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# Multimarket collusion and its welfare implications

Thesis presented by  
**Katarzyna Jagielnicka**

Supervisor  
**Julio Dávila (UCL)**

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## Table of contents

<b>Acknowledgments</b> .....	1
<b>Table of contents</b> .....	2
<b>Introduction</b> .....	4
<b>Part I: Tacit collusion and multimarket contact</b> .....	6
<u>1.1 Understanding tacit collusion</u> .....	6
1.1.1 The rationale for occurrence of anti-competitive behavior ..	6
1.1.2 Self-enforcing nature of tacit collusion .....	7
1.1.3 Factors facilitating and impeding collusion .....	8
1.1.4 Sustainability condition .....	10
<u>1.2 Increasing importance of multimarket contact</u> .....	12
1.2.1 The globalization of markets .....	12
1.2.2 Implications of multimarket contact .....	13
1.2.3 Sustainability of multimarket collusion .....	14
<b>Part II: Repercussions of multimarket collusion for welfare and policy-making</b> .....	16
<u>2.1 Welfare analysis</u> .....	16
2.1.1 Ambiguity in impact of multimarket contact .....	16
2.1.2 Trade costs and competition .....	17
2.1.3 Consumer-side analysis .....	18
2.1.4 Industry performance .....	20

2.2 Challenges for competition policy making ..... 22

    2.2.1 The role and competences of antitrust authorities ..... 22

    2.2.2 International character of competition provisions ..... 23

**Conclusions** ..... 25

**Bibliography** ..... 26

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# Introduction

In light of the increasing amount of interconnections and interdependencies between countries and firms the nature of markets and their interactions has undoubtedly changed a lot during the past decades. Thus, the problem of efficient and fair competition is of intensified significance for today's economies. The multiplicity of external and internal factors determining the level of competitiveness in particular markets and industries can be both ambiguous as well as difficult to identify.

In my thesis I am mainly focused on one of the forms of the anti-competitive behavior, namely a multimarket collusion. Identifying its causes, sustainability conditions and implications seems to be of significant relevance, especially given its potentially detrimental character for the society. Understanding why multimarket collusion appears in the first place, and which market characteristics and structures enables it to be sustained, is substantially useful especially in terms of competition and trade policy-making.

The main tools used are at the intersection of theoretical foundations of anti-competitive behavior analysis in industrial organization, trade and game theory literatures. I first begin by examining different types of collusive behavior, the rationale for its occurrence and sustainability, and different mechanisms and factors influencing its nature and scope. Following that part I explore the link between the globalization of the markets and changing nature of the behavior of multimarket firms which, in turn, affects its sustainability as well. In the second part, in order to understand how multimarket collusion impacts prices on the market, I provide an oligopoly model in two geographically separated markets, each market being home to a different number of firms. Following that, I aim at investigating the potential challenges and implications for competition policy-making.

The most striking result of my analysis is that with the existence of trade costs multimarket collusion could be more detrimental to the "home" market relative to the "foreign" one, as trade costs can partially offset its negative impact on the consumers. The intuition for this result follows from the analysis of the aforementioned model, in which I compare two potential scenarios, a competitive and collusive one. What is more, I also find

that given the asymmetrical market shares collusion across markets could be easier to sustain than in the case of a duopoly in a single market. Thus, I conclude that it is of crucial importance to identify and understand the conditions that give rise to anti-competitive behavior and how it affects different markets.

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## Part I: Tacit collusion and multimarket contact

### 1.1 Understanding tacit collusion

#### *1.1.1 The rationale for occurrence of anti-competitive behavior*

In economic theory it is generally assumed that competition is desirable due to a number of reasons. Most of all, it is considered to contribute positively to the market's efficiency by ensuring optimal level of output that maximizes social welfare. However, as we notice many forms of anti-competitive behavior occurring in modern economies, it is of crucial importance to analyze both their economic rationale and implications. Firms might be tempted to suppress competition and decide to engage in a collusive behavior as it enables them to obtain supra-normal profits. What is more, given the amount of long-run interactions existing in many industries, such as durable investments, barriers to entry, and technological know-how, it is very likely that firms will interact with each other repeatedly. Thus, it appears to be very intuitive that firms need to conjecture their competitors strategy as it will impact, to a greater or lesser extent, their own. This repeated interaction, alongside with the temptation of profit maximization, might result in forming an anti-competitive profit-maximizing entity of some sort.

Collusive agreements may take a number of forms, many of which being illegal in most jurisdictions. The main focus of this theoretical research is put on the tacit collusion which arises through aforementioned repeated interaction, and it does not involve any communication between the colluding parties. Firms non cooperatively decide on strategies that lead to coordinated profit-maximizing outcomes. From the perspective of antitrust authorities it is viewed as a competition threatening behavior, and for this reason, it is illegal. The other type of collusion, an explicit one, occurs when firms communicate openly and more formally about joint price or output decisions, the Organization of Oil Producing Countries (OPEC) being a good example of the latter. Explicit agreements are being treated in

a dissimilar manner to tacit collusion, due to a differing degree of their legitimacy. Hence, it is easily observable that communication, or lack of it, between the firms could be viewed as central in antitrust analysis.

### *1.1.2 Self-enforcing nature of tacit collusion*

In the initial stage each prospective colluder is faced with a decision whether to act competitively or monopolistically. Despite the lack of communication, it is commonly known that each player aims at maximizing its profits. With that in mind, the strategy that a particular firm will choose to follow is largely dependent upon a number of factors relating to market conditions, time horizon, frequency of interactions with other players, etc. Realizing mutual interdependences among the players in a given market is without doubt a first step towards a feasible tacit collusion, but it is hardly enough to sustain it in a long-term.

If the firms aim at maintaining higher prices collectively, any deviation from this situation must trigger some sort of retaliation. The cooperation between the players should be consistent with equilibrium play, despite possible short-term gains resulting from undercutting a given price. In other words, the reduced payoffs from retaliating, as a result of a price war, must be sufficiently large to successfully deter deviations. Collusive equilibria in dynamic games with repeated interaction are supported by the return to non cooperative behavior or, if possible, by some other credible punishment (Green, Marshall, & Marx 2014). In practice, however, the self-enforcing character of tacit collusion might be somehow complex. Price cutting has been widely recognized as a central problem that colluders are faced with, and lack of communication among them certainly makes it even more difficult. What is more, both the magnitude and probability of retaliation hinge on the characteristics of a given industry as well. In some industries tougher punishments might be required in order for the collusion to occur successfully, and in some others it might be even impossible to have effective enforcement mechanisms because the short-term benefits from deviating outweigh significantly any potential costs (Ivaldi et al. 2003).

### 1.1.3 Factors facilitating and impeding collusion

In addition to the difficulty of successfully maintaining a collusive outcome among the firms, there are many factors that, more or less directly, impact both the feasibility of tacit collusion as well as the decision whether to engage in it in the first place, as it was already mentioned in the beginning of the part 1.1.2. In this subsection I will try to briefly identify and describe the most pertinent of them, as it will be important for my further analysis. I find it also crucial to emphasize at this point, that even though it is possible (and has been done so numerous<sup>1</sup>) to derive conditions for the sustainability of tacit collusion with differing impact of the aforementioned factors, some of the results have a rather ambiguous character and thus are hard to interpret.

**Table 1: Factors influencing collusion**

<i>Market's structure</i>	Number of competitors, entry barriers, information transparency, multimarket contact
<i>Supply-side</i>	Marginal costs, capacity constraints, product differentiation
<i>Demand-side</i>	Aggregate demand

First of all, market's structural characteristics seem to be, at least intuitively, the most crucial ones, especially at the initial stages of collusion. As mentioned in the preceding subsection, the main problem for the sustainability of tacit collusion is coordinating the players' joint profit-maximizing decisions and successfully imposing punishment in the presence of deviations. With the increasing number of firms involved the nature of retaliation mechanisms becomes even more challenging, as the share of collusive profit for each firm becomes smaller and short-run gains from undercutting prices increases. Lack of information transparency or existence of market uncertainties can have similar negative implications, as observing prices, and consequently, detecting deviations, becomes tougher. This is especially true in the case of less stable markets (Ivaldi et al. 2003). The existence of information lags,

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<sup>1</sup> See for example Tirole (1988) or Belleflamme & Peitz (2015).

induced by the inability to detect changes in prices immediately, delays the punishment. This, in turn, makes the dynamic interactions far less relevant (the future is more distant), and thus, it becomes less costly to deviate.

Moreover, the existence of entry barriers has, at least in my opinion, an ambiguous effect on tacit collusion. On one hand, low barriers to entry makes the industry more competitive as it directly triggers entry, and this, in turn, reduces the potential costs of deviation following similar logic as in the case of the increased number of firms involved. On the other hand, however, low barriers to entry contribute positively to firms' decision about whether to operate on several markets or not. The rationale behind it is that it reduces fixed costs required for exporting activities, and as a consequence, allows a greater number of firms, even those less productive, to start operating in more than one market. Multimarket contact is widely presumed to facilitate collusion as it becomes more easily sustainable due to, for instance, increased frequency of interaction and softening of the asymmetries between the firms, or the increased scope of possible retaliation mechanisms (Tirole 1988). I will be discussing this in detail in the following subsections.

Supply-side characteristics are of equal importance, especially in terms of asymmetries between the firms, such as differing marginal costs or capacity constraints (that may arise in the presence of, for instance, drastic innovations) and vertical or horizontal product differentiation. Price or product heterogeneity makes the coordination on a given pricing policy more challenging as firms will have uneven bargaining powers and might eventually decide that deviation is far more profitable than collusion in the long-term. What is more, assuming perfectly symmetric conditions, profit-maximizing price should be set to the monopoly one (Tirole 1988). However, with the existence of asymmetries there is no clear focal price, and thus, agreeing on a common strategy becomes difficult. This is especially relevant in the case of vertical product differentiation, when firms try to differentiate their merchandise in terms of quality level.

Horizontal product differentiation, on the other hand, can appear a bit equivocal in its impact on collusive behavior. It focuses on targeting a different, from its competitors, segment of consumers, which allows the firm to gain more market power resulting from differing rankings of preferences among the people. At first glance, it seems to have a rather

negative influence on the sustainability of collusion due to the fact that it contributes to increases in asymmetries among the firms, and consequently makes the punishment less severe. At the same time, it might be less profitable to deviate since the firm is not in an explicitly direct competition with the other firms in the market.

As for the demand-side factors, the most important seems to be the condition of the market itself, whether it is growing, declining, or in a state of temporary stagnation. In the growing markets, it is quite intuitive that tomorrow's profit is going to be greater than today's. By the same token, it makes the deviation less profitable for the undercutting firm. In the event of a collapsing economic situation, if the uncertainty of future is extremely high, it is almost impossible for firms not be tempted to deviate, which makes the tacit collusion very unlikely to happen (Ivaldi et al. 2003). What is more, the more frequent and significant demand fluctuations, the more difficult it is to successfully sustain collusion.

#### *1.1.4 Sustainability condition*

Tacit collusion belongs to the class of noncooperative games with repeated interaction, also referred to as supergames, and it is characterized by multiplicity of equilibria. The nature of those equilibria is quite complex, and, in turn, the difficulty of analyzing the games is high and the relevance of the possible outcomes might be questionable. What is more, many outcomes that are different from collusion can also be equilibria. As mentioned earlier, collusion is enforced through a purely noncooperative mechanism, and the ability to collude depends strictly on the relative importance of current profits as compared to the future ones. Each firm aims at maximizing the present value of its profits, which is determined by its discount factor  $\delta$ . It measures the weight that firms put on future profits, and can additionally be interpreted as the firm's degree of impatience. The critical threshold for the discount factor allows to estimate the sustainability of the collusive behavior given particular market characteristics and the number of players. The lower this threshold is, the easier it is to sustain collusion due to the fact that even less patient firms will be willing to forgo the possible future profits resulting from deviating, as they put less weight on them.

Depending on the nature of the game played, the sophistication of the punishment structure, the types of strategic interactions allowed, etc., the discount factor, and consequently the scope for collusion, would be correspondingly modified.

In order to formalize the aforementioned condition for the sustainability of collusion related to the concept of discount factor, let us assume a simple case with two firms producing perfect substitutes with the same marginal cost,  $c$ . Firms are engaged in a repeated competition à la Bertrand with an infinite horizon ( $t \rightarrow +\infty$ ). Suppose that each firm sticks to the collusive price  $p^m$  in  $t$  periods, with the same discount factor  $\delta$ , and consequently obtains half of the monopoly profit  $\pi^m$ . If one of the firms undercuts the  $p^m$  it gains the entire  $\pi^m$  in the period of deviation, but for the rest of periods the price is set at marginal cost  $c$  forever. This can be summarized in the table below, where  $V^C$  and  $V^D$  correspond to future profits streams for collusion and deviation respectively:

**Table 2: Expected equilibrium payoffs**

<i>Collusion</i>	$\frac{\pi^m}{2}(1 + \delta + \delta^2 + \dots) = V^C$
<i>Deviation</i>	$\pi^m + (1 - \delta) \times 0 = V^D$

For the tacit collusion to be sustainable the following needs to hold:

$$\frac{\pi^m}{2}(1 + \delta + \delta^2 + \dots) = V^C \geq \pi^m + (1 - \delta) \times 0 = V^D \quad (1.1)$$

Thus, the critical threshold  $\delta^*$  in this case should be set at (see Annex A for a more detailed explanation):

$$\delta \geq \delta^* = \frac{1}{2} \quad (1.2)$$

## 1.2 Increasing importance of multimarket contact

### *1.2.1 The globalization of markets*

As mentioned in the previous section, firms might be tempted to engage in an anti-competitive behavior, and there are many factors that influence their decision-making process in that regard, multimarket contact being one of them. It might be worth beginning the analysis by trying to understand why the multimarket contact is occurring in the first place, as it will be helpful in understanding what does its existence imply for the interpretation and feasibility of collusive behavior. Without a doubt, the nature of markets and interactions between the players has undergone a lot of changes, which has its roots in many economic, political and social phenomena. In many real world cases firms compete with each other simultaneously in multiple markets, often in both customer and product ones, example of such situation being, for instance, the airlines industry. Hence, the behavior of firms is affected not only by their interactions in one market, but also by the extent to which they meet their competitors in other markets.

What is more, the growth of multimarket firms is directly linked with the increasing openness to trade, as a result of a progressively more globalized world. The amount of interdependencies between the countries as a consequence of bilateral and regional trade agreements has been intensifying at a staggering pace, especially after the second World War. Lowering of trade barriers and, as a result, decreased trade costs, alongside with the liberalization of natural monopolies have been of especially significant importance. Deregulation of formerly monopolized industries has resulted in an increase in international expansion, as a consequence of newly emerged market entry opportunities (Bonardi 2004). Diminishing trade costs made it possible for even less productive firms to engage in exporting activities.

Furthermore, innovations in communication and transportation technologies have lessened the importance of geographic distance. Although it is true that geographical proximity is still a crucial determinant of the extent of interactions between the players, increasing social proximity of firms across physical space has many new important

implications in terms of analyzing their behavior and motives behind their strategic decisions. All of the aforementioned issues have given rise, more or less directly, to an increasing amount of multimarket contact, on which I will be focusing in the following subsections.

### *1.2.2 Implications of multimarket contact*

The extent and nature of contact between firms in multiple markets has a noteworthy role in determining the level of competitiveness in particular industries. It is common knowledge, and I have already been discussing this issue earlier, that with a repeated amount of interactions between players it might be easier to sustain collusive agreements. Multimarket contact is certainly contributing positively to the extent of those interactions, as firms by increasing their geographic presence or product scope start to compete with the same rivals more and more frequently. This might result in forming of spheres of influence, increased merger activity, and what is the most pertinent in this analysis, tacit collusion (Bernheim & Whinston 1990).

It is important to point out, however, that this potentially increased feasibility of collusion as a result of multimarket contact is still dependent upon a number of market conditions. Assuming high level of homogeneity between firms and markets and constant returns to scale technology, multimarket contact might have very little effect on firms' decision whether to engage in an anti-competitive behavior or not, since it would be quite unlikely for them to collude in this scenario anyway. Thus, what kind of conditions would give rise to collusive gains from multimarket contact? I find this question to be a rather tricky, yet very important, one, especially from the antitrust authorities point of view. I will be discussing this further in the second part of my thesis.

For now, let us briefly focus on the implications of multimarket contact for market participants. We already know that it increases the number of interactions, but it obviously have a number of other repercussions. One of the most important among them is an increased amount of information about other market players, which is quite an intuitive consequence following a greater extent of contact (Bernheim & Whinston 1990).). As a consequence, predicting future behavior of firms becomes less challenging. This reduced strategic

uncertainty might result in firms behaving less aggressively, and, in turn, a decrease in competition. It could also be seen as an incentive to collude, as the higher degree of transparency strengthens the self-enforcing mechanism of tacit collusion, i.e. making the deviation easier to be detected.

Multimarket contact among firms influences behavior of single-market players as well. Creation of indirect ties between multimarket players, and a decrease in competition among them, will reflect their strategies towards others. On one hand, it might result in positive spillovers, as the degree of overall competitive pressures will decrease, and single-market firms will be prone to grow or enter new markets. On the other hand, however, multimarket firms might decide to deflect their competitive resources towards the single-market ones, and in the worst case scenario, even manage to successfully push them out of the market (Haveman & Nonnemaker 2000).

### *1.2.3 Sustainability of multimarket collusion*

The more markets in which a certain number of firms meet, the more frequent their interactions become, hence the easier it becomes to precisely anticipate each others' future strategic behavior. This, in turn, allows for a possibly quicker detection of deviation, but at the same time, with an increased number of markets, firms could achieve greater gains by deviating in all of them, not just one. Nonetheless, it is important not to forget that multimarket contact is experienced differently by firms with differing industry characteristics.

To understand slightly better how multimarket contact affects the sustainability of tacit collusion let us consider the already introduced scenario with two firms producing perfect substitutes with the same marginal cost. This time, however, suppose that they face another competitor in a second market. Recall that in order for the collusion to be sustainable in the first market we need:  $\delta \geq \delta^* = \frac{1}{2}$

The relevant question here is the following: under which condition would these two firms be able to sustain collusion in both markets? One of the possible solutions for a successful collusive outcome in the second market would be leaving their shared competitor a

higher market share in order to induce its willingness to stick to a collusive pricing strategy. The competitor will not deviate from the collusion if:

$$\alpha \pi^m (1 + \delta + \delta^2 + \dots) \geq \pi^m \quad (1.3)$$

Which implies:

$$\alpha \geq 1 - \delta \quad (1.4)$$

Thus, let us denote their competitor's share in the second market as  $\alpha = 1 - \delta$ , which leaves the two remaining firms' sharing  $\alpha = \delta$ .

For the tacit collusion to be sustainable for the two firms operating in both markets the following needs to hold:

$$\left( \frac{\pi^m}{2} + \frac{\delta}{2} \pi^m \right) (1 + \delta + \delta^2 + \dots) = V^C \geq \pi^m + \pi^m + (1 - \delta) \times 0 = V^D \quad (1.5)$$

The critical threshold  $\delta^*$  for all the firms is the same (because it is a discounted value of the cost that is attributed to deviating) and in this case it should be set at (see Annex B for a more detailed explanation):

$$\delta \geq \delta^* = \frac{1}{3} \quad (1.6)$$

The higher the threshold, the more difficult it is to sustain collusion, hence we can see that in this scenario, a multimarket collusion with asymmetric market shares, it is actually easier than in the duopoly case for the firms to stick to the collusive agreement and not be tempted to deviate.

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## Part II: Repercussions of multimarket collusion for welfare and policy-making

### 2.1 Welfare analysis

#### *2.1.1 Ambiguity in impact of multimarket contact*

As discussed in the first part, the increasing importance of multimarket contact as a result of many changes related to, more or less directly, the liberalization of trade can have potentially detrimental anti-competitive effects. Increased level of interactions between the players has without a doubt a certain amount of influence on the competitive behavior in the markets, however it might not always be easily assessable and straightforward. Bernheim and Winston's (1990) seminal article including a formal characterization of multimarket contact's effect on competition has started an ongoing debate about the relationship between collusive behavior and multimarket firms. The accelerated interest in this topic has contributed to a number of researches, a majority of which claiming that multimarket contact softens the competitive behavior and thus might be harmful for social welfare.

I have already briefly examined multimarket contact's possible implications, such as the behavior of other market participants, incentives to collude and the feasibility of the collusion itself. The extent to which a firm lies within the sphere of influence of a few larger firms determines the nature and magnitude of all relationships across the markets. These relationships, in turn, affect price levels and profitability of firms, which impacts welfare. Multimarket collusion, similarly to other forms of collusive behavior, is generally thought to be welfare reducing. The conventional wisdom that collusion hurts consumers seems to be intuitively correct, nevertheless it is important to point out that it might not necessarily always be the case. Identifying such possibilities could be of relevance, especially for the competition and trade policy-making.

### 2.1.2 Trade costs and competition

In the part 1.2.1 I have already discussed the link between openness to trade and an increasing level of multimarket contact. The conventional wisdom in the trade theory suggests that trade liberalization increases competition, as it is followed by a decrease in trade barriers, among which one of the most important ones are trade costs. As a consequence, lowering trade costs has a direct impact on the ease of entry into the foreign markets. Ease of entry, under the assumption of competitive behavior of firms, translates into an increased number of market participants and, thus, an overall increase of competition. However, once imperfect competition is present, the reduction in trade costs and its implications ought to be considered a bit more carefully.

It is possible, and has been shown in a number of models<sup>2</sup>, that trade liberalization might not always equal lower prices and increased efficiency resulting from the intensified competitive pressures. Could it be therefore the case, that lowering of trade costs increases incentives for the firms to cooperate on multiple markets? Or that in the presence of the trade costs multimarket collusion can be actually less detrimental to social welfare? Although there might not be a clear and unambiguous answer to any of those two questions, I believe that they are both worth examining. In my analysis I will be focusing solely on the second question as I find it to be more relevant.

Lowering of trade costs have different effects on the existence, profitability and sustainability of multimarket collusion. If collusion is an infinitely repeated game the already introduced discount factor  $\delta$  determining its sustainability will depend on the trade costs as well (Ashournia, Hansen & Hansen 2008). However, the most direct and immediate effects of reductions of trade costs are on the firm's profits. On one hand, it raises the firm's profits in its exports markets. On the other hand, it might reduce its rival's profits in the domestic market. By the same token, this reduction might increase the incentives to break out of the collusive arrangements since the profit from deviating will be greater. Which effect dominates will depend on the characteristics and structure of the market itself.

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<sup>2</sup> See for example Bond & Syropoulos (2008) or Eldor & Levin (1990).

The impact of trade costs reduction on collusion will also depend on the nature of the competition itself. Lommerud and Sørgaard (2001) argued that if firms compete à la Cournot the discount factor will be reduced simultaneously with the decrease in the trade costs, and thus, collusion will be harder to sustain and trade liberalization can be seen as pro-competitive. In the case of competition à la Bertrand, however, it could be seen as anti-competitive due to the fact that the discount factor will increase. Nevertheless, it is important to keep in mind that these results were based on the assumption that collusion itself is welfare reducing, and, as I have already brought it up, that might not always be the case.

### *2.1.3 Consumer-side analysis*

The most unusual possibility resulting from an occurrence of multimarket's collusion is that it could actually contribute positively to the social welfare by increasing the consumer surplus relative to the competitive scenario. On one hand, an increase in competition might lead to an excessive trade, and this in turn can cause cross-hauling<sup>3</sup>. In this case, collusion could partially distort the negative implications of cross-hauling, which are mostly related with unnecessary costs, and, thus, could be welfare enhancing (Deltas, Salvo & Vasconcelos 2012). Nonetheless, in the presence of multimarket contact and trade barriers sufficiently low the collusive agreement could be especially profitable if it involved cross-hauling (Bond & Syropoulos 2008). This, however, does not go in line with the intra-industry trade theory involving homogenous products, which implies that in this scenario firms would prefer to restrain from each other's territories as it is seen as a more profit-maximizing solution.

In order to understand how collusion affects prices let us consider two geographically separated markets, one home and one foreign, each comprised of three players,  $i$ ,  $j$  and  $k$ , selling a homogenous product across both markets and engaging in a competition à la Bertrand. Firms  $i$ 's and  $j$ 's plants are located in the home market, whereas firm's  $k$  plant is located in the foreign market. All firms incur a constant marginal cost,  $c > 0$ . In addition, each firm incurs a unit trade cost  $t > 0$  for shipping the product from one market to another. The price of the good produced at home will be denoted as  $p_1$ , and the price of the good

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<sup>3</sup> 'Cross hauling' occurs when a country imports and exports the same good in the same period.

produced at foreign will be denoted as  $p_2$ . In the oligopolistic competition scenario the strategic interactions between the firms are separable across the two markets, given that marginal costs are constant. In the anti-competitive scenario, however, the firms are engaged in a repeated game with an infinite horizon ( $t \rightarrow \infty$ ) and they have a common discount factor  $\delta$ .

In the oligopolistic competition scenario prices in the home market are given as follows, where  $\eta$  is the reciprocal of the price elasticity of demand,  $\varepsilon_p$ :

$$p_1 = \left( \frac{1}{1 + \eta} \right) \times c \quad (2.1)$$

$$p_1 = \left( \frac{1}{1 + \eta} \right) \times (c + t) \quad (2.2)$$

In the multimarket scenario firms are able to sustain monopoly prices in both markets under the following condition:

$$\frac{\pi^m}{3}(1 + \delta + \delta^2 + \dots) = V_c \geq \pi^m(1 - \delta) = V_d \quad (2.3)$$

That gives us the consequent critical threshold:

$$\delta \leq \delta^* = 1 \quad (2.4)$$

I have already pointed out before that colluding firms act as a monopoly, therefore they are able to charge higher prices. In here I will assume that they charge the highest price possible, given the constant marginal cost, so the price is set to the monopoly one ( $p_m = \frac{c}{1 - \varepsilon_p^{-1}}$ ).

Thus, prices in the home market under multimarket collusive agreements are as follows, provided that  $\delta \leq \delta^* = 1$ :

$$p_1^c = \frac{c}{1 - \eta} \quad (2.5)$$

$$p_2^c = \frac{c + t}{1 - \eta} \quad (2.6)$$

The condition for the price difference between the oligopolistic and the collusive scenario in the home market to be higher than the one in the foreign market is such that:

$$p_1 - p_1^c > p_2 - p_2^c \quad (2.7)$$

After plugging in the equations (2.1), (2.2), (2.5) and (2.6) we obtain:

$$\left( \left( \frac{1}{1+\eta} \right) \times c \right) - \left( \frac{c}{1-\eta} \right) > \left( \left( \frac{1}{1+\eta} \right) \times (c+t) \right) - \left( \frac{c+t}{1-\eta} \right) \quad (2.8)$$

After solving we get (see Annex C for a more detailed explanation):

$$\frac{-2\eta c}{(-\eta + 1)(\eta + 1)} > \frac{-2\eta c - 2\eta t}{(-\eta + 1)(\eta + 1)} \quad (2.9)$$

Given that  $t > 0$ ,  $c > 0$ , and price elasticity of demand being usually negative (and  $\eta$  as well since  $\eta = \frac{1}{\varepsilon_p}$ ) the price difference in the home market will always be bigger than the price difference in the foreign one.

This result implies that the existence of trade costs decreases the severity of collusion's impact on consumers in the foreign market, which, in turn, indicates that despite increases in interactions between players as a result of trade openness it can partially offset the negative repercussions of the anti-competitive behavior. Nonetheless, it is important to point out that in this setup prices in both markets under the collusive agreement will always be higher than under the competitive scenario, whether with, or without, the inclusion of trade costs. Hence, multimarket collusion is detrimental to the consumer surplus.

#### 2.1.4 Industry performance

When discussing implications of multimarket collusion, or in fact any other form of collusion, consumer-side analysis is obviously just a half of the story. Anti-competitive behavior can have significant implications on overall market performance and efficiency as well as behavior of other, not colluding firms. In any case, I will not go into as much detail in

this part as I did in the previous one. One of the reason for that is that higher prices mostly affect producer's surplus in a positive way, at least for the colluding parties. As for the implications for other firms in a given market, or markets, it appears to be rather more challenging to examine and there is not much prior literature on that topic, especially in the context of multimarket collusion.

Multimarket collusion can have various effects upon the industry's behavior and characteristics, most important of them being the incentives to launch a product, variety and quality of products, and market entry. The magnitude of these effects is obviously closely correlated with the size and impact of the collusion itself. To this day there is a debate surrounding the topic of efficiency and collusion, and without a doubt there are a lot of issues that need further attention. For me one of the most interesting question is the following: if we observe high market performance, would not it be therefore counter-productive to try to dismantle collusive agreements?

Even in the light of potential welfare losses in the short run, it could bring about a positive overall impact in the long run, as the market would become more efficient due to improvements in quality, increased variety of products, etc. All of the above would be an indirect implication of firms having higher profits, and thus, being able to invest a higher percentage of that profit in R&D. Innovation economists consider the innovation process as a primary stimulus of economic growth, and there might be indeed some truth to that. Although I do realize that this argument might be a bit too far-fetched, I still find it interesting enough to be perhaps considered in the future.

## 2.2 Challenges for competition policy making

### *2.2.1 The role and competences of antitrust authorities*

Assessing both the likelihood and impact of collusion can be very tricky. Nonetheless, as the world becomes more and more globalized and interconnected the problem of efficiently functioning markets and fair competition is of increasing importance. The complexity and amount of interactions between the players in a multiplicity of markets definitely makes it more challenging for the anti-trust authorities. There is without a doubt a need for governmental policies addressing the issues of fairness, transparency and level-playing field in terms of competition as it has important implications for both the firms and consumers. The most relevant question here is how antitrust authorities can, and whether they should, fight collusion?

In order to prevent an anti-competitive behavior competition authorities can act ex-ante by aiming at identifying industry structures and characteristics that could give rise to socially detrimental multimarket collusion. Upon identification of such conditions it is possible to ban practices facilitating collusion<sup>4</sup>. It is however more challenging, if not completely impossible, to apply ex-post remedies or intervene under suspicion of tacit collusion. As we have seen in the first part, explicit collusive agreements are far easier to prove for they leave a more tangible evidence of their activities. Article 81 of the European Union Treaty and Section 1 of the Sherman Act in the United States provide a basis under which explicit collusion can be dealt with. They both prohibit activities distorting or restricting competition provided there is a hard evidence on existence of such behavior. Uncovering this evidence has been made easier due to the introduction of leniency programs, that serve as a mechanism incentivizing colluding parties to come forward and provide the authorities with the proof of these agreements. Leniency programs in different countries vary in design and scope, however their main purpose is to provide reduced fines to the firm that deliver the required information first. This, in turn, encourages firms to break off their

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<sup>4</sup> I am strictly referring to the European Union and United States competition law and regulations, for it would be too long and unnecessary to further analyze it with respect to other countries.

collusive arrangements, which might be especially desirable if the other firms starts to deviate. Hence, it could also be seen as a deviation punishment.

Exploitation of market power through high prices is not directly condemned in the Sherman Act, although it is in the Article 82 of EU, which forbids abuse of a dominant position. However, whether it is reasonable and possible to take actions in the event of tacit collusion is quite questionable. Price regulation could be seen as a possible solution to that, although there is a considerable amount of dispute surrounding this topic due to possible negative side effects, such as disruptions in supply and demand that might lead to losses of efficiency. As a consequence, antitrust authorities might be considerably reluctant to implement any price controls at all.

### *2.2.2 International character of competition provisions*

The demand linkages across markets and occurrence of multimarket collusion might lead to a number of enforcement externalities. With the decentralized information about collusive agreements it is ever more challenging to identify and address anti-competitive behavior (Choi & Gerlach, 2012). Antitrust authorities while making a decision about remedies or scope of interventions in one market, without consulting authorities in the other one, can end up being highly ineffectual.

The European Union, for instance, has in fact included a number of competition provisions in its bilateral trade and investment agreements. It has also concluded two agreements with the United States regarding enforcement and application competition law. The European Commission has taken part in the work of international forums dealing with competition policy issues, such as for instance the United Nations Conference on Trade and Development (UNCTAD), or Organization of Economic Cooperation and Development (OECD). Nevertheless, the extent of those efforts and their actual impact ought to be carefully examined, as in the recent years a question mark on their implication has been raised.

An optimal international competition system is still something that is being discussed nowadays. With the criticism surrounding the negotiations of mega trade agreements, such as

The North American Free Trade Agreement (NAFTA) or The Transatlantic Trade and Investment Partnership (TTIP) the proponents of further internationalization of competition, trade and investment policies might not be as many as they used to be. At the same time, it is important to keep in mind that it would be naive to view trade policy and trade agreements's regulations and restrictions as a substitute of competition policy and law. In my opinion, they should be rather seen as complementary. Hence, given the importance of trade environment on competition, and vice versa, there is undoubtedly a need for further development and cooperation on that matter.

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## Conclusions

Multimarket contact and its implications for competition, international trade and policy-making has sparked a debate in the recent years, and for all the right reasons, since the world is becoming an increasingly globalized place. Accounting for the impact of anti-competitive behavior is relevant from many different perspectives, such as the consumers's welfare, industry efficiency and market functioning.

One of the main results presented has to do with the existence of trade costs, which in the event of multimarket collusion could potentially affect its magnitude negatively, to the advantage of consumers enjoying lower price differences between a collusive and more competitive one. What is more, even though multimarket contact is broadly perceived as rather facilitating collusive practices, I find that it is actually more difficult to sustain a collusive agreement under a single-market duopoly case than in the situation of collusion across two markets having asymmetric market shares.

The analysis presented in this thesis could be extended in several additional directions. For example, by developing the oligopoly model in two geographically separated markets to include more than two of them, or by investigating further the link between trade costs and collusion. It could be also equally interesting, however less relevant to the mainstream economics, to examine the currently existing competition laws and regulations and how they could be adjusted given the changing character of markets, or how to successfully incorporate these provisions in multilateral trade agreements.

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## Bibliography

- Aiginger, K., & Finsinger, J. (Eds.). (2013). *Applied industrial organization: Towards a theory-based empirical industrial organization*. Springer Science & Business Media, 150-155
- Ashournia, D., Hansen, P. S., & Hansen, J. W. (2008). *Trade liberalization and the degree of competition in international duopoly*. Syddansk Universitet.
- Belleflamme, P. and Peitz, M. (2015), *Industrial organization: markets and strategies*. Cambridge University Press, 331-367.
- Bernheim, B. D., & Whinston, M. D. (1990). Multimarket contact and collusive behavior. *The RAND Journal of Economics*, 1-26.
- Bonardi, J. P. (2004). Global and political strategies in deregulated industries: The asymmetric behaviors of former monopolies. *Strategic Management Journal*, 25(2), 101-120.
- Bond, E. W., & Syropoulos, C. (2008). Trade costs and multimarket collusion. *The RAND Journal of Economics*, 39(4), 1080-1104.
- Brander, J., & Krugman, P. (1983). A 'reciprocal dumping' model of international trade. *Journal of international economics*, 15(3-4), 313-321.
- Choi, J. P., & Gerlach, H. (2012). International antitrust enforcement and multimarket contact. *International Economic Review*, 53(2), 635-658.
- Cooper, D. J., & Kühn, K. U. (2014). Communication, renegotiation, and the scope for collusion. *American Economic Journal: Microeconomics*, 6(2), 247-278.
- Davies, S., Olczak, M., & Coles, H. (2011). Tacit collusion, firm asymmetries and numbers: evidence from EC merger cases. *International Journal of Industrial Organization*, 29(2), 221-231.
- Deltas, G., Salvo, A., & Vasconcelos, H. (2012). Consumer-surplus-enhancing collusion and trade. *The RAND Journal of Economics*, 43(2), 315-328.
- Globerman, S. (1990). Trade liberalization and competitive behavior: A note assessing the evidence and the public policy implications. *Journal of Policy Analysis and Management*, 9(1), 80-88.

- Green, E. J., Marshall, R. C., & Marx, L. M. (2014). Tacit collusion in oligopoly. *The Oxford Handbook of International Antitrust Economics*, 2, 464-497.
- Haveman, H. A., & Nonnemaker, L. (2000). Competition in multiple geographic markets: The impact on growth and market entry. *Administrative Science Quarterly*, 45(2), 232-267.
- Ivaldi, M., Jullien, B., Rey, P., Seabright, P., & Tirole, J. (2003). The economics of tacit collusion. *Final report for DG competition, European Commission*.
- Neumann, M., & Weigand, J. (Eds.). (2013). *The international handbook of competition*. Edward Elgar Publishing, 241-253.
- Sorenson, T. L. (2007). Credible collusion in multimarket oligopoly. *Managerial and Decision Economics*, 28(2), 115-128.
- Telser, L. G. (1971). *Competition, collusion and game theory*. Springer 175-206.
- Tirole, J. (1988). *The theory of industrial organization*. MIT press, 239-262.
- Waldfogel, J., & Wulf, J. (2006). Measuring the effect of multimarket contact on competition: Evidence from mergers following radio broadcast ownership deregulation. *The BE Journal of Economic Analysis & Policy*, 5(1).