Responses to Additional Questions Requested by the Dairy Industry Advisory Committee

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December 6, 2010

SUPPLY MANAGEMENT

1. *Where does the "cost" of volatility mitigation from the various supply management programs show up? This is not necessarily the same as where are the rents incorporated, although would it be possible to also provide that information? It has been suggested that the cost to mitigating volatility will show up in cattle values and that the increase in milk price will result in a decrease on the balance sheet in cattle assets. What do you think of that and what would be the net increase or decrease in equity (vs. income) under supply management.*

   Under traditional quota systems of supply management where quota is a tradable asset, quota rents become additional costs of production. The relatively short period for updating production base under the DMSP component of FFTF would probably limit any capitalization of base into production costs, even if base can be sold with the farm.

   With regard to potential costs related to asset values, our analyses track the total value of farm assets, but do not track changes in land, equipment or building values over time. Cow asset values are calculated based on market values for replacement animals and cull cows. Cow asset values in our model are primarily influenced by farm profitability (Net Farm Operating Income (NFOI) across the four farm sizes). When farms are profitable, more farms seek to expand and keep more cows in their milking herds, which increases the demand for replacement animals and reduces the supply. This results in higher cow asset values (and the opposite would be true in periods of low profitability). Our simulations indicate that the <u>average</u> cow asset value during 2012 to 2019 is very similar with and without the proposed Costa-Sanders and FFTF programs (although cow asset values, like milk prices, become less variable than without the programs). This suggests that decreasing asset values will not be a major cost of price stabilization. In comparison, the Milk Income over Feed Costs for a herd of constant size increase with FFTF compared to the Baseline with no new programs, and decrease with Costa-Sanders given current program parameters. For farms that expand production by more than the allowable growth under Costa-Sanders, the program will reduce NFOI during the period in which farms are paying the market access fee (which represents a cost for those farms.)

   To the extent that the programs to mitigate volatility increase long-term average dairy product prices, they may reduce export opportunities, which can also be considered a cost.

   There will also be administrative costs for any of the programs, although these will probably not be large.

2. *What are the risks of supply management programs? What are the possible unintended consequences? What are your key data points for cost-benefit analysis—what are the things to look at? You have done a lot of sensitivity analyses. What could go wrong? How do you calculate those probabilities?*

In the movie Jurassic Park, Ian Malcolm, the mathematician, was fond of warning folks that in complex systems that "nature would find a way". Our modeling is unusually detailed because we believe that details matter. Yet, our model is a simplification of reality with many assumptions.

The supply management programs, as crafted by various industry players, have been careful to attempt to only dampen price volatility with particular emphasis on not altering long-run average prices, maintaining a competitive position in export markets and not creating intangible assets in quota value. But the supply management components of any program provide tools that could be implemented more strongly to enhance prices and confound those goals. A producer oversight board that manages a supply management program could be one of the ways that a program begins to operate in whys which were not intended.

The question of cost-benefit analysis is a good one. Few economists would be supporters of more regulation in an economic system. Most would reserve policy for conditions of market failure or social good where markets simply don't exist. The question of market failure in price volatility falls into a grey area because it is difficult to know when we have experienced "too much" volatility.

However, volatility does have a cost to businesses. It isn't specific to dairy, but John Sterman (2000) writes that the costs of instability include:

<u>Operations:</u>

More volatile and unpredictable production leads to:

- Shorter run lengths and smaller batch sizes
- More set-ups and changeovers
- Less opportunity for workers to learn and stabilize production
- Higher error, scrap, and rework rates; lower product quality
- More idle time between lots and between set-ups, lowering average utilization of capacity
- Higher capacity costs: Compared to a stable firm with the same average demand, the unstable firm requires greater capacity to handle demand peaks, raising fixed costs per unit.
- Less reliable deliveries and longer delivery times, especially during peak periods, leads to expensive and disruptive expediting of production and use of premium freight to expedite delivery of late orders.
- Low delivery reliability, long delivery times, and lower quality also erode the firm's reputation and attractiveness, reducing demand.
- The customers lost most readily are those most interested in and willing to pay for delivery

reliability and product quality. Unreliable firms often lose "primary supplier" status with large customers, who will use them only when their own primary suppliers are overloaded. The result can be an increase in the volatility of orders. further disrupting operations.

- The customers lost most readily are those most interested in and willing to pay for delivery reliability and product quality. Unreliable firms often lose "primary supplier" status with large customers, who will use them only when their own primary suppliers are overloaded. The result can be an increase in the volatility of orders, further disrupting operations in a positive feedback.
- To compensate for volatile and unpredictable demand and production requirements, the firm may need higher average inventory levels, raising average holding and storage costs, and increasing the risk of product obsolescence and subsequent write-down.
- The firm will need higher peak storage capacity for inventory (materials, WIP, and finished goods), or will have to buy additional storage capacity during periods of excess inventory, raising average holding costs per unit.
- Equipment reliability will suffer: during booms, there is strong pressure to defer planned maintenance to avoid shutting operable equipment down. During recessions, there is strong financial pressure to avoid maintenance-idle equipment can be cannibalized for parts when operating equipment fails. Eventually equipment availability and quality suffer, and maintenance costs rise.

Suppliers:

- More volatile and less predictable operations lead to smaller and less predictable orders for materials and parts. Supplier delivery reliability will suffer and their costs will rise for the same reasons discussed above. These costs will be passed on to the firm in the form of higher prices for materials and parts.

Labor:

- Unstable operations lead to more setups and changeovers, more disruption on the production floor due to expediting, and therefore lower average productivity because worker have less experience with particular operations and less time for quality improvement and learning.
- During booms, overtime costs will rise; during recessionary periods, labor is underutilized.
- The firm will require a larger and more expensive human resources organization so that it can hire rapidly during booms and fire rapidly during recessions.
- Rapid hiring during booms dilutes experience and average worker quality, cutting productivity.
- Average worker quality will fall as employees at unstable firms face higher risks of unpredictable layoff and are attracted to firms offering greater job security.
- To attract high quality workers despite the risk of layoff the film may have to increase wages.
- Unstable firms with high frequency of layoffs are more vulnerable to organization by unions and other labor actions that disrupt operations.

- If enough firms in an industry or region are unstable, taxes may rise to fund state administered unemployment compensation and other social safety net programs.

Financial Markets:

- Unstable firms have less access to capital and higher capital costs.
- In the debt market, volatility lowers a firms credit rating and increases the premium over the prime rate it must pay.
- In the equity markets, unstable earnings raise the volatility of a firm's stock price; with higher 'betas' (the ratio of the variability of the firm's stock price to the general market), the higher the average return on equity investors demand, the lower the average stock price and the higher the firm's cost of capital in the equity markets.

Management:

- Management attention in the unstable firm is diverted to coping with the instability: expediting; dealing with machine breakdowns; responding to angry customers, suppliers, workers, and investors; etc. Consequently, management has less time to devote to product development and scanning the environment for new technologies, changes in competitor strategies, merger and takeover opportunities and threats, changes in government regulations, etc., all lowering competitiveness and growth opportunities, and increasing the firm's vulnerability to changes in the environment.
- Career opportunities for talented managers in the unstable firm are less attractive, lowering the average quality of management or increasing the premium the firm must pay to attract and retain talent.

Marketing:

- Unstable firms with lower delivery reliability, quality, etc., will find it harder to sell. The effectiveness and quality of the sales force may fall, advertising expense may rise, and most importantly, the firm may be forced to give concessions on price compared to more stable competitors.

Pricing

- Lower average prices denies resources to the firm that could be invested in new product development, process improvement, and other resources or programs that could boost the competitiveness and growth of the firm. As the firm's products become less innovative and its ability to sell and service declines, the firm's product attractiveness falls further, leading to more pressure for price cuts and potentially creating a death spiral leading to the demise of the firm.

These costs are increasingly being born by the dairy sector as milk price volatility has increased.

3. *Do your models include an investment component indicating the attractiveness of the industry for growth? In particular, could it be assumed that if there is a situation where profitability is unchanged and risk is reduced (as projected in most of the risk management results) then the industry is more attractive for investment by farmers or outsiders and that those additional resources would push prices or margins down.*

4. *Do the models incorporate risk return tradeoffs in any way?*

We will address questions 3 and 4 together. Our model modifies the rate of farm exits in response to price variability. Reduced price variability would increase the number of farms and therefore milk production, but this effect is small in the short run and can be offset by changes in profitability in the long run. In addition, variation in the level of expected NFOI will modify farm-level decisions about expansions and exits. We do not incorporate a specific additional response of supply because of reduced variation (in contrast to expected level) in profitability. One justification for this is that dairy farms do not appear to be strongly risk averse based on the limited current use of risk management tools under significant input and output price variability. This would imply that risk reduction would not markedly increase milk supplies. If dairy farmers are in fact more risk averse than it appears, the additional milk supplies could result in a reduced average milk price compared to our results, but would also probably further reduce variability.

5. *Will there likely be a long-term decline in average returns to farming if risk is reduced?*

Economic theory would suggest that firms profit maximize where marginal costs equal marginal revenue. Real participants in the dairy business seldom know exactly where those costs and revenues are because they are moving all the time. The model that we have constructed has producers responding to net farm income over operating costs. In other words, if it becomes more profitable (because milk prices have increased or cost of production have decreased or some combination of the two) to produce milk, then dairy farmers have the incentive and the wherewithal to increase production. The model uses an extrapolative expectations value which uses past profitability and a trend to make long run expansion decisions. Average returns are not expected to decline in the long term.

FARM SAVINGS ACCOUNTS

1. *The Farm Savings Accounts analysis documents states that the volatility mitigation from FSAs is similar to that of the classic supply management programs. Can you provide more detail around that statement?*

Our analysis of FSAs was an initial assessment that makes a number of important assumptions about the nature of the program and the behaviors of farmers. (These assumptions are described in greater detail in the document submitted to the committee, and undoubtedly could be further refined.) Under different assumptions about the proportion of dairy farmers participating in a voluntary FSA program, the average absolute deviation from the average US All-milk price (one measure of price variation) during the period 2013 to 2019 ranged from $0.91/cwt to $1.65/cwt for scenarios that included export demand and feed cost shocks. For comparison, the FFTF and Costa-Sanders programs with these same shocks had average absolute deviation from the average US All-milk price for 2013-2019 equal to $1.13/cwt and $1.25/cwt, respectively. This indicates that if dairy farmer participation in voluntary FSAs is high enough (and our other assumptions about program structure are appropriate), FSAs have the potential to reduce price variation to a degree

similar to that of FFTF and Costa-Sanders.

2. *What do you think of the cost-benefit of supply management vs. FSAs?*

   The modeling of the FSAs was not done as completely as conducted as was the supply management proposals. However, we do think that FSAs do have the capability to reduce volatility by altering producer investment decisions.

   Economic literature has many examples that demonstrate that it takes a bigger "carrot" than a "stick" to elicit the same outcome. So, we might imagine that the carrot of FSAs would have to be much stronger than the stick of supply management to moderate milk price volatility.

3. *What are the potential risks (unintended consequences) of FSAs?*

   One main concern with FSAs is that they have attracted limited interest as a policy option in the past, in part because the incentives to participate apparently need to be very large to elicit producer buy-in. If the incentives need to be large, the costs to the government could be considerable (although our analyses suggest that these costs can still be lower than under current programs). Another potential effect is that input suppliers (who might have benefitted from purchases designed to put money back into the farm business rather than pay taxes on it) may see lower sales in high-profitability years.