SCI LECTURE PAPER SERIES

# ECONOMIC EFFECTS OF THE EU CHOCOLATE DIRECTIVE

**Kees Burger and Hidde Smit,**
**Economic and Social Institute**
**Free University, Amsterdam**


ISSN 1353-114X
LPS 129/2003

*Key words: economic effect, chocolate, EU directive, vegetable fats*

## Introduction

The introduction of the EU Directive 2000/36/CE on August 3rd 2003 will enable the use of other vegetable fats in chocolate. We used recent data from major EU countries to derive the present use of cocoa in chocolate products. The economic effects of this Directive are that potentially some 65 000 tonnes, but more likely some 43 000 tonnes, of cocoa butter will be replaced by fats that are generally less expensive. Employing an elaborate model of the market for cocoa and chocolate, we estimate that this would lead to an initial reduction in demand for beans that amounts to approximately 3.3 % of world demand and would lower cocoa prices by around 10 % and trade by some 2.5 %. Producers' revenues would go down by some 12 %, while consumers will benefit from prices for chocolate products that are around 2 % lower. Margins for cocoa butter are likely to fall, while those for cocoa powder rise, in spite of lower prices for both cocoa products.

Paper presented at the SCI conference on 'Chocolate, Chocolate Fats and the EU Chocolate Directive'. York, 21-22 May 2003

Economic and Social Institute Free University, De Boelelaan 1105, 1081 HV Amsterdam
tel +31-20-4446086; fax +31-20-4446127; web www.feweb.vu.nl/esi; Email: kburger@feweb.vu.nl

# Economic Effects of the EU Chocolate Directive

## 1. Introduction

EU Directive 2000/36/CE will enter into force on 3 August 2003. As of this date, the use of some non-cocoa butter vegetable fats in chocolate will be legal. Its use is limited to specific fats, and is limited to a maximum of 5 % of the product weight, excluding all non-chocolate elements. Chocolate, according to the Directive, consists of cocoa products and sugars and in case of milk chocolate of milk products as well. All other ingredients do not count as contributing to the chocolate weight. In Table 1 below, we detail the requirements in the Directive for the different types of chocolate. It is important that the Directive has not changed any of the minimum requirements of cocoa in chocolate, compared to the version that was in force since 1973.

**Table 1 Minimum Requirements for Chocolate in the New Directive**

| | Chocolate couverture | Chocolate | Milk chocolate couverture | Milk chocolate | Family milk chocolate |
|---|---|---|---|---|---|
| Minimum dry cocoa solids | 35% | 35% | 25% | 25% | 20% |
| o. w. cocoa butter | 31% | 18% | | | |
| o.w. dry non-fat solids | 2.5% | 14% | 2.5% | 2.5% | 2.5% |
| Minimum dry milk solids | | | 14% | 14% | 20% |
| o.w. milk fat | | | 3.5% | 3.5% | 5% |
| Minimum cocoa butter and milk fat | 31% | | 31% | 25% | 25% |

In this paper, we investigate the economic effects that this Directive may have for the prices in the cocoa and chocolate market. First we assess the economic attractiveness of the alternative fats. On the basis of this we try to establish how large the potential market is for the alternative fats, which we shall call CBE. CBE stands for Cocoa Butter Equivalent, but needs not be fully equivalent, as the alternative fats can also be used to replace milk fat in chocolate. The Directive, however, stipulates that the alternative fats should be miscible with cocoa butter. The establishment of the size of the market requires an estimate of how much chocolate is in the chocolate products, and how much of the fats in the chocolate can be replaced by alternative fats. Once this is done, we try to infer how much cocoa butter will no longer be demanded. On the basis of this, we shall derive estimates of the effects on the demand for cocoa beans. We also try and estimate the effects on the markets for cocoa butter and cocoa powder.

In this paper, we look mainly at those countries in which the use of alternative fats was illegal. These are – ordered by size of production of chocolate products – Germany, France, the Netherlands, Belgium and Luxembourg, Italy, Spain and Greece.

## 2. Chocolate recipe and the room for CBE

To assess the economic attractiveness we look at the recipe costs of the main type of chocolate, milk chocolate. This type represents probably over two thirds of all chocolate consumed in Europe, with considerable regional differences: more in Germany, less in France. We employ a recipe shown in an earlier publication on this topic as it helps understand some of the particularities of the new Directive, which were not considered before.

The standard recipe, employed in the earlier analysis in 1996 (Burger, 1996) is shown in Table 2. This is a recipe for a relatively cheap type of milk chocolate, as shown by the use of whey powder. The effect of using CBE at that time was shown to lead to a cost reduction of 3.5 %.

According to the new Directive, however, whey powder and CBE would count as ingredients, and the chocolate contents of the no-CBE chocolate would be 95 %, and of the CBE-chocolate only 90 per cent. Hence, in the calculation of the permitted amount of CBE in the latter type of chocolate, we should only add 4.5 %, which brings the cost advantage down to 3.1 %. Whether or not CBE may be counted as chocolate is subject to discussion: while whey powder counts as 'ingredient', the share of CBE might logically be calculated as the ratio of CBE and the sum of chocolate and CBE.
If we would consider replacing part of the milk fat as well as part of the CB, we might employ a cheaper CBE. If, for example, CBE would cost only 1750 euro, a larger cost reduction of 4.3% can be obtained.

**Table 2. Example of a milk chocolate recipe, with and without CBE**

| | | No CBE | | With CBE | |
|---|---|---|---|---|---|
| Ingredient | €/ ton | share | Costs | Share | Costs |
| Sugar | 730 | 42% | 307 | 42% | 307 |
| Milk powder | 2240 | 15% | 336 | 15% | 336 |
| Cocoa liquor | 1460 | 12% | 175 | 12% | 175 |
| Cocoa butter | 3270 | 16% | 523 | 11.5% | 376 |
| Whey powder | 800 | 5% | 40 | 5% | 40 |
| Lactose | 480 | 5% | 24 | 5% | 24 |
| Milk fat | 3390 | 5% | 170 | 5% | 170 |
| CBE | 2180 | | 0 | 4.5% | 98 |
| **Total cost €/ton** | | | **1575** | | **1525** |
| **Relative cost** | | | **100** | | **96.9** |

However, the EU Directive may further restrict the extent to which milk fat in milk chocolate can be replaced. Both in the old and in the new version, milk chocolate should contain a minimum of 3.5 % milk fat. In addition, the total fat contents, now counting only CB (cocoa butter) and milk fat, should be no less than 25 %. Hence, the chocolate made from the above recipe with CBE may not be called milk chocolate, as the total CB plus milk fat content is 6.5+11.5 for CB (6.5 % is in the liquor) plus 5 for the milk fat and this adds up to only 23 %! To remain above the 25 % threshold, no more than 2.5 % of the CB can be replaced by CBE.

Many other recipes abound, while many more CBEs can be formulated, each with its own cost advantage. The overall picture appears to be that the more milk fat can be replaced in the chocolate by alternative fats, the larger will be the reduction in costs. This implies that especially milk chocolate lends itself for use for CBEs. Dark chocolate does not usuallycontain milk fat and while fat bloom is a more serious problem in this type of chocolate, typically the more expensive CBE should be used. The cost advantages of CBEs are between 50 % and zero, depending on the type of chocolate. If CB or milk fat is cheaper, the use of alternatives is less attractive. Thus,

in chocolate in which subsidised milk fat is used (some 50 % cheaper) it would be less rewarding to use alternative fats. Similarly, if CB was much cheaper than it is today, replacement would be much less attractive.

To arrive at a first estimate for the amount of chocolate affected, we assume that the milk chocolate in all filled bars and pralines can be grouped into this category. I think the milk fat content of these types of chocolate are generally high enough to permit some substitution, so we could assume that of the 5 % CBE, 1 % goes at the cost of milk fat and 4 % at the cost of CB. In addition, nearly all the filled products contain fats other than cocoa butter as they are now, but not in the chocolate part. In the solid chocolate bars, there is less scope to replace milk fat, so the attractiveness is reduced. Furthermore, the restriction of cocoa and milk fat content may be binding.

There is also a marketing aspect. The new Directive states that the wrapper of the chocolate (product) should mention that non-cocoa butter vegetables fats are used. This may make the product less appealing to some groups of customers and could be a strong reason for producers not to employ the alternative fats. This applies more to tablets than to filled chocolates as the latter typically contain other fats already. In view of these considerations, it seems unlikely that the full 5 % permitted by the Directive will be employed for all the chocolate. And it should be noted that the 5 % might actually be less than was assumed before, because of the new definition of ‘chocolate’.

## 3. The size of the market

We now turn to the question of how much chocolate is actually in these categories. Detailed information on, for example, the division of chocolate into dark and milk chocolate is not available, nor is it known with any accuracy how much ‘chocolate’ is in the chocolate products. Hence we must make estimates. We do this on the basis of older estimates of the chocolate contents made by the ICCO and ourselves in earlier reports and more recent information on the trade in cocoa and chocolate products in various countries.

We start with the largest consuming and producing country in the EU, Germany. Table 3 provides details on the net imports and production of cocoa products and the production of chocolate products, from which we derive an estimate of the use of cocoa butter and liquor in chocolate. Germany consumes (and produces) nearly half of the total consumption in the eight EU countries that we have considered. The consumption definition is from the International Confectionery Association, and includes spreads containing cocoa, whereas the production data do not. The ‘other’ product considered here is sugar confectionery containing cocoa. Conversion of this product into pure chocolate follows the practice of ICCO, which might overstate the chocolate contents to the extent that the new directive is more restrictive.?
Bulk chocolate here includes the trade in couverture, which has increased strongly over the past decade. For Germany, the estimated 150 000 tonnes includes what is called *Schokoladenüberzugsmasse* and *Schokoladenmasse.* A considerable part of this chocolate is not used for products that are counted as chocolate confectionery. Industry sources reported that only some 30% is actually used to this end, and the rest is used in a variety of products, such as ice cream and cake coatings.

| Table 3 Demand and supply in Germany | | | |
|---|---|---|---|
| ***Demand*** | | | |
| Chocolate products consumption ICA 2001 | | | 830 |
| Chocolate products production BDSI 2001 | | | 731 |
| of which | | | |
| | Filled | | 363 |
| | non-filled | | 303 |
| | other | | 65 |
| Implied pure chocolate* | | | *390* |
| Net imports bulk chocolate | | | -27 |
| Production bulk chocolate | | | *150* |
| Total implied pure chocolate** | | | 515 |
| Of which | | | |
| | butter | 16.40% | *84* |
| | liquor | 24.60% | *127* |
| ***Supply*** | | | |
| Net imports beans | | | 208 |
| Net imports liquor | | | 5 |
| Net imports butter | | | 77 |
| Production butter | | | 18 |
| Net imports powder | | | 13 |
| Production powder | | | 31 |
| Available liquor (80% of beans + imports) | | | 171 |
| Of which | | | |
| | pressed | | *51* |
| | Used directly | | *120* |

*: unfilled: 90%; filled: 45%

**: inc. bulk chocolate: minus 30% of net imports plus 70% of production
Figures in Italics are *estimates*, in Roman are data

The estimates for the use of cocoa butter and liquor are made so as to equate the supply and demand for both CB and liquor over the past decade. On the demand side, it includes some assumptions on the chocolate contents as mentioned above, while on the supply side, an unknown factor is to what extent imported and produced liquor is pressed into CB and cake. Reported CB production figures may understate actual production when this takes place within chocolate manufacturing units.
The fit between the derived demand and supply is shown in Figure 1.

The estimated shares of CB and liquor indicate an unexpectedly low share for milk chocolate of 55 %. This is based on the assumption that milk chocolate contains 12% liquor and 20% CB and plain chocolate 40% liquor and 12% CB. Based on informal data, we would expect a share of no less than 80 %, implying demand for CB of around 95 000 tonnes and liquor of 91 000 tonnes. But this would leave a substantial part of the liquor that is available unexplained for.

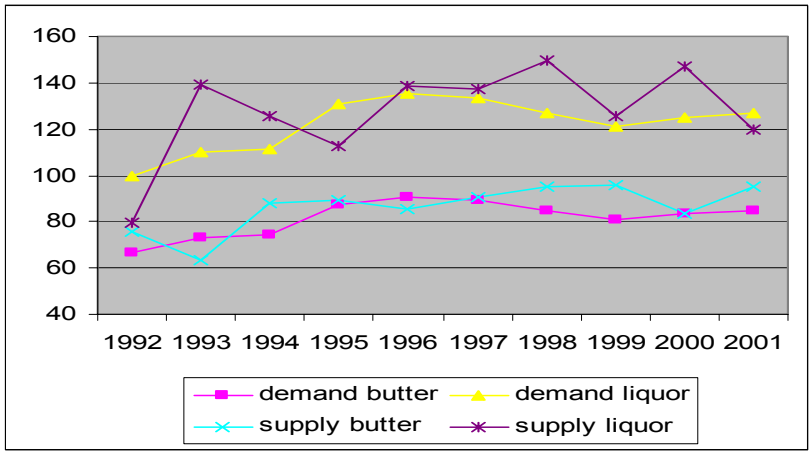


**Figure 1.** Supply and demand balances for CB and liquor in Germany

The next country that we considered was France. France consumes about half the volume of Germany. At the same time, where Germany is a large exporter of chocolate products, France is a net importer. The size of its industry is, therefore, considerably smaller than Germany's. In Table 4 a derivation is given, similar to Table 3, but adjusted for the availability of data. In particular, we do not know how much butter or powder, nor couverture is produced.

For Table 4 more assumptions needed to be made. This was further made necessary in view of recent changes in the French industry, leading to more exports of cocoa products. We assumed therefore that more pressing took place in recent years than in early parts of the 1990s. Another premise was that a relatively low share of milk chocolate was produced in France, set here at 50 %, which implies the butter and liquor shares as shown in the Table. The fit that was thus arrived at between butter and liquor demand and supply is shown in Figure 2.

The rest of what we shall call 'EU-8', the countries not yet permitting the use of non-cocoa butter vegetable fats in chocolate, consists of The Netherlands, Belgium/Luxembourg, Italy, Spain and Greece. Their total consumption of chocolate confectionery is in the order of 550 000 tonnes. Production of chocolate products exceeds consumption, as the region exports nearly 200 000 tonnes, and also nearly

| Table 4 Demand and supply in France | | |
|---|---|---|
| Demand | | |
| Chocolate products consumption ICA 2000 | | 415 |
| Chocolate products production Alliance 7 | | 375 |
| of which | | |
| Filled | | 165 |
| Non-filled | | 109 |
| Other | | 101 |
| Implied pure chocolate* | | *176* |
| Net imports couverture | | 47 |
| Production couverture | | *100* |
| Total implied pure chocolate** | | 231 |
| of which | | |
| Butter | 16% | *37* |
| Liquor | 26% | *60* |
| Supply | | |
| Net imports beans | | 144 |
| Net imports liquor | | 47 |
| Net imports butter | | -14 |
| Production butter | | *48* |
| Net imports powder | | -18 |
| Production powder | | *48* |
| available liquor (80% of beans + imports) | | 162 |
| of which | | |
| Pressed | | *97* |
| Used directly | | *65* |

*: unfilled: 90%; filled: 45%
**: inc couverture: minus 30% of imports plus 70% of production

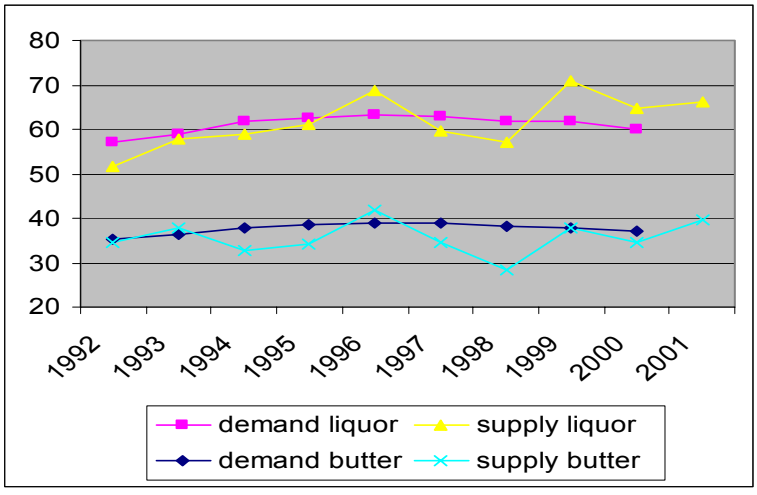


**Figure 2.** Supply and demand balances for CB and liquor in France

as much in the form of bulk chocolate, especially from Belgium. Table 5 lists the data used, and assumptions made and Figure 3 the resulting balances for liquor and cocoa butter.

| Table 5 Demand and supply in other EU-8 countries | | | |
|---|---|---|---|
| ***Demand*** | | | |
| Chocolate products consumption ICA 2001 | | | 545 |
| Of which | | | |
| | Chocolate products | | *327* |
| | other cocoa containing confectionery | | 218 |
| Net exports of chocolate products | | | 198 |
| Production of chocolate products total | | | 525 |
| Implied pure chocolate* | | | 315 |
| Net imports bulk chocolate | | | -143 |
| Production bulk chocolate | | | *300* |
| Total implied pure chocolate** | | | *568* |
| Of which | | | |
| | Butter | 18.40% | *104* |
| | Liquor | 17.60% | *100* |
| ***Supply*** | | | |
| Net imports beans | | | 653 |
| Net imports liquor | | | 7 |
| Net imports butter | | | -95 |
| Production butter | | | *211* |
| Net imports powder | | | -113 |
| Production powder | | | *211* |
| Available liquor (80% of beans + imports) | | | 529 |
| Of which | | | |
| | Pressed | | *423* |
| | used directly | | *106* |
| *: 60% chocolate, for filled and unfilled combined | | | |
| **: inc couverture: minus 30% of imports plus 70% of production | | | |

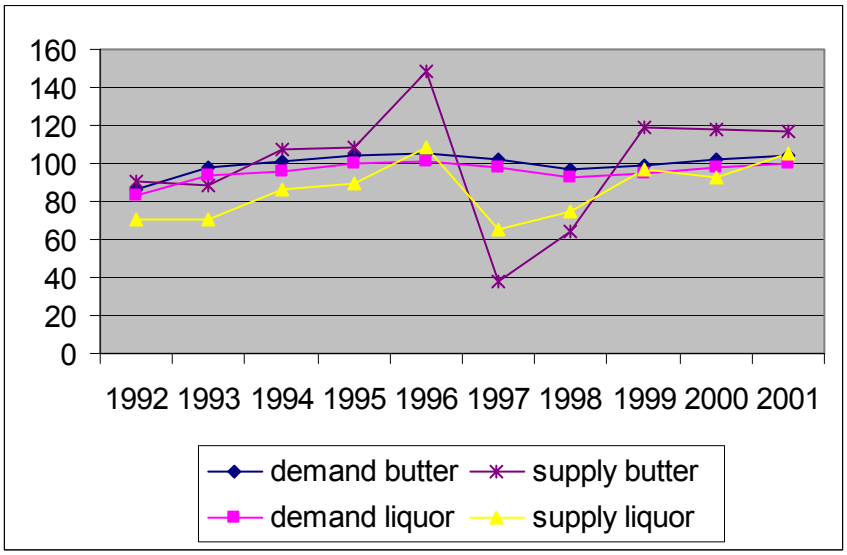


**Figure 3.** Supply and demand balances
for CB and liquor in other EU-8 countries

The final combined results of the exercise are that the total volume of production of chocolate products in these eight countries (not counting spreads etc.) is around 1 465 000 tonnes, and – because of the substantial production and exports of bulk chocolate – pure chocolate production is not much lower and lies around 1 315 000 tonnes for 2001. A crucial assumption in the derivation explains the high ratio of chocolate to its products, *viz.* that 70 % of the bulk chocolate is used for products outside the definition of chocolate products, say the coating of ice-cream and cereal confectionery and artisanal chocolate ware. If we were to make the assumption that only 50 % has this destination, the estimated chocolate volume would be reduced by some 50 000 tonnes.

**Table 6 Chocolate production in EU-8***

| 1000 tons | Production chocolate confectionery | Production of 'pure' chocolate | Implied Butter |
|---|---|---|---|
| Germany | 666 | 515 | 84 |
| France | 274 | 231 | 37 |
| Rest EU-8 | 525 | 568 | 104 |
| Total EU-8 | 1465 | 1314 | 225 |

* EU-8 includes Germany, France, the Netherlands, Belgium, Luxembourg, Spain, Italy and Greece

The maximum size of the market for CBE in chocolate in these countries, therefore equals 5 % of this volume of chocolate,approximately 65 000 tonnes.

The total size of the cocoa butter use in EU-8 is around 225 000 tonnes. The maximum displacement of cocoa butter is therefore nearly 30 %.

Actual replacement may be substantially less than this maximum. As indicated in section 2, even if the gains in costs were substantial, in only part of the chocolate products will cocoa butter be replaced to the maximum of 5 % of the chocolate weight. In some products, including much of the solid chocolate, the minimum requirements in terms of milk plus cocoa butter may be binding, while in other products the alternative fats may not be used in order to present the products as *purer* chocolate products.

To get some feeling for the order of size involved: if cocoa butter was replaced in half of the solid chocolate, and in all of the filled products, the amount of butter involved would be reduced from 65 000 tonnes to about 54 000 tonnes.

If furthermore the full 5 % that *is* replaced consisted of, say, 1 % milk fat and 4 % CB, a further reduction to around 43 000 tonnes is likely. This amount, which equals 3.2 % of the pure chocolate and about 20 % of the cocoa butter used, we shall take as the main scenario for the calculation of the effects of the introduction of the Directive.

## 4. Effects on prices

### 4.1 The initial effect on product prices

The first effect of substitution is on the costs of the product. As indicated above, recipe costs could fall by some 3 %. Lower recipe costs should be translated into lower product prices to have an effect on the volume of sales. This transmission of ingredient prices into product prices is not immediate and may differ from country to country. The earlier analyses (Burger, 1996; Burger and Smit, 2000b) of the relationships between products prices and cocoa prices have shown, however, that transmission indeed takes place and more or less in proportion to the share of the ingredient in total costs. This share can be derived from the average value of the chocolate mass and the products. Table 7 gives the unit values of German products and the derivation of the mean share in value, weighted by the share of pure chocolate in the various products. The resulting mean value share of chocolate mass in the products is 33 %.

**Table 7 Unit values of cocoa and chocolate products, Germany 2001**

| | €/kg | | | |
|---|---|---|---|---|
| cocoa powder | 1.06 | | | |
| Chocolate coating | 1.37 | | | |
| cocoa coating | 1.38 | | | |
| Chocolate mass | 1.74 | | | |
| cocoa paste | 1.78 | | | |
| cocoa powder | 2.20 | | | |
| sugared cocoa butter | 2.57 | | | |
| *Chocolate products* | | share choc in weight | share choc in value | weight choc |
| Solid | 3.15 | 0.9 | 0.50 | 191 |
| white choc | 4.46 | 0.9 | 0.35 | 7 |
| filled bars etc | 4.61 | 0.45 | 0.17 | 82 |
| other filled | 4.95 | 0.45 | 0.16 | 30 |
| other solid choc | 5.32 | 0.9 | 0.29 | 74 |
| praline no alcohol | 7.45 | 0.45 | 0.11 | 38 |
| praline with alcohol | 8.53 | 0.45 | 0.09 | 14 |
| total chocolate weight | | | | 436 |
| Weighted mean value share | | | 0.33 | |

A change, therefore, of 3.2 % in the price of chocolate mass should lead to a 1.1 % change in the price of the average product. This should increase demand for these

products if consumers are price responsive. As documented in Burger and Smit (2000b), the price elasticity of chocolate products was estimated at -0.25 for France, which is in line with findings for the UK, USA and Switzerland, but for Germany no credible elasticity was obtained. On the basis of older data, however, Burger (1996) estimated an elasticity of -0.24 for Germany (and hardly any for France). Now, assuming this to be a relevant elasticity, the price decline by 1.1 % would induce an increase in demand by 0.25 %.

### 4.2 The effect of reduced demand

The major effect on the prices works its way through the reduction in demand for cocoa butter. This reduction may amount to some 20 % of the total cocoa butter demand. The standard approach, as was also followed in earlier work and by the ICCO, is to translate this reduced demand immediately into reduced demand for beans. The assumption is that if, say, 43 000 tonnes of cocoa butter are no longer in demand, this will not be produced. This implies that another 43 000 tonnes of cocoa powder will also not be produced, and that total demand for beans will shift downward by 107 000 tonnes, being the sum of butter, powder and shells.

The response by the market depends on the elasticities of supply and demand for beans. This can be seen in Figure 4, where a shift in the demand function will lead to a new equilibrium in which the original shift is partly compensated, as lower prices would push up demand again.

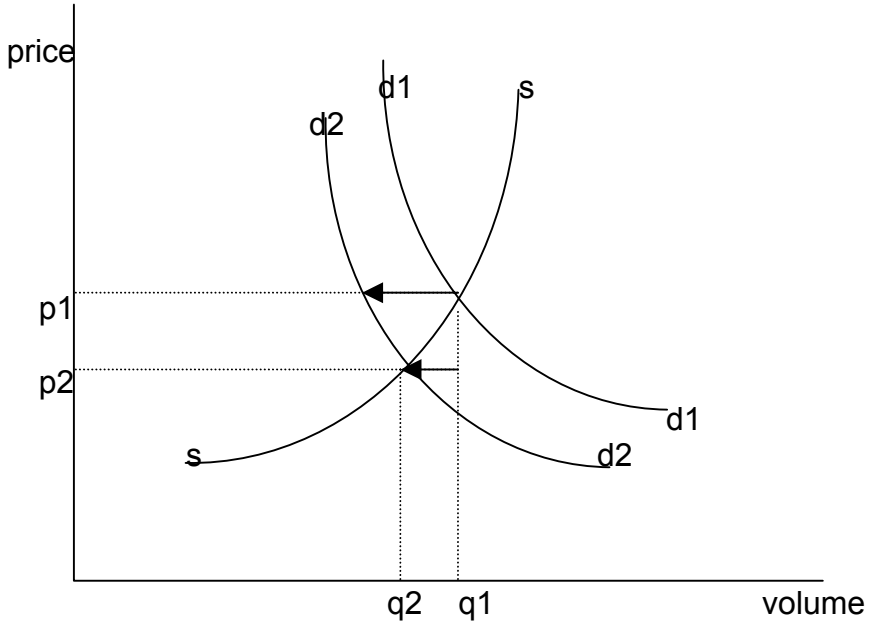


**Figure 4.** Effect of a shift in demand on the equilibrium price

From the original equilibrium, with p1 and q1, a new equilibrium is reached in (p2,q2), in which the original shift is mitigated by the demand increase due to lower prices. If the elasticity of demand is –a, and that of supply is +b, then the price effect of a 1 %

shift in the demand function is given by 1/(a+b) and the effect on the volume by b/(a+b).

Worldwide elasticities of supply and demand can be derived as the combined effect of all producing and consuming countries. We used the model, developed by Burger and Smit (2000c, and 2001) to simulate what would happen with world demand and supply and prices of cocoa bean in response to a fall by 107 000 tonnes (or approximately 3.5 % of present total demand, or 10% of the west-European demand). The effects are that the initial drop in demand leads to an initial fall in prices by up to 23 %, to recover later to stabilise at a level 10 % below the original path. Volumes that initially drop by 3.5 % will end 2.5 % below the original path. If the introduction of alternative fats occurs gradually, say a reduction of 1% every year until 10% reduction is reached, then the same equilibrium is reached eventually.

The evolution of the changes over time is shown in Figure 5.

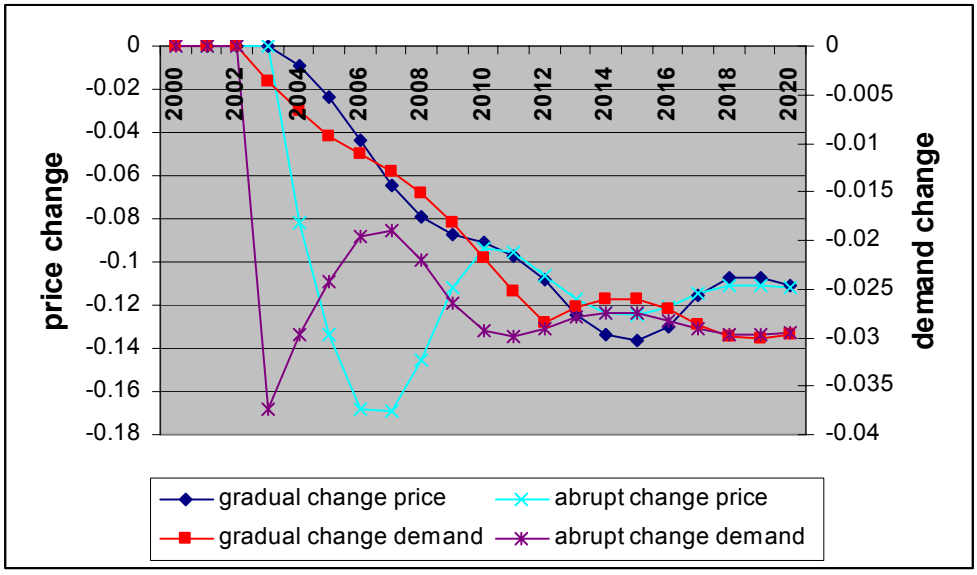


**Figure 5.** Effects of abrupt and gradual replacement of cocoa butter

This approach, therefore, leads to an estimated effect of the substitution on the revenues of producers, that is in the order of 10 to 12 % of their income, and that could be substantially stronger in the initial years. Consumers would benefit from the lower prices. Their per capita consumption is around 8 kg of chocolate confectionery. If cocoa prices fall by 10 %, prices of these products will eventually fall by something in the order of 2 % (c.f. Burger, 1996, p 31). At an average price of €4 per kg, this yields a total benefit for the consumer of (8 times 4 times 0.02 =) 0.64 euro per year per person.

## 5. Further considerations on the effect on cocoa products

### 5.1 The relationships between two jointly produced products

As indicated, this approach presumes that, initially at least, the reduced demand for cocoa butter is translated fully into reduced demand for beans. This may not be the

case, if the reduced supply of cocoa powder leads to higher prices for powder that compensate sufficiently for the reduced income from butter. We now turn to this trade-off between powder and butter. Here we elaborate on an earlier theoretical analysis by Kox (2000).

Even though the assumption above is that the shift in demand is partly compensated (because the lower prices trigger demand that is somewhat higher than after the initial shift), it does not take into account that the relative demand for butter and powder will be structurally affected. Demand for butter may fall, while that for powder will not. How would this affect an industry that must produce butter and powder in fixed (and almost equal) proportions?

In Figure 6 we provide some theory. This diagram shows the issues in joint production. In the NE diagram, the 45° line indicates that equal amounts of either product are produced. That the actual ratio may deviate from 1 is not important for our purposes here. The industry can choose some point on the line, which leads to production of butter and powder. Both products have their own markets and each faces an inverse demand curve that links levels of production to a certain price: low production leads to high prices. In the NW diagram this relation is shown for butter, and in the SE diagram for powder. Both prices are combined into some point in the SW diagram. Now, if demand for butter drops, one could – in principle – only adjust prices to accommodate this: one would arrive at price “pb?” in the diagram and the same quantities would still be produced. This cannot be an equilibrium like the original position was, because one cannot produce the same amount at lower prices. One could also – again in principle – only adjust production to reach “Dbut?” without a change in the price. But this cannot be, as it entails lower production of powder, higher prices and a disequilibrium. Hence, overall production is adjusted and a new equilibrium is established that leads to lower butter prices pb2, higher powder prices pp2 and slightly lower overall production, as point B is closer to the origin than point A. This lower production leads to lower demand for beans and correspondingly lower beans prices.
The various equilibrium prices in the SW diagram form a line, a straight line even if production is completely proportional and this line would indicate the trade-off between prices of powder and butter that are considered equally viable for the industry.
Such set of equilibria can be observed empirically. Recognising that what matters is not the prices, but the margins, we constructed the set of margins between butter and powder prices and the beans prices from the data on the powder and butter ratios (ICCO, 2003).

The empirical analogue of the SW diagram is given in Figure 7. The Figure shows the combinations of margins from 1980, more in the SE of the graph, until 2001 in the NW side, where powder margins became positive, as the powder ratio exceeded unity. As is easily observed, the combinations are on a more or less straight line, roughly equal to:

$$\textit{powder margin} = 350 - 0.40\ \textit{butter margin}\ ,$$

all expressed in SDR per tonne.

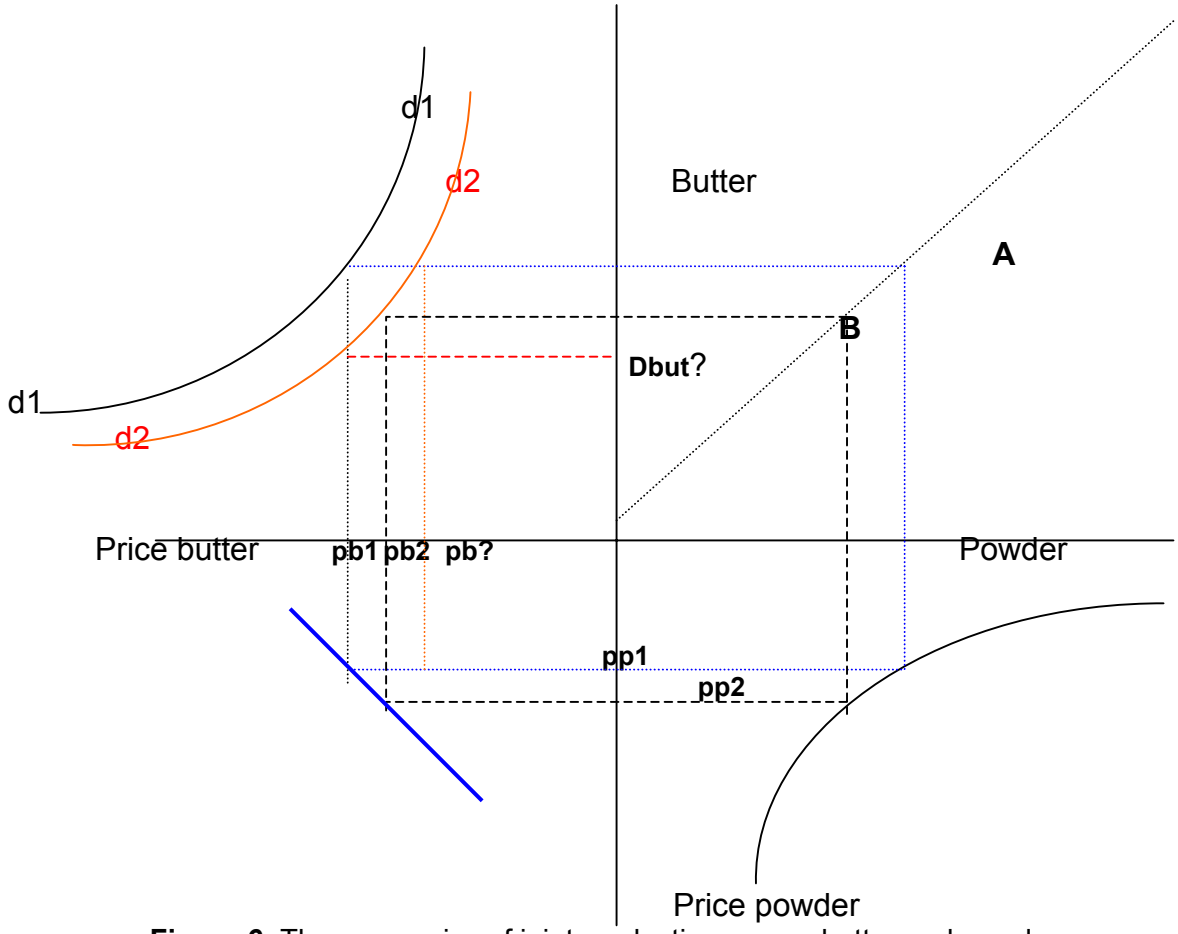


**Figure 6.** The economics of joint production: cocoa butter and powder

The lonely point to the SW of the line is the situation as per October 2002-January 2003. It represents a situation where the butter margin had not improved sufficiently to compensate for the decline in the powder margin.
The overall economic position of the processing industry is a challenging one, as the combined margin (the sum of the two margins) shows a clear downward, but fluctuating trend over time. The movement along the line from SE to NW represents a change in the price of powder compared to butter. It would typically result from increased demand for powder relative to butter. Hence, a future drop in demand for butter would also eventually result in a shift to the NW along this line. The question is by how much.

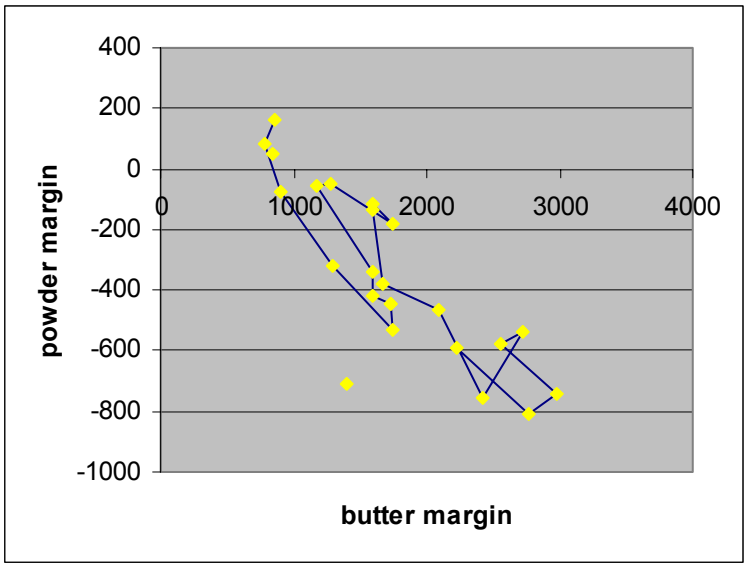


**Figure 7.** Butter-bean and powder-bean margins 1980-2002 (source ICCO)

### 5.2 An estimate of the effects on margins for cocoa powder and butter

The straightforward analysis of the effects on the beans prices indicated that, if the reduced butter would be translated fully into reduced beans demand, beans prices would fall by about 10 %. We can now use the above framework to derive an equilibrium change in the powder margin consistent with the change in butter prices that is induced.

The indirect way is to derive the beans price first, then the induced butter price and then distil the powder price and change in margins. This goes as follows:
Burger and Smit (2000b) give a relationship between butter prices and beans prices, indicating that the calculated 10% change in beans prices leads to 5.5% change in butter prices. At mean 1990s levels of beans and butter (in SDR terms, 955 and 2288) this would mean a drop in beans prices of 96 and in butter prices of 126 so that the margin goes down from 1333 to 1303, i.e. by 30 SDR. This would correspond to an increase in powder margin by 40% of 30, i.e. by 12, from –221 to –209, or powder prices of SDR 687. The combined margin of the industry would change from (1333-221=1112) to (1303-221=1082), and hence deteriorate by 2.7 %.

### 5.3 The case of lower cocoa butter prices

Finally, we look at the situation where the prices of cocoa butter are lower than assumed in the recipe calculations. The assumption there was for a CB price of € 3270 per ton. But the German average price in 2001 was only € 2570 (see Table 5). If prices were so low, would it still be interesting to substitute CB by CBE? This may not be the case. On the one hand, the CBEs are produced for use in chocolate products, and their prices, therefore, depend on the conditions prevailing in the market. It is not unlikely that, if CB prices would fall, prices of CBEs would fall as well in order to remain competitive. The industries that produce the fats are large enough to sustain long periods of prices that are barely enough to cover variable costs. On the other hand, there are limits to this flexibility, and we should expect to see

immediate effects on some products once CB prices fall. At high CB prices all substitution possibilities will be used, at lower prices more and more of the original CB using recipes will be maintained (or re-adopted). The implication is that the demand curve for CB will actually be less steep, which means that the sensitivity to prices will be considerably greater once the use of alternatives is permitted. This is important for the cocoa processing because changes in supply will not be accompanied by so large a change in butter prices as before.

### 5.4 The effects on shea nut prices

While cocoa producers would see the demand for their products fall, and hence be confronted with lower prices for somewhat lower volume of trade, other primary commodity producers will benefit. The alternative fats are derived from specific types of tropical origins, of which palm oil and shea nuts (or Karité) are the most important. The effect on the palm oil market is relatively small and can be disregarded, but the effect on the market for shea butter might be substantial. We make some crude assumptions in order to have some – very rough – idea about the magnitude of the effects on the shea butter market. The replaced butter in the EU-8 would be around 43 000 tonnes. Assumethat a quarter of this amount consists of fractionated shea butter, equalling 11 000 tonnes. To produce this about 22 000 tonnes of non-fractionated shea butter is needed, or 50 000 tonnes of beans (including shells, and if the conversion is the same as what holds for cocoa beans). This would equal about the exports of Ghana. Production of shea butter, according to FAO sources, is approximately 180 000 tonnes in West Africa, of which 130 000alone are from Nigeria.
If all additional demand would be sourced in West Africa, the required 22 000 tonnes (or roughly 12%) might push up prices by 25%, if we make the reasonable (but not research based) assumption that the price flexibility is 2. The same may apply to the prices of the nuts. The export prices equalled on average 16 dollar cents per kilogram (based on incomplete UN trade figures) in the last few years. Hence additional revenues of farmers might be in the order of 4 dollar cent per kg, for a total production of (2.5 times 180 =) 450 000 tonnes of nuts. Revenues would rise by 25%. The production response to the higher prices is not by planting more trees, but rather by going out to more distant trees to pick the fruits. This response is not likely to be strong.

## 6. Conclusions

In this paper we have looked again at the economic consequences of the introduction of new legislation into the EU. The chocolate production in eight member states will be affected, as it will be possible to use some specific types of alternative vegetable fats in chocolate after August 3rd, 2003. As it is likely that these alternative fats offer cost advantages its adoption is probable, but will vary from one type of chocolate to another. The costs advantages offered are in the range of 2-3 %, depending on the price of cocoa butter and whether there is scope for replacement of milk fat by the alternative fat.
The size of the market depends on the volume of pure chocolate that is used in the manufacturing of chocolate product in the eight countries. 5 % of this amount can be substituted by the non-cocoa butter fats. The assessment of the present use of pure

chocolate is hampered by the need for assumptions on the use of bulk chocolate in products other than those included in the normal statistics on chocolate manufacturing. Industry sources claim that no less than 70 % of the bulk chocolate goes to such end-use. Based on this assumption, the size of the market in Germany was estimated to be around 515 000 tonnes of pure chocolate containing 84 000 tonnes of cocoa butter and hence offering scope for maximum use of other fats to the amount of 25 500 tonnes. In France, pure chocolate contents was estimated at 231 000 tonnes, with 37 000 tonnes of cocoa butter, and potential use of other fats at most 12 000 tonnes. In the rest of the eight countries no less than 568 000 tonnes of pure chocolate is processed, much of which is for exports, and this contains some 104 000 tonnes of cocoa butter. The maximum amount of alternative fats used here is 29 000 tonnes. In total the size of the market for alternative fats in EU-8 might be around 65 000 tonnes.

The full use of this amount is unlikely as specific restrictions on the milk fat and cocoa butter contents of chocolate may prevent use of alternatives. Another reason is the sensitivity of the consumer for the use of non-cocoa butter in chocolate. It seems likely that the initial use is restricted to filled bars and other filled products that contain other fats already. A maintained hypothesis in our paper is that around 3.2 % of the pure chocolate could become some type of CBE, hence a market size of 43 000 tonnes.

The effects on prices of such use of non-cocoa butterfats will be substantial. The reduced demand for butter will induce less supply of this butter and hence less demand for the beans. The initial reduction of demand for beans is estimated at around 107 000 or 3.3 % of world demand. This reduction in the volume of demand will be attenuated by the increased attractiveness of cocoa when prices are lower. Yet, prices will be lower than they would have been otherwise. Eventually they will be some 10 % lower, while the volume of demand will end up being 2.5 % below the original growth path.

Prices of chocolate products will lower, not only because of the cheaper recipe – this effect will be around 1 % -, but even more so because of lower cocoa prices. This latter effect is in the order of 2 %.

Prices of cocoa butter should fall relative to other cocoa products. We tried to estimate these effects, and arrived at estimates for cocoa prices to be lower by a rounded 10 %, butter prices by 5.5 %, and powder prices by 6.5 %. Yet, powder margin will improve, while those of butter will deteriorate.

There are a number of uncertainties surrounding these estimates. First, we need to look for more evidence on the actual use of chocolate in all chocolate products. Secondly, the estimates of the attractiveness of CBE usage should be detailed to products and countries. Thirdly, the economics of the cocoa processing sector should be elaborated and validated further in order to better understand how lower demand for butter works its way to lower demand for beans.
The finding of lower prices for the producers is fairly robust however, and the calculated revenue reduction, in the order of 12 %, stands in stark contrast with the benefits for the consumers to the tune of 64 eurocent per capita per year. Producers of the raw material for the alternative fats would also benefit, however. A first, very

rough guess of the benefits for shea butter producers indicates that these gains might be in the order of 25%.

## References

Burger, K. (1996) The European Chocolate Market and the Impact of the Proposed EU Directive. Report, Economic and Social Institute, Free University, Amsterdam, September.

Burger,K. and H.P. Smit (2000a) Demand for chocolate products. Report, Economic and Social Institute, Free University, Amsterdam, September (www.feweb.vu.nl/esi/bin/pdf/666.pdf)

Burger,K. and H.P. Smit (2000b) Prices of cocoa, cocoa products and chocolate products. Report, Economic and Social Institute, Free University, Amsterdam, September (www.feweb.vu.nl/esi/bin/pdf/433.pdf)

Burger, K. and H.P. Smit (2000c) Understanding the changes in the cocoa and chocolate market. Report, Economic and Social Institute, Free University, Amsterdam, December (www.feweb.vu.nl/esi/bin/pdf/436.pdf)

Burger, K. and H.P. Smit (2001) Economic growth and demand for commodities – natural rubber and cocoa – Paper presented at the International Conference on The Future of Perennial Crops, 5-9 November 2001, Yamoussoukro. (www.feweb.vu.nl/esi/bin/pdf/667.pdf)

ICCO (2003) Trends in Global Supply and Demand for Cocoa. ICCO report EX/116/7. ICCO, London

Kox, Henk (2000) The market for cocoa powder. Report, Economic and Social Institute, Free University, Amsterdam, August. (www.feweb.vu.nl/esi/bin/pdf/395.pdf)