Oxera

What is the impact of a minimum price rule?

Report prepared for the Ministry of Economic Affairs

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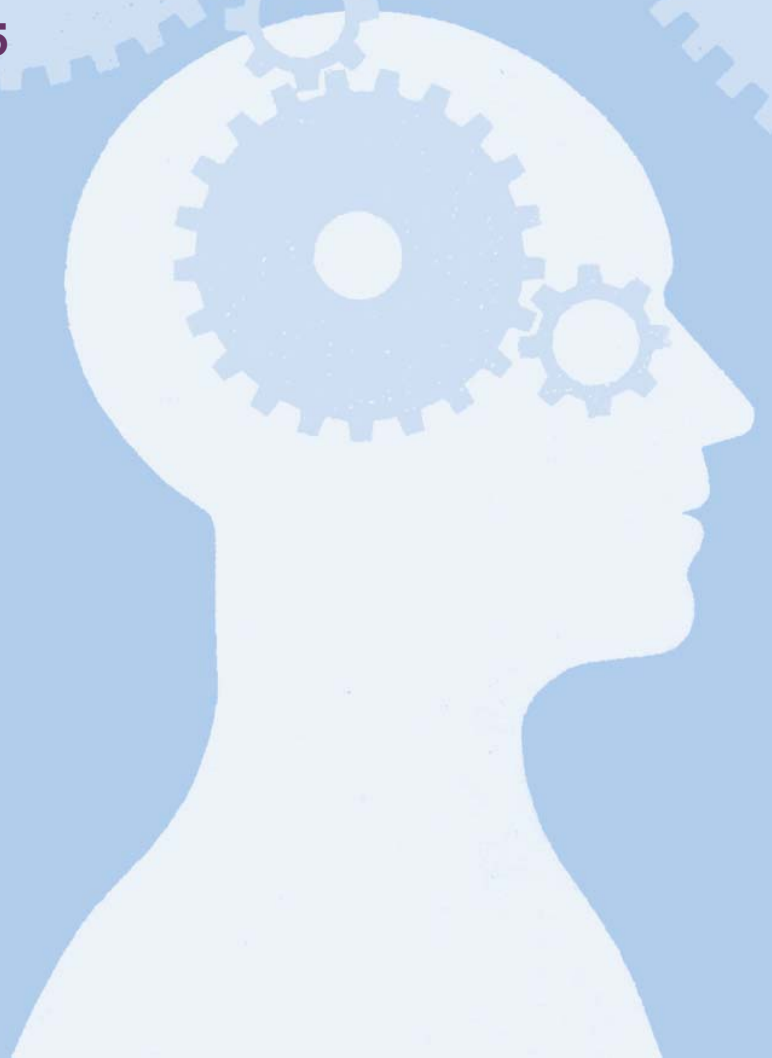

Executive summary

Inleiding

Het Ministerie van Economische Zaken (EZ) heeft Oxera gevraagd om ondersteunend onderzoek voor de beoordeling van een minimumprijsregel. De Minister van EZ is door het Nederlandse parlement gevraagd de wenselijkheid van een verbod op verkopen onder de inkoopprijs te onderzoeken.[1] Het debat over zo'n verbod vindt plaats tegen de achtergrond van de prijzenoorlog tussen supermarkten die in Nederland vanaf eind oktober 2003 gaande is.

Een minimumprijsregel kan resulteren in bepaalde sociale en economische kosten alsmede bepaalde sociale en economische baten. De analyse die door Oxera is ondernomen (binnen een beperkt tijdsbestek van 5 weken) richt zich op de kwantificering van een aantal kosten van een minimumprijsregel. De baten zijn beoordeeld in een studie door EIM.[2]

Om de effecten van een minimumprijsregel te beoordelen heeft Oxera gebruik gemaakt van het raamwerk voor kosten-baten-analyses dat Oxera heeft ontwikkeld in een vorige studie voor EZ.[3] Dit raamwerk is geschikt voor het beoordelen van kosten en baten van markttoezichthouders en regulering.

Wat wordt door een minimumprijsregel gevangen?

Voor een kosten-baten analyse is het van belang om eerst de *counterfactual* te bepalen om te kunnen beoordelen welke gedragingen worden ingeperkt door de minimumprijsregel die momenteel niet op andere wijze worden gevangen.

Supermarkten kunnen om verschillende redenen een beleid van lage prijzen voeren. De meest relevante vormen van lage prijzen zijn: prijspromoties, loss-leaders, prijzenoorlogen, en roofprijzen (*predatory pricing*). Deze vormen van lage prijzen leiden niet noodzakelijkerwijs tot prijzen onder de inkoopprijs. Grotere detaillisten kunnen bijvoorbeeld vanwege schaalvoordelen en lage inkoopprijzen in staat zijn producten tegen lage prijzen aan te bieden zonder dat dit gepaard hoeft te gaan met prijzen onder de inkoopprijs. Zelfs wanneer de detaillisten hun prijzen onder de kostprijs zetten, kunnen de prijzen nog steeds boven de inkoopprijs liggen.

Met andere woorden, een minimumprijsregel zal waarschijnlijk alleen bepaalde specifieke typen van voornoemde vormen van lage prijzen vangen (afhankelijk van de manier waarop een dergelijke regel wordt ingevuld—dat is op dit moment niet bekend). Ook kan in het kader van de counterfactual-analyse worden opgemerkt dat een beleid van roofprijzen reeds is verboden onder de mededingingswet—het incrementele effect van een minimumprijsregel op roofprijzen is derhalve nihil.

[1] Zie Motie Atsma (29800, Nr. 38, Motie van het lid Atsma c.s. voorgesteld 23 november 2004).

[2] EIM (2005), 'Verbod op verkoop beneden inkoopprijs—een international vergelijking', Mei.

[3] Oxera (2004), 'The Costs and Benefits of a Market Regulator', report prepared for the Ministry of Economic Affairs, the Netherlands, beschikbaar op www.oxera.com.

Beoordeling van de kosten van een minimumprijsregel

De kosten van een minimumprijsregel bestaan uit de volgende categorieën (hier tegenover kunnen verscheidene mogelijke baten staan waarop Oxera niet ingaat):

Handhaving- en nalevingkosten—handhaving zal leiden tot bepaalde kosten voor de relevante autoriteiten zoals bijvoorbeeld het gerechtshof of een specifieke autoriteit belast met handhaving van de minimumprijsregel (bijvoorbeeld de mededingingsautoriteit). Voorts zullen detaillisten administratieve kosten maken voor het naleven van de minimumprijsregel en kosten voor de verdediging van hun zaak in het geval ze worden onderzocht door de relevante autoriteiten. Het is moeilijk, zo niet onmogelijk, dit soort kosten precies te kwantificeren. Kosten die vaak bij mededingingsonderzoeken worden gemaakt, door de toezichthouder en de bedrijven in kwestie, kunnen echter als eerste benadering worden gebruikt. Ofschoon onderzoeken naar overtreding van de minimumprijsregel en de mededingingswet verschillend zijn, zijn de aard van de kosten hoogstwaarschijnlijk vergelijkbaar. Er is informatie beschikbaar over de kosten die bedrijven maken ten gevolge van de mededingingswet en de kosten die bijvoorbeeld de Nederlandse Mededingingsautoriteit (NMa) maakt. Op basis van deze benadering worden de kosten per onderzoek geschat op tussen €95.000 en €205.000. Ervaringen in andere landen met een minimumprijsregel (Oostenrijk, Belgie, Duitsland, Frankrijk en Ierland) geven aan dat er gemiddeld tussen de 2 en 20 onderzoeken per jaar worden uitgevoerd. Dit zou leiden tot een totale kostenpost van tussen €190.000 en €4 miljoen per jaar.

Negatieve effecten op de markt—een minimum prijsregel kan leiden tot een aantal negatieve effecten op de markt en kan in het bijzonder een effect hebben op de prijs die consumenten betalen voor producten. De negatieve effecten kunnen bestaan uit:

– *allocatieve inefficiënties*—hogere prijzen voor zover er nu producten zijn die worden verkocht onder de inkoopprijs. Opgemerkt zij dat het netto effect beperkt kan zijn, aangezien na de invoering van de minimumprijsregel, detaillisten prijzen op sommige producten kunnen verhogen en prijzen op andere producten juist kunnen verlagen;

– *productieve inefficiënties en beperking van dynamische concurrentie*—in theorie kan een minimumprijsregel het moeilijker maken om op agressieve wijze te concurreren op prijs—een minimumprijsregel kan derhalve de mate van concurrentie in de markt reduceren en daarmee mogelijke inefficiente aanbieders beschermen;

– *onzekerheid*—de invoering van een minimumprijsregel kan resulteren in een mate van onzekerheid over hoe de regel in praktijk zal worden toegepast door desbetreffende autoriteiten. Deze onzekerheid kan detaillisten een prikkel geven om het zekere voor het onzekere te nemen door prijzen op een hoog niveau te houden en van agressieve prijsconcurrentie af te zien. Aan de andere kant kan worden opgemerkt dat op termijn jurisprudentie en besluiten van de relevant autoriteiten waarschijnlijk meer duidelijkheid zullen creëren;

– *afschrikeffecten*—het opleggen van boetes en andere sancties kan detaillisten er van weerhouden om de minimumprijsregel te overtreden. De mate van het afschrikeffect zal waarschijnlijk afhangen van de hoogte van de boetes of het type sanctie, de kans waarmee detaillisten aangeklaagd worden (door een andere detaillist of door de relevante autoriteiten), en de kans dat de relevante autoriteiten er in slagen voldoende bewijs te verzamelen om boetes te kunnen opleggen. Deze factoren geven detaillisten mogelijk een prikkel om het zekere voor het onzekere te nemen en van agressieve prijsconcurrentie af te zien.

Sociale kosten—een minimumprijsregel kan resulteren in bepaalde sociale kosten. Indien de minimumprijsregel resulteert in hogere prijzen van bijvoorbeeld levensmiddelen, dan kan dit distributieve effecten met zich meebrengen en leiden tot een negatief effect op kwetsbare

huishoudens. Over het algemeen zullen huishoudens met een relatief laag inkomen een relatief groter deel van hun inkomen uitgeven aan levensmiddelen dan andere huishoudens. Dit betekent dat deze huishoudens disproportioneel kunnen worden getroffen door een minimumprijsregel.

Kwantificering van de negatieve effecten op de markt

De kwantificering van de negatieve effecten op de markt bestaat uit de drie componenten die hieronder worden besproken.

Statistische analyse van prijzen van levensmiddelen in landen met een minimumprijsregel
Oxera heeft de effecten geanalyseerd van de minimumprijsregels in België, Duitsland, Frankrijk, Ierland en Oostenrijk. Een ARIMA-analyse (autoregressive integrated moving average) werd toegepast op prijzen van levensmiddelen. De analyse laat zien dat na de invoering van de minimumprijsregel in Frankrijk in 1997, de prijzen sneller toenamen dan in de periode ervoor—dit effect was statistisch significant. In de andere landen werd geen significant effect gevonden.

Een ARIMA-model is een statistische methode en toetst niet voor causaliteit tussen het opwaartse prijseffect en de invoering van de minimumprijzenregel. Uit nadere analyse blijkt echter dat het onwaarschijnlijk is dat het volledige prijseffect in Frankrijk dat door het ARIMA-model wordt gemeten is toe te wijzen aan andere factoren zoals de conjunctuur of fusies. Voorts is om te corrigeren voor inflatoire effecten het ARIMA-model ook toegepast op prijzen van levensmiddelen gedeeld door de algemene prijsindex. Ook dit model liet een opwaarts effect op de prijzen zien na de invoering van de minimumprijsregel.

Bestaand empirische materiaal over de effecten van een minimumprijsregel
Er zijn relatief weinig empirische studies over de effecten van een minimumprijsregel. Er is een studie over de effect van de minimumprijsregel in Ierland en twee studies over Frankrijk.

De studie in Ierland laat zien dat de prijzen tijdens de periode van de minimumprijsregel ongeveer 4,6 procentpunten hoger waren dan voor de invoering van de minimumprijsregel in 1987.

Een studie van Nielsen laat zien dat twee maanden na de invoering van de minimumprijsregel in Frankrijk de prijzen van nationale merken gemiddeld met 4,14% waren gestegen. Een studie van het Franse Ministerie van Economische Zaken schatte de gemiddelde prijsstijging tijdens dezelfde periode op 0,5%. Het verschil tussen beide studies kan worden verklaard door het feit dat de Nielsen-studie alleen naar nationale merken kijkt en andere zoals eigenwinkelmerken niet in beschouwing neemt—de studie van het Franse Ministerie doet dit wel. De minimumprijsregel heeft voornamelijk een effect op de nationale merken.

Effecten van de prijzenoorlog in Nederland
Een eenvoudige vergelijking van de prijzen voor en na het begin van de prijzenoorlog in Nederland laat zien dat de prijzenoorlog een significant effect heeft gehad op de prijzen voor levensmiddelen. Prijzen namen af met ongeveer 3,5%. Tijdens dezelfde periode namen levensmiddelenprijzen in bijvoorbeeld Frankrijk en Duitsland af met ongeveer 0,5%. Dit betekent dat de prijzenoorlog waarschijnlijk heeft geresulteerd in een prijsreductie van ongeveer 3%.

Op zich zou de prijzenoorlog zelf ook een indicatie kunnen geven van de effecten van een minimumprijzenregel indien wordt verondersteld dat zo'n regel prijzenoorlogen onmogelijk maakt. Het is echter niet duidelijk in hoeverre de prijzenoorlog in Nederland gepaard ging met verkopen onder de inkoopprijs. Aankondigingen van supermarkten over kostenbesparingen geven aan dat producten wellicht beneden de kostprijs werden

aangeboden. Prijzen beneden de kostprijs van supermarkten kunnen echter nog steeds boven de inkoopprijs liggen.

Conclusie

De analyses geven aan dat een minimumprijsregel in twee landen tot hogere prijzen heeft geleid. Of een zelfde effect zich in Nederland zou voordoen is niet duidelijk en zal waarschijnlijk afhangen van specifieke omstandigheden zoals de mate waarmee een minimumprijzenregel zou worden gehandhaafd, en de mate waarin op dit moment supermarkten prijzen beneden de inkoopprijs zetten—detaillisten zouden onder een minimumprijsregel bijvoorbeeld de prijzen voor bepaalde producten kunnen verhogen (dat wil zeggen voor producten waarvan de prijzen momenteel onder de inkoopprijs liggen) en tegelijkertijd de prijzen voor andere producten kunnen verlagen (dat wil zeggen voor producten die voldoende hoge marges kennen zodat prijzen verlaagd kunnen worden zonder dat deze onder de inkoopprijs komen te liggen). In dat geval kan het netto-effect van een minimumprijsregel beperkt zijn.

Ten slotte kan worden opgemerkt dat indien de invoering van een minimumprijsregel tot hogere prijzen leidt, dit niet noodzakelijkerwijs resulteert in significante voordelen voor kleinere detaillisten. Ofschoon een prijsverhoging kleinere detaillisten op de korte termijn wellicht enige bescherming kan bieden, is de prijsverhoging niet noodzakelijkerwijs voldoende om er voor te zorgen dat kleinere detaillisten en speciaalzaken in de markt kunnen blijven opereren.

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1 Introduction

1.1 Scope of the report

The Dutch Ministry of Economic Affairs (MEA) has commissioned Oxera to undertake research to support the assessment of the impact of a 'minimum price rule'. The Dutch Parliament has debated the desirability of a price rule that would forbid retailers from selling goods at a price lower than that which they pay to their suppliers.[4] This debate on the minimum price rule has principally arisen as a response to a price war between supermarkets in the Netherlands that began at the end of 2003.

A minimum price rule may result in certain social and economic benefits in addition to certain social and economic costs. The analysis undertaken by Oxera (within a limited timescale of five weeks) focuses exclusively on quantifying some of the costs of a minimum price rule. The benefits were assessed in a separate study commissioned by the MEA from EIM.[5]

To assess the impact of a minimum price rule, Oxera has used the framework developed for the MEA in a previous Oxera study, 'Costs and benefits of a market regulator'.[6] This framework is suitable for assessing costs and benefits of regulators and regulations.

The assessment focuses on the introduction of a minimum price rule that would be applied to products sold by retailers, in particular those sold by supermarkets (such as food). The minimum price rule refers to a prohibition on selling below the purchase price—specific details of the rule have not yet been defined.

1.2 Structure of the report

This report is structured as follows.

– Section 2 identifies the incremental effects of a minimum price rule by comparing it against the counterfactual, in line with the general framework for cost–benefit analysis. In other words, which types of low pricing would be captured by a minimum price rule, and which are already captured by existing regulation (eg, competition law)?

– Section 3 assesses the types of incremental costs of the rule. As indicated, the benefits have been discussed in a separate study undertaken by EIM.

– Section 4 describes the quantification of the possible negative market impact that a minimum price rule may have, based on an analysis of price data of five countries with a minimum price rule in place (Austria, Belgium, France, Germany and Ireland), in addition to an analysis of price data of the Netherlands before and after the start of the price war.

– Section 5 concludes.

– Appendix 1 describes the statistical analysis of price data undertaken by Oxera.

[4] See Motion Atsma (29800, Nr. 38, Motie van het lid Atsma c.s. voorgesteld 23 november 2004)

[5] EIM (2005), 'Verbod op Verkoop Beneden Inkoopprijs—Een International Vergelijking', May.

[6] Oxera (2004), 'The Costs and Benefits of a Market Regulator', report prepared for the Ministry of Economic Affairs, the Netherlands, available at www.oxera.com.

2 Which pricing policies would be captured by a minimum price rule?

The relevant costs of a regulation to include in a cost–benefit analysis are the economic or *incremental* costs. They are the costs that arise solely due to the new regulation, excluding any other costs, for example those that are the result of existing regulations.

The incremental costs of a minimum price rule can be identified by assessing the counterfactual—ie, existing regulations and existing business practices in the absence of a minimum price rule. In other words, the relevant questions are: Which types of low pricing would be captured by a minimum price rule, and which are already captured by existing regulation (eg, competition law)? These questions are addressed in this section. This approach is in line with the general framework for cost–benefit analysis.[7]

Retailers apply various pricing policies that may involve pricing below the purchase price. The most relevant of these fall into four categories:[8]

– short-run price promotions;
– loss-leading;
– price wars;
– predatory pricing.

In identifying the incremental effects of a minimum price rule, it is important to take into account that there is a difference between below-cost pricing and below-purchase-price pricing. Below-purchase price pricing simply means that the retail price is set below the purchase price, while below-cost pricing means that retail prices are set below the costs incurred by the supermarkets, which is equivalent to the (net) purchase price plus the costs (eg, wages and rent) incurred by the retailer.

A further distinction can be made between the purchase price as it appears on the invoice and the net purchase price, which is equivalent to the purchase price minus payments received by retailers from suppliers for example for access to shelves and to finance marketing activities. For example, in France and Ireland, the minimum price rule refers to the purchase price, while in Germany it refers to the net purchase price.

By definition, the net purchase price is lower than the purchase price, and the purchase price lower than the cost price. This study focuses on both below-purchase-price pricing and below net-purchase-price pricing in line with minimum price rules in other countries.

2.1 What are the incremental effects of a minimum price rule?

The assessment of the costs and benefits of a minimum price rule should focus only on those pricing policies that involve below-purchase-price pricing and are not captured by existing legislation. These issues are discussed below for the various pricing policies.

[7] See Oxera (2004), 'The Costs and Benefits of a Market Regulator', report prepared for the Ministry of Economic Affairs, the Netherlands, available at www.oxera.com.

[8] There are other types of pricing policies that may involve below-purchase-price pricing which are not discussed here. For example, in some cases, a firm may introduce a new product to the market at a loss-making price in order to build up a sufficiently large customer base to allow it to achieve and benefit from economies of scale, at which point the price would become profitable. Products may also be sold at price below costs if they are perishable or as a result of unanticipated shocks.

2.1.1 Price promotions

Price promotions are a common form of price competition in the retail sector. Retailers may promote certain product lines for a short period of time—for example, by selling two items for the usual price of one (buy one get one free, or BOGOF)—in effect, a 50% price reduction. There are many variants of temporary price promotions. The marketing idea behind these promotions is often to encourage people to switch to a product that they do not buy normally and/or to a retailer they do not usually visit. Depending on the experience, consumers may decide to continue to buy the product after the promotion or to do their shopping on a more regular basis at the retailer that offered the promotion.

A minimum price rule would affect price promotions to a limited extent only. First, price promotions do not necessarily involve below-purchase-price pricing. For example, larger retailers may be able to offer price promotions without setting prices below the purchase price by passing on cost savings resulting from economies of scale and/or low purchase prices. In other words, a minimum price rule would only restrict the magnitude of the price promotion.

Second, if price promotions are financed by the supplier (which they often are), technically speaking, this would not involve below-purchase-price pricing. The retail price would then still be above the discounted purchase price. In other words, price promotion would be allowed, provided that it is financed by the supplier.

Finally, in some countries with a minimum price rule (eg, France and Ireland), retailers are allowed to set prices below the purchase price in the case of temporary promotions—ie, in these countries, there is an exemption for temporary price reductions. If this policy were followed in the Netherlands, by definition, a minimum price rule would have no effect on price promotions.

2.1.2 Loss-leading

Retailers often sell a certain, usually limited, range of product lines at a loss (charging customers less than the cost price or the price paid to the suppliers of those goods), with the aim of encouraging customers to visit their outlet and purchase other goods sold there at a profit.

The idea behind loss-leading is to encourage consumers to switch from one retailer to another. Since this is in the interest of retailers rather than suppliers, loss-leaders are more likely to be financed by the former than by the latter.

The economics of loss-leaders can be explained as follows. The vast range of products available in retail outlets and the convenience of one-stop shopping lead to imperfect consumer information and consumer-switching costs. In other words, consumers are likely to find it difficult to compare all the products, prices and levels of service across retailers. In theory, this degree of imperfect information may give retailers some scope for setting higher prices than in a fully competitive market with complete information. However, economic theory also suggests that, in such a situation, it can be efficient for retailers to set relatively low prices for well-known products (ie, with a strong brand) to attract customers and subsequently set higher prices for lesser-known products (eg, private label products).[9] Such pricing policies may result in lower overall prices and increase consumer welfare, as they ensure that no retailer can earn revenues above the level they would earn under perfect

[9] See, for example, Walsh, P. and Whelan, C. (1996), 'The Optimality of Loss Leading in Multi-Product Retail Pricing—A Rationale for Repealing the 1987 Groceries Order in Ireland', Trinity Economic Paper Series, Dublin; Holton, R. (1957), 'Price Discrimination at Retail: The Supermarket Case', *Journal of Industrial Economics*, **6**, 13–32; and Nelson, P. and Hilke, J. (1991), 'Retail Featuring as a Strategy Entry or Mobility Barrier in Manufacturing', *International Journal of Industrial Organisation*, **9**, 533–44.

information—any excess profits on lesser-known products are competed away on well-known products.

Although loss-leading policies may involve below-purchase-price pricing, this is not necessarily the case: prices may be set below costs and still above purchase prices.

Furthermore, if a policy of loss-leading is applied only to a limited number of products, under a minimum price rule retailers may be able to increase prices on these products and at the same time reduce prices on other products—ie, products with sufficiently high margins to avoid below-purchase-price pricing. In such a case, the net effect of a minimum price rule on loss-leading policies may be limited.

If loss-leaders involve below-purchase-price pricing on a wide range of products, loss-leading may induce a movement away from competition on price to competition on quality. Although it could be argued that such a movement may have advantages in terms of better quality of services, this may come at a cost in the form of higher prices and a dampening of competition—competition on quality may make the market less transparent and may make it more difficult for consumers to compare the offerings from retailers, which may give retailers the opportunity to set prices above the competitive level.

2.1.3 Price wars

Price wars often involve an aggressive and systematic application of a low-pricing policy, typically across a relatively wide range of product lines. They may be a rational choice for a retailer that believes that it can increase its market share by reducing its prices significantly, to increase its profitability. A price war often involves price reductions for an undefined duration (as opposed to temporary price promotions) on a wide range of products. These price reductions are so significant that they trigger price reductions by other retailers, which are forced to respond, to avoid losing market share; in such a case, the initiator of the price war may opt to reduce prices even further.

Price wars may occur for several reasons. In the economics literature, price wars have been modelled as a strategic 'punishment' response when one party in a market deviates (or is perceived to deviate) from the collusive steady-state level of pricing.[10] In other words, a supermarket may reduce prices to punish one of its rivals for reducing prices and taking away market share. In such situations, a price war may help bring down the equilibrium price level in the market from a collusive to a more competitive level.

Furthermore, the occurrence of price wars may also be explained by switching costs. Consumers may do their shopping every week in the same supermarket—switching to another supermarket may be costly since it may require consumers to travel further and become used to the other supermarket, in particular if products are located differently in rival supermarkets.[11] To make consumers switch, supermarkets may have to reduce prices significantly, thereby compensating consumers for their switching costs.

An explanation related to the argument of switching costs is that, over time, some supermarkets may focus too much on quality competition, thereby losing market share to discounters. To regain market share and rebuild their reputation for offering good quality at reasonable prices, they may have to reduce prices significantly, possibly to such an extent that it triggers a price reduction by rivals, resulting in a price war. In practice, price wars may resemble predatory pricing—for example, a retailer may set prices below costs to drive rivals

[10] See, for example, Rotemberg, J. and Saloner, G. (1986), 'A Supergame-theoretic Model of Business Cycles and Price Wars during Booms', *American Economic Review*, **76**, 390–407; and Green, E. and Porter, R. (1984), 'Non-cooperative Collusion under Imperfect Price Information', *Econometrica*, **52**, 87–100.

[11] Klemperer, P. (1989), 'Price Wars Caused by Switching Costs', *Review of Economic Studies*, **56**, 405–20.

out of the market and increase prices again after the predation period. However, price wars do not necessarily involve predatory pricing. First, it is not clear whether the price war strategy would be successful in driving (and keeping) competitors out of the market. Companies may use price wars to steal market share away from rivals without driving them from the market. Furthermore, although a price war may involve below-cost pricing on some products, the overall margin on all products may still be positive, making it less likely that a supermarket will be forced to exit the market.

If a price war involves predatory pricing (see section 2.1.4), the competition authority—the NMa in the Netherlands—has the powers to address the low-pricing policy under competition law.

Similarly, price wars do not necessarily involve below-purchase-price pricing. Retailers may simply reduce their margins on some products or take advantage of economies of scale, thereby being able to set prices below those of smaller retailers. Furthermore, even if prices are set below costs, they may still be above the purchase price.

The incremental effect of a minimum price rule would be that it prohibits price wars which involve below-purchase-price pricing but which do not involve predatory pricing. If price wars involve below-purchase-price pricing to a significant extent, a minimum price rule may make it easier for smaller retailers to stay in the market, in particular if smaller retailers do not have sufficient resources to finance a price war. In theory, a minimum price rule may therefore result in less market concentration.

However, a minimum price rule may have a negative impact on potential entrants. Economic theory indicates that the predator must be dominant for the predatory pricing strategy to be feasible, and under competition law, low-pricing policies by small companies are therefore not prohibited. As a minimum price rule would also affect low-pricing policies by smaller retailers, this may make it more difficult for existing or new players to increase their market share.

It is not clear to what extent a prohibition on below-purchase-price pricing could dampen competition. In theory, it may prevent supermarkets from competing aggressively on price, and may make it more difficult to adjust prices to a significant extent. However, if a price war involves below-purchase-price pricing on only a limited number of products, under a minimum price rule retailers may be able to increase prices on these products and at the same time reduce prices on other products—ie, products with sufficiently high margins to avoid below-purchase-price pricing. In such a case, the net effect of a minimum price rule on price wars may be limited.

2.1.4 Predatory pricing

A predatory pricing strategy consists of two stages. In the first stage, a firm reduces prices such that its competitors leave the market. In the second stage, the remaining firm raises prices above the price level present before the predation took place, and consequently earns higher profits because short-term losses are outweighed by long-run excess profits. Therefore, if a predatory pricing strategy is successful, it is likely to harm consumers.

A predatory pricing strategy usually means that the predator:

– must be pricing below cost;
– has an intent to eliminate specific competitors;
– has market power (or dominance) to eliminate competitors;
– is able to sustain future market power to recoup the earlier losses.

The predator must have a substantial market share from the start to depress the overall market price quickly. In addition, it needs sufficient capacity to pick up the additional demand created at the lower market price, as well as the extra sales it takes over from its rivals.

As predatory pricing is prohibited under competition law, the incremental effect of a minimum price rule on predatory pricing is likely to be zero. It may be argued that there is a difference between the way in which a minimum price rule is applied and the price–cost test under competition policy. A minimum price rule always applies to individual products, while the way in which a predation price–cost test is applied may depend on the specific details of the case. For example, for supermarkets, the predation price–cost test may be applied to a range of products, rather than to an individual product. In other words, it may be argued that a competition policy approach focuses too much on the overall price and may overlook the effects of predatory pricing on an individual product. However, the approach by competition authorities in the EU is sufficiently broad to take into account the effects of predatory pricing on individual products as well. Competition authorities have looked at specific types of predatory pricing, such as fighting brands where prices of just one product are set low to drive rivals from the market. In other words, competition policy prohibits low-pricing policies if they result in predatory pricing, irrespective of whether it concerns an individual product or a range of products.

2.2 Summary of the incremental effects of a minimum price rule

The discussion above suggests that most of the pricing policies may occur even under a minimum price rule regime—a minimum price rule would restrict the amount by which prices can be cut, but not the policies of loss-leading or price wars themselves. Table 2.1 summarises which pricing policies would be captured by a minimum price rule. Only certain types of these pricing policies would be prohibited.

– *Price promotions that involve below-purchase-price pricing and are financed by retailers*—often price promotions are financed by suppliers. These would not be captured.

– *Loss-leaders that involve below-purchase-price pricing and are financed by retailers*—loss-leaders are often financed by retailers themselves. However, the number of products sold below the purchase price may be limited—they may be below costs (ie, taking into account the total costs incurred by the supermarket), but not necessarily below the purchase price.

– *Price wars that involve below-purchase-price pricing and are financed by retailers*—price wars between retailers (rather than between products) are normally financed by retailers themselves. However, a price war does not necessarily involve below-purchase-price pricing. The number of products sold below costs may be limited.

Finally, predatory pricing normally involves below-cost pricing (which also captures below-purchase-price pricing). However, this practice is already prohibited under competition law.

As a result, the degree to which a minimum price rule would affect retailers would be determined by the extent to which retailers currently apply a policy of loss-leading or enter into a price war by setting retail prices below purchase prices. Although they may set prices low for a certain range of products, it is unlikely that they will do so for a substantial proportion of their products. Setting prices below purchase prices is an expensive strategy since it essentially means that prices are set below marginal costs.

The degree to which retailers currently set prices below purchase prices in price wars is likely to depend on the margins that retailers make on their products. If margins are relatively high, loss-leading pricing policies and price wars may occur even under a minimum price rule regime. In this case, the effect on overall prices as a result of the minimum price rule is likely to be limited.

As explained in section 4, the price war in the Netherlands has had a significant effect on prices. However, it is not clear to what extent the price war involved setting prices below

purchase prices. On some products, margins may have been high, which may have enabled supermarkets to set low prices and enter into a price war without setting prices below the purchase price. Furthermore, even if they had set prices below the purchase price on some products, under a minimum price rule regime, they would probably be able to increase prices on these products and at the same time reduce prices on other products—ie, products with sufficiently high margins to avoid below-purchase-price pricing. In such a case, the net effect of a minimum price rule on price wars may be limited.

Table 2.1 Overview of what would be captured by a minimum price rule

Type of low pricing that may involve pricing below cost	Prohibited by existing legislation?	What would be captured by a minimum price rule?	What would not be captured by a minimum price rule?
Short-run price promotion	No	Price promotions below the purchase price financed by retailers themselves	Price promotions financed by suppliers Price promotions above the purchase price—ie, low prices set by large retailers due to economies of scale and low purchase prices (as a result of buyer power
Loss-leaders	No	Loss-leaders below purchase prices and financed by retailers	Loss-leaders above purchase prices—large retailers may set prices below costs rather than below purchase prices or may be able to set prices below small retailers' price due to economies of scale and low purchase prices (as a result of buyer power) Loss-leaders financed by suppliers
Price wars	No	Price wars are normally financed by retailers—price wars involving below-purchase-price pricing are prohibited	Price wars that do not involve below-purchase-price pricing. Large retailers may benefit from economies of scale and low purchase prices (as a result of buyer power), and therefore be able to set prices low, below those of smaller retailers
Predatory pricing	Prohibited by competition law	No incremental effect	–

Source: Oxera.

3 Assessing the costs of a minimum price rule

This section describes the categories of the likely costs of implementing a minimum price rule. Table 3.1 gives an overview of the main categories of costs and benefits of a regulation.

Table 3.1 Main categories of costs and benefits of minimum price rule

Costs	Benefits
Direct costs of market regulator	
Direct costs of regulated firms	
Regulatory compliance costs	
Costs of specific regulatory proceedings	
Economic costs to the market in question (negative market impacts)	**Economic benefits to the market in question (positive market impacts)**
Allocative inefficiency	Allocative efficiency
Productive inefficiency	Productive efficiency
Distortion of incentives (reduced dynamic competition/innovation)	Enhanced dynamic competition/innovation
Reduced product/service quality	Increased product/service quality
Restriction on market functioning	Enhanced market functioning
Indirect regulatory costs	**Indirect regulatory benefits**
Regulatory uncertainty	Regulatory certainty
Likelihood of regulatory capture	Improved quality of regulation
Deterrent effects	
Social costs (if relevant)	**Social benefits (if relevant)**
Distributive costs	Distributive benefits
Reduced security/quality of supply	Enhanced security/quality of supply
Negative effect on vulnerable customers	Positive effect on vulnerable customers
Other negative externalities on society	Other positive externalities on society

Source: Oxera (2004), op. cit., Table 3.1, p. 12.

3.1 Direct costs of regulation

The direct costs of regulation comprise the costs of designing and implementing the regulation, the costs of enforcing the regulation, and the administrative compliance costs incurred by firms subject to the regulation.

Designing and implementing the regulation—the MEA will incur one-off costs in designing the regulation and implementing it into law.

Enforcing the regulation—there are several options for enforcing a minimum price rule: it could be enforced by civil law, criminal law or a specific regulator. For example, Belgium, Ireland and France operate a civil law regime, while Germany has a regulatory regime. Under a civil law regime, retailers suspected of selling products at prices below the purchase price can be sued by other private parties, such as rival retailers or suppliers. The court will have to establish whether products were indeed sold at prices below the purchase price.

Under a criminal law regime, investigations could also be initiated by public prosecutors, while, under a regulatory regime, investigations could be launched (and fines imposed) by a regulator such as the competition authority or a specific regulator responsible for enforcing the minimum price rule. Each option may have certain advantages and disadvantages. An assessment of these options is beyond the scope of this study.

Complying with regulation—retailers are likely to incur some administrative compliance costs in making sure that their prices are not set below the purchase price. They may also incur costs in defending themselves when they are investigated by, for example, a court or the competition authority. Furthermore, companies suing retailers for setting prices below purchase prices will incur costs in preparing their case.

Although the costs of designing and implementing the regulation may be substantial, they are one-off costs and therefore unlikely to affect the outcome of the cost–benefit analysis; they are therefore not quantified. The outcome of the cost–benefit analysis will depend on the ongoing annual costs (including the negative market impact costs) and benefits of the minimum price rule, rather than one-off costs.

The total amount of enforcement and compliance costs incurred by regulators and firms will be determined by the number of investigations per year and the cost per case. Furthermore, depending on the type of regime, some ongoing fixed costs may be incurred by the relevant authority in monitoring compliance.

Experience in countries with a minimum price rule indicates that, on average, the number of investigations may range between 2 and 20 cases per year.[12] Data on Ireland suggests that the number of cases per year may decrease over time after the introduction of a minimum price rule, indicating that the first cases may set precedent and have a deterrent effect.[13] In general, only a limited number of cases result in a positive finding of below-purchase-price pricing. For example, in Germany, 20–30% of investigations resulted in positive findings, and, in Belgium, the figure was 15% of the cases.

An approximate estimate of the order of magnitude of the costs could be obtained by using as a proxy the costs incurred by companies subject to an investigation by a competition authority. An assessment of below-purchase-price pricing may to some extent be similar to a competition authority investigation. (For example, both a competition investigation into predatory pricing and an investigation into compliance with a minimum price rule require an analysis of prices and costs.)[14] Although the analysis undertaken in a competition investigation is different, in both competition cases and minimum price rule cases, companies are likely to have to allocate the time of senior staff to the investigation, and may hire legal and economic expertise to assist them in preparing their case. In other words, the nature of the costs in both types of investigation is likely to be similar.

Some information is available about the costs incurred by companies in relation to competition investigations. A recent study for the International Bar Association and American Bar Association found that a typical, multi-jurisdictional merger generates, on average, €3.3m

[12] The EIM report showed that, on average, there were ten cases per year in Germany, nine in Belgium, and at least 2–3 in France. Furthermore, in Austria, there were nine cases in 2004 (although this was more than usual), and five cases in Ireland in the period 2002–04. There were, on average, 27 cases per year in the period 1988–98 in Ireland (Source: Competition and Mergers Review Group (1999), 'Review of the 1987 Groceries Order', December, p.14.). Adding to this the five cases in the period 2002–04 results in an average of 20 cases per year in Ireland.

[13] See Competition and Mergers Review Group (1999), op. cit., December, p.14.

[14] In practice, predatory pricing cases are likely to be more complicated since they normally also assess the feasibility of the predatory pricing strategy and likely market conditions after rivals have been driven out of the market.

in external merger review costs.[15] Of these, 65% are legal fees, 19% are filing fees and 14% are fees for other advisers. Using figures reported in that study, Oxera estimates that a merger notified in a *single* jurisdiction in the EU, such as the Netherlands, may incur, on average, costs to firms as reported in Table 3.2.[16]

Table 3.2 Estimate of the 'typical' cost to firms of a merger investigation notified in a single EU jurisdiction such as the Netherlands (€ '000)

Type of cost	First-stage merger	In-depth merger review
Internal	20–40	80–120
External	110–160	600–900
Total	**130–200**	**680–1,020**

Source: Oxera calculations based on PwC (2003), op. cit.

Table 3.2 shows the costs of both the first and the second (in-depth) stages of a merger review. If the analysis in the first stage indicates that the merger may have a substantial effect on competition, the merger requires a more in-depth analysis in stage 2. Minimum price rule investigations are likely to be less complicated than an in-depth merger investigation and most of the first-stage merger investigations—an investigation into compliance with the minimum price rule mainly requires a comparison of retail prices with purchase price, rather than an assessment of relevant markets and competitive effects. It may therefore be reasonable to take the lower estimate of the costs of a first-stage merger review as a proxy for the costs incurred by retailers investigated because of below-purchase-price pricing. This results in an estimate of between €20,000 and €130,000 per case.

The relevant authorities will also incur certain costs in monitoring compliance with the minimum price rule and in investigating possible infringements. The costs incurred by competition authorities may provide a proxy for the order of magnitude of these costs. The administrative cost of the NMa was approximately €22m in 2003 (not including the costs of the Dte (the energy regulator), Transport Chamber and Healthcare Authority). In that year, the NMa dealt with 190 competition cases covering the more resource-intensive type, such as in-depth merger investigations and investigations into agreements and company conduct, and the less resource-intensive notifications of agreements and of mergers. Giving the former type a weight of 10 and the latter type a weight of 1 results in an average cost per case of approximately €75,000. Furthermore, under a regulatory or criminal law regime, the regulator or public prosecutor may incur certain costs related to monitoring compliance in the market.

Under a civil law regime, part of these costs would be incurred by the complainant. Given that the burden of proof is on the complainant, they would have to provide evidence. In a criminal or regulatory regime, the complainant may receive assistance from the public prosecutor or the competition authority, and would therefore incur lower costs.

Table 3.3 shows that the direct costs per investigation may lie between €95,000 and €205,000. Assuming that, on average, there could be between a minimum of two and up to a maximum of 20 cases per year, this results in a total cost of between €190,000 and €4m per year.

[15] PwC (2003), 'A Tax on Mergers? Surveying the Time and Costs to Business of Multi-jurisdictional Merger Reviews', study commissioned by the International Bar Association and the American Bar Association.
[16] See Oxera (2004), 'The Costs and Benefits of a Market Regulator', report prepared for the MEA, the Netherlands.

Table 3.3 Estimate of direct costs of regulation of a minimum price rule (€ '000)

Type of cost	Costs per case	Number of cases per year	Total costs per year
Enforcing regulation	75	2–20	150–1,500
Compliance costs	20–130	2–20	40–2,600
Total	**95–205**	**2–20**	**190–4,100**

Source: Oxera.

3.2 Negative market impact

A minimum price rule may have several negative effects on the market, in particular on the price that consumers pay for their products. The negative effects may include the following.

– *Allocative efficiency*—a minimum price rule would prohibit retailers from setting prices below the purchase price. As explained in section 2, this may affect certain types of low-pricing policies; under certain conditions, overall prices may be higher than otherwise.

– *Productive efficiency and dynamic competition*—in theory, a minimum price rule may dampen competition between retailers more generally. The rule may close off a mechanism by which retailers can compete with each other. As explained in section 2, economic theory suggests that it can be efficient for retailers to set relatively low prices for well-known products (ie, with a strong brand) to attract customers and subsequently set higher prices for lesser-known products (eg, private label products). Such pricing policies may result in lower overall prices and increase consumer welfare, as they ensure that no retailer can earn revenues above the level they would earn under perfect information—any excess profits on lesser-known products are competed away on well-known products. Insofar as price wars and loss-leading policies normally involve below-purchase-price pricing, a minimum price rule is likely to have an upward effect on prices.

– *Regulatory uncertainty*—the introduction of a minimum price rule may result in some degree of uncertainty about how the rule would be applied in practice by the relevant authorities. The minimum price rule is likely to require further interpretation. For example, if the purchase price is defined as the net price paid by retailers to suppliers (ie, the price paid by retailers to suppliers minus charges paid by suppliers for access to, for example, shelf space and marketing activities), this is likely to require a judgement on how to allocate these revenues to the different products. Uncertainty about how the relevant authorities would apply the minimum price rule may give retailers an incentive to be on the safe side by keeping prices at a reasonable level and refrain from aggressive pricing.

  It could be argued that, over time, court decisions and/or guidance from the relevant authorities may clarify what is considered below-purchase-price pricing, thereby reducing legal uncertainty.

– *Deterrent effect*—the imposition of fines or other sanctions is likely to deter retailers from infringing the minimum price rule. The degree of the deterrent effect would depend on the level of the fines or the type of sanctions, the probability of getting sued (or caught by the relevant authorities), and the likelihood that the relevant authorities will be able to find sufficient evidence for them to impose fines. These factors may also give retailers an incentive to be on the safe side and refrain from aggressive price competition.

The possible negative effect of a minimum price rule on prices is quantified in section 4.

3.3 Social costs

If a minimum price rule leads to higher food prices, it may also result in some social costs. For example, it may involve some distributive costs and a negative effect on vulnerable consumers. In general, households with low income will spend a higher proportion of their income on food products than other households. This means that these low-income households would be affected disproportionately by any increases in food prices.

4 Quantification of the negative market impact

Assessing the effects of a minimum price rule on prices and quantifying the order of magnitude is far from straightforward. Prices are affected by many factors, including the business cycle, the exchange rate and the degree of competition. It may not be possible to analyse all these factors (eg, due to lack of data) or to assess the extent to which individual factors have affected prices.

From a theoretical perspective, it is not clear whether the effect on prices of a minimum price rule would be economically significant. In practice, the rule may not dampen competition, or may do so, but only to a small, economically insignificant, extent. This could indicate that retailers are able to compete against each other on price without using below-purchase-price pricing strategies. Absence of a significant effect on prices could also be due to other factors such as a relatively lax enforcement of, and compliance with, the minimum price rule.

To obtain indications of the possible effect of a minimum price rule on prices, Oxera has looked at several different types of analysis.

Analysis of prices in countries with a price rule
Oxera undertook an analysis of food prices in Austria, Belgium, Germany, France and Ireland—countries that have a minimum price rule and were examined in the EIM report. The logic behind this is that, if the minimum price rule has had a significant effect on prices in some of these countries, introducing a minimum price rule in the Netherlands may result in similar effects. The presence and order of magnitude of a price effect in these countries are likely to depend to some extent on the specific circumstances. For example, if pricing below purchase price was not very common before the introduction of the minimum price rule, it is unlikely that the rule had a significant effect. Similarly, if enforcement of the minimum price rule was relatively lax, the effect on prices may also have been limited. In interpreting the result of the statistical analysis, these factors need to be taken into account.

Although the minimum price rules in most of the countries apply to all goods and services sold by retailers, the focus of the analysis was on the prices of food (and non-alcoholic drinks) rather than of all retail products. Since low-pricing strategies are common in the food sector (because of the multi-product nature of supermarkets, see section 2), a minimum price rule is likely to affect food prices to some extent, probably more so that in other sectors.[17] By looking at prices of all products, the effect of the minimum price rule may not be captured. Furthermore, as explained, the costs and benefits of a minimum price rule in the Netherlands are being discussed as a result of the price war among supermarkets. It therefore seems appropriate to analyse supermarket or food prices. Food price indices were available for the countries examined and were taken as a proxy for supermarket prices (which were not readily available for most countries).

Existing empirical evidence on the impact of a minimum price rule
Oxera reviewed a number of existing studies on the impact of a minimum price rule in other countries.

Impact of the price war in the Netherlands
The impact of the supermarket price war in the Netherlands since the end of 2003 may in itself provide information about the effect and order of magnitude of a minimum price rule.

[17] Another sector where price wars or loss-leading policies may occur is department or do-it-yourself stores.

These types of analysis are discussed below.

4.1 Analysis of prices in countries with a price rule

4.1.1 Comparison of prices before and after introduction of minimum price rule

In line with the selection of countries in the EIM report, Oxera examined food price data in the Austria, Belgium, Germany, France and Ireland (see Table 4.1).

Table 4.1 Countries with a minimum price rule

	Minimum price rule	Date of commencement
Belgium	In legislation	July 14th 1991 (law amended on August 29th 1999)
Germany	In the competition Act	January 1st 1999
France	In legislation	January 1st 1997, amended in 2001
Ireland	In legislation	1987
Austria	In the competition Act	January 1st 2000

Source: EIM (2005), op. cit.

For these countries, the rate at which food prices grew before and after the introduction of the minimum price rule were compared and tested to ascertain whether they were statistically significantly different. Although, in two countries (France and Austria), the average growth rate of prices increased after the introduction of the minimum price rule, the difference in growth was not statistically significant. A more sophisticated technique may be needed to identify the effect of a minimum price rule.

4.1.2 Approach to modelling the impact of a minimum price rule

A preferred approach would be to estimate an econometric model of prices regressed against factors such as wholesale prices, costs, and concentration, which may explain the development of prices over time. However, this approach requires data on a large number of variables over time, most of which are not available.

Another approach is to use the autoregressive integrated moving average (ARIMA) methodology, also known as the Box–Jenkins (BJ) methodology. The emphasis of ARIMA models is on analysing the probabilistic, or stochastic, properties of economic time series on their own. Unlike an econometric model, in which the Yt (in this study, the variable 'price') would be explained by a number of regressors, in the BJ-type time-series models, Yt is explained by past, or lagged, values of Yt itself and stochastic error terms.

The ARIMA method can be applied to food price data of the aforementioned countries with a dummy variable included for the period after the introduction of the minimum price rule to capture possible price effects. In undertaking an ARIMA analysis, the following two factors need to be taken into account.

– A minimum price rule is likely to increase the level rather than the growth rate of prices. However, an ARIMA model can only be applied to time series in levels that are stationary. If the times series is not stationary, it can often be made so by taking the first differences (ΔY_t rather than Y_t) or differences of higher order if necessary. The coefficient of the dummy then represents a change in the growth rate of prices. Although differences can give indications about the significance of the effect on prices, this does not necessarily result in reliable estimates of the order of magnitude of the level effect. By running the regression in first differences, information about the impact on the level of prices is lost. In other words, if the time series is non-stationary, the main purpose of

the ARIMA analysis will be to test whether the impact on prices after the introduction of the minimum price rule was significant.

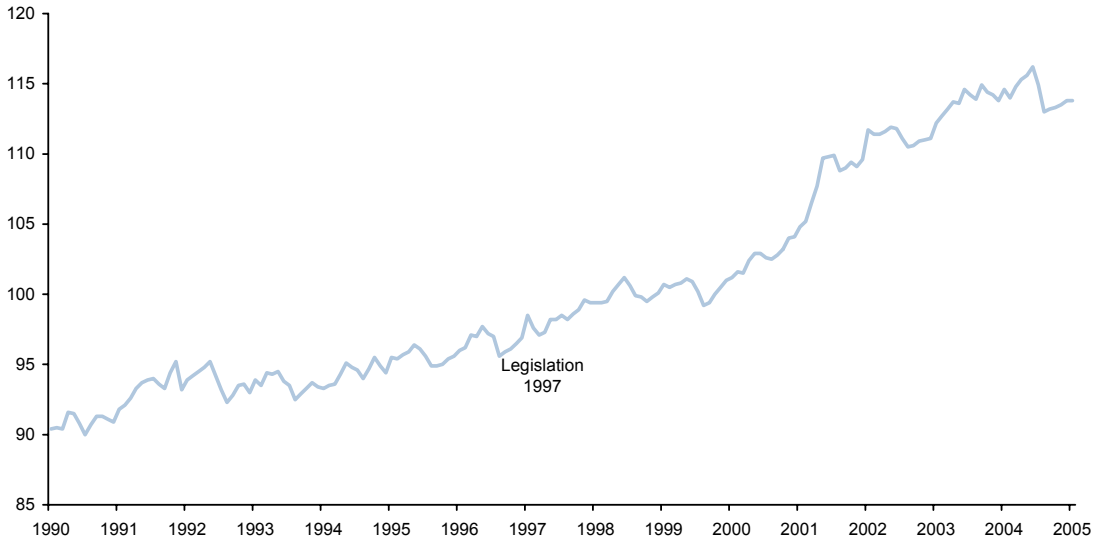
– The ARIMA method is purely a statistical technique and does not allow for a test of causality between the significance of the dummy and the minimum price rule. An ARIMA technique models changes in prices over time based on how prices have evolved in the past. If the dummy picks up any significant effects, after the introduction of the minimum price rule, it is then necessary to assess whether factors other than the minimum price rule may have contributed to the upward price effect.

4.1.3 Results of modelling analysis

ARIMA models using food price data in the aforementioned countries were estimated (for more detail, see Appendix 1). A dummy variable was included for the period after the introduction of the minimum price rule to pick up possible price effects.

The analysis shows that the dummy was significant in the regression for France—the sign of the coefficient of the dummy was positive, indicating that the growth rate of prices increased after the introduction of the minimum price rule.[18] Figure 4.1 shows food prices over time in France.

Figure 4.1 Food price index (France)



Source: Insee, series: food and non-alcoholic beverages.

To adjust for inflationary pressures, the regressions were also run on food price divided by the general price index as the variable. This also resulted in a significant positive coefficient for the dummy variable in the regression for France, indicating that the increase in food prices was not simply due to inflationary pressures.

In the other countries, the coefficient of the dummy variable was not significant. This could indicate that below-purchase-price pricing was not very significant in those countries; pricing

[18] As explained in more detail in Appendix 1, the ARIMA model had to be estimated in first differences because the price data is not stationary. This means that the coefficient of the dummy can be interpreted as the percentage point increase in the growth rate of prices.

policies such as loss-leading may involve below-cost pricing but not necessarily below-purchase-price pricing. Furthermore, it could be due to relatively lax enforcement of, and compliance with, the minimum price rule. For example, there are indications that, in Germany, compliance with the minimum price rule in the food sector is not very strict.[19] It could also be due to statistical problems such as too much noise in the data, which may disturb the statistical analysis. Prices are affected by many factors—using ARIMA modelling techniques does not guarantee that the effects of the minimum price rule are captured.

Furthermore, there may be specific reasons why a significant effect was found in France. The price rule in France is applied to the purchase price rather than the net purchase price. By definition, the purchase price is higher than the net purchase price, resulting in a higher price floor for retailers in France than in, for example, Germany (where the net purchase price is taken as the threshold). Applying the minimum price rule to the purchase price (rather than the net purchase price) is likely to make it more difficult for retailers to pass on the revenues received from suppliers to consumers without infringing the minimum price rule.

There are also indications that the combination of a minimum price rule and rules on transparency and non-discrimination has resulted in suppliers offering products on the same terms to retailers.[20] This may have made it more difficult for retailers to compete on the price of A-brand products (the Galland Law, which contains the minimum price rule, mainly affects A-brand products rather than for example, private-label products).

In addition, in France, the minimum price rule is enforced under criminal law rather than under a civil law or regulatory regime (as is the case in Germany), which may have resulted in a strong deterrent effect.

As explained, it is relevant to examine whether there are other factors that could explain the upward effect on prices:

– The significance of the dummy is in line with the finding that average growth rates of prices after the introduction of the minimum price rule (in 1997) were higher than before the introduction—the growth rate of food prices before 1997 in France was estimated at 1% per year during the period before the introduction of the minimum price rule (1990–96) and at 1.8% during the period 1997–2005.

– Prices are normally affected by the business cycle—the growth in the French economy was relatively strong during the period 1997–2000 (ie, above 3% GDP year-on-year), which may have resulted in some upward pressure on prices. However, economic growth was significantly lower in the period 2001–03, falling from 1.8% in 2001 to 0.5% in 2003. It could therefore be argued that if there were any effect from the business cycle on the significance of the dummy, that effect may have been limited and may not fully explain the significance of the dummy.[21] Furthermore, as explained above, the increase in food prices was not in line with increases in the general price index, indicating that the increase was due to factors other than the business cycle.

– Another factor that could lead to a rise in food prices is a growth in market concentration, for example through mergers. Although there were several supermarket mergers in France around the time of the below-purchase-price pricing legislation, it is not clear that these had a significant effect on prices in France, particularly as some of

[19] See EIM, op. cit., p. 19.

[20] Standard & Poor's (2004), 'Industry Report Card: European Retail—Competitive Pressures in France Set to Heighten Further following Expected Changes to Regulatory Environment', November.

[21] Applying the regression to the time period 1990–99 with a dummy for the period 1997–99 also resulted in a significant and positive coefficient, indicating that the significance of the dummy is unlikely to be due to the economic cycle. Furthermore, including a dummy one year earlier (in 1996) did not result in a significant coefficient.

them involved medium-sized players. Furthermore, these mergers were approved by the competition authority, making it less likely that they had a significant effect on overall supermarket prices in France.

In sum, it cannot be ruled out that other events may have affected prices during the minimum price rule period. However, it is unlikely that such events had a significant effect on prices, and there is no evidence that they occurred during exactly the same time period as the minimum price rule period. Although the analysis may have certain shortcomings, overall it may be taken as indicative of an upward effect on prices following the introduction of the minimum price rule.

4.2 Existing empirical evidence on the impact of the minimum price rule

There are relatively few empirical studies on the impact of a minimum price rule. Oxera has located a study on Ireland and two studies on France.

4.2.1 Impact of the minimum price rule in Ireland

The authors of the Irish study had access to data on retail margins, concentration ratios (over time) and other relevant factors, which allowed for an econometric time-series analysis.[22] Retail margins were estimated on the basis of a wholesale price index and a constructed retail price index for processed and preserved fruit and vegetables, which are covered by the minimum price rule.[23]

Retail margins were regressed against explanatory variables, including concentration (assuming that higher concentration may result in higher prices), advertising intensity (taken as a proxy for product differentiation), and real GDP per capita (to capture changing demand conditions over time).[24] A dummy was included to capture the effect of the minimum price rule. Two additional dummies were included to capture the exchange rate shock of pound sterling leaving the Exchange Rate Mechanism (in the last quarter of 1992) and the shock to the potato market (in 1994).

The analysis shows that the coefficient of the dummy for the minimum price rule is positive and statistically significant, and that during the minimum price rule period, retail gross margins on the products were 4.6 percentage points higher (This was the average margin increase across processed and preserved fruit and vegetables—the increase in margins of individual products may have been higher, lower or zero).

While the data and analysis may be subject to certain shortcomings,[25] the result of the analysis may be considered indicative of an upward effect on prices.

[22] Collins, A. and Oustapassidis, K. (1997), 'Below Cost Legislation and Retail Performance', Agribusiness Discussion Paper No. 15, April.

[23] Products that were not in the wholesale price index were not included in the RPI. This meant that not all products to which the minimum price rule applies were included in the basket.

[24] The expected sign of the GDP variable is unclear. On the one hand, the food category included in the analysis contains a number of tinned and staple food products. Demand for these products may diminish with increasing personal income. On the other hand, the category also contains frozen products, which may be closely related to the purchase of household durables such as fridge freezers, which should be positively correlated to income. Therefore, the sign may be either positive or negative, although the consumer price index basket weights suggest that a negative relationship may be more likely. The regression results in a negative coefficient for the GDP variable.

[25] For example, the model does not account for the potential endogeneity of concentration (the model assumes that concentration affects margins, but not the other way around), the advertising measure has an assumed, rather than actual, quarterly structure imposed on it for much of the series, and no lagged terms are included in the time-series model. The negative coefficients obtained on concentration and advertising intensity may be considered surprising, as both would be expected to increase price–cost margins.

The Oxera ARIMA modelling did not give significant results for Ireland. This may be due to differences in modelling techniques and dataset. An advantage of the Ireland study is that it sought to estimate an assumed theoretical relationship between retail margins and a series of explanatory variables. The authors of the Irish study had access to specific data on retail margins in combination with data on control variables such as changes in concentration over time, possibly making it easier to identify effects of the minimum price rule.

4.2.2 France

In France a study was undertaken by Nielsen two months after the minimum price rule was introduced.[26] Its analysis of 1,500 items (all national brand items) showed that the average price for these 1,500 items increased by 4.14% after the introduction of the minimum price rule in 1997. (This is an average increase of prices of the 1,500 items included in the study—price increases of individual products may have been higher, lower or zero.)[27]

The Ministry of Economics Affairs of France undertook a similar analysis over the same time period and estimated the price increase at 0.5%.[28]

The difference between these two estimates may be explained by the fact that the French Ministry's analysis included not only national brands, but also private labels and discount brands for each product. The Galland Law mainly affects A-brand products.

Both the Nielsen and the French Ministry of Economic Affairs studies measured the initial price effect shortly after the introduction of the minimum price rule (two months). If measured over a longer time period, the effect on overall prices could have been smaller—having increased prices of products sold below the purchase price, retailers may have reduced prices on other products with relatively high margins (without setting them below the purchase price), resulting in a small or no net effect on the average price of supermarket products.

4.3 Impact of the price war in the Netherlands

A simple comparison of the average growth rate of food prices in the Netherlands before and after the start of the price war in October 2003 suggests that the price war had a significant negative effect on prices—the growth rate of prices became negative after October 2003, the start of the price war.

An ARIMA analysis was undertaken of food prices in the Netherlands with a dummy from October 2003. The coefficient of the dummy was negative and statistically significant, confirming that the price war had an impact on the overall level of prices in the Netherlands.

Figure 4.2 below shows food prices over time in the Netherlands, with prices during the price war in the Netherlands falling by approximately 3.5%. The question is how would prices have developed in the absence of the price war—ie, what is the counterfactual? It could be argued that, in the absence of a price war (ie, under a minimum price rule regime), prices in the Netherlands could have developed in line with those in other economies in the Eurozone. For example, in Germany and France (both countries have a minimum price rule), food prices fell

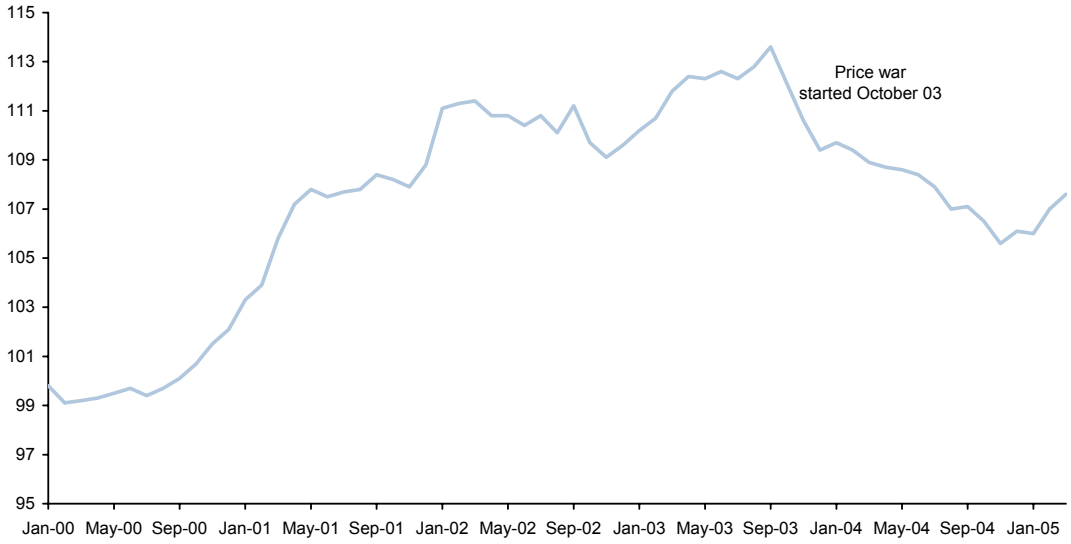
[26] In France, the first minimum price rule was introduced in 1966, but was not well defined and was generally considered not to be very effective. The definition of below-purchase-price pricing was further refined in 1996/97 in the Galland Law resulting in better enforcement and compliance.

[27] Nielsen (1997), 'Loi Galland: Jusqu'où les Prix vont-ils Grimper?' Linéaires no. 1529, March, cited in C. Chambolle, 'Stratégies de Revente à Perte et Réglementation', Laboratoire d'Econométrie de l'Ecole Polytechnique, Paris.

[28] Cited in Allain, M.L. and Cambolle, C. (2004), 'Below Cost Pricing as Vertical Restraints', Cahier du LORIA no 2004-01, August.

during this period by around 0.5%. This may indicate that the price war in the Netherlands resulted in a reduction in prices of around 3%.

Figure 4.2 Price index of food and non-alcoholic drinks in the Netherlands (January 2000 = 100)



Source: Central Bureau of Statistics (CBA) in the Netherlands.

The extent to which the price war in the Netherlands involved below-purchase-price pricing is not clear. Announcements by supermarkets about cost reductions indicate that retail prices may have been set below costs; however, they may still have been above purchase prices. It is therefore not clear to what extent prices would not have reduced under a minimum price rule regime.

4.4 Conclusion on quantification of negative market impact

Table 4.2 below summarises the results of the quantification of minimum price rules.

Table 4.2 Estimates of effects of minimum price rules and price war

	ARIMA modelling	Other studies	Order of magnitude	Comments
Belgium	No significant effect	n/a	n/a	–
Germany	No significant effect	n/a	n/a	–
France	Significant positive effect on prices	Significant effect	0.5%[1] (all supermarket products) 4.14%[2] (A-brands)	Short-term effect is estimated. The long-term effect may be smaller, but is still likely to be significant, as indicated by ARIMA analysis
Ireland	No significant effect	Significant effect	4.6%[3] (selection of products covered by minimum price rule)	
Austria	No significant effect	n/a	n/a	
The Netherlands (price war)	Significant negative effect on prices	n/a	Around –3% (all food products)	Price war does not necessarily involve below-purchase-price pricing. The effect of minimum price rule may be between 0% and 3%

Sources: Oxera [1] Ministry of Economic Affairs in France, cited in Allain and Cambolle (2004), op. cit. [2] Nielsen, (1997), op. cit. [3] Collins and Oustapassidis (1997). op. cit.

The analysis above shows that in two countries (France and Ireland), the minimum price rule may have had a significant positive effect on prices. The estimates of the price effect ranges from 0.5% to around 4%.

The statistical analysis of price data in the Netherlands suggests that the price war may have resulted in a reduction of prices of around 3%. Nonetheless, it is not clear whether the price war involved below-purchase-price pricing.

These results should be interpreted with care. As explained, the French studies gave estimates of the short-term effects, which may overestimate the long-run effects. Although the ARIMA analysis shows that the long-run effect was significant, the order of magnitude may be smaller. However, the Irish study did provide an estimate of the long-run effect.

The effects on prices in France (and Ireland) may be due to a combination of factors. Conditions in the Netherlands may be different and may therefore result in effects of different orders of magnitude. The effect is likely to depend on a range of factors, such as the extent to which supermarkets currently set prices below purchase prices (rather than below costs) and the degree with which the minimum price rule would be enforced and complied with.

It should be noted that even if the effect on prices is relatively small in terms of percentages, in absolute terms it may be significant. For example, supermarket turnover in the Netherlands was around €105 billion in 2004.[29] Consequently, every 0.1 percentage point price increase would result in an effect in absolute terms of around €105m—consumers would pay €105m more per year for supermarket products (this assumes that the demand for products sold by supermarkets is relatively inelastic—ie, consumers would not reduce their food consumption in response to a price increase).

[29] Source: CBS The Netherlands (2004).

5 Conclusions

The analysis undertaken by Oxera results in the following conclusions.

From the assessment in section 2, it can be concluded that low-pricing policies, such as price promotions, loss-leading and price wars, do not necessarily involve below-purchase-price pricing. In particular, large retailers may be able to set prices low (without setting them below purchase prices) as a result of economies of scale and/or low purchase prices. Furthermore, even if they set prices below costs, this does not necessarily involve below-purchase-price pricing. Finally, the incremental effect of a minimum price rule on predatory pricing is likely to be zero since this pricing policy is already prohibited under competition law.

In section 3 the direct costs of minimum price are estimated at between €95,000 and €205,000 per investigation. Assuming that, on average, there could be between 2 and 20 cases per year, this results in a total cost of between €190,000 and €4 million per year. This covers the costs incurred by the relevant authority enforcing the minimum price rule and the administrative compliance costs incurred by firms.

Section 4 quantifies the negative market impact of a minimum price rule. Such a rule may dampen competition. The analysis shows that the minimum price rule in France and Ireland may have had an upward effect of prices. However, the results should be interpreted with care and cannot be directly translated to the situation in the Netherlands. The effect on price in France and Ireland may be due to a combination of factors which may not necessarily be present in the Netherlands, such as the degree with which the minimum price rule is enforced and complied with and the extent to which supermarkets currently set prices below purchase prices (rather than below costs). Under a minimum price rule, retailers may be able to increase prices on some products (ie, those with prices below purchase price) and at the same time reduce prices on other products—ie, products with sufficiently high margins to avoid below-purchase-price pricing. In such a case, the net effect of a minimum price rule on loss-leading policies may be limited.

While the net effect of a minimum price rule on prices may be relatively small in terms of percentages, in absolute terms it could still be significant to consumers. For example, supermarket turnover in the Netherlands was around €105 billion in 2004.[30] Consequently, every 0.1 percentage point price increase would result in an effect in absolute terms of around €105m—consumers would pay €105m more per year for supermarket products. (This assumes that the price elasticity for products sold by supermarkets is relatively inelastic—ie, consumers would not reduce their food consumption in response to a price increase.)

A final comment could be made on the relationship between benefits of a minimum price rule and the potential upward effects on prices. If a minimum price were to lead to higher prices, this would not necessarily result in significant beneficial effects for smaller retailers. The price increase may not be sufficient to make smaller and more specialised retailers stay in the market—the fact that a minimum price rule could increase prices does not automatically mean that it would be effective in creating a market with more diverse parties. Under a minimum price rule, smaller retailers may still find it difficult to compete with larger retailers, which benefit from economies of scale and lower purchase prices (as a result of their buyer power).

[30] Source: CBS The Netherlands (2004).

Appendix 1 Statistical analysis

This appendix describes the statistical analysis of price data undertaken by Oxera. An ARIMA analysis was undertaken on the series of food price indices for all the relevant countries. A dummy variable was added for the time periods after the legislation was introduced, where a significant positive coefficient on the dummy would be indicative of a positive effect on prices of the minimum price rule. Finally, where a significant positive coefficient was found, other possible reasons for the increases in food prices were examined.

A1.1 Descriptive statistics

The rates at which food prices grew before and after the introduction of the minimum price rule were compared and tested to ascertain whether they were statistically significantly different. Although, in two countries (France and Austria), the average growth rate of prices increased after the introduction of the minimum price rule, the difference in growth was not statistically significant. A more sophisticated technique may be needed to identify the effect of a minimum price rule.

A1.2 ARIMA modelling

As noted in the main report, a preferred approach would be to estimate an econometric model of prices regressed against factors such as wholesale prices, costs, and concentration that may explain the development of prices over time. However, this approach requires data on a large number of variables over time, most of which are not available.

Another approach is to use the ARIMA methodology, also known as the BJ methodology. The emphasis of ARIMA models is on analysing the probabilistic, or stochastic, properties of economic time series on their own, under the philosophy of letting the data speak for itself. Unlike an econometric model, in which the Yt (in this study the variable 'price') would be explained by a number of regressors, in the BJ-type time-series models, Yt is explained by past, or lagged, values of Yt itself and stochastic error terms.

For example, an ARIMA model for the series Y_t may look like this:

$$Y_t = \alpha + \beta_1 Y_{t-1} + \varepsilon_t + \upsilon\varepsilon_{t-1}$$

This means that, at time t, Y is a function of a constant term, the value of Y in the previous period, plus a moving average of current and past error terms.

To identify the ARIMA model with the best fit, a number of steps were taken.

– **Is the time series stationary?** An ARIMA model can only be applied to time series that is stationary. A stochastic process is said to be stationary if its mean and variance are constant over time and the value of covariance between two time periods depends only on the distance or lag between the two, and not on the actual time at which the covariance is computed. Stationarity was tested by applying the Dickey–Fuller test.[31] Furthermore, the data was examined by looking at the autocorrelation functions (ACF)

[31] Dickey, D. A. and Fuller, W. A. (1979), 'Distribution of the Estimators for Autoregressive Time Series with a Unit Root', *Journal of the American Statistical Association*, **74**, 427–31.

and the partial correlation functions (PACF). These show the correlation between the value of a series at one point in time and its value at a number of past periods. (When calculating the correlation coefficient between Y_t and Y_{t-g}, the ACF includes the correlation between all intervening lags, whereas the PACF factors it out.) In general, if the ACF and PACF do not appear to decay quickly over time, the data is likely to be non-stationary.

If the time series is not stationary, it can often be made so by taking the first differences (ΔY_t rather than Y_t) or differences of higher order if necessary. Food price time series, the data analysed in this study, was found to be non-stationary for all selected countries, whereas the data in first differences was stationary. The ARIMA model was therefore estimated on the series of monthly *changes* in the food price index.

– **Which lags should be included?** The ACF and PACF were inspected to identify the highest lag with which the value of the series was still correlated. All lags up to the highest significant lag were included in the ARIMA model.

– **Is there a seasonal pattern?** Price series may have a seasonal pattern. For example, prices may be particularly high or low at a certain time of year, due to seasonal demand or supply factors. The value of the series at a certain month may therefore be more correlated with its value in the same month in the previous year than with its value at a different month in the same year. It may be that this seasonal pattern is non-stationary, which would mean that the correlation between values of the series in the same season (quarter, or month) does not decay to 0 over time. If the ACF showed that this was the case, a seasonal ARIMA component was added. As such, the difference was taken between the value of the series at t, and the value at t–s (where s is the order of seasonality, eg, 12 in the case of monthly data, where the value each month is highly correlated with the value 12 months previously).[32] If the data showed some seasonal effects but these appeared stationary, an extra 12th lag was added to the regression. Therefore, when the 10th, 11th or 12th lag appeared to be significant, these lags were included as a seasonal ARIMA component; the intermediate lags were not automatically included in the ARIMA model.

– **Which lags are significant?** The ARIMA model was estimated with all lags up to the highest significant lag in the ACF. The relevant lags were subsequently identified by following the general-to-specific approach: the least significant lag was removed from the ARIMA model whereupon the model was re-estimated and the then least significant lag was removed, and the model was estimated again. This procedure was followed until all lags were significant at the 5% level.[33]

A constant term and a dummy variable were added to the ARIMA model. A dummy variable only takes values 0 or 1. In this case, it takes value 0 for all periods before the minimum price

[32] This is also an issue when performing the Advanced Dickey Fuller (ADF) tests, to test for stationarity. The ADF test investigates whether the coefficient of y_{t-1} is equal to 1 in the regression $y_t = a + by_{t-1} + \Sigma_g \Delta y_{t-g} + e_t$ (the unit root). The lags of the changes in y are added to take into account the correlation between the error term and any of its past values. The ADF test is performed on several of these regressions, each with a different number of lags in Δy. The one selected to decide whether the series is stationary is that with the lowest Akaike criterion (an information criterion choosing the 'best' specification on the basis of the number of lags and how much of the movement in the series they help to explain). However, sometimes the Akaike criterion will choose a specification with a number of lags very similar to the order of seasonality. Using this specification, the ADF test will often conclude that the data is non-stationary (even though in the specifications with a smaller number of lags of Δy, the ADF test concludes that the data is stationary). This is likely to be due to a non-stationary seasonal pattern. When this case arose, it was assumed that the data was stationary, but a seasonal ARIMA component was added to take into account the possible seasonal non-stationarity.

[33] The data showed a strong seasonal pattern. On a couple of occasions, it was therefore decided to retain a seasonal ARIMA component, even though it was only marginally significant.

rule was introduced, and 1 for all periods after introduction of the rule. The coefficient of this dummy is a measure of the effect of the rule on prices.

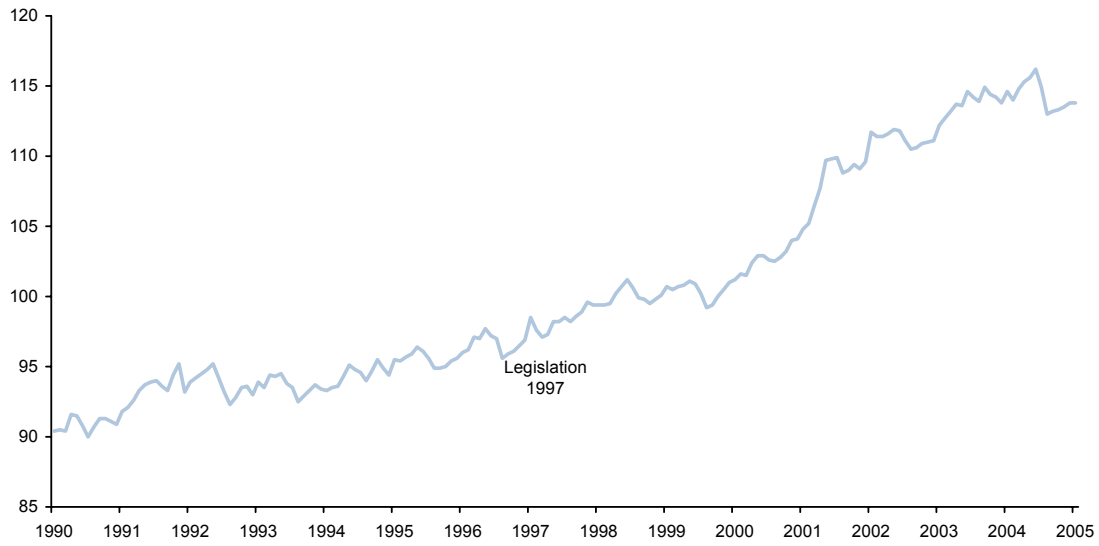
A minimum price rule would be expected to result in an increase in the level of price after the introduction of the rule. Ideally, one would want to measure an upward shift in the level of prices. However, the dummy is added to a regression on *differenced* data, which means that the coefficient of the dummy represents the coefficient of an underlying time trend in the series (in levels, not differences).[34] A positive coefficient on this dummy therefore represents an increase in the growth rate of the price series over time, rather than an upward shift in the level of food prices. This means that although the significance of the dummy may indicate whether the minimum price rule had a significant effect on prices, the coefficient may not give a reliable indication of the order of magnitude of the effect on prices.

After estimating the final ARIMA model, the residuals were tested for stationarity (using an ADF test as described above), to assess whether the model was specified correctly. For all models, residuals were stationary.

A1.3 Results

The coefficients of the dummies in the ARIMA model for Austria, Belgium and Ireland were positive but not statistically significant. The coefficient of the dummy in the ARIMA model for Germany was negative and not statistically significant, while only the coefficient of the dummy in the ARIMA model for France was positive and statistically significant (see Table A1.2 below). Figure A1.1 shows food prices in France.

Figure A1.1 Food price index (France)



Source: Insee. Series: food and non-alcoholic beverages.

To adjust for inflationary pressures, the regressions were also run on food price divided by the general price index as the variable. This also resulted in a significant positive coefficient

[34] This is because when an equation such is $y_t = by_{t-1} + cD + e_t$ is differenced (ie, subtract $y_{t-1} = by_{t-2} + cD + e_{t-1}$ from it), the dummy variable D (which, on the non-differenced series, represents a level shift) disappears. This is because it has the same value in both equations. A dummy on a regression of the differenced data results from differencing the following equation: $y_t = by_{t-1} + ct + e_t$, where t is a time trend.

for the dummy variable in the regression for France, indicating that the increase in food prices was not simply due to inflationary pressures. Therefore, it appears that the increase in food prices was significantly over and above the increase in the overall price level in the economy.

Table A1.2 Results of the ARIMA model for France

	France			France (adjusted for CPI)		
Regressors	Coefficient	Standard error	t-statistic	Coefficient	Standard error	t-statistic
Constant	–0.0005	0.01986	–0.03	0.0001	0.00013	0.58
Dummy	0.9669	0.46532	2.08	0.0071	0.00357	1.99
$Price_{t-1}$	–0.4620	0.08311	–5.56	0.4760	0.14908	3.19
$Price_{t-2}$	0.2789	0.09500	2.94			
$Price_{t-3}$	–0.3884	0.07535	–5.15	0.3321	0.15348	2.16
$Price_{t-4}$	0.4358	0.09737	4.48			
$Price_{t-5}$	0.8691	0.07387	11.77			
$Error_{t-1}$	–0.5320	0.08028	–6.63	–0.4971	0.10399	4.78
$Error_{t-2}$	0.1953	0.10623	1.84	0.4603	0.13653	3.37
$Error_{t-3}$	–0.4239	0.08535	–4.97			
$Error_{t-4}$	0.3997	0.10335	3.87	0.3374	0.14031	2.40
$Error_{t-5}$	0.8768	0.07309	12.00			
Seasonal AR $component_{t-12}$	–0.1158	0.09587	–1.21			
Seasonal MA $component_{t-12}$	0.7341	0.05884	12.48	–0.6498	0.10485	–6.20

Note: In the ARIMA model for food prices, the seasonal AR component is retained, even though it is not significant at the 5% level. This is because it is deemed important in correcting for seasonality. The coefficient on the error term at t–2 is significant at just above 5%, and therefore retained in the model.
Source: Oxera.

As discussed, it is difficult to interpret the coefficient of the dummy. The ARIMA model was estimated in differences rather than levels of prices because the series of food prices is non-stationary. By differencing the data, information on the levels of prices is lost. As explained above, it would be desirable to estimate the shift in the level of food prices after the introduction of the legislation, because it seems likely that the legislation had such an effect. However, it is only possible to estimate the coefficient on an underlying time trend. This may be one reason for the difficulty in identifying a positive price effect of the legislation in the other countries examined.

A1.4 Possible causes for the increase in food prices in France

The ARIMA method is purely a statistical technique and does not allow for a test of causality between the significance of the dummy and the minimum price rule. Further analysis is therefore needed to assess whether the significance of the dummy could have been related to factors other than the introduction of the minimum price rule. This results in the following observations.

– It is necessary to ascertain whether the increase in food prices took place as from 1997 (when the legislation was introduced). It could be that prices were growing faster from another point in time, and the dummy is picking up this effect. To test whether this is the case, an ARIMA model was estimated on the series of food prices for France. Instead of

adding a dummy from 1997 onwards, it was added from 1996 onwards. In this case, however, the coefficient of the dummy is no longer positive and significant, which suggests that the increase in food prices did start in 1997. Furthermore, an ARIMA model was estimated on the series of food prices for France, but using data until the end of 1999 only. In this model, the coefficient of the dummy was still positive and significant, which suggests that the rise in food prices was not due to events after 1999 (eg, the introduction of a common European monetary policy and the euro).

– Another factor that could lead to a rise in food prices is a growth in market concentration, for example through mergers. Although there were several supermarket mergers in France around the time of the below-purchase price pricing legislation, it is not clear that these had a significant effect on prices in France, particularly as some of them involved medium-sized players (ie, in the top 20), as shown in Table A1.3. Furthermore, these mergers were approved by the competition authority, making it less likely that they had a significant effect on overall supermarket prices in France.

Table A1.3 Supermarket mergers in France

Year	Acquiring firm	Top 20 ranking	Acquired firm	Top 20 ranking
1996	Auchan	5	Docks de France	6
1997	Carrefour	2	Cora (increased holding)	7
1997	Casino	6	Leader Price	Top 20
1997	Promodes	3	Catteau (ex Tesco)	Top 20
1997	Comptoirs Modernes	8	PG (ex Delhaize le lion)	Top 20
1997	Casino	6	Franprix	Top 20
1998	Carrefour	2	Comptoirs Modernes	8

Source: AIM (1995), 'Changing Patterns of Retailing and Influence Exercised by Major Retailers', unpublished report, Brussels, cited in European Commission DGIV (1999), 'Buyer power and its impact on competition in the food retail distribution sector of the European Union', prepared by Dobson Consulting (study contract IV/90/ETD/078).

– Prices are typically affected by the business cycle. Growth in the French economy was relatively strong during the period 1997–2000 (ie, above 3% GDP year on year), which may have resulted in some upward pressure on prices. However, economic growth was significantly lower in the period 2001–03, falling from 1.8% in 2001 to 0.5% in 2003. It could therefore be argued that if there were any effect from the business cycle on the significance of the dummy, that effect may have been limited and may not fully explain the significance of the dummy.[35] Furthermore, as explained above, the increase in food prices was not in line with increases in the general price index, indicating that the increase was due to factors other than the business cycle.

A1.5 Results for the Netherlands

The effect on food prices of the supermarket price war in the Netherlands was also examined, following the same methodology as that described above for the other countries examined. In the case of the Netherlands, a dummy variable was added in the ARIMA model, which controls for the time period after the price war, to determine whether the price war had a significant negative effect on prices.

[35] As explained above, applying the regression to the time period 1990–99 with a dummy for the period 1997–99 also resulted in a significant and positive coefficient, indicating that the significance of the dummy is unlikely to be due to the economic cycle. Furthermore, including a dummy one year earlier (in 1996) did not result in a significant coefficient.

A1.5.1 Descriptive statistics

Two sets of prices (both between 2000 and 2005) were looked at:

– an index of food prices;
– an index of supermarket prices.

In both cases, the compound growth rate of prices was positive between 2000 and October 2003 (when the price war started), but negative in the period thereafter. The difference between the average growth rates is significant.

A1.5.2 ARIMA modelling

Table A1.6 shows the results of the ARIMA model estimated on data for supermarket and food prices in the Netherlands.

Table A1.6 Results of ARIMA models for the Netherlands

Regressors	Netherlands food	t-statistic	Netherlands supermarket	t-statistic
Constant	0.1324	0.78	0.1599	1.135653
	(0.16894)		(0.14080)	
Dummy	–0.9554	–1.56	–1.0653	–1.49273
	(0.61223)		(0.71366)	
$Price_{t-1}$	0.3494	2.93		
	(0.11905)			
$Price_{t-2}$			0.3277	2.695566
			(0.12157)	
Seasonal AR component$_{t-12}$	0.6755	5.09		
	(0.13269)			
Seasonal MA component$_{t-2}$	0.4880	4.01		
	(0.12165)			

Source: Oxera analysis.

The coefficient of the dummy is negative, confirming the descriptive statistics that the growth rate of prices slowed down after the price war (and in fact prices decreased). The coefficient is only marginally significant at the 12% level for the model of the food price index, and at the 14% level for the supermarket price index.

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