

*THE CHAIN OF SUBSTITUTION IN MARKET DEFINITION:  
PITFALLS IN APPLICATION*

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**Abstract**

In defining markets, a common argument is that where the products of a number of adjacent firms are substitutable, forming a so-called “chain of substitution”, the products in fact could form a single relevant market. A chain of substitution may thus ultimately allow two products that do not constrain each other directly to be included in the same relevant market. The concept of a chain of substitution in the context of market definition is recognised in international precedent and guidelines, including the European market definition guidelines. This paper shows that a simplistic use of the chain of substitution effect in defining markets is not a substitute for the hypothetical monopolist test. This paper considers the extent to which the chain of substitution can be used in market definition assessments, drawing on relevant case precedent and the theoretical foundations of the chain of substitution effect. A model based on critical loss analysis also illustrates the influence of the degree of switching and the margin of the firm on the potential length of chain that could be included in the same relevant market. It concludes by outlining the key considerations when considering the impact of any chain of substitution in a market definition analysis.

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## I INTRODUCTION

Market definition is an important part of the analysis for most cases in competition law. Defining a ‘relevant market’ enables one to limit the application of the analysis to a specific set of products and geographies and thus exclude products and suppliers that are unlikely to be relevant. Thus market definition is key to the scope of the analysis and has the potential to be a significant determinant of the outcome. However, the process of defining the relevant market often presents challenges.

The most commonly used approach to define the relevant market is the hypothetical monopolist test. The test attempts to find the smallest group of products (and geographies) over which a hypothetical monopolist would have market power or, in other words, the group of products where a monopolist would be able to profitably raise price above the competitive level. This can be assessed using the SSNIP (Small but Significant Non-transitory Increase in Price) test. When applying the SSNIP test, one starts with the smallest possible group of products. One then asks whether a company supplying all of these products, the hypothetical monopolist, would have sufficient market power to profitably impose a SSNIP of 5% to 10% above the competitive level.<sup>2</sup> If the hypothetical monopolist could not do this, the grouping of products included in the potential market is expanded to include the next closest substitute, and the SSNIP test is performed again. This is repeated until the hypothetical monopolist over the chosen group of products is able to increase prices profitably – it is this group of products over which a firm could have market power. Products within this group are not significantly constrained by products outside of it and thus it represents a relevant grouping of products for analysis.

The relevant market is thus a group of products which exert a significant competitive constraint on each other. However, in some cases the relevant market may include products that do not *directly* constrain each other. This can occur where two such products are connected by a continuous chain of substitution. A chain of substitution means that a product at one end of the chain can potentially exert an *indirect* constraint on one at the other end of the chain. We show that this is possible below. However, what is evident is that in many instances (e.g. some commentators and parties to competition proceedings) a broader relevant market has been asserted based on the mere presence of a chain of substitution. In this paper we show that an observed chain of substitution between two products that do not constrain each other directly does not necessarily mean that the two products should be part of the same

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<sup>2</sup> Motta, M., 2004 “Competition Policy, Theory and Practice”, Cambridge University Press: p.105

relevant market. We also investigate the conditions under which a chain of substitution may result in a chain of substitution as well as some considerations in thinking about whether a particular chain may be sufficiently significant to broaden the relevant market.

Firstly, we look at relevant case precedent and guidelines from various competition authorities. Secondly, we examine the theoretical foundations behind chains of substitution and give a brief overview on the mechanisms thereof. Thirdly, we formulate a model to examine how various factors may affect the potential length of a chain that could be considered part of the same relevant market. Finally, we draw conclusions on the some of the relevant factors when considering whether to broaden a relevant market on the basis of a chain of substitution.

## II GUIDELINES AND CASE PRECEDENT

Market definition is a key concept for competition regimes and thus many authorities, including Europe, Australia, Canada, New Zealand, and the United Kingdom (UK), have issued guidelines on market definition<sup>3</sup>. At least three jurisdictions mention or examine the concept of chains of substitution in their market definition guidelines<sup>4</sup> – Europe, the UK, and Australia. We consider the guidelines and relevant case precedent for each of these jurisdictions below.

### (a) Europe

The market definition guidelines of the European Commission<sup>5</sup> refer directly to the concept of chains of substitution:

*“In certain cases, the existence of chains of substitution might lead to the definition of a relevant market where products or areas at the extreme of the market are not directly substitutable.”<sup>6</sup>*

The Commission refers to the possibility of both geographic chains and product chains. However, the guidelines also issue a caveat on the application of a chain of substitution argument. Specifically, it states that:

*“[T]he concept of chains of substitution has to be corroborated by actual evidence, for instance related to price interdependence at the extremes of the chains of substitution, in order to lead to an extension of the relevant market in an individual case.”<sup>7</sup>*

Thus the Commission cautions against a simple use of a chain of substitution to include products (or geographies) into one relevant market. It appears to suggest that some kind of indirect price constraint must exist. The European Commission has applied the chain of substitution concept in a few cases.

In *Pilkington-Techint/SIV*<sup>8</sup> the Commission examined the notion of chains of substitution under geographic market definition for the float glass market. In defining the relevant geographic market the Commission states that the “*natural geographic area of*

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<sup>3</sup> International Competition Network (April 2004) Report on merger guidelines, Chapter 2

<sup>4</sup> International Competition Network (April 2004) Report on merger guidelines, Chapter 2

<sup>5</sup> EU Commission “Notice on the definition of relevant market for the purposes of Community competition law” (97/C 372/03)

<sup>6</sup> EU Commission “Notice on the definition of relevant market for the purposes of Community competition law” (97/C 372/03): par. 57

<sup>7</sup> EU Commission “Notice on the definition of relevant market for the purposes of Community competition law” (97/C 372/03): par. 58

<sup>8</sup> Commission Decision December 1993 Pilkington-Technit/SIV Case No. IV/M.358

*supply from a given float-glass production plant can be represented by concentric circles with a length of radius determined by the relative transport cost.*<sup>9</sup> The Commission defined the geographic market as the European Community as a whole “*given the dispersion of the individual float plants and the varying degrees of overlap for the natural supply areas, so that the effects can be transmitted from one circle to another.*”<sup>10</sup> This Commission also recognises that prices for the various regions track each other and that a substantial degree of sales stemmed from producers in other countries. Based on this interaction between overlapping supply areas, the Commission concludes that the market is likely Community wide. While the exact details of the assessment are unclear it would appear that the Commission has attempted to test the degree to which the supply areas overlapped and thus the extent to which indirect constraints might be evident.

In the *AstraZeneca/Novartis*<sup>11</sup> case the Commission identified two types of herbicide that are not directly substitutable for each other, namely broadleaf weed herbicide and graminicide, and which the Commission deems as complementary products. However, the Commission also identifies a broad spectrum herbicide that is directly substitutable for both, and as such links the two complementary market segments. The Commission therefore indicates that, through a chain of substitution operating through the broad spectrum herbicide, a hypothetical monopolist is unlikely to be able to profitably increase prices in either broadleaf weed herbicide or graminicide. The extent of evidence given in support of this is not clear, although the Commission does state that broad spectrum herbicides derive a large proportion of their sales from their ability to control both grass and broadleaf weeds. In its reasoning the Commission states:

*“In this case, a natural question to ask would be whether a hypothetical sole supplier of all herbicides capable of controlling grasses (i.e. graminicides and, to a lesser extent, broad spectrum herbicides) would find it profitable to increase prices for these products in the way described above. This is not necessarily the case. After all, given that broad spectrum herbicides are competing with broadleaf weed herbicides, an increase in the price of the first would not only lead to a drop in sales stemming from farmers no longer using the broad spectrum product for grass control, but also stemming from farmers that used to buy the product for broadleaf weed control switching to “pure” broadleaf herbicides. To the extent that many buyers of broad spectrum herbicides buy the product to control both types of weeds and the value of broad spectrum products is substantial in comparison with grass weed*

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<sup>9</sup> Commission Decision December 1993 Pilkington-Technit/SIV Case No. IV/M.358: par. 16

<sup>10</sup> Commission Decision December 1993 Pilkington-Technit/SIV Case No. IV/M.358: par. 16

<sup>11</sup> AstraZeneca/Novartis Case No. COMP/M.1806

*herbicides, broadleaf weed herbicides do exercise a competitive pressure on the prices of broad spectrum herbicides and, hence, on the prices of graminicides. This is the so-called chain of substitution effect.*<sup>12</sup>

The Commission has also, in some cases, denied the relevance of chains of substitution in parties' arguments for a broader market. For example, in *Pirelli/BICC*<sup>13</sup> the Commission disagrees with the parties' arguments for a single market for energy power cables based on a chain of substitution between low, medium and high voltage cables.<sup>14</sup> The Commission argues that the evidence does not support that prices in high voltage ranges constrain prices in low voltage ranges.<sup>15</sup> As such the Commission defines a market for low/medium voltage power cables on one hand and high voltage/EHV power cables on the other.

Evident from these cases is that the European Commission recognises the potential for indirect constraints to be relevant in market definition. Such an indirect constraint may be sufficient enough to expand the definition of a geographic market as in *Pilkington-Techint/SIV* or a product market as in *AstraZeneca/Novartis*. However, as indicated in the guidelines, it is important that such claims are substantiated by evidence of the indirect interaction.

(b) United Kingdom

The market definition guidelines<sup>16</sup> of the Office of Fair Trading (OFT) consider the case where a particular product may form part of a long and unbroken chain of substitutes. However, the guidelines emphasise that hypothetical monopolist test should be used to determine what range of products within the chain that would constitute the relevant market since “*even though all products in the chain are substitutes, this does not mean the whole chain is the relevant market*”<sup>17</sup>. The OFT also states that the same principles would apply for the definition of both the geographic and product markets.<sup>18</sup>

The OFT has previously considered chains of substitution in the retail market for petrol in the UK<sup>19</sup>. In defining the geographic market, the OFT suggests that the chains of substitution may not be strong enough to conclude that there is a single market for petrol

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<sup>12</sup> AstraZeneca/Novartis Case No. COMP/M.1806, para. 60

<sup>13</sup> Pirelli/BICC Case No. COMP/M.188

<sup>14</sup> Pirelli/BICC Case No. COMP/M.188: par. 16

<sup>15</sup> Pirelli/BICC Case No. COMP/M.188: par. 17

<sup>16</sup> OFT (2004) Market definition Guidelines

<sup>17</sup> OFT (2004) Market definition Guidelines: par 3.11

<sup>18</sup> OFT (2004) Market definition Guidelines: par . 4.3

<sup>19</sup> OFT (1998) “Competition in the supply of petrol in the UK”

covering the whole of the UK, with the exception potentially of petrol stations in more rural or remote areas where linkages were less pronounced. Evidence of high levels of interaction in prices across the UK was used as a basis for this, although prices were also observed to vary considerably between some local areas. This was seen to suggest that the chain of substitution was not perfect (that there may be a break in the chain), or that price changes take some time to filter through the market segments. It seems that a national market definition (but not UK-wide) was ultimately adopted by OFT.

The UK Competition Commission (UKCC) has considered chains of substitution in its Safeway Report. In its analysis the UKCC considered the geographic market for grocery one stop shopping. While Asda and Safeway argued that the markets were local with a majority of customers coming from within a 10 minute drive<sup>20</sup>, Tesco argued for a national market due to the influence of stores outside the local catchment area.

The UKCC considered the chains of substitution argument put forward by Tesco and found few instances where there was a significant overlap between local catchment areas. As such the chain of substitution argument was found not to hold due to the lack of significantly overlapping catchment areas.<sup>21</sup> Furthermore, the UKCC examined the degree of overlap required for strong chains of substitution and concluded that there would need to be significant overlaps in order for stores to constrain each other. Thus the degree of overlap (and thus potential switching) between potential markets is a key consideration.

Similar to the European Commission, the competition authorities in the United Kingdom consider chains of substitution to be an appropriate notion when considering the relevant market. However, the OFT does not view the presence of a chain of substitution as a substitute for a hypothetical monopolist test. The UK authorities emphasise the importance of the degree of competitive constraint exerted by overlapping and adjacent markets.

#### (c) Australia

The merger guidelines of the Australian Competition & Consumer Commission (ACCC) consider the role of indirect substitution under which the notion of chains of substitution is considered. Essentially the guidelines state that in limited circumstances a relevant market may include products that are indirect substitutes for a product of one of the merging parties. An indirect substitute is considered to be a substitute for a direct substitute of the product in question.

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<sup>20</sup> UK Competition Commission par. 5.24 -5.24

<sup>21</sup> UK Competition Commission par. 5.318

The guidelines indicate three limitations on indirect substitutes' ability to provide an alternative to the product or region<sup>22</sup>. Firstly, there is often a break in chains of substitution, whereby products on one side of the break are not close substitutes to products on the other side of the break. The implication of this is that these products can therefore not be considered to be in the same relevant market. Secondly, as a chain of substitution expands, the proportion represented by customers that will switch to neighbouring links will decrease, meaning a price increase is more likely to be profitable. Essentially, the longer the chain, the more likely that a SSNIP would be profitable. Thirdly, where price discrimination is possible, a market may be limited to the captive customers.

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<sup>22</sup> ACCC November 2008 "Merger Guidelines": par 4.39

### III THEORETICAL BASIS

Through a chain of substitutable products (or geographies), one product may exert an *indirect* constraint on another product. If this indirect constraint is sufficiently large then, according to the hypothetical monopolist test, it should be justifiably considered as part of the relevant market. This is confirmed by O'Donoghue & Padilla<sup>23</sup>:

*“Within a relevant market, it is not necessary that all products or services (or regions) are substitutes for each other: it might be sufficient for some products to be indirect substitutes to other products to be included in the same market. Products are indirectly substitutable if they are linked through so-called ‘chains of substitution’.”*<sup>24</sup>

This concept of a chain of substitution can be evident with respect to both product and geographic markets. The concept can be illustrated using a widely cited hypothetical example. Consider a case where there may be a continuum of different types of products such as cars. A small car does not compete directly with a luxury car, however it may compete with a medium-sized car, which may compete with a large car which itself may in turn compete with a luxury car. Thus while the small car does not compete with the luxury car, there is a continuous chain of substitution connecting the various car segments. This continuous chain of substitution could mean that all cars could be thought to potentially belong in the same relevant market.<sup>25</sup> A similar chain may potentially be observed in a geographical sense where a number of firms producing the same product are spread out geographically such that the firms only compete with other firms located adjacent to them. Through a chain of substitution, a firm may exert an indirect constraint on another than is not adjacent to it.

Using the SSNIP test, we can show more formally how products that only indirectly constrain each other (through a chain of substitution) can be included in the same relevant market. Let us consider five hypothetical firms A to E, which are placed adjacent to one another as shown in the figure below. Assume that A's product is substitutable with the product of firm B, B's product is substitutable with A and C, C is substitutable with B and D, and so on. Thus each of the products is directly constrained by the product of the adjacent firm (to the left and to the right). This could represent geographical markets or product

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<sup>23</sup> Cooper T.E. 1986 “Indirect Competition with Spatial Product Differentiation”, The Journal of Industrial Economics Vol. 37, No 3. (Mar., 1989) pp.241-257.

<sup>24</sup> O'Donoghue R & Padilla J (2006) “The law and economics of Article 82 EC”: p. 75

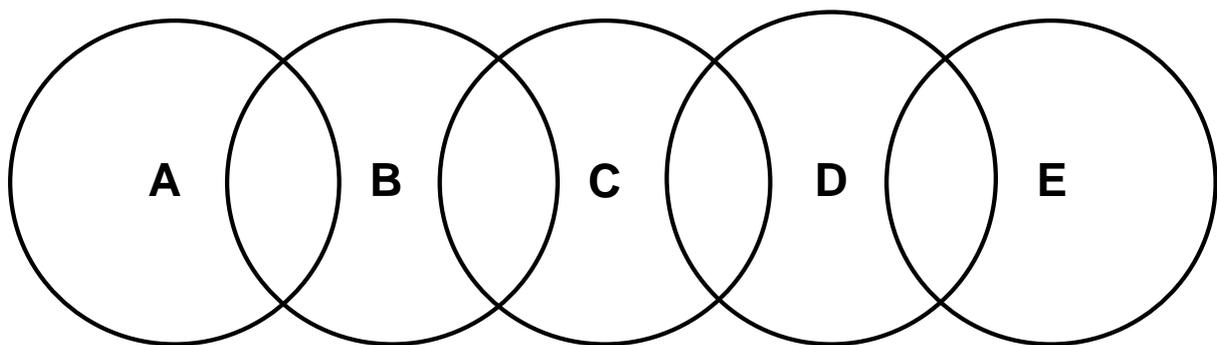
<sup>25</sup> Bishop S & Walker M (2002) “The Economics of EC Competition Law: Concepts, Application and Measurement” Second Edition

markets. If one considers the relevant market for firm A's product, it is clear that the products of C, D and E do not directly constrain the product of A.

However, in applying the SSNIP test<sup>26</sup>, one supposes that firm A increases its price (from the competitive level). Since the product of B directly constrains the price of product of A, some customers of A will choose to switch to purchasing the product from firm B due to the increased price of A. Thus while A increases its revenue from the customers that remain with it, it also incurs losses due to the customers that switch. If the net effect is a loss, it means that the product of A is constrained by that of B and thus both products form part of the relevant market.

The next step would be to consider whether a hypothetical monopolist over the products of A and B together would be constrained by C. Thus assuming the hypothetical monopolist raised the price of A and B (a SSNIP), if sufficient customers switched from B to C, the SSNIP would be unprofitable and thus the relevant market would include the products of A, B and C. As long as the next closest substitute sufficiently constrains the hypothetical monopolist, it must be included in the relevant market. Thus one could potentially find a relevant market including A, B, C, D and E. Thus, according to the hypothetical monopolist test, products which do not directly constrain each other – such as the product of A and the product of C – can be correctly included in the same relevant market.

Figure 1: Hypothetical chain of substitution from firm A to firm E



In order to further illustrate the dynamics of an indirect constraint in practice, let us assume a relevant market consisting of firms A, B, and C. The mechanics of the indirect constraint can be described as follows<sup>27</sup>. When A increases its price, B faces a greater demand (due to switching customers) and thus it is incentivised to increase its own price, although to

<sup>26</sup> For a further explanation of the mechanisms of the SSNIP test, see O'Donoghue R & Padilla J (2006) "The law and economics of Article 82 EC": p. 75

<sup>27</sup> This discussion of the practical dynamics of an indirect constraint is based on O'Donoghue R & Padilla J (2006) "The law and economics of Article 82 EC": p. 75

a lesser degree than A. Thus the actual constraint placed on A is then less than if B could for some reason not change its price. However, due to the presence of C and the constraint of C on B, B must also consider the potential loss of customers to C. Thus B's room to increase prices is constrained by C. Given this the constraint exerted by B on A is more pronounced than it would have been without the presence of C. Thus A is indirectly constrained by C. In other words, "*competition from (C) deters the company (B) from responding to the price increase of company A, making the price rise less profitable, and thereby imposing an indirect competitive constraint on company A.*"<sup>28</sup>

The concept of an indirect constraint (through a chain of substitution) is explored by Cooper<sup>29</sup> who models the case of a straddling firm between two firms that do not constrain each other directly. He states:

*"Although two markets may appear to be separate, sometimes one firm participates in both of them. That firm provides a link between the two markets. Such a straddling firm transmits indirect competition from each market to the other since its actions reflect competitive conditions in both markets."*<sup>30</sup>

However, as much as the SSNIP test shows how a chain of substitution may result in an expanded market definition including products (or geographies) that do not in fact constrain each other directly, the SSNIP test also shows that products cannot simply be included in one relevant market merely because they are connected by a chain of substitution. In the example, if the hypothetical monopolist over A and B could profitably enforce a SSNIP, then C would not be part of the relevant market for firm A, despite the constraint of C on B. This is confirmed by Bishop & Walker<sup>31</sup> who use a hypothetical example to illustrate that despite five firms exerting a direct constraint on each adjacent firm, the relevant market need not include all firms in one market. Bishop and Walker<sup>32</sup> show that care should be taken when considering the impact of a particular chain of substitution.

What drives the SSNIP test is a weighing up of the loss of customers to the adjacent market (the next market in the chain) against the additional returns from the customers that remain with the hypothetical monopolist. This means is that the longer the chain of products

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<sup>28</sup> O'Donoghue R & Padilla J (2006) "The law and economics of Article 82 EC": p. 75

<sup>29</sup> Cooper T.E. 1986 "Indirect Competition with Spatial Product Differentiation", The Journal of Industrial Economics Vol. 37, No 3. (Mar.,1989) pp.241-257.

<sup>30</sup> Cooper T.E. 1986 "Indirect Competition with Spatial Product Differentiation", The Journal of Industrial Economics Vol. 37, No 3. (Mar.,1989) p.241

<sup>31</sup> Bishop S & Walker M (2002) "The Economics of EC Competition Law: Concepts, Application and Measurement" Second Edition :p.121

<sup>32</sup> Bishop S & Walker M (2002) "The Economics of EC Competition Law: Concepts, Application and Measurement" Second Edition :p.121

in the relevant market, the greater the proportion of customers that must be willing to switch to the next adjacent product for it to be included in the relevant market. In terms of the example above, more customers would need to switch from C to D in order to discipline the monopolist over A, B and C than would need to switch from B to C in order to discipline the monopolist over A and B. Thus the proportion of customers relative to the hypothetical monopolist is key in understanding whether the next product in a chain can be included in the relevant market. Put differently, a hypothetical monopolist, at some point along the chain, will be able to increase prices profitability. As a chain of substitution expands, the relative proportion of customers that can switch to neighbouring links in the chain will tend to decrease. This will result in an increase in the ability of a hypothetical monopolists' to enforce a SSNIP at some point along the chain<sup>33</sup>.

A number of factors may influence the potential for a chain of substitution to be “effective”. As Cooper<sup>34</sup> shows, any factor that influences the ability of customers to switch to the adjacent product (the next product), such as transport costs for two adjacent geographic markets, will influence whether that next product (and geography) is included in the relevant market. The longer the chain, the more important those factors influencing the ability of customers to switch become.

A clear death knell for any potential chain is where there is a break in the chain. Bishop & Walker state that “*the continuous chain of substitution argument may also fail because there is a break in the chain.*”<sup>35</sup> A careful consideration of the chain may in certain cases reveal such a break. For instance, differing product characteristics may mean that two products are in fact not closely substitutable.

Cooper<sup>36</sup> also shows that if a straddling, or linking firm (i.e. firm B), can price discriminate effectively between the customers who can switch to A and C respectively, then C will not be able to exert an indirect constraint on A, and as such would not be included in the relevant market.<sup>37</sup> Price discrimination is of course also a consideration in standard market definition – a “*distinct group of customers for the relevant product may constitute a narrower, distinct market*”<sup>38</sup> where such a group can be subjected to price discrimination.

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<sup>33</sup> Australian Competition & Consumer Commission Merger Guidelines November 2008

<sup>34</sup> Cooper T.E. 1986 “Indirect Competition with Spatial Product Differentiation”, The Journal of Industrial Economics Vol. 37, No 3. (Mar.,1989) pp.241-257.

<sup>35</sup> Bishop S & Walker M (2002) “The Economics of EC Competition Law: Concepts, Application and Measurement” Second Edition

<sup>36</sup> Cooper T.E. 1986 “Indirect Competition with Spatial Product Differentiation”, The Journal of Industrial Economics Vol. 37, No 3. (Mar.,1989) pp.241-257.

<sup>37</sup> Cooper T.E. 1986 “Indirect Competition with Spatial Product Differentiation”, The Journal of Industrial Economics Vol. 37, No 3. (Mar.,1989) p. 242

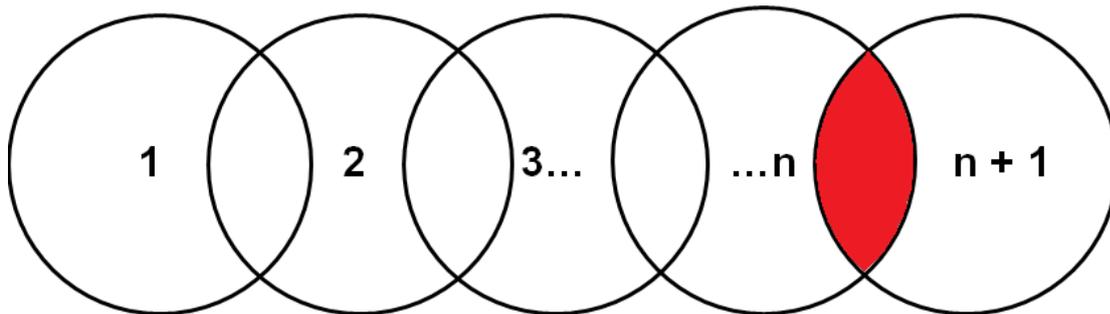
<sup>38</sup> O'Donoghue R & Padilla J (2006) “The law and economics of Article 82 EC”: p. 75

The essence of this discussion is that a chain of substitution is a necessary condition for products (or geographies) that do not constrain each other to be part of the same relevant market. However the existence of a chain of substitution is also not a sufficient condition. The presence of a chain of substitution is no substitute for the hypothetical monopolist test, carefully and correctly applied. Given the above, we now consider a model in order to understand how the various factors above might impact on the potential length of a chain that could be considered as one relevant market.

#### IV CRITICAL LOSS MODEL

Here we construct a simple model based on a critical loss analysis to test what factors influence the length of a chain of substitution that could be considered a relevant market. We assume a chain of substitution of identical firms  $1$  to  $n$  where each firm is constrained only by the firm adjacent to it, and the extent of the constraint for each possible pair of adjacent firms is identical. This could represent potential geographic markets where firms are equally spaced and the proportion of customers that would switch to an adjacent firm for a given SSNIP is identical. We also assume none of the firms can engage in price discrimination. The products of firms  $1$  to  $n$  represent a relevant market, with a SSNIP test excluding the product of firm  $n + 1$ . This can be represented graphically – in the figure below,  $1$  is constrained by  $2$ ,  $2$  is constrained by  $1$  and  $3$ , and so on until  $n$  is constrained by  $n + 1$ .

Figure 2: Hypothetical chain of substitution from firm  $1$  to  $n + 1$



Assuming linear demand, the profit function for the  $n$  firms in the relevant market is defined as follows:

$$\pi = n (mPQ - F) \quad (1)$$

Where:  $\pi$  is profit;  $n$  is the number of firms in the relevant market;  $m$  is the margin (percentage) for each firm;  $P$  is the price;  $Q$  is the quantity sold by each firm; and  $F$  is the fixed cost of each firm<sup>39</sup>.

Having constructed the model such that  $n$  firms constitute the relevant market within a chain of substitutes, the constraint of the firm  $n + 1$  would be insufficient to make a SSNIP unprofitable. Thus we need to construct functions for a) the increase in profit for the  $n$  firms from customers who do not switch due to a SSNIP and b) the loss arising from customers switching from firm  $n$  to firm  $n + 1$ . These two functions can be defined as follows:

<sup>39</sup> Note the price and margin would be per the competitive level.

$$\text{Additional profit (remaining customers)} = (n - 1)(aPQ) + aPQ(1 - z) \quad (2)$$

$$\text{Losses (switching customers)} = mPQz \quad (3)$$

Where:  $a$  is the increase in price (the SSNIP) and  $z$  is the proportion of customers that would switch to an adjacent market in the face of the SSNIP (the switching customers)<sup>40</sup>.

The point where the SSNIP becomes profitable (thus defining the relevant market) is found by setting equations (2) and (3) equal. Then solving for  $n$ , we find the following:

$$n = \frac{z(m+a)}{a} \quad (4)$$

From equation (4) we can deduce that, the higher the proportion of customers that would switch under a SSNIP, the longer the chain making up the relevant market would be. The greater the level of switching, the more likely the loss incurred due to a SSNIP will exceed the additional profits gained from customers who do not switch. This agrees with our understanding that indirect constraints are more pronounced where the competitive interaction between adjacent firms is greater. Furthermore, the greater the margin, the longer the chain making up the relevant market is likely to be (given a level of switching). For a given level of switching, the relevant market for firms with higher fixed costs and thus higher margins would comprise longer chains. This is because the loss function is driven by the losses of existing customers who contribute to profits according to the margin,  $m$ .

To illustrate this further the following table assumes a SSNIP of 5% ( $a$  is equal to 0.05) and shows the length of the chain that would constitute the relevant market under different combinations of switching and the margin. For example, even assuming switching of 50%<sup>41</sup> and a margin of 30%, the length of the chain would be 3.5 which would mean a chain of 3 firms.

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<sup>40</sup> We make the assumption that no customers would exit the market entirely following a SSNIP. Therefore losses arise only from customers switching from firm  $n$  firm  $n + 1$ . While this constraint can be built into the model, it however does not change the ultimate conclusions drawn.

<sup>41</sup> The assumption of this model is that firms only compete with adjacent firms and thus switching of more than 50% would be not be possible .

Table 1: Length of chain according to level of switching and margin level under a 5% SSNIP

		Proportion of customers who switch due to a price increase ( $z$ )					
		0%	10%	20%	30%	40%	50%
Margin ( $m$ )	0%	-	0.1	0.2	0.3	0.4	0.5
	10%	-	0.3	0.6	0.9	1.2	1.5
	20%	-	0.5	1.0	1.5	2.0	2.5
	30%	-	0.7	1.4	2.1	2.8	3.5
	40%	-	0.9	1.8	2.7	3.6	4.5
	50%	-	1.1	2.2	3.3	4.4	5.5

While this model is a very simplified version of reality it does suggest that the prospect of including long chains of substitution in a single relevant market is unlikely. However, under the right conditions of switching, the extent of indirect constraints may be sufficiently significant to include products that do not directly constrain each other in one relevant market.

## V CONCLUSIONS

The discussion above has shown that a chain of substitution may mean that products or geographies that do not directly constrain each other could be included in the same relevant market. However, it is clear that the mere existence of a chain of substitution is not sufficient to make such a conclusion.

Importantly, the concept of chain of substitution is not a substitute for the application of the hypothetical monopolist test. A careful application of the SSNIP test (at least where sufficient information is available to conduct the test) would still result in the inclusion in the relevant market of firms exerting indirect constraints.

We find four specific considerations when assessing the potential for any chain of substitution to be defined as a relevant market:

- Potential breaks in the chain
- The extent of switching relative to the total chain
- The cost structure of the firms
- The ability to price discriminate

### *(a)* Potential breaks in the chain

In some cases a continuous chain of substitutes will fail because there is a clear break in the chain. In such instances there is no link for the constraining competitive effect to be passed through the linked products. As such care needs to be taken in chains of substitution in order to assess whether two adjacent products, or geographies, are in fact constraining each other to any significant degree. This is particularly relevant when considering geographic markets. If transport costs are particularly high for a given product, there may be a break in the chain of substitution.

Thus one must carefully assess the chain, and the constraining influence of each adjacent market should be clearly justifiable.

### *(b)* Extent of switching relative to the total chain

While a chain of substitution may exist between the products of a number of firms, the extent of the constraints between them may not be sufficient. The SSNIP test and critical loss analysis above show that the proportion of customers switching away must be large enough to counteract the increased profits realised from increased prices. Thus the longer the chain and the larger the hypothetical monopolist's market, the greater the level of switching required when considering whether to include the next best substitute in the relevant market.

Effectively, the longer the chain is, the greater the required level of competitive interaction between the last firm included in the market and the next firm in the chain to be considered. The proportion of the switching customers to the remaining customers is thus vital.

What this also means is that where a market in the chain is particularly small it is less likely that the level of switching could be sufficient to expand the relevant market further. An application here may be where a particular, more niche, product links two broader groups of products. For instance, using the car example, if large and luxury cars do not compete directly but are linked only by one niche model in between, it may not be possible to include large and luxury cars in the same market. As Cooper explains, “*a straddler’s size is directly related to its competitive impact on a market*”<sup>42</sup>.

(c) The cost structure of the firms

The critical loss model shows that firms with a higher proportion of fixed costs and thus higher margins are more sensitive to losses in customers through price increases. Thus the constraint of competing firms is more pronounced for firms with higher fixed costs (relative to those with lower fixed costs), and thus chains of substitution resulting in firms not directly constraining each other being included in the relevant market are more likely (all things being equal).

(d) The ability to price discriminate

Price discrimination may enable a firm to create a different type of break in the chain. Where a straddling firm can price discriminate between customers of the two adjacent firms, the hypothetical monopolist can neutralise the potential losses by not increasing prices to customers who would otherwise switch and thus the hypothetical monopolist could increase prices profitably.

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<sup>42</sup> Cooper T.E. 1986 “Indirect Competition with Spatial Product Differentiation”, The Journal of Industrial Economics Vol. 37, No 3. (Mar.,1989) p. 244