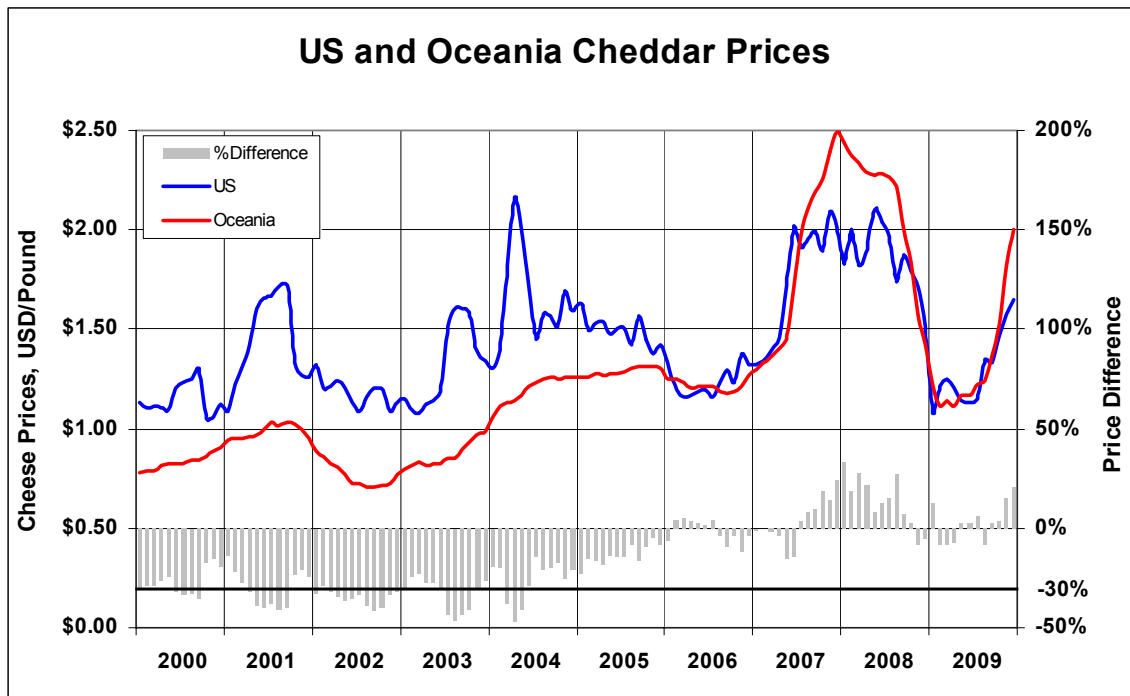
International Prices and DMSP

Historically, the U.S. has exported about 3-4% of its milk (in the form of various dairy products), but that percentage has been trending up with exports clearing about 10.5% of production in 2010. When prices on the world market fall below U.S. prices it

makes it very difficult to export, and it encourages imports into the U.S. Recognizing that U.S. prices need to track close to or below prices on the world market to keep exports moving and limit imports, if the DMSP is activated and the price of cheese or skim milk powder (SMP) is trading 20-30% below U.S. prices for two consecutive months, the program would deactivate unless margins were below \$4.00.

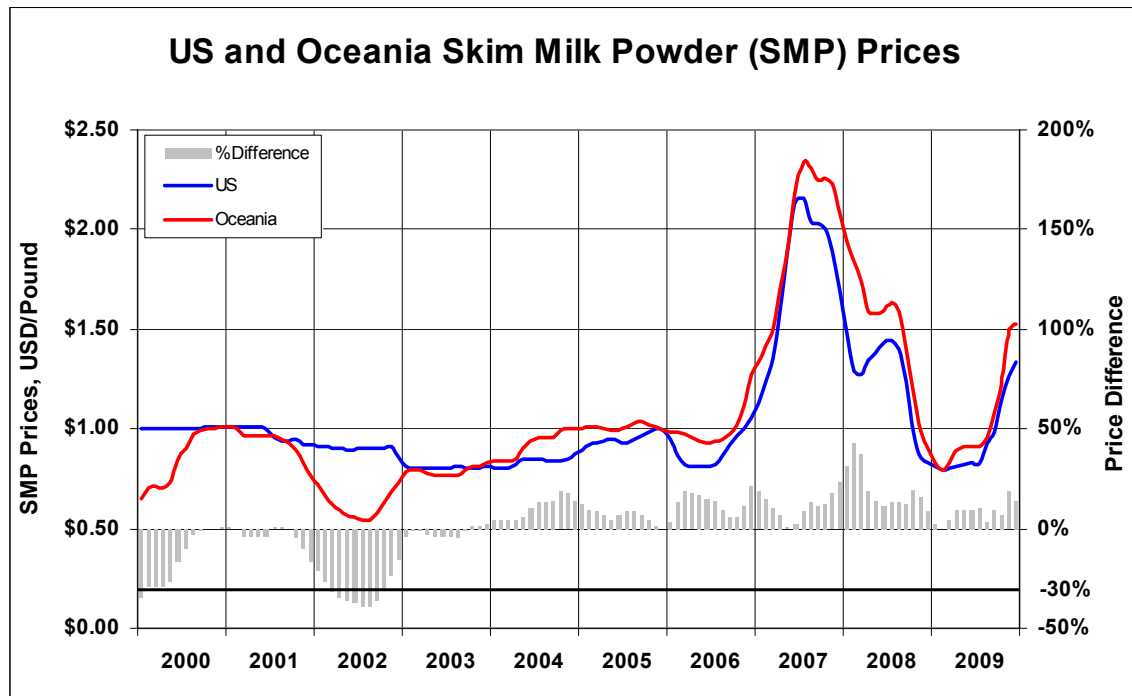
The exact price series to be used and exact difference (somewhere between 20% and 30%) are not well defined in the FFTF literature. We have used the CME block cheese price for the U.S. cheese price, and the average Oceania Cheddar cheese price reported by AMS bi-weekly, linearly interpolated to daily prices and averaged into a monthly price, for the price of cheese on the world market. We used the average of the “mostly” price for Western U.S. nonfat dry milk reported by AMS as our proxy for the U.S. SMP price, and again used the average AMS Oceania SMP price, interpolated to daily prices, and averaged into a monthly price. In our analysis, if either Oceania price series was more than 30% below US prices for two consecutive months while the program was activated, we deactivated the program. The program would have been deactivated early only once since 2000 due to international prices, and that was in 2002.

Exhibit 8: U.S. and Oceania Cheddar Cheese Price Graph



Sources: CME Group, USDA-AMS, Informa Calculations

Exhibit 9: U.S. and Oceania Skim Milk Powder Price Graph

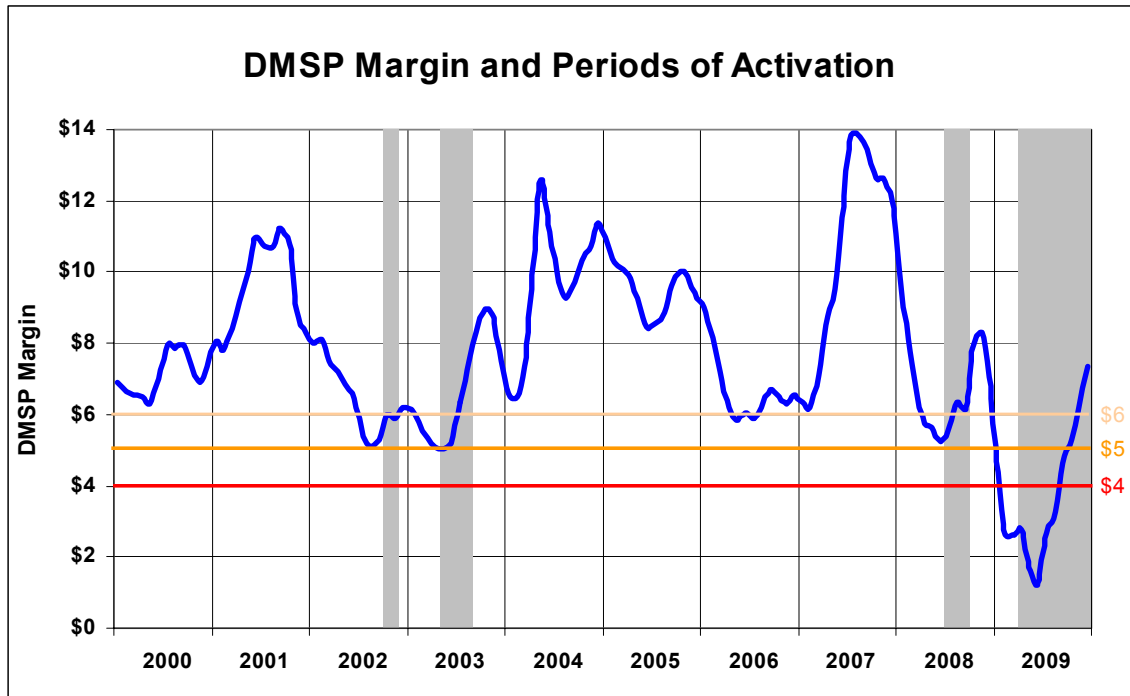


Sources: CME Group, USDA-AMS, Informa Calculations

DMSP Operational Periods, 2000-2009

The program would have been in effect for 4 periods between 2000, and 2009.

Exhibit 10: DMSP Margin and Period of Activation Graph



Sources: USDA, CME Group, Informa Calculations

Exhibit 11: Trigger, Activation, and Deactivation Dates Table

Margin Below Trigger	Program Went into Effect	Program Stopped	Months in Effect
Jul-02	Oct-02	Nov-02	2
Feb-03	May-03	Aug-03	4
Apr-08	Jul-08	Sep-08	3
Jan-09	Apr-09	Dec-09	9

Sources: NASS *Agricultural Prices*, CME Group, Informa Calculations

The process of activating the program requires the margin to be below \$6.00 for two consecutive months. An announcement would be made that the program has been triggered and would be put into effect 30 days after the announcement. Essentially, the program won't go into effect until 3 months after the margin has fallen below the trigger level. In 3 of the 4 periods when the program would have been active, margins had already bottomed out and were starting to turn around by the time the program would have been activated. After suffering through the collapse in margins, just as the market is

turning around, the program would reduce payments to farmers when they are most in need of the money.

The process of deactivating the program requires the margin to move back above \$6.00 for two consecutive months, or international prices to fall 20-30% below U.S. prices for two consecutive months.

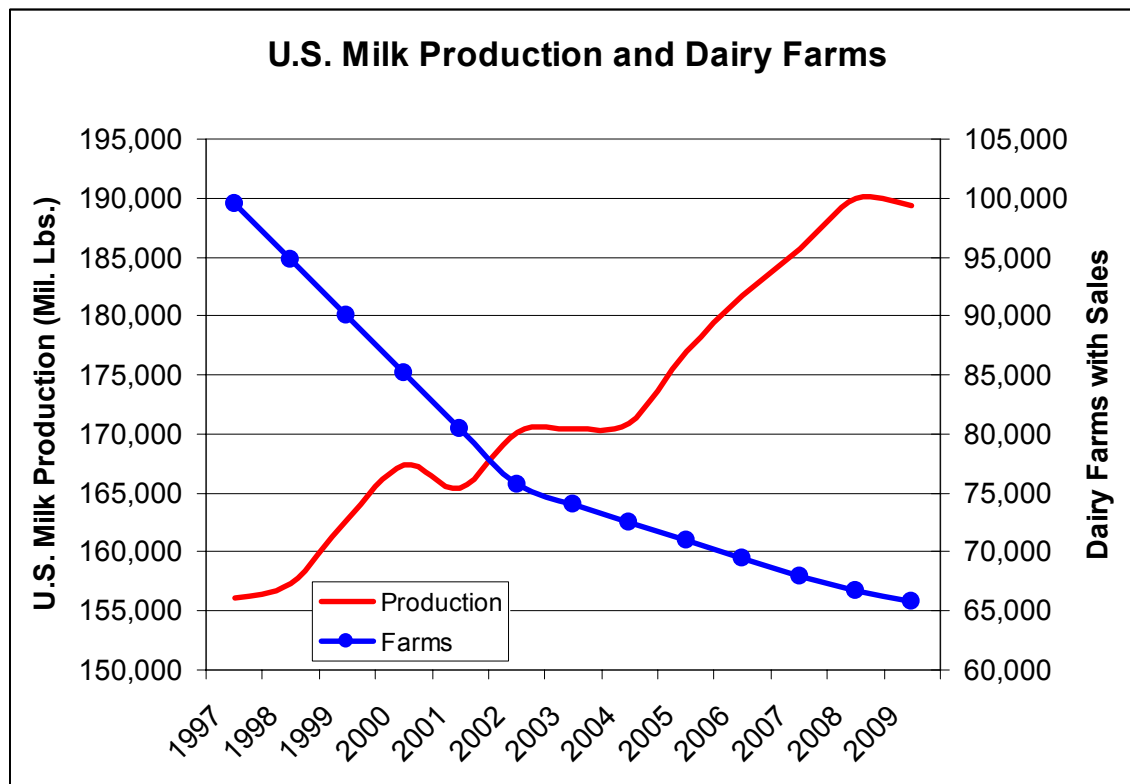
II. Estimating Historical Withholdings under DMSP

When the DMSP is in effect, farmers will only receive payment for a portion of their “base” production, with total dollar withholdings capped at a certain percentage of their total marketings, depending on how low the benchmark margin is. To estimate the amount of money that would have been withheld from farmers if the program had been in effect from 2000 to 2009, estimates of milk production per farm, base production for each farm, and milk prices received by farmers are needed.

Milk Production per Farm

Nationally, milk production has been steadily increasing while the number of dairy farms is decreasing, implying that the remaining farms are growing in size most years.

Exhibit 12: Milk Production and Dairy Farms Graph



Sources: USDA, Census of Agriculture, Informa Estimates

Intuitively, it makes sense that production on the average farm would be growing. Constantly improving cow genetics, improvements in ration balancing, cow comfort, and other advancements in technology increase the amount of milk the average cow produces each year. From 2000 to 2009, average production per cow grew 1.5% each year. Even without increasing the number of cows on the farm, production would still be growing by about 1.5% each year on an average farm.

Data on production for each individual farm in the country is not available, and simply dividing total U.S. milk production by the number of farms will overstate farm level production growth.* To estimate the average production per farm, we calculated the number of farms in five different size classes in each state, and average production for farms in the different size classes each month. For a detailed explanation of calculations see Appendix A for the number of farms, and Appendix B for the share of production. This methodology accounts for the varying growth rates between the different size classes and regions.

* Image that there are only 2 farms, one large (90 cows, 1.8 mil. lbs. production), and one small (10 cows, 0.2 mil. lbs.). The average farm size would be 2 mil. lbs./2 = 1 million pounds per farm. If the small farmer retires and sells his cows for slaughter and the large farm holds production steady, then average size would increase to 1.8 million pounds, an 80% increase in average size despite the big farm holding production steady. Since it has mostly been small farms that have exited the U.S. industry, dividing total U.S. milk

production by the number of farms without accounting for their size would bias average farm size growth upward.

We used five size categories, broken down by the number of dairy cows on the farm as of December 31st.

Exhibit 13: Farms, Share of Production, Avg. Production by Size Table

Dairy Farms by Farm Size (Head)						
	1-49	50-99	100-199	200-499	500+	Total
2000	37,982	28,385	11,544	4,678	2,644	85,233
2009	32,686	17,004	8,381	4,235	3,457	65,763
Change	-5,296	-11,381	-3,163	-443	813	-19,470
	-14%	-40%	-27%	-9%	31%	-23%

Share of U.S. Milk Production by Farm Size (Head)						
	1-49	50-99	100-199	200-499	500+	Total
2000	9.5%	19.8%	16.2%	16.0%	38.6%	100%
2009	4.9%	10.8%	11.1%	14.0%	59.3%	100%

Average Milk Production per Farm (Mil. Lbs.) by Farm Size (Head)						
	1-49	50-99	100-199	200-499	500+	Total
2000	0.42	1.17	2.3	5.7	24	N/A
2009	0.28	1.20	2.5	6.3	32	N/A
Change	-0.14	0.03	0.2	0.6	8	
	-33%	2%	6%	10%	33%	

Sources: Census of Agriculture, Informa Estimates

The shares of production by farm size were multiplied by the reported level of milk production in each state each month to estimate production by the different farm sizes each month. The USDA has published consistent monthly estimates of milk production for 23 states back to 2003, which account for about 90% of all the milk produced in the U.S. This study focuses on these 23 states, but monthly estimates for all states were calculated and are included in Appendix E. The states with official monthly estimates are displayed in the table below.

Exhibit 14: States with Monthly Reported Milk Production

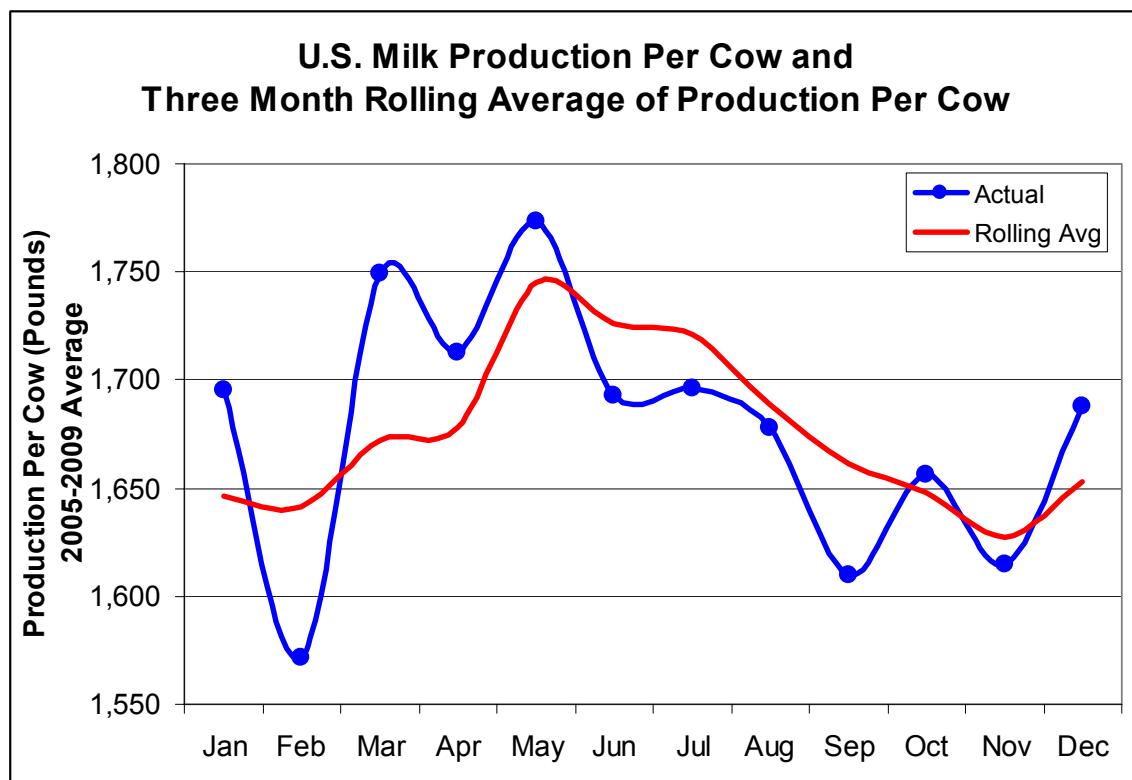
States with Monthly Milk Production Estimates by USDA (2003-2009)					
Arizona	California	Colorado	Florida	Idaho	Illinois
Indiana	Iowa	Kansas	Michigan	Minnesota	Missouri
New Mexico	New York	Ohio	Oregon	Pennsylvania	Texas
Utah	Vermont	Virginia	Washington	Wisconsin	

Base Production

The withholdings under DMSP are calculated relative to the level of base production for each farm. Base can be calculated in two different ways, and the farmer would be able to choose which way he wants his base calculated annually. The first way would set base equal to a three month average of production for the three months prior to the USDA announcing the program is being activated. The second option allows farmers to use the level of production from the same month in the previous year. Whether a farmer chooses the 3 month average or the production level from the previous year will depend on the seasonality in his production, recent production growth, expectations about if or when the DMSP might be activated, and his risk tolerance.

There is a strong seasonal pattern to milk production, which bottoms out in November then trends higher through May before trending back down through November. If a farmer chooses to use the three month average option for calculating his base, and the program is activated early in the year (when his average is being calculated on low producing months), there is a very good chance that his production will exceed his base, even if he hasn't expanded his herd. On the other hand, if the program is activated mid-year, his base will be the average of his highest producing months, and his production will be below base, giving no incentive to cut back on production.

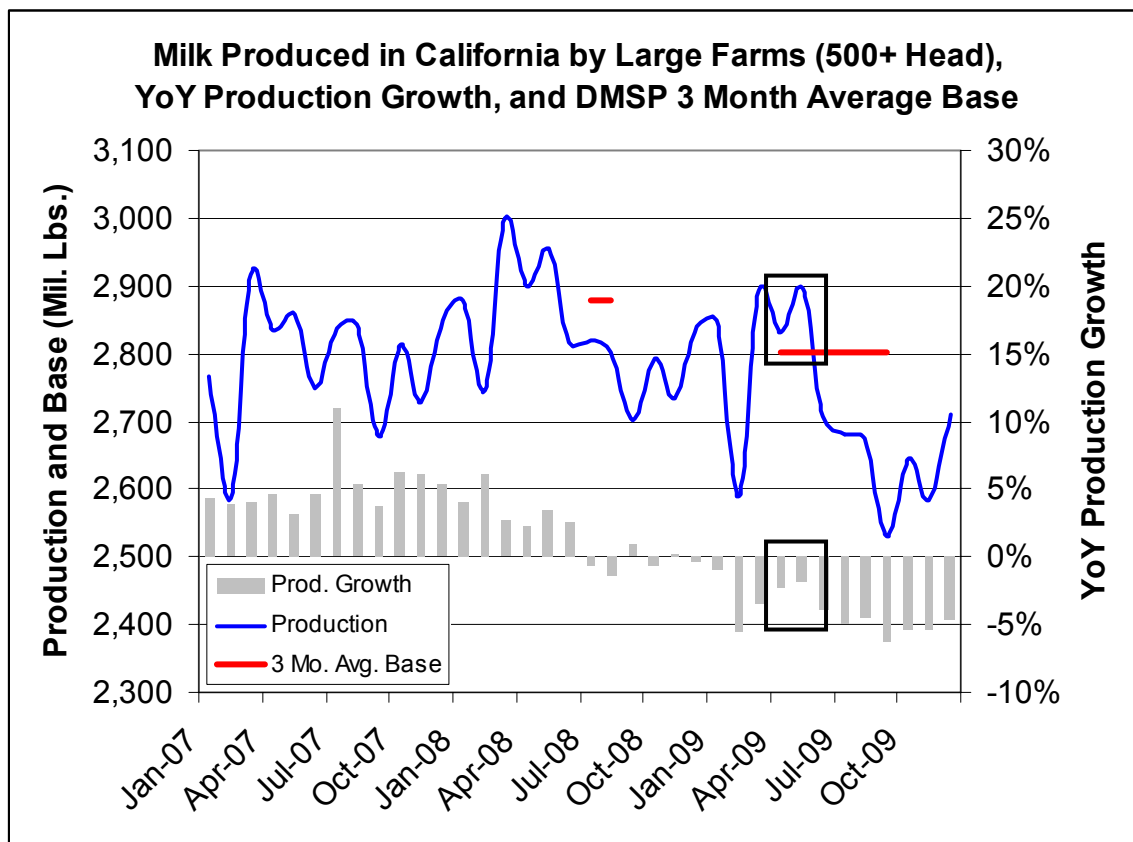
Exhibit 15: U.S. Milk Production per Cow Graph



Sources: USDA, Informa Calculations

A good example of this can be seen in the data for large California dairy farms in 2008 and 2009. The DMSP would have been activated in July of 2008, so any farmer that had elected to have his base calculated by the three month average method would have had base set based on his highest seasonal production. As summer heat reduced production per cow, his production would have fallen below his base without him taking any steps to reduce production. However, when the program triggered in January of 2009, large California farms would have had money withheld from their milk checks if they had elected to use the 3 month average even though farmers were already reducing herd sizes and adjusting rations to limit milk production at the time. Their base would have been calculated on some of their lowest production months, and despite the fact that production was down 2-4% from year ago levels, they still would have had money withheld.

Exhibit 16: California Large Farm Milk Production Base Example Graph



Sources: USDA, Informa Calculations

The other choice, setting base equal to production in the previous year each month, reduces uncertainty regarding what an individual farmers base level is going to be, but with production per cow growing about 1.5% per year, choosing that option would almost always result in money being withheld when the program is activated.

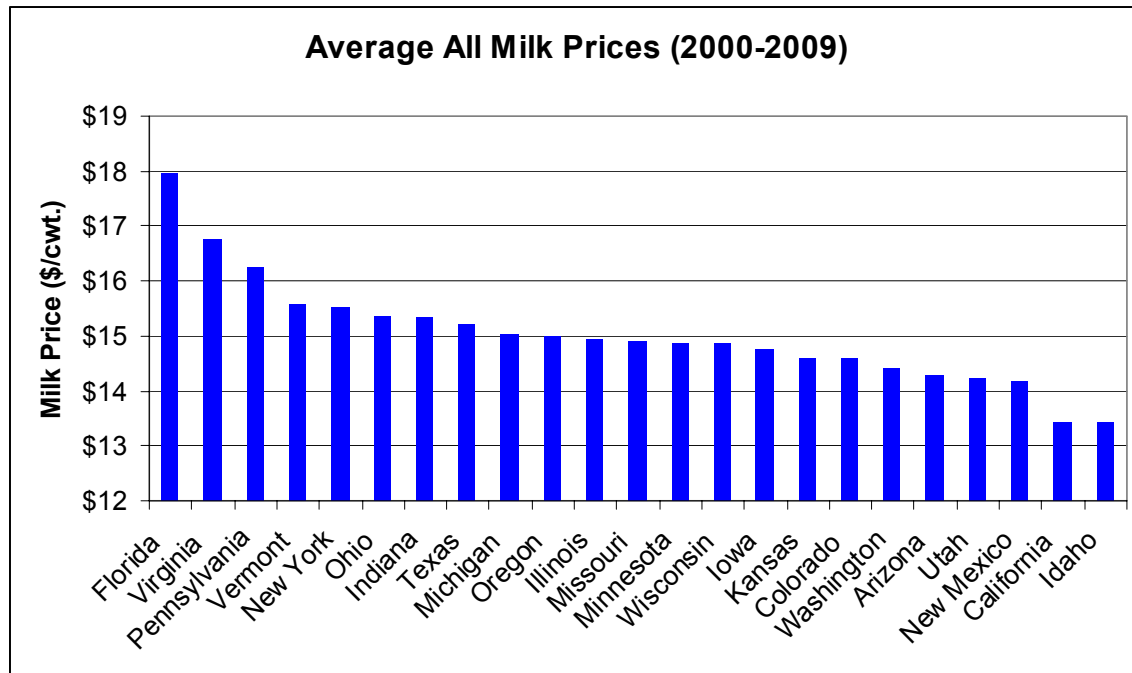
The choice between the three month average or seasonal base calculation becomes a risk-reward tradeoff. If the farmer chooses the three month average, depending on when/if the program is activated in the coming year, he may not have anything withheld from his milk check even if he has expanded production, or he may have money withheld even if he has cut production. It just depends on what time of the year the program is activated. If he chooses the seasonal base calculation method (base equal to production in the corresponding month during the previous year), he is almost certainly going to have money withheld, but he knows with a greater level of certainty how much will be withheld based on how his milk production is running compared to the previous year.

Our calculated withholdings assume that farmers would choose their base calculation method each year, with the choice taking effect in January. We assume they have perfect foresight with regard to production levels and timing of program activation, and they chose the calculation method that would result in the highest base level each year.

Milk Prices

The third component needed to calculate withholdings is the price that farmers would have received for their milk. The national benchmark margin uses the U.S. all milk price, which is a weighted average of the state level all milk prices. State level prices vary considerably depending on the type of dairy products produced in the state. The USDA typically publishes all milk prices each month for the 23 states that they track monthly milk production in, but they also publish annual milk prices for the other states as well. There are a few instances where monthly milk prices were not published for a particular state while monthly milk production was published. In those instances, monthly milk price estimates were derived from the published annual estimate (see Appendix C). Since withholdings under DMSP are calculated as a percentage of milk payments, farmers in states with higher milk prices will have higher total withholdings than farmers in states with lower milk prices, assuming the same base levels and production growth.

Exhibit 17: Average Milk Prices by State Graph



Sources: USDA, Informa Calculations

Estimated Withholdings, 2000-2009

If it had been in place, the DMSP likely would have been activated four times between 2000 and 2009. Using our estimates of average milk production per farm and milk prices in each state, we were able to estimate how much money would have been withheld from farmers in each state if the program had been in place. We assume that farmers have perfect foresight and chose the base production calculation method (three month average or seasonal) that maximized their base while the program is in effect. If the program had been in place, some would argue that the periods of low margins would not have lasted as long as they did. To account for this possibility, we reduced the period the program would be active by 30%, rounded to the nearest whole number. For example, based on the actual margins, the program would have been active from April through December, or 9 months during 2009. Reducing that by 30%, we only estimated the withholdings from April to September, 6 months. The estimates presented below are for the 23 major milk producing states, estimates for the other 27 states are included in Appendix E.

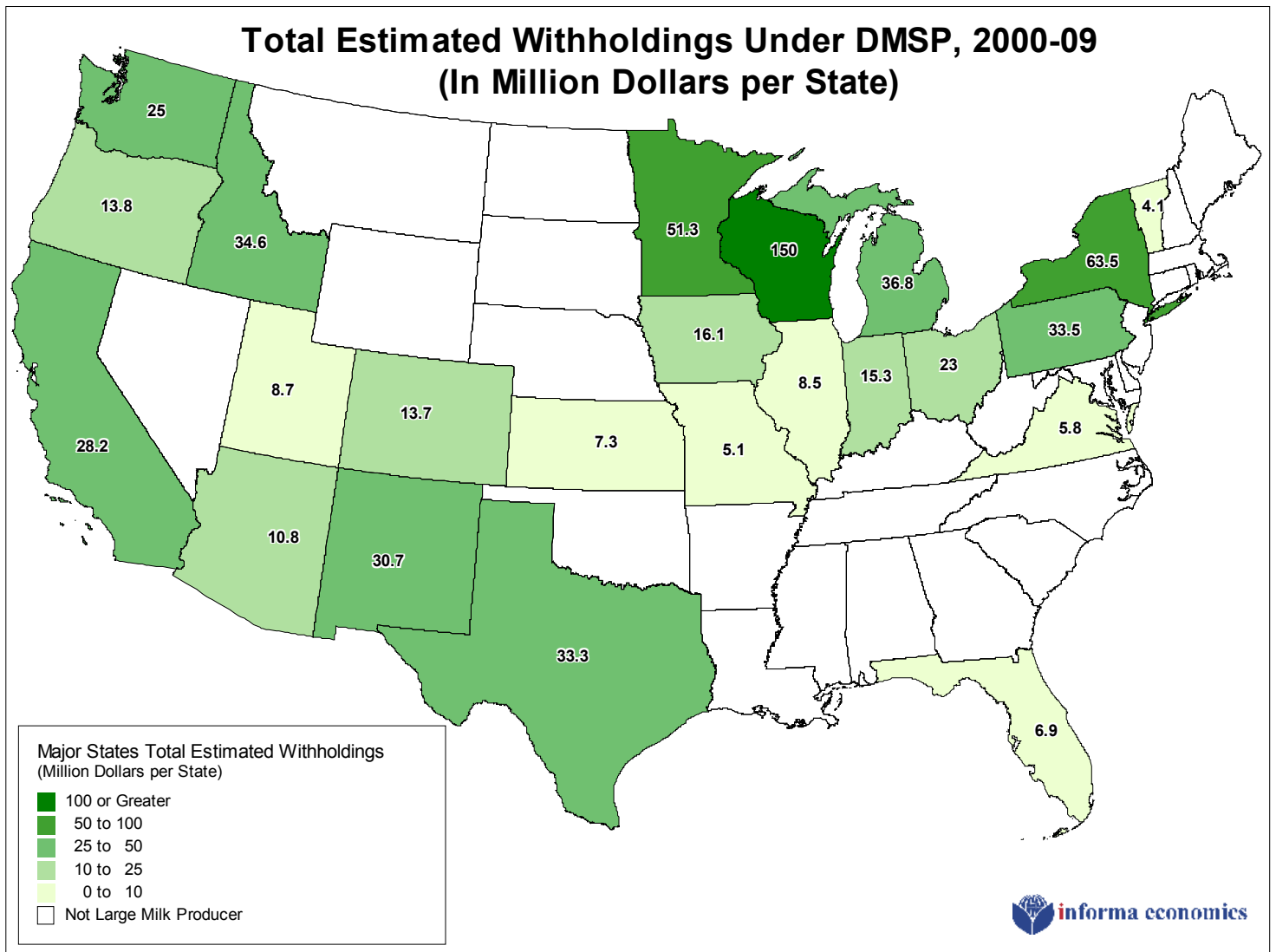
Total Withholdings

Exhibit 18: Estimated Total Withholdings Under DMSP, 2000-2009 Table

Estimated Total Withholdings from Farmers Under DMSP, 2000-2009					
	2002	2003	2008	2009	Total
Wisconsin	\$3,527,148	\$28,241,963	\$13,764,635	\$104,477,588	\$150,011,333
New York	\$0	\$2,366,116	\$18,993,512	\$42,112,626	\$63,472,254
Minnesota	\$2,397,149	\$5,436,102	\$7,916,932	\$35,529,228	\$51,279,411
Michigan	\$1,786,602	\$8,095,396	\$3,427,537	\$23,489,693	\$36,799,228
Idaho	\$207,031	\$12,665,837	\$20,933,901	\$748,270	\$34,555,038
Pennsylvania	\$548,021	\$106,234	\$2,644,311	\$30,246,914	\$33,545,480
Texas	\$3,498,511	\$5,605,027	\$3,049,181	\$21,131,140	\$33,283,859
New Mexico	\$0	\$9,395,681	\$7,034,156	\$14,272,118	\$30,701,955
California	\$169,522	\$14,570,197	\$0	\$13,446,075	\$28,185,794
Washington	\$0	\$3,330,661	\$10,295,863	\$11,371,212	\$24,997,736
Ohio	\$0	\$3,909,657	\$3,875,963	\$15,208,665	\$22,994,285
Iowa	\$759,983	\$2,831,025	\$958,680	\$11,588,463	\$16,138,152
Indiana	\$1,597,433	\$3,023,342	\$0	\$10,655,025	\$15,275,800
Oregon	N/A	\$2,418,590	\$2,784,558	\$8,599,666	\$13,802,814
Colorado	N/A	\$250,694	\$5,384,736	\$7,919,036	\$13,670,115
Arizona	\$78,241	\$3,979,948	\$0	\$6,709,637	\$10,767,826
Utah	\$176,888	\$783,494	\$2,372,762	\$5,411,625	\$8,744,769
Illinois	\$549,339	\$1,266,166	\$45,991	\$6,631,169	\$8,492,665
Kansas	N/A	\$970,573	\$2,595,580	\$2,751,824	\$7,254,159
Florida	\$0	\$0	\$0	\$6,887,345	\$6,887,345
Virginia	\$5,802	\$0	\$0	\$5,791,928	\$5,797,731
Missouri	\$242,075	\$1,369,815	\$0	\$3,523,896	\$5,135,786
Vermont	\$24,942	\$231,672	\$2,592,863	\$1,212,945	\$4,062,422
Total	\$15,568,686	\$110,848,190	\$108,671,162	\$389,716,089	\$625,855,957

Sources: USDA, Census of Agriculture, Informa Estimates and Calculations

Exhibit 19: Estimated Total Withholdings Under DMSP, 2000-2009 Map



Sources: USDA, Census of Agriculture, Informa Estimates and Calculations

States are listed by total withholdings, with the largest at the top. Over the 10 year period, an estimated total of \$626 million dollars would have been withheld from farmers in the 23 main dairy producing states. Most of the money was withheld during 2009, when the program was active for six months, compared to just two months in 2008, and three months in 2002 and 2003. The states that took the largest hit were the traditional dairy states, primarily in the Upper Midwest and Northeast U.S. Dairy farms in Western and Southwestern regions felt the run-up in feed prices more acutely than UMW and Northeast farmers did in mid-2008. The result was a significant slowdown in milk

production in the major Western and Southwestern states like California, Idaho, and Texas. That slowdown kept milk production growth in those states constrained during 2009, and limited their estimated withholdings.

Per Farm Withholdings

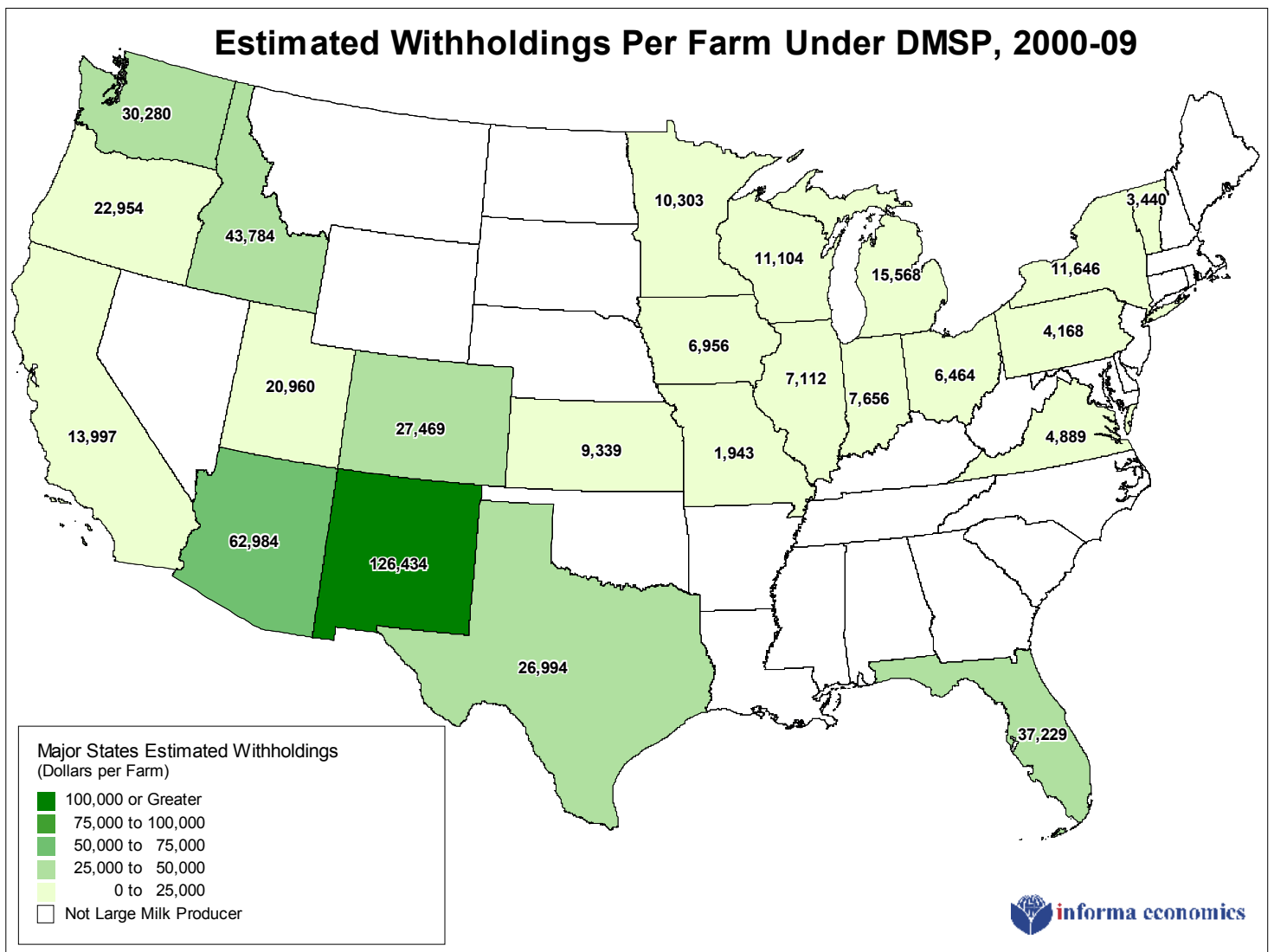
Exhibit 20: Per Farm Withholdings Under DMSP, 2000-2009 Table

Estimated Per Farm Withholdings from Dairy Farmers Under DMSP, 2000-2009					
	2002	2003	2008	2009	Total
New Mexico	\$0	\$48,431	\$26,848	\$51,155	\$126,434
Arizona	\$652	\$30,381	\$0	\$31,951	\$62,984
Idaho	\$281	\$16,888	\$25,717	\$898	\$43,784
Florida	\$0	\$0	\$0	\$37,229	\$37,229
Washington	\$0	\$4,072	\$12,541	\$13,667	\$30,280
Texas	\$3,096	\$4,887	\$2,451	\$16,560	\$26,994
Colorado	N/A	\$895	\$11,034	\$15,055	\$26,985
Oregon	N/A	\$4,866	\$4,587	\$13,500	\$22,954
Utah	\$425	\$1,888	\$5,731	\$12,916	\$20,960
Michigan	\$669	\$3,100	\$1,478	\$10,321	\$15,568
California	\$74	\$6,599	\$0	\$7,324	\$13,997
New York	\$0	\$369	\$3,445	\$7,832	\$11,646
Wisconsin	\$214	\$1,771	\$1,027	\$8,092	\$11,104
Minnesota	\$394	\$923	\$1,593	\$7,393	\$10,303
Kansas		\$1,363	\$3,261	\$3,372	\$7,996
Indiana	\$712	\$1,377	\$0	\$5,567	\$7,656
Illinois	\$389	\$923	\$39	\$5,761	\$7,112
Iowa	\$277	\$1,062	\$418	\$5,199	\$6,956
Ohio	\$0	\$964	\$1,092	\$4,407	\$6,464
Virginia	\$5	\$0	\$0	\$4,884	\$4,889
Pennsylvania	\$61	\$12	\$324	\$3,771	\$4,168
Vermont	\$18	\$173	\$2,199	\$1,050	\$3,440
Missouri	\$84	\$484	\$0	\$1,375	\$1,943

Sources: USDA, Census of Agriculture, Informa Estimates and Calculations

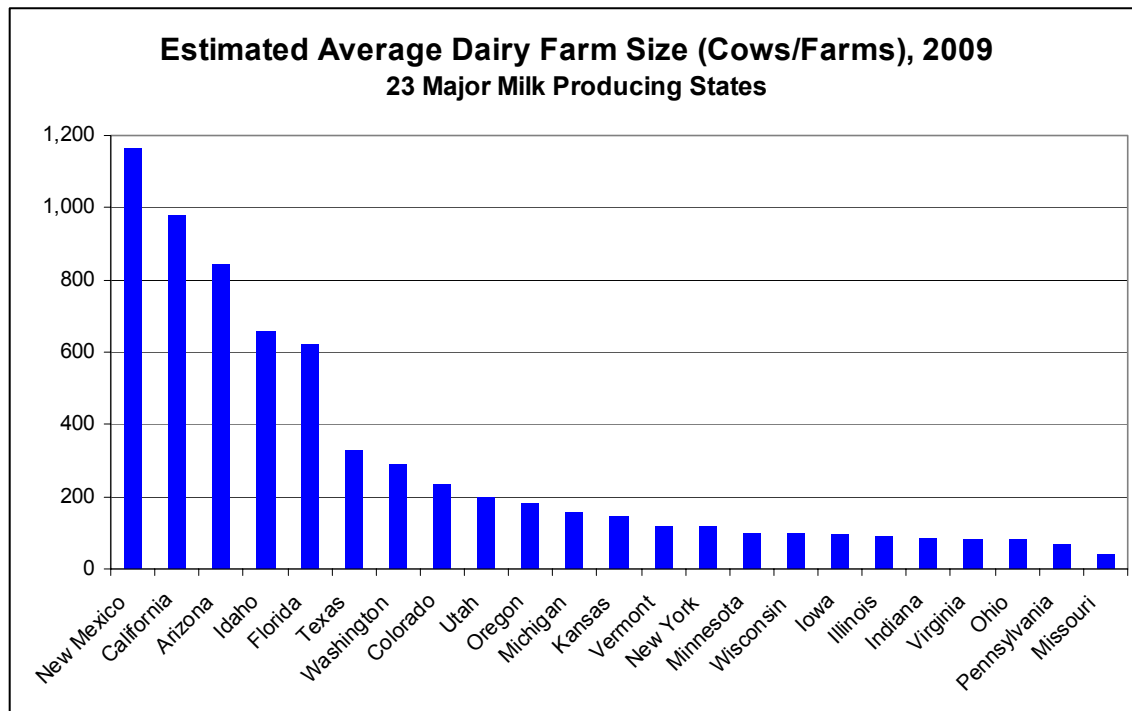
Per farm withholdings were calculated as total withholdings divided by the number of dairy farms in the state. On a per farm basis, withholdings were largest in New Mexico, followed by Arizona and Idaho. These states have relatively large farms, and have generally seen strong year to year growth in milk production.

Exhibit 21: Per Farm Withholdings Under DMSP, 2000-2009 Map



Sources: USDA, Census of Agriculture, Informa Estimates and Calculations

Exhibit 22: Average Dairy Size by State, 2009 Graph



Sources: USDA, Census of Agriculture, Informa Estimates and Calculations

Withholdings as a Percent of Marketings

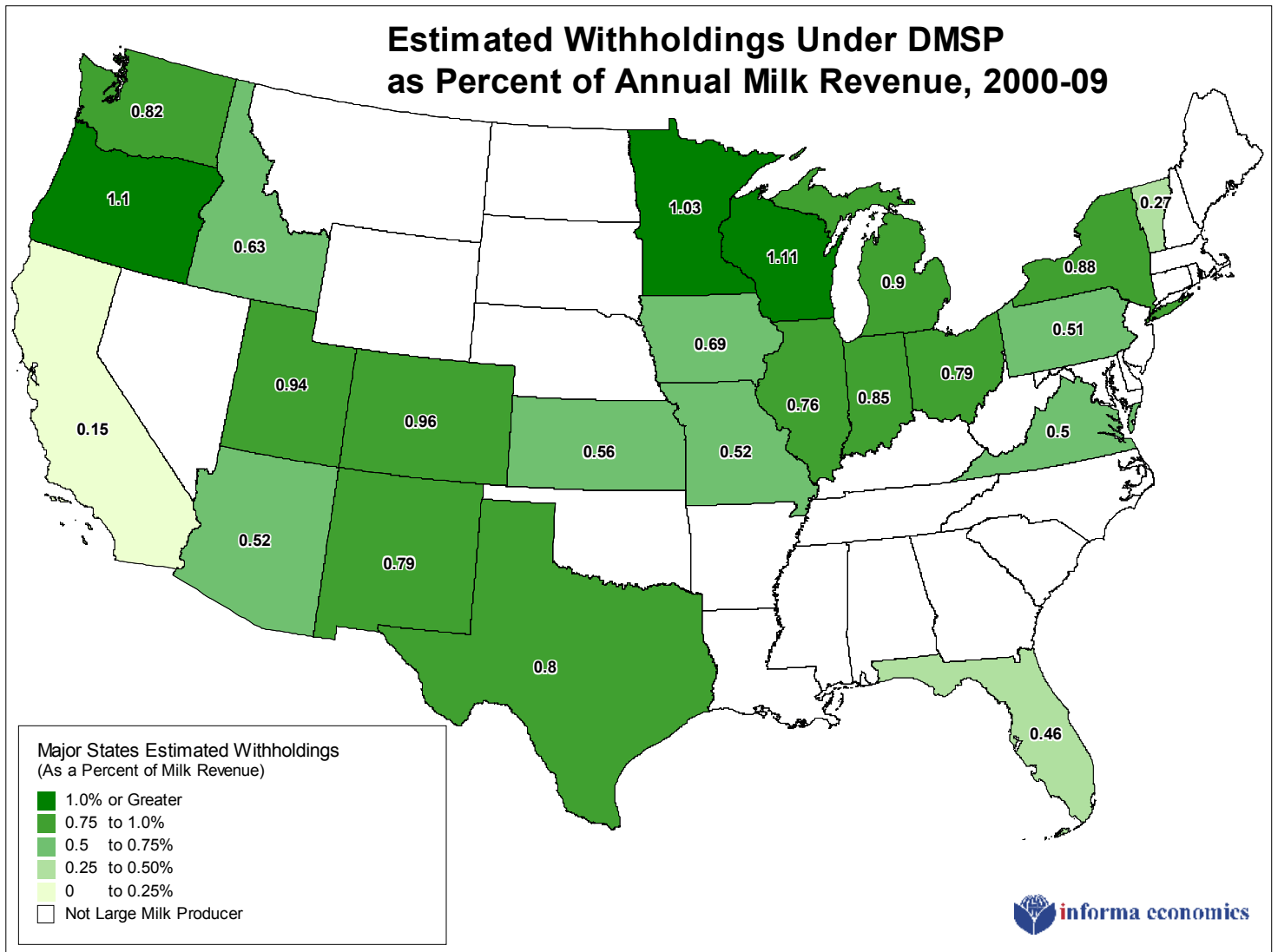
Exhibit 23: Withholdings as Percent of Annual Marketings, 2000-2009 Table

Estimated Withholdings as a Percent of Annual Marketings Under DMSP, 2000-09					
	2002	2003	2008	2009	Total
Wisconsin	0.1%	1.0%	0.3%	3.2%	1.1%
Oregon	N/A	0.9%	0.7%	2.8%	1.1%
Minnesota	0.2%	0.5%	0.5%	2.9%	1.0%
Colorado	N/A	0.1%	1.0%	2.2%	1.0%
Utah	0.1%	0.4%	0.7%	2.5%	0.9%
Michigan	0.2%	1.0%	0.2%	2.2%	0.9%
New York	0.0%	0.2%	0.8%	2.5%	0.9%
Indiana	0.5%	0.8%	0.0%	2.4%	0.8%
Washington	0.0%	0.5%	1.0%	1.7%	0.8%
Texas	0.5%	0.8%	0.2%	1.8%	0.8%
Ohio	0.0%	0.7%	0.4%	2.1%	0.8%
New Mexico	0.0%	1.2%	0.5%	1.5%	0.8%
Illinois	0.2%	0.5%	0.0%	2.6%	0.8%
Iowa	0.2%	0.6%	0.1%	2.0%	0.7%
Idaho	0.02%	1.3%	1.0%	0.1%	0.6%
Kansas	N/A	0.4%	0.6%	0.8%	0.6%
Missouri	0.1%	0.6%	0.0%	1.7%	0.5%
Arizona	0.02%	0.9%	0.0%	1.4%	0.5%
Pennsylvania	0.04%	0.01%	0.1%	2.0%	0.5%
Virginia	0.0%	0.0%	0.0%	2.2%	0.5%
Florida	0.0%	0.0%	0.0%	2.0%	0.5%
Vermont	0.0%	0.1%	0.5%	0.4%	0.3%
California	0.0%	0.4%	0.0%	0.3%	0.1%

Sources: USDA, Census of Agriculture, Informa Estimates and Calculations

Withholdings as a percent of marketings were calculated as total withholdings divided by total milk revenue (milk production multiplied by milk price) each year. Wisconsin, Oregon, and Minnesota would have had the largest withholdings as a percentage of milk marketings if the DMSP had been in place from 2000 to 2009. Withholdings in Eastern states as a percentage of total marketings appears to be lower than other regions on average.

Exhibit 24: Withholdings as Percent of Annual Marketings, 2000-2009 Map



Sources: USDA, Census of Agriculture, Informa Estimates and Calculations

Withholdings per Hundredweight of Milk

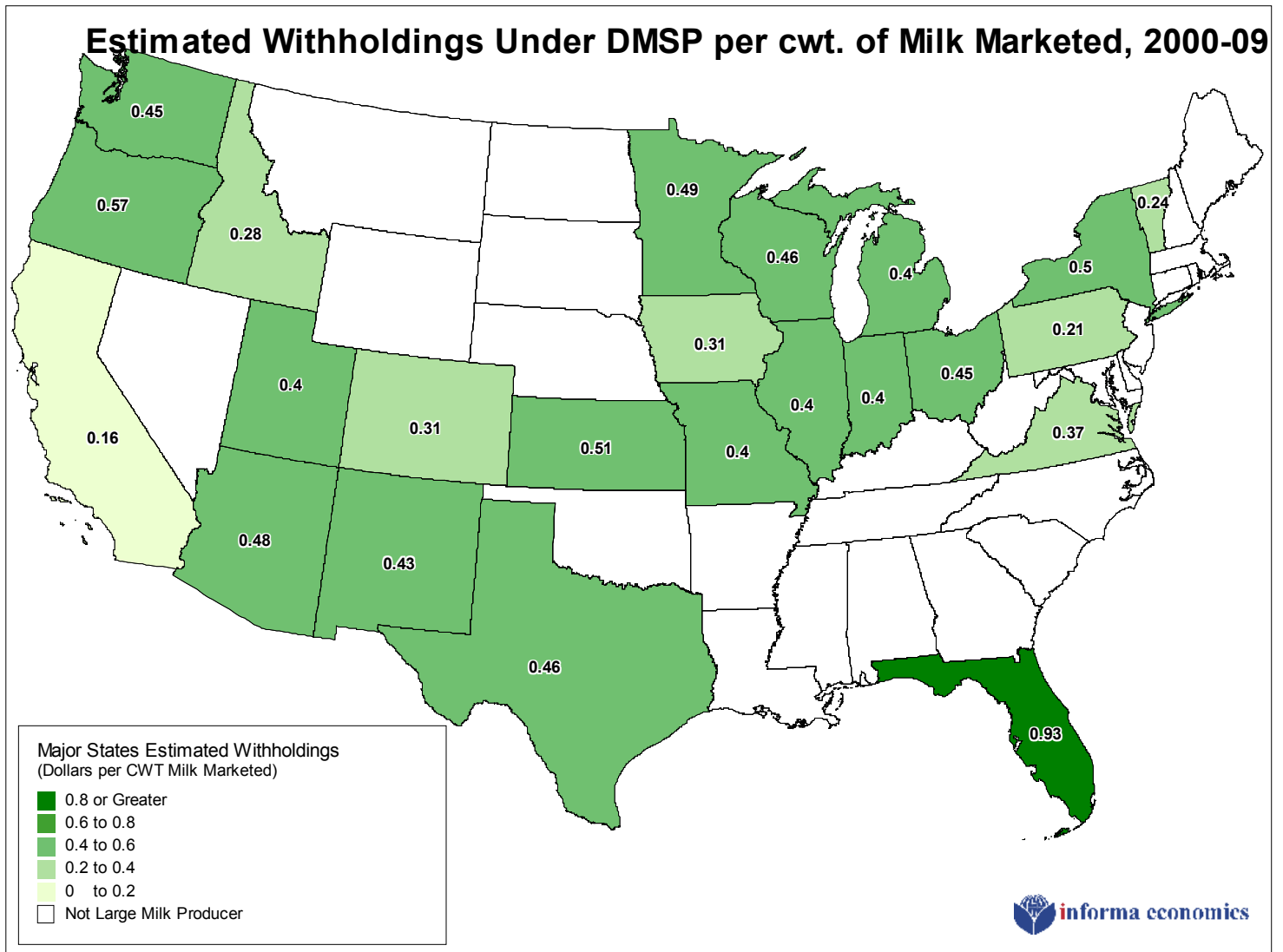
Exhibit 25: Withholdings per Hundredweight Under DMSP, 2000-2009 Table

Estimated Withholdings per Cwt. of Milk from Dairy Farmers Under DMSP, 2000-09					
	2002	2003	2008	2009	Average
Florida				\$0.93	\$0.93
Oregon	N/A	\$0.37	\$0.72	\$0.61	\$0.57
Kansas	N/A	\$0.63	\$0.55	\$0.51	\$0.56
New York		\$0.09	\$0.80	\$0.59	\$0.50
Minnesota	\$0.33	\$0.35	\$0.50	\$0.76	\$0.49
Arizona	\$0.20	\$0.42		\$0.82	\$0.48
Wisconsin	\$0.20	\$0.51	\$0.36	\$0.78	\$0.46
Texas	\$0.76	\$0.31	\$0.23	\$0.53	\$0.46
Ohio		\$0.36	\$0.43	\$0.56	\$0.45
Washington		\$0.14	\$0.94	\$0.27	\$0.45
New Mexico		\$0.46	\$0.52	\$0.32	\$0.43
Michigan	\$0.33	\$0.47	\$0.32	\$0.49	\$0.40
Missouri	\$0.16	\$0.42		\$0.63	\$0.40
Illinois	\$0.31	\$0.35	\$0.20	\$0.74	\$0.40
Indiana	\$0.26	\$0.37		\$0.55	\$0.40
Utah	\$0.15	\$0.17	\$0.78	\$0.48	\$0.40
Colorado	N/A	\$0.09	\$0.76	\$0.32	\$0.39
Virginia	\$0.08			\$0.66	\$0.37
Iowa	\$0.24	\$0.30	\$0.20	\$0.51	\$0.31
Idaho	\$0.04	\$0.43	\$0.62	\$0.04	\$0.28
Vermont	\$0.14	\$0.06	\$0.62	\$0.12	\$0.24
Pennsylvania	\$0.07	\$0.03	\$0.18	\$0.57	\$0.21
California	\$0.21	\$0.21		\$0.07	\$0.16

Sources: USDA, Census of Agriculture, Informa Estimates and Calculations

Withholdings per hundredweight of milk marketed was estimated as total withholdings divided by milk produced each month the program was active. It is approximately the reduction in average milk price the average dairy farm would have seen during the months the program was active. Since withholdings under DMSP are calculated as a percentage of marketings, states with higher average milk prices will end up having more withheld in dollar terms, all other things considered. Florida is near the bottom of the list for total withholdings, but because of the relatively high milk price, farmers would see a relatively large deduction. With a relatively low milk price, California is at the bottom of the list when calculating withholdings on a per hundredweight basis.

Exhibit 26: Withholdings per Hundredweight Under DMSP, 2000-2009 Map



Sources: USDA, Census of Agriculture, Informa Estimates and Calculations

III. Milk Supply Price Elasticity

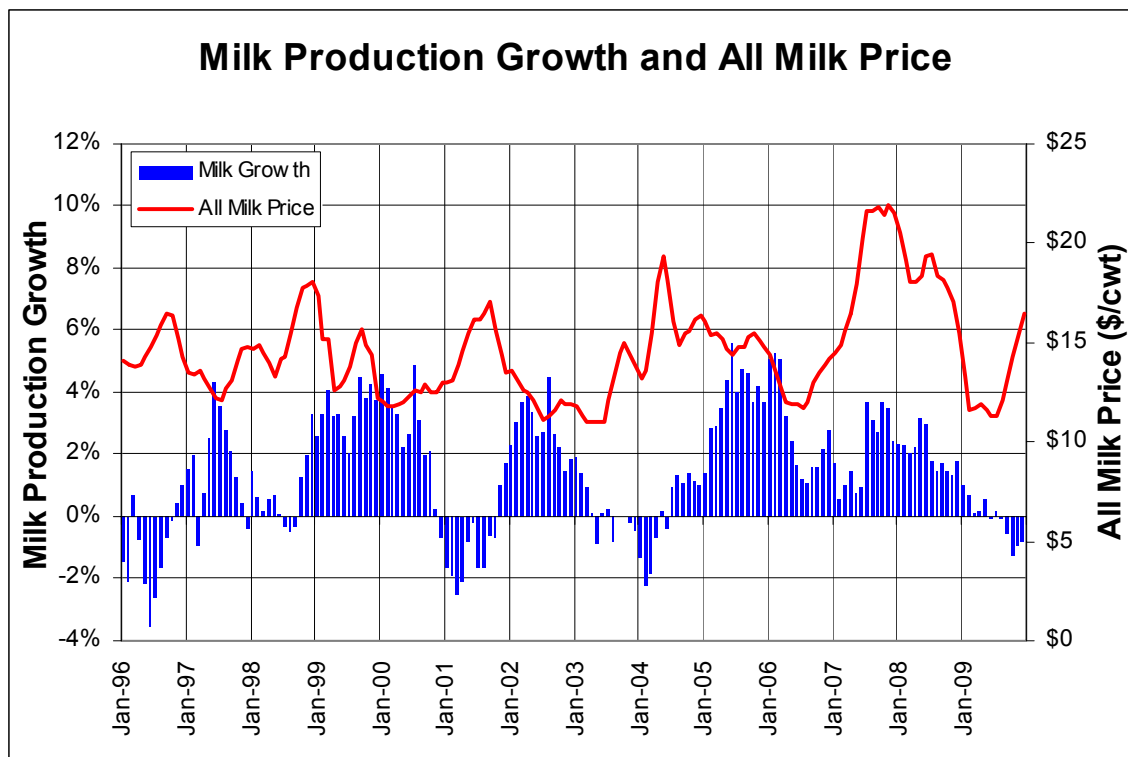
Price elasticity of supply measures the responsiveness of quantity supplied to changes in price. Economic theory says that if the price of a good increases, more of it will be produced or offered to the market. We can see this effect in the dairy markets. As milk prices (and/or margins) improve, more milk is produced, when milk prices (and/or margins) fall, less milk is produced. Price elasticity, mathematically, is the percentage change in quantity supplied divided by the percentage change in price. For example, if

the price of a good increased by 10% and the supply increased by 5%, the price elasticity of supply would be $5\% / 10\% = 0.5$. In this instance, supply would be “inelastic”, because the change in price and change in quantity were less than 1-for-1. A 10% increase in price only resulted in a 5% increase in production.

The price elasticity of milk production is also inelastic, it takes very large changes in prices to affect the production of milk. For instance, the U.S. all milk price fell from \$18.40/cwt. in August 2008 to \$12.10/cwt. in August of 2009, a 33.5% drop in the price, but milk production was only down 0.1% in August 2009 compared to August 2008.

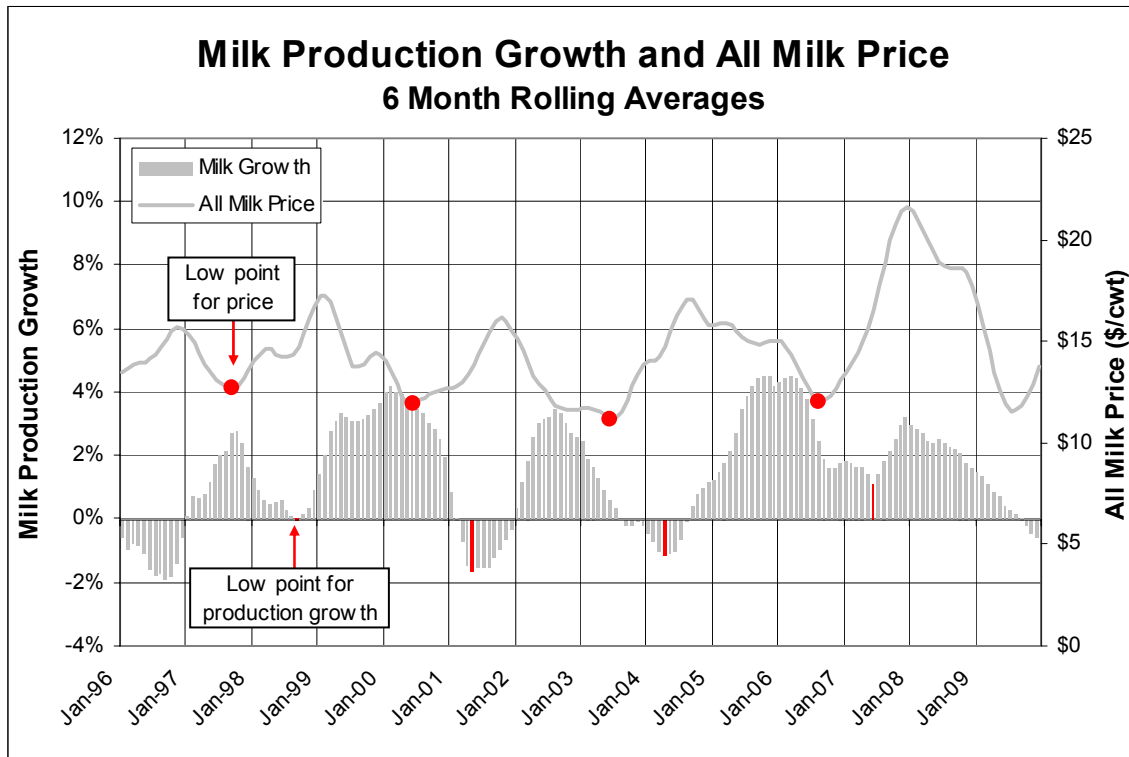
Not only is milk production inelastic, there is a long lag time between changes in prices and changes in production. When prices increase, it takes time for farmers to react. There are biological and financial constraints that limit how fast production can increase or decrease in response to prices. The first graph below shows the year over year change in milk production (blue bars) and the U.S. all milk price (red line). The second graph shows the same data using a six month rolling average to smooth the data.

Exhibit 27: Milk Production Growth and Milk Price Graph



Source: USDA, Informa Calculations

Exhibit 28: Milk Production Growth and Milk Price, 6 Month Rolling Averages



Source: USDA, Informa Calculations

Notice that the peaks in the milk price typically occur when milk production growth is negative. The high milk price encourages more production, which eventually pushes the milk price back down, which leads to negative milk production growth and higher prices again. There is a significant lag between the lowest milk price, and the lowest level of milk production growth in each cycle. In the four cycles between 1996 and 2008, the lag between the lowest point for prices and the lowest point for milk production growth has averaged about 11 months.

Exhibit 29: Price to Production Lag Table

	Lowest Price	Lowest Milk Production Growth	Months
Cycle 1	Sep-97	Sep-98	12
Cycle 2	May-00	Apr-01	11
Cycle 3	Jun-03	Apr-04	10
Cycle 4	Aug-06	Jun-07	10

Source: USDA, Informa Calculations

Estimates of Milk Production Elasticity

Economists use estimates of elasticity to forecast supply, demand, prices, and evaluate potential changes in government policies. Estimates of short-run elasticities from three different published models were relatively consistent, with estimated elasticity averaging 0.075.

Exhibit 30: Estimates of Supply Elasticity Table

Study/Model	Elasticity	Lag (Years)	Notes
UW-2009	0.076	1	Estimated on 2003-2007 data Elasticity w.r.t. Milk-Feed Ratio, *No lag on cow equation
AMS-2007	0.068	1*	
FAPRI	0.08	1	

Sources: University of Wisconsin⁶, Agricultural Marketing Service⁷, FAPRI⁸

A production elasticity of 0.075 with a one year lag means that if the milk price falls 10%, then milk production should be about 0.75% lower than if the price had been steady one year later.

Price Elasticity of Milk Production and DMSP

The DMSP withholdings will effectively reduce the average milk price received by farmers, but the withholdings are capped at 6, 7, or 8 percent of their marketings each month depending on how low the benchmark margin is at the time. The withholdings essentially lower the average price received for milk. If farmers treat the withholdings in this way, it would have a similar impact as a 6-8% reduction in the milk price. Multiplying that by estimated elasticity would imply that when activated would reduce milk production by 0.45% to 0.60% about a year after activation. That reduction would not apply to national milk production, but only to a subset of farmers who hit their maximum withholdings cap. It is very difficult to say what the short-term impact of the program would be on production and deliveries of milk.

Marginal versus Average Price

Typically a dairy farmer receives just one price for his milk each month, whether he produced 1.0 or 1.1 million pounds that month. His level of production doesn't substantially alter the price he is paid. But under the DMSP, if the program is active and the farmer produces above his base level, he essentially receives two prices, the market average price for the milk below base (or above cap), and he receives a price of \$0 for milk above base but below the withholding cap.

The introduction of a \$0 marginal milk price has not been experienced nationally before (as far as we're aware). It's likely that farmers who know they are about to go over their base production level while the program is active will try to limit production during

that month, but with no historical comparison in the US, it's nearly impossible to say exactly what the impact on milk production will be.

IV. Higher Cost Farms Hit Hardest

When active, the DMSP will reduce payments to farmers with milk deliveries over base. By definition the program will only be activated when margins are already low, so the withheld payments will be hitting farmers when margins are already tight. Farms with low average costs are going to be better able to cope with the withholdings than higher cost farms.

While there are low cost farms of all sizes and in nearly all states, in general, larger farms are able to achieve lower average costs and higher returns than small farms.⁹ Larger farms are able to concentrate and specialize in the production of milk, average down fixed costs, and invest in newer technology. While these farms would potentially face large total withholdings if the DMSP were active, their lower cost, assets, and access to capital would give them an advantage over smaller farms facing the same percentage withholdings.

Appendix A – Estimating the Number of U.S. Dairy Farms

There are two potential comprehensive and publicly available sources for data on the number and size of dairy farms over time in the US, Census estimates that are collected every five years, and NASS annual estimates. The Census estimates have the benefit of potentially being more complete, while the NASS estimates have the benefit of being published each year. Up to the 1997 Census, the estimates from both sources tracked each other well, but they have diverged significantly since then. Most studies have relied on the estimates published annually by NASS in the *Farms, Land in Farms, and Livestock Operations* report, but comparing these in detail against Census estimates shows that the NASS estimates dramatically undercount the number of small farms.

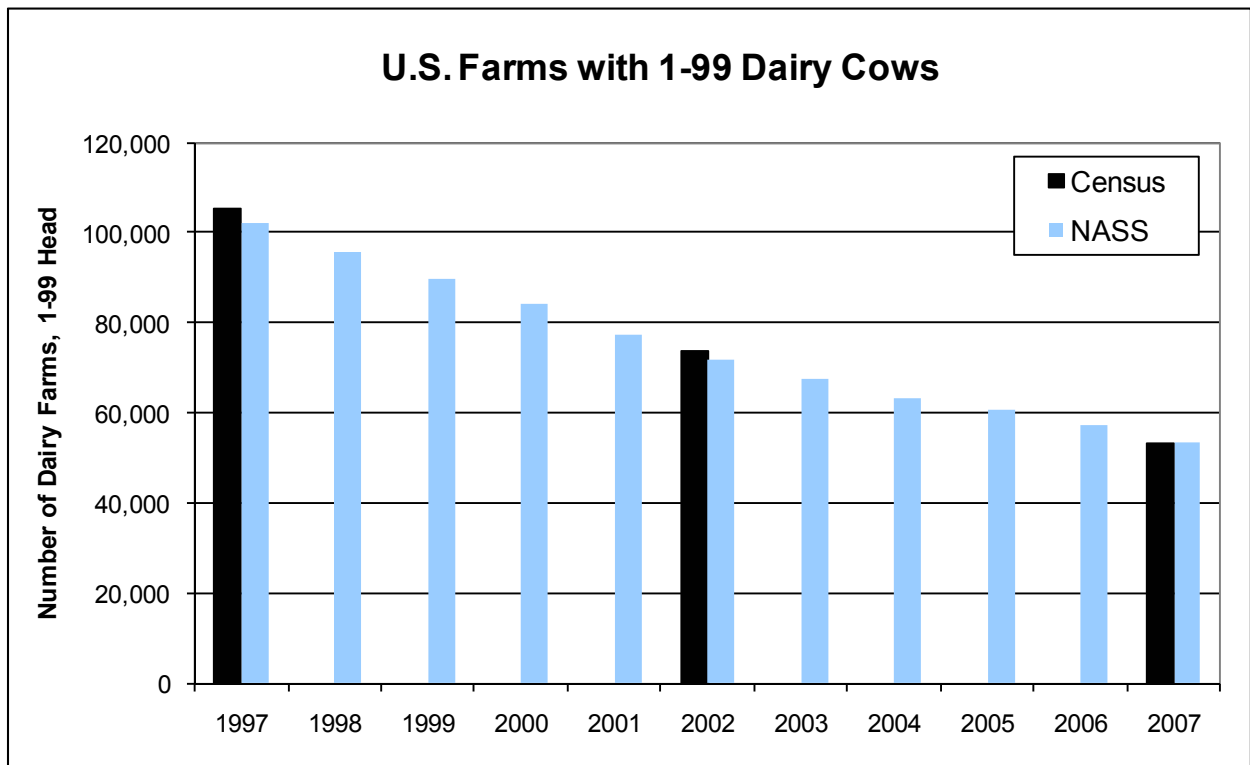
Problems with Annual NASS Estimates

The discrepancy in the data between NASS and Census estimates arises from different motivations and sampling procedures in the collection of the data. The Census of Agriculture “... is a complete count of U.S. farms and ranches and the people who operate them.”² The intent is to find and count every operation and operator, regardless of size or location. The Census estimates serve as the basis for the NASS estimates in the *Farms, Land in Farms, and Livestock Operations* annual report. NASS then estimates annual changes in the number and size of farms between Census years to generate a consistent annual series. The annual change estimates are derived from other survey work that NASS carries out throughout the year to track the number of cattle and the level of milk production.

Milk production has become increasingly concentrated on the largest farms. Based on 2007 Census figures, dairy farms with over 1,000 head accounted for 2.3% of all dairy farms, but produced nearly 42% of all the milk. The smallest farms, with 1-9 dairy cows, accounting for 20% of all dairy farms but produced only 0.3% of the milk. Since the intent of the *Cattle, Cattle on Feed, and Milk Production* reports is to estimate head counts and production levels as closely as possible, NASS pays particularly close attention to the largest farms.³ This has led to an underestimation of the number of small dairy farms over time in the NASS estimates. After the 2007 Census, NASS recognized the discrepancy and discontinued publishing annual estimates of the size of farms for individual states.⁴

At the national level, the discrepancies are relatively small. Below is a chart showing the estimates from NASS and from the Census of Agriculture for the number of U.S. dairy farms with 1-99 head.

Exhibit 31: U.S. Farms with 1-99 Dairy Cows Graph

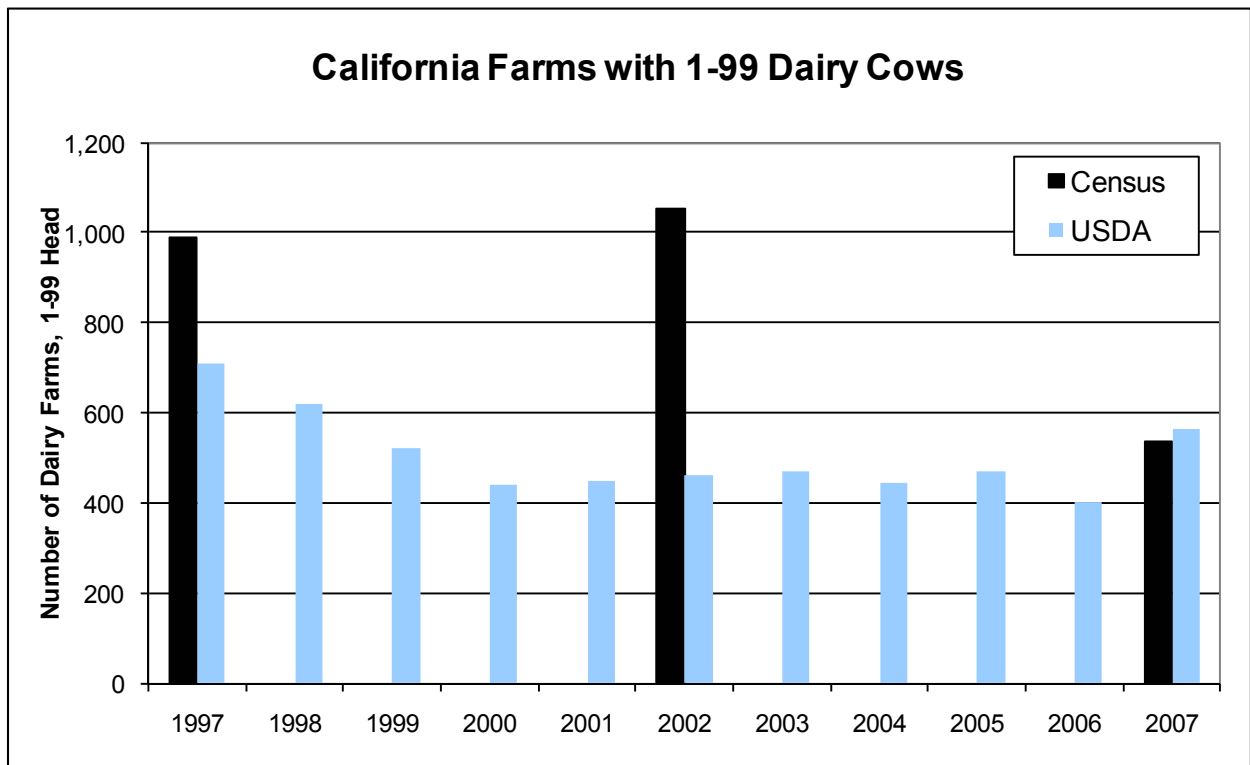


Sources: Census of Agriculture, USDA-NASS

Both data series are trending in the same direction, but the NASS estimates are below Census figures for both 1997 and 2002. After the 2007 Census, NASS recognized the problem and essentially set their estimates equal to the Census figure for that year, creating a breakpoint in their methodology and data series. It should also be noted that the Census figures represent farms that had cows as of December 31st in the particular year, while the NASS figures represent the number of farms that had 1-99 cows at any point during the year, not necessarily on December 31st. This difference in exact timeframe likely accounts for some of the discrepancy, but it doesn't account for all of it.

While the estimates at the national level are relatively close, the estimates at state level vary greatly. The best example is small farms in California. The chart below shows the estimated number of dairy farms with 1-99 head in the state of California over the same 1997-2007 period.

Exhibit 32: California Farms with 1-99 Dairy Cows Graph



Sources: Census of Agriculture, USDA-NASS

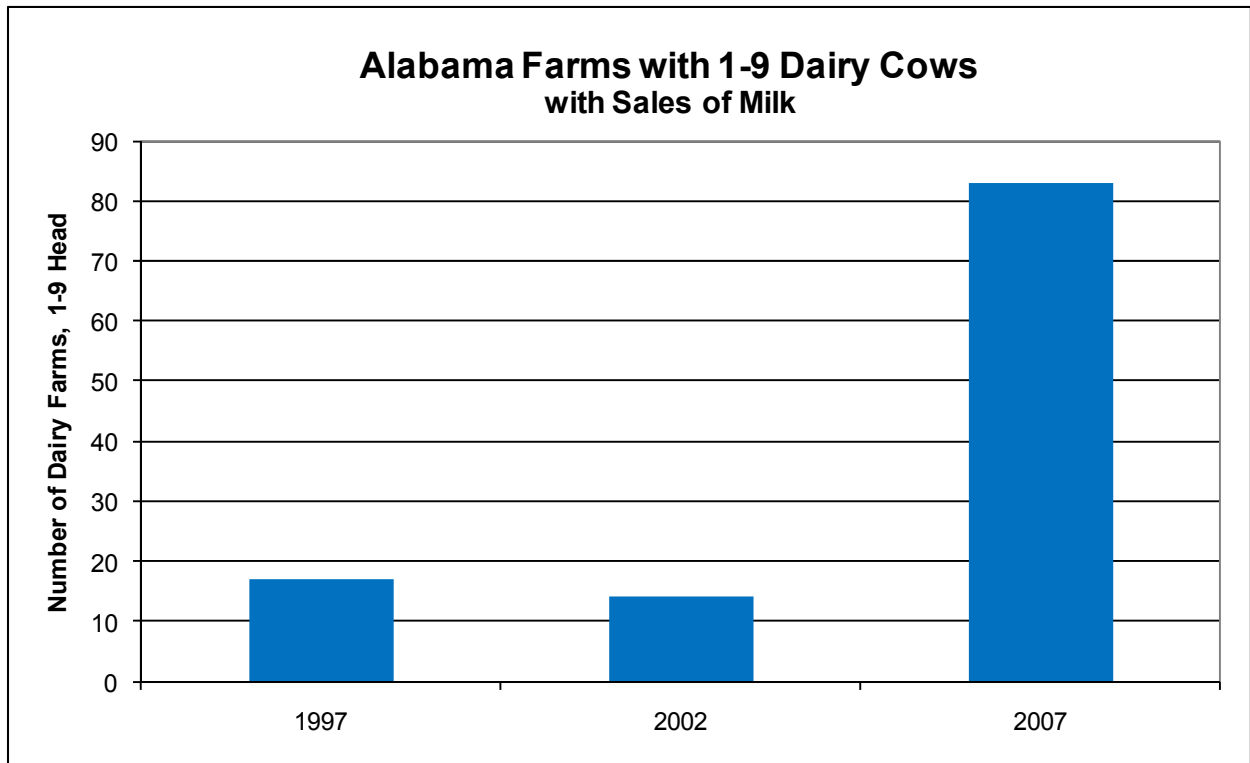
It's clear that at the state level there are serious discrepancies between the Census and NASS estimates. Through detailed low level analysis and discussions with NASS personnel, the Census figures appear to be a better approximation of the actual number and size of farms in existence, particularly for the smaller size groups. For this reason, we have used Census estimates in this study. We linearly interpolated between the actual Census figures to create annual estimates of the number of farms by size in each state from 1997 to 2007. The figures for 2008 and 2009 were estimated using a stochastic trend calculated over the 2002-2007 time period.

Problems with the Census Estimates

While Census figures are the more accurate of the two choices, they also have some issues. Prior to 2002, the Census of Agriculture was carried out by the Census Bureau. Starting in 2002, the responsibility was shifted to the USDA. The USDA changed the estimation methodology when they took over, making a systematic effort to adjust the data for farms that had not received the Census questionnaire. With the change in methodology, the original data in 1997 and 2002 are not directly comparable.⁵ However, the USDA did release revised 1997 figures that were adjusted using the coverage adjustments applied to the 2002 estimates to create a comparable data set. The 1997 data used in this study is the revised, coverage adjusted data.

For the 2007 Census, the USDA made a special effort to improve coverage of minority operated farms, which tend to be smaller than average. While there was no change in methodology, the extra effort has boosted estimated farm numbers, particularly small farm sizes in Southern states. With the long-run trends toward fewer and larger farms, the sudden increase in the number of small farms in the 2007 Census figures runs counter to general industry knowledge. One of the best examples of this is the number of small dairy farms in Alabama.

Exhibit 33: Alabama Farms with 1-9 Dairy Cows Graph



Source: Census of Agriculture

It's very unlikely that 69 new farms with 1-9 cows were started in Alabama between 2002 and 2007. More than likely all of those farms were in existence in the past, but were missed by the Census. But these farms were not being picked up in the annual NASS estimates either, so we have no way of accurately adjusting the prior data and have simply accepted the Census numbers as the best available and used them.

Appendix B – Estimating Milk Production per Farm

We used the number of farms reporting sales of dairy products (milk), and the total value of those sales from the Census of Agriculture to estimate the share of each state's production that could be attributable to each size class of dairy farms in that state. The last Census of Agriculture was in 2007, so the number of farms and the share of milk in each size class were estimated for 2008 and 2009, then rationalized by actual level of production in each state for those years. The Census of Agriculture classifies dairy farms into 8 sizes, 1-9 head, 10-19, 20-49, 50-99, 100-199, 200-499, 500-999, and 1,000+. In 2007, two more sizes were added, 1,000-1,999 and 2,000+. All of our estimates and forecasts of production were done with the Census size breakdowns, but the data was aggregated into five classes for estimating withholdings.

Due to privacy concerns, dairy product sales for some size classes in some states were not disclosed and had to be estimated. To estimate sales we first calculated the average number of cows on farms in each class of farms in the states that had published data. To do this we divided reported sales by the milk price to find the number of pounds sold, then divided that by the average production per cow in that state to find the implied number of cows. To estimate missing data in each size class, the calculation was essentially reversed. The national average implied number of cows in that class size was multiplied by the average production per cow for the state in that year, then multiplied by the milk price to derive estimated sales from farms in that size class. For instance, sales from farms with 10-19 head in the state of Illinois were not reported in 2007. The average implied number of cows on farms in that size class for the states with reported data was 10.5 cows, production per cow (PPC) in Illinois in 2007 was 18,612 pounds, the average milk price was \$19.70/cwt, and the number of farms in that size class was 52.

Exhibit 34: Estimating Dairy Sales Example Table

Estimating Dairy Sales from Farms with 1-9 Head in Illinois, 2007												
Avg. Implied Cows per Farm											IL. Sales by Farms w/10 29 Head (Dollars)	
IL. Production per Cow		Production per Farm (Pounds)		IL. All Milk Price (cwt.)		Sales per Farm (Dollars)		Number of Farms in Class				
10.5	X	18,612	=	195,426	X	\$19.70	=	\$38,499	X	52	=	\$2,001,944

Sources: USDA, 2007 Census of Agriculture, Informa Calculations

Once estimates of sales were derived for all size classes in all states, they were converted to percentage shares of sales for the state.

Exhibit 35: Share of Sales Example Table

Illinois Dairy Product Sales by Farm Size, ('000 Dollars, 2007)								
	1-9	10-19	20-49	50-99	100-199	200-499	500-999	1000+
Sales	\$2,425	\$2,002	\$24,784	\$77,639	\$92,430	\$83,660	\$30,874	\$19,811
Share of Sales	0.7%	0.6%	7.4%	23.3%	27.7%	25.1%	9.3%	5.9%
								100%

Sources: 2007 Census of Agriculture, Informa Calculations

These calculations were done using Census data from 1997, 2002, and 2007. Shares of sales were interpolated between Census years. To interpolate to monthly frequency, December of each year was set equal to the estimated share of sales calculated for the year since the Census data is as of December 31st, then each month was linearly interpolated between December and December. The share of sales for each farm class in each state was then multiplied by monthly milk production in the state to estimate actual production for each size class.

Since the last Census of Agriculture was in 2007, the number of farms in each class and their share of production needed to be forecasted. The change in the number of farms was forecasted using the rolling average annual change over the last five years. The share of production by each size class was divided by the number of dairy farms in each class to estimate the share of milk produced in each state by each farm in each size class, which was then forecasted in the same manner as farm numbers, using the average annual change in share of production over the last five years. The share of production for each farm in each size class was then multiplied by the number of dairy farms in each size class to estimate the total share of milk produced in each size class in each state. The forecasted share of sales by each size class was then multiplied by milk production for the state to estimate milk produced by each size class for 2008 and 2009. The forecasts were graphed and checked for consistency with trends in total production, share of production, production per farm, actual size of farms, and share of total production per farm.

Appendix C – Calculated Monthly Milk Prices

In the *Agricultural Prices* report the USDA publishes estimates of the milk price received by farmers for all milk (both fluid and manufacturing grades) on a monthly basis for a number of states, and publishes an annual estimate for all states. To estimate monthly prices for states when they were not published by the USDA we calculated the annual spread between the unpublished (monthly) state and a nearby state with a similar industry structure that did have monthly published estimates. We added that spread to the published state's monthly price to derive an estimate of the monthly milk price in the state without a published (monthly) estimate.

For example, the USDA did not publish monthly estimates for the all milk price in Oregon during 2004, but they did publish a monthly milk price for Washington. The spread between the annual price for Oregon and Washington that year was 10 cents per hundredweight (cwt.). To estimate the monthly prices in Oregon, 10 cents was simply added to the Washington price for each month in 2004 to derive estimates for Oregon.

Exhibit 36: Annual Milk Price Spread Example Table

Published Annual All Milk Prices (\$/cwt.)			
	Oregon	Washington	Spread
2000	\$12.80	\$12.80	\$0.00
2001	\$15.50	\$15.00	\$0.50
2002	\$12.50	\$12.00	\$0.50
2003	\$12.50	\$12.10	\$0.40
2004	\$16.00	\$15.90	\$0.10
2005	\$15.70	\$14.90	\$0.80
2006	\$14.70	\$12.60	\$2.10
2007	\$18.30	\$19.20	-\$0.90
2008	\$18.30	\$17.60	\$0.70
2009	\$13.70	\$12.30	\$1.40

Source: USDA

The table below shows which states had published monthly all milk prices, and which states/years were estimated based on annual spreads. States that are in bold are the 23 states that have published monthly milk production estimates.

Exhibit 37: States and Years with Published and Estimated Monthly Milk Prices

States with Published and Informa Estimated Monthly All Milk Prices											
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	
Alabama	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
Alaska	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
Arizona	Published	Published	Published	Published	Published	Published	Published	Published	Published	Published	
Arkansas	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
California	Published	Published	Published	Published	Published	Published	Published	Published	Published	Published	
Colorado	Estimated	Estimated	Estimated	Estimated	Estimated	Published	Published	Published	Published	Published	
Connecticut	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
Delaware	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
Florida	Published	Published	Published	Published	Published	Published	Published	Published	Published	Published	
Georgia	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
Hawaii	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
Idaho	Published	Published	Published	Published	Published	Published	Published	Published	Published	Published	
Illinois	Published	Published	Published	Published	Published	Published	Published	Published	Published	Published	
Indiana	Published	Published	Published	Published	Published	Published	Published	Published	Published	Published	
Iowa	Published	Published	Published	Published	Published	Published	Published	Published	Published	Published	
Kansas	Published	Published	Published	Published	Estimated	Published	Published	Published	Published	Published	
Kentucky	Published	Published	Published	Published	Published	Published	Published	Published	Published	Estimated	
Louisiana	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
Maine	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
Maryland	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
Massachusetts	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
Michigan	Published	Published	Published	Published	Published	Published	Published	Published	Published	Published	
Minnesota	Published	Published	Published	Published	Published	Published	Published	Published	Published	Published	
Mississippi	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
Missouri	Published	Published	Published	Published	Published	Published	Published	Published	Published	Published	
Montana	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
Nebraska	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
Nevada	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
New Hampshire	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
New Jersey	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
New Mexico	Published	Published	Published	Published	Published	Published	Published	Published	Published	Published	
New York	Published	Published	Published	Published	Published	Published	Published	Published	Published	Published	
North Carolina	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
North Dakota	Estimated	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
Ohio	Published	Published	Published	Published	Published	Published	Published	Published	Published	Published	
Oklahoma	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
Oregon	Published	Published	Published	Published	Estimated	Published	Published	Published	Published	Published	
Pennsylvania	Published	Published	Published	Published	Published	Published	Published	Published	Published	Published	
Rhode Island	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
South Carolina	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
South Dakota	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
Tennessee	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
Texas	Published	Published	Published	Published	Published	Published	Published	Published	Published	Published	
Utah	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Published	Published	
Vermont	Published	Published	Published	Published	Published	Published	Published	Published	Published	Published	
Virginia	Published	Published	Published	Published	Published	Published	Published	Published	Published	Published	
Washington	Published	Published	Published	Published	Published	Published	Published	Published	Published	Published	
West Virginia	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	
Wisconsin	Published	Published	Published	Published	Published	Published	Published	Published	Published	Published	
Wyoming	Published	Published	Published	Published	Estimated	Estimated	Estimated	Estimated	Estimated	Estimated	

Appendix D – Estimating Monthly Milk Production

The USDA has consistent monthly milk production estimates for the largest 23 milk producing states going back to 2003. Prior to 2003, they only estimated monthly production in 20 states. However, they do estimate production quarterly for all 50 states. To estimate monthly production in the 27 states that the USDA does not publish monthly estimates for, we used the quarterly estimates for the state, and broke it down to monthly figures using the seasonal production pattern of a nearby state with similar industry structure and weather conditions.

When estimating milk production, there are two independent components; the number of cows, and the production per cow. The quarterly estimate of cow numbers released by the USDA is an average for the quarter, and production per cow is the total produced by a cow during the entire quarter. To break cow numbers down to monthly numbers, we centered the average for the quarter in the middle of each quarter, and then used linear interpolation between those points. For instance, the quarterly estimate for the number of dairy cows in Maryland in Q1-2000 was 85,000 head, while the estimate for Q2-2000 was 84,000 head. So we assumed that there were 85,000 head in the state in February, and that fell to 84,000 head in May, with the number falling an equal amount each month in between.

Exhibit 38: Quarterly to Monthly Cow Interpolation Example Table

Maryland Dairy Cows			
USDA Estimates		Informa Interpolation	
2000-Q1	85,000 →	Jan-00	85,000
		Feb-00	85,000
		Mar-00	84,667
		Apr-00	84,333
2000-Q2	84,000 →	May-00	84,000
		Jun-00	83,667
		Jul-00	83,333
		Aug-00	83,000
2000-Q3	83,000 →	Sep-00	82,667
		Oct-00	82,333
		Nov-00	82,000
		Dec-00	82,000

Sources: USDA, Informa Calculations

Breaking down quarterly production per cow figures into monthly is considerably harder than interpolating cow numbers. Production per cow (PPC) is seasonal, at the national level, it typically peaks in May and falls through November before trending back up into May. The seasonality is driven in large part by the weather, so different regions have slightly different seasonal patterns. To account for this seasonality we used a nearby state's PPC seasonality within each quarter to breakdown the quarterly PPC estimate in states where production was not reported monthly.

Exhibit 39: Quarterly to Monthly Production Per Cow Example Table

Estimating Maryland Monthly Production per Cow using PA Seasonal						
	Pennsylvania	% of Quarterly		Maryland Q1 PPC		Maryland Monthly Estimate
Jan-00	1,520	33%	X	4,200	=	1,383
Feb-00	1,475	32%	X	4,200	=	1,342
Mar-00	1,620	35%	X	4,200	=	1,474
2000-Q1	4,615					4,200

Sources: USDA, Informa Calculations

The monthly estimate for cow numbers was then multiplied by the monthly estimated production per cow to derive a monthly estimate for the amount of milk produced each month. The monthly estimates were then summed back into quarterly to ensure that the estimation procedure did not under or overstate known quarterly production. When the summed monthly estimates did not match published quarterly figures, the monthly PPC estimates were iteratively adjusted until the summed monthly estimates matched the known quarterly production in each state. The adjustments were relatively small, rarely larger than one half of one percent.

Appendix E – Withholdings Maps

23-State Maps

Total Withholdings

Exhibit 40: Total Estimated Withholdings Under DMSP, 2000-2009 (23 States)

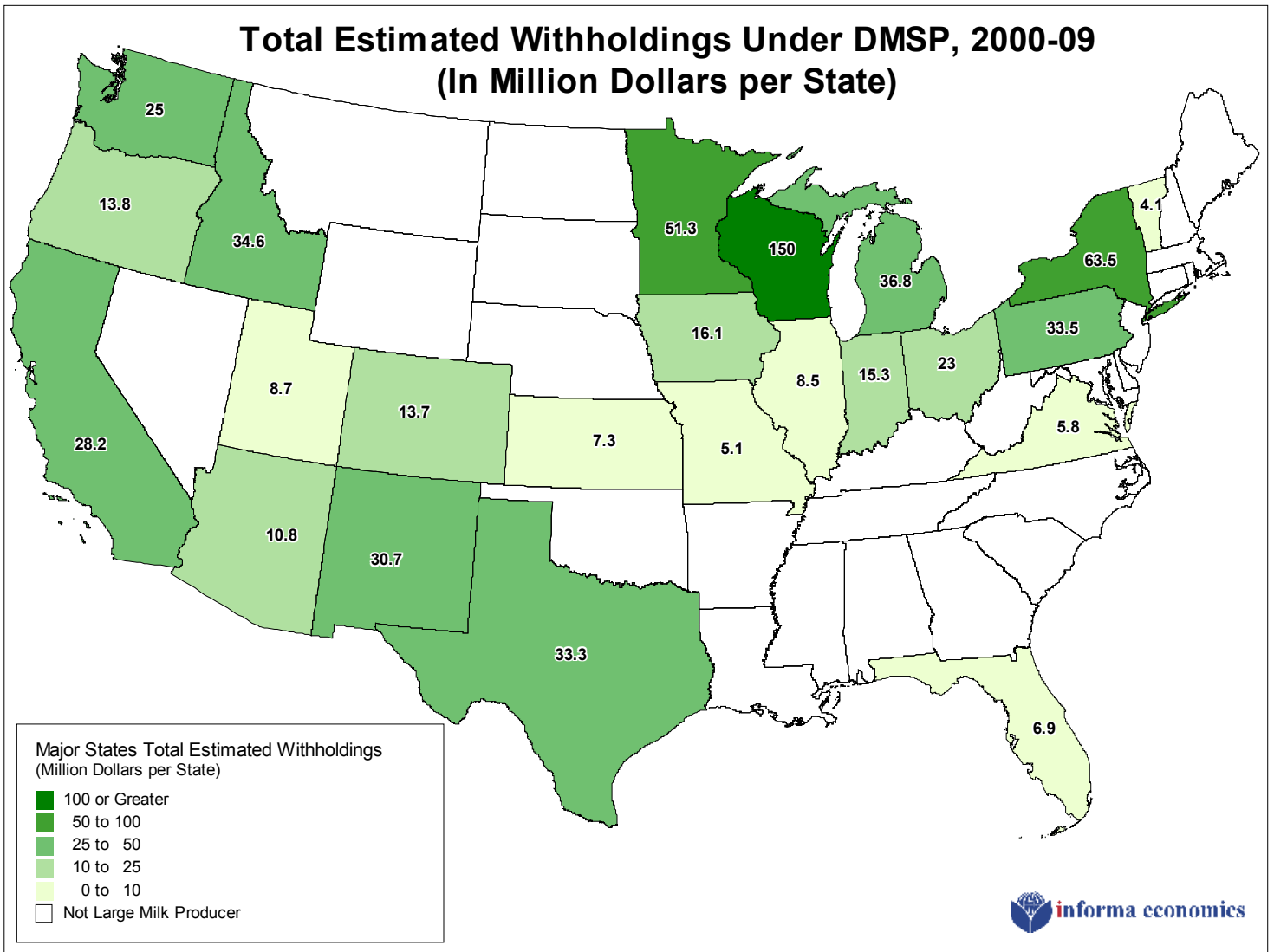


Exhibit 41: Total Estimated Withholdings Under DMSP, 2002 (23 States)

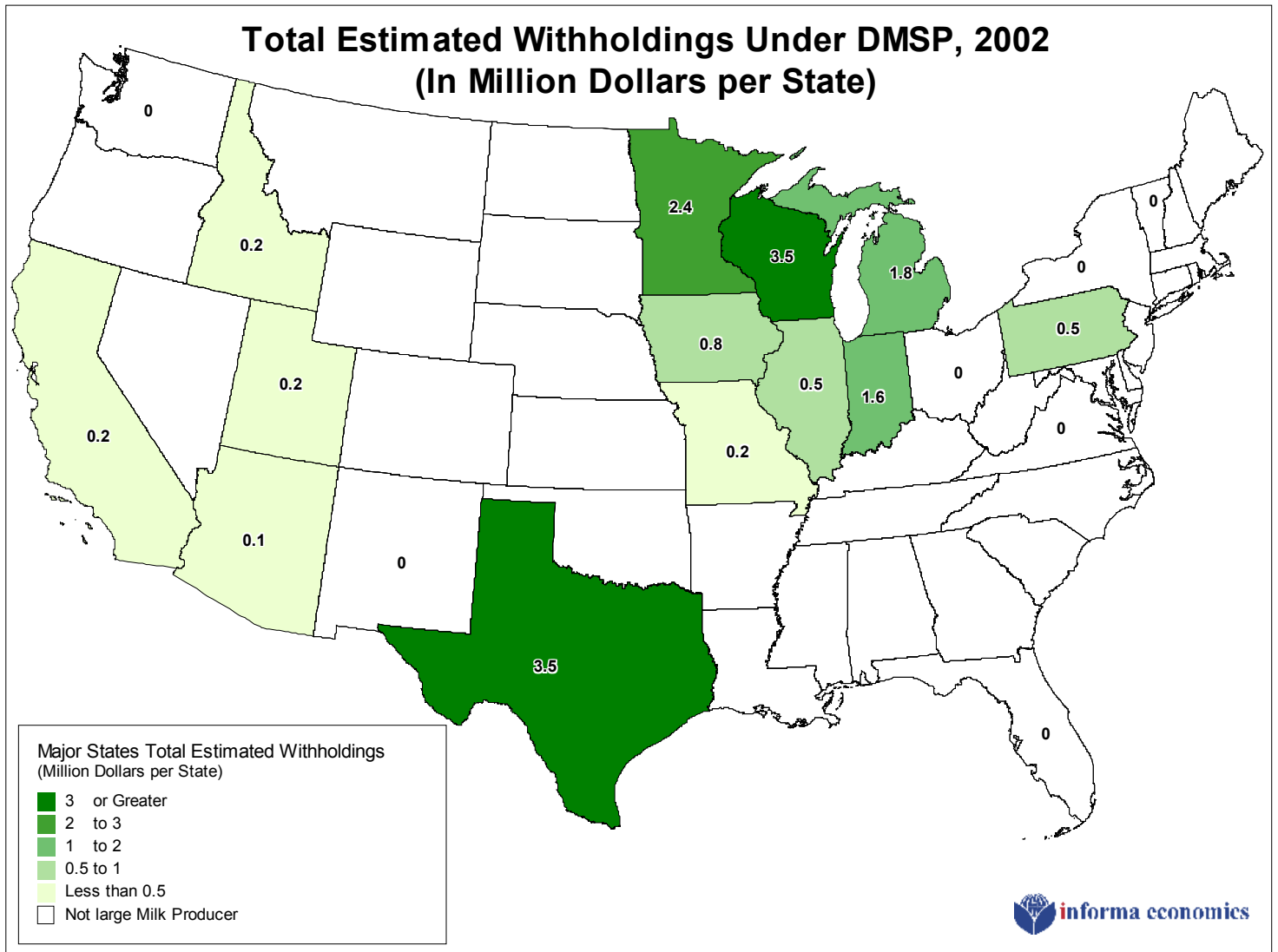


Exhibit 42: Total Estimated Withholdings Under DMSP, 2003 (23 States)

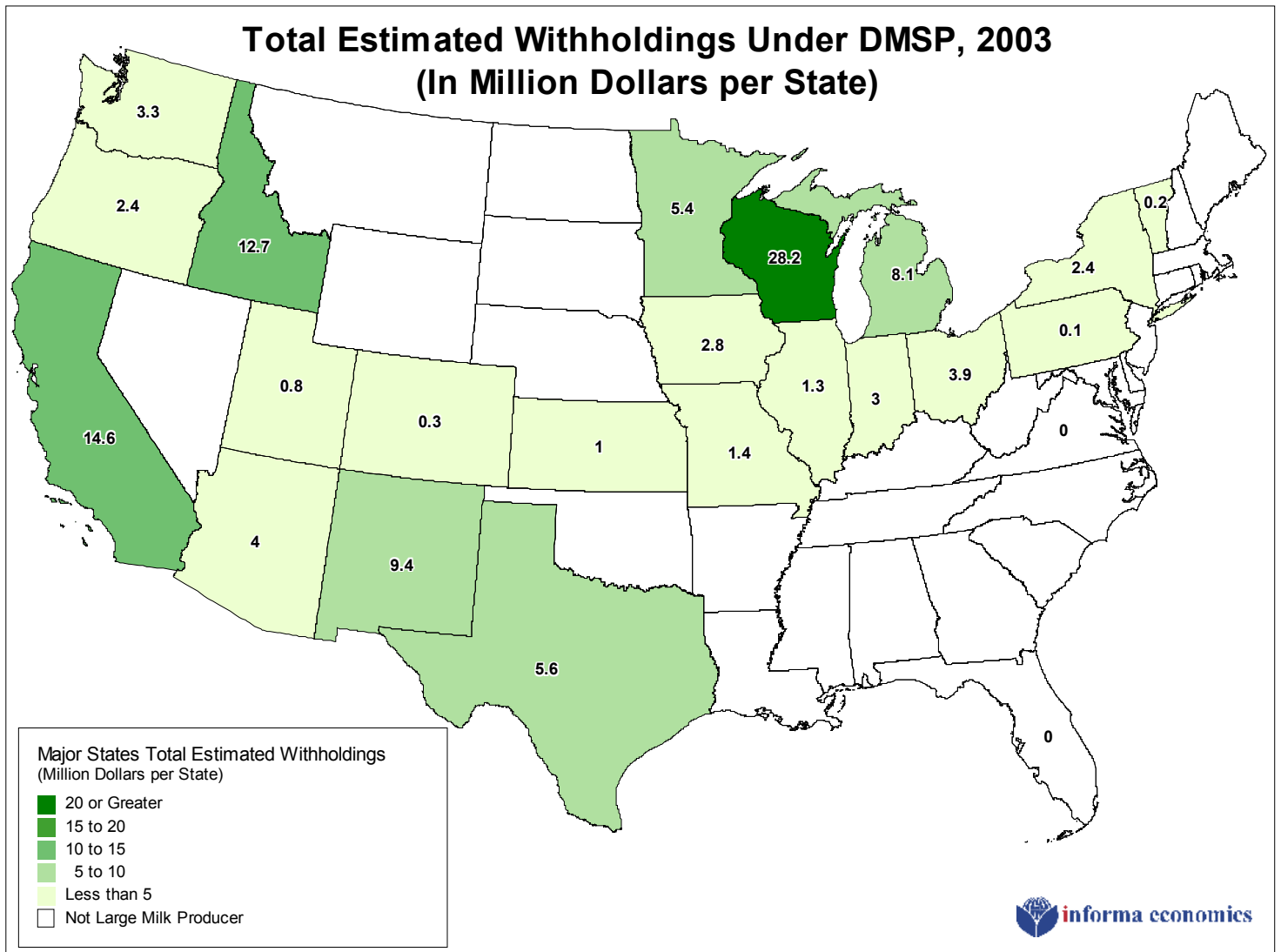
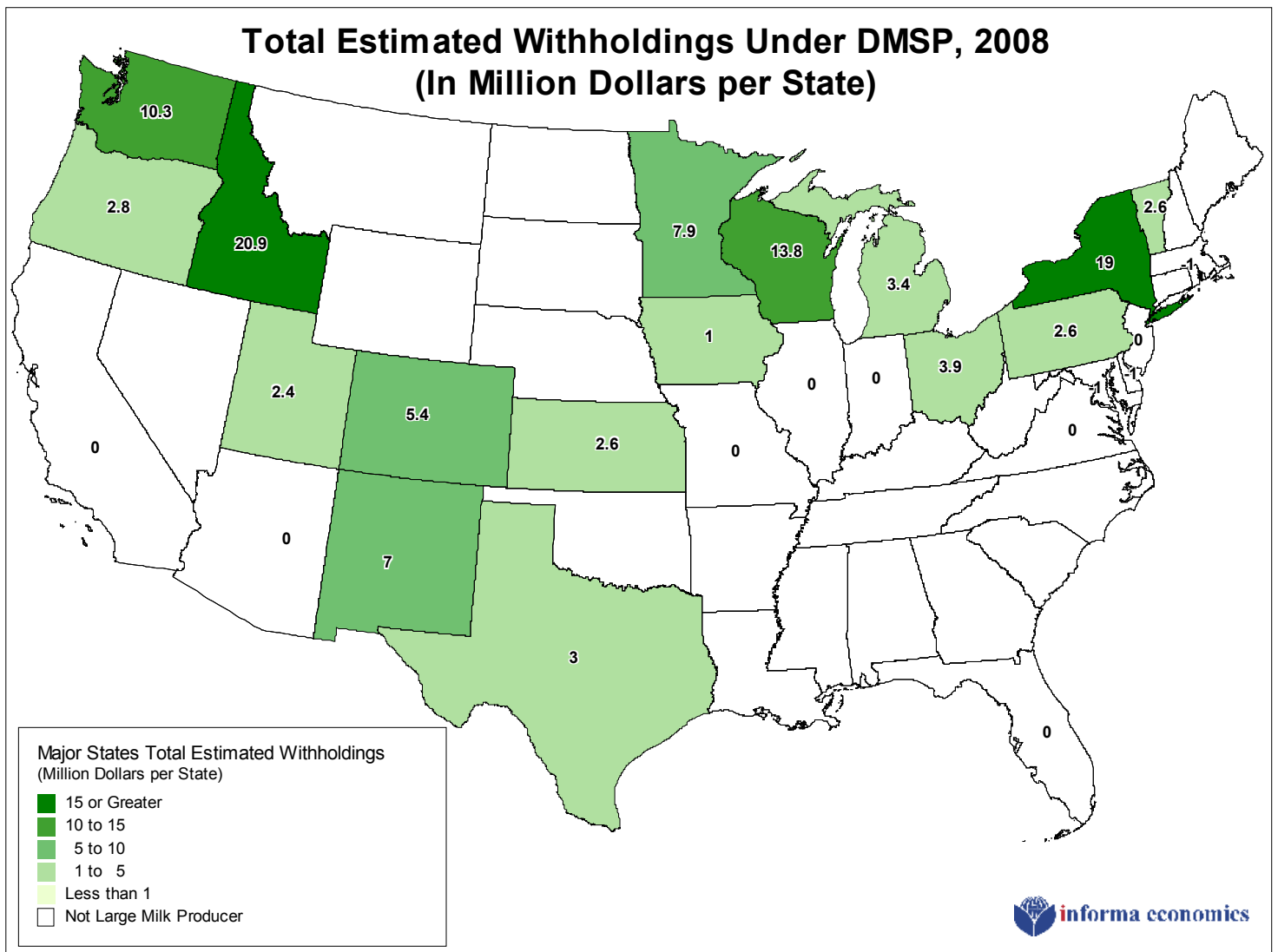


Exhibit 43: Total Estimated Withholdings Under DMSP, 2008 (23 States)



Per Farm Withholdings

Exhibit 45: Estimated Withholdings Per Farm Under DMSP, 2000-2009 (23 States)

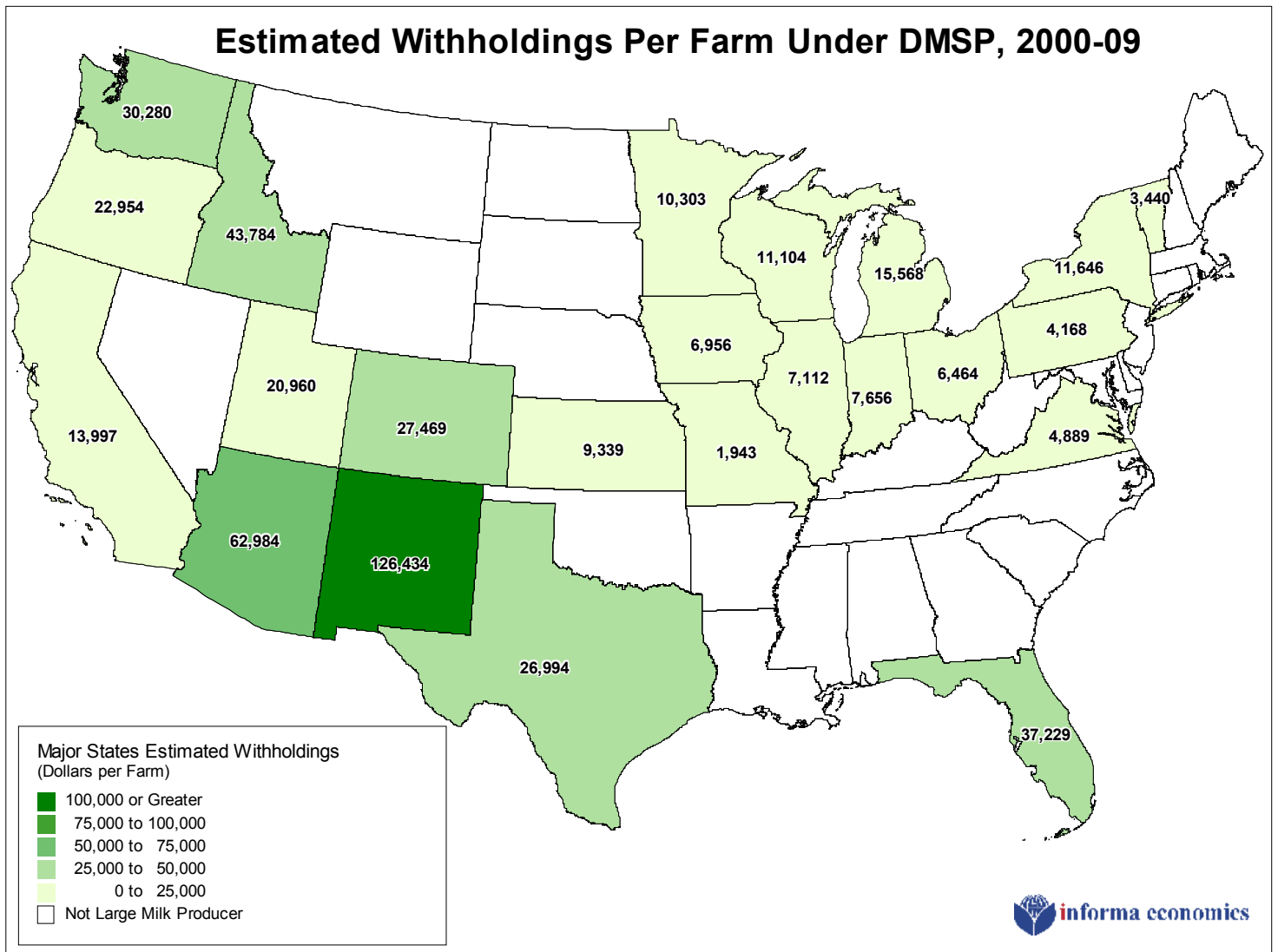


Exhibit 46: Estimated Withholdings Per Farm Under DMSP, 2002 (23 States)

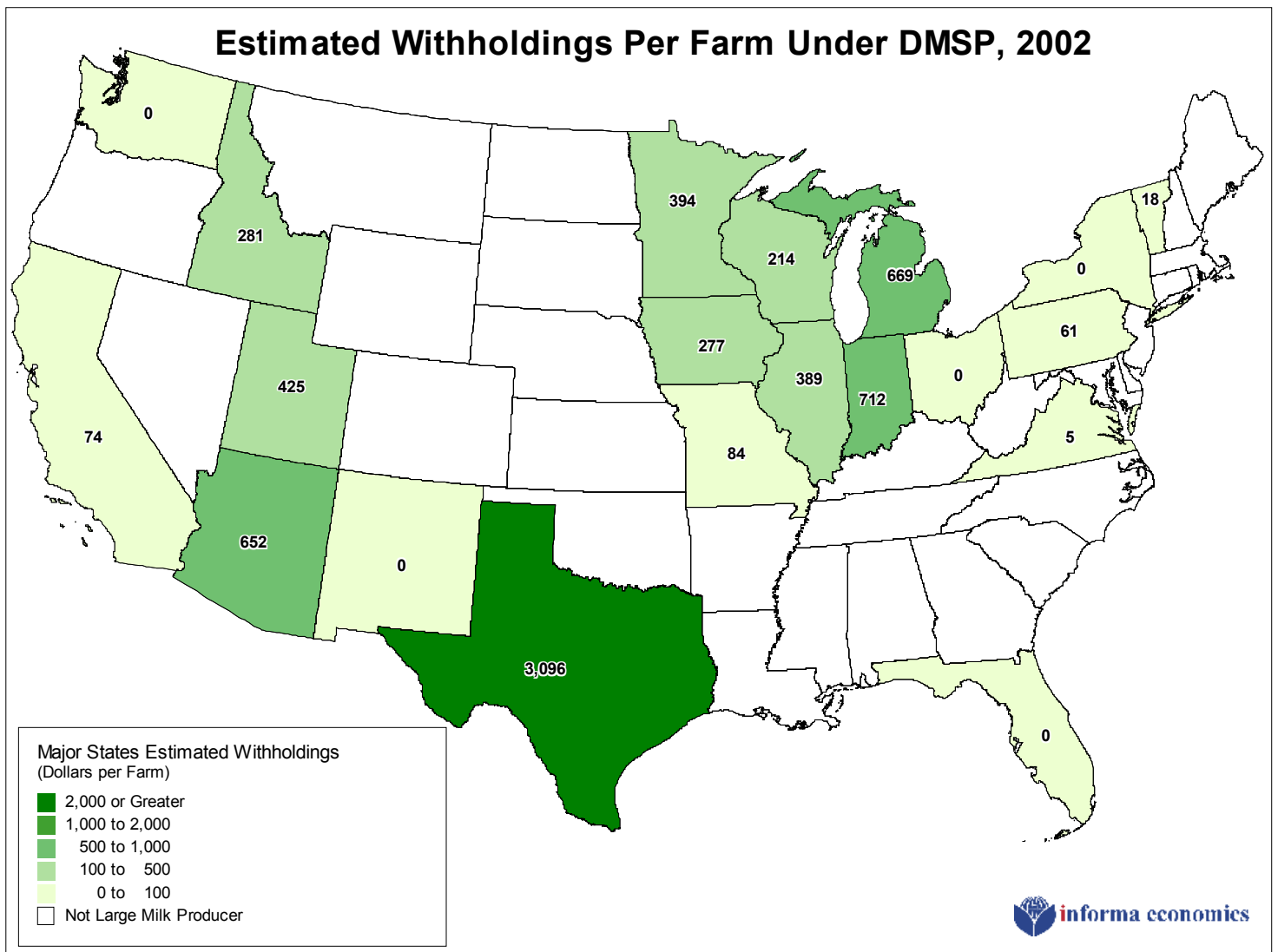


Exhibit 47: Estimated Withholdings Per Farm Under DMSP, 2003 (23 States)

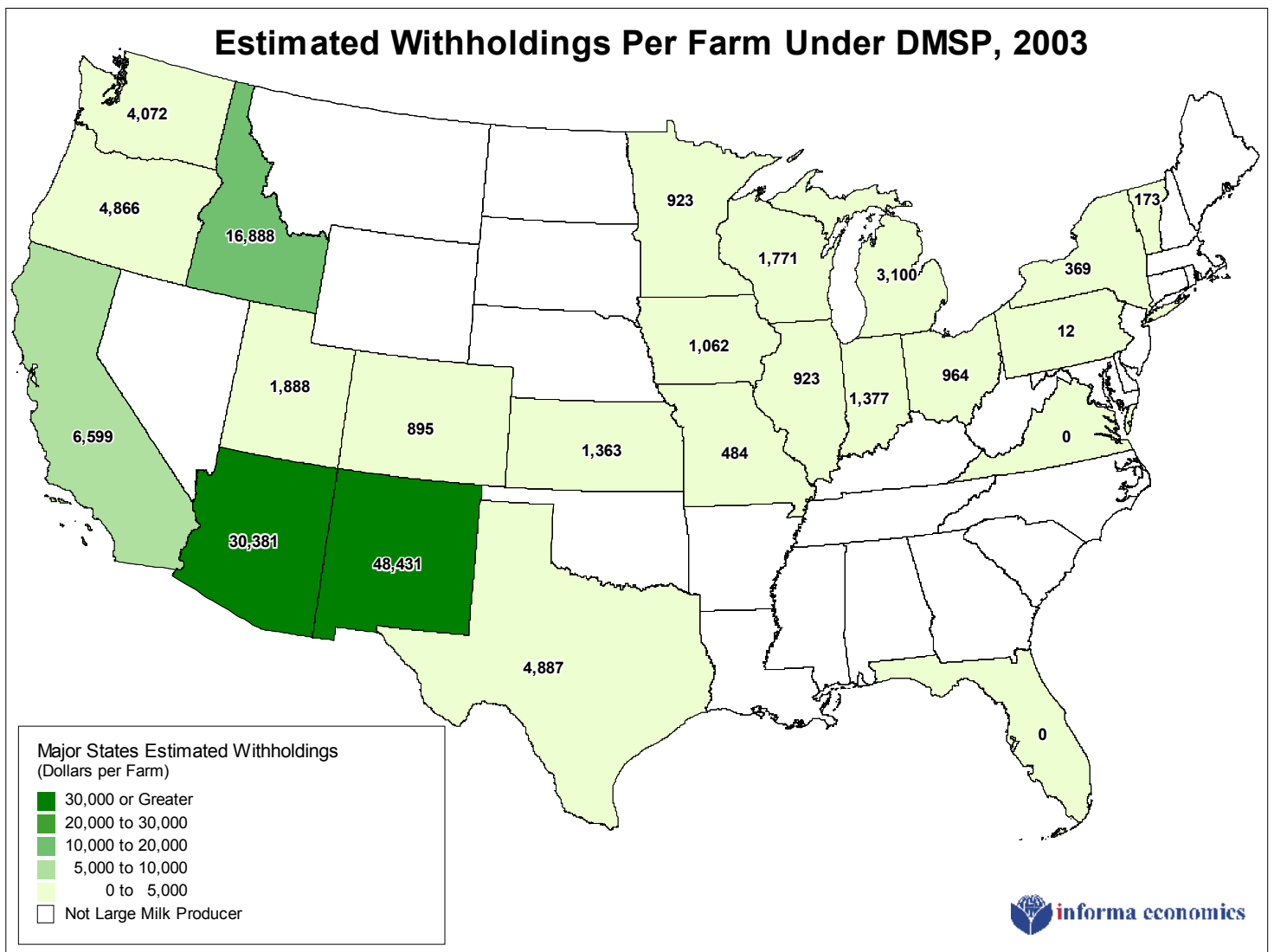


Exhibit 48: Estimated Withholdings Per Farm Under DMSP, 2008 (23 States)

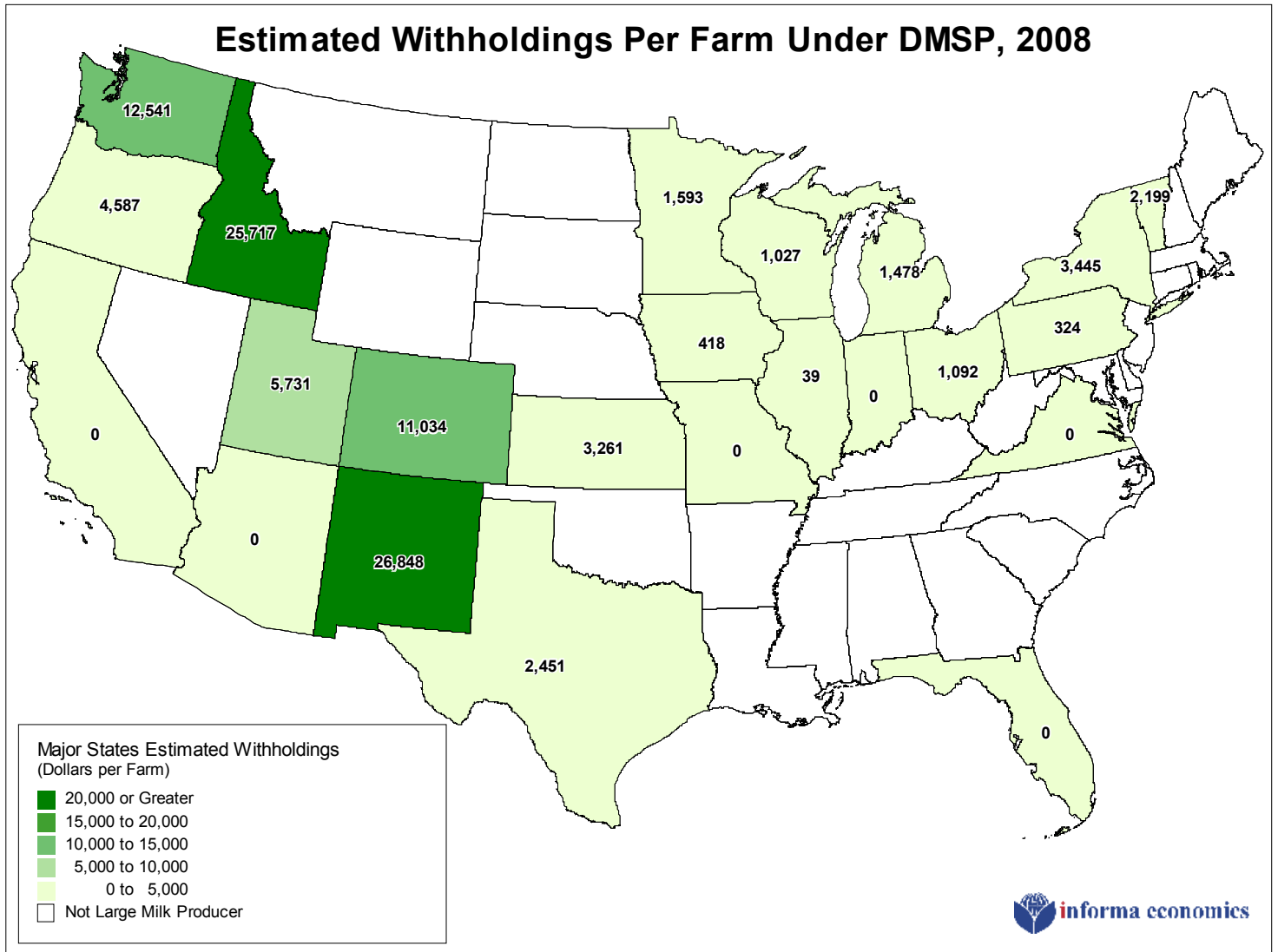
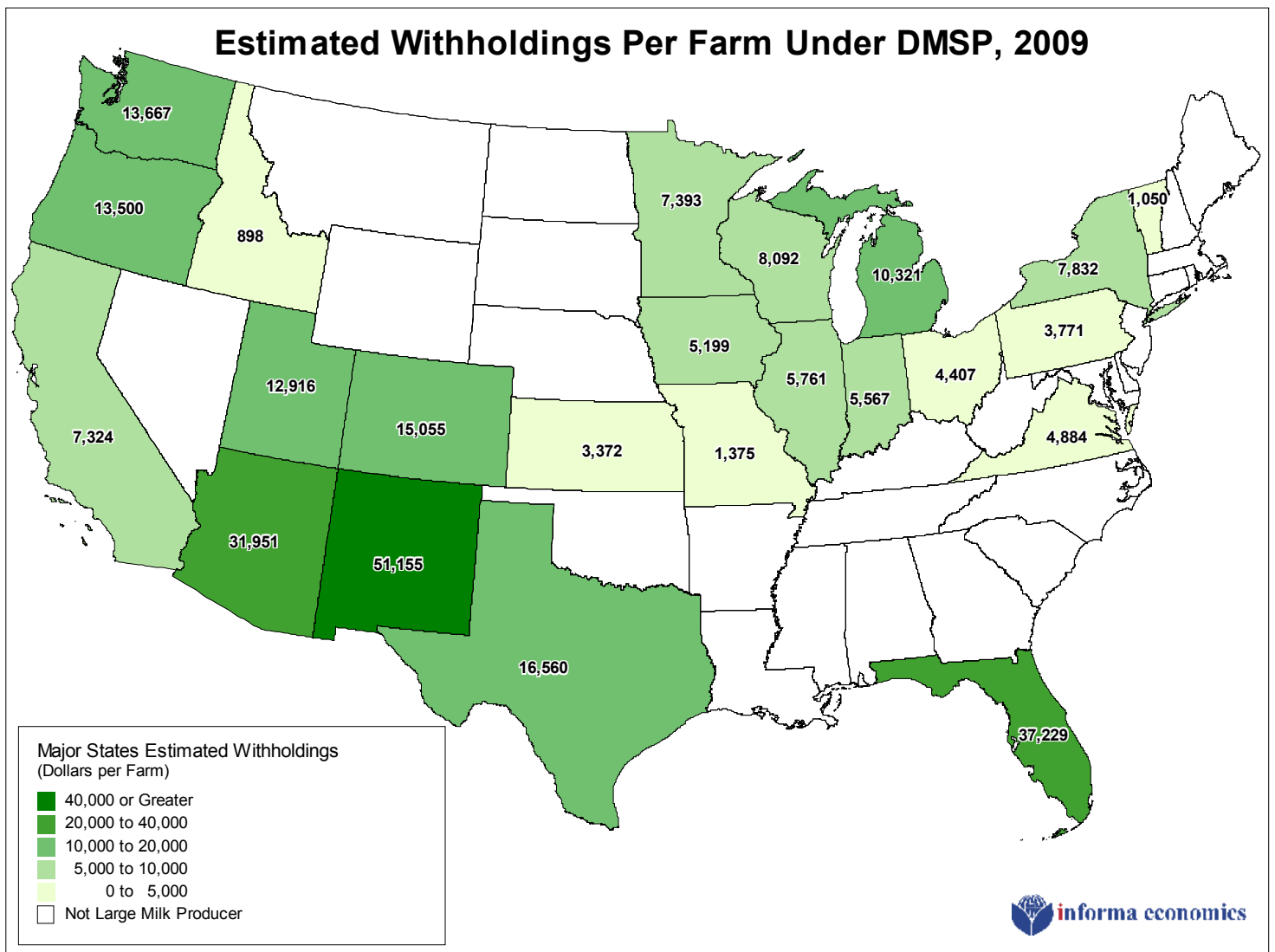


Exhibit 49: Estimated Withholdings Per Farm Under DMSP, 2009 (23 States)



Percent Withholdings

Exhibit 50: Estimated Withholdings as Percent of Marketings, 2000-2009 (23 States)

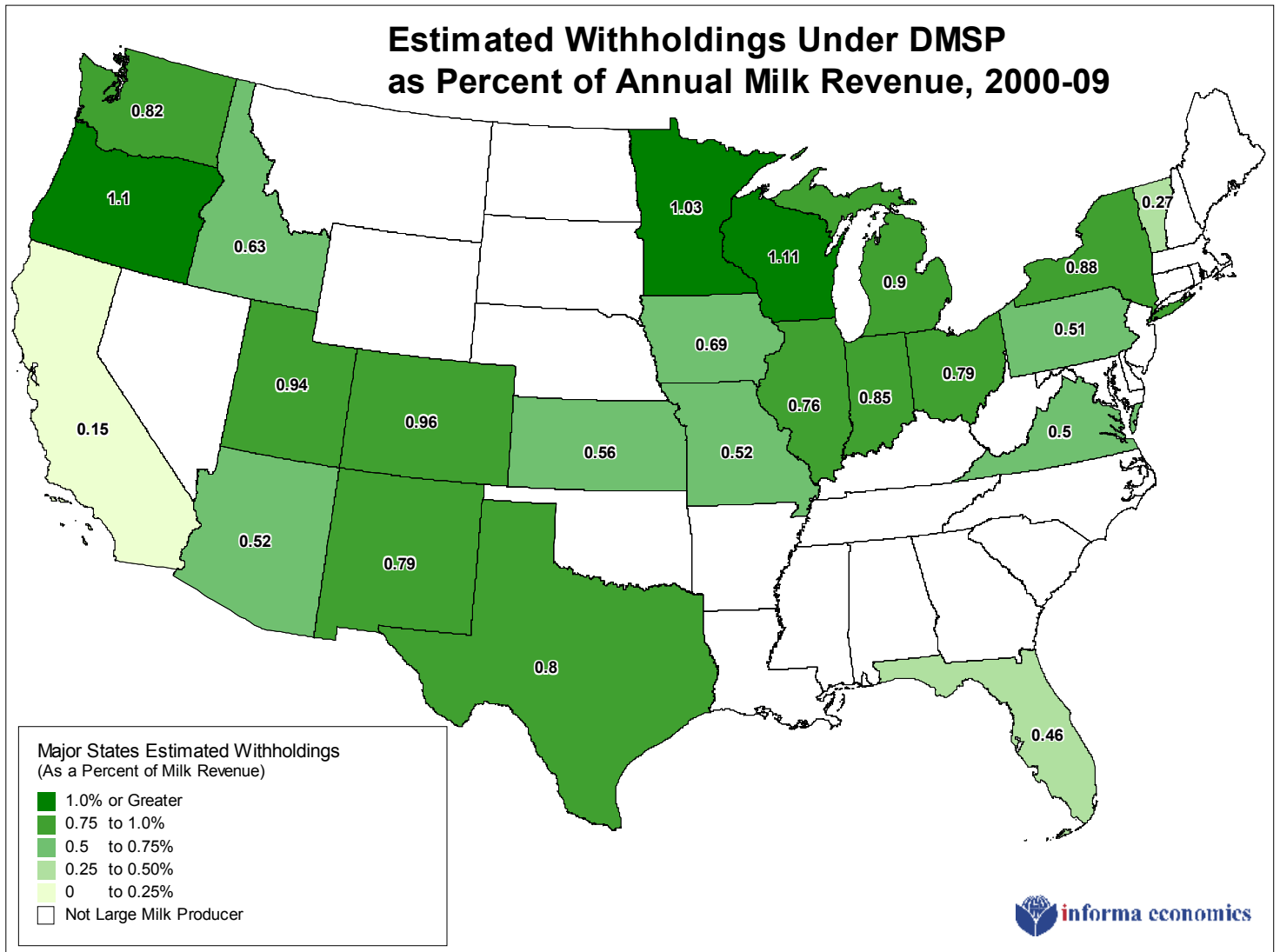


Exhibit 51: Estimated Withholdings as Percent of Marketings, 2002 (23 States)

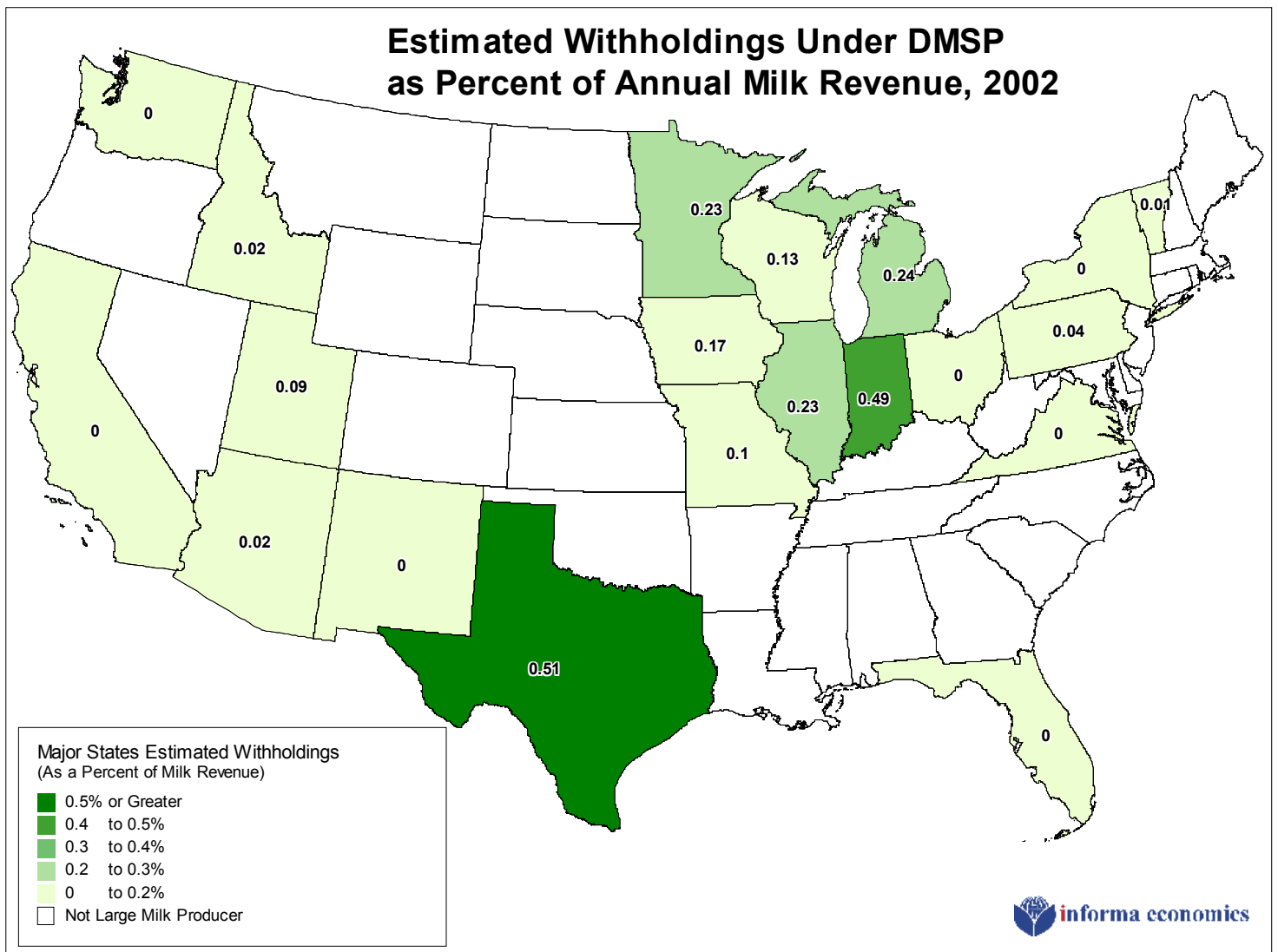
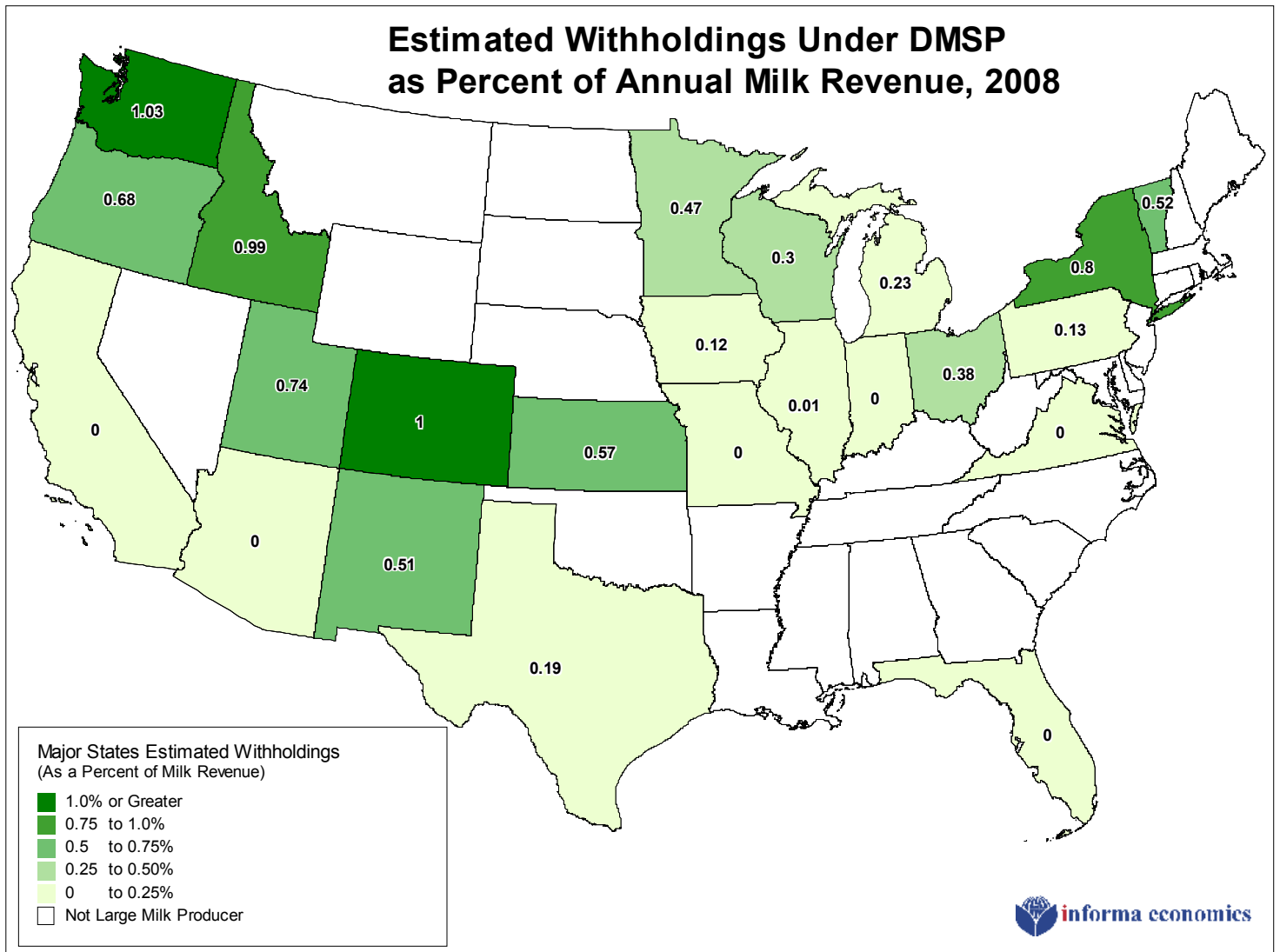


Exhibit 53: Estimated Withholdings as Percent of Marketings, 2008 (23 States)



Per Hundredweight Withholdings

Exhibit 55: Estimated Withholdings Per Hundredweight, 2000-2009 (23 States)

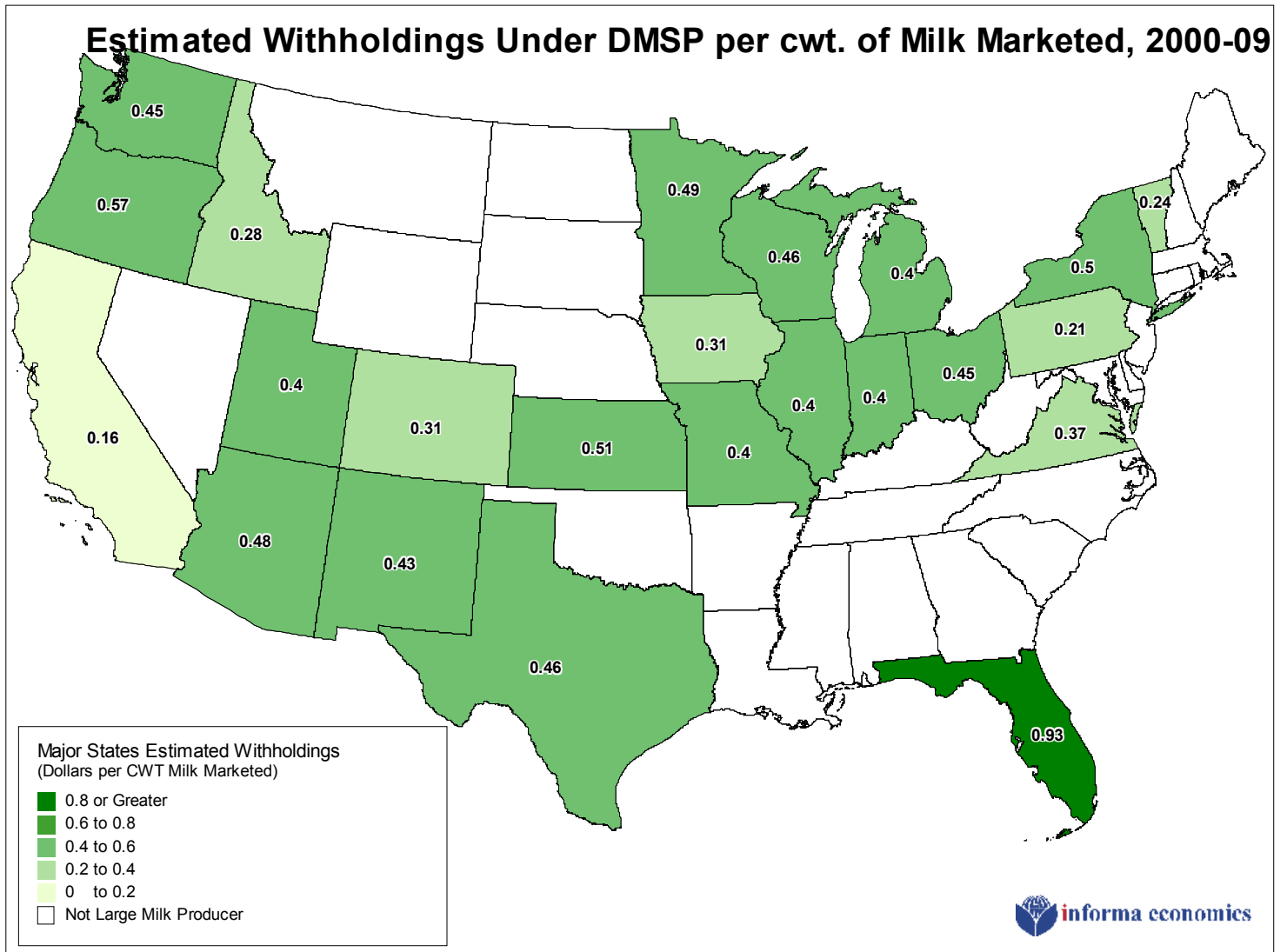


Exhibit 56: Estimated Withholdings Per Hundredweight, 2002 (23 States)

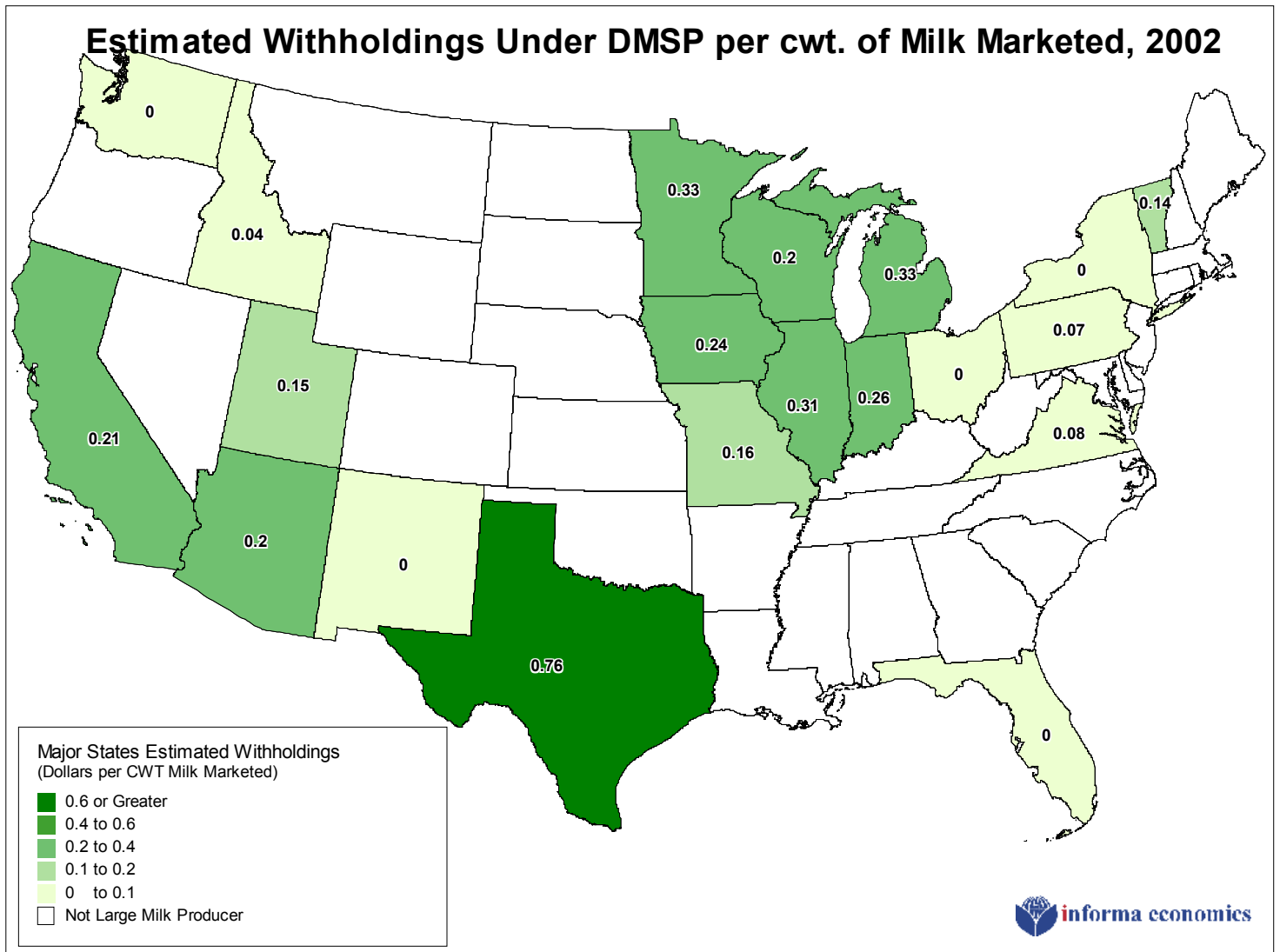


Exhibit 57: Estimated Withholdings Per Hundredweight, 2003 (23 States)

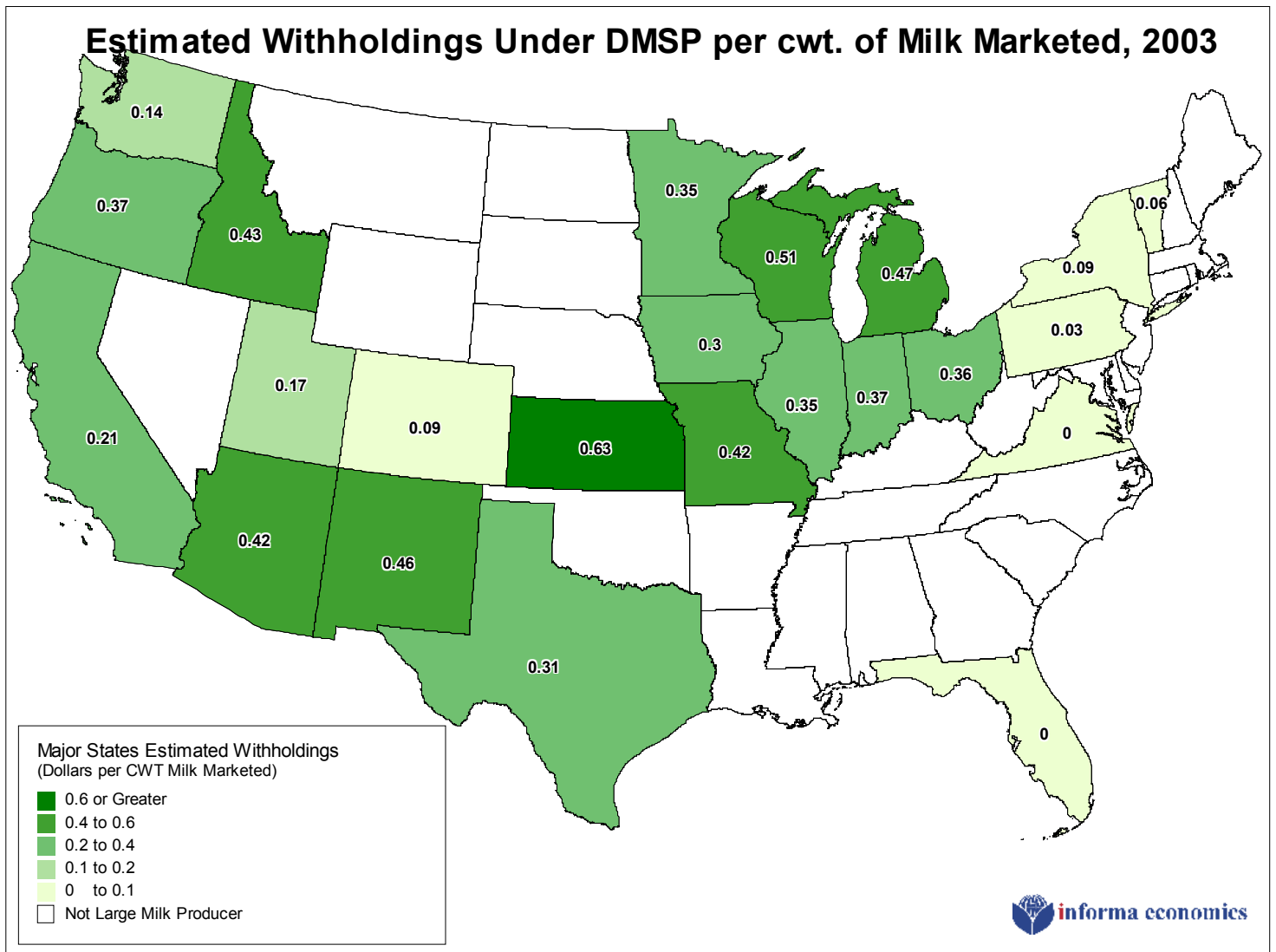
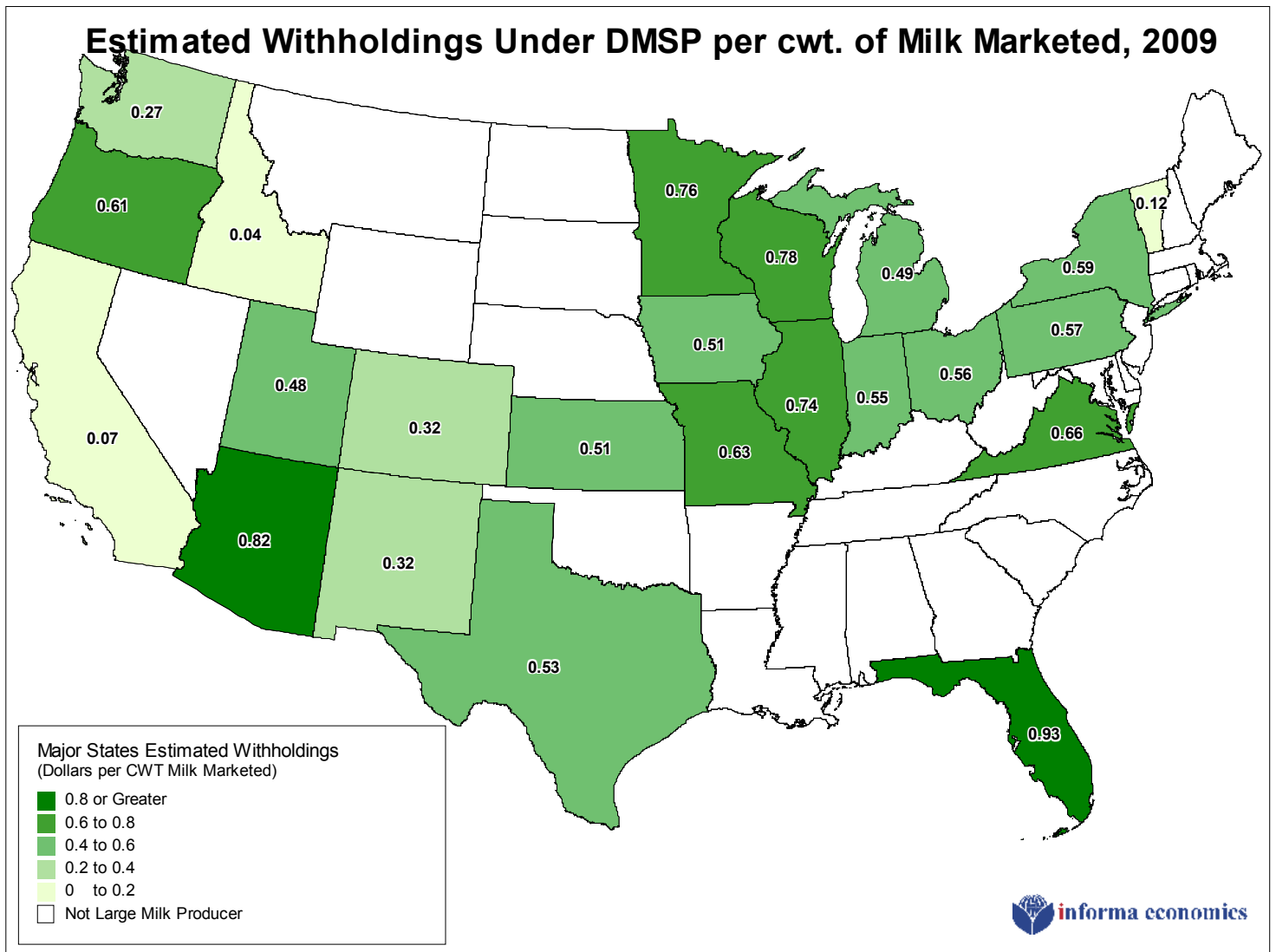


Exhibit 59: Estimated Withholdings Per Hundredweight, 2009 (23 States)



50-State Maps

Total Withholdings

Exhibit 60: Total Estimated Withholdings Under DMSP, 2000-2009 (50 States)

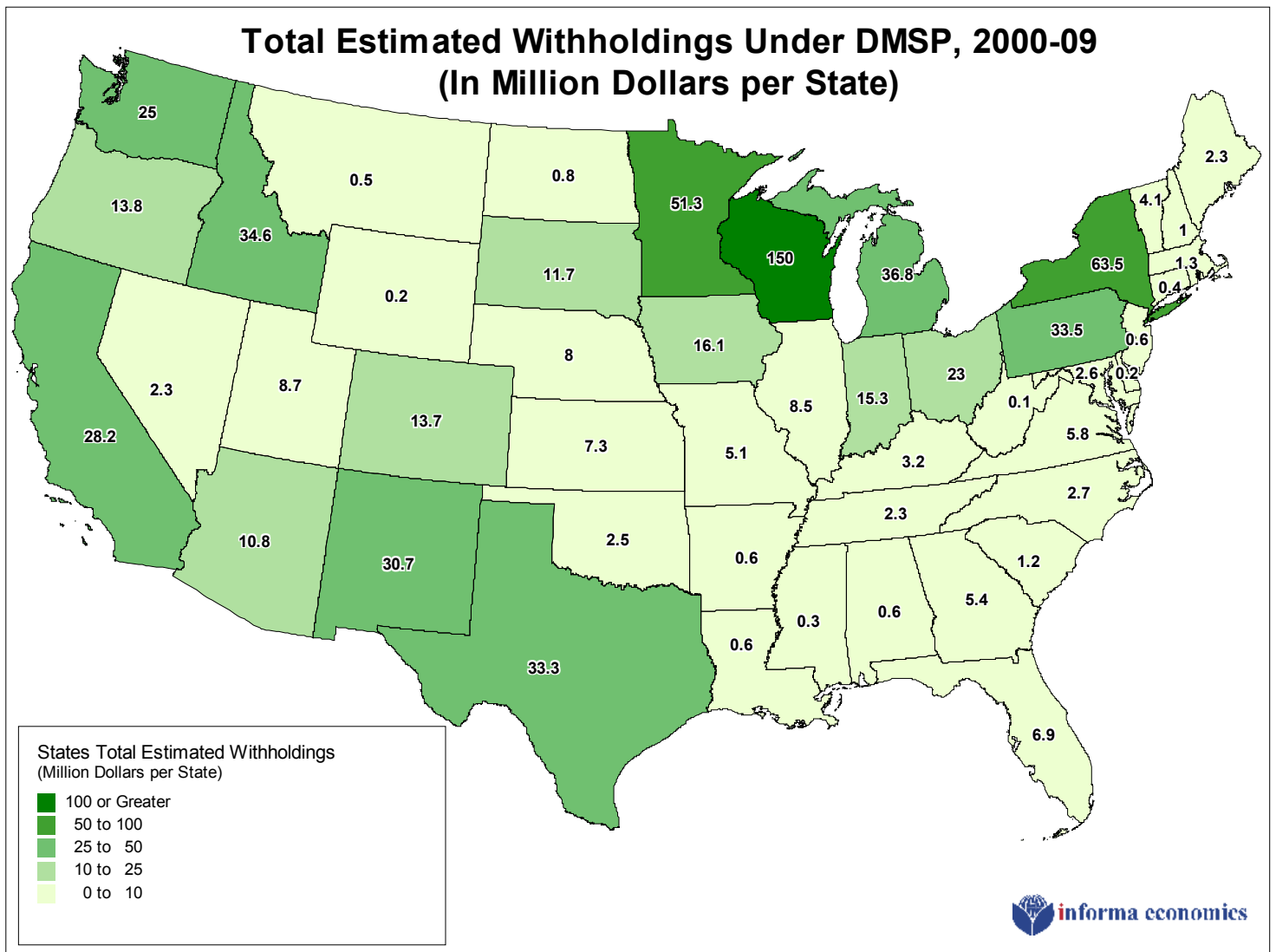


Exhibit 61: Total Estimated Withholdings Under DMSP, 2002 (50 States)

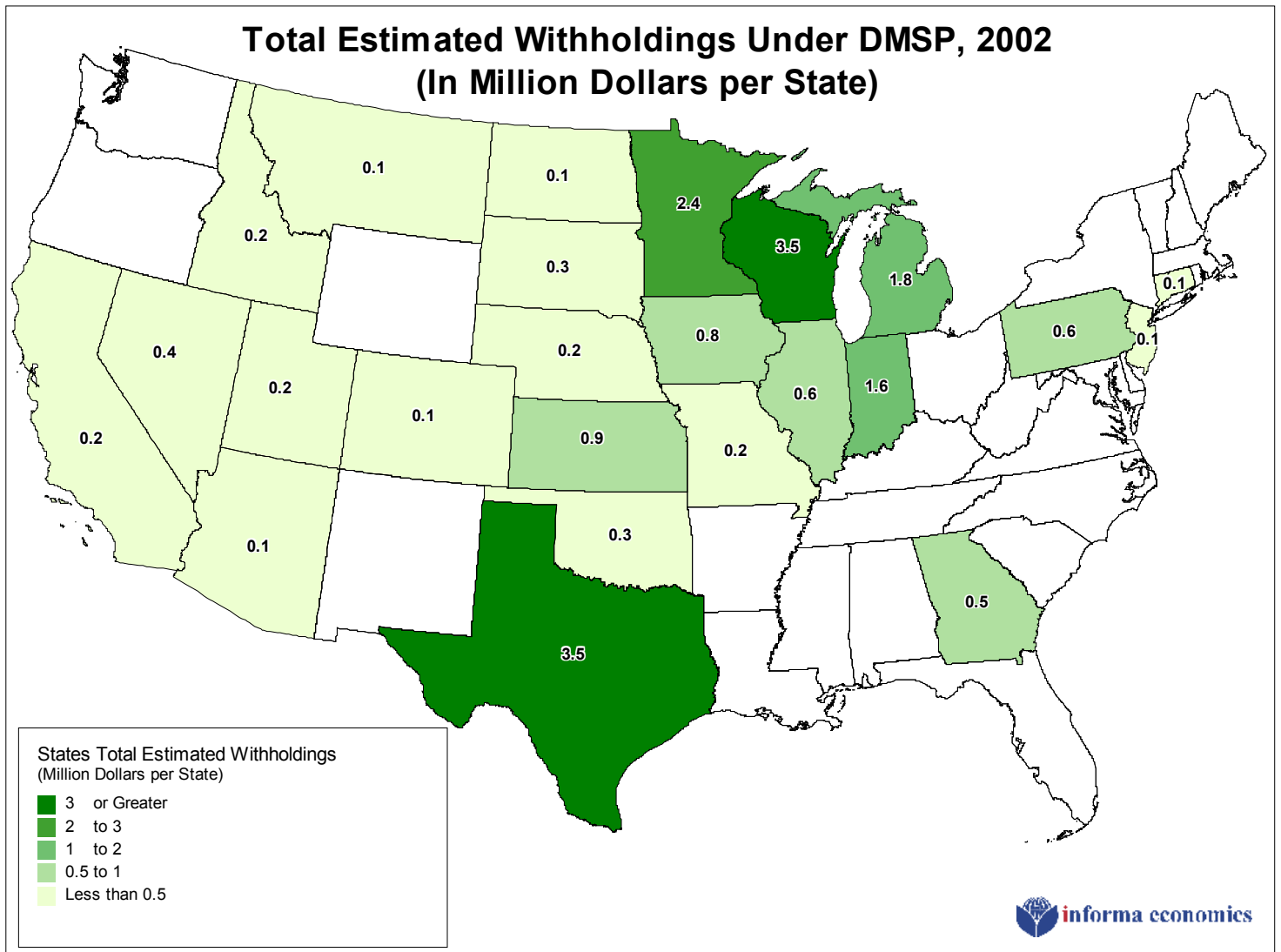


Exhibit 62: Total Estimated Withholdings Under DMSP, 2003 (50 States)

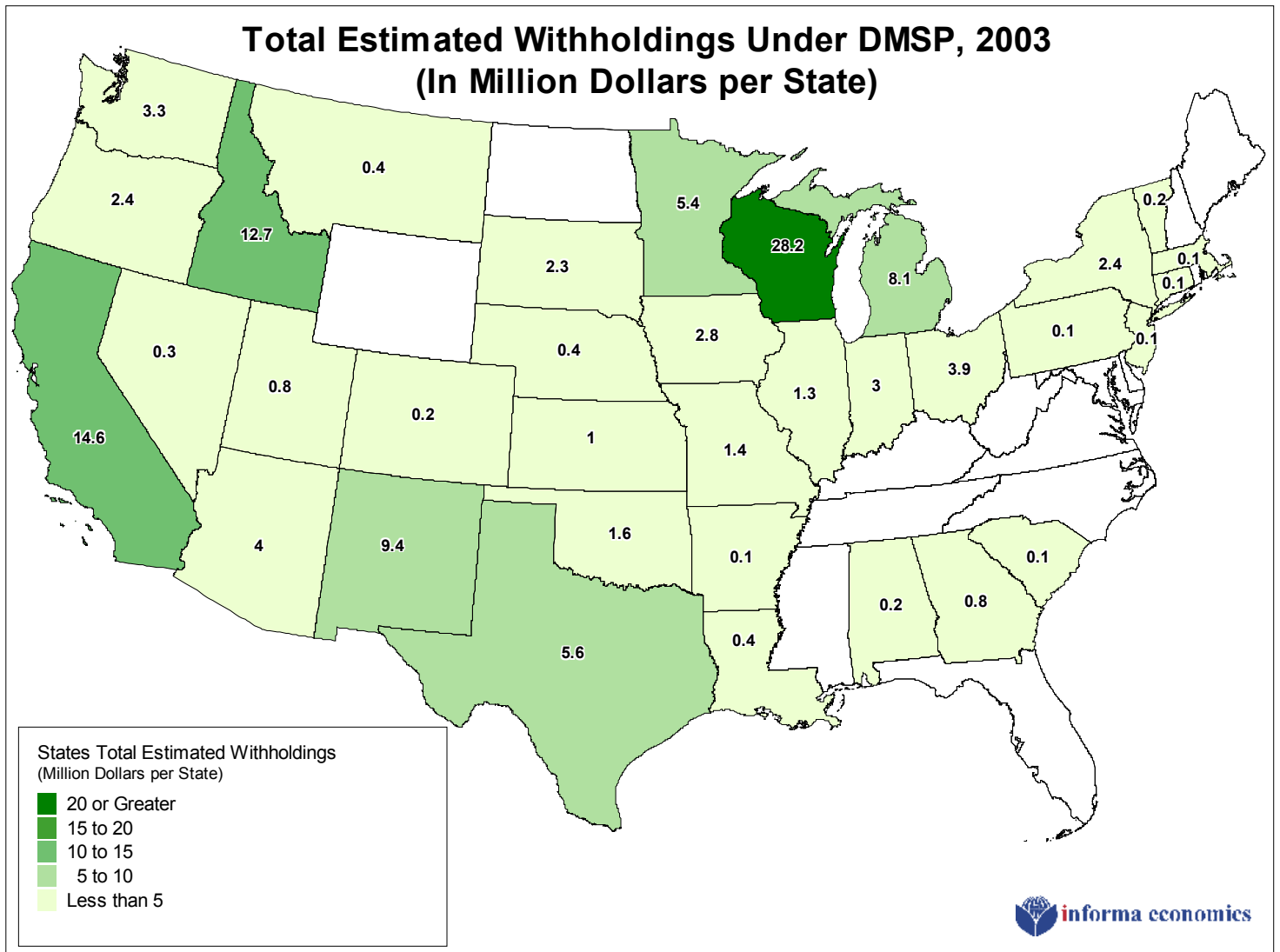


Exhibit 63: Total Estimated Withholdings Under DMSP, 2008 (50 States)

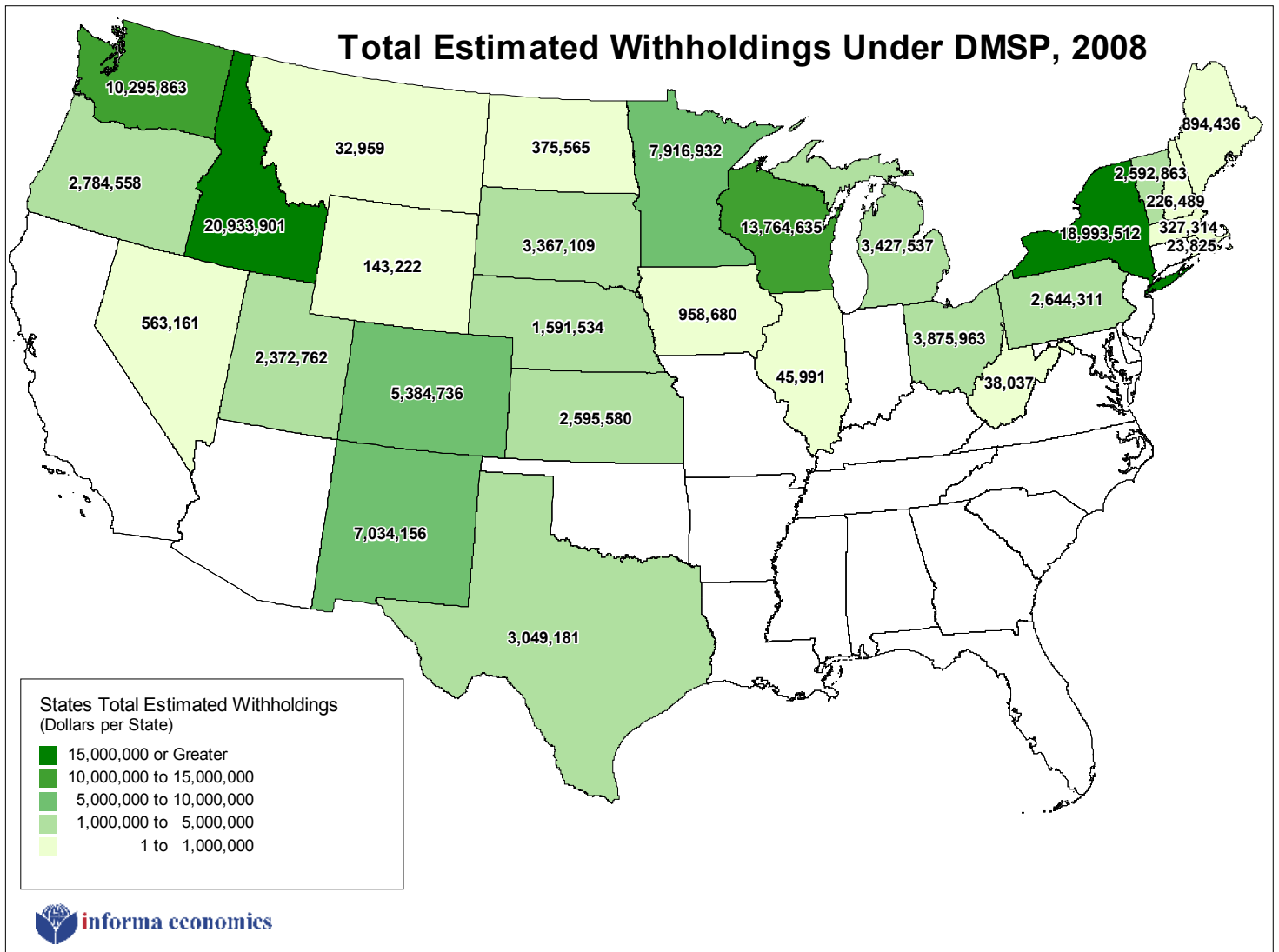
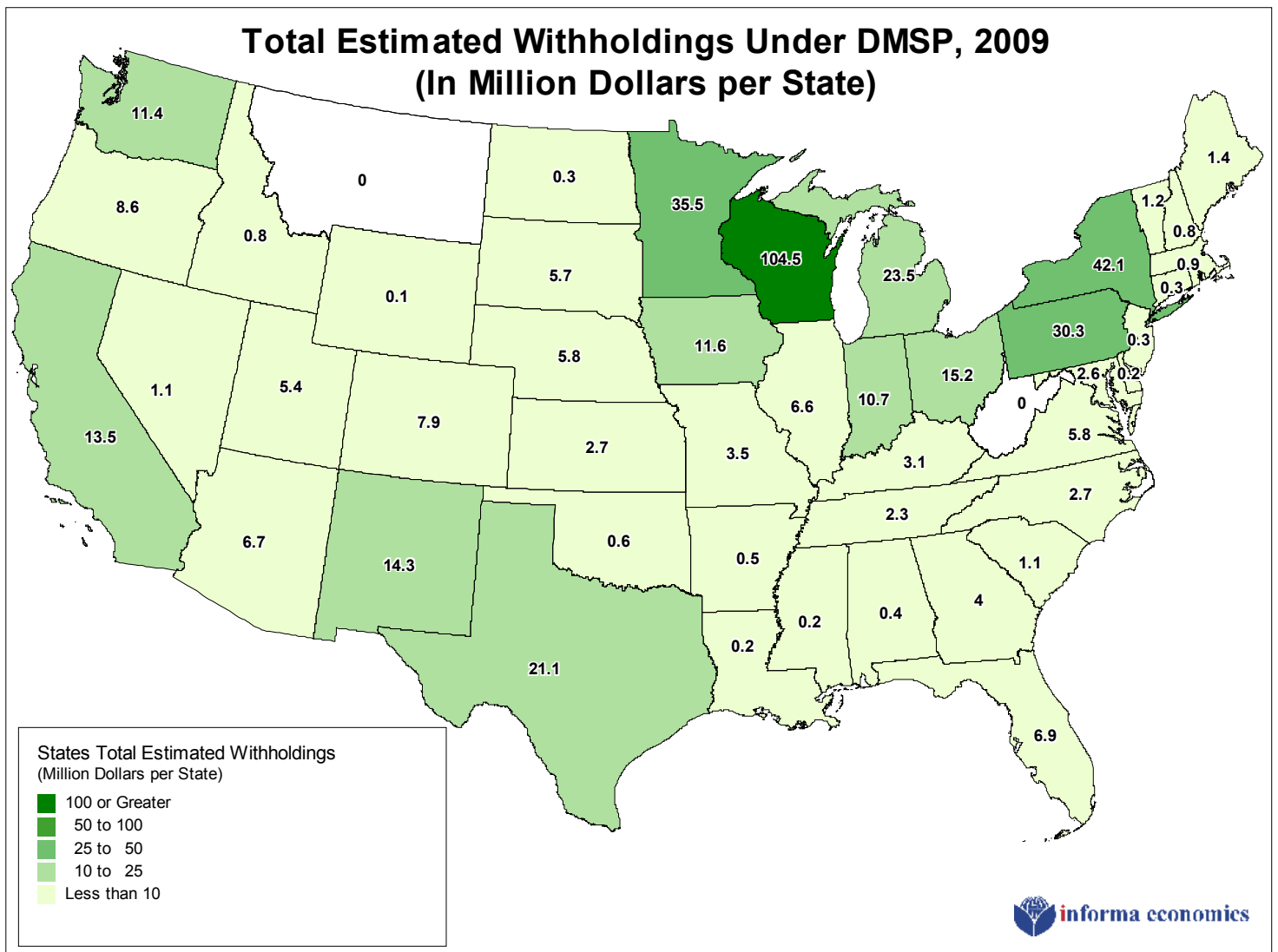


Exhibit 64: Total Estimated Withholdings Under DMSP, 2009 (50 States)



Per Farm Withholdings

Exhibit 65: Estimated Withholdings Per Farm Under DMSP, 2000-2009 (50 States)

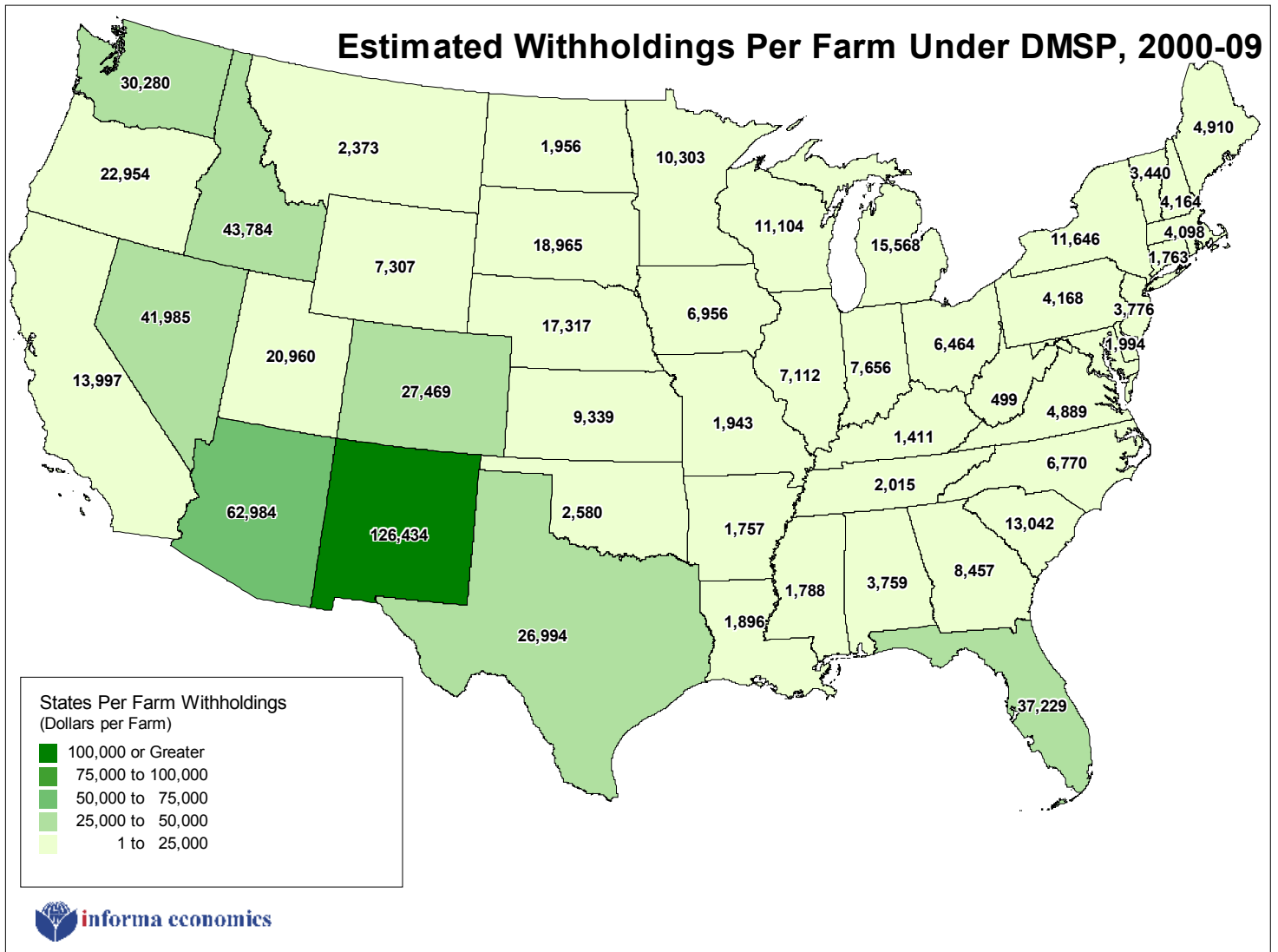


Exhibit 66: Estimated Withholdings Per Farm Under DMSP, 2002 (50 States)

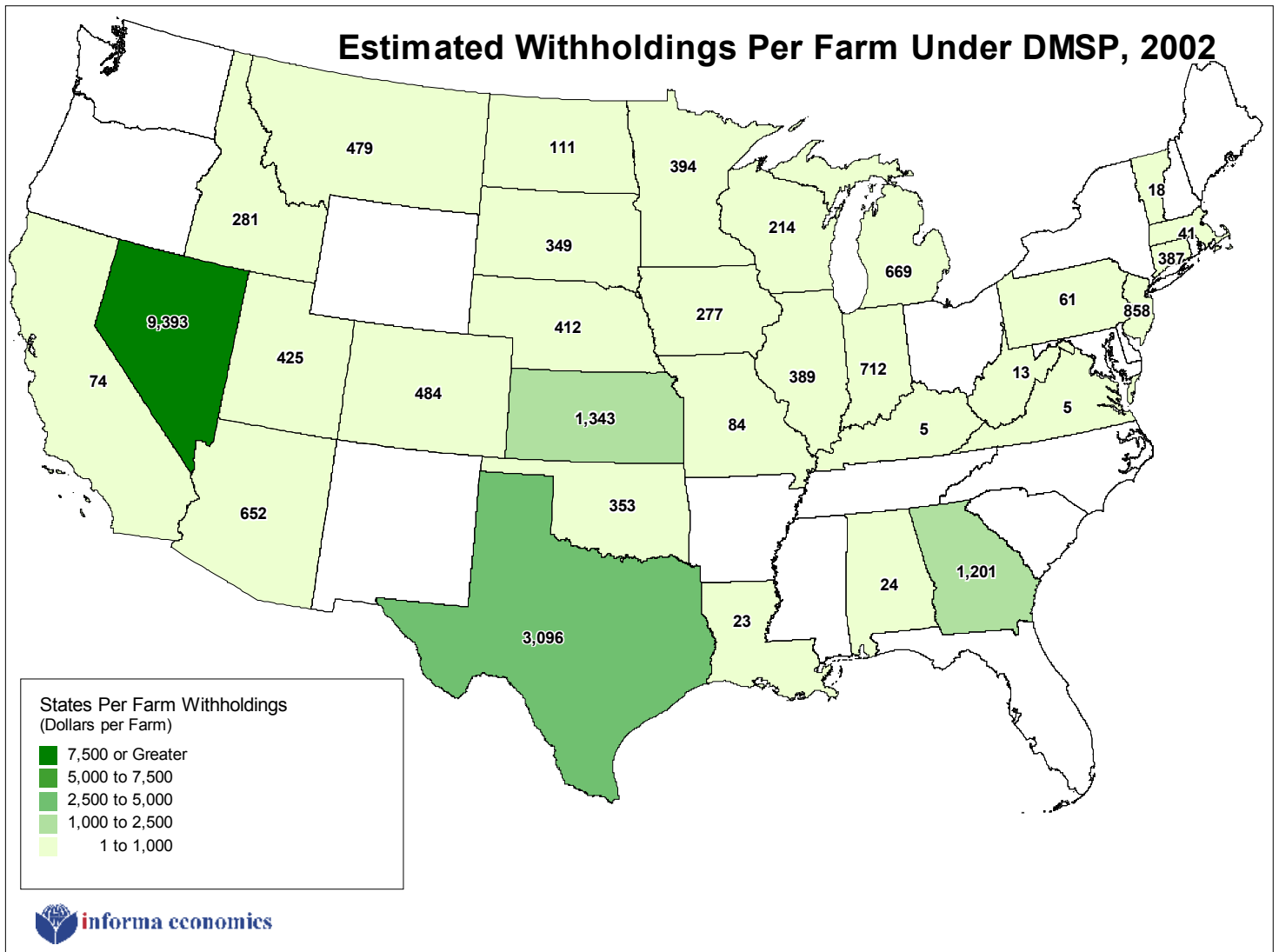


Exhibit 67: Estimated Withholdings Per Farm Under DMSP, 2003 (50 States)

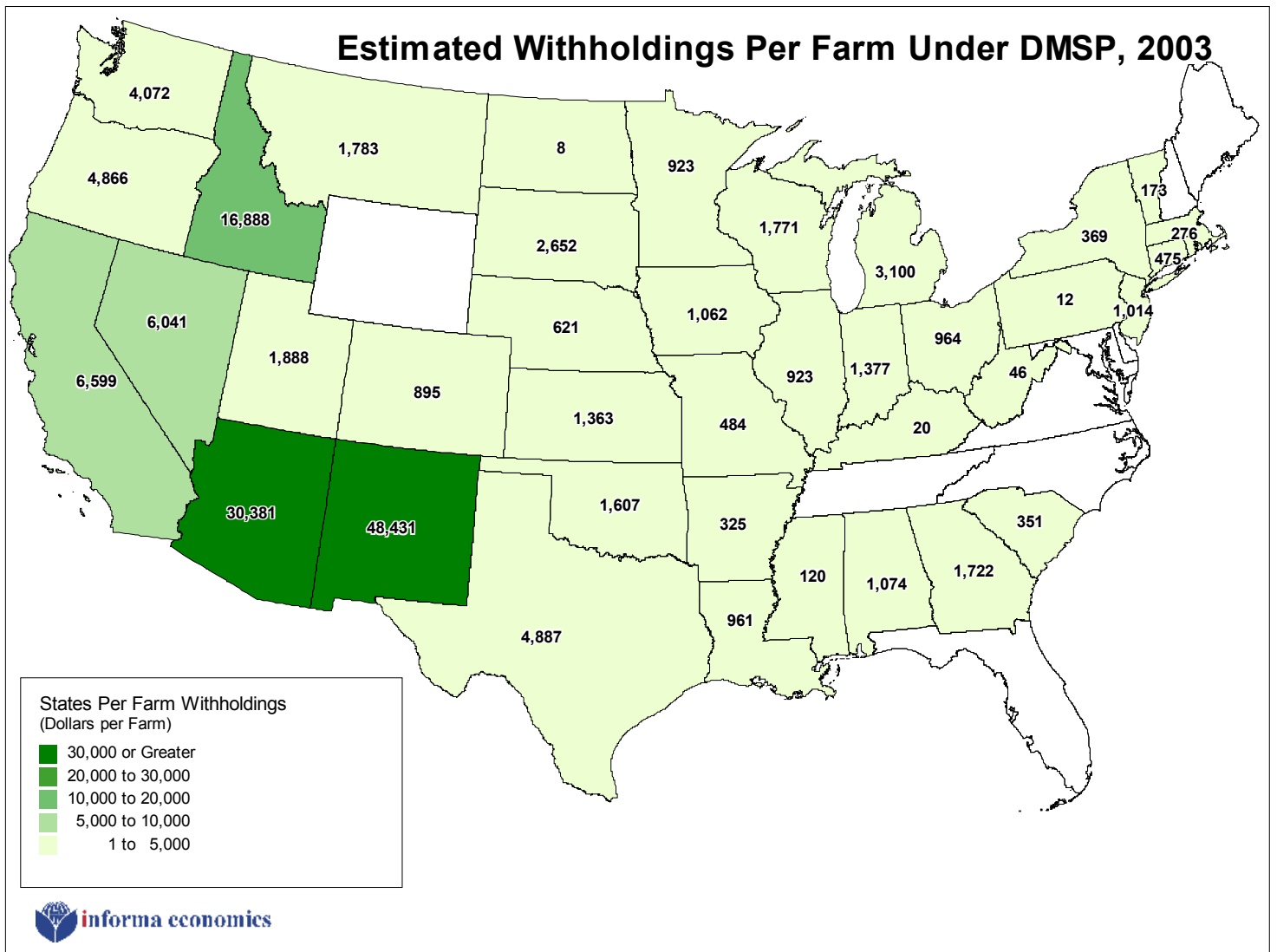


Exhibit 68: Estimated Withholdings Per Farm Under DMSP, 2008 (50 States)

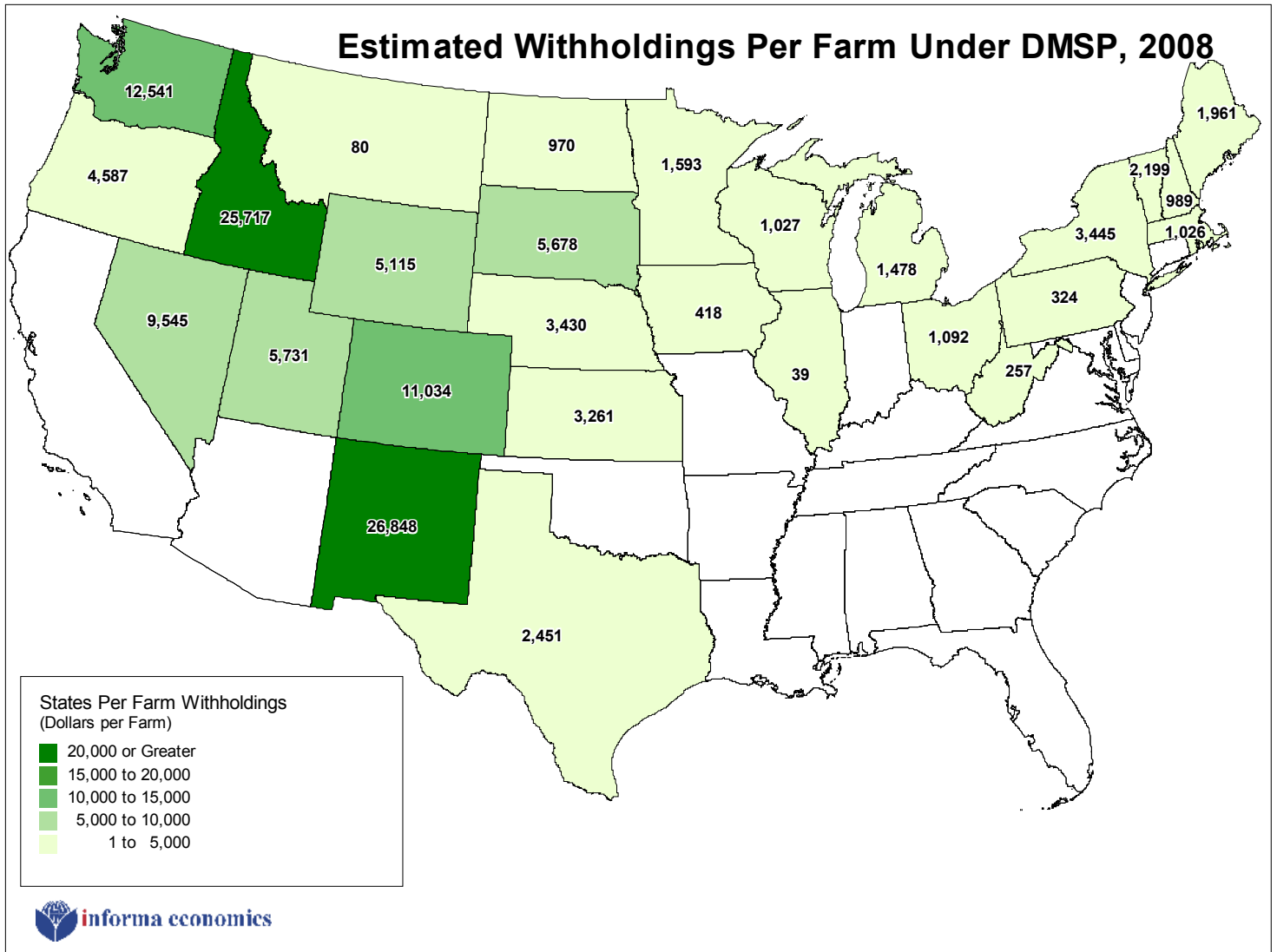
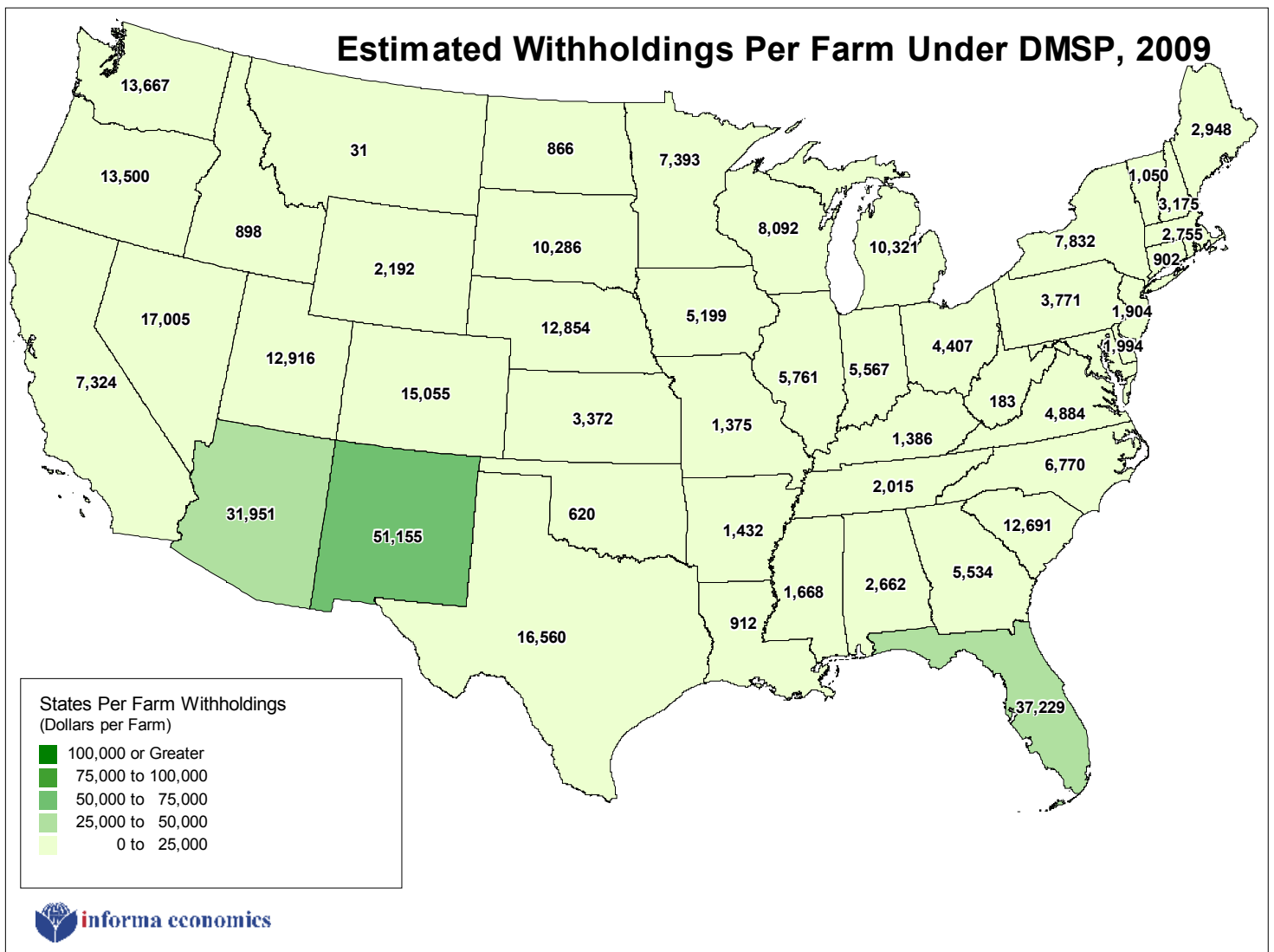


Exhibit 69: Estimated Withholdings Per Farm Under DMSP, 2009 (50 States)



Percent Withholdings

Exhibit 70: Estimated Withholdings as Percent of Marketings, 2000-2009 (50 States)

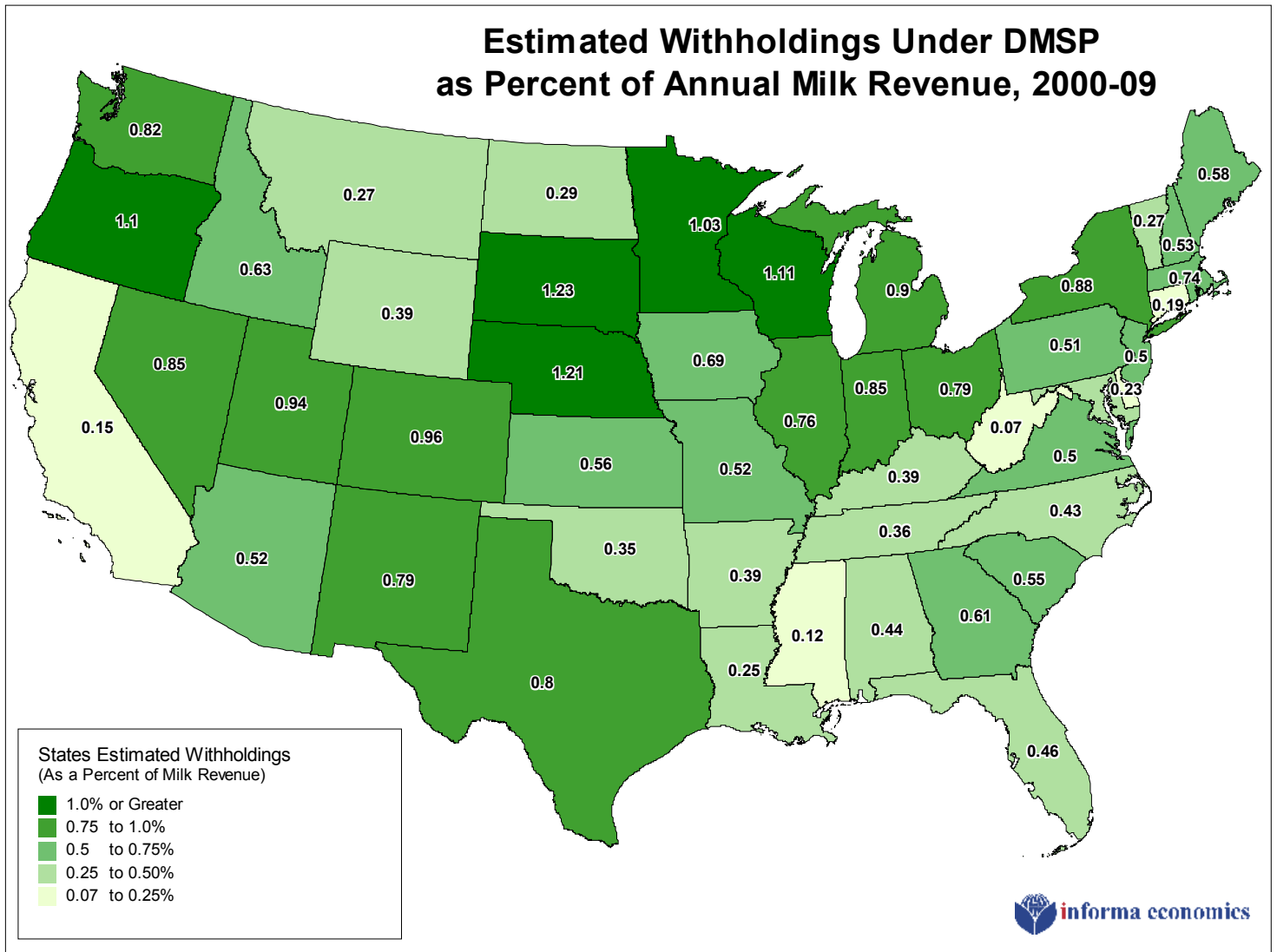


Exhibit 71: Estimated Withholdings as Percent of Marketings, 2002 (50 States)

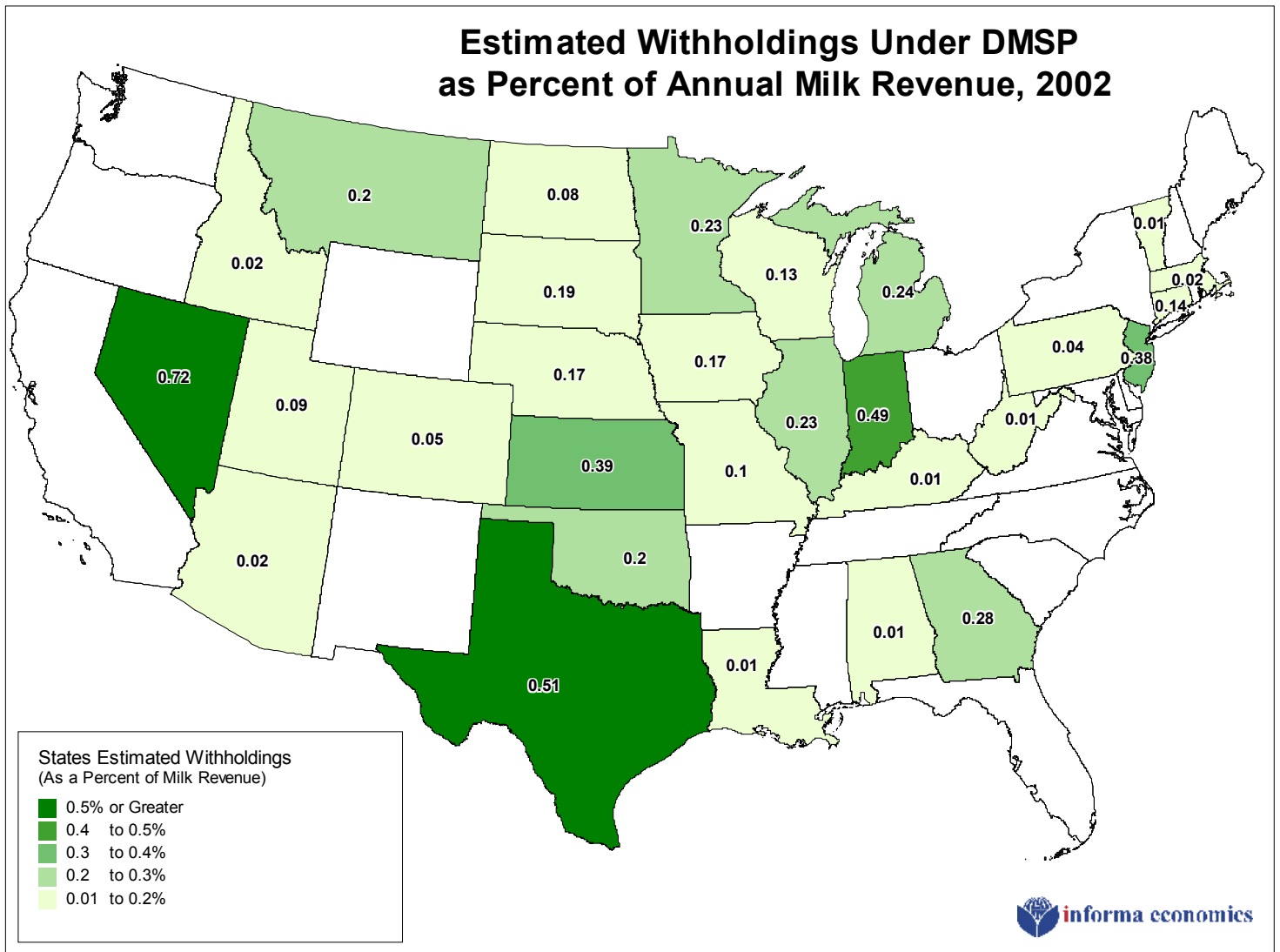


Exhibit 72: Estimated Withholdings as Percent of Marketings, 2003 (50 States)

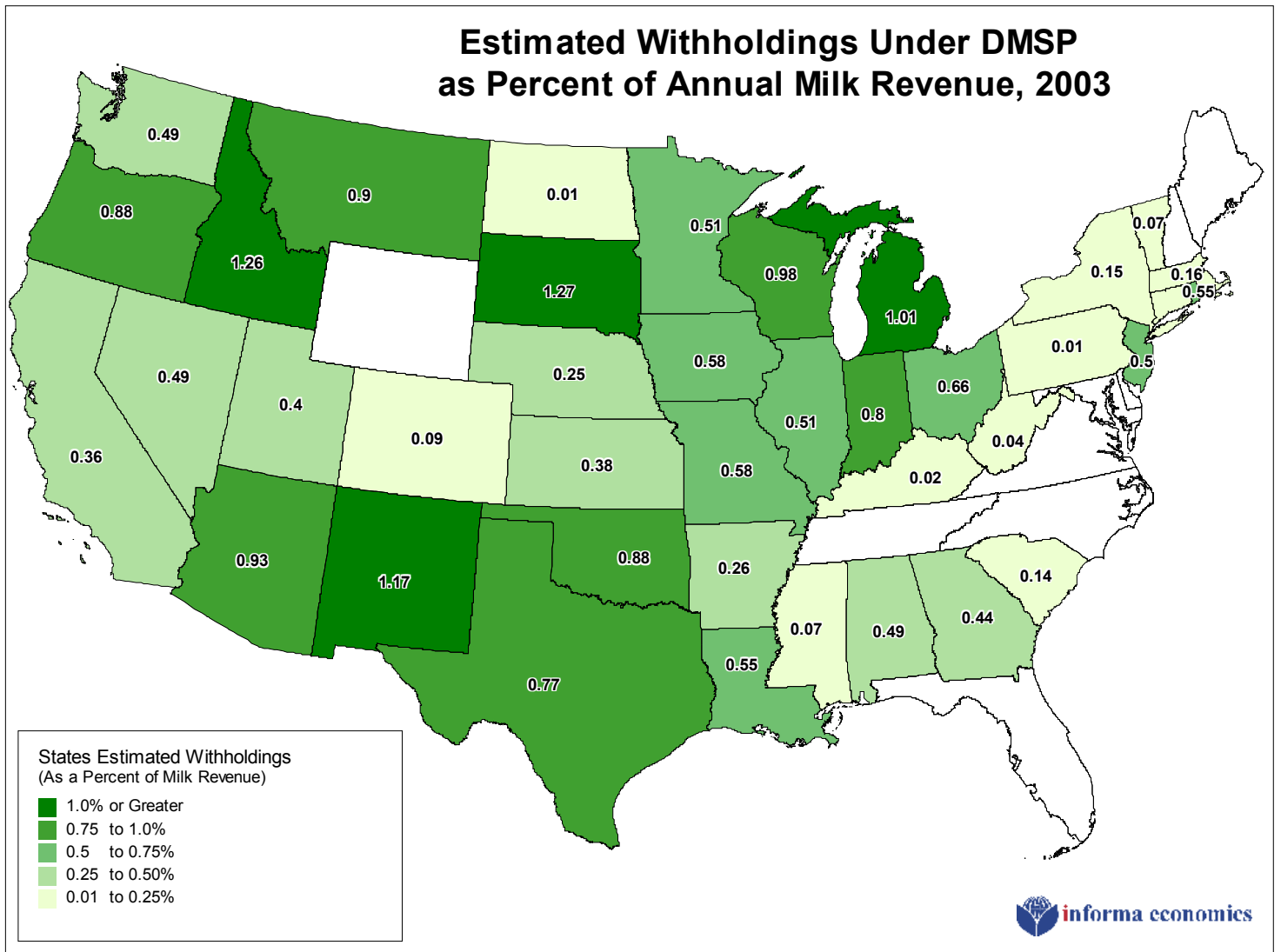


Exhibit 73: Estimated Withholdings as Percent of Marketings, 2008 (50 States)

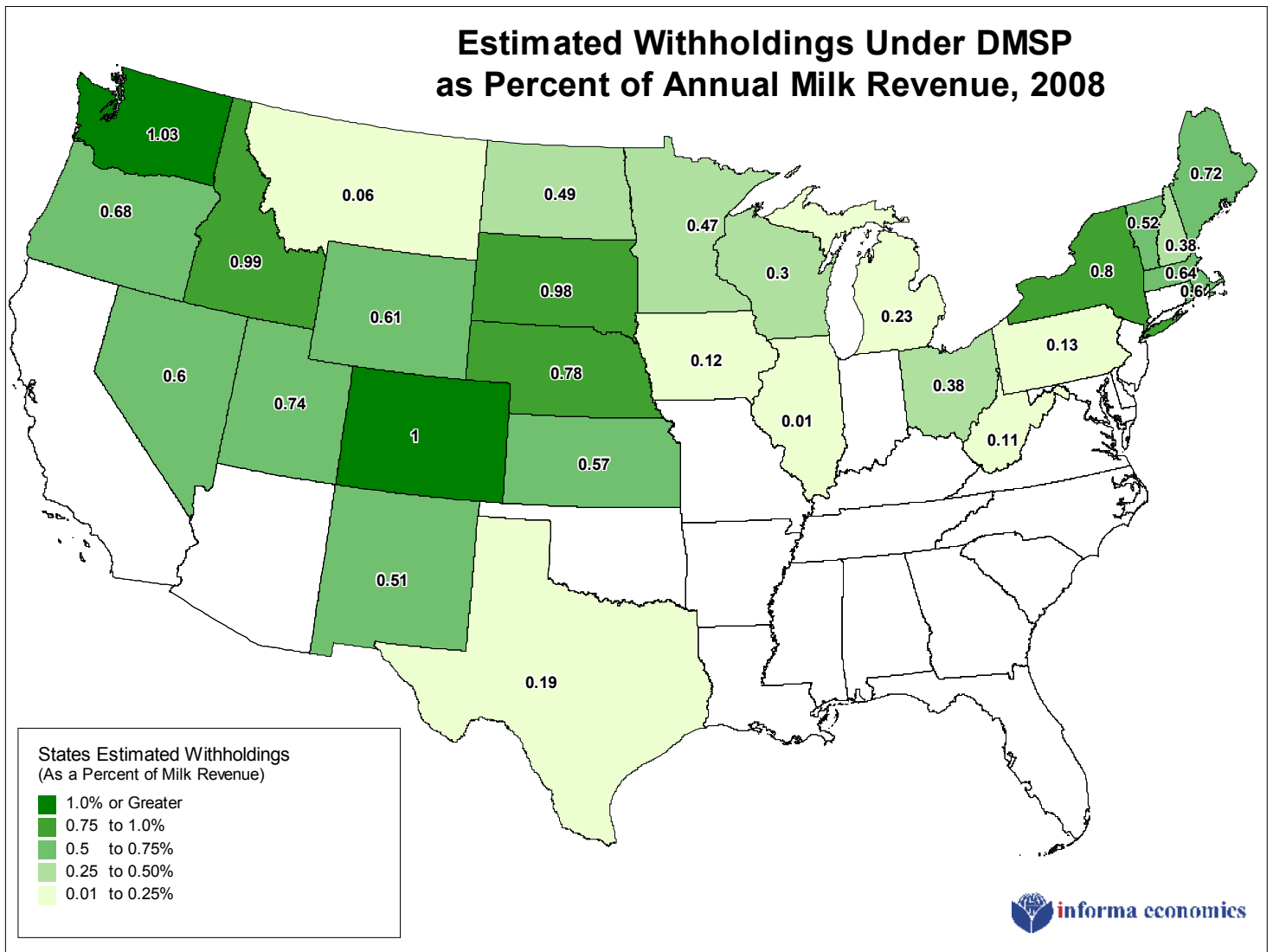
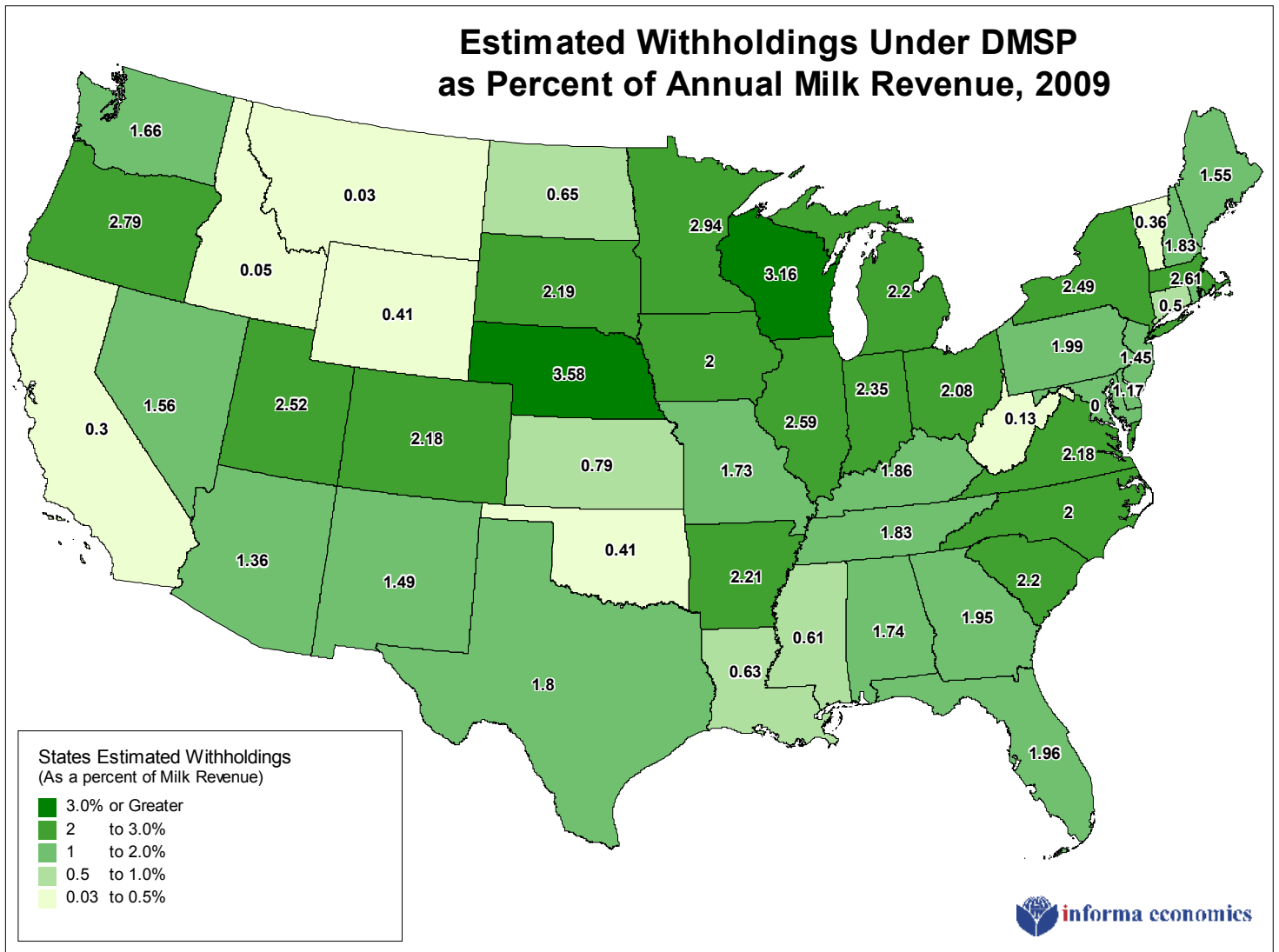


Exhibit 74: Estimated Withholdings as Percent of Marketings, 2009 (50 States)



Per CWT Withholdings

Exhibit 75: Estimated Withholdings Per Hundredweight, 2000-2009 (50 States)

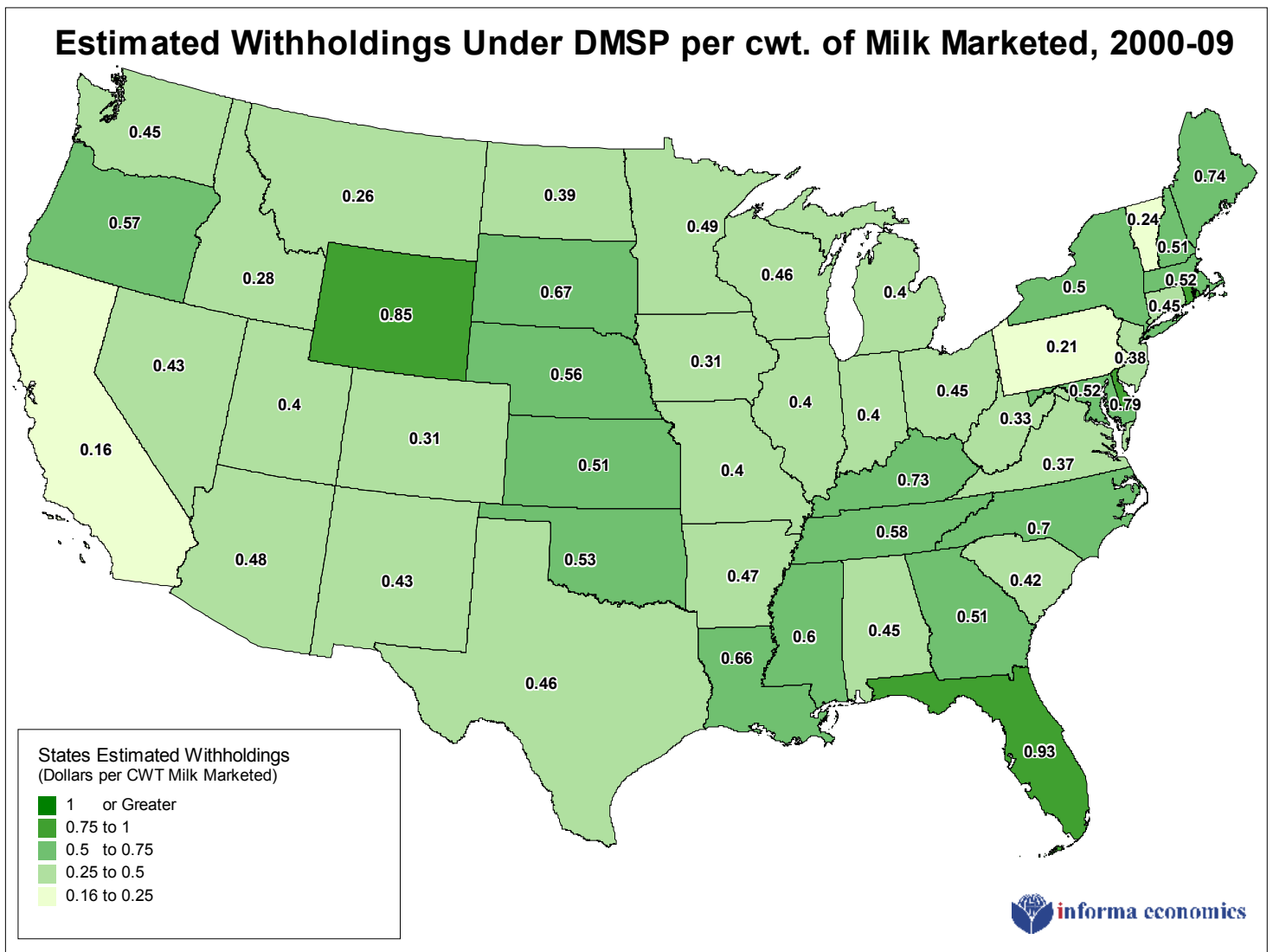


Exhibit 76: Estimated Withholdings Per Hundredweight, 2002 (50 States)

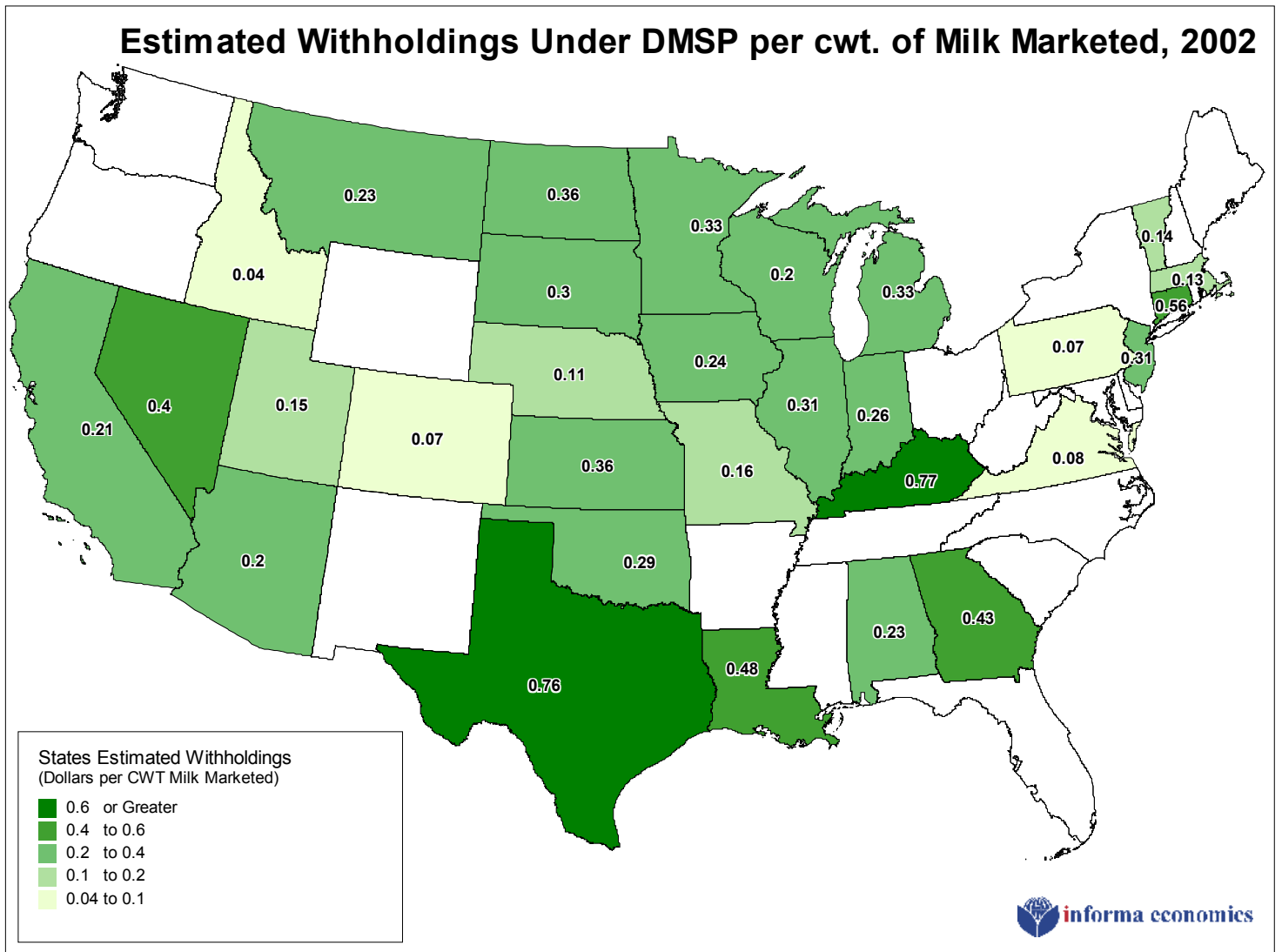


Exhibit 77: Estimated Withholdings Per Hundredweight, 2003 (50 States)

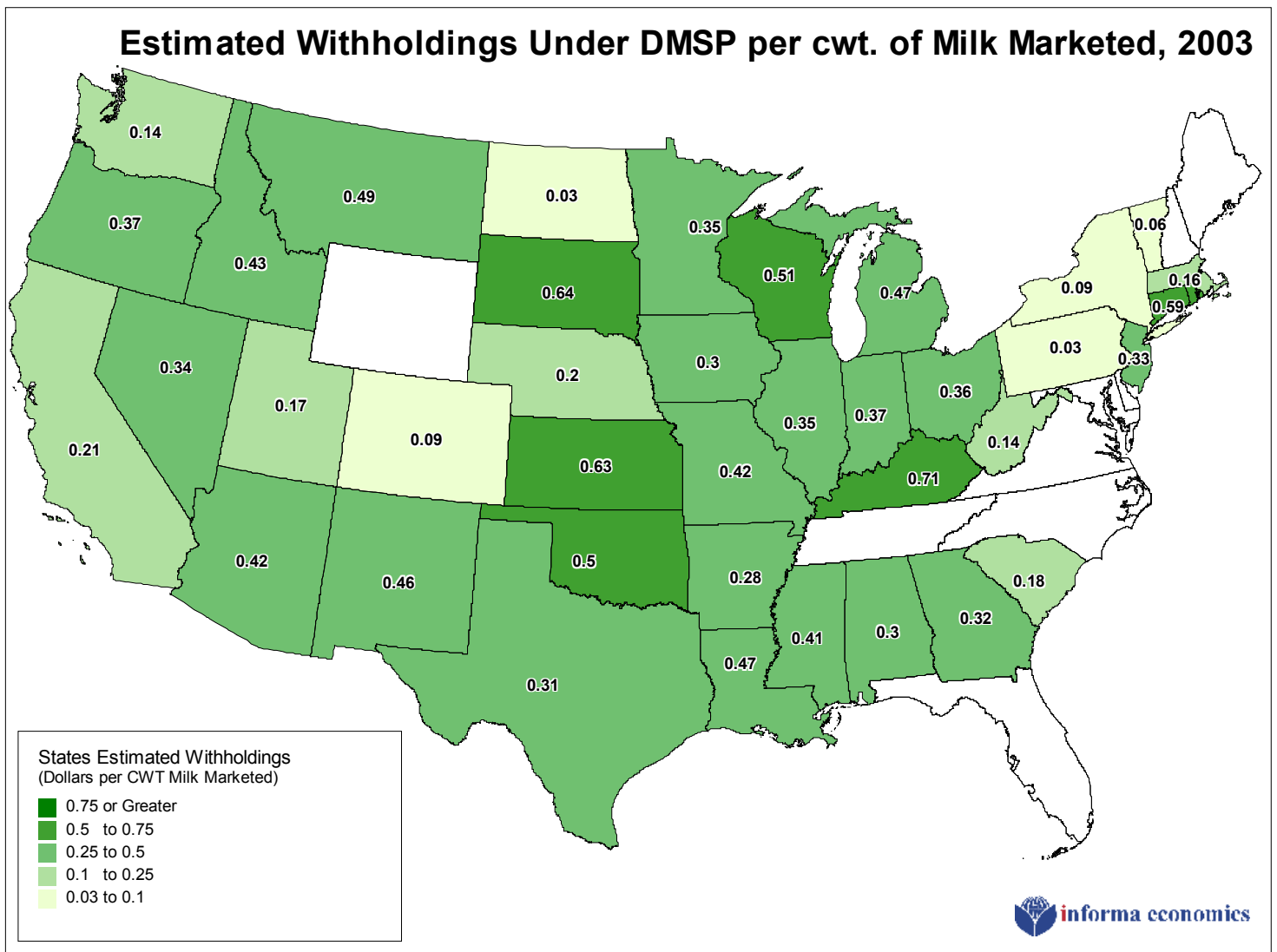


Exhibit 78: Estimated Withholdings Per Hundredweight, 2008 (50 States)

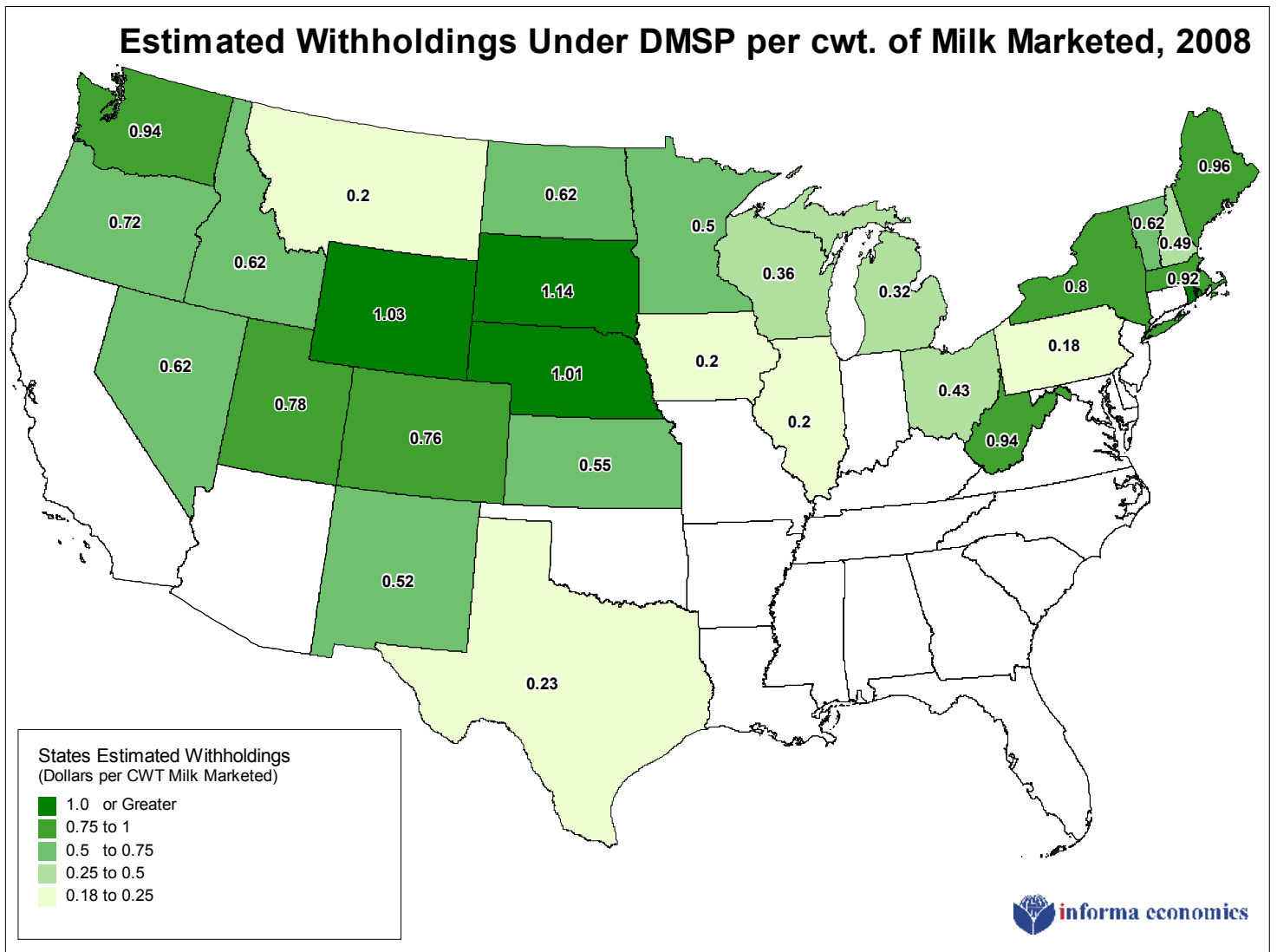
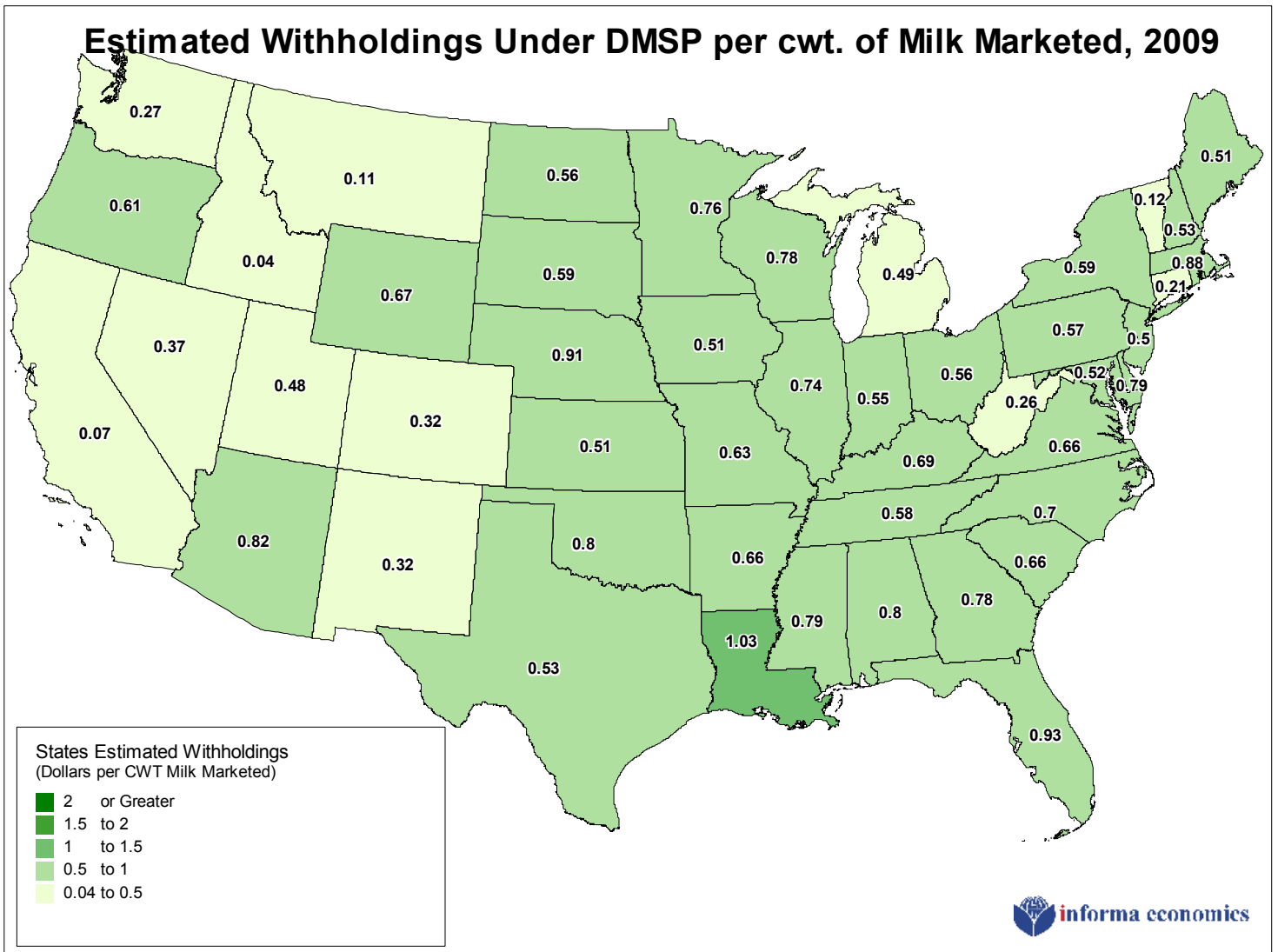


Exhibit 79: Estimated Withholdings Per Hundredweight, 2009 (50 States)



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