

*Irish Dairy Industries Association*

*Draft Report*

*Preliminary Analysis of the Crisis Dairy Supply Management Proposal in the Report of the Committee on Agriculture and Rural Development (COMAGRI) on CAP Reform 2012.*

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## Conclusions

The report of the Committee on Agriculture and Rural Development (COMAGRI) on CAP Reform – article 156a included the following:

*Measures to address severe imbalances in the market for milk and milk products*

*From 1 April 2015, In the event of a severe imbalance in the market for milk and milk products, and notably when a price of EUR 0.24/litre is reached, the Commission may decide, by means of implementing acts adopted in accordance with the examination procedure referred to in Article 162(2), to grant, for a period of at least three months which may be extended, aid to milk producers who voluntarily cut their production by at least 5% compared with the same period in the previous year..... The Commission shall also impose a levy on milk producers who increase their production during the same period and in the same proportion.*

The proposal has recently been supported by vote of the European Parliament in plenary session. This analysis of the COMAGRI crisis supply management proposal is in three parts; (1) an economic analysis of the proposal, (2) an analysis of the extreme dairy price volatility period of recent years in the context of the COMAGRI proposal; (3) other relevant issues.

A preliminary economic analysis has clearly demonstrated that this proposal can only work successfully in a closed economy, or alternatively if the policy is introduced by all major international suppliers together in an open economy. The problem if such a policy is introduced unilaterally by one supplier, e.g. the EU, in an open economy context is that much of the benefit accrues to those suppliers who do not introduce the policy, a classic example of the “free rider” problem. With the EU dairy market now largely embedded as part of a mainly open global economy, if the EU was to attempt unilaterally to constrain production, the gains for EU producers would at best be quite limited and indeed the real winners from such a policy would be the EU’s major international competitors in the supply of dairy commodities to the world market. Expert analysis of somewhat similar crisis supply management policies in the USA over recent decades has also reached rather similar conclusions.

The original COMAGRI proposal suggested 24 cent/litre as the market imbalance trigger that would activate the policy. Reviewing overall EU monthly weighted average prices, a monthly price below 24 cent/litre was never reached during the 2009 low price crisis year, with 25 cent/litre approx. being the lowest monthly price attained. Reviewing annual milk prices, just six EU countries had an annual average milk price below the trigger point during the crisis year 2009. These consisted mostly of the newer member states. Annual milk price by country (2009) varied from a peak of about 46 c/l approx. to a low level of about 18 c/l. The great diversity in milk price among the member states emphasizes the difficulty in introducing any price based trigger as a basis for an EU wide emergency policy. Reviewing the number of months that each of the 27 EU countries had a monthly milk price below 24 cent/litre over the 2006-2012 period, it is clear that a

substantial subgroup of 10 countries never had a monthly milk price below this trigger point. At the aggregate EU level, milk deliveries dipped below the previous years' level for a sustained period in 2009/2010 and the market recovered quite quickly in 2010/2011. This clearly indicates that the market can quite quickly self correct.

It was also concluded that further negative consequences of a voluntary EU milk deliveries reduction policy in an open economy context could arise involving; disruption of long term planning, effect on producer productivity, effect on economies of scale, counterproductive base establishment effect, mistiming of policy implementation, effect on the provision of milk contracts, market effects (short term versus longer term), effect on consumers, manufacturers and the supply chain, effect on the provision of private market risk solutions, perverse production response, unintended consequences.

# **Preliminary Analysis of the Crisis Dairy Supply Management Proposal in the Draft Report of the Committee on Agriculture and Rural Development (COMAGRI) on CAP Reform 2012.**

## **Executive Summary**

Proposals on CAP reform by the Committee on Agriculture and Rural Development (COMAGRI) were recently supported by vote of the European Parliament in plenary session. Article 156a includes the following:

*Measures to address severe imbalances in the market for milk and milk products*  
*From 1 April 2015, In the event of a severe imbalance in the market for milk and milk products, and notably when a price of EUR 0.24/litre is reached, the Commission may decide, by means of implementing acts adopted in accordance with the examination procedure referred to in Article 162(2), to grant, for a period of at least three months which may be extended, aid to milk producers who voluntarily cut their production by at least 5% compared with the same period in the previous year..... The Commission shall also impose a levy on milk producers who increase their production during the same period and in the same proportion.*

This analysis of the COMAGRI proposal is in three parts; (1) an economic analysis of the crisis supply management proposal involving supply/demand, milk/milk product price and related policy considerations; (2) an analysis of the recent extreme dairy price volatility period in the context of the COMAGRI proposal; (3) other relevant issues.

### **1. An economic analysis of the COMAGRI crisis supply management proposal**

Over the past 30 years the EU dairy sector has been undergoing fundamental change, moving from a largely closed economy model with policy decisions largely at EU discretion, to a much more open global market regime now established under international agreement. This has coincided with much more volatile dairy market prices in the internal EU market with extremely low prices in particular in 2009. The movement from the closed economy model to the more integrated global market has led to much greater international price convergence.

The COMAGRI proposal involves activation of a temporary supply management regime to reduce production so as to stabilise or increase price levels during a period when prices in a volatile market are falling to unacceptably low levels. Following a preliminary economic analysis it is clearly demonstrated that this proposal can only work successfully in a closed economy, or alternatively if the policy is introduced by all major international suppliers together in an open economy. The problem if such a policy is introduced unilaterally by one supplier, e.g. the EU, in an open economy context is that much of the benefit accrues to those suppliers who do not introduce the policy, a classic example of the “free rider” problem. With the EU dairy market now largely embedded as part of a mainly open global economy, the consequences are that if the EU at this stage was to attempt unilaterally to constrain production as proposed, the gains for EU producers

would at best be quite limited and indeed the real winners from such a policy would be the EU's major international competitors in the supply of dairy commodities to the world market. It is demonstrated that an attempt to reduce production internally in the EU, while raising EU prices somewhat, would also raise world prices in an open economy context. Furthermore international competitors with no supply constraints would be thus encouraged to maintain or increase production which would limit the price increase, not just on the world market but internally in the EU as well. Thus the clear winners from such a policy would be the EU's international competitors who would achieve both a higher price and increased production. This would increase their total revenue earnings and their world market share, a clear win-win outcome for them. For the EU itself however the outcome is considerably more ambiguous and even at best would be just modestly positive. Expert analysis of somewhat similar crisis supply management policies in the USA over recent decades has also reached rather similar conclusions.

## **2. An analysis of the recent extreme dairy price volatility period in the context of the COMAGRI proposal.**

The COMAGRI proposal suggests a low price of 24 cent/litre as the market imbalance trigger that would activate the policy. (Having completed the analysis with this policy trigger it will be a fairly simple exercise to complete a similar analysis with any other trigger price that might be suggested). Reviewing overall EU monthly weighted average prices, a monthly price below 24 cent/litre was never reached during the 2009 low price crisis year, with 25 cent/litre approx. being the lowest monthly price attained. Reviewing annual milk prices by country, just six EU countries had an annual average milk price below 24 c/l during the crisis year 2009, accounting for about 12.5% of EU 2011 milk deliveries (data unavailable for five countries). These consisted mostly of the newer member states. There is major diversity in milk prices among the member states, as highlighted by the range in prices in 2009. Annual milk price by country (2009) varied from a peak of about 46 c/l approx. to a low level of about 18 c/l. Four countries had a milk price of over 35 c/l in 2009, in contrast with four countries where price levels were below 22 c/l. The great diversity in milk price among the member states emphasizes the difficulty in introducing any price based trigger as a basis for an EU wide emergency policy.

Reviewing monthly prices, of the 27 EU countries the number with a monthly price below 24 c/l on a specific month over the period January 2006 to October 2012 never exceeded 14. For most of 2009 the number of countries with a price below 24 c/l on a specific month varied between nine and 14. A subset of these countries, drawn exclusively from the newer member states, had milk prices below 24 c/l on a large number of occasions throughout the 2006-2010 period.

Reviewing the number of months that each of the 27 EU countries had a monthly milk price that fell below 24 cent/litre over the 2006-2012 period, it is clear that a substantial subgroup of countries, 10 in all, never had a monthly milk price below this reference point. Just five countries (Estonia, Latvia, Lithuania, Hungary, and Romania) had

monthly milk prices below 24 c/l for greater than 10 months during the 2006-2012 period.

The EU has increased milk deliveries slightly each year since 2006 with the exception of 2009 when there was a modest decline which was sustained for many months. It would be premature to solely attribute the exceptional decline in deliveries in 2009 as a response to the large decline in milk price in that year as outlined earlier, as a range of other factors including change in milk production costs, climatic change, etc. could also be important causative factors. Nevertheless the 2009 deliveries decline was followed by a quite rapid market recovery in 2010/2011. This clearly demonstrates that the market can quite quickly self correct.

Given the seasonal nature of milk production, monthly comparisons of milk deliveries were considered on a year on year basis (that is, a comparison of deliveries in each month with the corresponding month of the previous year). At the aggregate EU level, monthly deliveries were rarely more than 2% below the previous years' level over the period January 2007 to August 2012 and never reached a 5% monthly reduction. The number of EU countries where the decline in monthly milk deliveries (year on year basis) exceeded 5% was six or less on all but five months over the period January 2007 – August 2012. Finally, in a detailed review on a per country basis, the number of occasions in which each EU country had monthly milk deliveries declines (year on year basis) exceeding 5% over the period January 2007- August 2012 shows that eight of the 27 EU countries had greater than 10 months in which such a deliveries decline occurred. These were mostly newer EU member countries. As the COMAGRI proposal is producer based, this analysis should ideally be completed at this micro level.

### **3. Other issues**

A number of other issues involving further negative consequences of a crisis EU milk deliveries reduction policy in an open economy context are also briefly discussed. While no detailed analysis or literature review has been completed to explore these issues in this report, ideally it would be desirable to explore these issues further in the future.

- Disruption of long term planning
- Effect on Producer Productivity
- Effect on Economies of Scale
- Counterproductive base establishment Effect
- Mistiming of Policy Implementation
- Effect on the provision of milk contracts
- Market Effects- Short term versus Longer term
- Effect on Consumers, Manufacturers and the supply chain
- Effect on the provision of private market risk solutions
- Perverse Production Response
- Unintended Consequences

# **Preliminary Analysis of the Crisis Dairy Supply Management Proposal in the Report of the Committee on Agriculture and Rural Development (COMAGRI) on CAP Reform.**

## **Introduction – the COMAGRI Proposal**

The objective of this report is to complete a preliminary economic analysis of the Dairy Crisis Supply Management Proposal in the Report of the Committee on Agriculture and Rural Development (COMAGRI) on CAP Reform as supported by recent vote of the European Parliament in plenary session. As the proposal in this report is not outlined in any detail, this study is of necessity a preliminary analysis and a more comprehensive analysis, which could include quantitative modelling of the dairy industry, is deferred for the present.

The relevant section of the COMAGRI/European Parliament Proposal is article 156a which states the following:

*Measures to address severe imbalances in the market for milk and milk products*

*1. From 1 April 2015, In the event of a severe imbalance in the market for milk and milk products, and notably when a price of EUR 0.24/litre is reached, the Commission may decide, by means of implementing acts adopted in accordance with the examination procedure referred to in Article 162(2), to grant, for a period of at least three months which may be extended, aid to milk producers who voluntarily cut their production by at least 5% compared with the same period in the previous year..... The Commission shall also impose a levy on milk producers who increase their production during the same period and in the same proportion.*

*2. The supply of milk, free of charge, to charitable organisation may be deemed a cut in production under the conditions laid down by the Commission pursuant to paragraph 4.*

*3. During the period referred to in paragraph 1, subparagraph 1, the products of undertakings that have implemented this system under the arrangements provided for in that subparagraph shall be given priority when intervention measures, as referred to in Title I of Part II are taken on the market for milk and milk products.*

*4. Taking into account the need to ensure that this scheme is operated in an effective and appropriate manner, the Commission shall be empowered to adopt delegated acts in accordance with Article 160 to establish:*

*(a) the amount of the aid and the size of the levy referred to in paragraph 1;*

*(b) the criteria to be met in order to be eligible for aid; (c) the specific conditions that will trigger implementation of this scheme; (d) the terms under which free distribution of milk to charitable organisations, as referred to in paragraph 2, may be deemed a cut in production.*

This very preliminary analysis of the COMAGRI proposal is in three parts;

1. An economic analysis of the COMAGRI crisis supply management proposal involving supply, demand and milk/milk product price and related policy considerations.
2. An analysis of the extreme dairy price volatility period of recent years and in particular the crisis low milk price year 2009 in the context of the COMAGRI proposal.
3. Other relevant issues

## **1 An economic analysis of the COMAGRI supply management proposal**

### **1.1 Background:**

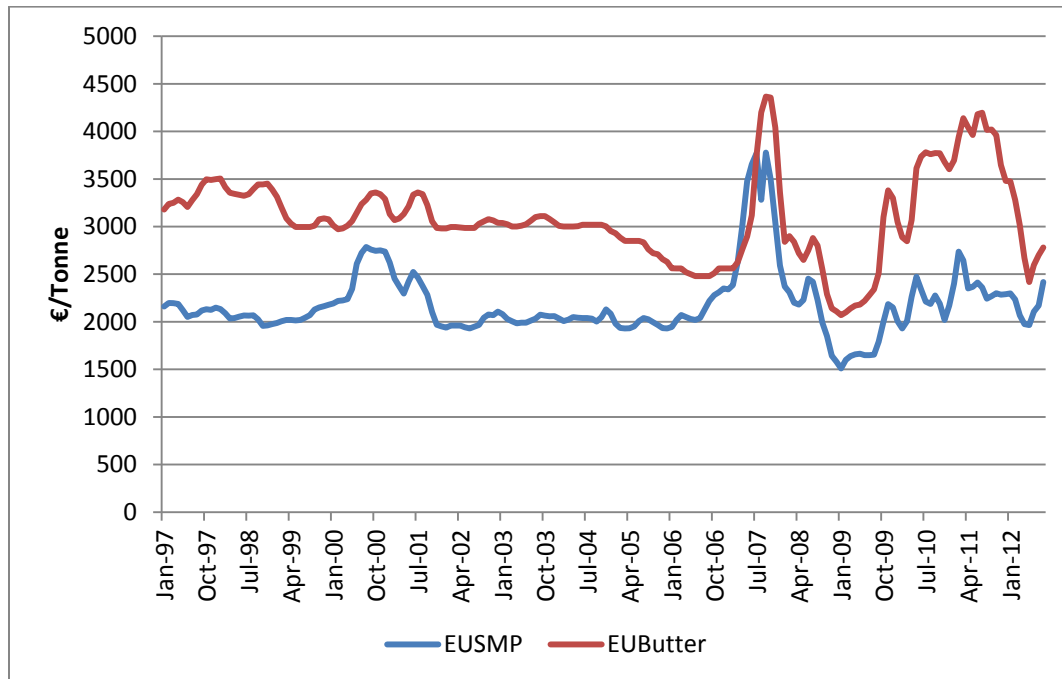
Over the past 30 years the EU dairy sector has been undergoing fundamental change to accommodate both internal and external pressures. The open ended price support policy of the 1970's created an internal crisis of very large surpluses which were extremely difficult to dispose of at reasonable prices creating unacceptable budgetary pressures. This led to the introduction of milk quotas in 1984. The external pressure of GATT/WTO from the mid 1980's onwards led to a fundamental trade policy shift from a comparatively closed market with a stable target milk price, supported by variable import levies, export refunds, intervention prices and related measures, to a much more open market regime of much reduced import tariffs/export refunds, now fixed under international agreement (WTO) rather than at internal EU discretion, much lower intervention prices with limited and exceptional intervention and the abandonment of the stable milk target price principle. Farmer support has instead been primarily directed towards direct income support through the direct payments regime with policy consolidated under the Luxembourg agreement and the CAP Healthcheck over the last decade. This also includes the planned elimination of the milk quota regime in 2015.

### **1.2. Price Volatility:**

The abandonment of a price stability policy over which the EU itself had almost total discretion, to be replaced by a much more open global market policy underpinned by international (WTO) agreement, has coincided with much more volatile dairy market prices in the internal EU market. Extreme price volatility has become a feature of EU milk and milk product markets in recent years, partly as a result of the major policy changes summarised above. This is apparent in Fig 1 where the comparative stability of EU butter and SMP prices up to 2005 has been replaced by a much more volatile market situation. The technical measurement of price volatility has been conducted in a number of studies as summarised in Appendix 1. The results in summary show that there has been around a threefold increase in price volatility in both the EU butter and SMP markets between 1997-2004 and 2005-2012 (see Appendix 1).



**Fig 1 EU Butter and SMP Monthly Prices<sup>1</sup>, 1997-2012.**



### 1.3. Extreme Low Prices – Policy Response:

The extremely low prices for milk and dairy products of the 2008/9 period resulted in a series of policy responses. Firstly the existing set of policy instruments, which were available at a “safety net” level to provide a floor to the market, including intervention and export refunds, were activated. Secondly the European Commission established a High Level Group to provide policy advice for such situations. The report of this group included a number of recommendations to further support milk producers and these recommendations are being steadily progressed in policy terms.

### 1.4. Effect of Supply Management under Closed and Open Market Policy Regimes – Economic Analysis

The COMAGRI proposal involves activation of a temporary supply management regime to reduce production so as to stabilise or increase price levels during a period when prices in a volatile market are falling to unacceptably low levels. In economic terms this proposal is based on an assumed relationship between price and quantity produced. In a market such as the EU and international market for dairy commodities, economists generally describe demand as inelastic, implying that a modest reduction in quantity produced will result in a more than proportionate increase in price. For example if it is assumed that demand for basic dairy commodities is – 0.3 approx., this implies that

<sup>1</sup> Wholesale Dutch prices sourced from Agra Europe are taken as representative EU prices for the purpose of this study.

(other things being equal) a 3% reduction in quantity produced may result in a price level which is 10% higher than would otherwise be the case.

One fundamental problem with the COMAGRI proposal however is that in economic terms it can only work successfully in a closed economy, or alternatively if the policy is introduced by all supplier countries together in an open global economy. The problem if such a policy is introduced unilaterally by one supplier in an open economy is that much of the benefit accrues to those suppliers who do not introduce the policy, a classic example of the “free rider” problem. The economic consequences of introducing such a policy in a closed versus an open economy are discussed in more technical economic detail in Appendix 2.

Summarising the analysis in Appendix 2, if a supply management policy is introduced in a closed economy the desired price effect is achievable. A modest reduction in quantity supplied by one country or region can result in a more than proportionate price response in that region, provided the market is largely isolated from the global market. This in many respects represents the old EU dairy commodities market until recent years. The combination of variable import levies and export refunds, adjusted at the EU’s sole discretion, as well as extensive intervention buying and a stable internal target price for milk, created the necessary closed market policy conditions for such a successful price outcome from the producers viewpoint. This was reflected in the achievement of largely high and stable internal dairy commodity prices in the EU until recent years. (While not developed further in this report the outcome represented a negative development from the consumers’ viewpoint).

The fundamental policy changes that have occurred since the 1990’s however, including the GATT/WTO agreement of the mid 1990’s, the Luxembourg Agreement (2003) and the CAP Healthcheck (2008) have resulted in the EU dairy commodities market being now largely embedded as part of a mainly open global economy. The consequences are that if the EU at this stage was to attempt unilaterally to constrain production as proposed, the gains for EU producers would at best be quite limited and indeed the real winners from such a policy would be the EU’s major international competitors in the supply of dairy commodities to the world market. The consequences in economic terms, as outlined in detail in Appendix 2, are that an attempt to reduce production internally in the EU, while raising EU prices somewhat, would also raise world prices in an open economy context. Furthermore international competitors with no supply constraints would thus be encouraged to maintain or increase production which would limit the price increase, not just on the world market but internally in the EU as well. Thus the clear winners from such a policy would be the EU’s international competitors who would achieve both a higher price and increased production. This would increase their total revenue earnings and their world market share, a clear win-win outcome for them. For the EU itself however the outcome is considerably more ambiguous. There would be a more limited price increase internally than would be the case with a closed economy and this would be combined with reduced production. While there would be a likely increase in sales revenues for commodities in the internal market it would be constrained, while revenue earnings on the export market would likely decrease due to a combination of

significantly lower export sales volumes combined with moderately higher prices. EU market share on the growing world market would decrease and the overall outcome for EU producers would at best be just modestly positive (see Appendix 2 for detailed economic analysis).

It could be argued that while the above economic analysis might be relevant for a permanent policy change, if an internal EU supply constraint was applied for a temporary short-term benefit, the outcome might be different. It could be suggested for example that a benefit of a temporary supply constraint might be that there would be reduced growth in intervention stocks in a market crisis situation which, combined with any price increase would be positive. However a lower EU intervention stocks overhang in an open economy would likewise ensure that any internal EU price increase would be transmitted to international markets where again the price increase would help stabilise or increase production among international competitors, thus limiting the overall price increase both internationally and internally in the EU in an open economy context.

Thus the conclusion from the market analysis (Appendix 2) is that an EU unilateral temporary supply reduction in an open economy context, either short-term or more permanent, would be of just ambiguous benefit at best for EU producers but would be of clear benefit to the EU's international competitors. For such a policy to be of significant benefit to EU producers there would need to be a return to a largely closed EU dairy market as applied in the 1970's and 1980's. Following the whole thrust of policy and associated international trade agreements over the last 25 years it is unimaginable that a return to such a closed market policy regime is now possible or even desirable in a wider economy context.

### **1.5 USA Crisis Supply Management Programs**

A variety of crisis dairy supply management programs have been operated in the USA over the last thirty years in a largely closed economy context. These include a milk diversion program, refundable assessment, whole dairy farm retirement, Class 1 Base Plan, cull cow and/or heifer programme (e.g. CWT). The programs have been analysed by the leading US dairy economics researchers such as Cropp (Wisconsin University) and Novakovic (Cornell University). Of the above programs the milk diversion program most closely resembles the COMAGRI proposal.

The researchers identified a number of major issues with these programs. For example one milk diversion program (MDP) offered payments to producers who agreed to reduce their marketings by various percentages from a given base with a payment for all "diverted" milk, quite similar to the COMAGRI proposal. Quoting Cropp "the MDP invited what has come to be known as "selling air", ie farmers could cash in on reductions made in between the time of the base forming period and the time the MDP actually took effect. In an analysis of one program the average participant had already achieved 20 to 25% of the contracted reduction from the base before the MDP applied. Cropp also pointed out that production control programs also have the potential to lead to

local geographic milk shortages. With regard to CWT Cropp also drew specific attention to “free rider” problems.

Novakovic, in reviewing milk diversion programs, emphasised that the programs “will surely be faced with having to purchase some “air” as well as paying for actual reductions in production relative to current production. How much “air” will there be?” He draws attention to the experience of a milk diversion program which “amply demonstrates that this approach does nothing in and of itself to encourage marginal farmers to exit, in fact its price increasing effect tends to encourage them to stay. Thus, the potential for higher prices to lead to surplus problems is greater in the out years; and this is only exacerbated if the support price is also increased. As was learned under both the diversion program and the buyout program, production increases by non participants can also result in increasing surpluses”. He further speculated that “most producers who would sign up would be those who hadn’t planned to increase or whose base was at or above their current production anyway. In other words, the program might not do anything to affect production, it may only reward those who were doing what they planned to do anyway. If this were the case it would be inappropriate to say that this feature of the program did anything to constrain production.”

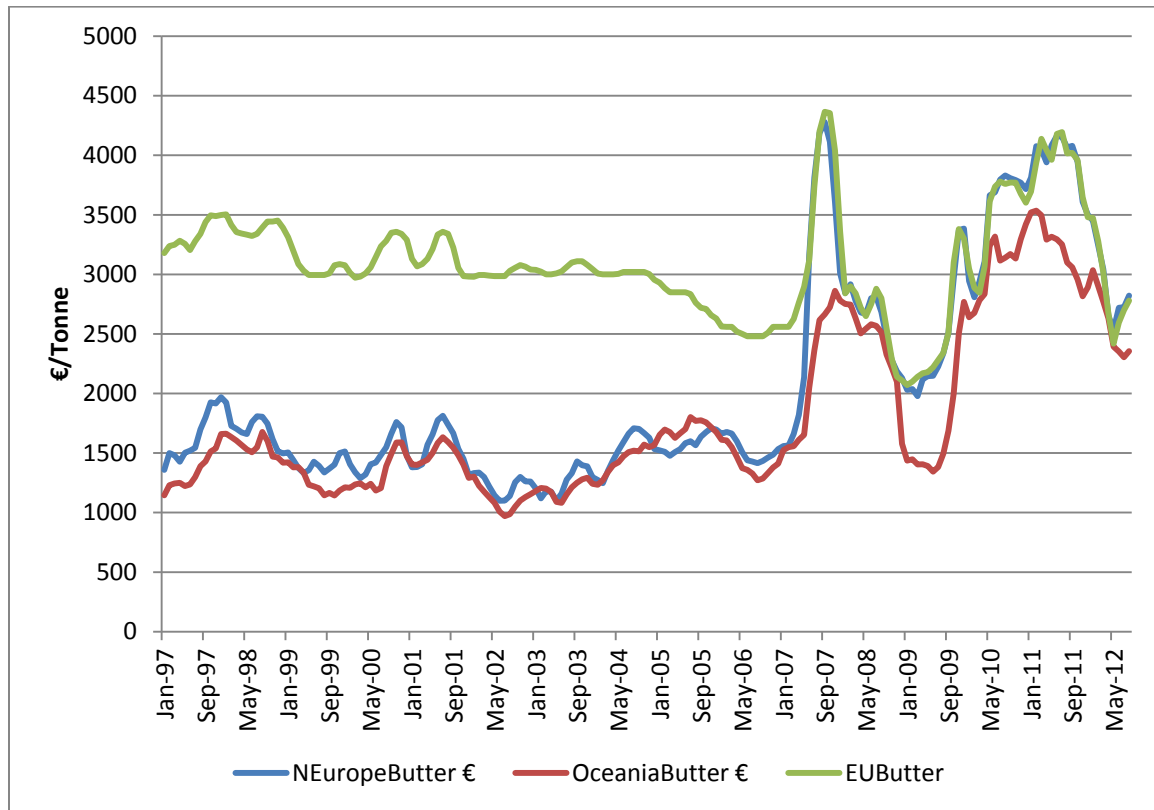
## **1.6 Dairy Market Correlation and Convergence – EU and Global**

EU and world market monthly prices for butter and SMP for the period January 1997 to May 2012 are shown in Figs 2 and Fig 3. It is clear that, led by the major policy changes of the GATT/WTO and Luxembourg agreements during that period, there was a quite different price level in the EU relative to the world market following the completion of the price adjustments of the Luxembourg agreement in particular in 2007. In fact there has been almost total convergence of EU and world market prices at times post 2007, reflecting the movement from a rather closed EU dairy economy in earlier years to a more open global dairy economy in recent times.

### **Market Correlation**

The movement from a fairly separate price pattern for the EU relative to the world market towards a much more correlated pattern, while demonstrated for both commodities, has been particularly pronounced for SMP, as indicated by the correlation coefficient comparison for 1997-2004 relative to 2005-2012, Tables 1 and 2. This applied analysis of prices, showing much closer correlation in recent years, is sufficient to conclude that the EU dairy market has moved from a largely closed economy to a largely open economy post Luxembourg agreement, with the consequences for an EU unilateral crisis supply management reduction policy in an open economy context as outlined in the economic analysis section earlier.

**Fig 2 EU and World Market Monthly Butter Prices<sup>2</sup>, 1997-2012**



**Table 1 EU and World Market Monthly Butter Prices, 1997-2012, Correlation Coefficients**

**1997-2005**

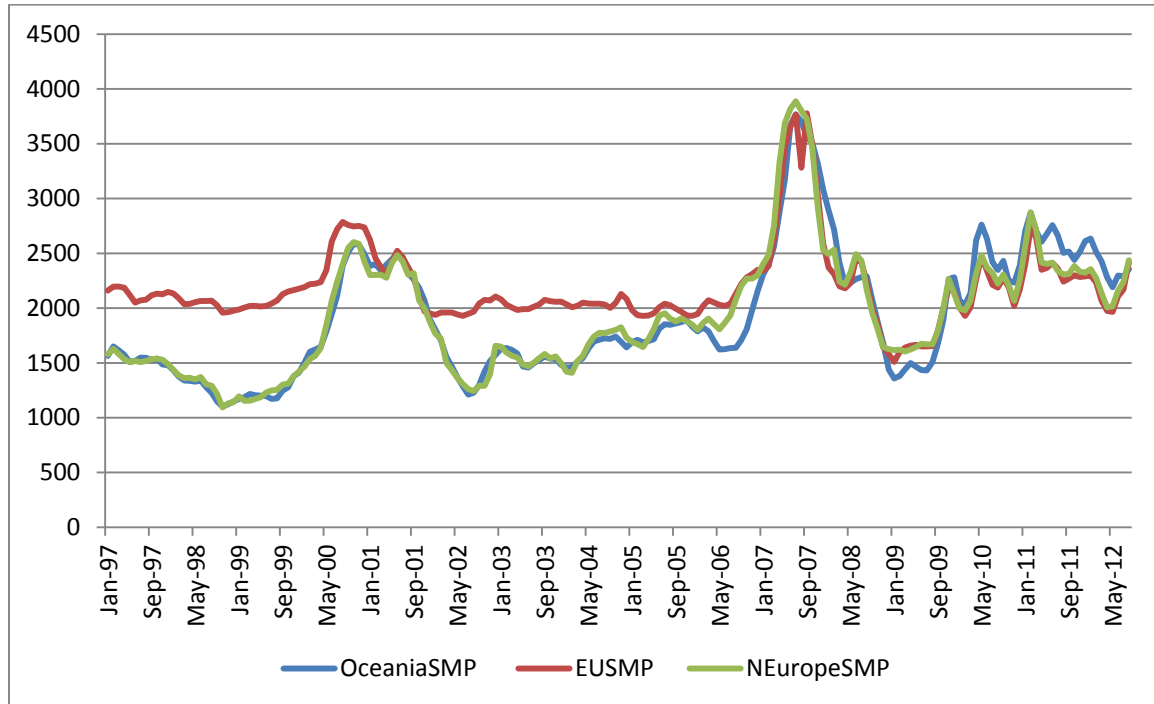
	<i>NEuropeButter</i>	<i>OceaniaButter</i>	<i>EUButter</i>
<i>NEuropeButter</i>	1		
<i>OceaniaButter</i>	0.80395	1	
<i>EUButter</i>	0.483601	0.080729	1

**2006-2012**

	<i>NEuropeButter</i>	<i>OceaniaButter</i>	<i>EUButter</i>
<i>NEuropeButter</i>	1		
<i>OceaniaButter</i>	0.909107	1	
<i>EUButter</i>	0.906875	0.819439	1

<sup>2</sup> Wholesale North European (FOB) and Oceania prices as published by the USDA are taken as representative World prices for the purpose of this study.

**Fig 3 EU and World Market Monthly SMP Prices, 1997-2012**



**Table 2 EU and World Market Monthly SMP Prices, 1997-2012, Correlation Coefficients**

1997-2005			
	<i>NEuropeSMP</i>	<i>OceaniaSMP</i>	<i>EUSMP</i>
<i>NEuropeSMP</i>	1		
<i>OceaniaSMP</i>	0.99023	1	
<i>EUSMP</i>	0.729504	0.724671	1

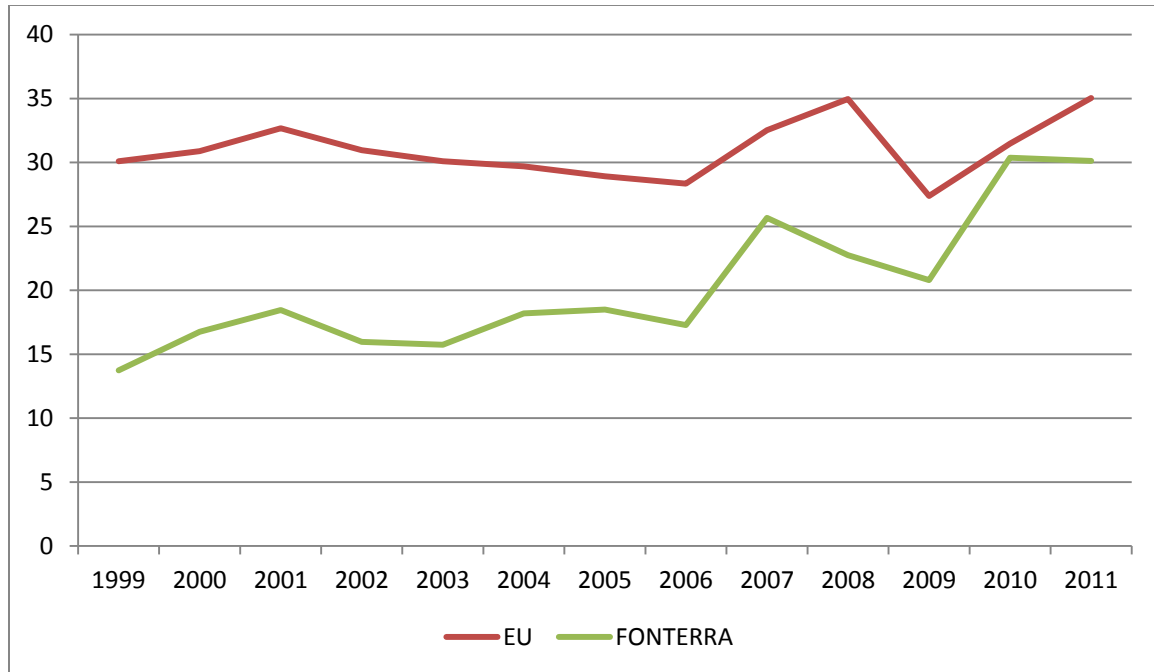
2006-2012			
	<i>NEuropeSMP</i>	<i>OceaniaSMP</i>	<i>EUSMP</i>
<i>NEuropeSMP</i>	1		
<i>OceaniaSMP</i>	0.91879	1	
<i>EUSMP</i>	0.98294	0.903048	1

### Market Convergence

It is quite clear than prices in both the EU and world dairy markets have not just become more closely correlated but also have moved much closer to market convergence. This signifies that the EU dairy market has moved beyond an open economy and has now moved very much towards a single global economy. With regard to market convergence it is visually very clear in relation to both butter and SMP that there has been very major movement towards EU and world market convergence over the past decade (Figs 2.3).

As well as milk product prices, the convergence towards a single global dairy market can also be illustrated by a comparison of milk prices of leading EU dairies and that of Fonterra, based on the standard milk price data of the highly regarded LTO Netherland International Milk Price Review. The Fonterra milk price can be assumed to represent a world market price at farm level. The movement towards EU dairies and Fonterra milk price convergence since the late 1990's is very clear, Fig 4

**Fig 4 Annual Milk Price Comparison, Standardised Milk, €/100kg**



**Source:** LTO Netherland International Milk Price Comparison, Annual Review

Reviewing the milk price comparison since 1999, The difference between the average price of the leading EU dairies and Fonterra was €13.7/100 kg milk in the 1999-2005 period compared with just €7.1/100 kg milk in the 2006-2011 period (Table 3), and indeed the price in both regions has come close to being identical in the 2010-2011 period (Fig 4).

**Table 3 Milk Price Averages, €/100 kg milk,**

	1999-2005	2006-2011
EU Dairies	30.5	31.6
Fonterra	16.8	24.5
Difference, EU minus Fonterra	13.7	7.1

**Source:** LTO Netherland International Milk Price Comparison, Annual Review

## **2 An analysis of the recent extreme dairy price volatility period in the context of the COMAGRI proposal.**

### **2.1 Background**

As the objective of the COMAGRI proposal is to seek to allay producer loss during an extreme low price period it seems appropriate to complete a preliminary analysis of the 2008/9 crisis period.

The COMAGRI proposal states:

*Measures to address severe imbalances in the market for milk and milk products*

*1. From 1 April 2015, In the event of a severe imbalance in the market for milk and milk products, and notably when a price of EUR 0.24/litre is reached, the Commission may decide, by means of implementing acts adopted in accordance with the examination procedure referred to in Article 162(2), to grant, for a period of at least three months which may be extended, aid to milk producers who voluntarily cut their production by at least 5% compared with the same period in the previous year..... The Commission shall also impose a levy on milk producers who increase their production during the same period and in the same proportion.*

As the proposal does not elaborate on the precise specification of a litre many questions arise e.g.

- Is this an EU weighted average price?
- It does not refer to fat %, protein % or other parameters, TBC, SCC, etc.
- It makes no mention of seasonal or end of year (13<sup>th</sup> payment) bonuses and penalties as applied by most dairies which would distort quoted prices
- Is it an ex-farm price or delivered to dairy
- What about VAT?

A further problem for analysts is that official EU milk prices are quoted in €/100kgs rather than cent/litre. However as the conversion factor is 1.03 approx., the data can almost be used interchangeably. Converted cent/litre prices as in the COMAGRI proposal and the official EU €/100 kg prices are both used in the following analysis. Having completed the analysis with one policy trigger it would be a fairly simple exercise to complete a similar analysis with any other trigger that might be suggested.

### **2.2 Data Sources and Timeliness**

The monthly milk price data are sourced from the European Commission CIRCABC website<sup>3</sup>. These data which were published on December 13<sup>th</sup> only provide complete

<sup>3</sup> The Milk statistics-Market situation data was accessed on December 20<sup>th</sup> 2012  
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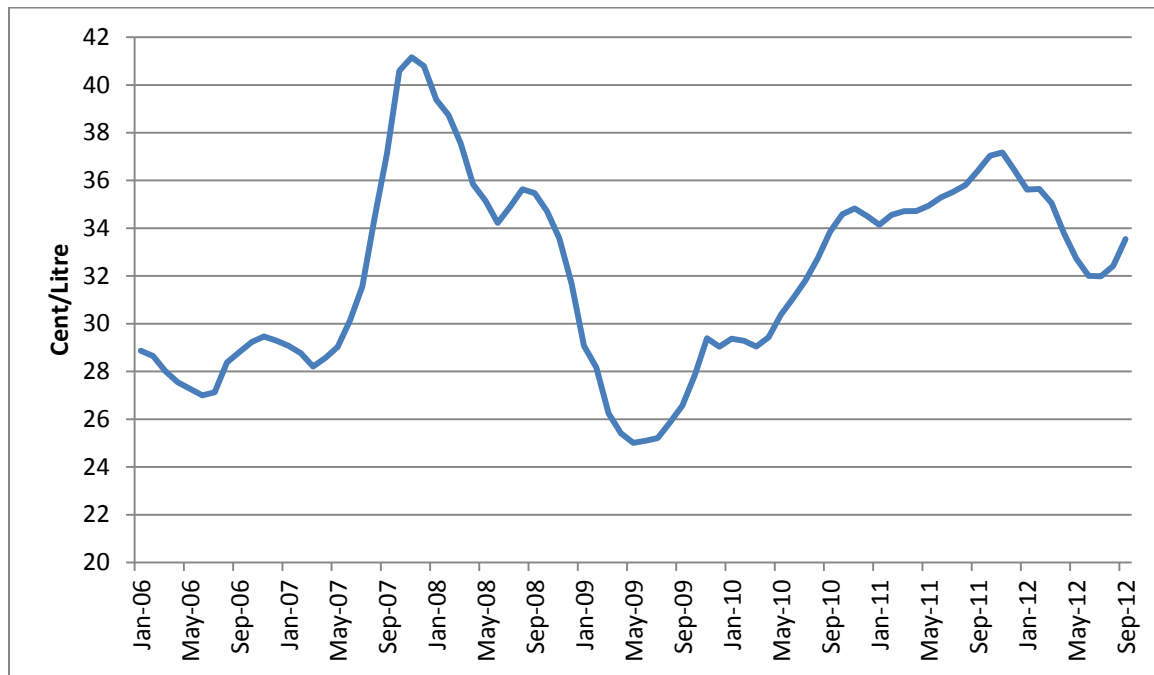


estimates for all 27 members up to September 2012 (estimates are provided for 5 countries in October 2012 while only three countries provided data for November). All milk production data are taken from Eurostat and are based on “Milk Cows' Milk Collected” data<sup>4</sup>. The timeliness of this data should be noted. When this dataset was accessed on December 20<sup>th</sup> 14 of the member states had not reported data for October 2012. Furthermore it should be noted that many monthly observations for Malta are missing and thus Malta is excluded from some of the following analysis. This illustrates the difficulty in the EU involving the timely availability of price data to initiate policy change.

### 2.3 Overall EU weighted average price

As a preliminary exercise this report estimates the EU weighted average monthly milk price from January 2006 to September 2012 (Fig 5).

**Fig 5: Weighted average EU milk price, Cent/Litre**



. These estimates are based on the following sources:

- Monthly milk price data are sourced from the European Commission CIRCABC website<sup>5</sup> and are for (Raw cows' milk, actual fat content - prices per 100 kg) converted to cent/litre.

<sup>4</sup> <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&plugin=1&language=en&pcode=tag00037>

<sup>5</sup> The Milk statistics-Market situation data was accessed on December 20<sup>th</sup> 2012  
[https://circabc.europa.eu/faces/jsp/extension/wai/navigation/container.jsp?FormPrincipal:\\_idcl=FormPrincipal:\\_id3&FormPrincipal\\_SUBMIT=1&id=888cb737-47be-4c4f-93b5-](https://circabc.europa.eu/faces/jsp/extension/wai/navigation/container.jsp?FormPrincipal:_idcl=FormPrincipal:_id3&FormPrincipal_SUBMIT=1&id=888cb737-47be-4c4f-93b5-)

- Weights are sourced from Eurostat and are based on monthly “Milk Cows' Milk Collected” data<sup>6</sup>

As seen in Fig 5 the monthly EU weighted average price never falls below the proposed trigger price of 24 cent/litre. In fact the lowest price during this period was 25 cent/litre recorded in May 2009.

## 2.4 Milk Prices – Annual by Country

Given the initial assumption of a 24 c/l market imbalance trigger, it seems appropriate to review annual milk price by country to identify where prices dipped below this reference point. Annual Milk Prices by country for the entire period 2006-2011 were available for 22 EU countries, (Raw cows' milk, actual fat content - prices per 100 kg), and sourced from Eurostat. While these prices have been converted to cent/litre (Table 4) the original prices per 100kg are shown in Appendix 3. Note that no annual price data were available for France, Bulgaria, Czech Republic, Cyprus and Latvia. For comparison purposes, Fonterra and USA prices are also included and sourced from LTO.

Reviewing these prices, just six of the 22 EU countries had an annual average milk price below 24 cent/litre during the crisis year 2009, accounting for 12.5% approx. of EU 2011 milk deliveries (data unavailable for five countries accounting for 20% approx. of EU milk deliveries). These six consisted mostly of the newer member states Table 4. There is major diversity in milk prices among the member states, as highlighted by the range in prices in 2009. Annual milk price by country (2009) varied from a peak of 46 cent/litre approx. to a low level of about 18 cent/litre. Four countries had a milk price of over 35 cent/litre in 2009, in contrast with four countries where price levels were below 22 cent/litre (Table 4). The great diversity in milk price among the member states emphasizes the difficulty in introducing any price based trigger as a basis for an EU wide emergency policy.

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<sup>6</sup> <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&plugin=1&language=en&pcode=tag00037>

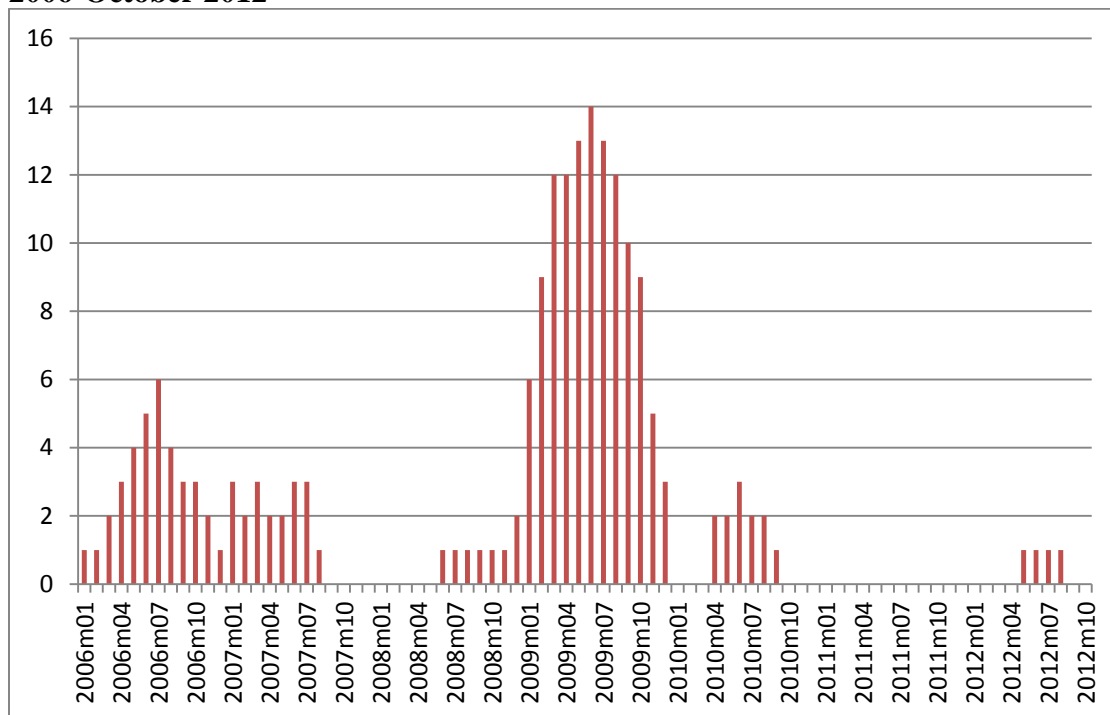
**Table 4 Annual Milk Price by Country, Cent/litre**

	% of EU Milk Cows' Milk Collected 2011	Annual Milk Price Cent/litre					
		2006	2007	2008	2009	2010	2011
Belgium	2.24	27.75	34.76	33.08	24.29	31.30	34.05
Denmark	3.46	31.34	40.20	38.95	29.74	34.86	37.05
Germany	21.22	29.37	35.75	36.06	26.01	32.17	36.25
Estonia	0.45	25.05	27.67	30.56	<b>21.63</b>	28.53	32.66
Ireland	4	25.18	32.07	32.19	<b>22.18</b>	28.99	33.58
Greece	0.46	36.00	39.83	44.50	38.82	38.45	44.45
Spain	4.3	30.51	36.41	39.08	30.07	30.45	31.80
Italy	7.42	36.15	37.50	42.71	38.18	38.58	44.68
Lithuania	0.95	<b>20.66</b>	30.33	25.71	<b>18.41</b>	25.76	29.40
Luxembourg	0.2	31.34	36.77	39.27	26.77	30.85	33.95
Hungary	0.95	24.87	29.79	33.79	<b>22.52</b>	26.87	32.25
Malta	0.01	35.44	38.64	48.93	46.21	42.58	48.60
Netherlands	8.42	30.18	35.64	37.44	27.50	34.92	39.40
Austria	2.1	30.79	34.76	40.07	29.87	32.67	36.40
Poland	6.72	<b>23.84</b>	28.31	29.99	<b>21.33</b>	27.48	30.29
Portugal	1.33	29.77	33.43	37.31	30.19	29.85	32.36
Romania	0.64	<b>19.57</b>	<b>23.39</b>	<b>24.65</b>	<b>21.87</b>	<b>22.99</b>	26.24
Slovenia	0.38	27.45	28.66	33.77	26.77	28.16	32.05
Slovakia	0.59	26.75	29.89	35.15	26.51	28.13	32.75
Finland	1.63	36.90	39.05	44.79	40.11	40.59	43.91
Sweden	2.06	31.06	33.86	38.35	29.00	37.26	40.84
United Kingdom	9.98	26.35	30.22	32.57	26.55	28.76	31.53
Fonterra		<b>17.80</b>	26.44	<b>23.43</b>	<b>21.42</b>	30.95	
USA Class III		24.17	33.08	30.25	<b>20.85</b>	28.05	

## 2.4 Milk Prices - Monthly

Of the 27 EU countries, the number with a price below €24/100kg on a specific month over the period January 2006 to October 2012 never exceeded 14<sup>7</sup> (Fig 5). For most of 2009 the number of countries with a price below €24/100kg on a specific month varied between nine and 14. A subset of these countries, drawn exclusively from the newer member states, had milk prices below €24/100kg on a large number of occasions throughout the 2006-2010 period (Fig 5).

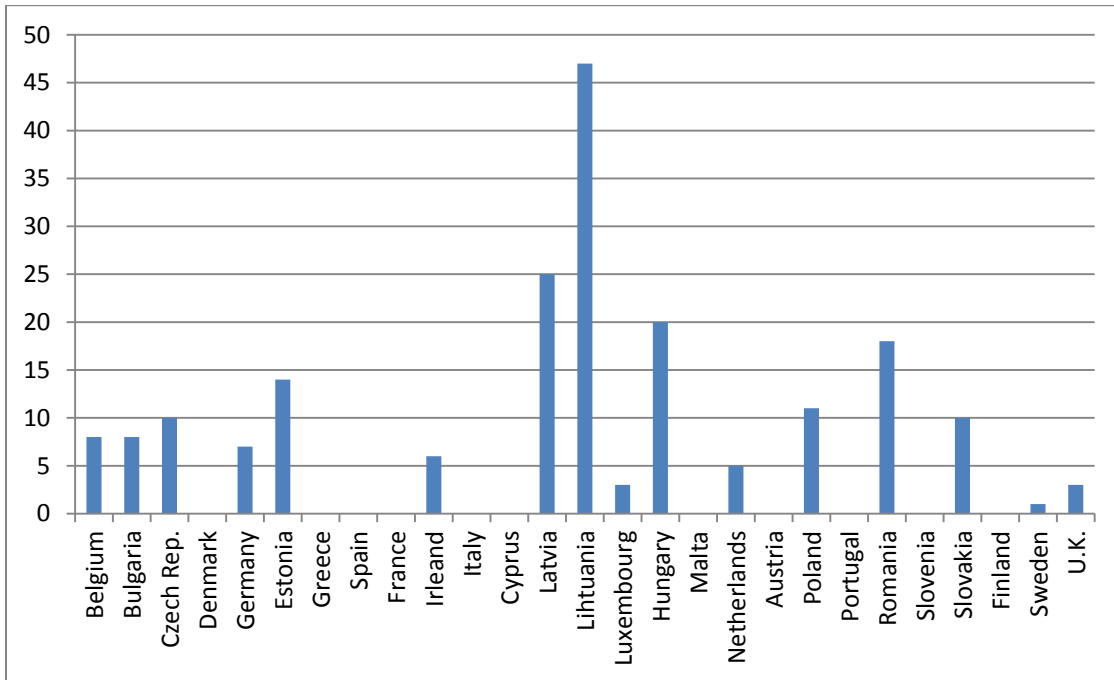
**Fig 5 Number of EU countries with a monthly milk price below €24/100kg, January 2006-October 2012**



Reviewing the number of months that each of the 27 EU countries had a monthly milk price that fell below €24/100kg over the 2006-2012 period, it is clear that a substantial subgroup of countries, 11 in all, never had a monthly milk price below this reference point, Fig 6. A further subgroup of 10 countries had a monthly milk price below €24/100kg for 10 months or less. Thus just five countries (Estonia, Latvia, Lithuania, Hungary, and Romania) had monthly milk prices below €24/100kg for greater than 10 months during the 2006-2012 period (Fig 6). The latter five countries account for just 3 % of EU milk deliveries in 2011.

<sup>7</sup> It should be noted that not all data are available for Bulgaria, Romania and Malta.

**Fig 6 Number of Months each EU country had a monthly milk price below €24/100kg, January 2006-October 2012.**



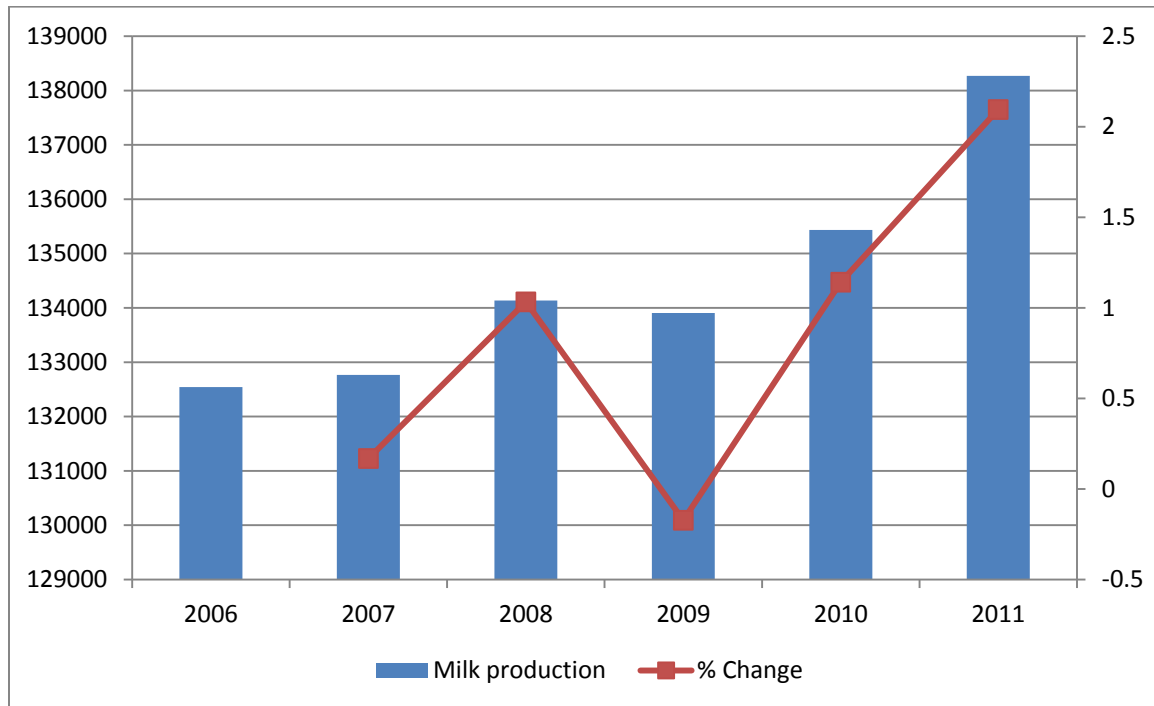
## 2.5 EU Milk Deliveries

Following the Luxembourg agreement and the CAP Healthcheck the EU milk quota was increased by 2% in 2008/9 and is being increased by 1% per annum in subsequent years. More detailed analysis of actual deliveries is now completed in relation to both annual and monthly changes in milk deliveries, together with a very preliminary discussion of supply response.

## 2.6 EU Annual Milk Deliveries

The EU has increased milk deliveries slightly each year since 2006 with the exception of 2009, Fig 7. In contrast with other years there was a slight decline of 0.17% in deliveries in 2009. (It may be noted that global cow milk production grew by 0.6% in 2009, albeit its lowest rate since 1997, IDF 2010). It would be premature to solely attribute the exceptional decline in deliveries in 2009 to the large decline in milk price in that year as outlined earlier, as a range of other factors including change in milk production costs, climatic change, etc. could also be important causative factors.

**Fig 7 Annual Milk Deliveries and Percentage Annual Change, EU 27**



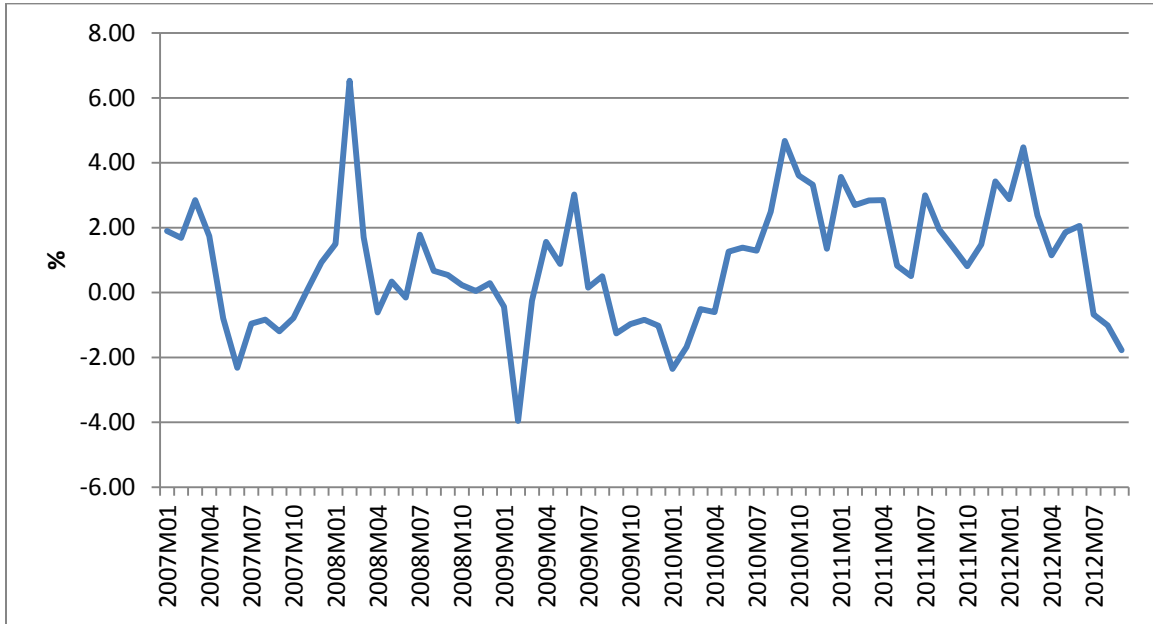
## 2.7 Monthly Milk Deliveries

Given the seasonal nature of milk production it is probably best to consider monthly comparisons of milk deliveries on a year on year basis (that is, a comparison of deliveries in each month with the corresponding month of the previous year). It also appears reasonable to assume that any restriction proposed would be relative to deliveries in the corresponding month of the previous year. Figure 8 shows that, at the aggregate EU level, monthly deliveries were rarely more than 2% below the previous years' level over the period January 2007 to August 2012 and never reached a 5% monthly reduction. The only extended periods in which monthly deliveries dipped below the previous years level were from September 2009 to May 2010 and also for a shorter period May 2007 to October 2007 (Fig 8).

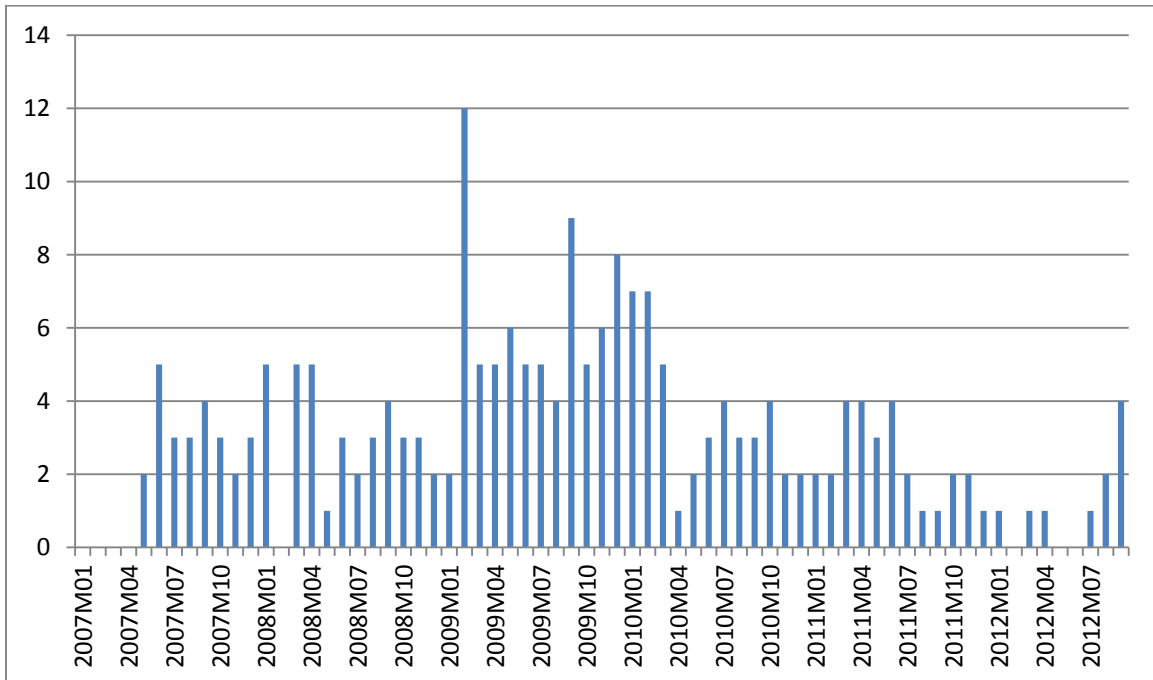
The number of EU countries where the decline in monthly milk deliveries (year on year basis) exceeded 5% was six or less on all but five months over the period January 2007 – August 2012. This somewhat exceptional period occurred on an occasional monthly basis over the period February 2009 – February 2010 (Fig 9).

Finally, in a detailed review on a per country basis, the number of occasions in which each EU country had monthly milk deliveries declines (year on year basis) exceeding 5% over the period January 2007- August 2012 shows that eight of the 27 EU countries had greater than 10 months in which such a deliveries decline occurred (Fig 10). These were mostly newer EU member countries.

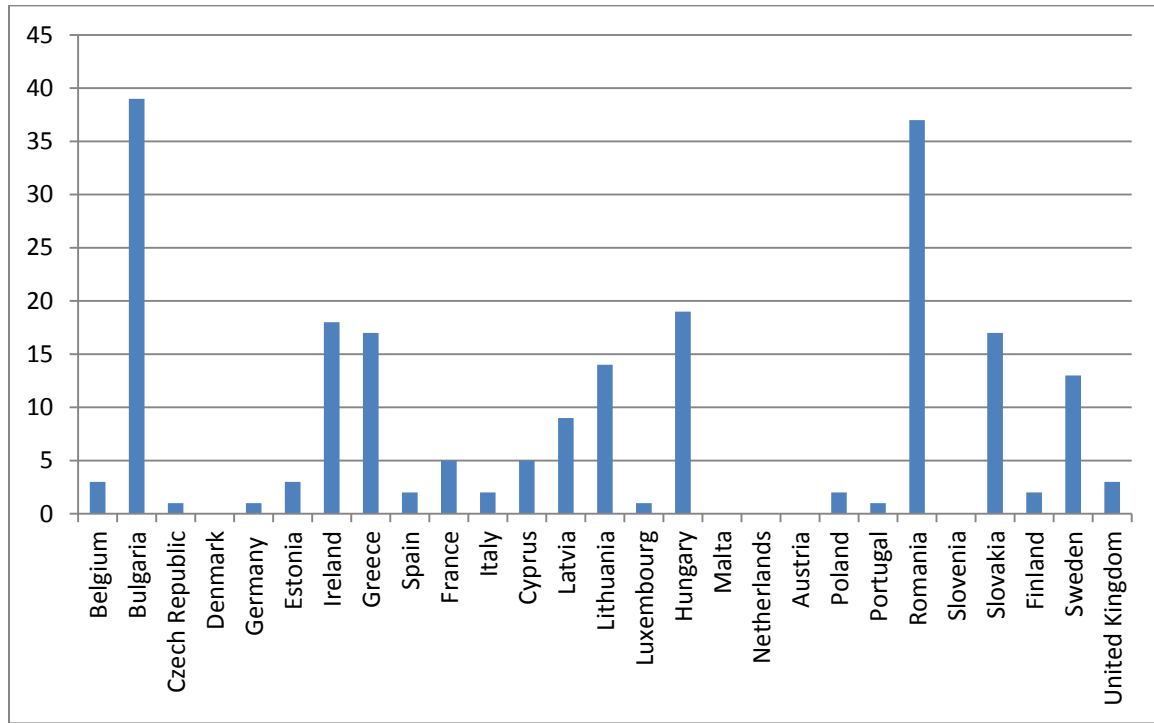
**Fig 8 EU Monthly Milk Deliveries Comparison, Percent change year on year basis, January 2007 – August 2012**



**Fig 9 The number of countries which had a monthly decline in milk deliveries (year on year basis) exceeding 5%, January 2007-August 2012**



**Fig 10 The number of months in which each country had a monthly decline in milk deliveries (year on year basis) exceeding 5%, January 2007-August 2012**



## 2.8 Supply Adjustment

The COMAGRI proposal states the following:

*In the event of a severe imbalance in the market for milk and milk products, the Commission may decide to grant aid to milk producers who voluntarily cut their production by at least 5% compared with the same period in the previous year, for a period of at least three months, which may be extended. When granting such aid, the Commission shall also impose a levy on milk producers who increase their production during the same period and in the same proportion.*

Ideally in reviewing the potential consequences of such a proposal based on historic data, one would require access to the increases or declines in milk deliveries at producer level, however access to such data is not available at this point. Hence as a very preliminary exercise the extent to which whole countries had a decline in deliveries of at least 5% compared with the same period in the previous year, for a period of at least three months has been estimated, Table 5. The results show that just 9 of the 27 EU countries had such a three month consecutive milk deliveries decline, and that these were mostly drawn from the newer EU member states. Obviously in addition to economic factors, exceptional weather conditions for milk production, drought, rainfall etc. can be an important factor in precipitating such a decline in deliveries.



**Table 5 Countries which had a decline in milk deliveries of at least 5% compared with the same period in the previous year, for a period of at least three months**

	Ireland	Greece	France	Cyprus	Latvia	Lithuania	Hungary	Romania	Slovakia
2007M01									
2007M02									
2007M03									
2007M04									
2007M05									
2007M06									
2007M07									
2007M08									
2007M09									
2007M10									
2007M11									
2007M12									
2008M01									
2008M02									
2008M03									
2008M04									
2008M05									
2008M06									
2008M07									
2008M08									
2008M09									
2008M10									
2008M11									
2008M12									
2009M01									
2009M02									
2009M03									
2009M04									
2009M05									
2009M06									
2009M07									
2009M08									
2009M09									
2009M10									
2009M11									

2009M12	Red				Red	Red	Red	Red	Red
2010M01	Red					Red	Red	Red	Red
2010M02						Red	Red	Red	Red
2010M03						Red		Red	Red
2010M04									
2010M05								Red	
2010M06								Red	
2010M07							Red	Red	
2010M08							Red	Red	
2010M09							Red	Red	
2010M10							Red	Red	
2010M11							Red	Red	
2010M12							Red	Red	
2011M01							Red	Red	
2011M02							Red	Red	
2011M03		Red					Red	Red	
2011M04		Red					Red	Red	
2011M05		Red					Red		
2011M06							Red		
2011M07		Red							
2011M08		Red							
2011M09		Red							
2011M10	Red	Red							
2011M11	Red	Red							
2011M12	Red								
2012M01	Red								
2012M02									
2012M03									
2012M04									
2012M05									
2012M06									
2012M07	Red								
2012M08	Red								
2012M09	Red								

### **3. Other relevant issues**

There are a number of other relevant issues worthy of discussion involving further negative consequences of a voluntary EU milk deliveries reduction policy in an open economy context. While no analysis or literature review has been completed to explore these issues in this report, it may be possible to explore these issues further in the future.

#### **3.1 Disruption of long term planning**

Dairy farming and manufacturing is a somewhat unique industry in that production arises from a long term planning process and is not an industry where production can easily be reduced or increased on a short term basis. In this context it also requires a long term consistent policy environment.

#### **3.2 Effect on Producer Productivity**

The COMAGRI proposal involves penalising expanding suppliers while rewarding contracting suppliers in the short term. Expanding suppliers, who in general are younger, more productive and innovative, represent the future of the industry. In contrast, suppliers with static or declining output are generally less productive, older suppliers. It would seem very counter progressive when considering the longer term future of the EU dairy industry to penalise the more productive suppliers while rewarding the less productive by transferring income from the former to the latter. This is particularly the case in an open economy context where EU suppliers would merely become less competitive than otherwise in contrast with international competitors who would get an opportunity to expand and enhance competitiveness from the policy.

#### **3.3 Effect on Economies of Scale**

Related to the previous point, it has been widely demonstrated that there are in general economies of scale benefits in terms of lower milk production costs as production moves to larger scale farms. The proposed policy is in total conflict with this finding and thus would make the EU dairy industry less productive and competitive in a global context.

#### **3.4 Counterproductive base establishment Effect**

The mere announcement of such a policy, involving the potential rewarding of suppliers who reduce supply relative to a historic base, could immediately trigger a rush to expansion so as to establish as large a base as possible which may exacerbate the very market problem that is being addressed. Thus the proposed policy may in effect bring about a totally counterproductive classic “race for base”.

### **3.5 Mistiming of Policy Implementation**

If a delayed identification of the price trigger point as discussed earlier is combined with a slow “politicised” decision-making process, the implementation of the proposed policy may be mistimed. By the time the proposed policy is implemented the crisis may have passed and the policy change could then have the opposite effect to that intended and exaggerate the very problem it is designed to lessen. This could occur as the periods of low prices in the overall cyclical price pattern are quite short as shown earlier.

### **3.6 Effect on the provision of milk contracts**

Any milk supply contract would have to provide for the possibility that farmers may or may not sign up to reduce production. In addition, as the duration of the proposed policy intervention is unknown, this may further complicate contract terms.

### **3.7 Market Effects- Short term versus Longer term**

Any policy involving market intervention, while seeking to achieve short term benefits, can have an opposite effect in the longer term. Take for example the current COMAGRI proposal which advocates a milk supply reduction in the short term. Take the EU and world dairy commodities market over the last five years which involved a short term low price period in 2009 followed by a price boom in 2011. If a further reduction in production was achieved in 2009, the effects would likely follow through to 2011 creating an even greater price boom which would in turn generate even greater expansion in output, in turn precipitating a greater than otherwise price reduction in the subsequent low price period. Thus the “normal” cyclical price pattern as applies in many commodities may be exaggerated in a counterproductive manner by market intervention of the type proposed.

### **3.8 Effect on Consumers, Manufacturers and the supply chain**

The proposed policy would also have negative consequences for consumers through higher prices, as well as for manufacturers. EU dairy product manufacturers, in seeking to meet the needs of customers in an expanding global market, would be obliged to source additional supplies outside the EU.

### **3.9 Effect on the provision of private market risk solutions**

A market intervention of this nature will have a negative effect on the development of private market risk solutions to manage price/income volatility. For example it is unlikely that speculators would wish to participate in a market where downside volatility is limited while hedgers may postpone decisions in anticipation of an intervention which may or may not occur.

### **3.10 Perverse Production Response**

During periods of low prices, some producers under severe financial pressure may increase production in order to generate cashflow and the policy proposal would generate an extra penalty for these producers at a time of greatest financial pressure. At the same time producers who reduce production may have to wait until well after the crisis has passed to receive their ex post payments. Again this would do little to solve any immediate cashflow problems.

### **3.11 Unintended Consequences**

It should finally be borne in mind that all policy interventions are subject to the law of unforeseen consequences, as has been apparent on various occasions in the past.

While this set of issues is not analysed in detail, in this report, many of these issues are worthy of further analysis which can be completed at a later stage.

## Appendix 1: The Measurement of Price Volatility

This appendix is a brief summary of more technical research on price volatility and is taken mainly from a recent paper

*Kelly, E., O'Connor, D. and M. Keane "The Effect of Policy Changes on Volatility in Dairy Markets" Paper presented at Agricultural Economics Society of Ireland Annual Conference November 2012.*

Many methods are used to quantify volatility ranging from econometric modelling techniques to simple descriptive statistical analysis. In this summary review price volatility is highlighted by analysis of monthly prices over time. The measures used include (1) standard deviation (SD) and coefficient of variation (CV). The CV of a price series expresses variation in the series relative to the mean value of the series with this ratio then multiplied by 100. (2) Another useful measure of volatility is given by the mid 90% range which is generated using the range between 95% and 5% percentiles for the data. (3) The annualized standard deviation as routinely used in reports by the FAO and the European Commission to compute historic volatility is also used.

1. It may be represented as follows,

$$AnnStdDev(r_1, \dots, r_n) = StdDev(r_1, \dots, r_n) * \sqrt{Num\ Periods\ Per\ Year}$$

where  $r_1, \dots, r_n$  is a return series, i.e., a sequence of returns for  $n$  time periods.

The data source used is the Dutch wholesale Skim Milk Powder (SMP), Whole Milk Powder (WMP) and butter prices which were sourced from Agra Europe. As well as the commodity prices per se two imputed milk prices were also analysed. The first is based on the gross combined return for skim milk powder (SMP) and butter while the second is based on the return for wholemilk powder (WMP). These imputed series can be expressed as a cent per litre gross return. These price series are available from January 1997 until March 2012. To account for changes in policy as summarised above, volatility is measured firstly for the whole sample period followed by a pre and post Luxembourg Agreement implementation comparison.

The results in Table A1 show a CV of 15, 16 and 13 for the whole period between January 1997 and August 2012 for Dutch wholesale butter, SMP and WMP respectively. In comparison with volatility between January 1997 and December 2004, volatility increased dramatically from a CV of 5, 10 and 6 to 21 for both butter and SMP and 18 for WMP for the period January 2005 to March 2012. Therefore, the large increase in volatility for these commodities came post the Luxembourg agreement. This indicates that the rise in wholesale price volatility coincided with the major policy changes such as the lowering of price supports bringing the EU prices more in line with world market prices. The policy changes exposed EU commodity prices to shocks on a world level

without the protection of intervention prices until the much lower safety net levels were reached. Focusing on the mid 90% range measure, it is highlighted that 5% of observations had prices of above €4,157, €3,369 and €3,545 for butter, SMP and WMP respectively post 2005 while the corresponding figures pre January 2005 for these commodities were €3445, €2726 and €2914 respectively. Similarly, prices at the lower end post 2005 have moved to new territory with for example 5% of butter now trading below €2,157 while pre 2005 the comparable figure is €2,984.

The CV results also show that volatility increased from 7 approx between 1997 and December 2004 to 19 between January 2005 and 2012 for the imputed butter and SMP milk price equivalent. Similarly volatility for imputed WMP milk price equivalent increased threefold approximately from 6 between January 1997 and December 2004 to 18 between January 2005 and 2012.

**Table A1: Commodity Price Volatility**

	<b>Butter</b>	<b>SMP<sup>1</sup></b>	<b>WMP<sup>2</sup></b>	<b>Butter and SMP<sup>3</sup></b>	<b>WMP<sup>4</sup></b>
1997-2012	€/tonne	€/tonne	€/tonne	(c/l)	(c/l)
Average	3084	2186	2640	32.89	35.20
St Dev	457	357	341	4.56	4.54
CV <sup>5</sup>	15	16	13	13.86	12.91
95%	3997	2756	3176	39.53	42.35
5%	2308	1709	2144	25.46	28.58
1997-2004					
Average	3149	2144	2642	32.80	35.23
St Dev	165	212	158	2.22	2.11
CV	5	10	6	6.77	5.98
95%	3445	2726	2914	38.42	38.86
5%	2984	1956	2424	30.44	32.32
2005-2012					
Average	3015	2230	2638	32.98	35.17
St Dev	626	459	461	6.13	6.15
CV	21	21	17	18.58	17.47
95%	4157	3369	3545	45.34	47.27
5%	2157	1647	1872	24.09	24.96

<sup>1</sup>Skim Milk Powder (SMP)

<sup>2</sup>Whole Milk Powder (WMP)

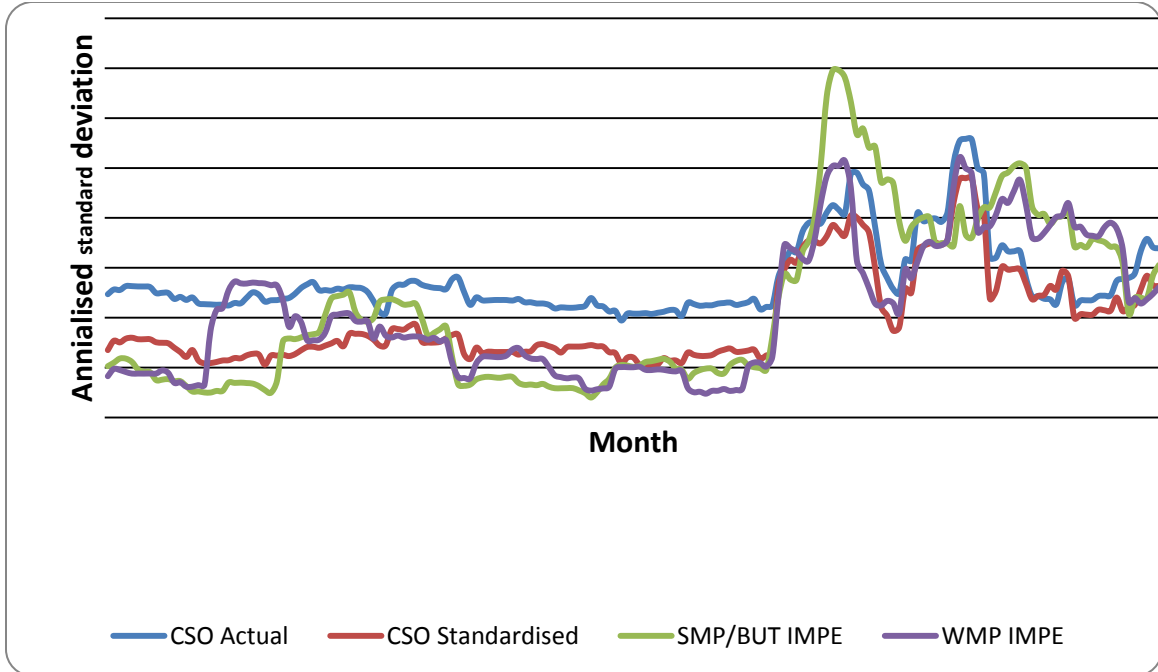
<sup>3</sup>Imputed milk price butter and SMP

<sup>4</sup>Imputed milk WMP

<sup>5</sup>Coefficient of variation

Figure A1 shows the results of the annualised standard deviation between 1997 and 2012. It is clear that for all commodities tested the annualised standard deviation increases dramatically post 2005 which also highlights the effects of policy changes on volatility.

**Figure A1: Annualised standard deviation for commodity prices**





## Appendix 2 Economic Analysis of Market Consequences of Temporary Reduction in EU Milk Production

This representation of the market consequences of a temporary reduction in EU milk production is based on a number of simplifying assumptions. The global dairy market is reduced to two regions, the EU and Rest of World (ROW) with the EU as a substantial net exporter to ROW. Three market situations are analysed using simplified economic analysis:

- Economic effect in EU market of a reduction in EU milk production in a closed EU economy context, Figs A2.1 and A2.2 ( note all Figs at the end of this section)
- Economic effect on world market of a reduction in EU milk production in an open economy context, Figs A2.3 and A2.4
- Economic Effect on EU market of a reduction in EU milk production in an open economy context, Figs A2.5 and A2.6.

Like all market models the analysis is highly simplified, however it is felt that it captures the essential market consequences of the policy proposal being reviewed. The major simplifications include:

- Omission of import tariffs and export refunds.
- Omission of intervention buying or other EU market supports
- Omission of non-EU dairy market policy regimes.

Overall it is felt that the essential conclusions are unaffected by these omissions.

1. Economic effect in EU of a reduction in EU milk production in a closed economy context.

The EU milk market in a closed economy prior to the reduction in production is shown in Fig A2.1. It includes the following elements:

- inelastic demand for dairy commodities  $D_{E,DE}$
- EU milk quota  $OQ1$ . It is assumed for simplicity that EU deliveries equals EU quota
- EU over quota levy  $PLPL1$
- EU market price  $PE$

The effect on EU producers of a reduction in EU milk production in a closed economy context as shown in Fig A2.2 involves the following additional elements:

- EU revised milk quota (deliveries)  $OQ2$
- EU revised market price  $PE1$

Effect on EU producers of reduced EU deliveries:

Revenue: Gain:  $PE1 PE A E$

Loss:  $Q2 Q1 B A$

Net Revenue Gain:  $PE1 PE A E$  minus  $Q2 Q1 B A$

It is concluded that the reduction in EU production can result in a significant price increase and increase in EU producer revenue in a closed economy context.

2. Economic effect in World Market of a reduction in EU milk production in an open economy context.

The world milk market prior to the reduction in EU production is shown in Fig A2.3. It includes the following elements:

- inelastic demand for dairy commodities  $D_w$
- world market trade OB
- world market price PW1
- EU share of world market OA/OB

The effect of reduced EU deliveries on the world market is shown in Fig A2.4

- reduced EU supply to world market D A
- world market supply reduction: HB, i.e. OB minus OH
- new world market price: PW2
- new world market price increase: PW2 minus PW1

- (a) Effect on EU suppliers in world market

- Revenue:
  - Gain: PW2 E G PW1
  - Loss: G C A D
  - Net Revenue Loss: G C A D minus PW2 E G PW1
- Market Share
  - Loss: OD/OH < OA/OB

- (b) (b) Effect on non EU suppliers in world market

- Revenue:
  - Gain: E G F Y
  - Loss: F H B X
  - Net Revenue Gain; E G F Y minus F H B X
- Market Share
  - Gain: DH/OH > AB/OB

3. Comparison of Economic effect in EU Market of a reduction in EU milk deliveries in a closed economy and an open economy context.

The EU milk market following a reduction in EU deliveries in a closed economy context as shown in Fig A2.2 is shown again in Fig A2.5 for comparison purposes with Fig A2.6. As before it includes the following elements:

- EU reduced milk quota (deliveries) OQ2 versus O Q1

- EU increased market price PE1 versus PE

Effect on EU producers of reduced EU deliveries in closed economy context

Revenue: Gain: PE1 PE A E

Loss: Q2 Q1 B A

Net Revenue Gain: PE1 PE A E minus Q2 Q1 B A

The EU milk market following a reduction in EU production in an open economy context is shown in Fig A2.6. It includes the following elements:

- inelastic demand for dairy commodities  $D_E$
- EU supply to internal EU market: O Q3
- EU market price: PW2 (limited price increase due to world market exposure in open economy context).

The effect on EU producers of reduced EU deliveries in the EU market:

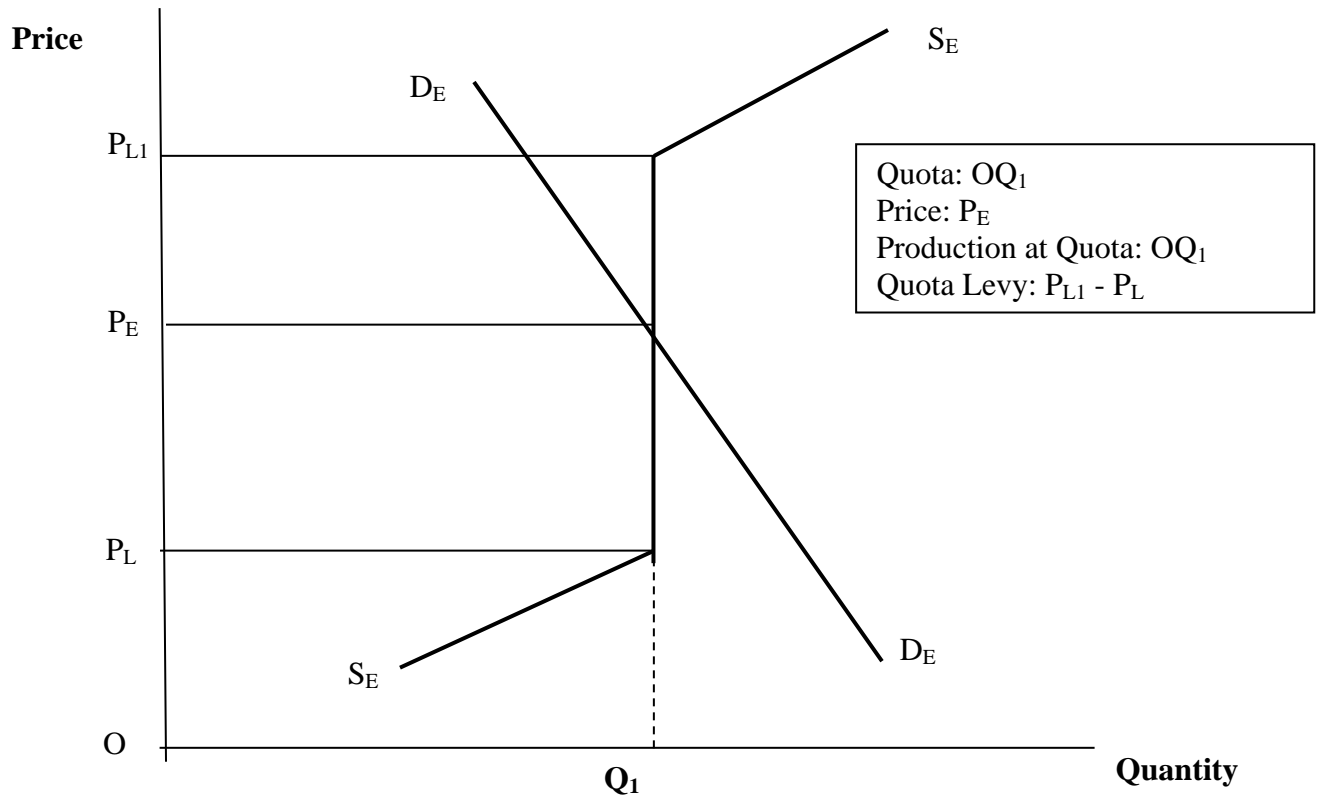
- Price Gain: PW2 minus PE
- Revenue: Gain: PW2 G H PE  
Loss: Q3 Q1 B H
- Limited net revenue gain: PW2 G H PE minus Q2 Q1 B H

Comparison of revenue gain in EU market, closed versus open economy

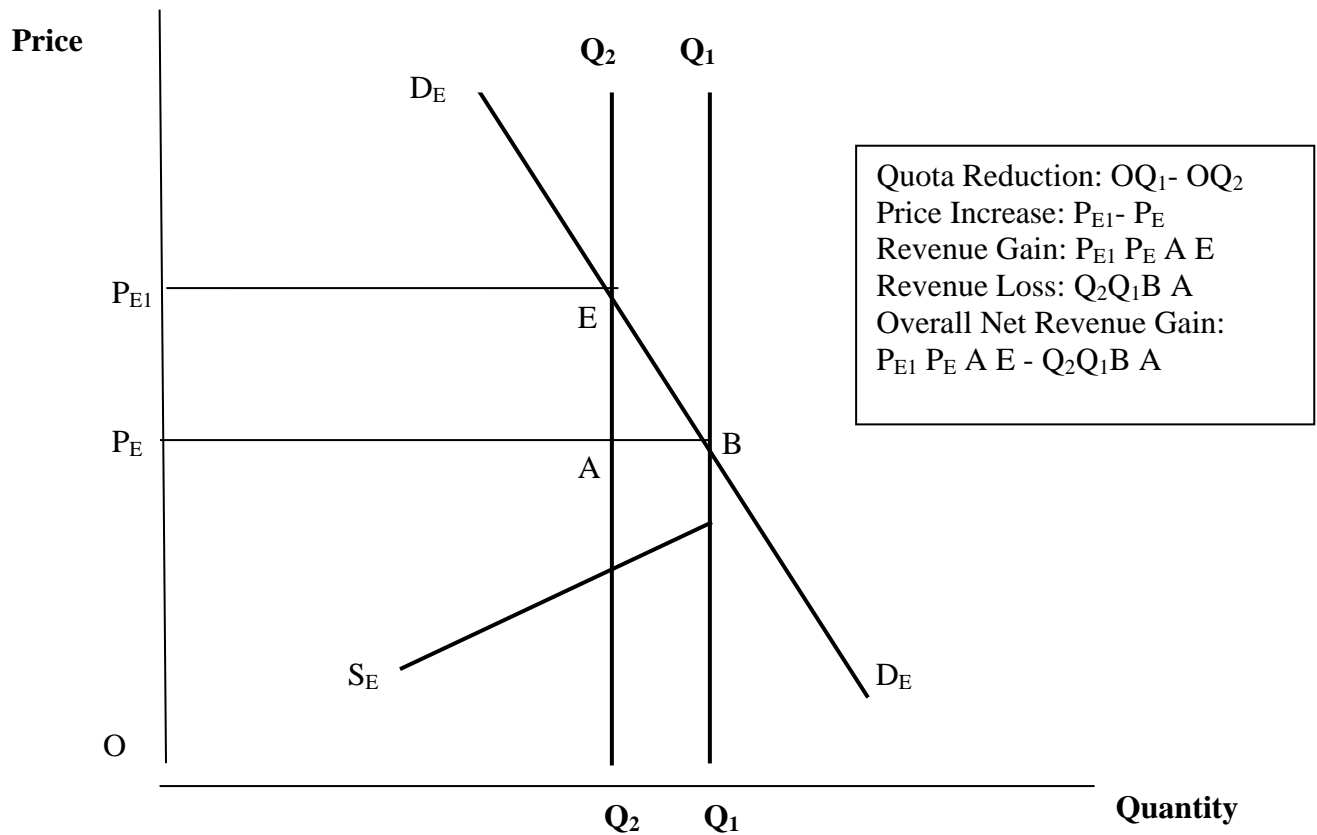
Closed Economy minus open economy

- Price Gain: PE1 minus PW2
- Revenue: Gain: PE1 E F PW2  
Loss: Q2 Q3 G F
- Net revenue gain: PE1 E F PW2 minus Q2 Q3 G F

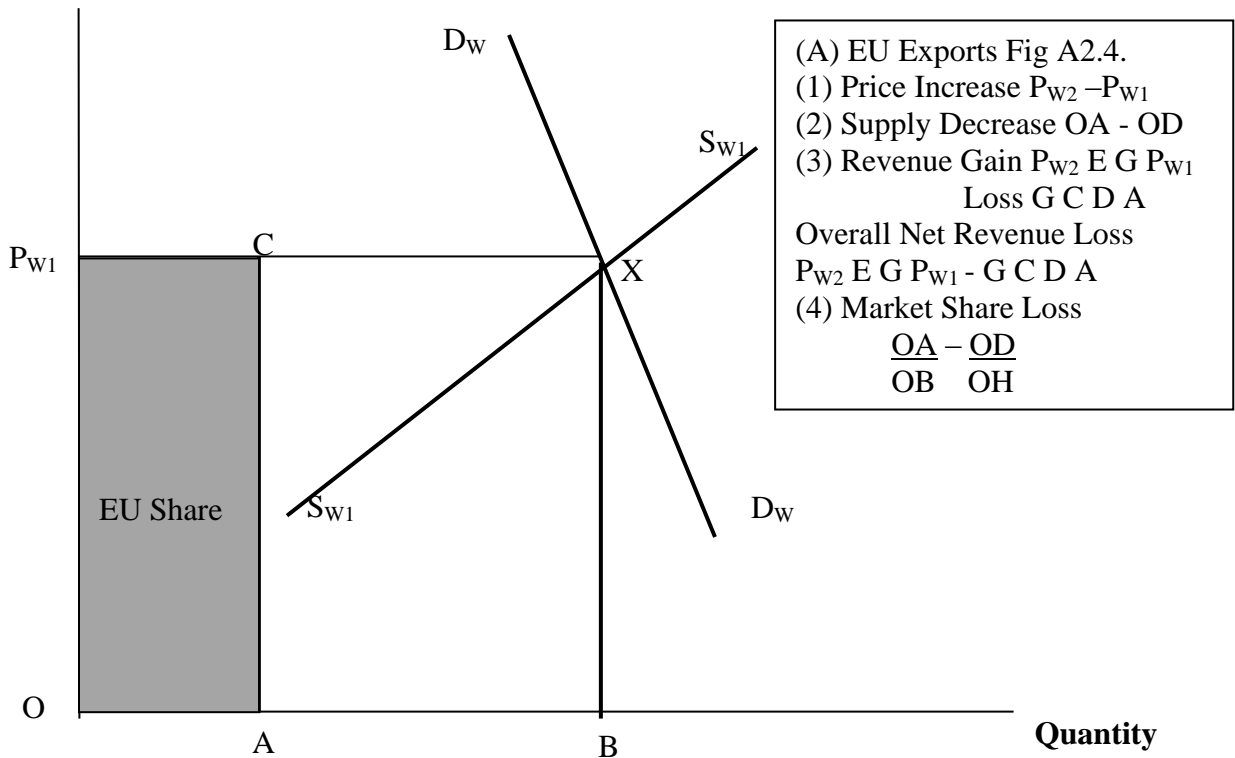
**Figure A2.1:** EU Market – Closed Economy -Pre Additional Supply Constraint



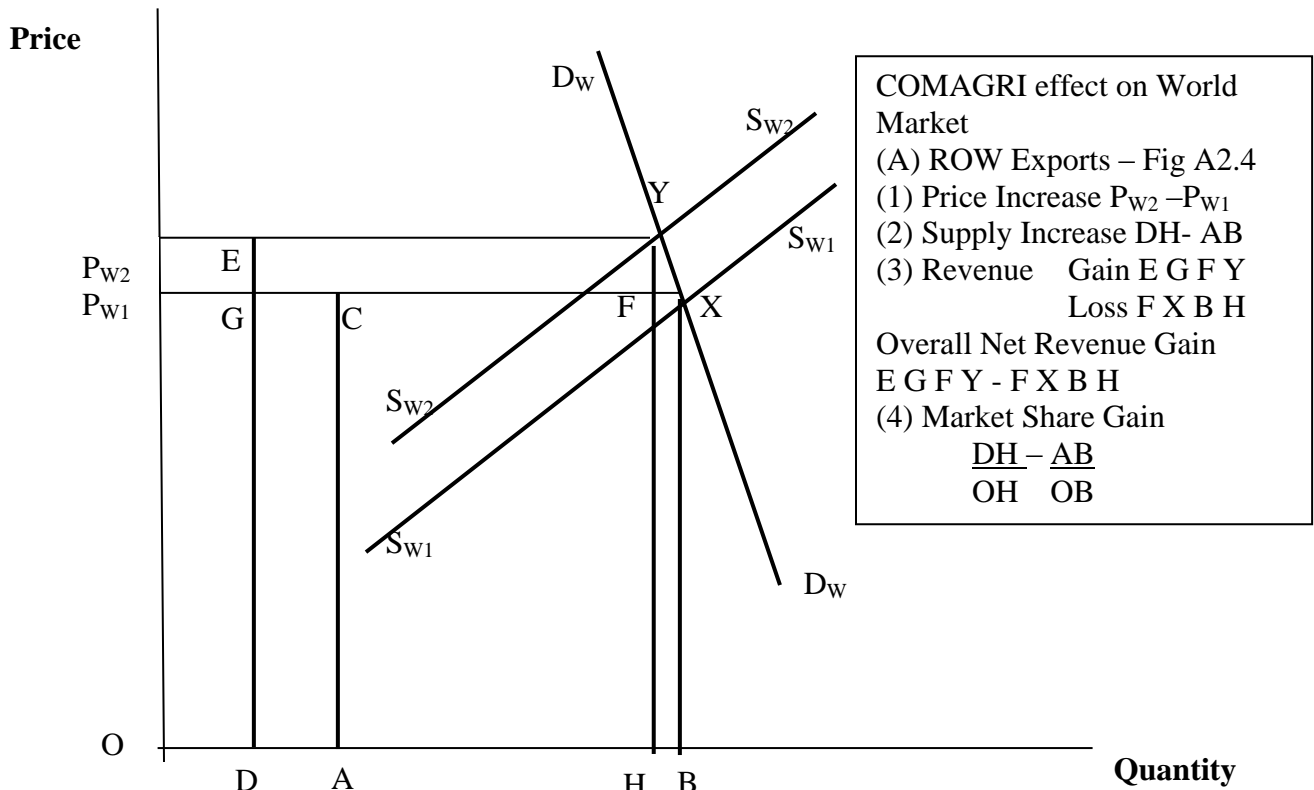
**Figure A2.2:** EU Market – Closed Economy -With Additional Supply Constraint



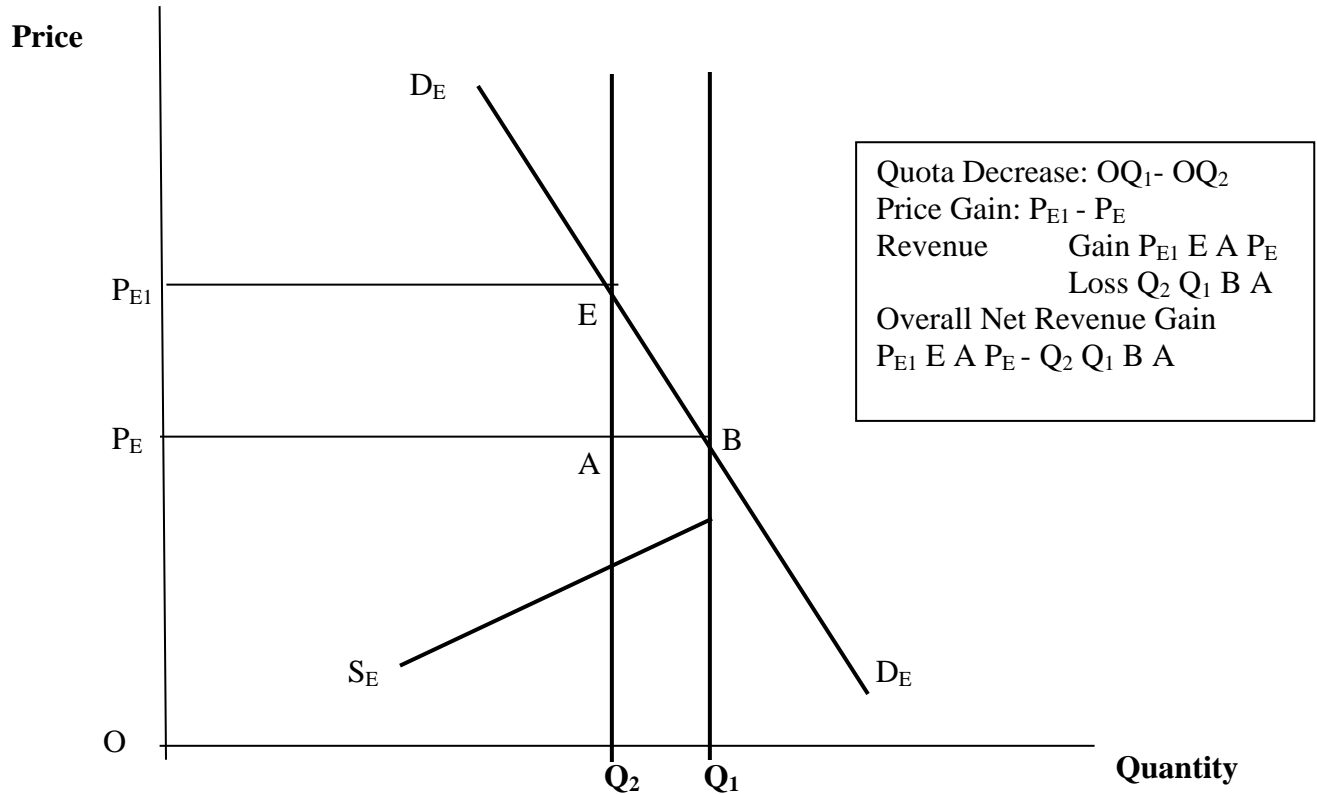
**Figure A2.3: World Market, Pre COMAGRI**



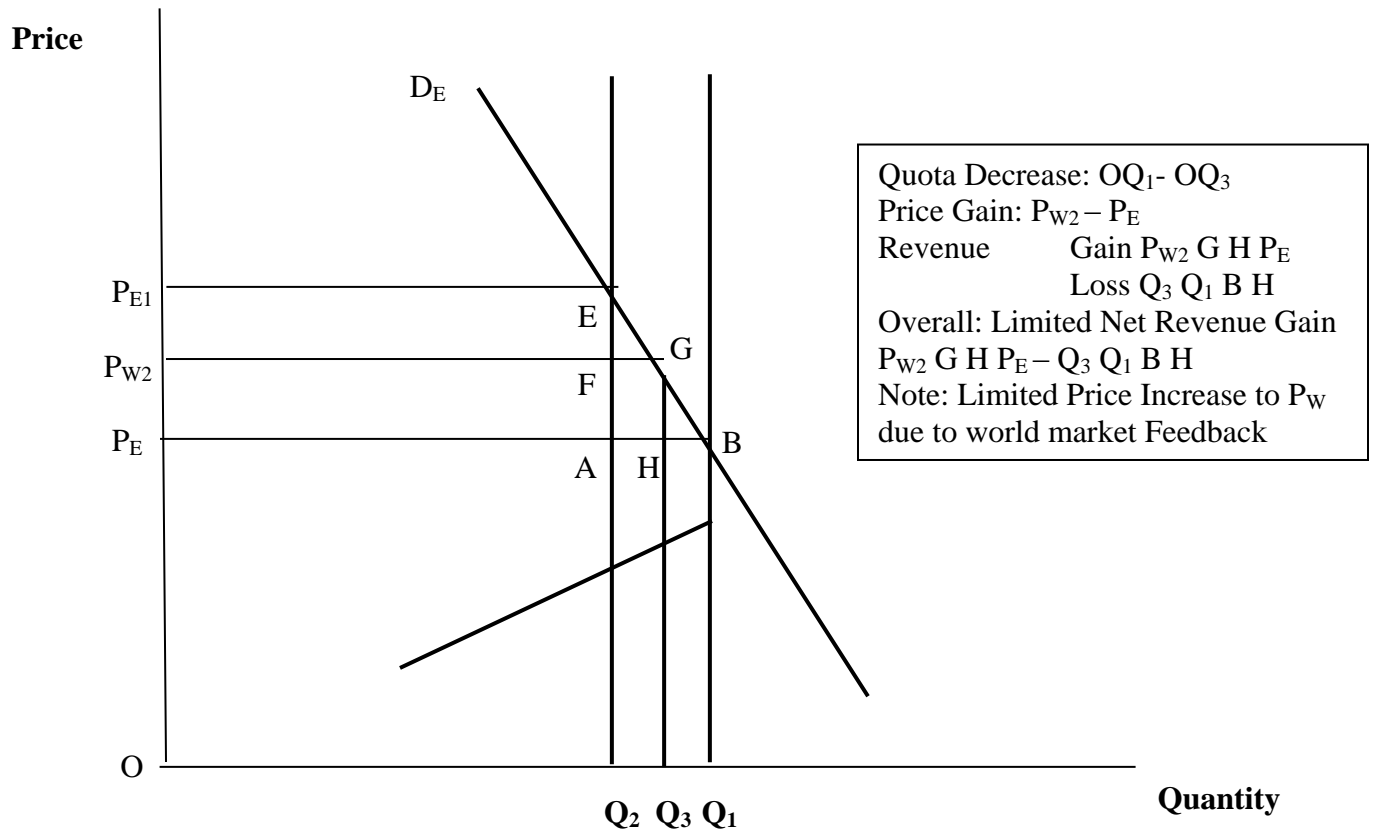
**Figure A2.4: World Market, Post COMAGRI**



**Figure A2.5:** EU Market – Closed Economy, With Additional Supply Constraint



**Figure A2.6:** EU Market – Open Economy, With Additional Supply Constraint



### Appendix 3 Annual Milk Price by Country €/100kg

	% of EU Milk Cows' Milk Collected 2011	Annual Milk Price (€/100kg)					
		2006	2007	2008	2009	2010	2011
Belgium	2.24	26.94	33.75	32.12	<b>23.58</b>	30.39	33.06
Denmark	3.46	30.43	39.03	37.82	28.87	33.84	35.97
Germany	21.22	28.51	34.71	35.01	25.25	31.23	35.19
Estonia	0.45	24.32	26.86	29.67	<b>21.00</b>	27.70	31.71
Ireland	4.00	24.45	31.14	31.25	<b>21.53</b>	28.15	32.60
Greece	0.46	34.95	38.67	43.20	37.69	37.33	43.16
Spain	4.30	29.62	35.35	37.94	29.19	29.56	30.87
Italy	7.42	35.10	36.41	41.47	37.07	37.46	43.38
Lithuania	0.95	<b>20.06</b>	29.45	24.96	<b>17.87</b>	25.01	28.54
Luxembourg	0.20	30.43	35.70	38.13	25.99	29.95	32.96
Hungary	0.95	24.15	28.92	32.81	<b>21.86</b>	26.09	31.31
Malta	0.01	34.41	37.51	47.50	44.86	41.34	47.18
Netherlands	8.42	29.30	34.60	36.35	26.70	33.90	38.25
Austria	2.10	29.89	33.75	38.90	29.00	31.72	35.34
Poland	6.72	<b>23.15</b>	27.49	29.12	<b>20.71</b>	26.68	29.41
Portugal	1.33	28.90	32.46	36.22	29.31	28.98	31.42
Romania	0.64	<b>19.00</b>	<b>22.71</b>	<b>23.93</b>	<b>21.23</b>	<b>22.32</b>	25.48
Slovenia	0.38	26.65	27.83	32.79	25.99	27.34	31.12
Slovakia	0.59	25.97	29.02	34.13	25.74	27.31	31.80
Finland	1.63	35.83	37.91	43.49	38.94	39.41	42.63
Sweden	2.06	30.16	32.87	37.23	28.16	36.17	39.65
United Kingdom	9.98	25.58	29.34	31.62	25.78	27.92	30.61
Fonterra		<b>17.28</b>	25.67	<b>22.75</b>	<b>20.80</b>	30.05	
USA Class III		<b>23.47</b>	32.12	29.37	<b>20.24</b>	27.23	