Market price support measures in the dairy sector

Scenarios testing potential effects on trade and prices

February 2025

SENSE PARTNERS
DATA LOGIC ACTION

1. Context

Governments frequently intervene in food markets, to support farm incomes or stabilise volatile prices.

The idea is that governments pay a fixed price for product when the market price is low, store the product and then sell it when market prices have recovered. In theory the net effect on producer prices is neutral.

These intervention programmes are often presented as relatively benign, if not positive:

- building buffer stocks to avoid shortages in times of poor harvests
- smoothing out peaks and troughs of prices.

History suggests these schemes work better in theory than they do in practice. The EU's "butter mountains" and "wine lakes" of the 1980s are classic examples of how price supports can lead to massive, costly surpluses.

The lessons of the 1980s have been learned and market price support is less prevalent than it was but it has not disappeared. It seems the simplistic logic of these interventions is too enticing.

Two existing examples are the EU's intervention programme for butter and skim milk powder and Canada's minimum price for butter. Indian state and federal governments also intervene in dairy markets by buying butter and skim milk powder when prices are low.

One significant problem with such schemes – and of market price support more generally – is that they get in the way of a more orderly adjustment in production. Producers get used to the insurance provided by market intervention, they keep producing regardless of demand, and governments build up large stocks of product that – if sold – will collapse prices and crystallise large losses. In fact, the existence of large public stockholdings can depress market prices.[1]

In Canada, within the construct of its supply managed dairy system, this has led to an imbalance in the market for dairy products, where butter and similar high fat products are expensive and in comparatively short supply but there is a significant surplus of non-fat products like skim milk powder.

Another significant challenge posed by interventionist policies is that there is an incentive for governments to export surplus product – to recoup costs of domestic purchases while minimising effects on domestic prices. This makes producers in other countries extremely nervous about the flow on effects for them.

[1] European Court of Auditors, 2021. Special Report 11/2021: Exceptional support for EU milk producers in 2014–2016.

It used to be that governments would export product at a discount on the price they paid. In principle, that no longer happens because WTO members agreed to phase out such export subsidies.

In practice, export subsidies are still explicitly used[2] and government interventions create suspicions of export subsidies – partly because the schemes are not very transparent. This is also not helped by explicit calls for export subsidies by industry groups in countries with intervention programmes, including recently in India.[3]

Governments that use administrative pricing and buy at above market prices, may argue that they only sell it at above purchase price. But that is hard to verify.

In 2017 the Canadian Dairy Commission introduced a new milk pricing method (class 7) that improved the competitiveness of Canadian skim milk powder on international markets. Canada's exports of skim milk powder increased substantially and, in 2017, amounted to around two-thirds of domestic production (72,000 tonnes exported against 109,000 tonnes produced). Albeit a chunk of this export volume is likely to have come from a clearing of stockpiled product, with stocks starting the year at 70,000 tonnes and falling to 50,000 tonnes by year end.

Subsequently the United States sought and received an agreement from Canada – as part of the CUSMA trade agreement – to limit exports of skim milk and powder and whey proteins. The US considered those exports were subsidised. Canada claimed that they were not. Nonetheless, Canada agreed to the limit on exports.

Ultimately, the defense of intervention programmes leans on the case being made that the schemes do not negatively effect international trade.

Our scenarios

The purpose of this report is to quantify the effects that intervention purchasing and disposal can have on international dairy trade, prices and producer incomes.

The way we have approached this is to analyse the effects of possible hypothetical policy changes, informed by policies we have seen used in the past and around the world; albeit not necessarily in the specific countries identified in the scenarios.

We have selected three very different countries for our scenario analysis. These countries differ significantly in terms of e.g. size, climate, development status, and approaches to agricultural support.

---

[2] For example, the USDA reported in 2020 that the state of Gujarat had implemented an export subsidy USDA GAIN (2020) Dairy and Products Annual: India, IN2020-0153.

[3] How surplus milk powder is dairy industry's new problem, indianexpress.com July 5 2024. Notably, calls for export subsidies appear to occur periodically in India. According to Reuters (July 2018), state and federal governments responded to farmer protests in 2018 by providing export subsidies for skim milk powder that amounted to around 40% of the price that skim milk powder was being sold for on the Global Dairy Trade Auction.

The 'what if' scenarios we have generated are:

1. The implementation in India of an intervention purchasing programme in response to an illustrative large increase in milk supply.
2. A change in milk pricing in Canada that, in principle, might have avoided the spike in Canadian exports of surplus SMP in 2017, which resulted from a supply-managed imbalance between supply of butterfat and non-fat milk solids.
3. A hypothetical scenario in which New Zealand props up domestic SMP prices in 2015 in response to the effects on global dairy trade of a Russian import ban.

These scenarios span the range of different market conditions or causes that can motivate decisions to intervene in markets to support domestic prices.

The intent in running these 'what if?' scenarios is to help demonstrate and quantify three features of administered pricing and intervention purchasing and market price support:

1. That intervention purchasing and market price support impact international trade and prices irrespective of attempts to have only neutral effects. This is because it typically incentivises production of storable and exportable products: butter and SMP. Absent, market intervention, supply shocks would have more broad-based effects on a wider range of tradable and less-tradable products.
2. That relatively small changes in supply can have material impacts on international trade and prices. Demand for globally traded commodities is very price sensitive one way or another and the international market for dairy products is relatively thin – as a share of global production – because of large tariff and non-tariff barriers.
3. That interventions entail policy gambles that shift risk and costs onto domestic taxpayers and producers in other countries, or both. In doing so they undermine efficient incentives for domestic producers to manage their production in response to changes in local and global supply and demand.

2. Scenarios

2.1. What if India used intervention purchasing to address a milk surplus?

India's dairy production

India produces more milk than any other country in the world. In 2023 production was nearly one quarter of global production and production has grown at an average rate of 4.8% per year in the past 20 years.[4]

Half of the milk produced is consumed by farmers or in small scale local trade. The other half is processed by dairy factories.[5]

Processed products are mainly consumed domestically with relatively limited amounts of exports or imports (see Table 1.). India has high tariff and non-tariff barriers to protect domestic producers.

TABLE 1: PRODUCTION AND CONSUMPTION OF DAIRY PRODUCTS IN INDIA
Value shares, percent of world total, average 2013-2019[6]

Product	Production	Expenditure	Exports	Imports
Milk	22.52	22.51	0.09	0.01
Butter & ghee	35.13	35.00	0.87	0.08
Cheese	0.04	0.02	0.09	0.03
Skim milk powder	4.83	4.10	1.50	0.04
Whole milk powder	0.16	0.07	0.23	0.02

Scenarios

We consider the implications of positive shock to milk supply and short-term effects on international dairy prices from that shock under four scenarios:

1. No intervention. We assume increased milk supply leads to increased production of a range of fresh and storable dairy products, in proportion to pre-shock production and demand. This scenario sees the supply shock spread across a wide range of distinct products and largely absorbed by domestic demand.

2. Domestic intervention. We assume that all the increase in milk supply is diverted to production of bulk manufactured products, specifically: butter, cheese, SMP and

[4] https://www.fao.org/faostat/en/#data/QCL.
[5] USDA GAIN (2022) India dairy and products annual.
[6] From the data used in our model of global dairy trade. Sources are principally FAO, FAO-OECD and UN Comtrade.

WMP. In proportion to pre-shock production shares.[7] We refer to this as domestic intervention because it is not necessarily targeted at export commodities.

3. Partial export-led intervention. We assume that increased milk supply leads to increased production of a range of fresh and storable dairy products, in proportion to pre-shock production and demand, but that supply of manufactured products is diverted to butter and skim milk powder because they are most amenable to sale on international markets without having to establish new production capacity or marketing networks.

4. Full export-led intervention. We assume that the full amount of the milk supply shock is diverted to production of butter and skim milk powder. Thus the structure of the shock is similar to the partial export-led intervention but the size of the impact on butter and skim milk production is much larger.

The milk supply shock we analyse is a two standard deviation change in the rate of growth in milk supply.

We simulate the effects of the scenarios using data on global milk production and trade in major dairy products in 2019. The products we track are cheese, whole milk powder, butter, and skim milk powder.[8]

The analysis does not distinguish between the timing of intervention stock build up and disposal of product. This is a simplification. We are assuming that 2019 was a reasonable representation of the structure of global dairy trade, such that our findings are not materially affected by choice of year of disposal. We are also assuming that any intervention purchases are sold before product depreciates sufficiently to materially affect tradability of the product.

Impacts of scenarios

The modelled shock to India's milk production amounts to a modest 0.16% change in global milk production. We assume no effect on production in other countries based on this being a short term shock.

If there is no intervention, the supply shock expands global supply of traded products and puts downward pressure on prices. But most of this effect will be on incomes of dairy producers in India – with gross income on processed products declining by USD570 million. Global sales of major dairy products increases by 0.06% in volume terms and prices fall by an average of 0.39%. Sales fall by USD700 million.

[7] With one exception. We assume that intervention means that increased skim milk powder production is proportional to increased butter production. Observed pre-shock levels of production are not consistent with proportionality between butter and skim milk powder production. But we assume that intervention is focused on paying large dairy processors that jointly maximise production of butter and skim milk powder using non-fat milk solids not consumed in butter production.

[8] Data on production of other products such as whey proteins and fresh products like yoghurt are too patchy to be included.

The fact that India is not very open to trade in dairy products – whether via imports or exports – limits the transmission of the supply shock to other parts of the world.

There is some adjustment via trade, with exports from India increasing 3.2% and imports declining by 15%, given extra domestic supply which is competitively priced. These trade changes are minor, relative to the size of the market. The largest increase in exports is in SMP, which grows from USD33 million to USD39 million.[9]

Domestically, there would be a decline in farm gate milk prices. However, because the shock is essentially a productivity shock, our first order assessment of the net effect on farm incomes – outside of manufactured tradable products – is that the shock would be neutral, with price and volume effects offsetting one another.[10] Any shock to farm incomes would come via a squeeze to gross margins in dairy processing and consequently lower prices for the 13% of milk used in manufacturing of tradable dairy products.

The impact on prices would be largest in the SMP market where domestic demand is much smaller than for other products. Prices for SMP fall 34% on a 7% increase in volumes as compared to a 1.8% reduction in the price of butter and ghee on increased volumes of 0.2%.

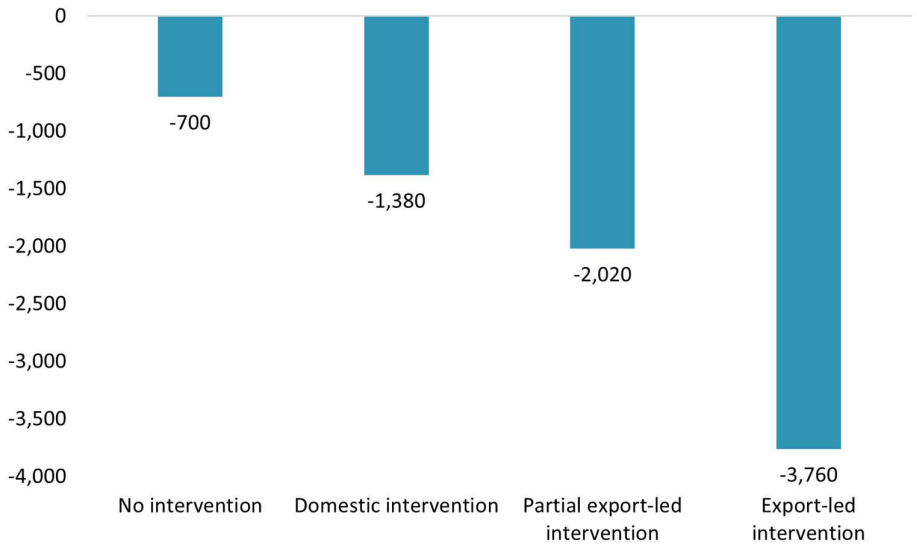
Market interventions magnify the effect on the supply shock on global markets by channelling the increased milk supply to a narrower number of products and into export markets. This can be seen in Figure 1, where impacts on global markets are much larger under export-led intervention. The value of global production shrinks by USD 3.76 billion, an effect that is USD 3.0 billion larger than the no-intervention case.

Note that these hypothetical scenarios do not assume that export subsidies are used directly. Only that intervention focusses on paying an administered minimum price for particular storable products.

[9] This partly down to our assumption that incremental production of butter leads to proportionate increases in SMP.

[10] This assessment is based on estimates of price elasticities of demand for milk in India of around 1 and given that commentators have for some time noted the rising consumption of milk and dairy products and speculated that this would lead to increased import demand.

FIGURE 1: SHORT TERM IMPACT ON DAIRY PRODUCER INCOMES GLOBALLY
US dollar (2019) change in global sales of butter, cheese, SMP and WMP



As the intervention scenarios shift towards exported products and expand in scale, the reductions in prices get larger and processor incomes get lower.

The shock to producer incomes continues to be felt most keenly in India, only the reduction in market value gets much larger and is shared more widely with other producers around the world.

In the fully export-led intervention (all increase in supply diverted to butter and SMP production), the market value of Indian dairy processors' sales falls by USD2.51 billion. This is made up of a USD1.95 billion (9%) reduction in the value of butter sales and a USD560 million (70%) reduction in revenue from sales of SMP.

Of course, with the intervention including minimum prices, producers' incomes will not fall by anywhere near so much.

Elsewhere, the increase in Indian exports of butter and SMP drive down prices and reduce producer incomes by 1.25 billion. This effect is felt mainly through the price of SMP (92% of the reduction).

The countries most affected are net exporters, such as New Zealand, the US and EU countries (see Figure 2). Perhaps most notably, the impacts measured here are the result of a relatively modest 0.7% increase in global exports of SMP.

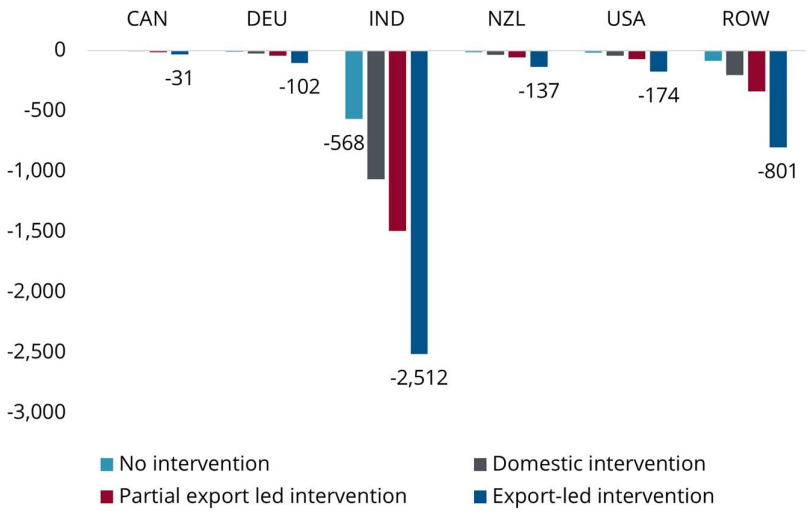
Herein lies a major problem. Even for a large producer of SMP like the US, the USD 132 million shock presented Figure 2 represents a material 9% decline in skim milk powder revenue to dairy processors and a 16% decline in export revenue.

For New Zealand, a USD137 million reduction in SMP exports would be a 16% decline in 2019 revenue from SMP. It thus does not take much for export led market interventions to begin to spark calls for defensive measures.

SMP is only a small part of dairy producers' and dairy farmers incomes. But that is rather beside the point. The issue that arises, with the sorts of interventions analysed here, is that they negatively affect other countries. One appreciates that countries differ in their domestic policy objectives and strategies. But if those objectives and strategies begin to shift costs onto other countries, it creates instability and provokes negative reactions that undermine trade relations and global economic prosperity.

If, over the long-term, Indian production of dairy products becomes more efficient, India opens up to world trade in dairy products and becomes a major supplier to the world, that would be a very different story. That would be of benefit to consumers in India and around the world.

FIGURE 2: IMPACT OF INTERVENTION ON PRODUCERS IN OTHER COUNTRIES
Impact of price reductions in revenue, USD millions, relative to a 2019 baseline



2.2. What if Canada had not exported surplus milk protein?

We analyse – through a counter-factual - the effects that Canada's protein surplus and surge in SMP exports in 2017 had on global markets.

Unlike the India case study, where we posit the introduction of hypothetical market interventions, we start from the observation that Canada had a policy that was potentially distortionary, and we analyse what would happen if that policy was not in place.

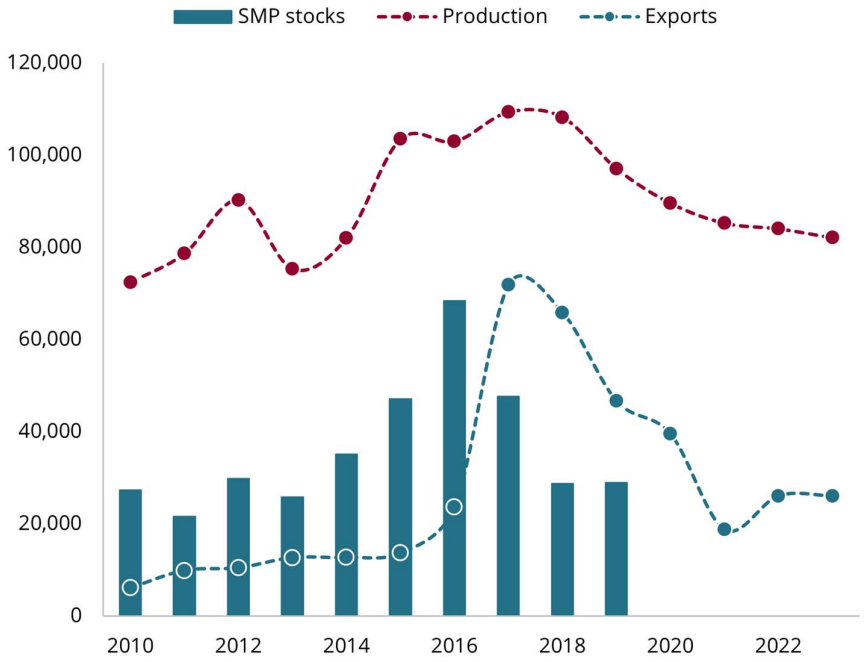
For several years, Canada's milk supply management regime has been grappling with an imbalance in demand for fat and not-fat milk solids. A surplus of these non-fat solids is a

structural feature of Canada's supply managed system, arising from the difference in demand for the components in 'a bucket of milk'. In Canada there is high demand for butter/butterfat but not commensurate demand for the volume of non-fat solids. This poses a dilemma for regulatory authorities trying to manage milk prices. How to expand quota to keep butterfat prices from rising too much when demand increases without collapsing prices for non-fat solids for which demand is not increasing.

Historically, Canada addressed this problem by shipping subsidised exports offshore. But international agreements against export subsidies (Nairobi, 2015) and legal cases at the WTO began to limit this option.

In the mid 2010s Canada's stocks of skim milk powder began to grow (see Figure 1) and a new strategy was sought for disposing of skim milk powder in a way that would not negatively affect domestic prices.

FIGURE 3: CANADIAN SMP PRODUCTION, STOCKS AND EXPORTS
December year tonnes. Stocks as at December. Data on stocks not available since 2020.



At the start of 2017, Canada introduced new regulated milk ingredients prices (class 7) for products that would be used in further processing, be tradable and which would incentivise the use of non-fat milk solids. Industrial milk prices were to set to ensure that the products being produced would be competitive on world markets. Without such a price structure,

Canadian production is not generally price-competitive, with domestic farmgate milk prices typically around 50% higher than in most other OECD countries.[11]

This policy was trade distorting. While questions have been raised about the consistency of the policy with Canada's export subsidy commitments, in simple terms the policy was distorting given that it was designed to help Canada export its problem. The purpose of the scheme was clearly to divert non-fat solids to international markets to ease pressure on the supply managed system and balance domestic prices, but at the risk of destabilising international prices.

Canada no longer uses milk class 7 and committed to limiting exports of skim milk and some other protein powders as part of its 2018 trade agreement with the US and Mexico (CUSMA).

Nonetheless this scenario continues to be relevant because Canada continues to grapple with the problem of balancing supply and demand for fat and non-fat milk solids and has introduced new Milk Class 4a. As a result, Canada has shifted its non-fat solids into higher value protein products that sit outside the CUSMA export limits and is continuing to export these onto global markets.

The scenario

This case study estimates the effect of unwinding the export 'shock' that occurred in 2017. This allows us to quantify the effect that Canada's diversion of SMP had on the trade of countries. This is done by way of a counterfactual simulation of trade and prices in the absence of the shock.

We estimate the effect of Canada's diversionary policies by reducing milk supply in 2017 by 5%. We then estimate the effect on production and prices using the full export intervention scenario defined earlier for India - where all the incremental change in production, in this case a contraction, occurs via reduced milk supply to butter and skim milk powder manufacturing.

The purpose of shocking production of these products is that it

- directly tackles the problem faced by Canada in managing prices for butter and skim milk simultaneously
- ensures consistency with production relationships, in so far as skim milk can be considered a byproduct of butter production, so one cannot have a shock to skim milk availability without an equivalent shock to butter availability.

[11] Observation based on national annual milk prices published in the OECD-FAO Agricultural Outlook database, 1990 to 2021.

Impacts

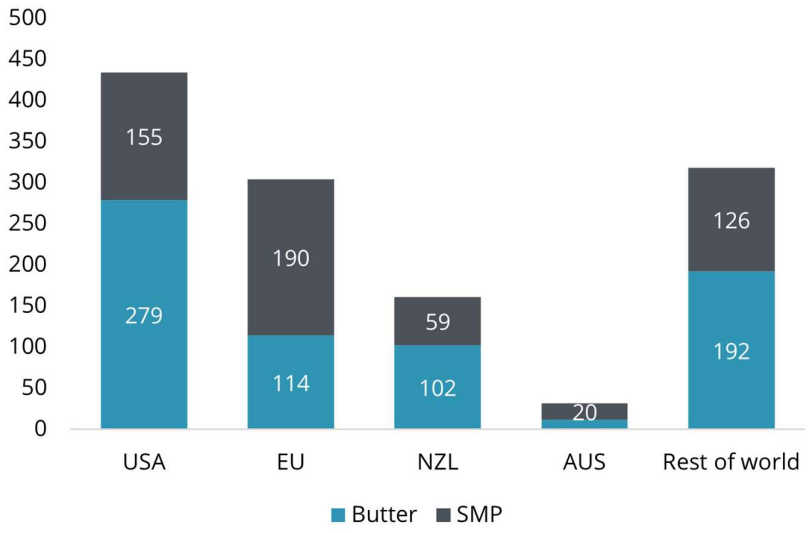
The shock we impose leads to a 19% decline in butter production and a 36% decline in skim milk powder production. Canadian skim milk powder exports decline by 55% in value - volumes falling by 36% to around 12,000 tonnes.

The size of this shock is, on the one hand, a function of our assumptions. However, at least in the case of SMP, the scale of the shock does seem plausible given that the size of Canadian SMP exports between 2005 and 2015 averaged only 11,000 tonnes a year.

With high demand for butter, domestic prices double. There is also a 160% increase in imports, though this does little to limit domestic price increases due to high tariffs on this product. Domestic skim milk powder prices rise by 120%, albeit from a low base.

The bump in imports of butter and decline in SMP exports principally benefits large dairy exporting OECD countries (see Figure 4): the US, New Zealand and large EU dairy producers like Germany, France, Ireland and the Netherlands.[12] Factory gate prices in the US, where benefits are largest due to proximity to Canada and size of dairy sector, rise by 7.5% for butter and 8.4% for skim milk powder. That amounts to an increase in sales of USD 434 million, holding output constant.

FIGURE 4: IMPACT ON DAIRY PRICES OUTSIDE CANADA
Short term change in sales in USD millions holding output constant



These simulated SMP price effects occur in large part due to the decline in Canadian exports to third markets – to countries without large dairy industries and without large barriers to imports. In 2017 Canada exported USD 133 million of skim milk powder, with around half that

[12] For this simulation the EU includes the UK as it was part of the EU in 2017.

trade to Algeria, Egypt and the Philippines. And export sales were at an average price that was 10% lower than the global dairy trade auction price that year and 3% lower than the average US skim milk price.[13]

The notable increase in butter prices is a result of both the short-term reduction in global production of butter, so a global price effect, and the fact the reduction in supply occurs in a high income market with high demand for butterfat.

It seems unlikely that Canadian authorities would permit such large increases in butter prices. But that illustrates the severity of the problem. It shows the strength of incentives that Canadian authorities have for finding ways to manage the problem of surplus protein, unless Canada fundamentally addresses the structural imbalance in the supply managed system as presently designed.

If Canada persists with price controls and milk quotas, new solutions to the surplus protein problem will almost certainly, once again, involve the diversion of product out of Canada and onto world markets – because you cannot control prices and quantities at the same time.

2.3. What if New Zealand reacted differently to market disruption?

This scenario examines the trade and price effects and pitfalls of multiple countries engaging in market price support.

We use the hypothetical scenario of New Zealand responding to significant shocks to international dairy prices in 2014[14]. We focus on skim milk powder (SMP), by way of example and because SMP has, in recent years, been a major focus internationally for policies intended to prop-up producer prices.

Russian 2014 import ban caused turmoil in dairy markets

At the start of 2014, SMP was trading at over USD 4,500 tonne. One year later it was trading at less than USD 2,400 per tonne, a 47% fall.[15] Whole-milk powder and cheese prices had similar-sized declines.

[13] The average GDT auction price was USD 2,059 per tonne, the US price (according to OECD data) was USD 1,909, and the average Canadian export price was USD1,855.

[14] In reality the New Zealand government did not make any intervention or response to the Russia ban. Further, the impact on New Zealand of EU market intervention during the subsequent slump in dairy prices has been modelled by Bailey and Mao (2019), in 'Impact of the European Union's SMP Intervention Program on the United States: 2016-19" https://www.idfa.org/wordpress/wp-content/uploads/2020/06/Impact-of-EU-SMP-Intervention-Program_6.5.20-3.pdf

[15] Global Dairy Trade auction prices.

The catalyst for this shock was a Russian import ban[16], imposed in response to sanctions on Russia following its invasion of Ukraine in 2014.

The size of the slump was also influenced by rapidly increasing production prior to the ban. Dairy prices had been strong for several years and were at record highs in 2013. Producers were expanding to take advantage. This set the stage for a significant slump in prices.

The direct effect of the Russian import ban was most strongly felt by the EU dairy industry. In 2013 Russia took around one third of EU cheese exports and 28% of butter exports. Few other dairy producers were directly affected.[17]

But, being that the EU is the largest source of internationally traded dairy products in the world, the turmoil in Europe transmitted straight to global markets.

The market for skim milk powder was most heavily impacted, in terms of prices. In part because excess production needed to go somewhere. Following the ban, EU dairy production shifted away from fresh products (-1%) and cheese (-2%) and into other readily storable products like butter (+2%) and skim milk powder (+24%).

New Zealand had more cause to intervene than most … but didn't

In New Zealand, where farm-gate prices are closely tied to international milk powder prices, the milk price fell by almost 45% between May 2014 and May 2015.

The price collapse in New Zealand was substantially larger than in any other country in the world and a 50% deeper reduction than in the EU.

As SMP was the product with the deepest price declines, production of SMP in New Zealand fell substantially, by 20% between 2015 and 2016. This reduction, a little over 100,000 tonnes, was equivalent to 4% of global trade in SMP.[18]

Outside of New Zealand, production and exports of SMP increased. This put further downward pressure on prices and by 2016 SMP prices had fallen a further 5% even as prices for other dairy products had rebounded a little.

At the farm gate, in New Zealand, milk prices fell a further 8% between May 2015 and May 2016.

Overall, between May 2014 and May 2016 dairy farm incomes fell by more than half, substantially more than anywhere else in the world.

---

[16] The Russian import ban was not the only factor weighing on dairy prices in 2015 and 2016, but it was a key factor.
[17] The Russian Embargo: Impact on the Economic and Employment Situation in the EU.
[18] Also 2% of global production, 80% of Russian imports and five times larger than EU exports of SMP to Russia prior to the import ban.

New Zealand could have intervened to prop up prices ….but didn't

If the New Zealand government had moved quickly in 2015 to withdraw SMP from the market it could have moderated the early and substantial declines in prices that were experienced in that year.

For example, we estimate that intervention purchases that removed and stored 10%[19] of SMP production (approximately 50,000 tonnes) would have reduced the decline in SMP export prices by 10 percentage points, with prices declining 28% instead of 38%.

This intervention would have raised the revenue of dairy processors in New Zealand by USD 220 million, approximately 3% of the value of revenue of major export products in that year.

It would also have raised the revenue of producers in other countries. We estimate that globally, dairy processors' revenue would have increased USD 1.1 billion, with producers in the EU benefiting most (+USD 490 million), New Zealand producers being the second largest beneficiaries and US producers the third (+USD 170 million).

Costs and risks would have been borne by New Zealand tax-payers

The benefit to New Zealand producers of the hypothetical intervention would have come mainly from a transfer from the New Zealand government, of USD 150 million. The remainder of the increase in producer revenue being from the uplift in prices received on the remaining 90% of volumes not sold to the government (USD 65 million).

Ultimately, the government purchases would have amounted to a bet that market prices would improve and such a bet has a short shelf life.

Storage costs must be paid so the net value of the purchased stock is declining over time. The product will also deteriorate so that after 18 to 24 months it will have to be sold at a discount or otherwise gotten rid of, for a loss.

The bet also comes with substantial market risk, both external risk and risks created by the intervention itself. For example, in 2015 key external risks would have been

- the continuation of the Russian import ban
- whether and to what extent lower prices stimulated increased demand
- actions taken by other countries to support dairy production during the shock.

A key risk that the intervention itself creates is that producers are less likely to reduce production when demand goes down.[20] This means, for example, if demand does not rebound

[19] We use 10% as an illustration because it accords with the de facto limit on SMP intervention purchases, as a share of production, by the EU immediately prior to the Russian import ban. As such, it provides a reference point for New Zealand government as to what may be regarded as reasonable.
[20] Producers are not myopic. They know that, if they increase production, they would be betting, to some extent, on continued government intervention. They would not take intervention for granted. However,

then prices will be even lower than they would otherwise have been and government will have to decide whether or not to take on more and larger bets.

As much as governments might try to limit intervention to a fixed amount (e.g. 10% of production in a single year) the same political incentives that caused the intervention in the first place will remain, at least for a time, and the demand for intervention will intensify.

A solution that would have given way to more problems

If the government of New Zealand had bet on prices recovering in 2016 it would have lost that bet. The question then would have been whether to double-down on the 2015 bet.

As already mentioned, prices for SMP were in fact lower in 2016 than in 2015, because demand did not recover and supply did not contract; despite New Zealand production shrinking by 100,000 tonnes and, in 2016, the EU purchasing and storing 330,000 tonnes of SMP.

A New Zealand intervention in 2015 could have only made the situation in 2016 worse by, for example, inducing a smaller reduction in New Zealand production of SMP in 2016 than we observed without the intervention.

To keep prices at or near the levels sustained by the 2015 intervention, the New Zealand government would have had to purchase between 75,000 and 105,000 tonnes of SMP, depending on whether the 2015 intervention meant production was higher in 2016 that what we observed without intervention.[21]

The cost of these purchases would have been between USD 200 million and USD 290 million, bringing the total cost of intervention over two years to between USD 350 million and USD 440 million, excluding storage and finance costs. The government would then have been left with a stock of SMP of between 125,000 and 155,000 tonnes and a question about what to do with it.

To keep these scenarios simple, let us assume that the New Zealand government had intervened but then decided not to double down on its 2015 bet.

If New Zealand dairy processors misjudged that outcome and kept production a little higher (7%) in anticipation of continued price support then prices for SMP in 2016 would have been 7% lower and SMP revenue USD 10 million lower.

The effects of intervention policy distorted supply out of New Zealand would have been felt in other countries. Already low SMP prices in the US and the EU would have fallen a further 5%, costing producers USD 80 million and USD 245 million in the US and EU respectively.

---

the fact that the government has intervened before means it may again and thus would be a factor in production decisions.

[21] The upper end of the range factors in a 7% increase in production relative to what was observed for 2016 without intervention. The 7% is based on a price decline of 28% with intervention and a SMP supply elasticity of -0.5.

Furthermore, New Zealand would have still been sitting on 50,000 tonnes of SMP and a question about what to do with it in a market environment where additional supply will likely impact the incomes of others.

If New Zealand had adopted intervention it would have frustrated interventions in the EU

In actual events, market conditions were such that the EU made further purchases of SMP during 2017 with prices for SMP remaining depressed. By the end of 2017 the intervention stock was 375,000 tonnes.

In January 2018, the EU halted automatic intervention purchases as it seemed that the protracted period of purchasing was itself putting downward pressure on prices.[22]

Like a game of chicken, as long as the EU kept buying automatically, producers had less incentive to reduce production to match actual market demand. Buyers would have been hesitant to purchase at higher prices knowing a supply overhang existed and stockpiled product might soon be released to the market to recoup intervention costs.

If it had been adopted, market price support intervention by New Zealand in 2015 would have made that situation worse. Most likely it would have meant an increase in supply of SMP from New Zealand in 2017 as the New Zealand government unwound its position, at a loss but at a much smaller loss than if it held onto the stocks for longer.

Increased supply out of New Zealand would have further depressed world prices and caused an increase in intervention purchasing in the EU, a larger stockpile and a worsening of the supply overhang. It is difficult to know how much the overhang would expand, as EU policy was evolving rapidly and policy decisions would have affected SMP production as much as the other way around.[23]

Sale of intervention stock would have driven down already low prices

Based on market conditions as they were in 2017, if New Zealand had increased supply of SMP by 50,000 tonnes – the hypothetical amount of product stockpiled during 2015 in this illustrative scenario – prices in the EU would have fallen by 9% essentially reversing the gains from New Zealand's intervention in 2015 but creating a bigger headache for EU policy makers as they grappled with increasing stocks of SMP alongside low prices and rising production.

---

[22] Skimmed milk powder: Council modifies rules on public intervention to help the market - Consilium

[23] For example, alongside intervention purchases, farmers were paid for voluntary reductions in production. We cannot be sure whether intervention in New Zealand and somewhat higher prices in international markets would have meant reduced voluntary reductions or reduced intervention purchases or some of both.

The New Zealand government would have been hesitant to sell intervention stocks at less than the purchase price. The sale would have reduced New Zealand producers' incomes and largely undone the efforts of the intervention two years prior.

There would have been public outcry at the losses incurred. And the government would have had to weigh the effects on trade relations with other governments as, for example, dairy processors in the US would be expected to object to a 9% price decline and a fall in revenue of USD 160 million.

On balance, the worse outcome for the government in this hypothetical scenario would have been the more severe condemnation at home if the government waited longer to dispose of the stockpiled product and crystallised larger losses, to the benefit of industry interests and substantial cost to taxpayers. Because their bet didn't pay off, the government would have cut their losses.

Overall, if New Zealand had taken a different policy approach and pursued intervention it would have caused costs for others

If New Zealand had taken a different policy approach and intervened in the market, the net effect would have been to make producers in other countries worse off, New Zealand taxpayers worse off and New Zealand producers slightly better off.

New Zealand producers would have been better off because of government transfers and because, in 2017, New Zealand producers would have reduced their exposure to the SMP market, following the drop in prices in 2016.

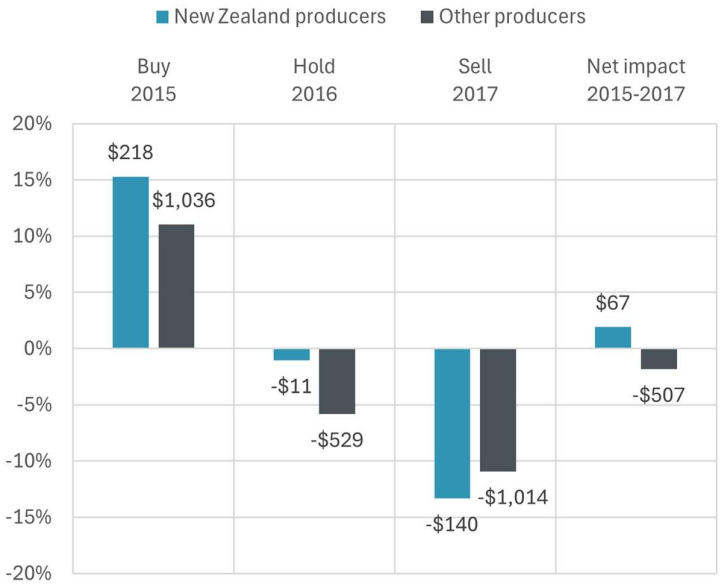
Non-New Zealand producers would have been worse off because

- the New Zealand intervention would have induced an increase in production in 2016, following the intervention, causing a reduction in prices and incomes
- the model predicted that producers in other countries would not have, in aggregate, reduced their production of SMP – so would also have been exposed to the effects of price declines in 2017.

These results are but one set of possible outcomes. Producers in other countries may, under other circumstances, adjust their SMP production so that prices do not fall quite so much. New Zealand producers may have been slower to adapt their production – if they had received, and gotten used to, government support.

FIGURE 5: IMPACT OF HYPOTHETICAL NEW ZEALAND INTERVENTION ON PRODUCERS' INCOMES

Percent change in revenue from SMP sales. Dollar values are USD millions



Coordinated interventions are not a stable solution

One might speculate that coordinated intervention could have avoided some of the downside presented in this hypothetical scenario. In theory, this could be done by the European Commission and New Zealand government sharing information on intervention purchasing and disposal intentions so that they could adapt or agree on approaches that minimise negative effects of interventions.

History suggests that this is not a stable solution in practice. European and New Zealand governments coordinated on international dairy trade for many years, via the International Dairy Arrangement.[24] Between 1980 and 1995, this arrangement was used to set minimum prices for internationally traded prices. In that time, there were numerous disputes involving countries selling below minimum prices when it suited them. The US exited the arrangement in 1985 because the EC sold butter to the Soviet Union below the agreed minimum price.

Domestic policy objectives, fiscal constraints and growing conditions of countries will differ over time. That means views on what the right price is will differ. Those with surplus production may be happy with a lower price, if the populace is willing to bear fiscal transfers.

[24] Set up following the Tokyo Round of negotiations (1973-1979) on the General Agreement on Tariffs and Trade (GATT), to help deal with surplus production and volatile prices.

Those that do not receive transfers, will rail against any steps that depress prices and reduce their income.

When government intervention plays an explicit role in setting prices, even a back-stop role, producers will lobby governments to intervene to change prices they do not like. And, when producers are used to relying on government intervention, they are slow to adapt to changing market conditions, leading to still more demands for intervention.

Thus, although coordinated government intervention might seem a pragmatic course of action in the short term, it is not a sustainable response to economic shocks.

3. Implications

A key message of these scenarios is that relatively small changes in exports can have material effects on other producers' incomes.

Where those changes in exports appear to be the result of domestic support initiatives or shifting problems onto others, it will inevitably cause discontent.

This is in large measure because these policies turn a blind eye to the effects they have on others – that they export problems instead of solving them and they hide the real economic costs in fiscal transfers.

That in turn lays the foundations for defensive counter measures to the point where governments are drawn into a tit for tat exchange in costly anti-trade policies.

In the long run, that drives protectionism or demand for subsidies that drive up costs to both taxpayers and consumers.

Appendix: modelling methods

The simulations have been completed using a short run version of the Global Dairy Distortions Model (GDDM), which is a structural gravity model of dairy trade for major manufactured dairy products.

The data and general theoretical and empirical structure of the model is as described in earlier reports.[25] However, the mechanics of the modelling are different to what we did in earlier case studies. Prior case studies focussed on empirical estimation of the effects of subsidies on dairy production and trade. Here the focus is on simulation rather than estimation.

Modelling market interventions using output shocks

We model market support interventions as exogenous output shocks e.g. changes in the amount of milk available for processing.

We assume that marginal changes in milk supply affect downstream production of tradable commodities according to pre-existing average shares of milk solids use, except in the case of SMP.

SMP production is a special case. This is because butter is a more widely produced commodity than SMP and consequently average shares of milk solid use and of output at a national level do not reflect marginal production relationships for large dairy processors. We assume that changes in SMP volumes follow marginal changes in butter production and that a 1 tonne reduction in butter production implies a 1.85 tonne reduction in SMP.

We allow for cases where interventions are targeted only at products that are more readily storable and internationally tradable products.

In all scenarios we enforce adding up constraints that ensure that changes in output follow and do not exceed the change in milk solids available.

Modelling impacts of output changes on trade and prices

The approach we use to assess the effects of changes in output on trade and prices is a reduced form model (system of equations), founded in structural gravity models[26], that relates changes in trade shares ($\hat{s}_{ij}$) to changes in trade costs ($\hat{\tau}_{ij}$) and changes in factory or farm gate incomes/output ($\hat{Y}_i$). The indices i and j denote origins (sellers) and destinations (buyers) and nominal output is equal to output volumes (Q_i) multiplied by average factory-gate prices (p_i).

[25] Details available at https://dcanz.com/GDDM/.
[26] For further details and background around this approach to measuring the effects of trade costs see Head, K., Mayer, T., 2014. Chapter 3 - Gravity Equations: Workhorse,Toolkit, and Cookbook, in: Gopinath, G., Helpman, E., Rogoff, K. (Eds.), Handbook of International Economics, Handbook of International Economics. Elsevier, pp. 131–195.

The trade share values denote the share of a destination's expenditure that is spent on products from a given origin. All change ($\widehat{\ }$) variables are ratios of new values to baseline values.

The first equation explains changes in trade shares as a function of changes in output, changes in trade costs, baseline/initial trade shares (s_{ij}) and trade elasticity of substitution (θ):

$$\hat{s}_{ij} = \frac{\left(\hat{Y}_i \hat{t}_{ij}\right)^{1-\theta}}{\sum_i s_{ij}\left(\hat{Y}_j \hat{t}_{ij}\right)^{1-\theta}}$$

The second equation, based on a market clearing, explains changes in the value of sellers' output/incomes in terms of initial (baseline) output (Y_i), changes in trade shares, initial trade shares, initial (baseline) destination expenditure (X_j) and changes in destination output ($\hat{Y}_j$).

$$\hat{Y}_i = \frac{1}{Y_i}\sum_j \hat{s}_{ij} s_{ij} \hat{Y}_j X_j$$

A third equation describes short run changes in factory-gate prices given change in output volumes ($\widehat{Q}_i$)

$$\hat{p} = \frac{\hat{Y}_i^{\frac{1}{\theta}}}{\widehat{Q}_i}$$

We iterate over the above equations until we find a solution that satisfies all three.

Our simulations use a value for θ of 2.3. This value is taken from recent estimates by Lashkaripour and Lugovskyy (2023) of elasticities of food trade based on firm level data.[27]

Future research could usefully investigate dairy-specific and product-specific estimates for θ. This might usefully include calibrating values for θ (using e.g. simulated method of moments) that ensure model predictions closely match observed trade and price data e.g. global dairy trade auction prices.

[27] Lashkaripour, A., Lugovskyy, V., 2023. Profits, Scale Economies, and the Gains from Trade and Industrial Policy. American Economic Review 113, 2759–2808.

SENSE PARTNERS

DATA LOGIC ACTION