LEGAL CARTELS

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ACM = *Autoriteit Consument en Markt* (Netherlands Authority for Consumers and Markets)
CAS = *Centrale Archief Selectiedienst* (Central Archive Selection service)
CBS = *Centraal Bureau voor de Statistiek* (Statistics Netherlands)
CEM = *Commissie Economische Mededinging* (Committee for Economic Competition)
CPB = *Centraal Planbureau* (Netherlands Bureau for Economic Policy Analysis)
DCEV = Data collection, encoding and verification
ECSC = European Coal and Steel Community
ECU = European Currency Unit
EEC = European Economic Community
EEG = *Europese Economische Gemeenschap* (European Economic Community)
EU = European Union
GDP = Gross Domestic Product
GGDC = Groningen Growth and Development Centre
GWB = *Gesetz gegen Wettbewerbsbeschränkungen* (Act against restraint of competition)
ISIC = International Standard Industrial Classification
NACE = *Nomenclature statistique des activités économiques dans la Communauté européenne* (Statistical Classification of Economic Activities developed in the European Community)
NMa = *Nederlandse Mededingingsautoriteit* (Netherlands Competition Authority)
OECD = Organisation for Economic Cooperation and Development
SBI = *Standaardbedrijfsindeling* (Standard business classification)
SER = *Sociaal Economische Raad* (Social Economic Council)
SPO = *Vereniging van Samenwerkende en Prijsregelende Organisaties in de Bouwnijverheid* (Association for co-operative and price arranging organizations in the construction industry)
TEC = Treaty establishing the European Community
TFEU = Treaty on the Functioning of the European Union
TFP = *Totale Factor Productiviteit* (Total Factor Productivity)
VwEU = *Verdrag betreffende de werking van de Europese Unie* (Treaty on the Functioning of the European Union)
WEM = *Wet Economische Mededinging* (Economic Competition Act)

1 Introduction

This thesis studies the impact, determinants, organization, internal dynamics and characteristics of Dutch cartels during a period in which most cartels were legal. The terminology "legal cartels" might raise the reader's eyebrows because presently, private cartels are illegal in industrial countries. This is in line with the mainstream view that cartels are harmful for economic welfare. Cartels put three types of economic efficiencies at risk. First, allocative efficiencies are jeopardized because prices will be higher due to a cartel, while output is lower than in competitive markets. Second, productive inefficiency may arise because colluding firms are to a lesser extent challenged to operate efficiently. And third, cartels reduce the incentives to innovate.

Legal cartels are thus presently the exception rather than the rule. Yet, for two thirds of the 20th century, most cartels were legal in the Netherlands. From 1935 until 1998, Dutch competition laws explicitly permitted the creation of domestic cartels. Only those cartels that conflicted with public interests could be prohibited. In this thesis, the period from 1935 until 1998 is referred to as 'the legal-cartel era'. This era was full of business agreements, intra-firm cooperation and corporatist features. Cartel agreements were sometimes considered as being in the best interest of the Dutch economy. The government recognized several merits of cartels, including the protection of (firms of) the Dutch economy to destructive competition. For over sixty years cartels controlled the very lives of all Dutch: from *sauerkraut* to sugar, and from drugstores to driving schools. Up to 1958 (the year of the establishment of the EEC) the Dutch policy could be practiced without major international interference. Although the EEC (and EU from 1992) prohibited cartels as of 1958, it was only in 1998 that the Netherlands incorporated the EEC/EU prohibition principles in full. Information from the Dutch cartel register, containing the Dutch cartel notifications, is disclosed in this thesis and forms the basis and novel major contribution of this research.

1.1 Background

Economic policy is subject to the different, contradicting and often changing ideas and theories of pre-economists (or: do-it-yourself economists), economic policy makers and economic academics (Van Sinderen, 1992; Henderson, 1986: 11–12). And so is the cartel policy. The current mainstream view that cartels are harmful for economic welfare did not exist in the first half of the 20th century. Actually, cartelist practices as well as ideas about their desirability date back to before the legal-cartel era. Cartelist practices appear to have

been phenomena of many periods and all places: legal or illegal, harmful or welfare increasing, effective or ineffective. In the Middle Ages, for example, a myriad of sectors and crafts were organized through so called guilds. Guilds protected the economic interests of artisans, regulated production, quality, prices and sales, took care of vocational education, regulated complaints and provided a sort of social security (Amsenga, 2006). In the Netherlands, guilds were legally abolished only in the early nineteenth century, because, among other reasons, they curtailed economic freedom (Amsenga, 2006). In 1776, the risks of cartelist practices were already identified by Adam Smith when he observed that "*People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or in some contrivance to raise prices*" (Smith, 1776, Chapter X, Part II, p. 152). Although not explicitly referred to as a cartel, Smith considered the product of "the conversation" as a "conspiracy against the public".

Approximately about a century later, in 1883, the concept cartel was for the first time explicitly introduced and unravelled in the academic literature by the Austrian Friedrich Kleinwächter (1883). Kleinwächter also paid attention to the merits of cartels (e.g. Kleinwächter, 1883: iv, 150).[1] A few decades later, the leading economist at that time, Alfred Marshall (1920), explicitly acknowledged the phenomenon of a cartel in his book, but only paid minor attention to the concept and only considered cartels as "*a German term, of a rather loose kind*" (p. 304). He related cartels to trading federations (p. 282) generating economies of buying and selling and methods to create combinations and trusts (p.304). For instance: "*Where there is a strong combination, tacit or overt, producers may sometimes regulate the price for a considerable time together with very little reference to cost of production*" (Marshall, 1920, 8th ed.: 275). Marshall did not explicitly consider the welfare implications of cartels.

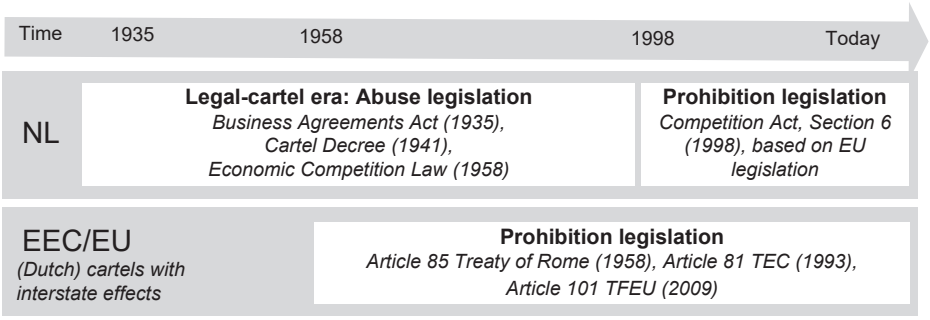
The discussion on cartels gathered interest in the 1930s and led to increased international political debate about their (un)desirability and harm. The topic was discussed during the League of Nations meeting in Geneva in 1927 and the Inter Parliamentary Union IPU of 1930 and 1931 (Shanahan and Fellman, 2016). From the 1930s onwards cartels became serious business. It was estimated that cartels were involved in approximately 40 per cent of world trade between 1929 and 1937 (Nussbaum, 1986). Cartels seemed to become a universal

[1] On page vi Kleinwächter (1883) states that cartels may bring order in chaos and regulate production ("*Und ich glaube — d. h. so weit der Theoretiker, der sich sein Urtheil auf dem Wege des deduktiven Denkens bildet, eben berechtigt ist überhaupt ein Urtheil in derartigen Fragen zu fällen — dass die Kartelle, die ja das Ziel verfolgen Ordnung in das Chaos zu bringen und die Produktion dem Bedarfe anzupassen, berufen sein könnten für die Gegenwart und nächste Zukunft Dasjenige zu werden, was die mittelalterlichen Zünfte für ihre Zeit waren.*"). On page 149–150 Kleinwächter (1883) states that despite the fact that cartels are established for selfish reasons, it does not necessarily imply that cartels are undesirable ("*Ich will an dieser Stelle noch kein abschliessendes Urtheil über die Kartelle fallen, aber die Thatsache, dass diselben da oder dort von einzelnen Personen aus egoistischen Motiven angestrebt warden, zwingt noch nicht zu dem Schlusse, das die Kartelle als solche eine verwerfliche Institution seien*").

concept, and around the 1930s in the Netherlands as in many other countries in continental Europe, laws emerged that regulated cartels, which on a regular basis were permitted.

The cartel policy in the Netherlands, since the 1930s (after the onset of the Great Depression), as well as in many other countries around the world, seemed to ignore Smith's warning for "a conspiracy against the public". Instead, the fundament of the cartel policy became that cartels could serve the economy[2]: cartelization was widespread, tolerated and sometimes actually supported by the Dutch government. Up until 1998 cartels were permitted under the so called "abuse legislation". Only those cartels that interfered with public interest could be prohibited. It was in the early 1990s that this perspective changed and ultimately led to an overhaul of the Dutch competition laws. The focus of policy shifted from a permissive attitude towards cartels to a policy perspective where perfect competition became the benchmark. In 1998 all cartels in the Netherlands became de facto illegal. Section 6 of the Dutch Competition Act from 1998, based on Article 101 of the Treaty of the Functioning of the European Union (TFEU) prohibits cartels.[3,4] Almost 40 years after the EU prohibition principles were implemented, the Dutch policy followed.[5] Figure 1.1. illustrates a timeline of the development of the Dutch cartel policy framework and the EU context. This thesis concentrates on the period 1935–1998, or: the legal-cartel era.

Figure 1.1: Cartel framework, the Netherlands



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[2] See also Explanatory Memorandum of the Economic Competition Law (Tweede Kamer, 1953, no. 3295-3).

[3] Section 6, paragraph 1 of the Dutch Competition Act that went into force in 1998 prohibits cartels: "*Agreements between undertakings, decisions by associations of undertakings and concerted practices of undertakings, which have the intention to or will result in hindrance, impediment or distortion of competition on the Dutch market or on a part thereof, are prohibited*" (Dutch Competition Act, Section 6, paragraph 1).

[4] Although the prohibition legislation (Article 101, paragraph 1 TFEU and Section 6, paragraph 1 of the Dutch Competition Act) prohibits cartels in principle, there are exemptions to this rule. Agreements that improve the production of distribution of goods or promote technical or economic progress may be candidates for exemption under certain circumstances, such as arranged in Article 101, paragraph 3 TFEU and Section 6, paragraph 3 of the Dutch Competition Act.

[5] Note that domestic legislation is applicable on domestic matters causing domestics effects, whereas (Dutch) cartels affecting trade between member states (interstate effects) are subject to EU legislation.

1.2 Research question

The change in 1998 was implemented after almost three quarters of a century in which competition legislation and policy were cartel friendly. This transition meant that the previous pro-cartel policy was abandoned. A new competition authority (the Netherlands Competition Authority; NMa), based on the principles of competition was to combat cartels.[6] Since the introduction of the new competition regime, the legal-cartel era (1935–1998) has not been studied by a comprehensive empirical examination into the impact, determinants, organization, internal dynamics and characteristics of cartels. This thesis seeks to answer the following research question:

What were the impact, determinants, organization, internal dynamics and characteristics of Dutch cartel behaviour during the legal-cartel era?

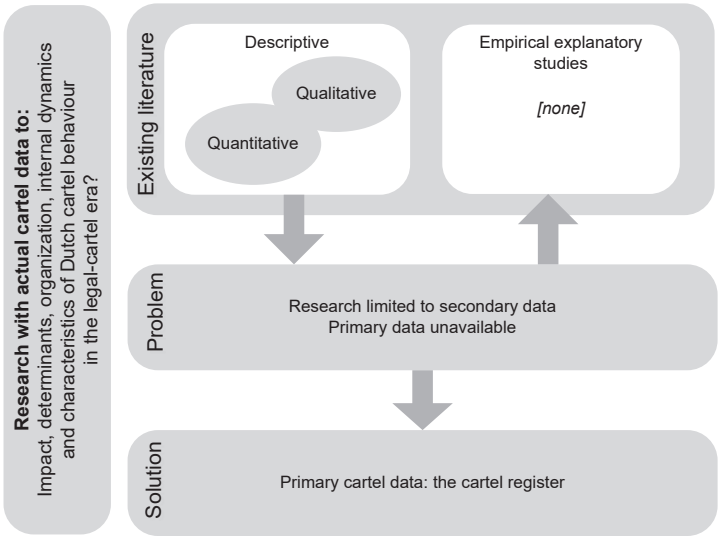
This thesis adds value by (a) collecting and using primary cartel data, (b) addressing these issues identified in the research question from a quantitative, econometric perspective based on the primary data and (c) putting earlier assessments of Dutch cartels that are based on secondary data into a new perspective. This approach to the research question is highly relevant because there are important problems with the existing academic literature and also because the thesis is able to fill significant gaps in the earlier literature. Figure 1.2 visualises how these problems form the motivation for this research question.

The problems with the existing academic literature on cartels in the legal-cartel era follow from the restricted availability of data for earlier researchers. The data existed because cartels were required to notify the Ministry of Economic Affairs of their anticompetitive agreements and provide detailed information in the so-called cartel register. Yet, the data were not publicly available due to the confidential nature of the cartel register. Noteworthy contributors to literature on the legal-cartel era are amongst others Asbeek Brusse and Griffiths (1997, 1998) and Bouwens and Dankers (2005, 2010, 2012, 2014). These researchers by necessity use descriptive statistics on cartelization and qualitative assessments on cartels and cartel policy in the 20th century. An important limitation of these publications is that the research is restricted to the use of secondary data that is aggregated at the level of industries or a selection of cases that were published by the Ministry. The aggregation was necessary in order to maintain the confidential nature of the cartel register.

The only accessible research material on legal cartels was therefore secondary data produced and released by the Ministry of Economic Affairs. This basically concerned ag-

[6] From April 2013 the Authority for Consumers and Markets (ACM). ACM was established a result of a merger between the NMa, the Netherlands Independent Post and Telecom Authority and the Netherlands Consumer Authority.

Figure 1.2: Existing academic literature with cartel data from the legal-cartel era covering the Dutch economy, problems and solution



gregated cartel data from the annual reports that described the number and types of cartels in various industries. Other data that were published on cartels regarded a selection of individual cases or industries. For instance the annual report could contain cases where the Committee for Economic Competition (*Commissie Economische Mededinging*, CEM) intervened or cases or industries where the Ministry saw a reason to mention it in its annual report in line with its publication rules. Also, in one instance in 1987, a static list of the names of individual cartels and the industries in which they were active was published.[7] The primary data were inaccessible at a large scale, and therefore could not be used in these analyses.[8] Consequently, opportunities for further research were basically limited to the Ministry's aggregates or qualitative case studies.

The fact that only aggregated secondary data were available is a significant weakness of the earlier literature: because neither the behaviour at the level of individual cartels nor the impact of cartelization on productivity could be analysed. In general, there are no empirical explanatory studies focussing on individual legal cartels that operated in the Dutch economy.

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[7] During the legal-cartel era several (fruitless) discussions took place about creating a public cartel register. In 1987 State Secretary Evenhuis acted in advance of a public register and published a list of the notified agreements in 1987 (see chapter 2 and chapter 7).

[8] In 2009 a request based on the Government Information (Public Access) Act was filed by Utrecht University. The request regarded access to the cartel register. Eventually, in 2011 material on three separate cartels was provided.

The only available studies that shed some light on the issue are meso and macroeconomic in nature and/or based on a before-after analysis of the new competition regime that in addition to cartel illegality also includes new elements such as privatization, deregulation, merger control and abuse of economic dominance. Van Bergeijk and Haffner (1993) provide an analysis of market inertia across sectors for the period 1974–1992 (identifying quite some 'inert' sectors that with hindsight can be identified as highly cartelized). Van Bergeijk, Haffner and Waasdorp (1993) provide an internationally comparative perspective – ranking the Netherlands as a country with high market inertia – and estimate the impact of this inertia. The scarcity of studies also reflects the more general issue that empirical Dutch studies in the field of industrial organization were virtually absent (Bergeijk, 2002) and also because the official producer of analysis for the Dutch government, the Netherlands Bureau for Policy Analysis (CPB), did not want to consider the impact of (a lack of) competition into its analyses (Van Bergeijk and Van Sinderen, 2000). It was only in the 1990s that the research on empirical industrial organization gathered pace in the Netherlands. Research that studied Dutch competition in relation to productivity was basically conducted for the illegal cartel regime. For instance Van Sinderen and Kemp (2008) estimate the impact of the introduction of the Dutch Competition Act in 1998 on productivity finding that production had grown and employment increased as a result of the new Competition Act. In addition, Brouwer and Van der Wiel (2010) examined the relationship between competition, productivity and innovation in the period 1996–2006 in the Netherlands, which includes only two years of cartel legality, finding amongst others that competition had a positive impact on TFP growth.

Empirical research was therefore conducted into the effects of the apparent lacking competition in the Netherlands but actual cartel data were never used due to the confidentiality of the cartel register.[9] Consequentially, no rigorous analysis with regard to the prevalence, anatomy and harm of legal cartels as such has taken place so far, even though it is highly relevant to investigate what legal cartels have meant for the economy. Competition policy currently starts from the view that cartels are harmful for economic welfare and that they should therefore be prohibited. This view has actually never been empirically substantiated with data on actual legal Dutch cartels. Cartel legality is the appropriate benchmark analysis of different institutional contexts. It is important to study behaviour in the specific context of this benchmark also because knowledge about illegal (thus by definition hidden) cartels is built on the limited set of detected cases only.

The aim of this thesis is to solve the problems with respect to (i) the level of detail of existing research and (ii) the existence of empirical explanatory studies using primary legal cartel data regarding the impact, determinants, organization, internal dynamics and characteristics of cartel behaviour in the Netherlands during the legal-cartel era. In this

[9] See for instance: Kremers (1991); Van Bergeijk, Haffner and Waasdorp (1993); Van Sinderen *et al.* (1994); Gradus (1996); Van Dijk and Van Bergeijk (1997) and Van Bergeijk and Haffner (1996).

research these problems are tackled by collecting and coding the raw primary microdata from the Dutch cartel register. To this date, the register remains confidential and the precise content has never been analysed extensively. Besides the Netherlands, various other countries have had a register as well: including Norway, Denmark, Italy, Sweden, Japan, the United Kingdom, Germany, Finland, New Zealand, Austria, Israel, Spain, Australia, India, Pakistan and South Korea (Shanahan and Fellman, 2016: 117)[10]. This thesis actually contributed to a project that involves seventeen researchers from many countries that analyse the material from cartel registers around the world (see: Fellman and Shanahan, 2016). The research project includes qualitative and quantitative contributions. Illustratively, part of the contributions specifically addresses the contexts of the registers, whilst other contributions provide descriptive statistics relating to the number of registrations, the industries and the types of agreements. Below, we explain how the use of the primary data provides novel and important opportunities for further research such as conducted in this thesis.

First, if we conduct research with primary cartel data (or: the raw data), this means that the data can be studied detached from political influences, in particular regarding the manner of aggregation and reporting. Using primary data implies that we are able to get closer to reality and thus to increase the reliability of the subsequent analyses. Second, the primary data concern micro data. This allows one to perform empirical explanatory studies that help to understand the impact, determinants, organization, internal dynamics and characteristics of individual cartels. Third, studying cartels in a legal regime allows one to grasp the anatomy of cartels in general, not only of the detected cases. Studying legal cartels means studying cartels detached from influences from a competition authority. It is highly relevant to assess the internal dynamics of cartels in a legal regime for at least two reasons: (a) to *reflect* on the *past*, and just as important, (b) to *learn* for the *future*. This is particularly relevant if one moves from a legal setting to an *illegal* setting, or from known to *hidden* cartels. Indeed, research on recent cartels is often limited and likely to be biased. It is limited to the detected conspiracies, and from studying this sample, biases in the results may arise. The successful illegal cartels may still be alive and hidden. It might well be that the successful ones have a different internal organization and may cause different economic effects compared to the unsuccessful detected cartels. Studying today's cartels means that we are probably analysing the tip of an iceberg only. We will come back to that later in section 1.4. In conclusion, we are able to reliably study the characteristics of Dutch individual cartels that would have been illegal (and unobservable at a large scale) under today's prohibition regime.

[10] Also the EEC/EU had a cartel register from 1962–2003 (Warlouzet, 2016). Agreements between firms that sought application of Article 85 (3) of the Treaty of Rome (arranging exemption from Article 85 (1) of the Treaty of Rome that prohibits cartels) had to be notified to the Commission.

1.3 Research sub-questions

In order to shed light on the impact, determinants, organization, internal dynamics and characteristics of cartel behaviour during the legal-cartel era, we have defined four sub-questions. By design, this thesis is comprised of four chapters (articles) and a data appendix on the data (which in itself is a contribution to the literature). Each sub-question will be dealt with in a separate chapter. The articles can be read independently from each other. At the same time, the articles complement each other, and each helps to answer the overarching research question. Below we describe and motivate each of the sub-questions. The first sub-question (chapter 2; Petit, Van Sinderen and Van Bergeijk, 2016) is:

1 What were the institutional and regulatory, national and international drivers behind the transition from the pro-cartel regime to the anti-cartel regime?

Sub-question 1 clarifies the context of the prevailing cartel policy before 1998, it describes the social, legal and economic transformation processes in the Dutch society. This sub-question is crucial to understand why and in what forms cartels arose during the legal-cartel era. In addition, it is necessary for understanding why legality consistently remained preferred in the three Dutch cartel friendly laws of 1935, 1941 and 1958 until the system was fully overhauled and the new Dutch Competition Act came into effect in 1998. Institutional and regulatory, national and international drivers are important catalysts for changing a competition regime. At the same time, these three drivers can be cumbersome obstacles for changing a competition regime. Examples of regulatory drivers are cartel laws, laws relating to cartel laws, but also the relevant institutions that advise on the competition policy. National drivers can be macroeconomic conditions (such as occurred in the Netherlands during the Great Depression, the Golden Era of growth in the 1970s or the economic crisis in the 1980s). Examples of international drivers are developments in the field of competition policy in other European countries, and European initiatives. By assessing these drivers, we gather insights into the role that cartels played in the Dutch economy.

The second sub-question (chapter 3; Petit, 2016) is:

2 What was the extent of cartelization in the Netherlands in the 20th century?

At the outset, sub-question 2 provides a first insight into the organization and impact that cartels might have had. The scope of this sub-question regards the entire 20th century. Hence, this question is well able to substantiate the qualitative analysis resulting from sub-question 1. Various sources are available for painting a picture of Dutch cartels in the 20th century: data on international cartels according to the League of Nations, secondary data from the cartel register, primary data from the cartel register and finally, data on exemption requests

from the cartel prohibiting Dutch Competition Act of 1998. Combination and triangulation of these sources provides a comprehensive overview of Dutch registered cartelization in the 20th century. We are able to analyse changes in the number or nature of cartelization during that period. Especially, the primary data from the register will be able to cover a significantly long period and allow us to study cartel characteristics in detail. In addition, the answer to this sub-question provides important building blocks for the remaining two sub-questions as it provides a critical foundation for further analyses of the primary data from the cartel register and identifies the characteristics, structure and content of the data, which is necessary for the interpretation of subsequent research with the cartel register dataset and is able to place further analyses in a better perspective.

The third sub-question (chapter 4; Petit, Kemp and Van Sinderen, 2015) is:

3 Did Dutch legal cartels affect Total Factor Productivity growth in the Netherlands?

Sub-question 3 focuses on the economic implications that legal cartels have had for the Dutch economy. Cartels behave like (near) monopolies (possibly with a competitive fringe). Therefore various types of economic efficiencies are put at risk. According to the neo-classical school of thinking, a cartel might harm, similar to a monopoly, three types of efficiencies: allocative, innovative and productive inefficiency. First, cartels harm allocative efficiency. For instance, by limiting production or fixing prices, resources are not optimally used. Second, from a dynamic point of view, cartels harm innovative efficiencies. A group of colluding firms has fewer incentives to invest in innovation (both incremental and disruptive)[11]. Third, productive efficiency is at risk. Firms are to a lesser extent challenged to organize the production process most efficiently. Sub-question 3 particularly addresses the third type of inefficiency: productive efficiency. We focus on the impact of the so-called 'Total Factor Productivity growth' of legal cartels in Dutch industries. The degree of competition (or the lack of competition due to cartels) is expected to affect Total Factor Productivity growth due to fewer incentives to operate efficiently. Primary data from the cartel register in combination with industry productivity data are suited to empirically analyse this question. For this research productivity measures at industry level are crucial, since these are only available from 1980, the timeframe of the analysis is restricted to the final two decades of the legal-cartel era (see also section 1.5).

Currently, there are only a few empirical studies that actually study the possible consequences of cartels in a legal setting on productivity growth. The impact of cartels during the

[11] Note, however, that perfect competition does not necessarily result in optimal incentives to innovate. Aghion *et al.* (2005) and Van der Wiel (2010) stress the existence of an inverted U-curve between competition and innovation. In both situations, perfect competition and a monopoly, firms have fewer incentives to innovate than for instance in an oligopoly setting.

legal-cartel era on productivity growth in the Netherlands was never empirically studied. Those insights may, however, reveal information about the impact and hence the (un) desirability of a cartel-permissive policy when it comes to productivity. A possible negative relation would underline the current mainstream view that cartels are harmful for economic welfare.

This research also relates to the view of competition regulators on the determination of the harm caused by cartels. The basic idea of a fine is to annul the benefits of collusion and fine in line with the economic harm that was caused. In both the Dutch and EU penalty guidelines the gravity of the infringement is, together with the duration of the infringement, one of the most important factors for the determination of the fine.[12] According to the European Commission the value of the affected sales multiplied by the duration is a good indicator of the damage to the economy (European Commission, n.d.). Sub-question 3 is particularly related to the gravity of cartelization, while sub-question 4 is related to the duration. Gravity may be determined qualitatively (for instance, the nature or intention of the agreement, as was the usual approach in legal procedures in the first years after the introduction of the new Competition Act), but also directly (the actual effects, which has become more relevant in recent years) (see also: Posada and Freitas, 2015; Baarsma, 2013; Zenger and Walker, 2012).[13] This research addresses the direct effects of cartelization at a meso-economic level thereby providing insight in the gravity of cartelization.

Finally, the fourth research question (Chapter 5) is:

4 What cartel characteristics contribute to the duration of legal cartels?

Sub-question 4 examines if and how cartels can be durably organized. In general, the game theoretical view on cartels is that they are inherently unstable and short-lived (see for instance: Baumol and Blinder, 1994: 294; Frank and Bernanke, 2001: 252). Cartel members have an incentive to defect from the agreement in order to appropriate all the monopoly profits. Yet, Stigler (1964), an important contributor to the cartel stability theory, identifies stabilizing

[12] The EU penalty guidelines on the method of setting fines (2006) state that "*The basic amount of the fine will be related to a proportion of the value of sales, depending on the degree of gravity of the infringement, multiplied by the number of years of infringement*". Section 2.2 from the Dutch Penalty Guidelines (Boetebeleidsregel ACM, 2014) state that the basic amount of the fine is based on the (a) gravity of the infringement, (b) the circumstances, and (c) the duration.

[13] A distinction can be made between infringements that are impeding competition from an object or an effect angle. "*Restrictions of competition "by object" are those that by their very nature have the potential to restrict competition*" (European Commission, Guidance on restrictions of competition "by object" for the purpose of defining which agreements may benefit from the De Minimis Notice (2014)). In cases of restrictions "by effect", on the other hand, an authority has to prove that the infringement harms competition based on the actual effects.

conditions. First of all, this relates to a high probability, level and credibility of punishment when a cartel member defects from the cartel agreement. A second important factor is the ability to monitor co-conspirators. That is: are firms able to detect defecting cartel members and distinguish negative demand shocks from suspected cheaters appropriating the entire market? Sub-question 4 allows us to test whether legal cartels do have durable implications. If legal cartels cannot be constructed as stable constellations, they will have only negligible implications or even none at all for the economy. The primary data from the cartel register are an appropriate source to empirically analyse their duration. The sub-question provides an answer to what cartel characteristics result in the most durable cartels.

As said, gravity and duration of a cartel infringement are two important measures for competition regulators to determine the level of the fine. More durable agreements are (ceteris paribus) more harmful for the economy than shorter agreements and they result in lower fines (ceteris paribus). If an agreement can be extremely durably organized, it is convenient to adopt duration in the fine. In addition, the findings of this study may also produce valuable insights for today's cartel policy and detection strategies.[14]

1.4 Basis: the cartel register

The value added of this thesis extends beyond answering the overarching research question and its sub-questions. It also regards the construction of the basis of this thesis: the coding of the raw primary data of the cartel register. The data from the Dutch cartel register is crucial for answering research questions 2, 3 and 4. Chapter 7 provides a detailed description of the construction of the dataset. The cartel register contains cartel registrations in the Netherlands from 1941 until 1998. The register emerged in 1941 as result of the second cartel friendly law, the Cartel Decree, and had remained in operation until the Dutch Competition Act came into effect in 1998. By law, firms had to administer their cartel agreements at the Ministry of Economic Affairs. The Ministry had the exclusive right to assess these agreements on their merits. The register contains cartel files that include among other documents: cartel registration forms, correspondence between the Ministry and the firms, internal Ministry correspondence, statutes from for instance trade associations, price lists, background information, etc. The raw data originally covered more than 150 meters of shelve space with

[14] Illustratively, competition authorities deal with a scarce amount of resources to regulate the entire economy. Schinkel (2010) metaphorically refers to a cat-and-mouse game that is played between big businesses and competition authorities. If we are able to distinguish more harmful cartels from less harmful cartels, in terms of duration, it can help authorities in allocating their resources.

cartel notifications and related documents.[15] Below, we describe why a cartel register in a legal-cartel regime is a unique source of information.

Figures 1.3 and 1.4 present the 'iceberg' and the 'inverted iceberg', analogies for our (current) knowledge on illegal cartels and the knowledge on cartels during the legal-cartel era, respectively. Figure 1.3 visualizes today's state of observable and unobservable cartels: the iceberg. Figure 1.4 visualizes the types of observable and unobservable cartels in the Dutch legal-cartel era: the inverted iceberg.

Figure 1.3: Today – The iceberg

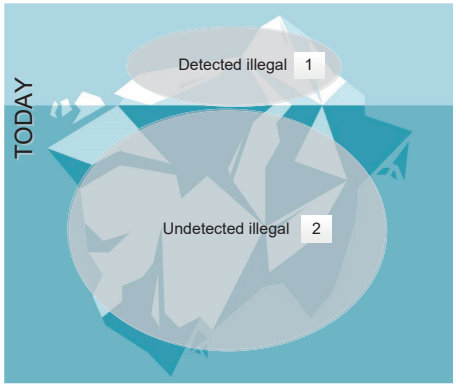
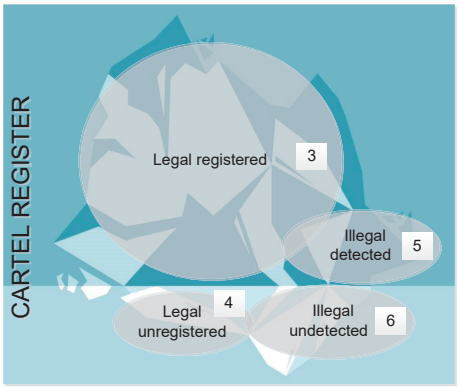


Figure 1.4: Before – The inverted iceberg



Knowledge on current cartels is prone to present a biased picture of the population of current cartels. Knowledge that can be gathered about illegal cartels may concern the following: (i) information voluntarily provided by the firms themselves (for example, leniency cases); (ii) information collected by an authority through inspections; (iii) publications from competition authorities, which actually concern secondary data; (iv) whistle-blowers or third parties providing inside information. Illustratively, Van Bergeijk (2008) used the detailed cartel administration based on shadow accounts that was provided by a whistle-blower (this dataset was made publicly available as part of the Parliamentary Hearings on the Construction Sector Fraud). This detailed administration was particularly useful for an in-depth case study. Yet, it did not consider firm level characteristics as they were not part of the original cartel administration of the cartel. The data were shadow accounts established by, and from the perspective of, one member of the cartel. An official institution that collects an extensive amount of Dutch firm data is Statistics Netherlands. Statistics Netherlands collects micro-data on firms. However, these data do (of course) not contain information about whether a firm is part of a cartel. In addition, the Law on CBS (Section 37, paragraph 3)

[15] And 109 meter after repacking and selection (see chapter 7) by the Central Archive Selection service (*Centrale Archief Selectiedienst*; CAS).

prohibits publication of micro-data that is traceable to individuals (firms or persons). Overall, in a setting that prohibits cartels, it is difficult if not impossible to gather information on the total population of cartels.

Datasets covering modern illegal cartels include thus by necessity only the detected ones (see figure 1.3 (1)). Combe, Monnier and Legal (2008: 17) conclude that most EU cartels are detected when they are, on average, seven years old. Moreover, only 6 out of 86 (1969–2007) detected cartels from their sample die a 'natural death', meaning that they failed uninfluenced by antitrust interventions. Bryant and Eckard (1991) analyse detected cartels in the US and report an annual probability of discovery and conviction of 13–17% in the period 1961–1988. Therefore, our knowledge on illegal detected cartels is prone to represent the tip of the iceberg only.[16] On top of that, it might well be that this 'tip' is not even the part that is most interesting, because the advanced and sophisticated cartels most likely remain 'under water', unexamined and hence un-understood (see figure 1.3 (2)).

Figure 1.4 (3) represents the data from the cartel register during the legal-cartel era. Use of these data presumably overcomes the problem of studying the biased tip (figure 1.3 (1)). First of all, because most cartels were legal, they did not need to hide. Yet, we observe two exceptions. Cartels with interstate effects were prohibited from 1958 under Article 85 of the Treaty of Rome. Furthermore, the Dutch cartel legislation adopted some prohibition principles in the 1990s. For instance, price-fixing agreements became prohibited as of 1993. These illegal cartels might have moved from above to below surface. Of the illegal cartels, some remained "under water" (figure 1.4 (6)), and some came to the "surface" and got detected (figure 1.4 (5)). A second advantage of research data on legal registered cartels (figure 1.4 (3)) compared with illegal detected cartels (figure 1.3 (1)) is the fact that registration was compulsory. This is expected to have a positive effect on the completeness of the legal registered cartels. Third, the confidentiality of the register may have complicated research with legal Dutch cartels, but, at the same time, it is most likely that it improved the completeness of the data. Confidentiality was quite exceptional compared with other countries that had a register. Only the Netherlands and Australia had kept a secret register, while registers in other countries were public (Shanahan and Fellman, 2016: 117)[17]. During the preparation of the Dutch law of 1958 the minister argued that a non-public register was preferred over a public register since the latter would not be compatible with the idea of full registration (SER, 1973: 5). Cartels could be hesitant to register their cartel agreement honestly in

[16] There are indications that this tip is small. Illustratively, in the period 2011–August 2017 the ACM imposed sanctions in fourteen cartel cases (see: decisions of ACM). Connor and Hemers (2007) were able to collect data on 283 illegal cartels discovered anywhere in the world in the period 1990–2005.

[17] According to Shanahan and Fellman (2016: 119) "*Where the register were public, the rationale was that competitors or consumers should normally be informed of agreements existing in the market. Such publicity, it was hoped would restrain conspiring firms and cartels and thus have a deterrent effect*".

a public register (Tweede Kamer, 1980). They could fear public opinion and bear the risk of reputational damage, even if they were legal. From that perspective, a confidential legal-cartel register is expected to be even more complete than a public legal-cartel register, ceteris paribus. Indeed, there remains an unobserved area of the inverted iceberg (figure 1.4 (4)). There is a risk that some legal cartels did not register themselves due to unawareness of the notification requirement. In addition, it might well be that agreements which clearly conflicted with public interest were partly notified or not even notified at all. Estimating the share of the unregistered cartels remains difficult. De Jong (1990), a former employee of the Ministry of Economic Affairs, claims that the register included only 50 percent of the Dutch cartels. This is, however, a claim that remains unsubstantiated and impossible to verify.

Based on the presumptions that were outlined above, the register is expected to be a suitable source for analysis of Dutch cartels in general. Overall, the data are also expected to be complete, and to give a less biased picture of cartels than the knowledge we currently have about modern illegal cartels does. We already observed a scarce amount of detailed quantitative publications about the legal-cartel era. An important explanation is the lack of accessible quantitative microdata on legal cartels. Our primary dataset is sufficiently detailed to take into account the micro determinants of cartels and perform analyses at the cartel or industry levels.

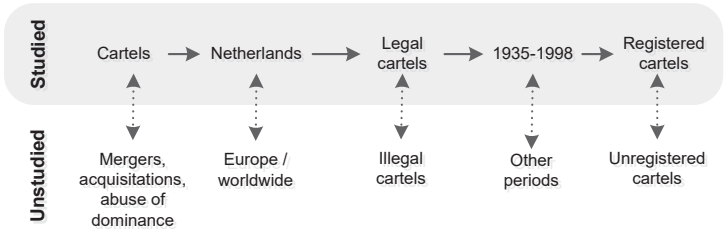
1.5 Focus

This subsection defines the focus of this thesis. Figure 1.5 provides an overview of this thesis in relation to five alternatives. First of all, competition policy covers a broader domain than solely cartels. It also covers abuse of dominance and mergers and acquisitions.[18,19] Despite the fact that these topics are highly important to secure and maintain vital competition, they fall beyond the scope of this thesis. Second, as regards the geographic scope, we concentrate on cartels organized and active within the Netherlands. When relevant for answering the research question, international comparisons will be made. For instance, we have to recognize that the Dutch policy became part of a broader policy domain with the start

[18] From 1970 until 1998 the Social Economic Council (SER) monitored mergers and acquisitions (based on the *Fusiecode*, Merger code) but the SER primarily looked at protecting interests of shareholders and employees. The Ministry of Economic Affairs got informed about the mergers and acquisitions but had a minor influence on the consequences of the created market position (Bouwens and Dankers, 2012: 236). However, the Ministry could act against abuse because the law of 1958 (the Economic Competition Act, Section 24) foresaw in instruments to tackle abuse of market power.

[19] Abuse of dominance is since 1998 arranged in Section 24 of the Dutch Competition Act and currently enforced by the ACM (and Article 102 of the TFEU) and the assessment of mergers by the ACM is arranged in Section 26-49 of the Dutch Competition Act (and/or the EC Merger Regulation).

Figure 1.5: Focus of the thesis



of the EEC in 1958. Third, we concentrate on legal cartels, meaning that the illegal cartels are, at the outset, not investigated in this thesis. Expanding the analysis with illegal cartels will come at the expense of the depth of this thesis. Wherever relevant, however, references to or comparisons with illegal cartels will be made. Fourth, as regards the timeframe, we concentrate on the period 1935–1998 (the legal-cartel era). Until 1935, no official cartel legislation existed. And from 1998, cartels became prohibited and the cartel register was abolished. Fifth, as regards the quantitative analysis (chapters 3, 4, 5 and 7), we examine the cartels that were registered, so the unregistered and unknown cartels remain unexamined. Here we assume that each registered cartel was a legal one.[20] Identifying unregistered cartels would be an entirely new study into itself. Moreover, the unregistered cartels were often not even technically legal, because those that fell under the duty to report should have been notified to the Ministry in order to be legal. Furthermore, it is also important to emphasize that *each* submitted cartel notification is qualified as a 'registered legal cartel,' even those that were effectively not a cartel or that were exempted from notification.

With respect to the data drawn from the cartel register, we analysed cartels registered in 1980 and later. This selection is based on three considerations. First, the register's extensiveness: the entire register covers 3,826 files, equal to 24 GB of scanned documents. In order to keep the data verification and collection processes manageable, we choose to analyse a selection of the cartel register (see chapter 7). Second, an important aspect of this thesis is the assessment of the impact that cartels had on productivity. The relevant data on Total Factor Productivity levels and growth rates are to the level of our knowledge only available at sector level across multiple countries as of 1980. These are the data that can be linked to the data from the register for sub-question 3. For the purpose of sub-question 3, disclosing data before 1980 is redundant. In order to be able to compare the findings of chapter 4 and 5 we use an overlapping period regarding question 3 and 4. For the period 1980–1998 1,379 files or 6 GB are analysed. Third, until 1985, detailed reports had been produced by the

[20] There were however cartels in the cartel register that were examined by the CEM and declared illegal, so not each registered cartel was by definition legal. We do not determine whether and which registered cartels were actually declared illegal.

Ministry of Economic Affairs. If we start the raw data collection from 1980, there is an overlap of five years between the secondary and primary data. The two data sources together are able to present a complete picture of cartels in the legal-cartel era. The overlap of five years offers some opportunities to examine the extent to which the primary data connect to the secondary data, so we can assess differences and similarities of the Ministry reports with the cartel register.

1.6 Methodology

A multi-method approach, specifically methodological triangulation, is applied to answer the main research question. Triangulation is defined as combining multiple data sources, investigators, methodologies and/or theoretical perspectives (see: Denzin, 1970; Thurmond, 2001: 253). In order to answer the main research question and its underlying sub-questions, the following methodologies are used: document research, data collection, encoding and verification (henceforth: DCEV), interviews (especially regarding the collection of primary and secondary data by the national archive and the Ministry of economic affairs), quantitative descriptive analysis and econometric analyses (panel analysis and time survival analysis). The advantage of a multi-method approach is the complementarity of approaches that may help to create a better, more adequate image of reality (Erzberger and Prein, 1997: 144). Below, we discuss the use of these methodologies in this thesis. Table 1.1 provides an overview of the methodologies that are applied per chapter.

Table 1.1: Methodologies per chapter

	Academic-literature research	Document research	Data collection, verification, encoding	Interviews	Descriptive research	Econometric research
Chapter 2	x	X				
Chapter 3	x	x	x		X	
Chapter 4	x		x			X
Chapter 5	x		x			X
Chapter 7	x		X	x		

Note: X main focus; x secondary focus.

First of all, each chapter includes a discussion of the relevant academic literature. Second, qualitative document research is conducted. This mainly concerns chapter 2: the identification of the drivers behind the transition from a cartel friendly regime to an anti-cartel regime. The research thus relies on the study of historical (academic) literature, government documents and semi-scientific articles. Document research is also present in chapter 3;

historical literature and government documents are studied to collect data and to describe the cartel policy. As a methodology, document analysis could carry a risk that the relevant material is not exhaustively collected (see also: Frechtling and Sharp, 1997). One benefit of this approach, however, is that qualitative research is able to paint a more nuanced picture of the Dutch cartel policy. A third set of methodologies applied in this thesis is DCEV. This methodology is described in the data appendix in chapter 7 and forms the basis for chapters 3, 4 and 5. Chapter 7 provides detailed background information on the collection of the data used in this research. The cartel files from the register are transformed into a consistent and structured dataset. We transformed the qualitative data into quantitative data. Encoding might come with the risk of losing some essential nuances (see also: Srnka and Koeszegi, 2007). On the other hand, an important advantage of encoding data is that it becomes fit for use for further quantitative analyses. The methodology of DCEV is complemented with a fourth methodology: interviews with involved experts (see chapter 7). Through expert interviews, or key informants, the data can be more properly placed in perspective (Frechtling and Sharp, 1997). For instance, the scope of the data, trends and outliers in the dataset can be explained. A fifth methodology concerns quantitative descriptive research, which is conducted in chapter 3. The results from the DCEV are combined with the quantitative data that are derived through the document research. Although we cannot draw any statistical significant conclusions, by combining the sources, we are able to present a complete picture of cartels in the 20th century. The sixth methodology concerns the econometric exercises that are conducted with primary cartel data and secondary data on economic growth performances.[21] This methodology is applied in chapters 4 and 5. Econometric exercises are of great importance because this manner of analysis allows one to draw conclusions based on statistical inference. In the econometric exercises, we concentrate on testing hypotheses. First, we assess how cartels affect the Total Factor Productivity growth. Second, we investigate how cartel duration can be explained. We construct hypotheses based on economic cartel theory and test the hypotheses. Through this approach we contribute to existing cartel theory and provide more insights in the two principle fining determinants as measure for the economic harm: gravity and duration of the infringement. A limitation of hypothesis-testing is that novel or disregarded relations remain unexplored and under water. Still, findings on cartels that lack a theoretical foundation might suffer from an omitted variable bias that may underestimate or overestimate the impact of variables.

By applying various methodologies (and triangulation of methodologies) and analysing the overarching research question from different angles, we aim to obtain a comprehensive picture of the impact, determinants, organization, internal dynamics and characteristics of

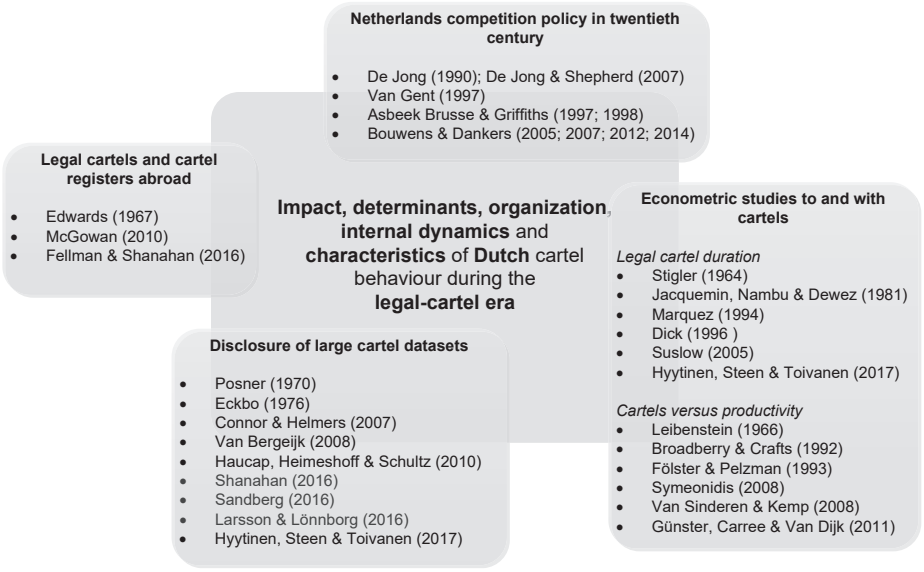
[21] In chapter 4 we use secondary data from EU KLEMS and GGDC (Groningen Growth and Development Centre) on growth and productivity at industry level. In chapter 5 we use GDP growth rates from Statistics Netherlands.

cartel behaviour during the legal-cartel era. Each chapter of this thesis will elaborate more extensively on the applied methodologies.

1.7 Related literature

This thesis can be positioned within four different strands of literature: (i) literature on Dutch competition policy in the 20th century, (ii) international literature on cartel policies and cartel registers, (iii) construction of cartel data for research purposes and (iv) using this data to econometrically assess the success factors of legal cartel duration and examine the relation between cartels and productivity growth. Figure 1.6 depicts the scope and refers to the most important related literature.

Figure 1.6: Position in literature



The first strand of literature regards studies to the Dutch policy practice. There are various important contributors to the legal cartel literature in the Netherlands. During the legal-cartel era, a sceptical contributor was De Jong (1986; 1990; 1992), objecting against the Dutch cartel policy in the 1980s and 1990s, and he is the founder of the popular term 'Cartel Paradise' coined in 1990 and published the book *Pioneers of Industrial Organization: How the Economics of Competition and Monopoly took shape* (De Jong and Shepherd, 2007). Asbeek Brusse and Griffiths (1997; 1998) described the transition towards the current anti-cartel system. Besides their qualitative contribution, they provided a quantitative overview of the number, nature and scope of the legal cartels up to 1985. Still, as earlier observed, they were

restricted to the use of secondary-data sources, namely: those produced by the Ministry. Bouwens and Dankers published various contributions on the legal cartel period (2005; 2010; 2012; 2014) and dealt with similar data issues as Asbeek Brusse and Griffiths (1997; 1998). Their comprehensive book *Tussen concurrentie en concentratie; belangenorganisaties, kartels, fusies en overnames* (2012) discusses the development of Dutch competition policy also including the role of mergers and trade associations. Van Gent (1997) also provided an important contribution about the development of competition policy and the role of economic research. He particularly pays attention to the absence of empirical research to competition policy. Up to 1993 empirical research was virtually absent.[22] Van Gent (1997: 72) stresses the importance of conducting this research because a "*sound competition policy*" should rely on *"firmly based quantitative economic realities*", that are "*rooted in sound economic theory*".

The second directly relevant strand of literature regards international studies into legal-cartel policies and registers in the 20th century. Particularly in the second half of the 20th century, cartels flourished worldwide. Nussbaum (1986) estimated that cartels were involved in approximately 40% of world trade in the period 1929–1937. Schröter (1996) made a classification of cartel-tolerating countries, and concluded that most Western countries had a tolerant attitude towards cartels during the interwar period (i.e. Austria, Belgium, Czechoslovakia, Finland, France, Germany, the Netherlands, Norway, Sweden and Switzerland). Edwards (1967) provided an overview of cartel and monopoly policies in a number of countries. McGowan (2010) described the 'antitrust revolution' in Europe, with a focus on the European Commission's policy. In particular with respect to the use of cartel registers, Fellman and Shanahan (2016) published a book about cartel registers in various countries. Chapters 2 and 3 of this thesis are published as separate chapters in the book. The context of the registers, their design and impact on anti-competitive behaviour are investigated. Cartel registers were common in Norway, Denmark, Italy, Sweden, Japan, United Kingdom, Germany, Finland, the Netherlands, New Zealand, Austria, Israel, Spain, Australia, India, Pakistan, South Korea (Shanahan and Fellman, 2016: 117). In addition, there was also a register for US export cartels and cartels within the EEC (Shanahan and Fellman, 2016).

Third, this research can also be placed in the literature of constructing large cartel datasets for research purposes. Important examples are: Posner (1970), Eckbo (1976), Gallo *et al.* (2000) and Connor and Helmers (2007). So far, only a few cartel registers have been disclosed, and they used the raw data for research purposes (e.g. Germany (Haucap, Heimeshoff and Schultz, 2010), Finland (Hyytinen, Steen and Toivanen, 2017), Australia (Shanahan, 2016), Sweden (Sandberg, 2016; Larsson and Lönnborg, 2016)). In the Netherlands, a comparable example is the disclosure of the administration of the Dutch construction fraud (Van Bergeijk, 2008).

[22] With exceptions from De Wolf (1987), Van Schaik (1991), Prince and Thurik (1992) and Kuipers (1991) (see: Van Gent, 1997: 70–71).

Finally, the fourth relevant strand of literature includes econometric studies *to* and *with* legal cartels. Sub-questions 3 and 4 regard econometric exercises with the legal cartel data. In the following a limitative selection of related literature is discussed. Sub-question 3 relates to the impact of cartels on productivity growth and sub-question 4 relates to cartel duration. As regards sub-question 3, Leibenstein (1966) discusses the X-inefficiency caused by a lack of competition. Important empirical literature on legal cartels and productivity is for instance, Broadberry and Crafts (1992) and Symeonidis (2008) both studying UK-cartels during the period of permissive cartel legislation. A case study to the legal sugar cartel in the US was conducted by Bridgman, Qi and Schmitz (2009). Furthermore, Fölster and Peltzman (1993) examined regulated and legally cartelized industries in Sweden by using the cartel register. A final important study is Van Sinderen and Kemp (2008). This research does not concentrate on legal cartels, but studies the impact of competition policy on productivity growth from 1998–2007. This research connects to our research because we study the two previous decades 1982–1998.

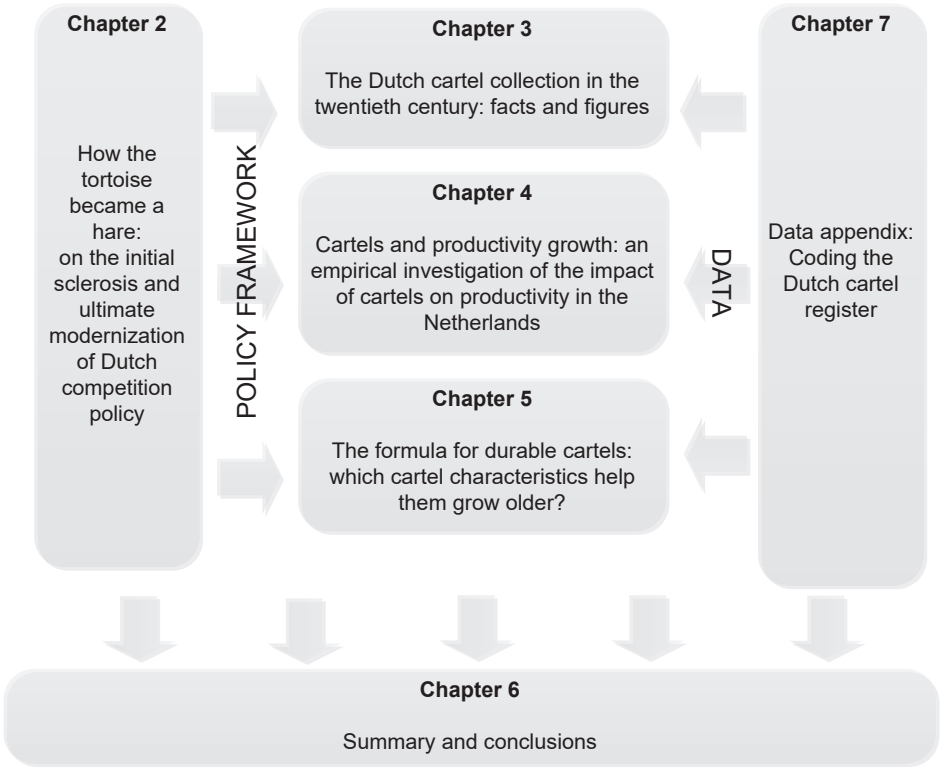
The most important theoretical contribution with regard to sub-question 4 is the seminal paper by Stigler (1964). Cartel duration is examined by a number of empirical studies. There are five important studies that particularly concentrate on legal cartels. Hence, they show the most overlap with our empirical investigation. Suslow (2005) studies legal cartels in the EU and US, Dick (1996) concentrates on legal cartels in the US, Marquez (1994) studies legal international cartels, Jacquemin, Nambu and Dewez (1981) focus on legal cartels in Japan and Hyytinen, Steen and Toivanen (2017) use the cartel register in Finland to examine legal cartel duration.

1.8 Structure of thesis

The four sub-questions are discussed in respectively chapters 2 through 5, each constructed as an independent article. In order to increase readability and to avoid a break in the flow of argumentation chapter 6 provides the summary and conclusions. The detailed report on data collection procedures that can be read as an independent chapter is included as chapter 7. Figure 1.7 provides an overview of the outline of this thesis and the relationships between the chapters.

Chapter 2 describes the cartel policy of the Netherlands in the twentieth century. The chapter deals with sub-question 1 and investigates the social, legal and economic transformation processes of Dutch competition policy from the 1930s until 1998. We distinguish four periods of the transformation process: cartels and cooperation, modification, institutional inertia and transformation. For each phase we identify (1) international determinants and developments (2) national determinants and developments and (3) changes in regulation and policies. We describe how these factors led to the changes or impeded changes in

Figure 1.7: Outline



Dutch competition policy. In this chapter the different cartel laws in the Netherlands and reasons behind these laws are discussed. An important nuance was that the cartel friendly laws used a so-called 'abuse system', which meant that cartels that were in conflict with public interests, could be prohibited by the government. We explicitly pay attention to whether this exemption to the rule could be efficient in blocking harmful cartels. Furthermore, we take into account that the cartel policy was applied against the backdrop of the so-called Polder Model, implying a culture of cooperation and consensus between consumers, employers, trade unions and the government. In addition, we pay attention to the existence of empirical literature of the functioning of Dutch markets which could emphasize the need for change. International developments such as the establishment of the European Economic Community and cartel legislation abroad will also be thoroughly discussed. Overall, this chapter, describing the transformation processes of Dutch policy, reveals insights in the role that cartels fulfilled in Dutch society. Chapter 2 is initially published as a chapter in the book *Regulating Competition: Cartel Registers in the Twentieth-Century World* (Fellman and Shanahan, 2016). The article is written with two co-authors, Jarig van Sinderen and Peter van Bergeijk.

Chapter 3 investigates sub-question 2 and presents a quantitative overview of the Dutch cartel collection in the 20th century. This chapter quantitatively substantiates the qualitative description of the cartel policy from chapter 2. It provides a detailed description of cartelization in the 20th century by using data from registered legal cartels. Various sources are used: data on international cartels according to the League of Nations, secondary data from the cartel register, primary data from the cartel register and finally, data on exemption requests from the cartel prohibiting Dutch Competition Act. We describe how the sources relate to each other and reveal the degree of cartelization and changes therein. Furthermore, we provide insight in the types of cartelization and the changes over time. In addition, the characteristics, opportunities, limitations and quality of the underlying data are described with a particular focus on the primary data from the cartel register. Chapter 3 is single-authored, and is published as a chapter of *Regulating Competition: Cartel Registers in the Twentieth-Century World* (Fellman and Shanahan, 2016).

Chapter 4 examines sub-question 3 and deals with one of the economic consequences of cartels, a curbed productivity growth caused by the presence of legal cartels. Inefficiencies due to a lack of competition, or in this case: the presence of cartels will be reflected in the Total Factor Productivity growth, which indirectly contributes to productivity growth. In this article we execute an econometric exercise to test the causality between the presence of cartels in an industry and the Total Factor Productivity growth. The primary data from the cartel register is the fundament of this analysis. We examine 27 industries of the Dutch economy in the period 1982–1998 and study the impact of three cartel variables: (1) cartel formation, (2) cartel termination and (3) cartel presence. Chapter 4 is published as an article in the *Journal of Competition Law and Economics* (2016) and written with two co-authors, Jarig van Sinderen and Ron Kemp.

Chapter 5 focuses on sub-question 4 and concentrates on the success factors of legal cartels in terms of their duration. In this chapter we use the primary data from the cartel register to perform an econometric time survival analysis. This analysis measures to what extent the explanatory variables contribute to an extra year of cartel survival. We discuss which characteristics contribute to cartel duration based on empirical and theoretical expectations. An extensive overview of empirical literature is provided to select and discuss the variables which are used to explain cartel duration. The variables for explaining cartel duration relate to four different groups: variables concerning the types of restrictive elements, organization related variables, coverage related and external related variables. We use the cartels from the cartel register that were still registered in 1980 or established after 1980 in the period 1980–1990. Chapter 5 is a single-authored manuscript.

Chapter 6 is the concluding chapter. A summary and final analysis is presented that triangulates the separate conclusions to the research sub-questions. Together, they provide a conclusion to the overarching research question. In addition, avenues for further research are discussed.

Chapter 7 is the data appendix and includes a detailed description about the disclosure of the data from the cartel register. The legal-cartel dataset that is constructed with data from the cartel register is the foundation of this thesis. The source, scope and the selection of the material is thoroughly discussed. Furthermore, we extensively describe the methodology of the construction of the legal cartel dataset with regard to the collection, encoding and verification of the data. Examples from the raw data are included to illustrate collection, encoding and verification decisions.

2 How the tortoise became a hare: on the initial sclerosis and ultimate modernization of Dutch competition policy

This chapter was published as: L.T.D Petit, J. Van Sinderen and P.A.G. Van Bergeijk (2016). How the Tortoise became a Hare: on the initial sclerosis and ultimate modernisation of Dutch competition policy. In S. Fellman and M. Shanahan (eds.), Regulating Competition: Cartel Registers in the Twentieth-Century World (pp. 66–87). Abingdon and New York, NY: Routledge.

Abstract

Today cartels are prohibited in the Netherlands. Until 1998, however, the Netherlands applied an 'abuse policy' which permitted cartels provided they did not abuse their position. The Ministry of Economic Affairs was responsible for the assessment of cartels. Cartels had to be notified to the ministry and records were kept in a confidential register. A policy of consensus and cooperation facilitated the continued existence of the abuse system. The policy gradually became outdated. Economic, social and international forces finally resulted in the 1990s in reform and harmonization of Dutch competition policy with EU principles.

2.1 Introduction

Dutch economic policy making traditionally aims at consensus and cooperation between employers, trade unions and the government to find a balance between sustainable growth, a low level of unemployment and acceptable wage increases. In this so-called Polder Model, the different parties attempt to strike a balance between the freedom to negotiate legally on wages and working conditions, and the impact of these negotiations on economic and social goals. The Polder Model was also clearly evident in the Dutch policy towards cartelisation through much of the twentieth century. Cooperation and consensus was desired between both the participants in the markets and between the government and the market (see also Bouwens and Dankers, 2012). From 1935 until 1998, competition

legislation allowed the formation of domestic cartels. Particular statutes in 1935, 1941 and 1958 arose from the changing circumstances at that time. The relatively tolerant Competition Law of 1958 remained in effect for about 40 years. This finally changed in 1998 when the Netherlands passed a new Competition Law that met international standards and also established an independent competition authority.

This chapter investigates the social, legal and economic transformation processes of Dutch competition policy from the 1930s until 1998. We identify four periods that reflect the shift from the Netherlands being regarded as a 'cartel paradise' to a situation, which began in 1998, where competition in the product and service markets was explicitly viewed as a core element of Dutch economic policy. In broad terms the periods can be categorised as[23]:

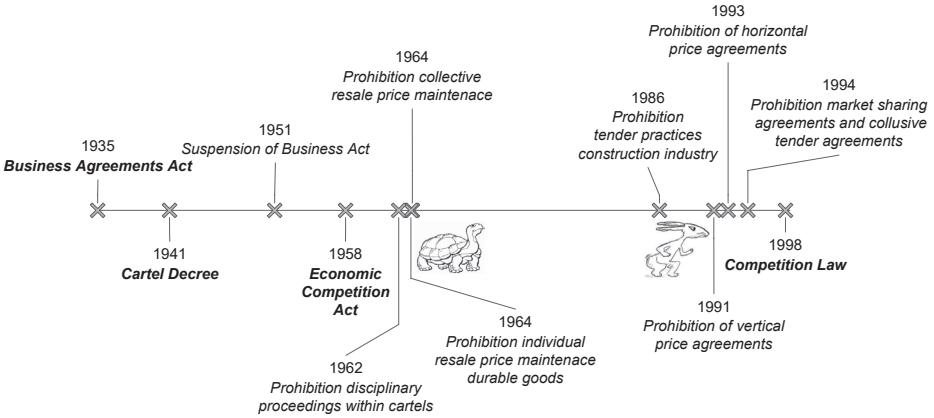
- 1930–1950 when the foundations of the 'cartel paradise' were established;
- 1951–1958 a period of modification, starting with the introduction of the Economic Competition Act (1958);
- 1959–1986 when the Netherlands was considered to be a cartel paradise – a period of policy inertia; and finally
- 1987–1998 when Dutch policy adapted and harmonized with EU policy, resulting in the introduction in 1998 of the revised Dutch Competition Law.

For each phase we identify (1) international determinants and developments (2) the social, political and economic changes that occurred and (3) changes in Dutch regulation and policies.

Our analysis reveals that the change in competition policy from one that enabled a cartel paradise towards a competition law shaped policy according to EU legislation, was primarily driven by economic circumstances and EU pressure. Our analysis also clarifies, however, that institutions designed in response to a concrete policy environment may prevent necessary change later on. This is where the 'tortoise' makes its entrance. The self-centred policy of the 1970s and 1980s provided limited room for discussion. Dutch corporate culture meant that the few discussions that occurred on changing the system were not easily settled. Further, the economic research needed to motivate change as an outcome of an academic debate simply did not exist. Eventually, it became exceedingly obvious that the relatively stagnant Dutch economy of the 1980s was a result of failing competition and that a change in attitude towards competition policy was necessary. This transformation gradually occurred in the 1990s. An outdated straggling policy demanded rapid reforms. The tortoise, so to say, had to be made ready to be transformed into a 'hare'. European integration required reform and Dutch academic research on the impact of competition policy took off. Proposed policy transformations that prohibited anti-competitive behaviour accelerated and finally succeeded in 1998.

[23] The categorisation is in line with Asbeek Brusse and Griffiths (1998). They distinguish 1935–56 (pro-cartel phase); 1956–87 (indifference); 1987–97 (anti-cartel drive).

Figure 2.1: Timeline of the different competition acts in the Netherlands



2.2 Cartels and cooperation (1930–1950)

The key to understanding economic policy developments between 1930 and 1950 is to recognise that the Dutch economy was confronted with two major crises: the Great Depression and the Second World War. Prior to the crisis in the 1930s, both government and Dutch academic economists were inspired by the Austrian School that favoured free markets and a small government (Dullaart, 1984: 5). This policy orientation changed dramatically after the Great Depression which reduced trust that market clearing would also produce socially acceptable results. Indeed, markets were now distrusted and a majority of economists and policy makers were convinced that cooperation between companies, government and trade unions was essential for recovery. Government had to guide the recovery process. One should place the development of a pro-cartel policy in the 1930s against this background.

2.2.1 International developments

The Dutch view on competition policy in this era did not deviate from that of almost all other European countries. Generally speaking, cartels were considered to provide a solution to the economic crisis and to protect local producers from international competitiveness. Cartels "*were particularly pronounced as an essential, accepted and even government-orchestrated feature of business activity in German-speaking Europe throughout the first half of the twentieth century*" (McGowan 2010: 14). Other countries that also had a positive attitude towards cartels in the inter-war period were: Austria, Belgium, Czechoslovakia, Finland, France, Germany, Norway, Sweden and Switzerland. Conversely, countries which officially prohibited cartels at that time were: Argentina, Australia, New Zealand, US and Yugoslavia (Schröter, 1996; Shanahan and Fellman, 2016).

Starting in 1929 after the Wall Street Crash, the League of Nations constructed a database of various international cartel agreements (Bertilorenzi, 2016). The League of Nations saw merit in providing transparent and publicly available information on, for example, essential facts of production, price developments and world supplies, as this would "*assure the consumer of accurate knowledge so that he might not be misled through any misrepresentations by international industrial groups*" (Klein 1928: 456). The presence of the Netherlands was notable in the cartelisation data recorded by the League of Nations. In the 1930s the Netherlands participated in 17 of the 47 identified international cartels. Other European countries, such as Germany, France, the UK and Belgium took part in respectively 23, 14, 13 and seven cartels (United Nations 1947; Petit, 2016 or chapter 3 of this thesis).

2.2.2 National developments

The developments in Dutch competition policy were a reaction to the economic circumstances that supported central organisation, cooperation and consensus. The Great Depression led to protection of national markets and the widespread notion that firms should cooperate rather than compete in order to survive and to guarantee their international competitiveness. Leading Dutch economists in this period, such as Jan Tinbergen, argued in favour of government involvement and considered free competition to be unsustainable. Tinbergen constructed the first macro-econometric models and showed that the economic crisis was caused by a lack of effective demand. He was convinced that policymakers should employ an active demand management policy to control the business cycle. Other leading Dutch economists such as François de Vries (the first chairman of the Dutch Social Economic Council formed in 1950) and Johannes Veraart (leading the Dutch employers' organisation) were in favour of self-regulation within sectors to control competition and curb the crisis. De Vries and Veraart, however, opposed the increased government intervention suggested by Tinbergen, and instead advocated a corporatist model. Veraart proposed the 'organisation of industry' and introduced the concepts of 'reasonable prices' and 'reasonable wages' (Dullaart, 1984).

The idea of self-regulation was put into practice after the Second World War. In 1950 the Industrial Organisation Act (*Wet op de bedrijfsorganisatie*) was introduced providing a legal foundation for the cooperation of employers and employees at industry level. The core of this policy legalised a centralised regime of wage and price restraint. This policy improved international competitiveness and kept unemployment at about two percent of the labour force in the late 1940s (Statistics Netherlands, 2014). In this period average economic growth was about four percent annually (Statistics Netherlands, 2014). The Social Economic Council (Sociaal Economische Raad; SER) played a prominent role in this cooperative model of recovery. In this council, the cooperative model for negotiation between employers, employees, government and independent specialists was formalised. This typical Dutch model of economic decision making later became known as 'the Polder Model'.

2.2.3 Institutional and regulatory change

Business Agreements Act

In 1935 the Dutch government introduced the Business Agreements Act (*Ondernemers-overeenkomstenwet*). This law was intended to enhance and support cooperation among entrepreneurs and organisations: "*Its main aim was to curtail the deleterious effects of excessive (domestic) competition on prices and employment*" (Asbeek Brusse and Griffiths, 1998: 16). The idea was that in following this law, Dutch businesses and thus employment would remain secure. The act contained two instruments to regulate and support agreements.[24] The most important was the government's right to declare agreements binding within a specific sector. The purpose was to force entrepreneurs or organisations in a particular sector, to take part in, and act in accordance with, an agreement, even if they had initially declined to participate.

The Business Agreements Act was limited to the extent that enforcement required a formal request from stakeholders, rather than being initiated by the government. The law was seen as an instrument promoting socially desirable market outcomes, as long as participating firms did not abuse the market power they derived from the agreement. As Dullaart (1984) argues, they were expected to serve the public interest. The government also could declare agreements nonbinding. The minister of Economic Affairs decided on a case-by-case basis whether an agreement should be declared binding or non-binding (Bervoets, 2000). From January 1935 until December 1939, 45 requests for binding agreements were filed. Only a few proved successful after assessment by the government. Of the 45 requests, fifteen were declared binding, sixteen were not granted, four were withdrawn while the remainder were still under discussion in 1940, when Nazi Germany occupied the Netherlands. Of fifteen successful requests to declare an agreement binding, seven were new, and the rest concerned eight requests for extension of an already binding agreement. Requests to declare agreements nonbinding were rarely submitted; this occurred a mere three times and those that were submitted, all failed within a few months.

Cartel Decree

In 1941, under the Nazi regime, the Business Agreements Act was replaced by the Cartel Decree (*Kartelbesluit*). Under this law the government had virtually unlimited powers to regulate the market (Tweede Kamer, 1953). The principles of binding and non-binding

[24] In 1937 a similar act was introduced for collective labour agreements. At the request of stakeholders, the government could declare an agreement on wages binding, or nonbinding. Whereas the Business Agreement Act dealt with regulation among firms, collective labour agreements were concerned with terms of employment and were arranged between employers and employees. Together, both laws regulated labour and product markets.

agreements remained the same. The most important amendment to the 1935 law was that the Cartel Decree also allowed the government to enforce government-initiated cartels and to intervene ex officio: on the ministries´ own initiative, similar to the German legislation from 1933 (Hesse and Roelevink, 2016). In 1943 another new element was introduced that allowed the government to act against dominant economic positions in specific markets (Verbond van Nederlandse Werkgevers, 1958).

Parties that were engaged in a cartel agreement were obliged to report their agreements to the Ministry of Economic Affairs. During the German occupation no actual decisions were taken and only the requirement to report business practices to the ministry was enforced (Verbond van Nederlandse Werkgevers, 1958). Agreements were archived in a confidential cartel register (*kartelregister*). Again, the German practise was followed. Germany had a register from 1936 which was also confidential (Hesse and Roelevink, 2016). The cartel register was a piece of war legislation consistent with the idea of full control of the economy; it was parallel to the German cartel legislation at that time (Hesse and Roelevink, 2016). Reasons for the requirement of confidentiality of the Dutch register are unclear (Tweede Kamer, 1980). It was assumed that cartelisation details only concerned the government and the practising firms (Tweede Kamer, 1980). The register introduced in 1941 would stay in effect until 1998.

Social Economic Council (1950)

A major institution of the polder model, which is still in place today, is the Social Economic Council (*Sociaal Economische Raad*). At present it "*represents the interests of trade unions and industry, advising the government (upon request or at its own initiative) on all major social and economic issues*" (Sociaal Economische Raad, n.d.). In 1950 the SER's impact on the Dutch economy was much stronger than today because the law then demanded that the Council be asked for advice in all important economic decisions. The SER's influence diminished over time, but it always continued to play an important role in advising the government, also while representing industry, and changing competition legislation.

2.3 Modification (1951–1958)

The increased importance of public interest as part of cartel evaluation began in 1951 with the introduction of the Suspension of Business Regulation Act (*Wet Schorsing Bedrijfsregelingen*). It was followed in 1958 by the Economic Competition Act (*Wet Economische Mededinging, WEM*). The increase in economic prosperity after the Second World War made the government reconsider the efficacy of cartels. This saw a decisive shift away from the legislation framed in times of crisis towards regulation based on the idea that only those car-

tels that benefitted the public (a concept which later appeared an inconvenient criterion), should be permitted.

2.3.1 International developments

In the 1950s the Netherlands was a leading proponent of European integration. Along with France, Germany, Italy, Belgium and Luxembourg it was one of the founding countries of the European Coal and Steel Community (ECSC), established by the Treaty of Paris in 1951. The ECSC promoted mutual economic interests between the former foes Germany and France (Warlouzet, 2016). It also reflected the recognition by policy makers, that the success of the USA emerged from competition (Motta, 2004). In 1957 the Treaty of Rome established the European Economic Community (EEC) or 'Common Market'. Article 85 of the Treaty prohibits cartelisation affecting trade *between* member states and specifies particular practices that are incompatible with the common market.[25] The article provided the direction towards stricter competition policy that was eventually taken by all member states (Warlouzet, 2016).

Before the formation of the EEC, various European economies had already started to prohibit cartels. In 1945 France prohibited restrictive business agreements of all kinds if their purpose or effect was to impair competition "*by preventing a decrease in costs or selling prices or by facilitating an artificial increase in prices*" (Souam, 1998: 206). Their first competition statutes (Le Décret du 9 Août 1953) came into effect in 1953 (Souam, 1998: 206). A *rule of reason* policy was applied; only those cartels that would result in increased prices were prohibited. In 1956 the UK introduced the Restrictive Trade Practices Act; it did not prohibit all kinds of restrictive business practices. Its main principle, however, was that "*restrictive agreements are in general adverse to the public interest unless shown otherwise*" (Symeonidis, 1998: 56). From 1958 the German GWB (*Gesetz gegen Wettbewerbsbeschränkungen*, the act against restraint of competition) prohibited cartels in general. Yet, a considerable number of cartels could opt for exemption under the GWB, such as cartels on conditions; rebate cartels; those formed because of crisis; rationalisation cartels; specialisation cartels; cooperation cartels; cartels involved with imports and exports and ministerially decreed emergency cartels (Hesse and Roelevink, 2016; Haucap, Heimeshoff and Schultz, 2010). A Federal Cartel Office (*Bundeskartellamt; BKA*) was established to enforce the GWB. Cartels had to be registered at the BKA, who determined whether they would be accepted (Warlouzet, 2016).

Overall there was a major re-orientation of policy on competition issues in France, the UK and Germany. This is relevant because of the central role of Germany and France in the European integration process and also because all three countries were important trading partners of the Netherlands. As with the Dutch legislation, there was still room for

[25] There were, however, some issues of interpretation. The prohibition legislation could also be interpreted as abuse legislation (Warlouzet, 2016).

some types of cartels in all three countries. Up to this point all these countries had a similar perspective on competition.

2.3.2 National developments

During the 1950s the Netherlands enjoyed the fruits of economic cooperation and consensus between economic agents as the reconstruction and recovery from the Second World War progressed. Between 1951 and 1958 real average GDP grew at more than four percent per annum, unemployment averaged less than two percent and inflation was around three percent (Statistics Netherlands, 2014). Employment increased and the welfare state gradually expanded. Keynesian ideas of government intervention were generally accepted and cooperation and consensus continued to develop.

The government no longer needed to promote cartelisation and curb excessive competition to overcome an economic crisis or assist recovery from war. In fact, by the end of the 1940s the Ministry of Economic Affairs had begun receiving various requests to act against specific cartel agreements (Verbond van Nederlandse Werkgevers, 1958). As a prelude to the regulatory changes yet to come, between 1945 and 1955, the ministry intervened when it considered business behaviour adverse to the public interest. Its priorities were in cases where there was:

- exclusion of firms in horizontal and vertical relationships;
- conditional inclusion of firms in such relationships;
- a risk or threat of exclusion of firms in such relationships;
- prescription of distribution channels;
- limitation of production;
- prescription of minimum prices and
- tender agreements.

The good condition of the economy meant that cartels were not needed; in fact minimum price cartels could even jeopardise economic objectives such as controlling inflation. The perception of cartels shifted from a presumption that they provided an economic advantage for the country, to a conditional acceptance that cartels may use their advantage only in specific situations.

2.3.3 Institutional and regulatory change

Suspension of the Business Regulation Act

The 1941 Dutch Cartel Decree was complemented in 1951 by the Suspension Act. This served as a temporary solution until the Economic Competition Act was ready to be introduced in 1958. By 1951, the Economic Competition Act was at the drafting stage (Verbond van Nederlandse Werkgevers, 1958). Both laws were enacted during a period when the Labour Party (Partij van de Arbeid) and the Christian democratic parties (KVP, CHU and ARP)

formed the Cabinet. Under the old legislation it was time-consuming to declare agreements non-binding once they were found to be contrary to public interests. The successive governments of the 1950s however, all recognised the urgency to dissolve such agreements as the economy started to grow (Verbond van Nederlandse Werkgevers, 1958). The 1951 Act complemented the Cartel Decree and provided for immediate suspension of agreements that conflicted with public interests. Both the Suspension of the Business Regulation Act and the Cartel Decree remained in effect until 1958.

Economic Competition Act

The Economic Competition Act (WEM) was passed in July 1956 and came into force in November 1958. It remained in operation for four decades. This act permitted cartels as long as they did not run counter to the public interest. The term 'public interest' was, however, undefined in the initial legislation and remained so until the WEM was terminated in 1998. Despite noteworthy attempts by De Roos (1969) and Kuin, Becker and Admiraal (1982) to define public interest, it was problematic to develop uniform criteria that could be applied in specific cases ('T Gilde and Haank, 1985: 5). Aspects such as productivity increases, price stability, economic development, employment and balanced public finances were all mentioned as belonging in the public interest domain ('T Gilde and Haank, 1985). The WEM specified the roles of different players in the assessment of agreements. The Ministry of Economic Affairs carried the prime responsibility of enforcement of the Act.

An important role in securing objectivity was played by the Committee for Economic Competition (*Commissie Economische Mededinging*, CEM). The CEM was appointed by the minister and was able to provide advice. The minister was obliged to ask the CEM for (non-binding) advice under specified circumstances (see Appendix 2.1). In the final analysis it was the minister who decided whether an agreement conflicted with the public interest or not[26].

The WEM provided the minister with four instruments to intervene in *agreements*:

(i) On request of the firms involved, the minister of Economic Affairs could declare an agreement binding on all the firms within an industry. This was the case if the turnover of the firms involved in the cartel exceeded the turnover of the 'outsiders'. (WEM 1956, s 6);

(ii) The minister of Economic Affairs could declare an agreement (partly) nonbinding and generally non-binding in the event that it interfered with public interests; for a maximum of five years, (with possibilities for extension. (WEM 1956, ss 10, 19(1)(b));

[26] The minister of Economic Affairs was also obliged to involve the ministry concerned with the particular sector in his decision.

(iii) The minister of Economic affairs could (partly) suspend a specific agreement. Suspension is a temporary but immediate measure to declare an agreement non-binding until the decision of the Committee for Economic Competition (WEM 1956, s 23);
(iv) The ministry could publicise (parts of) the agreement in cases where it interfered with public interests (WEM 1956, s 19(1)(a)).

In addition to intervening in agreements, the WEM provided five instruments to tackle *market power* which could harm the public's interest (see Appendix 2.2).

The agreements were archived in the cartel register, an inheritance from the former Cartel Decree. The registration pertained to those agreements that regulated economic competition between owners of firms. Agreements that regulated noneconomic competition in the Netherlands were exempted from registration (WEM 1956, s 4(1)). The definition of non-economic competition was not clearly defined in WEM. The goal of registration was to gather comprehensive insights into the economic competition agreements affecting the Dutch economy. The key prerequisite for a complete cartel register was considered to be confidentiality. Transparency towards the public was not considered appropriate. For example, it was argued that community members would not be able to judge the information objectively.[27] Therefore, the government fulfilled the role as 'guardian' of public interests. Since the system was based on anti-abuse, and cartels were by definition, considered neither harmful nor beneficial for the economy, the ministry required information about the agreement. Once registered, the ministry could assess the agreements on their merits; particularly on whether they were conflicting with the public interest. In cases where certain aspects appeared dubious for the ministry, its employees and the concerned firms tried (informally) to reshape the agreement so that it would become acceptable. Thus the cartel register functioned as an instrument for the government to safeguard excessive behaviour. Each year, an overview was published about the number of cartel agreements by industry and by type of agreement (price agreements, market sharing, conditions, etc.; see Petit, 2016 or chapter 3 of this thesis).

The WEM provided for the publication of information on the existence of certain agreements. First, agreements that would conflict with the public interest could be published in detail (WEM 1956, s 19(1)(a)). Second, decisions on agreements that were declared binding (WEM 1956, s 6(3)), exemptions from binding agreements (WEM 1956, s 8(4)), exemptions from general prohibitions (WEM 1956, s 12(7)), and agreements declared non-binding or which were published in detail (WEM 1956, s 19(2)) should be announced in the government gazette. Third, agreements that were subject to advice from the CEM should be announced in the government gazette as too, agreements that were suspended (WEM 1956, s 23(2)).

[27] In for example Finland, Norway and Sweden public transparency was considered an instrument to regulate cartels. Public opinion would discipline the degree of cartelization (see: Sandberg, 2016; Espeli, 2016 and Fellman, 2016).

In summary, the WEM was designed as a neutral law, but one that was equipped with the tools to act against harmful cartels. What was considered harmful was to be decided by the government. In that sense the public had to rely on the Ministry's judgment. Only in a few circumstances, mainly when action had already been taken, were particular cartels made public.

2.4 Institutional inertia (1959–1986)

From 1959 to 1986 the Dutch regulatory cartel framework put in place in 1958 remained unchallenged and comparatively static, although other major European countries reoriented their competition policy. The process by which the Dutch institutional regime became obsolete was gradual and went by largely unnoticed. Even the economic crisis of the 1980s did not, at first, have much impact on Dutch competition policy. Stagflation (double digit inflation combined with high unemployment) however, meant that the traditional macro-policies of demand management appeared to be unsuccessful for economic performance in the long run. Restructuring the supply side became the main focus of policy. At this point there was little discussion on the adverse results of competition policy on the goods and services markets.

2.4.1 International developments

With the establishment of the EEC, cartel practices that were likely to harm interstate competition between countries became regulated and were subject to prosecution if proven illegal.

While the Netherlands was clearly part of the EEC, the country preserved its own attitude to cartels. The first example of a cartel fined by the EEC was the 1969 quinine cartel, organised between Dutch, French and German firms. It involved many types of illegal conduct such as agreements on export quotas, conditions on the sale of quinine, price calculations, etc.[28] From 1970 until 1990, around 40 percent of the EEC's decisions on serious competition infringements concerned Dutch firms (De Jong, 1990; Asbeek Brusse and Griffiths, 1998). Bouwens and Dankers (2012) identify 21 serious infringements from Dutch firms between 1970 and 1989. Among these decisions one particular intervention illustrates the divergence between the Dutch government's view on cartels and that of the EEC at the time. In 1982 the European Commission fined a Dutch cigarette industry. The Netherlands had been dominated in the 1970s by a cartel that limited competition between cigarette

[28] European Commission, 69/240/EEG, Celex number: 31969D0240, Quinine.

companies at the retail level.[29] The firms were fined a total of 1.47 million ECU (European Currency Unit). This cartel stood out because it also involved the Dutch government which was also influencing retail prices by setting excise duties.

By 1986, several European countries had each established a competition regulator. As mentioned, Germany established its regulator (*Bundeskartellamt*) and its prohibition-oriented law in 1957. The UK established its regulator (Office of Fair Trading) together with the Fair Trading Act in 1973 and the Restrictive Trade Practices Act in 1976 (Symeonidis, 1998). The UK law also relied on abuse principles. France introduced its first regulator (*Le Conseil de la Concurrence*) together with new competition rules (*Ordinance relative a la liberté des prix et de la concurrence*) in 1986. This ordinance "*established the free market economy as the model to be used in France*" (Souam, 1998: 209). By contrast, the Netherlands did not establish its competition regulator until 1998.

2.4.2 National developments

The early 1980s saw a deterioration in the Dutch economy. The Netherlands were in a recession from 1980 to 1982; economic growth was negative and the budget deficit increased above six percent in 1982. Unemployment rose to approximately ten percent in 1983 (Statistics Netherlands, 2014).With the public interest as its priority, the WEM equipped the ministry with tools to react to changing economic circumstances. Yet, the interventions were very limited during the crisis itself.

The first reason was that the crisis was primarily considered a problem of public finance and wage restraint which together caused a deterioration of the competitiveness of the Netherlands and a worsening of the labour market. Second the WEM's legislation implied that government intervention only took place when there were complaints or signals from third parties. The crisis had a lagged impact on the change in competition policy. After the change from a policy of Keynesian driven demand management towards an economic policy which was based on neoclassical principles, the lack of flexibility in the product market became more and more evident (Van Sinderen, 2000). The momentum for change was also stimulated by international developments.

Limited proactive powers

The idea of cooperation and consensus are deeply rooted in the Dutch mind-set and in the regulatory system. Market outcomes were affected by, among other things, the WEM, the Wage Law (*Wet op de loonvorming*), the Price Law (*Prijzenwet*), and the social partners (employers' organisations and trade unions). One problem with this institutionalised polder model was that it allowed significant influence to be exerted by lobby groups and sectorial

[29] European Commission, 82/506/EEG, Celex number: 31982D0506, SSI; Tweede kamer, vergaderjaar 1986–1987, 19 700 chapter XIII, no. 3: 92.

interests. For example if the minister of Economic Affairs wished to rule that an agreement was in conflict with the public interest (meaning that prohibition was appropriate), he was obliged to involve other relevant ministers in the decision thus ensuring specific interests were always represented in the debate (Fellman, 2016). Asbeek Brusse and Griffiths (1998) and the Sociaal Economische Raad (1994) argue that the implementation of the WEM was driven by complaints which were resolved by internal discussions between civil servants and firms. Peeperkorn (1987: 67) even claims that competition policy was controlled by the government and the cartelised firms and that the Ministry of Economic Affairs was biased in favour of trade interests and industry at the expense of 'third parties' (consumers and/or competitors) who were neither involved nor informed about the cartel agreements.[30]

Under the WEM little recourse existed for consumers or parties not directly involved in the cartel practises but who were nevertheless dissatisfied with particular cartel's conduct. In essence, the policy was kept in-house. After 1969, some efforts were made to change this situation; all were unsuccessful.

Political inconsistency

Two attempts at change illustrate the political climate surrounding competition policy. First, a recurring issue was the secrecy of the cartel register. A debate between the government and Parliament occurred in 1969, and the SER was asked to advise on proposed policy changes. In 1971, the SER was asked not only to advise on whether the previously secret register should be made public, but also on specific revisions to the WEM, including a general prohibition of horizontal price agreements. The SER advised in favour of public disclosure of the register in 1973. A new bill authorising public disclosure of the register's contents was submitted to the SER for advice in 1977 and in January 1981 a bill was sent to the House of Representatives (*Tweede Kamer*). It was eventually passed, only to be rejected in June 1986, by the Senate (*Eerste Kamer*).[31] The most important parties which were opposed to the bill were the liberal party (*Volkspartij voor Vrijheid en Democratie*) and the Christian Democrats (*Christen-Democratisch Appèl*). Eventually, in 1987, the state secretary for Economic Affairs, Evenhuis saw a chance to use the Freedom of Information Act (*Wet openbaarheid van bestuur*) to allow parts of the cartel register to be disclosed on demand (Peeperkorn, 1988). Evenhuis acted in advance of this development and published a list of certain existing agreements. Employers' representatives reacted furiously (Peeperkorn,

[30] This also appears partly true in Finland and Sweden (Fellman, 2016 and Sandberg, 2016)

[31] There were at least four reasons given for this rejection. First, the parties argued that the position of small and medium-sized enterprises was still too weak for publicity. Second, as only horizontal agreements were to be subject to publicity, this would result in inequity. Third, publicity would not conform with the Freedom of Information Act. Finally, it was argued that the parties acknowledged resistance from businesses themselves (Eerste Kamer, 1986).

1988). The State Council (*Raad van State*) then decided that the Freedom of Information Act was overruled by the original pledge of secrecy adopted in the WEM. From that moment, the debate about publicity of the cartel register was closed and would not be resumed; the register would remain confidential.

Second, in addition to advising in favour of public disclosure in 1973, the SER gave an opinion on horizontal price agreements. The SER argued against a general prohibition on horizontal agreements and proposed that specific legal criteria should be used to identify 'condemnable' price cartels; those which would undeniably conflict with the public interest. Eventually in 1977, a bill dealing with prohibition principles for price agreements was filed by the minister of Economic Affairs, but rejected by Parliament. Obviously, the firms themselves were content with the current policy ('T Gilde and Haank, 1985).[32] In their advice to the SER, industry representatives stated that firms saw no justification for changing the law (Sociaal Economische Raad, 1973). The SER also argued that regulation of collective labour agreements was in line with the rigidity of the markets for goods and services. Thus any amendment to the regulation of goods and services markets would also require a change in the regulation of labour markets. The latter would have been politically difficult for the government since changing labour market policy was a challenge that would bring them into conflict with the labour unions. These fruitless torturous journeys illustrate the political inconsistency associated with developing Dutch competition policy.

Ministry inertia

The passive attitude of the ministry is illustrated by its formal decisions and the continued existence of the cartel register. From 1960 until 1983 only one decision was taken about a binding agreement; four general prohibitions were declared; one decision was taken on a non-binding agreement; and there were no publications of agreement details (Barendregt, 1991). The role of the cartel register during the period of inertia remained; to assess new agreements on their merits. The political call to make the register public, and so inform society about cartel agreements, remained fruitless. Simultaneous with seeking advice from the SER in 1973, an enquiry was launched to update the content of the cartel register. This led to a downward adjustment in the number of registered, operational, agreements. Of the 654 agreements then recorded, 111 appeared to have already been terminated.[33] Interestingly, the enquiry concluded that neither the rules and regulations of the WEM, nor firms' obligations to notify an agreement to the ministry, were generally known (Tweede Kamer, 1973). After this enquiry the urgency to keep the content of the register up-to-date lost

[32] As in Germany businesses tried to push the system towards abuse instead of prohibition (Hesse and Roelevink, 2016).

[33] The obligation to announce the termination of the agreement was often ignored. This was also true in Sweden and Finland.

priority so that by 1984 the ministry concluded that another 74 agreements had expired (Tweede Kamer, 1985). Overall, the register continued to exist but was updated infrequently.

This might have been due to the confidential character of the register, no detailed information was to be published so there was no incentive to maintain it accurately. Note, however, that in Finland the register was public, and it too suffered from lack or updating (Fellman, 2016). Another reason may have been that with few modifications to the legislation there was no urgency to reassess existing cartel agreements.

Academic inertia

While policy makers created no catalyst for change, neither did academics. There was virtually no research in the Netherlands on the lack of competition at either a micro or macro level, and no assessment of the impact of cartels on competition. Industrial organisation was part of the curriculum of all Dutch economics faculties but was held in low esteem and typically was descriptive in nature (Van Gent, 1997). Economic policy was mostly macro-oriented. Van Bergeijk and Van Sinderen (2000) identify three reasons why academic research was absent at the micro level: the barriers to obtaining (confidential) government information; the limited size of the Dutch economy; and/or the poor short-term rewards of developing specific models on this topic, which all resulted in limited funds for researchers.

2.4.3 Institutional and regulatory change

Economic Competition Act

The Economic Competition Act of 1958 remained basically unchanged, except for minor changes from 1959 until 1986. The three modifications that were made to the WEM occurred in the 1960s: a prohibition against disciplinary proceedings within cartels (1962); a prohibition against collective resale price maintenance (1964); and a prohibition against individual resale price maintenance for various durable consumer goods (1964).[34]

Resale price maintenance was, at that time, considered highly anti-competitive. It was argued that resale price maintenance curbed the competition at retail level, and hence there was less incentive to increase efficiency in distribution. Moreover, resale price maintenance provided no opportunities to decrease prices and increase sales, diminishing the incentive to decrease costs for inefficient distributors (Sociaal Economische Raad, 1971). In the 1970s and 1980s the only serious challenge to the regulations surround cartels had been the SER advice on the transparency of the cartel register and horizontal price agreements.

[34] These goods were, radio and television sets, record players, tape recorders, electric refrigerators, toasters, mixers, vacuum cleaners, washing machines, centrifuges, plat irons, dry-shavers, hair dryers, passenger automobiles, cameras, photo or film projectors, and phonograph records (Staatsblad Nos. 110, 352 and 35).

2.5 Transformation (1987–1998)

After such a long period of inertia change became almost inevitable. Poor economic performance showed that the reigning policy required reorientation to improve economic outcomes. Researchers, aware of the impact of regulatory changes in other countries began to study product and services markets in the Netherlands more closely. Dutch policy makers realised the need for legislation prohibiting cartel behaviour and the divergence of their country's policies from the rest of Europe; something that had to be altered if the Netherlands were to continue to be aligned with EEC policy (Bouwens and Dankers, 2012).

2.5.1 International developments

The signing of the Maastricht Treaty in 1992, which came into effect in 1993, was a milestone in EU convergence. Nonetheless Dutch cartel regulation was not yet aligned with EU requirements. For example, at the beginning of the 1990s the European Commission (EC) scrutinised the Dutch construction sector, in particular the 'Association for co-operative and price arranging organisations in the construction industry' (*Vereniging van Samenwerkende en Prijsregelende Organisaties in de Bouwnijverheid, SPO*). According to the EC, their agreements harmed trade in other member states. The EC decided that the SPO's practises did not comply with European legislation and in 1992 imposed a 22.5 million ECU fine.[35] The EC also initiated proceedings against the Dutch government.[36] In 1995 the EC concluded that the rules for public procurement in the Netherlands did not comply with the Treaty on the Functioning of the European Union (TFEU). Dutch competition policy was also becoming problematic for other individual EU countries.[37] Geelhoed, Secretary-General of the Ministry of Economic Affairs at the time, and an important promoter of the new Competition Law, used these examples to argue that the Dutch competition regime had become outdated and the regime raised eyebrows internationally (Den Hoed, Buevink and Keizer, 2007).[38]

In the meantime, several other countries had adopted policy and competition principles that prohibited cartel behaviour. For example, Italy and Belgium introduced their

[35] European Commission, 92/204/EEG, Celex no. 31992D0204, Building and construction industry in the Netherlands.

[36] European Commission, C-359/93, Celex no. 61993CJ0359, Commission of the European Communities v Kingdom of the Netherlands.

[37] Other countries also had problems. Portugal was reluctant to promote competition for several years. Barros and Mata (1998: 273) claim that 'the presumption was that most firms in Portugal are too small to be competitive by international standards'. The Belgian government regulated prices until the 1990s. Sleuwaegen and Van Cayseele (1998) argue that price regulation is usually employed to correct undesirable market outcomes, however in Belgium it was used as a policy instrument to secure fair prices and an equitable distribution of benefits. Belgium enacted a modern competition law in 1993.

[38] See also Van Bergeijk (2008) on the construction sector cartel.

first laws in 1990 and 1993 (Van Bergeijk and Haffner, 1996: 26–28). The pressure to change Dutch competition policy and cartel regulation was becoming irresistible. This was also the case in Sweden and Finland in 1992 in conjunction with their EU membership applications (Fellman, 2016).

2.5.2 National developments

The end of the 1980s marked the first changes in attitude towards competition issues. In July 1987, the Ministry of Economic Affairs explicitly stated that a well-functioning market mechanism was crucial for Dutch welfare (Tweede Kamer, 1987b). It was argued that competition yields an incentive to produce efficiently, keep prices low and adjust services and goods to the buyers' preferences. There was, however, no call to abandon the WEM. Instead, the state budget outlined a strategy to increase the effectiveness of competition policy within the context of the WEM (Tweede Kamer, 1987b). This scheme included: (i) a critical assessment of new competition agreements; (ii) a reconsideration of previously applied agreements; (iii) a prompt reaction to complaints and other signals; (iv) computerising the cartel register; (v) provision of more information about competition policy, and (vi) enhanced control on decisions and actions to be taken under WEM (Tweede Kamer, 1987b).

The cartel register was reviewed in 1987 and 1988. Cartel members recorded in the register were contacted by mail and asked about their agreement's current existence. Approximately sixteen percent of the firm's responses revealed the register included outdated agreements that were already terminated (Tweede Kamer, 1988). Consequently, the Dutch government launched a campaign in June 1988 called 'the new vision on free competition' (Tweede Kamer, 1988, 1989). This campaign defined the policy's principles, the need for registration of existing cartels and the opportunities to file complaints. Especially, in the period of transformation the ministry required data about new and existing cartels. The activated policy also manifested itself in an increase in the number of decisions. From 1984 until 1990 six (partly) non-binding decisions were taken (compared to two between 1958 and 1983) and one decision on a binding agreement took place in the bakery industry (compared to one in the sugar industry between 1959 and 1983) (Barendregt, 1991).[39]

The economic crisis of the early 1980s caused politicians to look for solutions outside the long used, but increasingly ineffectual standard policies. Wages and prices were spiralling upward and serious questions were raised about the limits of the welfare state. The Netherlands, like many other members of the OECD, opted for structural reforms, including tax reform and more flexible labour markets (Van Sinderen, 1990). One of the most important influences of this restructuring in the beginning of the 1990s was the scheduled completion of the European internal market ('Europe 1992'); something that clearly required a level playing field across a number of areas including competition policy. Bouwens and

[39] The backing agreement was abandoned in 1988 and the sugar agreement in 1989.

Dankers (2012), studying the role of trade associations, cartels and mergers, show that in late 1980s mergers become increasingly popular. The more stringent anti-cartel policy may have provided firms with the incentive to merge instead of continuing to cooperate via cartels (Bouwens and Dankers, 2012).

Most Dutch economists, however, remained more interested in studying the labour market and international phenomena than examining the effect of more competitive goods and services markets. It became increasingly apparent that the lack of research into the economic impact of uncompetitive Dutch markets was making it difficult to convince politicians that the WEM was almost obsolete and that the economy urgently required increased competition. Even the Netherlands Bureau for Economic Policy Analysis (*Centraal Planbureau; CPB*) found it difficult to supply any analysis. The CPB is the independent agency responsible for advising the government on economic policy. Although it became interested in the economic impact of structural reforms to competition policy, it was slow to engage in economic modelling. This was because, the agency argued, there were few modelling tools available to quantify the effects of institutional change (Van Bergeijk and Haffner, 1994). The economic proof needed to allow the CPB to forecast accurately the consequences of reform remained elusive (Van Bergeijk, 2005).

Policy makers thus encountered a critical problem. They could not provide estimates of the costs and benefits of any contemplated changes in the competition policy regime. By the beginning of the 1990s, however, empirical research had increased sharply. The first empirical academic research on the functioning of Dutch markets was published in 1987, followed by two more in 1991 (De Wolf, 1987; Van Schaik, 1991; Kuipers, 1991). The research then gathered pace, with an average 6.5 studies per year over the next decade (Van Bergeijk, 2002). In an effort to provide the necessary empirical evidence, economists at the Ministries of Economic Affairs and Finance published a number of articles estimating the costs of rigidities in product markets, although none drew on the cartel register for data.

A plethora of studies revealed the extent of anti-competitive elements in the economy; market rigidities and distortions by Dutch institutions and the government (including certain legislation such as the Establishment of Businesses Act (*Vestigingswet*) and Shopping Hours Act (*Winkelsluitingswet*); business agreements under WEM; market inertia; and other Dutch regulations (Kremers, 1991; Van Bergeijk, Haffner and Waasdorp, 1993; Van Sinderen *et al.,* 1994) Others demonstrated the economic gains to be made through reform (Gradus, 1996; Van Dijk and Van Bergeijk, 1997). Collectively this substantial increase in research helped to substantiate the claim that the Netherland's lagging competition framework created substantial macroeconomic costs. There was much to gain from liberalisation and reregulation of labour and product markets (Van Bergeijk and Haffner, 1996).

Under pressure from the looming 'Europe 1992', the Ministry of Economic Affairs argued in 1991 that the Netherlands competition policy should be made more congruent with European practices (Tweede Kamer, 1991b). The WEM and its institutional regime was

not compatible with the introduction of free capital and goods markets. It was initially decided to simply modify the WEM, but by 1992 the design of a new competition law was announced (Tweede Kamer, 1992b). In 1994 the government also launched an initiative to deregulate the economy and improve the functioning of markets. The aim was "*to increase the dynamics and competitiveness of the Dutch economy by comparing, critically examining and adapting Dutch legislation to modern requirements*" (Ministerie van Economische Zaken, 1996: 9). Revision of the competition policy, the WEM and its institutions, was part of this project. Geelhoed pleaded for more competition in both Dutch product and labour markets to stimulate economic growth (Geelhoed, 1996). This position was partly based on the research carried out within his ministry. Economists and policymakers were now keen to stimulate change in the national competition regime.

2.5.3 Institutional and regulatory change

Economic Competition Act

In the last operating decade of the 1958 Dutch Economic Competition Act there was slight movement towards the prohibition of cartels. For example, in 1986 a ban against certain tender practices in the building industry was introduced. Five years later a general prohibition against vertical price agreements was enacted. By 1993 the prohibition of horizontal price agreements was introduced, followed the next year by the prohibition of market sharing and collusive tender agreements.

In 1995 aspects of the WEM were amended as an interim solution before the proposed Competition Law came into effect (Ministerie van Economische Zaken, 1996). The government's changed view about the effectiveness of the WEM is summarised in the 1996 annual report.

"The WEM regime, which is based on control of abuse combined with a number of general invalidations – i.e. prohibitions – of certain severe forms of cartel, is not enough … for this. Firstly, supervision of abuse is intrinsically ineffective, because action must be provided for the assessment of a conflict with the general interest. Secondly, the system of general invalidations of agreements and decisions combined with enforcement under penal law is a cumbersome one. Thirdly, the system of separate general prohibitions for different types of competition agreements inevitably entails problems of definition". (Ministerie van Economische Zaken, 1996: 3)

Again, the question of how to assess the public interest was identified as a shortcoming of the prevailing policy. Even though general prohibitions were introduced in 1993 and 1994, definitional problems arose in the practical application of the policy. The prohibitions were based on the legal form of the agreement, rather than capturing the effect of the agreement (i.e. an object approach). Conversely, the WEM initially concentrated on the outcomes for the public. Overall, however, it is clear that the Dutch government had by now recognised the lack of effectiveness of the WEM and adopted a positive attitude towards

modernisation and a prohibition system. By 1996 the minister of Economic Affairs, appears to have accepted that the lack of competition between 1984 and 1990 had led to considerable macro-economic costs for the Dutch economy (Tweede Kamer, 1996).

The new competition law

In May 1996, the new Competition Act was submitted to Parliament. It was referred to as a "*radical break with the regime of the present Act*" (Ministerie van Economische Zaken, 1996: 1). Cartelisation was simply prohibited; assessing cartels on their merits was not an option. The cartel register maintained under the abuse system became obsolete and was no longer used after 1997. The new Competition Law (*Mededingingswet*) was based on the prohibition principle and a separate body, the Netherlands Competition Authority (*Nederlandse Mededingingsautoriteit; NMa*), was established. In 2005 it became an (independent) non-departmental public body.

By the beginning of 1998 Dutch competition policy was at last aligning with European practices. Section 6 of the Competition Law, based on Article 101 of the TFEU, prohibits cartels: "*Agreements between undertakings, decisions by associations of undertakings and concerted practices of undertakings, which have the intention to or will result in hindrance, impediment or distortion of competition on the Dutch market or on a part thereof, are prohibited*" (Competition Law 1998, Section 6, paragraph 1). Abuse of dominant positions is similar to Article 102 of the TFEU and addressed in Section 24 of the Competition Law: "*Undertakings are prohibited from abusing a dominant position*" (Competition Law 1998, Section 24, paragraph 1). Although it had taken decades to achieve, cartels were finally prohibited.

2.6 The new competition policy

While cartels were prohibited *per se* from 1998, it took until 2004 for the NMa to deal with a series of exemption requests. Firms could apply for exemption as a transition from the old WEM to the new prohibition system. In total only 39 of 315 requests for exemption of Section 6(1) of the Competition Law were granted; and most only for a transition period (Petit, 2016 or chapter 3 of this thesis). Early in its administration, one of the biggest cartels prosecuted by the NMa was in construction.[40] This prosecution was made possible by a whistle-blower providing inside information (Van Bergeijk, 2008). Other cartels that received attention were in shrimp fisheries, bicycle manufacture and in the flour industry.[41] While the

[40] Netherlands Competition Authority – Case 4155 / GWW-activiteiten.

[41] (Shrimp) Netherlands Competition Authority – Case 2269 / Garnalen, (Bicycles) Netherlands Competition Authority – Case 1615 / Fietsfabrikanten and (Flour) Netherlands Competition Authority – Case 6306/ Meel.

concept of free competition was embedded in the NMa's policy approach, the organisation soon started to face new challenges.

Nationally, third parties began to question free competition as a goal, rather than looking at the final market outcomes of competition enforcement. Debate about the value of free competition was revived with the introduction of competition in the healthcare sector in 2006. Over time the debate influenced the NMa's merger policy in the healthcare industry and its successor the Authority for Consumers and Markets (*ACM, Autoriteit Consument en Markt*). Competition policy came under more attack after the banking crisis of 2008 turned into both a national and international economic crisis. In such a climate, some politicians found it expedient to plead for a relaxation of the stringent competition rules. The NMa also received requests from, for example, the inland navigation industry, which requested exemptions from the Competition Law to help accommodate cut-backs in their industry. Until now, the NMa has resisted the pleas for exemptions submitted by self-interested industries (Don *et al.,* 2013). Politicians too sought to make the ACM more 'accountable' to the community. To quantify the merits of its interventions, the ACM publishes an annual estimate of the monetary value of its activities on consumer welfare in the Netherlands (Van Sinderen and Kemp, 2008).

Institutionally the ACM's policy gradually shifted to an effect (impact) approach, rather than the formal object (motivation) approach. The ACM has the consumer as its main focus. Consumer surplus, therefore, is the most important variable to consider, but there is also scope in its policy decisions to include other elements of the public interest, that includes granting exemptions on the prohibition of cartels. The new authority has a broad array of instruments, from fines to other interventions to enforce Competition Law (Ottow, 2014). The Netherlands, once a jurisdiction with little interest in combating cartels, now possess a policy regime well equipped to ensure firms operate in a competitive market place.

The Netherlands was one of the first countries in Europe to consolidate its regulatory powers. With the establishment of the ACM in April 2014 (a result of a merger between the NMa, the Independent Post and Telecom Authority and the Consumer Authority) the organisation regulates the whole domain; from competition and regulation to consumer protection. This has occurred ahead of the international trend to consolidate regulators (e.g. Spain, UK).

2.7 Concluding remarks

Competition policy and social and economic developments are interconnected. The transformation of Dutch competition policy in the second half of the twentieth century has both shaped, and been shaped by important social and economic changes to the Netherlands over the same period. Competition policy is not an isolated field of decision making.

Changes in competition policy are much more effective if combined with reform in other areas – such as labour markets. Initially, the consensus policy framework and their enabling laws in effect after the Second World War were an endogenous barrier to change in the Netherlands. Combined with the introverted competition policy of the WEM the result was a significant institutional and cultural barrier to change. The introverted policy was also expressed in the confidential cartel register. Firms had to notify their cartel agreements at the ministry, which had the exclusive right to assess these agreements. Due to the confidentiality of the cartel register, there was limited room to provide the society information about the scope of cartel agreements. Attempts in the 1980s to make the register open to the public, so that society could also (re)act against cartels, were fruitless.

In this context, external economic and international developments became critical to making policy change in the Netherlands. From the start of the EEC, competition was vital to ensure market integration. The economic breakdown of the 1980s and the failure of alternative economic policies to combat these problems increased pressure to change. 'Europe 1992' provided still further impetus for integration. Cross-border competition was essential to the pursuit of the goals of European integration. In order to achieve a level playing field convergence of national policies was essential. In sum, these changes meant that the Netherlands' policy tortoise of the 1950s to 1980s transformed into a policy hare in the late 1990s – a position from which it now leads other nations adapting to new challenges.

2.8 Appendices

Appendix 2.1

The minister was obliged to ask the CEM for (a non-binding) advice *before*:

i) Declaring an agreement binding (WEM 1956, s 7(1));
ii) Declaring an agreement generally non-binding (WEM 1956, s 11(1));
iii) Declaring an agreement non-binding (WEM 1956, s 20(1));
iv) Publicising (parts of) the agreement (WEM 1956, s 20(1));
v) Granting exemption for general prohibitions (WEM 1956, s 13(1));
vi) Acting against dominant positions (WEM 1956, s 25(1));
vii) Invalidating an agreement due to non-notification (WEM 1956, s 5(2)).

In addition, the minister was required to seek advice of CEM *at the moment* he took a decision on a:

i) Suspension of an agreement (WEM 1956, s 23(3));
ii) Temporary solution for dominant positions (WEM 1956, s 27(3)).

Source: WEM (*Wet Economische Mededinging*, 1958).

Appendix 2.2

The WEM provided five instruments to tackle *market power* which could harm the public's interest. The minister could:

(i) Publish information about the market power in question (WEM 1956, s 24(1)(a));

(ii) Force involved firms to desist from engaging in certain practices (WEM 1956, s 24(1)(b)(1));

(iii) Oblige supply of certain goods or services (WEM 1956, s 24(1)(b)(2));

(iv) Prescribe prices of certain goods and services (WEM 1956, s 24(1)(b)(3));

(v) Prescribe conditions governing delivery of specific goods and services (WEM 1956, s 24(1)(b)(4)).

3 The Dutch cartel collection in the twentieth century: facts and figures

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Abstract

It was in 1998 that the prohibition legislation replaced the existing abuse legislation which permitted cartels. The abuse principle assumed that cartels could be in the public's interest. Cartels were registered in the Dutch cartel register. By studying the details of cartels we gain insight in the presence and characteristics of registered cartels from the register. Although there have been many well organized agreements, the degree of cartelization decreased in the 1990s. Before the prohibition legislation was introduced in 1998, the so called paradise ceased to exist according to the register.

3.1 Introduction

Cartels were common in the Netherlands for the greatest part of the twentieth century. Petit, Van Sinderen and Van Bergeijk (chapter 2) discuss the Netherlands' competition policy and its drivers in the twentieth century. The present chapter studies the extent of cartelisation by providing data on the number of registered cartels in the Netherlands. By cartelisation we mean the presence of registered cartel agreements between firms, either submitted by firms themselves or identified by the government as such.

The Dutch have often characterised their country as a 'cartel paradise' (De Jong, 1990; Van Rooy, 1992; Van Gent, 1997; Asbeek Brusse and Griffiths, 1998). The introduction of the prohibition legislation in 1998, however, suggests an absolute turning point for the continued existence of that paradise. By studying the development of the registered agreements we examine whether the end of the Netherlands cartel paradise coincided with the

introduction of the prohibition law of 1998.We will also provide a general overview of the content of the Dutch register.

Our information on cartels is drawn from several sources, however the Netherlands cartel register is the prime basis of information. This register existed from 1941 until 1998. In addition, two other sources complement the research findings. First, we can determine the extent of Dutch international cartelisation at the beginning of the twentieth century from a United Nations dataset (1947). Second, we can refer to the database of exemption requests, which were filed between 1998 and 2004 at the Netherlands Competition Authority (*Nederlandse Mededingingsautoriteit*, NMa).

We start with an overview of the formation of cartels prior to the introduction of the cartel register; international cartelisation during the inter-war period. Next, we study cartelisation through the cartel register. Third, we examine the exemption requests that were filed during the transition to the new Competition Law. We conclude by summarising our insights and assess whether the Netherlands cartel paradise was actually ended in 1998.

3.2 Before the cartel register

The Netherlands is a small open economy, implying that the country's economy is dependent on multiple international trade relations (Driehuis, Van Heeringen and De Wolff, 1975). International cartels were widespread at the beginning of the twentieth century. The worldwide crisis of the great depression, and resulting attitudes against wasteful competition caused a wave of international cartels (Fear, 2006). Nussbaum (1986) estimates that cartels were involved in approximately 40 per cent of world trade between 1929 and 1937. In such an environment, firms inside a small open economy would also be expected to participate in cartels.

The League of Nations compiled a database of international cartels to "*assure the consumer of accurate knowledge so that he might not be misled through any misrepresentations by international industrial groups*" (Klein, 1928: 456; see also Bertilorenzi, 2016). The Netherlands-based firms participated in 22 (26 per cent) of the 86 registered cartels relating to industrial output and raw materials presented by League of Nations (see table 3.1).

Of the purely international cartels, firms from the Netherlands took part in 17 (36 per cent) of 47, which appears high compared to the results from neighbouring countries. Germany had the highest cartel penetration ratio; German-based companies were active in 23 (49 per cent) international cartels. Other European countries, such as France, the UK and Belgium had companies that participated in respectively 14 (30 per cent), 13 (28 per cent) and seven (15 per cent) international cartels.

We observe that the Dutch firms' main allies were German companies; in ten of the 17 international cartels that included firms from the Netherlands, German companies were also

Table 3.1: International cartels including the Netherlands during the interwar period

Product	International (I)/ Local (L)	Participating countries	Start (exit)	Nature
Nitrogen I	I	UK, Germany, Norway, Belgium, France, Czechoslovakia, Netherlands, Italy, Poland, (separate agreement with) Chile	1930	Export regulation, import regulation, domestic reservation
Nitrogen II	I	UK, Germany, Norway, Belgium, France, Czechoslovakia, Netherlands, Italy, Poland, separate agreement with Chile (June 1934) and Japan (1936)	1931	Prices, import regulation
Diesel engines	I	Germany, Netherlands, US	1930	Market division
Radio equipment	I	Netherlands, US	1925	Export regulation, market division
High tension cables	I	Germany, Austria, Hungary, Czechoslovakia, Poland, Sweden, Norway, France, Spain, Netherlands, US	1930	Prices, production
Glass bottles	I	Netherlands, Germany, Czechoslovakia, Poland, Austria, Yugoslavia, Romania	1929	Export regulation
Cotton Bale strips	I	Germany, Belgium, France, Netherlands		Prices, production
Cement	I	UK, Germany, France, Belgium, Denmark, Sweden, Norway, Yugoslavia (later: Netherlands)	1937	Prices
Moving picture recording and reproducing apparatus	I	Germany, Netherlands, US		Export regulation
Aluminium foils – Dutch market	L	Germany, Netherlands, Switzerland	1936	Sales
Aluminium foils – Belgian market	L	Germany, Netherlands, Switzerland, Belgium	1936	Sales
Aluminium foils – Scandinavian market	L	Germany, Netherlands, Switzerland, Belgium, Scandinavian countries	1936	Sales
Fittings – Dutch market	L	Germany, Netherlands	N.A.	Sales, prices
Door locks	L	Germany, Netherlands	N.A.	Prices
Linoleum	I	Germany, Sweden, France, Switzerland, Austria, Netherlands,	N.A.	Export prices, domestic reservation
Petroleum	I	Standard Oil, Shell, Anglo Persian	1928 (1933)	Maintain current production
Petroleum II	I	Standard Oil, Shell, Anglo Persian	1929 (1933)	Maintain current production
Petroleum III	I	Standard Oil, Shell, Anglo Persian, Romania	1932 (1933)	Maintain current production
Rubber thread	I	Germany, Italy, Hungary, Czechoslovakia, France, Netherlands, US	1931	Prices
Tin (ore) I	I	Malaya, Netherlands, East Indies	1921 (1925)	Surplus stocks

Table 3.1: International cartels including the Netherlands during the interwar period (*continued*)

Product	International (I)/ Local (L)	Participating countries	Start (exit)	Nature
Tin (ore) II	I	Malaya, Nigeria, Netherlands, East Indies, Bolivia (later: Siam, French indo-china, Belgian Congo, Portugal, UK)	1931 (1942)	Prices, surplus stocks
Rubber	I	Malaya, Ceylon, India, Burma, Netherlands, East Indies, French Indo-China, North Borneo, Sarawak (later: Siam)	1934 (1944)	Prices, surplus stocks

Source: United Nations (1947)

Notes: Seven other cartels include 'various European countries'. The participation of the Netherlands is not mentioned explicitly. These cartels do not appear in this table. Consequently, the involvement of the Netherlands might be underestimated.

N.A. denotes not available.

present. Only four of the 17 international cartels with Dutch firms included industries from its neighbour, Belgium.

Of the 39 local cartels, Dutch firms took part in only five (13 per cent) of them. Besides its 13 international cartels, the UK was active in one local cartel, while German firms were active in 27 local cartels, France had companies in 13 local cartels and seven Belgium based cartels were local.

Beyond Europe's borders, Dutch firms appeared to be the only European cartel members involved in radio equipment with firms in the US, and with firms located in various Asian countries involved with tin (ore) and rubber. The purpose of cartelisation ranged from the preservation of markets (e.g. export regulation and maintenance of production) to price setting and disposing of surplus stocks (overcapacity). The Netherlands-based firms arranged prices in nine of the 22 cartels (41 per cent).

At the start of the twentieth century the Netherlands appeared to be linked to a relatively high number of registered cartels, from an international perspective. The following section presents the cartels in the Dutch cartel register in the second part of the twentieth century.

3.3 The cartel register

3.3.1 Overview of the register material

Under the legislation of 1941, (the Cartel Decree; *Kartelbesluit*), cartel agreements were required to be reported to the Ministry of Economic Affairs and this file was archived in the cartel register. The 1958 Economic Competition Act (*Wet Economische Mededinging*; WEM), continued the use of the cartel register. In 1998 the register was brought to an end by the introduction of the Competition Law (*Mededingingswet*). Thereafter, the cartel register was

redundant as the Competition Law prohibited cartels *per se*. Altogether, the register covers more than half of the twentieth century.

Registration of cartel agreements was not uncommon. Other countries (e.g. Sweden, Finland, Australia, the UK, Austria, Spain, Germany, Denmark and Japan) have kept a cartel register (Shanahan and Fellman, 2016). Most registers were closed before 1993 (the Finnish register was closed in 1992, and the Norwegian and Swedish register existed until 1993; Fellman, 2016; Espeli, 2016; Sandberg, 2016). The Netherlands was the last country to close its register in 1998.

Asbeek Brusse and Griffiths (1997, 1998) set out the nation's cartel policy together with descriptive data, for the period up until 1985 using official ministry reports (see also Bouwens and Dankers, 2012). Using the ministry reports, or secondary data, means their results may slightly differ compared to results based on the original cartel register and which are retained in the National Archives.

Accessing the original source material allows a more detailed study of registered cartels and, because the detailed ministry reports ceased in the early 1980s, can extend the period of analysis compared to previous investigations. This we will do for the period 1980 to 1998. Unlike the two studies that relied on parliamentary and ministry reports, re-examining the register means the material can be analysed, detached from any political interests that may have been important at the time of the minister's reports.[42] The present study examines the degree of registered cartelisation in the Netherlands from both a macro perspective and a sectorial perspective.

In the period 1941 to 1958, when the Cartel Decree operated, policies were affected more by the Second World War and the subsequent rebuilding process of the economy, than by competition policy (Verbond voor Nederlandse Werkgevers, 1958).

To cover the period when the 1958 Economic Competition Act (WEM) operated, two other data-sources are used to throw light on cartelisation. The first is the annual reports of the Ministry of Economic Affairs, which included information from the cartel register from 1959 to 1981. The second is the primary data in the cartel register from 1980 until 1998. Thus for the last 18 years of the study we access the original cartel files.[43] We use the primary data after 1980 as detailed information was published in the annual reports only up until 1982.

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[42] The coding was done by professionally trained persons of the ACM who were familiar with competition policy. We used the digitalized original source material, identifying files which were not closed before 1980 such as reported by 'Centrale Archief Selectiedienst' (Central Archive Selectionservice – CAS). All the variables were checked, either by constructed by CAS and checked by a trained person of the ACM or constructed and checked by different trained persons of the ACM. Sample checks were performed and the final coding was compared with the original files.

[43] The database was compiled from separate files of the 'Directoraat Mededinging, Ordening en Kartel van het Ministerie van Economische Zaken' (Directorate of Competition, Organization and Cartel of the Ministry of Economic Affairs – the Directorate). The total dataset contains over 4000 electronic scans. The CAS

Using the secondary data runs the same risks as Asbeek Brusse and Griffiths' analyses (1997, 1998), they may differ from the primary data. Since two different data-sources are used, it is possible that the two time series are not perfectly comparable and there may be a structural break in the series in the early 1980s.

3.3.2 Content and scope

The content and scope of the cartel register must be clearly understood to draw accurate conclusions from the primary data. The following discussion explains the issues, opportunities and assumptions associated with the cartel register. First, we discuss how representative the register is. Second, we describe the duty to report.

The cartel register was, and still is, confidential. A non-public register was preferred to a public register since the latter would not be compatible with the idea of full registration. Confidentiality was expected to result in a higher reporting-rate. Nevertheless, several fruitless attempts were made to introduce a public cartel register, but they all failed because of political inconsistency (see Petit, Van Sinderen and Van Bergeijk, 2016).

Firms themselves saw the merits of an open dialogue between business and the government; a public register would frustrate this open dialogue (SER, 1973). Driven by a fear of misunderstanding and resistance from third parties, cartelised firms supported the confidentiality of the register (SER, 1973). Nevertheless, under certain conditions the WEM provided for the publication of information (see Petit, Van Sinderen and Van Bergeijk, 2016).

The basic assumption of confidentiality should have led to a comprehensive administration of cartels. Nevertheless, threats and failed attempts to disclose the register as well as the fear of publicity under specified conditions might have reduced the incentive for firms to register their agreements at certain points in time.

The incentive to notify a cartel to the Ministry of Economic Affairs could also be subject to (intended) policy changes. If firms initiated an agreement and registered this accordingly just before 1998, the Netherlands Competition Authority (*Nederlandse Mededingingsautoriteit*; NMa) might have investigated them as a result. As a prelude to the new competition law several policy changes were implemented. Specifically, these policies included: a general prohibition against vertical price agreements (1991); a prohibition of horizontal price agreements (1993); and a prohibition of market sharing agreements and tender agreements (1994). New agreements which would soon become prohibited in the 1990s might run the risk of non-notification or under-reporting in their official application.

The competition policy during the existence of the 'dormant' WEM from 1958 was labelled 'reactive' by Asbeek Brusse and Griffiths (1998). This contributed to firms' comprehensive lack of awareness of their duty to report their agreements. In 1973, 1984 and 1987/1988

categorized the scans belonging to one cartel file. We count more than 2000 cartel files amongst these scans. The records that were still open after 1980 were analyzed in detail.

inquiries were conducted by employees of the competition department of the Ministry of Economic Affairs with the objective of updating the cartel register. A considerable number of agreements were notified and outdated agreements were cleared. Moreover, De Jong (1990), a former employee of the Ministry of Economic Affairs, claims that a mere 50 per cent of the cartels were registered in the cartel register; a claim that remains unsubstantiated.

Nevertheless, under both the Cartel Decree (1941) and the WEM (1958) the duty to report was formalised into law. Deliberately ignoring the duty to report was considered an offence. A modest fine (less than 500 Dutch guilders) was imposed in various cases of non-notification under the Cartel Decree.[44] This duty to report was reinforced in the approach of the WEM. Under the WEM, in the case of non-notification, an agreement could lose its legal force and firms could risk a fine of up to 10,000 Dutch guilders or the business owner could receive a prison sentence of up to six months (WEM 1956, ss. 5, 49). In practice, parties were merely asked to make a notification, and sometimes this was combined with a minor fine (Barendregt, 1991).

In summary, there are some limitations that impair the value of the cartel register as a definitive measure of actual cartelisation. On the other hand, several guarantees, such as the threat of fines in the case of non-notification and the confidentiality of the register strengthen the reliability of the register as a source of information. Overall, the register is, and remains, the most reliable and consistent means of assessing (registered) cartels in the Netherlands.

A competition agreement was considered an agreement or a civil contract that regulated economic competition between the owners of firms. Competition agreements (henceforth: agreements) were required to be reported to the Ministry of Economic Affairs within one month of the establishment of the agreement (WEM 1956, s. 2).

Agreements that regulated *non-economic* competition in the Netherlands were exempted from registration (WEM 1956, s. 4(1)). Also exemptions were granted for agreements that were applied abroad (i.e. export agreements or those that concerned international transport; Tweede Kamer, 1960). Several exemptions for various sectors or agreements were implemented during the WEM. Free professionals or practitioners (such as notaries or medical specialists) were exempted from registration until 1987. Overall, from 1987 agreements were exempted that: were in operation less than one month, concerned regulated parts of the healthcare sector, joint purchase, individual vertical price maintenance, employees, international transport and export cartels.[45]

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[44] Some areas fined for non-notification were: hairdressers (1952), painters (1953), hosier producers (1953), ropewalks (1954), evaporated milk (1954), milk producers and grocers (1958) and sauerkraut producers (1959).

[45] Staatscourant 92 1987.

3.3.3 Measures of cartelization

Both the ministry's annual reports and the primary data used in this study were based on the individual files of the cartel register. Within the files, the application form was the leading source of information.[46] Over time there were various types of application forms, although their questions remained relatively constant over time. As application forms were almost always found in the cartel files, they contained the information necessary to permit the study of the agreements and to make comparisons of cartel characteristics. In our study, the original files not containing an application form (approximately five per cent of cases) were omitted. It is unclear if these were reported in the ministry's annual reports. We included every submitted application form, even those with agreements that did not actually fall under the duty to report. On the basis of the responses to questions in the application form and the contents of the file we can assess the key features of registered cartels. Four elements are studied: the scope, persistency, nature and intensity of registered cartels.

The scope of cartelisation in the economy is ascertained by identifying the specific industries which were involved in cartels. The persistency of cartelisation is calculated by identifying the recorded cartel entry and exit dates; the difference between those dates provides a measure of their duration. Cartel duration is considered to be an important measure of cartel success by Levenstein and Suslow (2006a). In contrast to the annual reports, which used the date of notification, we tried to capture the actual starting date recorded in the primary data. This was based on the date of establishment of the agreement. This is either taken from the application form itself, or from the attached Statutes or contracts. A cartel could be in existence for a significant time without being registered, either by mistake or on purpose. The exit date was the last date of added content in the file and does not necessarily coincide with the actual termination of the cartel. Ideally, one would use the actual termination date, but unfortunately this information is either unclear in the file or is not mentioned at all. In summary, the exit date implies the last visible visit in which content was added to a cartel file by the Ministry of Economic Affairs, regardless of the reason.

The content of the agreement has been classified in our study to draw conclusions about the nature of cartelisation. We used a classification of the agreements similar to Sandberg (2016). Eleven types of agreements have been categorised: price agreements, division of markets, allocation of quotas, agreements on conditions, tender agreements, agreements on delivery and production, buy and/or sell combinations, marketing agreements, trade-

[46] In addition to the application form, the cartel files include: correspondence between the businesses and the ministry, statutes and contracts, background information such as newspaper-articles and reports of the Economic Surveillance Department (*Economische Controle Dienst*).

marks and protection of markets, and ancillary agreements.[47] The annual reports mention nine slightly different categories: price agreements, market sharing, tender agreements, exclusive dealing, financial agreements, production agreements, sales agreements, agreements on conditions and a remaining category 'other'.

As a measure of the intensity of cartelisation, three variables were examined in addition to those in the annual reports. First, the number of cartelised firms per agreement. Second the presence of an organising body. Such a body could support the coordination and stability of an agreement. Historically, high involvement by trade associations was thought typical for the Netherlands (Bouwens and Dankers, 2012). Cartels with organisational and/or contractual solutions to problems of coordination, cheating and entry are expected to be the most successful in terms of duration (Levenstein and Suslow, 2006a). A third dimension of the intensity of a cartel is its internationalisation (i.e. the presence of foreign firms). De (2010), for example, suggests that global cartels had more chances to cease naturally than national or regional ones.

3.3.4 Cartelization from a macro perspective

The foundations of the cartel register date back to the Cartel Decree, under which firms were obliged to report their cartel agreements to the Ministry of Economic Affairs. In 1948, 513 cartels were registered (Asbeek Brusse and Griffiths, 1997). From 1951 to 1954, the number of domestic cartels increased by 100, 62, 116 and 198 respectively (Barendregt, 1991). In 1955, 831 agreements were registered and in 1958 under the WEM 801 agreements were recorded in the cartel register (Tweede Kamer, 1960). This section examines the agreements recorded in the Dutch register under the WEM between 1959 and 1998.

Cartels, entry and exit from the register

In this study we overlap the annual ministry reports from 1959 until 1985 with the original data files from 1980 until 1998 to compare directly the data from both sources for a period of five years. Figure 3.1 reveals a close match between both series.

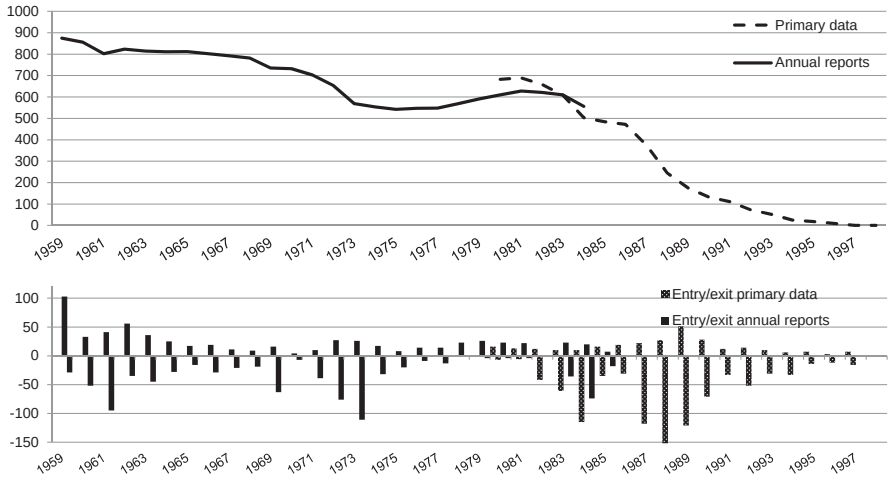
As mentioned above, the annual reports indicate cartel entry based on the notification date whereas the primary data from 1980 onwards permit identification of the actual starting date. Since we are looking at cartelisation, rather than the registration of cartels, we focus on the actual starting date rather than the notification date. Identifying the termination date remains an intractable problem, since the actual date is unknown in most cases. Consequently, statements about termination and duration should be interpreted with caution.

[47] Sandberg defines exclusive conditions as ancillary agreements. Our definition of ancillary agreements includes subordinate aspects of cartel arrangements (i.e. not hard core) such as arbitration and corresponding fines, credit control, employees, etc.

Figure 3.1 shows the number of agreements and shows the entry and exit from the records. Examining only the total number of recorded agreements, it is notable that the two time series correspond exactly in 1983. Yet in 1980 and 1981, the primary data report more cartels than the annual reports and the opposite happens for 1985. In 1980 the annual report shows 70 (10per cent) fewer agreements than the primary data. In 1985 the annual report shows 63 (13 per cent) more cartels than the primary data.

Once we study the entry and exit in these years, we find more discrepancies. The primary data reports 16 new agreements and seven terminations in 1980; the annual report on the other hand, reports 23 new agreements and four terminations. In 1985 the primary data reports 16 new agreements and 35 terminations, whereas the annual report reports seven new agreements and 18 terminations. The discrepancies can partly be explained by the use of the starting date, the primary data use the actual starting date instead of the registration date. Since the actual starting date is most often before the registration date, the primary data tend to report more agreements at a certain point in time. Yet, this does not explain the gap between the annual reports and the primary data in 1984 and 1985.[48] The outliers of cartel exit in 1974, 1984, 1987 and 1988, mark a reassessment of the register, and actually reflect that cancellation rarely took place. Appendix 3.1 (table 3.4) provides an overview of the differences between the two data sources.

Figure 3.1**: **Number of active agreements reported in the cartel register (upper graph) and entry and exit of agreements (lower graph)



Source: Cartel register (primary data), Tweede Kamer and Nederlandse Staatscourant (1962 - 1982)

[48] A possible explanation may be the reassessment of the cartel register in 1984. The reassessment led to many terminations. The ministry may have processed the terminations later in its administration than that the primary data treated them as terminations.

Overall, the number of agreements decreases between 1959, when it peaked at 875, and 1977. In the 1960s we notice a decreasing trend of new agreements in the Netherlands. In 1973 the ministry updated the content of the cartel register. This led to a considerable decrease in the number of registered agreements (Nederlandse Staatscourant, 1975). Of the 654 agreements originally recorded, 111 appear to have been terminated (Nederlandse Staatscourant, 1975). The total stock of agreements reduced to 554 by the end of 1974. Terminations rarely occurred according to the ministry.

From 1977 an upward trend is visible; the number of agreements increases by approximately 20 a year until 1982. It is noteworthy that the number of agreements falls sharply, by more than 50 per cent, between 1986 and 1989. This again coincides with the reassessment of the cartel register in 1987 and 1988 by the ministry focussing on accuracy and completeness of the register (Tweede Kamer, 1989). The 1987–1988 annual report states that many of the agreements in the register appeared outdated (Tweede Kamer, 1989).

From 1991, the number of agreements steadily decreased, with only a handful of new agreements notified after that date. This coincided with the 1991 announcement of the design of the Competition Law (*Mededingingswet*) that finally came into force in 1998 and the general prohibitions on vertical price agreements (1991), horizontal price fixing (1993) and market sharing and tenders (1994). On the one hand, the reduced number of new agreements may be attributable to greater restrictions on permitted agreements. It is also possible, however, that such agreements were initiated but not notified (see also Shanahan and Fellman, 2016). At the same time as the Netherlands was modifying its regulations, the European Union (EU) was established (in 1993). Its influence, together with less favourable public opinion towards cartels, means it is likely that more cartels terminated their agreements and fewer were initiated.

The annual reports from 1989 to 1992 provide aggregates of the number of agreements in the cartel register. They reveal respectively 293, 371, 455 and 468 registered agreements; significantly higher numbers than figures from the original files (Tweede Kamer, 1989, 1990, 1991, 1992). Recall that the analysis based on the original files is using the last date of correspondence on the cartel, which is not implying that the cartel had actually been terminated. Once we ignore terminations, both series – the original data and annual report data – become rather similar (see appendix 3.2, table 3.5). This underlines the effect of using the last date of correspondence in cartel register, but also illustrates that (after adjustment) both sources are relatively similar. At the same time, it might well be the case that the ministry's calculations from 1989 until 1992 did not pay attention to the cartels that were registered after the 1988 reassessment; ignoring both their activity or inactivity, and simply including them in the yearly reports.

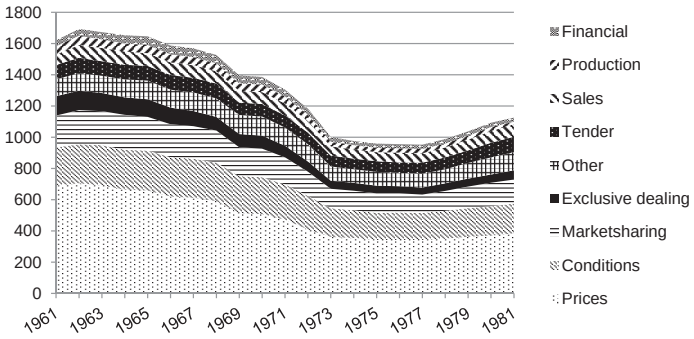
Nature

Agreements may include various restrictions of competition (henceforth: sub-agreements) such as price, quantity and/or production aspects. On average, a single agreement comprised 1.7 sub-agreements from 1961 until 1998.[49] Figures 3.2 and 3.3 illustrate the total number of sub-agreements categorised by type, for the periods 1961–1981 and 1980–1998. In terms of the total number of sub-agreements, figure 3.3 reveals more sub-agreements than figure 3.2. This is partly explained by the difference in the number of categories used in the annual reports (9) compared to those applied to the primary data (11). Figure 3.2 reports slightly more price agreements and slightly fewer agreements on conditions than figure 3.3. The discrepancy can also be explained by differences in definition. Discounts and bonuses are classified as price agreements in the annual reports, while the classification from 1980 views them as conditions. As a result, there are more agreements on conditions and fewer concerning price agreements from 1980 onwards. Appendix 3.1 provides an overview of the differences between the primary data and the annual reports for various categories.

Agreements on prices and conditions were the two most common types of restrictive elements from1961 to 1998. In 1961, 244 agreements included sub-agreements on conditions although this decreased slightly over time. Approximately a third of the agreements dealt with conditions from 1961 until 1998.[50] Market sharing and the allocation of quotas were also common; both are direct instruments to increase profits.

In 1961 there were 692 sub-agreements on prices. Typically, this is one of the main interventions to exploit cartelisation optimally and increase profits. Horizontal price agree-

Figure 3.2: Frequency of restrictive elements by type, 1961 – 1981

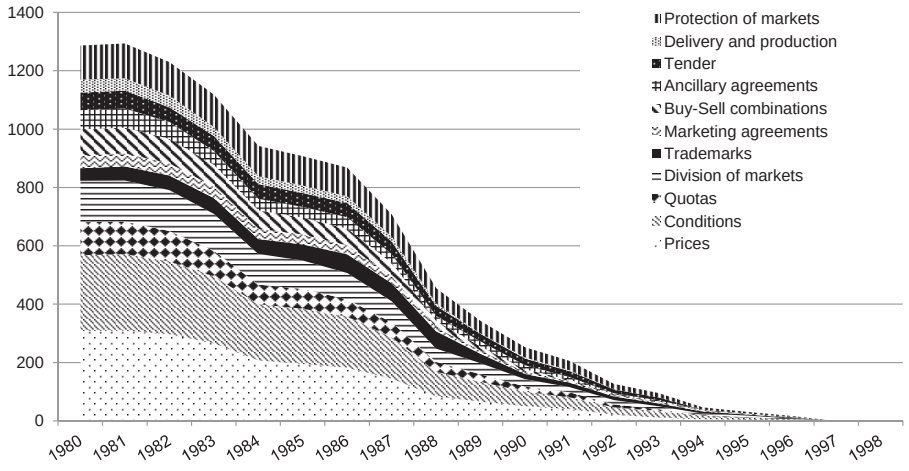


Source: Tweede Kamer and Nederlandse Staatscourant (1962-1982)

[49] The figures for 1962–82 are the average of the annual stock of registered cartels (i.e. the characteristics of a cartel is part of the analysis in each year it was registered), while after 1980 the figure refers to the average of unique cartels in the register (i.e. a cartel characteristic is taken into account only once).

[50] The figures for 1962–82 are the average of the annual stock of registered cartels, while after 1980 the figure refers to the average of unique cartels in the register.

Figure 3.3: Frequency of restrictive elements by type, 1980 – 1998



Source: Cartel register, primary data

Notes: In approximately six percent of the agreements a restrictive element is absent due to there being either no description or a meaningless description in application form.

ments were the most common types of price agreements; they appear in 45 per cent of cases in 1961 and 34 per cent in 1981 (Nederlandse Staatscourant, 1982). Figure 3.2 shows that the number of price clauses reduced by 40 per cent between 1968 and 1973, where after it increased again from 1974. This fits the general decreasing trend in the total number of agreements (see figure 3.1).

In the agreements from 1980, price clauses appear in 39 per cent of the compacts. On average an arrangement on prices comes with 1.3 other sub-agreements. Almost half (48 per cent) of the price arrangements are combined with agreements arranging conditions (e.g. selling conditions). The allocation of quotas was present in 22 per cent of price agreements. The division of markets occurred simultaneously with 21 per cent of cases with deals on prices.

After the reassessment in 1988 approximately 140 new agreements were established. The new pacts were less complex: they comprised on average 1.2 sub-agreements. Most of these arrangements approximately 44 per cent, concerned sub-agreements on trademarks (e.g. franchises). Price agreements, agreements on conditions and the protection of markets were present in approximately 12 per cent of these new compacts. The division of markets, the allocation of quotas, buy and/or sell combinations and clauses on delivery and production occurred in less than ten per cent of the agreements. Deals on vertical and horizontal prices were prohibited from 1991 and 1993 respectively. As of 1991 a mere six price agreements were submitted to the Ministry of Economic Affairs. Market sharing too was prohibited from 1994, and only three agreements were submitted that concerned the division of markets. Two of these concerned exclusive dealing.

Intensity

The primary data (1980–1998) permit us to study the intensity and persistency of agreements. We observe that the average annual number of cartel members was 210. This extremely high average might be explained by the high number of trade associations which tended to attract and facilitate more members and is therefore causing marked outliers. Also, the number of cartel members is measured as the maximum number of members mentioned in the cartel file. The median number, however, was 20, which points to a skewed distribution with marked outliers. Although comparing these data with those from other countries is highly speculative, Posner (1970) reports a mean of 29.1 participants in illegal cartels in the US. In the Swedish cartel register the mean number of members was 14.1 (median six) (Berg, 2011) and in Germany the mean was 15 (Haucap, Heimeshoff and Schultz, 2010). In new agreements, established after 1988, the mean and median number of members fell to 155 and ten respectively but from an international perspective, remained quite high.

The presence of an organising body was quite common; over half (51 per cent) of the agreements were controlled by a central organisation. Posner (1970), Hay and Kelley (1974), Fraas and Greer (1977) and Gallo *et al.* (2000), all using US data, find central organisations controlled respectively 44, 29, 36 and 23 per cent of the cartels they studied. Roughly one fourth of the new agreements after 1988 involved a central organisation, which is 50 per cent lower than over the period 1980–1998.

Various agreements involved foreign firms. We observe that 11 per cent of the agreements included at least one foreign participant. This might seem low for a small open economy such as the Netherlands. Sandberg (2016) finds that seven per cent of the Swedish registrations between 1947 and 1988 were international cartels with activities in Sweden. For the new agreements from 1988 still 11 per cent included a foreign firm in the Netherlands.

Persistency of the agreements in the register

The average duration of agreements active from 1980 was 23 years; the median duration was 18 years. International comparisons of cartel persistency are particularly risky, but compared to other studies, the duration is fairly long: i.e. the average duration is 19.3 years (median 15.8) in Sweden (Berg, 2011), 13 years in Finland (Hyytinen, Steen and Toivanen, 2011), 13.4 years (median 11) in Germany (Haucap, Heimeshoff and Schultz, 2010) and 7.2 years (median 5.5) in EU cartels (Connor and Helmers, 2007).

The Netherlands duration might be overestimated due to the fact that firms often ignored the obligation to announce a termination, although other countries which had a cartel register may have suffered from similar biases. Yet, the duration measure might also be an underestimation because some cartel files were not officially closed and in those cases the last date of correspondence is used. It is unclear which effect dominates.

3.3.5 Cartelization from a sectorial perspective

The Netherlands legislation followed the abuse principle, which meant that the WEM only prohibited cartels once it was clear that these ran counter to the public interest. It appears that the abuse legislation and the emerging competition policy provided a fruitful basis for cartel agreements. Van Muiswinkel, Vredevoogd and Van der Wilde (1977: 158) claim that the products bought by the Dutch consumer were cartelised from A to Z. Meaning that each product was subject to cartelisation somewhere in the supply chain. This section describes the industries in the Dutch economy that were cartelised.

The period 1961–1981

Table 3.2 shows the average number of restrictive agreements between 1961 and 1981, the number of cartels in 1961, 1971 and 1981 and the two most popular sub-agreements per industry during the period 1961–1981.

Whereas traffic/transport and retail show a significant upward trend in the number of recorded agreements over the period, most of the manufacturing industries show a downward trend from 1961 until 1981. The vast majority are concerned with hard core restrictions such as prices, quotas and market sharing.[51] Agreements on conditions were also relatively popular. Tender agreements were relatively popular in the construction industry, the wood and furniture industry and mechanical engineering. Exclusive dealing was prevalent in the retail industry and in 'other metal' industries.

Table 3.2: Dutch registered cartels classified by industry (1961; 1971; 1981) and two most common restrictive elements

Industry	1961	1971	1981	Most common restriction	Second most common restriction
Wholesale	152	126	102	P	C
Other metal	74	39	58	P	ED
Chemicals	72	55	29	P	MS
Ceramics, glass and plaster	65	49	36	MS	P
Foods and stimulants	54	48	39	P	MS
Graphics and publishing	45	45	20	P	C
Other industrial	43	37	29	P	MS
Textiles	32	11	10	P	C
Paper	29	31	16	P	C
Electro technical	27	12	7	P	C
Traffic/transport	26	53	48	P	MS
Construction	26	30	32	T	P

[51] Following OECD guidelines we define price fixing, bid-rigging, output restrictions and market division (sharing) to be hard core restrictions (OECD, 1998).

Table 3.2: Dutch registered cartels classified by industry (1961; 1971; 1981) and two most common restrictive elements (*continued*)

Industry	1961	1971	1981	Most common restriction	Second most common restriction
Handicrafts	26	21	25	P	O/C
Retail	24	26	55	P	ED
Mechanical engineering	21	20	19	P	T
Insurance	20	19	24	P	C
Wood and furniture	19	22	22	P	T
Banking	14	14	12	P	O
Shoes and clothing	8	9	5	P	C
Metal	7	6	4	P	C
Agriculture	6	8	14	MS	P
Leather and rubber	5	5	4	C	P
Other	4	14	15	P	C
Electricity, gas and water pipes	3	3	3	O	O

Source: Tweede Kamer and Nederlandse Staatscourant (1962–1982).
Notes:
Ranked by number of agreements in 1961.
The top two restrictions are based on the average presence of these restrictions from 1961–1981.
P= prices; C= conditions; ED= Exclusive dealing; T= Tender; MS= Market sharing; O=Other.

The period 1980–1998

Table 3.3 provides an overview of the total quantity of agreements in 1981, the number of agreements from 1980 onwards and the two most popular restrictions per NACE industry.

Taken together, the data show that in the Netherlands between 1961 and 1998, the wholesale, retail, construction, food, beverages and tobacco and non-metallic mineral (or: ceramics, glass and plaster) industries contained the greatest number of reported agreements, and are thus most represented in tables 3.2 and 3.3. By contrast, in the second half of the twentieth century agriculture and the rubber and plastics industries tended to have fewer cartels in the Netherlands.[52]

We also find some overlap with the pattern of cartelisation in Finland and Sweden – both small and open economies such as the Netherlands – over the same period (Fellman and Shanahan, 2011; Sandberg, 2016); although reliable comparisons are difficult. In these countries, both the retail and wholesale sector were ranked first and second in terms of cartelisation. Transport, food production and the metal industry appear in the third, fifth and sixth place of the most heavily cartelised sectors in Finland (Fellman and Shanahan, 2011).

[52] Due to the classification of industries, there are some minor discrepancies in smaller industry sectors. Leather, for example, was classified as part of the textile industry in table 3.3 whereas it was recorded as part of the rubber industry in table 3.2.

Table 3.3: Dutch registered cartels classified by NACE industry 1980–1998

Industry	1981	1980 –'98	Most common restriction	Second most common restriction
Retail trade; repair of household goods	91	184	TM	P
Wholesale and commission trade	128	141	C	P
Other non-metallic mineral	84	97	P	Q
Construction	50	85	T	PRT
Transport and storage	68	80	P	MS
Food, beverages and tobacco	50	57	C	P
Financial intermediation	34	46	P	C
Renting of m&eq and other business activities	18	39	C	P
Metal	29	38	T	P
Chemicals and chemical products	33	35	P	C
Pulp, paper, printing and publishing	24	28	P	C
Other community, social and personal services	13	25	P	C
Machinery, nec	23	25	T	P
Wood and products of wood and cork	15	16	T/Q	
Mining and quarrying	11	15	P	Q
Hotels and restaurants	8	15	TM	P / C
Textiles, leather and footwear	14	14	C	P
Manufacturing nec; recycling	13	13	C	P
Real-estate	9	12	P	C / MKT
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of fuel	5	10	C/ P	
Agriculture, hunting, forestry and fishing	7	9	Q	P / C / MS / T
Transport equipment	5	6	P/ C	
Education	3	6	P	C / TM
Rubber and plastics	5	5	P	PRT

Source: Cartel register.
Notes:
NACE industry classification refers to the statistical classification of economic activities in the European Community.
Ranked by number of agreements from 1980–1998.
Only industries containing 5 or more agreements were adopted in this table.
P= prices; C= conditions; Q= quotas; PRT= Protection of markets; T= Tender; MS= Market sharing; TM=Trademarks; MKT=Marketing agreements.

In Sweden food production, engineering industry and manufacture of engines are being ranked third, fourth and fifth (Sandberg, 2016).

Compared to the cartelised industries in Germany, we notice that the building materials, as well as the construction industry were relatively cartelised (Haucap, Heimeshoff and Schultz, 2010). Together these two sectors accounted for 30 and 43 per cent of the legal and illegal cartels (excluding wholesale and retail industries) in that country. We observe

an aggregated rate of 18 per cent of the cartels active in the building materials and the construction industries after 1980 (including the wholesale and retail industries). Connor and Helmers (2007) find an aggregate rate of 14 per cent in those two industries in Europe. The Australian register, however, finds quite a low rate of agreement in the building materials industry; less than one per cent.

The road motor vehicles industry in Australia, on the other hand, was ranked first with 17 per cent of all the recorded agreements (Fellman and Shanahan, 2011). In Connor and Helmers (2007) the chemical intermediates contained most cartels; around 18 per cent of the sample. Despite international differences as regards the prevalence of cartels in various industries, we notice that cartelisation abroad prevailed in the entire economy. Obviously differences in the nature of the economies, as well as the legislation may contribute to differences in the degree of cartelisation recorded in various industries in each country.

Nature

When we look at the nature of the restrictive elements, we see that prices and conditions remained the most popular restrictions within most industries. Yet, prices were ranked as the most popular element in table 3.2, whereas in table 3.3 the popularity of conditions increased. We observe a slight shift away from hard core agreements after 1980. Typically, tender agreements in table 3.3 occur in the same industries as in table 3.2 (i.e. wood and cork, machinery and construction).

Intensity

The existence of a central organising body or association was relatively common in 'construction', 'pulp, paper, printing and publishing', 'wood and cork', 'textile', 'manufacturing not elsewhere classified (nec)', 'agriculture' and 'machinery not elsewhere classified (nec)'. Three out of four industries that most commonly arranged tender agreements were part of this group (i.e. 'wood and cork', 'machinery' and 'construction'). It is likely that tender agreements would require some form of central body as the coordinating agent for the interests of the participating parties. It might also suggest that these industries engaged a lot with one customer (i.e. the government) to build or construct public infrastructure or housing.

Agreements involved a relatively high presence of foreign firms in the industries: 'chemicals and chemical products', 'pulp, paper, printing and publishing, 'financial intermediation', 'textiles, textile, leather and footwear' and 'mining and quarrying'. The number of participants differs between the industries. Manufacturing industries usually included fewer participants in their agreements, whereas agreements in 'real estate activities', 'sale, maintenance and repair of motor vehicles and motorcycles' and 'transport equipment' included many participants. The latter coincides with a relatively high degree of organisation. Industries involving a relatively high number of organising bodies, tend to include more members per agreement.

3.4 The competition law of 1998

The Netherlands Competition Authority (NMa) and its associated Competition Law came into effect in 1998, ending the cartel register. Figure 3.1 may suggest the number of cartels was reduced to zero in 1998. In fact, the correspondence between the ministry and firms was closed in 1998 but actual cartelisation and the incentive to engage in anticompetitive behaviour was still present.

As a transition from the WEM to the Competition Law, firms could file a request for exemption for their cartel. From 1998 until 2004 the NMa assessed whether the applications were compatible with the new Competition Law. These exemption requests thus serve as an indirect measure of the intended continuing degree of cartelisation from 1998 to 2004.

A total of 315 exemption requests were filed over the six years, of which 276 were ruled ineligible, meaning that there was an intention to initiate or to continue with otherwise prohibited cartels. A mere 39 requests were granted. The healthcare industry filed the most requests – over 100. This outlier can be explained by a change of legislation in 2004, when the healthcare industry became subject to competition and this triggered a rush to claim exemption. Firms in the construction industry, for example filed 19 fruitless exemption requests and those in the manufacturing industries filed 25 exemption requests, of which only seven were granted. Comparing the exemption requests with the number of agreements from the register indicates that at least 18 per cent of the agreements recorded from 1980 to 1998 requested exemption. This implies that the degree of cartelisation was not actually zero in 1998, as suggested in figure 3.1.

Connor and Helmers (2007) show the number of fines, the sum of the fines and the number of cartel recidivists in a number of European countries from 1990 until 2005. Although Germany has the highest number of cartel recidivists and sum of fines, the Netherlands still ranks relatively highly on these aspects and has the highest number of fines (14). Whether this is a result of an active and stringent competition authority, or a lack of awareness of the new legislation is unclear (see also Van Sinderen and Kemp, 2009).

3.5 Discussion

This chapter reveals an important era of registered cartelisation in the Netherlands that existed across the twentieth century. Measured by registered agreements, the degree of national cartelisation in the Netherlands was relatively high in the 1950s, 1960s and 1970s. Most of the Netherlands' cartels used a specific instrument to increase profits: price agreements. The cartels themselves appeared to be highly resilient and organised. A more stringent cartel policy that began in the late 1980s coincided with a reduced number of registered agreements (e.g. persistency), a reduced participant intensity and central organisation and

less severe cartelisation. Compared to other studies, we observe that the duration, degree of organisation, international scope and number of participants was high in the period 1980–1998, and cartelisation was widespread through multiple sectors.

What was popularly regarded as a 'cartel paradise' through the second half of the twentieth century concluded as an anti-cartel regime by the end of the century – but with the real possibility that many cartels still operated. The question remains whether the cartel paradise was ended by the introduction of the prohibition legislation in 1998? The register, being a proxy for cartelisation, illustrates a smoothly fading paradise and not an absolute turning point in 1998.

One might assume that the intensity and incentive for firms to cartelise remains more or less the same over time. Should the Netherlands be classified as a cartel paradise up until 1998, we would expect to see no severe fluctuations in the number and characteristics of registered cartels. However, from late 1980s, the registered number of agreements reveals that fewer agreements were in operation or announced and they were less severe. Changing legislation and a changing attitude might explain the smooth disappearance of the paradise measured by registered cartelisation in the late 1980s (Petit, Van Sinderen and Van Bergeijk, 2016). Yet, the desire to cartelise remained intact, as illustrated by the high number of declined exemption requests after 1998. Hence, it is unlikely that the deeply rooted habit to cartelise disappeared in 1998. Perhaps the seemingly lost paradise was regained underground?

3.6 Appendices

Appendix 3.1

Table 3.4: Primary data compared to secondary data

	Primary data – Original files	Secondary data – Annual reports	Discrepancy %
Number of agreements 1980	680	610	–10
Number of agreements 1983	606	610	1
Number of agreements 1985	482	545	13
Number of new agreements 1980	16	23	44
Number of new agreements 1983	10	23	130
Number of new agreements 1985	16	7	–56
Number of terminated agreements 1980	7	4	–43
Number of terminated agreements 1983	61	36	–41
Number of terminated agreements 1985	35	18	–49
Number of price agreements 1980	309	371	20
Number of price agreements 1981	310	384	24
Prices 1980	309	371	20
Conditions 1980	259	187	–28
Market sharing, quotas and exclusive dealing 1980	255	203	–20
Tender 1980	61	93	52
Buy and sell combinations 1980	89	101	–13
Other 1980	314	139	–56

Sources: Cartel register (primary data), Tweede Kamer and Nederlandse Staatscourant (1960–1982) (secondary data).

Appendix 3.2

Table 3.5: Comparison of the number of cartels adjusted for exit 1989–1992

Year	Cartels	Exit	Cartels not taking into account exit	Cartels
	Primary data – Original files	Primary data – Original files	Primary data – Original files	Secondary data – Annual reports
1989	176	121	297	293
1990	132	71	324	371
1991	111	33	336	455
1992	74	51	350	468

4 Cartels and productivity growth: an empirical investigation of the impact of cartels on productivity in the Netherlands

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Abstract

Currently, there are only a few empirical studies that have studied the possible consequences of cartels on productivity growth. Empirical insights about cartels would be critical for competition authorities to examine and legitimize their own policies. Until 1998, the Netherlands had a permissive attitude towards cartels – cartels were required to register. The Netherlands' cartel register provides an opportunity to study the effects of cartelization on productivity growth. By using cartel and industry data on productivity growth, we estimate the impact of cartel formation, cartel presence, and cartel termination on the total productivity growth in the Netherlands between 1982 and 1998. Our research results suggest that cartel presence, indicated by registration status in the cartel register, indeed curbs productivity growth.

4.1 Introduction

Although many economists acknowledge the detrimental effects of cartels on productivity, there is only a scarce amount of empirical studies, which closely examine the possible consequences of cartels on productivity growth. Levenstein and Suslow (2006a: 84) state, "*Perhaps the least studied, but most important issues are the effect cartels have on investment and productivity*." The lack of reliable cartel data in time series likely contributes to the scarcity of empirical studies on cartels. The vast majority of today's cartels are unknown due to their illegal and secret nature. The "unsuccessful" cartels may be more likely to be

detected, whereas the more interesting and successful ones may be more likely to remain hidden. Studies including only detected cartels, hence, would yield biased results at best. The Netherlands' cartel register provides a solution to this sample selection bias. Until 1998, the Netherlands had a permissive attitude towards cartels. From 1941 to 1998 cartels were registered in a database, the so-called "cartel register." Since most of the cartels were permitted in this era, the cartel register provides a reliable set of data to study the economic impact of cartels in sectors, in which cartels were common practice. In this study, we use the cartel register to look into the empirical relationship between cartels and productivity.

Productivity growth is an important economic goal. Porter (2001: 922) states, "*productivity growth (…) is the single most important determinant of long-term consumer welfare and a nation's standard of living.*" Competition enforcement encourages consumer welfare and productivity growth. Nevertheless, the question arises, whether competition enforcement and regulatory measures actually result in increased productivity (see for instance: Van Sinderen and Kemp, 2008; Buccirossi *et al.*, 2013). Our study contributes to the literature on the effect of cartelization on productivity growth. In this study, we analyze how the legal registered cartels affected productivity growth in the Netherlands. By using cartel and sector data on productivity growth, we estimate the impact of cartel formation, cartel presence, and cartel termination on the total productivity growth in the Netherlands between 1982 and 1998. We take into account only those cartels that were active after 1981. As of 1982, cross-section productivity data is available for the Netherlands (Buccirossi *et al.*, 2013).

The Netherlands was not unique in its permissive attitude towards cartels before the standardization of competition law in the European Union (EU). Several other countries had the same policy and also have had similar cartel registers. Fölster and Peltzman (1993), for example, analyzed the Swedish cartel register to study the effect of cartels on productivity. Berg (2011) used the Swedish register to study institutional design and characteristics of cartels. Hyytinen, Steen, and Toivanen (2011) used data of the Finnish cartel register of manufacturing industries between 1951 and 1990 to estimate the actual population of cartels using the Hidden Markov model. Fellman and Shanahan (2011) also conducted a comparative analysis of Finland's and Australia's cartels after World War II. They concluded that the cartel registers bridged the transition from excessive competition to fair competition in these world economies. In addition, Haucap, Heimeshoff, and Schultz (2010) studied the dataset of legal and illegal cartels from 1958 until 2004 in Germany. Most of these studies of cartel data, however, mainly describe cartel characteristics. Research on the impact of cartels on sector productivity growth is scarce, and this study attempts to contribute to this body of literature.

The paper is organized as follows. Section 4.2 provides a brief overview of the existing literature on cartels and productivity growth. Section 4.3 specifies our theoretical framework. Section 4.4 describes the content of the cartel register in the Netherlands. This data of the register will be used to estimate the impact of cartels and cartelization on productivity

growth. The data and summary statistics are presented in Section 4.5. Section 4.6 presents the estimation results. Part VII concludes and proposes recommendations for future research.

4.2 Literature

A common view held by economists is that competition drives productivity growth through innovation in products, processes, and methods of management (see for instance: Porter, 2001; Van der Wiel, 2010; Van Reenen, 2011). Nickell (1996) investigates the relationship between competition and productivity growth in the UK manufacturing industry. He finds that an increase in the price mark-up, as a measure for the level of competition, reduces the total factor productivity growth. Additionally, Disney, Haskel and Heden (2000) find that competition in terms of entry rate, exit rate, and market share growth increases both productivity levels and growth rates for labor and total factor productivity in the UK manufacturing industries. Conversely, monopolies and cartels are believed to reduce the level of competition and thereby reduce incentives for process innovation and reduce efficiency. As such, organizational slack arises, the so-called X-inefficiency. Leibenstein (1966: 412–413) claims that "*the degree of X-efficiency […] depends on the degree of competitive pressure, as well as on other motivational factors. The responses to such pressures, whether in the nature of effort, search, or the utilization of new information, is a significant part of the residual in economic growth*." Leibenstein (1966) refers to the total factor productivity or "the residual" as a contributor to economic growth. In other words, competitive pressure is, amongst others, an important driver of total factor productivity.

A few empirical studies examine the direct impact of cartels on productivity growth. Broadberry and Crafts (1992) study the productivity gap in the UK in the 1930s. They conclude that at least a part of Britain's labor productivity decline in the twentieth century can be attributed to its permissive attitude towards collusion and the limited exit of inefficient firms. Fölster and Peltzman (1993) observe a similar trend in Sweden, where cartelized and regulated manufacturing industries negatively affected productivity growth between 1976 and 1990. They attribute growth in total factor productivity to cartels, regulation, prices and market structure (that is, HHI and number of firms). They take products as their unit of observation rather than number of firms or industries. Zitzewitz (2003) finds that the US Tobacco industry experienced lower labor productivity growth during the cartelized period from 1890 through 1911 when using the UK tobacco industry as a comparative benchmark. Growth in productivity recovered after the cartel termination. Furthermore, Symeonidis (2008), through econometric analysis of cartelized and non-cartelized industries, shows the negative impact of collusion on labor productivity growth in the UK. Similarly, Günster, Carree, and Van Dijk (2011) use EU cartel data to examine how the formation and extinction of cartels affect the performance and efficiency of their member firms. They demonstrate

that productivity, defined as sales over employees, and research and development (R&D) investments are lower during the cartelized periods compared to the non-cartelized periods. Profitability appears to be higher during the cartelized period.

The effect of cartels on productivity growth is also closely connected to the enforcement of competition law. Ma (2011) finds that an efficient enforcement scheme is crucial for a competition law to support productivity in a cross-sectional analysis of 101 countries. Buccirossi *et al.* (2013) study the relationship between competition policy and total factor productivity growth in OECD countries and argue that a well-designed and well-implemented competition policy positively influences productivity growth. Their study supports that better cartel detection and enforcement would result in more competition.

Although most studies show that cartels have a negative impact on productivity or productivity growth, some argue that specific agreements between companies may favor productivity. Salin (1996: 37) claims that: *"[…] cartels exist not only, or even not mainly, in order to make resources scarcer and to increase prices, but to increase the value of production and improve productive processes."* In this line of reasoning, a cartel is seen as an efficient structure. Illustratively, Webb (1980) claims that restriction of competition through tariffs and cartels may have contributed to the productivity advances in the German steel industry around the turn of the twentieth century. In comparison to the UK, Germany's productive efficiency was higher. Regulations and cartels reduced the riskiness of capital-intensive technologies and encouraged vertical integration. Burhop and Lübbers (2009) studied the effect of cartels on the productive efficiency in the German coal mining industry during the same period. By using a stochastic frontier regression, they conclude that cartelization did not significantly affect productive efficiency.

Another argument for allowing specific cartel agreements is the reduction of risks in high-tech industries. As Baumol (2003: 54) stated, "*[a]nti-monopoly statutes should take account of the possible benefits of cooperation in technology production. Research joint ventures, research consortia, and even mergers in high-technology industries are frequently a socially optimal response to market failures that beset the production and dissemination of knowledge*." Dutch economists in the heydays of the cartel agreements used similar arguments to defend cartels. They argued that a higher producer surplus would induce investments and would therefore benefit the consumer in the long run (see for instance: Kolnaar, 2003).

The relationship between cartels and productivity growth may also be indirect, namely via innovation (Van der Wiel, 2010). The relationship between cartels and innovations appears to be non-linear. Theory and empirical evidence show that there exists an inverted U-relationship between competition and innovation (Aghion *et al.*, 2005; Van der Wiel, 2010). Excessive competition may increase the risk that one cannot extract sufficient rents from investments in innovation. In that case, competitors are either close behind, catching up or imitating innovations. Consequently, excessive competition may postpone or foreclose innovation. Conversely, if a market consists of a monopoly, there would be lower competi-

tive pressure and, therefore, lower incentive to innovate. Van der Wiel (2010) concludes that competition is a useful tool to induce productivity through innovation (see also: Aghion *et al.*, 2005). According to his research, most firms appear on the upward sloping portion of a graph displaying the relationship between productivity versus innovation, implying that innovation benefits competition. It is, however, possible that some firms are situated on the downward sloping portion, implying that more competition is detrimental for innovation. This illustrates that innovation and hence technological change and productivity growth is not exclusively achieved via perfect competition. A restriction of competition may result in a better organization of the innovation process, reduce hold-up problems and, as a result, increase productivity growth.[53]

In sum, we observe that cartels, competition and competition enforcement may yield productivity growth. Also innovation may be a mediator among cartels, competition, and productivity growth. Yet, there are circumstances in which cooperation might enhance innovation and productivity.

4.3 Specification and methodology

Section 4.3 provides the theoretical framework for productivity and how cartelization is expressed in productivity measures.

4.3.1 Theoretical framework

Overall productivity is determined by the input compared to its output. Assume Y, is the total output. Consider L and C being the input of labor and capital respectively. Equation (1) depicts output as a function of labor input and capital input.

(1) $Y = f(L, C)$

The level of productivity is often measured as the total output per unit of labor, Y/L, or labor productivity. Yet, for growth studies, the total factor productivity growth (hereafter TFP) is a common measure. TFP growth is the difference between the growth of the output and the input growth (such as labor and capital) and. Put it differently, the TFP reflects the growth of

[53] In some cases, cooperative investment or R&D cooperation may offer a solution to the (hold-up) problem of innovation. Therefore, this kind of cooperation is allowed in the EU and Netherlands Competition Law. Article 6.3 of the Dutch competition act states that there is an exemption if agreements contribute to technological progress and if a reasonable share benefits the user, without restricting unnecessary elements or exclude competition for an essential part of the goods and services.

the labor productivity, which remains unexplained by the growth in capital per unit of labor (Donselaar, 2011). Equation (2) depicts a simplified definition of labor productivity growth:

(2) $\Delta LP = \Delta (C/L) + \Delta (L_s/L) + \Delta TFP$

LP = labour productivity
C= capital
L= labour
L_s = labour services
TFP= total factor productivity

Where LP indicates labor productivity, C indicates capital, L indicates labor, Ls indicates labor services, and TFP indicates total factor productivity. Labor productivity growth is defined as a function of the growth in the capital-labor ratio (which is defined as the extra amount of capital that is provided per unit of labor), the growth of human capital (which is defined as the growth in labor services adjusted for the growth of overall labor in units), and TFP growth (for an extensive discussion and derivation of this equation see: Donselaar, 2011). TFP growth is thus characterized as a residual of the labor productivity, unexplained by either growth in capital or labor. Hence, with equal inputs, high-TFP performers produce more output than low-TFP performers.

4.3.2 Model specification

TFP growth originates at the firm level. Inefficiencies in production, for instance, due to imperfect competition or cartels, occur at the firm level of economic analysis (OFT, 2007). These inefficiencies affect productivity, which is commonly measured at industry or country level. Thus, inefficiencies at firm level contribute to aggregated TFP growth and hence, the labor productivity of an economy or industry.

This study focuses on registered cartels as a driver for or an impediment to TFP growth. More specifically, we investigate the effects of cartel formation, cartel termination, and the presence of cartels on the TFP growth. We expect that a cartel, arising from a restriction of competition, would restrict productivity growth. Competition may drive productivity growth via three mechanisms (OFT, 2007). First, cartel members may experience less competitive pressure and hence have a reduced incentive to organize production as efficiently as possible. Competition may encourage firms to cut slack in the production process and optimize the allocation of resources. Potential market entry would strengthen this incentive. Second, a cartel may keep market shares artificially high, block entry of other firms or contrarily keep inefficient firms alive, reducing productivity of an industry as a whole. Under perfect competition, efficient firms may experience natural rise in market share, whereas the inefficient firms experience decline in market share. Similarly, perfect competition would encourage entry of efficient firms and exit of inefficient ones (see for instance: Disney,

Haskel and Heden, 2000). Third, cartels may lower incentives to innovate. Considering these three mechanisms altogether, we expect the entry and presence of cartels to diminish TFP growth, whereas cartel termination increases TFP growth. Since the TFP growth directly contributes to labor productivity growth, any effects of cartelization on the TFP growth would influence labor productivity growth.[54]

In order to model the productivity effects, we use a framework similar to that of Nicoletti and Scarpetta (2003) and Buccirossi *et al.* (2013). Nicoletti and Scarpetta (2013) assess how the extent of regulation affects the TFP growth in 20 OECD countries for 23 industries between 1984 and 1998. Buccirossi *et al.* (2013) investigates how institutional and enforcement features of a competition policy affects the TFP growth in 12 OECD countries for 22 industries from 1995 through 2005. Our setting is comparable to both studies as we aim to assess the cartelization effects on TFP growth per industry. However, instead of focusing on specific competition policy and regulation indicators, we use an overall cartel variable.

Both studies employ three additional elements to explain TFP growth. First, the technology gap is measured as the relative difference between the level of the TFP leader and the industries' own TFP level (Nicoletti and Scarpetta, 2003). The rationale behind this variable is that industries that lag further behind the leader can catch up more easily with the technological frontier by adopting the leading technologies (Buccirossi *et al.*, 2013). Second, the growth of the frontier leader is defined as the growth experienced by the country that operates on the highest TFP level in that particular industry and thereby measures the "frontier shift." This variable is more short-term oriented than the technology gap. It captures the immediate effect of the growth of the frontier leader. Third, human capital is defined as the level of labor services per hour multiplied by the number of hours worked. The stock of human capital is expected to positively affect the TFP growth.

We propose also that the presence of cartelization influences TFP growth. The extent of cartelization is divided into three variables (a) cartel entry, (b) cartel exit, and (c) cartel presence. Each of these three events may have its own effect on productivity growth. We expect cartel entry to diminish productivity growth compared to periods and industries without entry. During the presence of a cartel, we expect lower TFP-growth rates compared to non-cartelized periods and industries. In these years, we expect that firms experience less pressure to produce efficiently as possible. In the year that the cartel is terminated, we expect a recovery in the TFP growth rate, relative to industries and periods without cartel exit, due to the newly introduced competition.

We control for industry fixed effects by using a fixed effects panel regression. A fixed effects regression absorbs the industry-specific effects, making the industries become cross-sectional comparable. Furthermore, time dummies are included in order to correct for year-specific effects. By adopting time dummies, we correct for macro-economic effects,

[54] The weight of the TFP growth as a contributor to the labor productivity growth equals one.

which are applicable on all the industries.[55] We opt for robust standard errors in order to correct for heteroscedasticity. Our regression model is specified as follows:

$$\Delta \ln TFP_{it} = \beta_0 + \beta_1 \, (technology\ gap_{it-1}) + \beta_2 \, (\Delta \ln TFPLeader_{it}) + \beta_3 \, (human\ capital_{it}) + \beta_4 \, (cartel\ entry_{it}) + \beta_5 \, (cartel\ exit_{it}) + \beta_6 \, (cartel\ presence_{it}) + industry\ fixed\ effects_i + time\ dummies_t$$

Cartels are, in studies on productivity growth, often considered independent of the prevailing state of productivity. This may be subject to criticism since one may face the risk of endogeneity. Eckel (1968) argued that cartels are "*Kinder der Not*" (or "Children of Misery"), meaning that lagging productivity may induce cartelization for self-preservation or recovery. Crises, reduced demand, or overcapacity, for instance, may induce cartelization. Empirical research shows mixed results. Levenstein and Suslow (2006a) demonstrate that six of the sixteen studied cartels were formed during an economic downturn. Fölster and Peltzman (1993) find that 90 percent of the cartels were formed during a period of low output growth. Conversely, Hyytinen, Steen, and Toivanen (2011) find that positive GDP shocks positively affect cartel formation. In our analysis, we check for possible endogeneity by regressing the gross output growth on cartel formation.

4.4 The cartel register of the Netherlands

4.4.1 Background

Today, anticompetitive behavior and cartels are prohibited in most countries. Nevertheless, cartelization was a norm and even encouraged in some historical periods. Fear claims that cartels historically provided a form of social policy, risk management, and economic development (Fear, 2006). According to Fellman and Shanahan (2011: 4), "[d]*uring the 1930s depression some countries accepted cartels as a valid response to the devastating economic situation.*" The Netherlands experienced the same. The Business Agreements Act introduced in 1935 in the Netherlands was initiated to enhance and support cooperation among entrepreneurs and organizations. Asbeek Brusse and Griffiths (1998: 16) claim that "[i]*ts main aim was to curtail the deleterious effects of excessive (domestic) competition on prices and employment*." Dutch firms were highly involved in cartels; the Netherlands was even referred to as the "cartel paradise" by De Jong (1990). Illustratively, van Muiswinkel, Vredevoogd and Van der Wilde (1977) state the products bought by the Dutch consumer were cartelized from A to Z. During the so-called "abuse system" from 1935 through 1998, the policy of

[55] Illustratively, the wage reductions in the Netherlands during the 1980s are often mentioned as a cause of lagging productivity growth. By adopting time-dummies, these macro effects are absorbed and do not require further specification.

the Netherlands became gradually congruent with the policy of the EU. Cartels with an international dimension became prohibited with the establishment of the EU. Price fixing and market sharing became prohibited as well in the 1990s. It was only since 1998 with the introduction of the Competition Law that the Netherlands regime adopted prohibition principles instead of the abuse system. The establishment of the Netherlands Competition Authority was necessary in order to enforce the competition law.

4.4.2 Limitations and opportunities

During the abuse system, the Ministry of Economic Affairs required cartels to be registered in a cartel register.[56] The cartel register data covered a considerable number of years— the period from 1941 to 1998 contains over 2000 cartel registrations.[57] Despite the enormous scope and level of detail of the dataset, the cartel register is not without limitations. The first involves the application on today's situation. Cartelization effects found from before 1998 cannot be said to be directly indicative of cartelization effects today. For instance, communication and coordination among competitors were permitted during the period of the cartel register. There may have been lower barriers for cartels to organize during this period. The second limitation regards the geographical scope of the agreements. Most of the registered agreements were domestic. The Netherlands provided exemptions to competition law for agreements that were applied abroad. Foreign firms were required to register if they did business in the Netherlands (Edwards, 1967); however, export agreements were exempted from reporting. The third limitation is that the competition policy under the "virtually dormant" Economic Competition Act (Wet Economische Mededinging), as Asbeek Brusse and Griffiths (1998) call it, was in large part reactive. An unknown number of cartels may have not registered due to the low awareness of the registration process among firms. De Jong (1990) estimates that a mere 50 percent of the cartels were registered during this period. Fines for non-application were rather low (maximum of 10.000 guilders) and the chance of detection was almost zero (De Jong, 1990). A fourth limitation concerns the informal nature of the competition policy in the Netherlands. Despite the existence of formal bodies such as the Economic Surveillance Authority and the Committee of Economic Competition, most of the complaints or disputes were resolved through internal discussion between civil servants and firms, without the intervention of the institutions (SER, 1994).[58] Van der Weijden (1981), chairman of the Committee of Economic Competition, stated that cases of dissension were

[56] It should be noted that some cartels in the Netherlands were prohibited under the EU legislation.

[57] Since cartelization was permitted, occasionally encouraged and moreover registered in detail, the risks of type I (false positives) and type II (false negatives) errors remain rather limited within this sample. Moreover, a cartel application is unmistakably a cartel (type I) and non-applicants did most likely not participate in a cartel (type II).

[58] Commissie Economische Mededinging (CEM) in Dutch.

resolved indoors with the relevant parties to avoid incriminating the Ministry of Economic Affairs. The implication is that some important amendments may not have been included in the cartel dataset. The fifth limitation is that policy changes in the nineties, as a precursor to the Competition Law, created biased number of notifications. Various types of agreements became prohibited in the 1990s. Among others, vertical price agreements were prohibited in 1991, horizontal price agreements in 1993, and market sharing agreements in 1994.[59] Another policy change concerns exemption of notification. From 1987 several agreements were exempted from notification (Bervoets, 2000).[60] Furthermore, a registration bias as firms anticipated the new competition law may have affected the data just before 1998. The Competition Authority may have paid extra attention to the firms that initiated an agreement and registered accordingly. This behaviour may have reduced the incentive to register. Finally, the risk of underreporting remains, especially due to missing files. Underreporting may have been limited, since the documentation process was confidential. Underreporting due to possible publicity is not expected to be an issue. The latter risk could be minimized as well, the cartel administration was stored altogether in a public archive.

4.5 Data

In the regression analysis, we investigate the period from 1982 through 1998. Both the (lagged) TFP levels and growth rates are available for the EU peer group as of 1982. The analysis includes 1998, the year the Netherlands competition authority was established and the new competition law outlawed cartels. We observe that the existing literature frequently addresses the effects of manufacturing and servicing. We consider the two distinct effects in our regression analysis. The coefficients for the technology gap, the growth of the TFP leader, and cartelization are estimated separately for manufacturing and non-manufacturing indus-

[59] More precisely, the 1951 Introduction Suspension of Business Regulation Act (to suspense agreements that were in conflict with public interests); the 1964 Prohibition collective resale price maintenance and prohibition resale price maintenance agreements for multiple durable consumer goods; the 1986 Introduction of a ban against certain tender practices in the building industry (initially proposed in 1953); the 1991 General prohibition against vertical price agreements; the 1993 Prohibition horizontal price agreements; and the 1994 Prohibition market sharing agreements and collusive tender agreements became prohibited.

[60] (1) Agreements with duration less than one month, which will not be continued; (2) agreements that do not arrange economic affairs other than joint purchasing or purchase combinations (without price agreements regarding sales), international transport, agreements arranging obligations for a single supplier to deliver merely to a single buyer, obligations for a single buyer to merely buy from a single supplier or obligations for an intermediary to act as an agent of merely one principal, export cartels containing elements which are not relevant for the Netherlands, competition agreements regarding employment contracts (prohibiting employees after dismiss to switch to a competitor); (3) agreements that are approved or which are monitored by the healthcare legislation.

tries. For the purpose of our analysis, we use the ISIC Revision three classifications for 32 industries. We exclude non-competition industries such as public administration, defense and compulsory social security; education; health and social work; private households with employed persons; and extra-territorial organizations and bodies. Appendix 4.1 (table 4.4) lists the 27 industries that are subject to analysis. We match the cartel data to 27 industries. Due to availability of data, we do not analyze productivity growth on a more detailed level.

4.5.1 Dependent variable: Productivity

TFP growth, as discussed in section 4.3, is our dependent variable. We use EU KLEMS panel data for 27 industries for the period from 1982 through 1998. Appendix 4.2 (figure 4.3) shows the performance of the 27 industries in the Netherlands by TFP growth.

We calculate TFP growth under neoclassical assumptions of constant returns and perfect competition. We investigate cartelization, which can be considered a restriction of (perfect) competition. Alternative methods to correct for this bias exist (see: Balk, 2010; Buccirossi *et al.*, 2013). However, even in the case of no perfect competition, TFP growth is able to reflect technological development under certain circumstances (Donselaar, 2011). For instance, if companies are not making monopoly profits and there are constant returns to scale on a macro-economic level, there can be TFP growth, as Donselaar (2011) argues. In addition, one may argue that restrictions adopted by the cartel register do not necessarily result in monopoly profits. Therefore, the TFP, as calculated in equation (2), would still be able to reflect the actual TFP.

4.5.2 Independent variable: cartels

We use various factors from the cartel register data as inputs. The National Archives of the Netherlands digitalized the files of the cartel register.[61] The cartel files are classified by industry, entry date, exit date, number of involved firms, their names, location, and a brief description.[62] For the purpose of our analysis of productivity, we selected a sample of these cartel agreements. We selected those cartels that were active after 1981 for which the time series of productivity panel data is available. For the purpose of our cartel variable we omitted observations with a similar beginning and ending year according to the National Archives.

We specified an additional variable to capture the nature of the cartel, such as price fixing, allocation of quotas, tender agreements, agreements on discounts and conditions, buyer and/or seller combinations, among other characteristics. We excluded franchise agreements because they mainly concerned the use of a specific brand or label from the dataset. Other agreements related to trademarks, such as agreements regarding licenses,

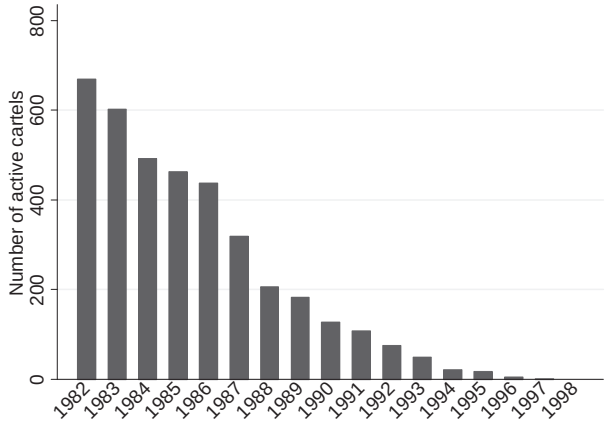
[61] The hardcopies covered 109 meters of shelve space.

[62] The researchers did a cross check on the industry classification, entry date and exit date.

dealerships, and joint ventures, were kept as a cartel observation. Most of the joint ventures dealt with market division and cooperation. Dealerships and licenses often included recommended prices and non-competition clauses (that is, requirements for geographical establishment). The exit dates reflect the closing date as specified by the National Archives. Ideally, one would use the actual termination date of the cartel. Yet, this information is rather hard to obtain from the cartel file, if mentioned at all. We use the entry date from within the file, which reflects when the cartel was formed, and the exit date, which implies the closure of a cartel file such as specified by the National Archives.

It can be stated that the cartels adopted in our analyses were certainly cartels: that is, the risk of type 1 errors (false positives) is limited. Type 2 errors (false negatives) may exist. Some cartels might have been active that were not registered. These observations will not appear in our dataset. Furthermore, some cartels may concern more than one industry, for instance in the case of vertical agreements. In these cases, the cartel appears as an observation in both industries. Figure 4.1 depicts the development of the number of active cartels in the Netherlands. Overall, we observe a declining trend in the number of active cartels from 1982 until 1998.

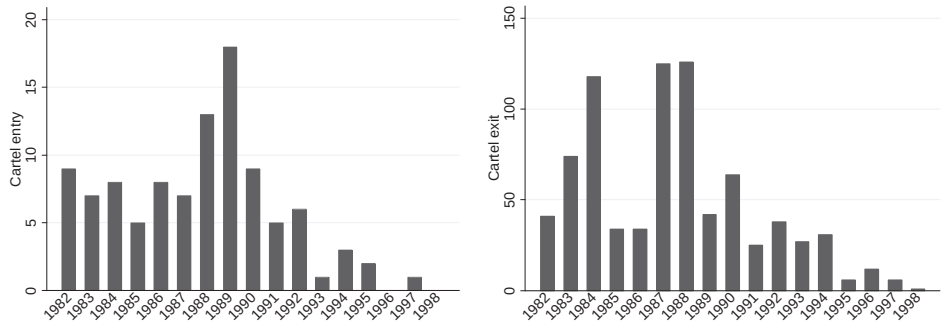
Figure 4.1: Number of active cartels in the Netherlands from 1982 until 1998



Source: Cartel register

Figure 4.2 illustrates the extent of entry and exit of cartels in the Netherlands from 1982 until 1998. The left hand side of figure 4.2 depicts cartel entry. On average five cartels a year were established during the period 1982 until 1998. Most of the cartel entries occurred in the non-manufacturing industries, approximately 80 percent. Cartel exit is depicted on the right hand side of figure 4.2. We observe three outliers in this graph. In 1983 and 1987 the cartel register was re-examined. This meant that all the registered cartels were approached and those that were terminated were deleted of the cartel register, this leads to peaks in cartel

Figure 4.2: Cartel entry (l.h.s.) and cartel exit (r.h.s) in the Netherlands from 1982 until 1998



Source: Cartel register

exit. As stated previously, we are unable to accurately determine the termination date of the cartels. Supposedly, this distortion will influence the estimation results and consequently diminish the effects of cartel exit.

In our analysis, we have three cartel variables. Firstly, we look at cartel formation in an industry. It is examined whether there was a cartel entry in an ISIC industry in a specific year. Our second cartel variable is cartel termination. Cartel termination is measured as a cartel exit in an ISIC industry in a specific year. Both, cartel entry and cartel exit are defined as dummy variables where an entry or exit has the value 1. Thirdly, cartel presence is constructed as a dummy variable, which equals 1 in periods with at least one cartel present and 0 otherwise.[63]

4.5.3 Independent variables: control variables

In addition to our cartel variable, three variables are included in the regression. These are: (i) the technology gap between the TFP frontier leader in the EU and the corresponding Netherlands industry; (ii) the TFP growth of the TFP frontier leader in the EU; and (iii) the stock of human capital in the corresponding industry. The former two variables have an international dimension. They are constructed with industry level data for various countries in the EU. It is assumed that the performance of industries abroad influences the performance of the industries in the Netherlands. We selected a peer group of countries in the EU for which growth accounting could be performed as of the 1980s. Our peer group includes Austria, Belgium, Denmark, Finland, France, Germany,[64] Italy, Spain, the UK, and the Netherlands.

[63] The starting year of a cartel changes the cartel dummy into 1, whereas the ending year of a cartel makes the cartel dummy zero.

[64] Germany, which is an important neighbour country of the Netherlands, is part of the peer group after 1991.

In order to calculate the technology gap, the absolute TFP levels are required. EU KLEMS data is not sufficient to calculate the TFP levels, since EU KLEMS only provides index numbers of the growth levels per industry per country (1995 = 100). The GGDC (Groningen Growth and Development Centre) database provides complementary and compatible data to EU KLEMS. The dataset contains the TFP levels in 1997 relative to a common reference point (which is the United States). By applying the EU KLEMS growth rates on the GGDC levels we obtain the TFP levels.[65] Consequently, one can identify the TFP leader per industry per year and the relative distance of the Netherlands to this leader. The TFP growth of the TFP frontier leader is simply determined by the growth of the country that has the highest TFP in a specific year and industry. The stock of human capital of the corresponding industry is constructed by EU KLEMS and calculated as a quantity index per hour of different labor types (for example, high-skilled, low-skilled, etc.) multiplied by the number of hours worked. The weights in this aggregation process reflect the average share of each type of labor in the total labor compensation (Koszerek, Havik, Mc Morrow, Röger and Schönbor, 2007).

4.5.4 Summary statistics

Table 4.1 summarizes the cartel entry, exit, and presence variable. From table 4.1, it follows that cartel exit occurred more often in our period of scrutiny than cartel entry.

Table 4.1: Summary statistics of the year-industry cartel entry and exit dummy (0 ≠ cartel entry/exit/presence; 1=cartel entry/exit/presence) 1982–1998

Variable	Obs	Mean	Std. Dev.	Min	Max
Dum cartel entry	459	.15	.36	0	1
Dum cartel exit	459	.48	.50	0	1
Dum cartel presence	459	.65	.48	0	1

Source: Cartel register.

Table 4.2 presents the average TFP growth in three different settings. First, the average TFP growth is presented for the cartel entry periods compared to the periods with no cartel entry. In years with cartel entry, the TFP growth is lower than years without cartel entry. This indicates that cartel entry has a negative effect on productivity growth. Second, the average TFP growth is presented for the cartel exit periods and the periods without cartel exit. Years with cartel exits show on average higher TFP growth rates; the exit of a cartel has a positive

[65] We used the single deflated TFP figures for 1997. Another option is the use of double deflated TFP figures, this is an improved technique. Although this latter technique has an improved point estimate, its standard errors (particularly on more disaggregated levels) are larger. Since we look at industry level, we chose single deflation. The TFP levels of GGDC were aggregated for the retail and wholesale industries. Yet, the TFP growth figures are at a lower level. We applied the aggregated TFP level figures on the underlying three sub industries. See: Inklaar and Timmer (2008).

Table 4.2: Summary statistics of TFP growth (sorted by cartel entry; cartel exit; cartel presence) 1982–1998

Entry	**0 (no entry)**		**1 (entry)**	
	Obs.	Average	Obs.	Average
ΔlnTFP	388	.008	71	.001
Exit	**0 (no exit)**		**1 (exit)**	
	Obs.	Average	Obs.	Average
ΔlnTFP	237	.003	222	.011
Presence	**0 (no presence)**		**1 (presence)**	
	Obs.	Average	Obs.	Average
ΔlnTFP	160	.002	299	.010

Sources: Cartel register, EU Klems.

effect on the productivity growth. Finally, we examine the average TFP growth differences for periods where there is a cartel present and periods where no cartels are present. Years with cartel presence show on average higher TFP growth rates than no-cartel years. This is contrary to our expectations. The means of all three settings are, however, not significantly different from each other at a 5 percent level of significance.

4.6 Empirical results

This section presents the results of our fixed effect panel estimation (see appendix 4.3 for the correlation matrix). In table 4.3, regression (1) represents the baseline model where the TFP growth is explained by the technology gap, the growth of the frontier leader, the stock of human capital, the entry of cartels, the exit of cartels and the presence of cartels.[66] We observe a significant positive effect of the technology gap. This is in line with our expectations. If an industry is further behind the frontier leader, it will experience higher growth rates. The growth of the TFP leader positively influences the TFP growth of the Netherlands industries. However, the variable is insignificant. Human capital enters positively but is insignificant as well. The cartel entry dummy (Dum cartel entry) indicates that the presence of at least one cartel entry negatively influences the TFP growth in an industry, yet its significance exceeds the 10-percent level. The cartel exit dummy (Dum cartel exit) enters positively; this indicates that cartel exit positively influences the TFP growth. Nevertheless, this variable is

[66] We checked for possible endogeneity between cartel formation and the economic fluctuations by estimating a simple fixed effects regression of the gross output on cartel formation. The growth of the gross output per sector does not significantly influence cartel formation. Hence, endogeneity is not considered an issue.

Table 4.3: Regression of TFP growth in the Netherlands 1982–1998, results of fixed effects panel regression with robust standard errors

ΔlnTFP	(1)	(2)	(3)
Technology gap	.04**		
Technology gap manufacturing		.05***	.05***
Technology gap non-manufacturing		.02**	.02**
ΔlnTFPLeader	.06		
ΔlnTFPLeader manufacturing		.01	+.00
ΔlnTFPLeader non-manufacturing		.20	.20
Human capital	+.00	+.00	+.00
Dum cartel entry (1= entry; 0 = no entry)	−.00	−.01	−.01
Dum cartel exit (1= exit; 0 = no exit)	+.00	+.00	+.00
Dum cartel presence (1= present; 0 = not present)	−.02**	−.02***	
Dum cartel presence (1= present; 0 = not present) manufacturing			−.03**
Dum cartel presence (1= present; 0 = not present) non-manufacturing			−.02**
R^2 within	0.10	0.11	0.11
# observations	459	459	459
# groups	27	27	27
F	14.84	74.79	70.97
Prob > F	0.000	0.000	0.000

Notes:
In this table, * denotes significance at the 10-percent level, ** at the 5-percent level, and *** at the 1-percent level. Regression (1) uses base model. Regression (2) shows technology gap and growth of frontier leader controlled for manufacturing and non-manufacturing industries. Regression (3) shows results controlled for manufacturing and non-manufacturing for the technology gap, growth of the frontier leader, and cartel presence. Robust standard errors are used in all regressions. All equations include yearly time dummies and industry fixed effects.

insignificant as well. Finally, cartel presence (Dum cartel presence) enters negatively and significant. This indicates that a cartel presence led to a 2 percent reduction of TFP growth.

Regression (2) makes a distinction between manufacturing industries and non-manufacturing industries as regards the technology gap and the growth of the frontier leader. Nicoletti and Scarpetta (2003), find for instance a more rapid catch-up effect in servicing industries. These sectors were able to adjust faster. Bernard and Jones (1996) suggest that this might be due to the greater heterogeneity in the manufacturing industries, which consequently experience a lower catch up rate. Hence, we allow for different slopes between manufacturing and non-manufacturing industries. We observe a more rapid catch-up effect in manufacturing industries than non-manufacturing industries. This contradicts both results of Nicoletti and Scarpetta (2003) and those of Bernard and Jones (1996). Conversely, the coefficient of the growth of the TFP leader is higher for non-manufacturing industries. We observe that the signs and magnitude of the cartel entry, exit and presence dummy remain unchanged.

Regression (3) adds a similar distinction regarding manufacturing and non-manufacturing industries, as introduced in Regression (2) presence dummies. Since the cartel entry and exit dummies were insignificant, we will not make a further distinction. It might be the case that due to the high risks and capital costs such as present in the manufacturing sectors, cartelization has other effects in these sectors than in non-manufacturing sectors (see for instance: Webb, 1980). Hence, we allow for different TFP-effects in the manufacturing and non-manufacturing sectors. The signs and magnitude of the technology gap and the growth of the frontier leader remain roughly unchanged as compared to Regression (2). The cartel entry and cartel and exit dummy remain insignificant. The magnitude of cartel presence is slightly higher in manufacturing industries than in non-manufacturing industries.

All equations included time dummies, these dummies are included to adopt time specific effects which occur in the entire economy. The time dummies do significantly affect the TFP growth in some years. Moreover, they significantly deviate from zero taken altogether. As a robustness check, we eliminate the time dummies in the regression. The overall significance of the coefficients remains unchanged, but in Regression (3) the cartel dummy (non-manufacturing) becomes insignificant. Yet, their magnitude (particularly cartel presence) diminishes.

As an extra robustness check the exit dates were defined alternatively. The coefficient of the cartel dummy (non-manufacturing) in Regression (3) becomes insignificant. Overall, we observe a negative effect of cartelization on the TFP growth. The coefficient of the cartel presence dummy varies between –0.02 and –0.03. The cartel entry and exit dummy have the correct signs, but both variables remain insignificant. We can tentatively state that the presence of at least one cartel resulted in an approximate 3 percent reduction of the TFP growth in the manufacturing industries, in the non-manufacturing industries this is 2 percent.[67,68] Once we translate those findings to the overall labor productivity growth, we can conclude that cartelization curbed the labor productivity growth via the TFP growth. Since the contribution of the TFP growth to the labor productivity growth is approximately factor 1, the cartelization effect directly influences the labor productivity growth with about 2 percent.

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[67] We performed a robustness check with the latest version of the dataset of 2017. The analyses (1) and (2) from table 4.3 remain unchanged. Analysis (3) of table 4.3 changes to the extent that the dummy for service cartels becomes insignificant.

[68] In the original analysis from table 4.3 we include 1998, this is the year the Competition Act came in effect. If we restrict the period of analysis to 1982–1997 (instead of 1982–1998) with the latest version of the database of 2017. We observe similar results as described in the previous footnote. However, if we exclude the insignificant variables (dum cartel entry and dum cartel exit) from analysis (3) stepwise, we observe that the cartel presence dummy remains negative and significant. If we further restrict the period the sign of the cartel dummy loses significance and becomes sometimes positive.

4.7 Conclusion and discussion

Our goal in this paper is to assess the relationship between cartels and productivity growth. Vital competition is expected to generate more efficient and productive results than anti-competitive restrictions. This study is one of the first studies to examine a cartel register for the purpose of estimating productivity effects. Micro interventions are used to estimate the macro impact of cartels in the Netherlands. Today, there are only a few studies that examined the macro effects of cartels. These insights are highly important in order to legitimatize the existence of competition policy and more specific the prohibition of cartels.

With our unique cartel dataset, we estimate the effects of cartel formation, cartel termination and cartel presence on the TFP growth. We looked into 27 industries of the Netherlands economy in the period 1982–1998. Our research results suggest that cartel presence, such as registered in the cartel register, indeed restricts productivity growth. Therefore the detection of cartels and the conviction of their members is an important task of competition authorities. As expected, cartel formation points to a lower TFP growth rate and cartel termination points to a higher TFP growth rate. However, these two events show insignificant effects.

With respect to further research, we recommend to enrich the cartel dataset. Particularly, the scope and affected turnover of agreements may be useful additional information. It is than possible to compile a cartel indicator that is more representative than the cartel dummy used in this study. Furthermore, the level of aggregation in this study is still rather high, particularly due to a lack of data on productivity. It would be interesting to take a specific industry (or a limited number of industries) as a subject to scrutiny and gather firm specific data. Ideally, as Van der Wiel (2010) argued, the cartel-productivity relationship should be studied with firm level data as well.

4.8 Appendices

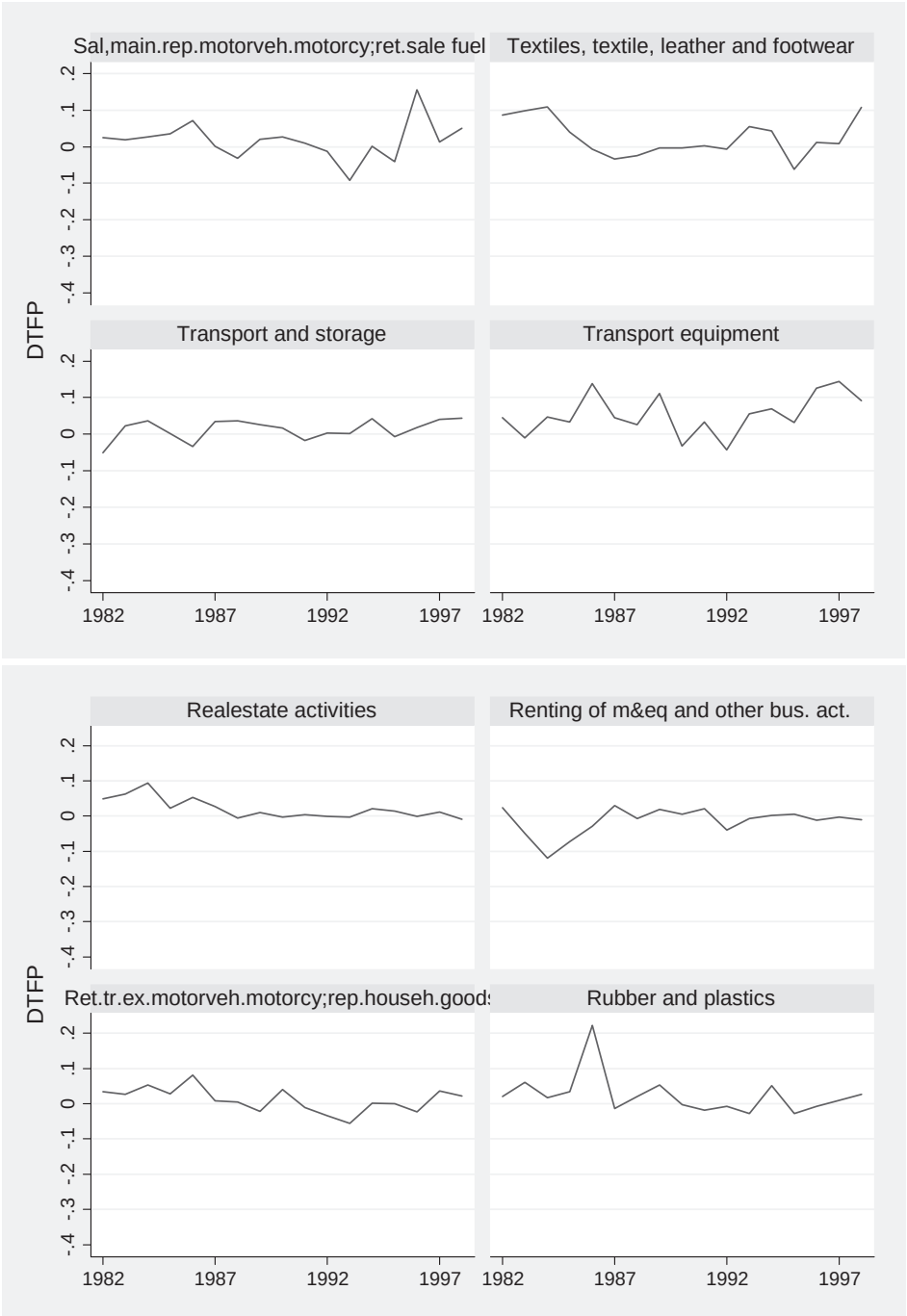
Appendix 4.1

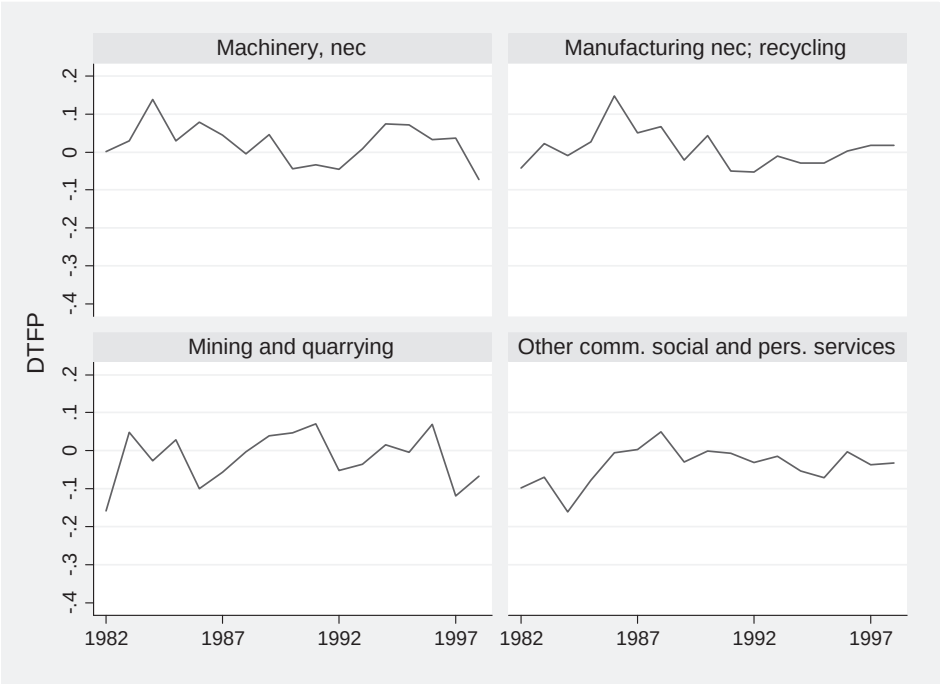
Table 4.4: Overview of industries subject to scrutiny

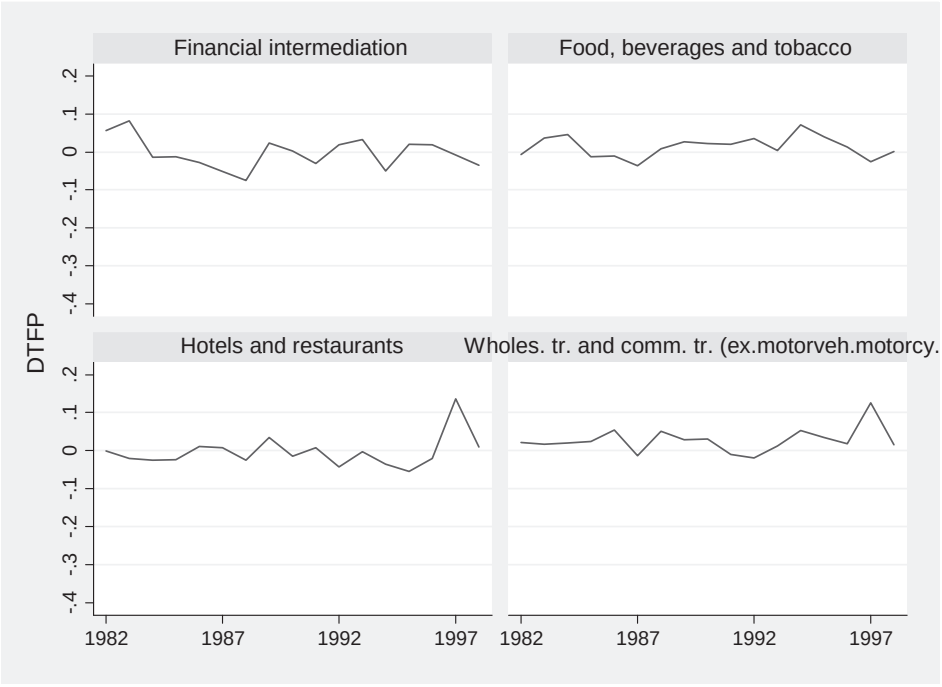
Industries	Manufacturing
Agriculture	
Basic metals and fabricated metal	X
Chemicals and chemical products	X
Coke, refined petroleum and nuclear fuel	X
Construction	
Electrical and optical equipment	X
Electricity, gas and water supply	
Financial intermediation	
Food, beverages and tobacco	X
Hotels and restaurants	
Machinery, nec	X
Manufacturing nec; recycling	X
Mining and quarrying	
Other community, social and personal services	
Other non-metallic mineral	X
Post and telecommunication	
Pulp, paper, paper products, printing and publishing	X
Real-estate activities	
Renting of m&eq and other business activities	
Retail trade, except of motor vehicles and motorcycles; repair of household goods	
Rubber and plastics	X
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of fuel	
Textiles, textile, leather and footwear	X
Transport and storage	
Transport equipment	X
Wholesale trade and commission trade, except of motor vehicles and motorcycles	
Wood and products of wood and cork	X

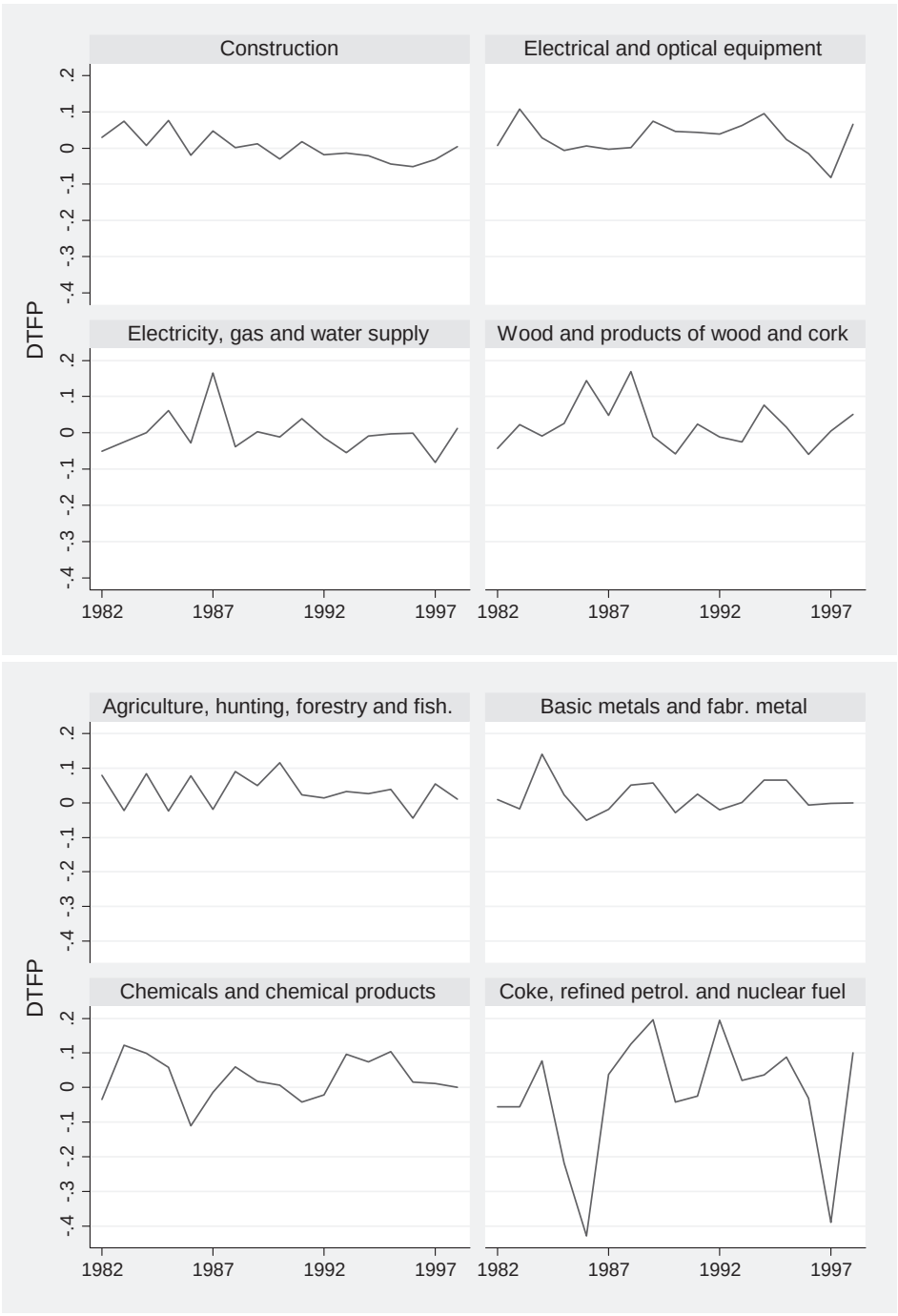
Appendix 4.2

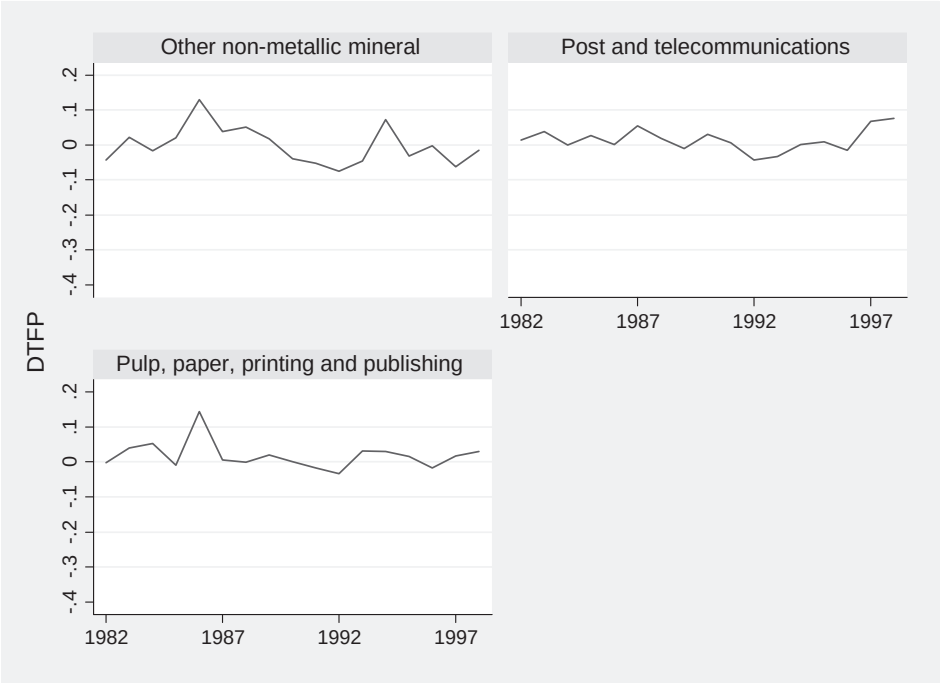
Figure 4.3: Total factor productivity growth per industry in the Netherlands




Machinery, nec
Manufacturing nec; recycling
Mining and quarrying
Other comm. social and pers. services
DTFP
-.4 -.3 -.2 -.1 0 .1 .2
1982 1987 1992 1997


Financial intermediation
Food, beverages and tobacco
Hotels and restaurants
Wholes. tr. and comm. tr. (ex.motorveh.motorcy.
DTFP
-.4 -.3 -.2 -.1 0 .1 .2
1982 1987 1992 1997


Construction
Electrical and optical equipment
Electricity, gas and water supply
Wood and products of wood and cork
Agriculture, hunting, forestry and fish.
Basic metals and fabr. metal
Chemicals and chemical products
Coke, refined petrol. and nuclear fuel
DTFP
-.4 -.3 -.2 -.1 0 .1 .2
1982 1987 1992 1997



Appendix 4.3

Table 4.5: Correlation matrix of variables which are included in the regression

	TFP growth	Technology gap	TFP growth leader	Human capital	Dum cartel entry	Dum cartel exit
TFP growth	1					
Technology gap	0.07	1				
TFP growth leader	0.06	−0.06	1			
Human capital	−0.01	−0.30	−0.09	1		
Dum cartel entry	−0.04	−0.13	−0.06	0.27	1	
Dum cartel exit	0.06	−0.15	0.00	0.27	0.32	1
Dum cartel presence	0.06	−0.08	−0.10	−0.17	0.31	0.47

5 A formula for durable cartels: which cartel characteristics help them grow older?

Abstract

This chapter investigates which cartel characteristics help a cartel to survive. Duration is, together with gravity, an important determinant for the harm caused by cartels. A common theoretical view on cartels is that they are short-lived and unstable. Nevertheless, we still see many durable cartels. In addition, we observe plenty of empirical findings suggesting that there *are* cartel stabilizing characteristics. In this study we will use data on legal cartels from the Dutch cartel register to identify characteristics that contribute to the likelihood of survival. We will conduct a time survival analysis for 667 legal cartels in the Netherlands that were active in and from 1980 and we concentrate on survival in the period 1980–1990. The effects of twelve cartel variables are estimated to explain duration. The analysis reveals that high-density cartel industries and an extensive cartel administration contribute to a cartel's survival probability. The type of agreement (related to gravity) is also related to duration. Cartels that arrange market division reveal a higher probability to survive. Finally, real GDP growth shows a negative exponential relationship with cartel duration.

5.1 Introduction

The economic view widely held on cartels is that they are inherently unstable and short-lived (see for instance: Baumol and Blinder, 1994: 294; Frank and Bernanke, 2001: 252). Nevertheless, cartels remain a widespread phenomenon and are in most cases only dissolved or detected after having been in operation for several years. Illustratively, Combe, Monnier and Legal (2008: 17) studied EU cartels that were detected. They found that the probability of detection in a given year was around 13 percent and only 6 out of the 86 (1969–2007) detected cartels died a natural death. This means that they did not fail due to antitrust interventions. Bryant and Eckard (1991) estimate the annual probability of discovery and conviction at 13–17 percent (1961–1988) in the US. Harrington and Wei (2015: 32) estimate

that the annual probability of failure of US cartels is 17 percent (1960–1985). Duration is considered, together with gravity, an important determinant for the harm caused by cartels. Illustratively, both the EU and Dutch fining guidelines use these two determinants for the calculation of the fine. My research puzzle is that cartels face serious stability challenges, but still exist. And on top of that, they are durable. So what causes cartels to survive?

This chapter contributes to the literature on cartel duration by exploring what cartel characteristics contribute to their duration. We concentrate on legal cartels in the Netherlands, because legal cartels can be better observed than illegal cartels. Up to 1998, almost all cartels were legal in the Netherlands (see: Petit, Van Sinderen and Van Bergeijk, 2016, chapter 2 of this thesis). Only those cartels with interstate effects were prohibited under Article 85 of the Treaty of Rome and in the 1990s several specific cartel arrangements, such as price-fixing, became prohibited. From 1941 until 1998 Dutch cartels were registered in the cartel register of the Ministry of Economic Affairs. Today, the documents from this register are still confidential, but part of the register is disclosed in this thesis for academic research purposes (see chapter 7 of this thesis). Due to the legal status for the majority of the cartels, the mandatory registration and the confidential nature of the register, it covers a large and comprehensive sample of cartels and overcomes many methodological problems associated with illegal cartels. First, we study a more complete sample of cartels than only the detected illegal cartels. Secondly, since the dataset is not influenced by antitrust activities, we are able to explore the characteristics in a cartel-friendly setting. We use data from the cartel register to investigate what cartel characteristics contribute to the continuing of cartel agreements. Twelve variables are selected to explain cartel duration of Dutch legal cartels. We analyse which of these variables actually contribute to the cartel's survival probability.

The chapter is organised as follows. Section 5.2 discusses the theoretical and empirical literature that is relevant for our research design. In section 5.3 we present the twelve variables that are empirically investigated in this study. Section 5.4 describes the model and the data that are used in our research. The results and conclusions are presented in section 5.5 and 5.6 respectively.

5.2 Literature review

5.2.1 Why cartels arise

At the outset it is important to make a distinction between the existence of legal and illegal cartels. Depending on the regulatory framework, firms have different incentives to collude. Some cartels may only arise when they are legal. First of all, it is likely that some illegal cartels do not arise because firms simply act in accordance with the law. Moral considerations of breaking the law may be more important than cost-benefit considerations. Secondly, in a prohibition regime under which cartels are illegal, the potential costs of a fine (including

reputational damage) render collusion less profitable and therefore less attractive.[69] Due to the probability of a fine, cartels which are only able to realize a small overcharge, may not arise under a prohibition regime because the expected profits do not compensate the expected costs. They are unprofitable, whilst they may arise, and remain profitable, in a legal setting. The probability of getting detected and getting fined is not only dependent on the searching skills of competition authorities or third parties. Most authorities use leniency schemes to destabilize cartels from the inside. Leniency may increase the likelihood of breaking up and thereby leniency raises the expected costs of a cartel (i.e. the probability of a fine).[70] For instance, if for some reason third parties or the authority are likely to notice the cartel, leniency becomes opportune and may cause the cartel to fail. While on the contrary, in the event of a legal cartel, the cartel might have been continued. Our study concentrates on legal cartels. By studying legal, instead of illegal, cartels, we expect to obtain a complete and representative sample of cartels. First of all, the dataset is influenced by antitrust activity and cartels with high enforcement costs that will not arise under a prohibition regime are presumably included in the sample. Secondly, studies of illegal cartels, in comparison to studies of legal cartels, tend to use biased samples because they are limited to detected (or failed) cartels.

5.2.2 Why cartels survive

Although cartels are said to be inherently unstable, we still observe plenty of durable (legal and illegal) cartels. Which raises the question: which conditions need to be satisfied for cartels to survive? Not surprisingly, profit is the primary driver behind the incentive to collude. At the outset, cartel profits are preferred to competitive profits. Through collusion firms can earn monopoly profits and are able to avoid cutthroat competition. However, the additional profits of cheating (and the according losses of being deceived) render cartelization a less stable equilibrium (Stigler, 1964). Nevertheless, the future profits of collusion (or the foregone profits due to cheating) using a trigger strategy may, on the other hand, positively contribute to cartel stability. In theory, stability or duration boils down to the incentive to cheat (Stigler, 1964). The incentive to cheat is related to (i) the net profitability of (not) deviating and (ii) the punishment and detection of possible deviation.

The net profitability of (not) deviating is best explained by Motta's (2004: 160) incentive constraint (see equation (5.1)). For sustainable collusion, the cartel profits should be large enough to compensate the profits of cheating plus the future profits under punishment. In equation (5.1) $\prod^{c}_{i}$ represents the current cartel profit; ∂ the discount factor; V^{c}_{i} the future

[69] Yet, the precise level of fines rendering collusion sufficiently unattractive is extensively debated in the literature and no consensus is emerging (see also: Katsoulacos and Ulph, 2013).

[70] This is under the assumption of risk neutrality. For the purpose of simplicity we assume risks neutrality.

cartel profit; $\prod^{d}_{i}$ the profits of cheating, and; V^{p}_{i} the future profits under punishment.[71] Note that the cartels' enforcement costs are also discounted in the cartels' profits. As long as the left-hand side of equation (5.1) exceeds the right-hand side, a cartel persists in theory. Equation (5.1) does not include the probability and costs of punishment by a competition authority because we concentrate on legal cartels. In an illegal cartel setting the probability and the level of the fine should be included in the right hand side of equation (5.1).

$$\prod^{c}_{i} + \partial V^{c}_{i} \geq \prod^{d}_{i} + \partial V^{p}_{i} \qquad \textbf{Equation (5.1)}$$

So the cartel profits compared to the competitive profits can render collusion an attractive alternative. Still, the credibility of punishment for, and by, cartel members (e.g. competitive profits thenceforth) is a crucial condition for stable collusion. Furthermore, if the discounted profits after deviation (∂V^{p}_{i}) are sufficiently high, collusion will not continue and not even arise in the first place. Should circumstances change, the incentive constraint (equation (5.1)) may be violated and the cartel becomes prone to collapse. This might be the case if the expectations on the (future) state of demand change, if the profit distribution changes (e.g. when the number of cartel members changes or when the enforcement costs of collusion increase), or if the firms' discount rate changes, meaning that the future becomes less important.

An underlying prerequisite for equation (5.1) with regard to durable collusion, is the detection of defecting cartel members (Stigler, 1964; Motta, 2004: 150). Access to monitoring information facilitates detection of deviation and therefore reduces the incentive to cheat in advance. According to Stigler (1964), even without antitrust concerns, cartels do not have full access to the relevant monitoring information. For instance, one cannot always distinguish cheating fellow conspirators from random bad-luck, e.g. a sudden downfall in demand.[72] The ability to successfully monitor the implementation of the agreement depends amongst others on the number of cartel members, the nature or complexity of the agreed restriction, the presence and effectiveness of an organizing central body and whether external (demand) shocks can be distinguished from defecting conspirators. Section 5.3 extensively discusses these elements.

[71] Note that the incentive constraint assumes risk neutrality of firms basing themselves on expected profits. Risk averse firms might even wish a higher compensation for engaging in cartel activities. Again, for the purpose of simplicity we assume risks neutrality.

[72] Illustratively, the legal and public Organization of Petroleum Exporting Countries (OPEC) cartel, that organizes oil output is also continually dealing with such monitoring issues.

5.2.3 Empirical studies on cartel duration

A plethora of studies in the academic literature examines cartel duration. For the purpose of this research we distinguish two strands of empirical literature. The first strand of literature includes studies similar to ours: those that empirically explain cartel duration by estimating the effects of independent variables on cartel duration. The second strand of literature constitutes a myriad of other studies that calculates or uses cartel duration for other purposes. For instance, Connor and Helmers (2007) provide a thorough description of 283 modern EU and US cartels (1990–2005) including their duration. Some of the various other examples that unravel the idiosyncrasies of cartels, including duration, are: Eckbo (1976), Van Bergeijk (2008), Haucap, Heimeshoff and Schultz (2010), Sandberg (2016), Petit (2016). In this research we primarily concentrate on the first strand of literature: the studies that explain duration.

Table 5.1 summarizes the most important features of fourteen other studies that we are aware of that belong to the first strand of literature. The construction, insights and results of these studies are directly comparable to, and relevant for, our research design. The regula-

Table 5.1: Overview of comparable cartel duration explanatory analyses, sorted by mean duration

Study	Legal	Mean duration (years)	Median duration (years) [E]	Sample size	Geographic scope	Period
Suslow (2005)	Yes[A]	3.7	2.8	71	EU and US	1920–1939
Dick (1996)	Yes	5.3	5.3	111[B]	US (multiple export markets)	1918–1965
Gallo *et al.* (2000)	No	5.4	N.A.	1348	US	1955–1997
Zimmerman and Connor (2005)	No	6.3	4.4	59	EU	1990–2004
Brenner (2009)	No	6.5	N.A.	53	EU	1990–2003
Marquez (1994)	Yes	7	5.2	52	International	1888–1984
Posner (1970)	No	7.5	N.A.	989	US	1950–1969
Combe and Monnier (2007)	No	7.5	5.5	86	EU	1969–2007
Levenstein and Suslow (2011)	No	8.1	7	81	EU and US	1990–2007
Jacquemin, Nambu and Dewez (1981)	Yes	10	8.5	40	Japan (export)	1967–1972
De (2010)	No	10.3	N.A.	93	EU	1990–2008
Hyytinen, Steen and Toivanen (2017)	Yes	11.2[C] 13.6[D]	N.A.	898	Finland, cartel register	1958–1993
Feinberg, Kim and Park (2016)	No	25.06	14	388	Korea	1989–2012
Choi and Hahn (2014)	No	27.07	N.A.	619	Korea	1981–2012

Notes:
A Some US cartels were illegal.
B This sample concerns the total number of cartel episodes. One cartel may comprise multiple episodes.
C Manufacturing.
D Non-manufacturing.
E N.A. denotes not available.

tory framework, the mean and median duration, the sample size, the geographical scope and the period are reported in each of the separate columns of table 5.1. Studying illegal cartels appears slightly more popular than legal cartels; only five of the fourteen studies examine legal cartels. In addition, De (2010), Brenner (2009), Zimmerman and Connor (2005), Levenstein and Suslow (2011) and Choi and Hahn (2014) also measured the effects of the legal framework or antitrust activity in their investigations. For instance whether a cartel broke up by its own or through antitrust interventions (Levenstein and Suslow, 2011), or what effect the introduction of leniency had on the probability of survival (Brenner, 2009).

From table 5.1 follows that there is a wide variation in the mean and median duration of researched cartels. Note that table 5.1 only reports results of the fourteen duration analyses, duration estimates from other studies are not reported in table 5.1. The mean duration ranges from 3.7 to 27.07 years. The median duration, on the other hand, shows a more dense distribution and ranges from 2.8 to 14 years.

From table 5.1 does not directly follow whether legal cartels tend to last longer, on average, than illegal cartels, or vice versa. The representativeness of the length of legal cartels compared to the length of illegal cartels, and the differences therein, can be explained from different angles. First of all, a difference in duration between legal and illegal cartels can be explained by the method of collecting data. Most illegal-cartel duration studies are restricted to using the proved lifespan. This concerns the period a competition authority was able to prove the cartel's activity. This lifespan is likely to be an underestimation of the actual period the cartel was effectively in operation. Legal-cartel duration studies, on the other hand, especially those using cartel registers, calculate the lifespan of the registered duration. These estimations, on the other hand, come closer to the actual lifespan. Firms are expected to register the actual starting date and are expected to deregister themselves when they are officially inactive and no future activity is to be expected. This might, perhaps, come with some delay and hence may result in a very slight overestimation. Second, reported results about the lifespan of illegal detected cartels can be expected to exceed the lifespans of the total population of cartels. The short-living illegal cartels might probably fail before they actually get noticed by a competition authority (Levenstein and Suslow, 2011: 463). Illustratively, Harrington and Wei (2015: 32) estimate this bias of overestimation at 10–15%. In addition, it might well be that competition authorities do not prosecute each suspected cartel and prioritize the ones with a longer lifespan. As regards legal registered cartels, even the cartels that are short-living will be registered. So the legal-cartel duration figures might be less biased from that perspective. Third, Bryant and Eckard (1991: 535) argue that "*the life of a caught conspiracy is typically no longer than that of an uncaught conspiracy*". This would suggest that the average length of the total population of illegal cartels is longer than that of detected illegal cartels. Again, this would suggest that the legal-cartel duration figures are relatively more representative for cartel duration analyses. Yet, we should acknowledge that working with legal cartels comes with the minor imperfection that in a legal setting

there is the risk that cartels last artificially too long, due to state subsidization, i.e. governments which stimulate collusion (Dick, 2004).

As regards the sample size of cartels, the studies from table 5.1 can be distinguished in two groups. Nine studies have relatively small samples (up to 110 cartel observations); four studies have around four hundred and more observations. The majority of the studies includes cartels from multiple countries, particularly EU countries or EU and US studied together. Still, there are single-country studies to cartels in the US, Japan, Finland and Korea. Noteworthy is that almost the entire twentieth century of EU cartels is covered by separate studies (Suslow, 2005; Combe and Monnier, 2007; Brenner, 2009; De, 2010; and Zimmerman and Connor, 2005).

The empirical literature reported in table 5.1 uses a myriad of indicators to explain cartel duration. Table 5.2 provides an overview of the most important variables that are used in the fourteen studies from table 5.1. Below we discuss some noticeable results from this overview. At the outset, a wide variety of indicators and their respective results can be observed. We observe very little, to no, consistency in the direction of the variables. None of the variables shows consistent outcomes, leaving the indicators which are examined only once aside. Yet, if we strictly concentrate on the significant and consistent outcomes, we observe that for both, illegal and legal cartels, the relation between foreign firms and duration is positive. In addition, we observe consistent significant results for legal and illegal-cartel concentration. A higher concentration of the market positively affects cartel duration. Finally, we notice that market sharing agreements in legal and illegal cartels positively contribute to cartel duration. If we only focus on consistent and significant results for either legal or illegal-studies, a significant and consistent positive impact of cartel coverage on duration is found for legal cartels. Second, a significant and consistent positive impact of the number of cartel members on duration is found for legal cartels.

Foreign firms, economic growth, the number of cartel participants and the presence of a central body appear the four most popular variables in the empirical literature. The presence of foreign firms is included in eight studies. Seven of the studies report a positive relation and five of those are actually significant. The negative, but insignificant, result is found for legal cartels. As regards economic growth, there are multiple theories with varying explanations (Rotemberg and Saloner, 1986; Haltiwanger and Harrington, 1991; Green and Porter, 1984). We come back to that later in section 5.3. The empirical results correspond with the mixed theories and show mixed results about the relation between economic growth and cartel duration.

Expectations about the number of participants may differ for legal and illegal cartels. As said, an important challenge for cartels is the monitoring of cartel members (Stigler, 1964). In an illegal setting it is expected to be more difficult to monitor multiple co-conspirators than in a legal setting. Each contact may trigger detection. As said, it follows from table 5.2 that the significant outcomes for legal cartels all point at a positive relation.

Table 5.2: Overview cartel duration explanatory variables

Type	Legal	Study	Result
Buyer concentration	Yes	Dick (1996)	–*
	No	Levenstein and Suslow (2011)	+/–* [E]
Cartel coverage	Yes	Marquez (1994)	+*
		Dick (1996)	+*
		Suslow (2005)	+
	No	De (2010)	+/–
Cartel experience	Yes	Marquez (1994)	+
		Suslow (2005)	–
		Dick (1996)	–*
	No	De (2010) [A]	+
Central body	Yes	Dick (1996) [B]	+*
		Suslow (2005) [B]	+/–
	No	Zimmerman and Connor (2005)	+/–
		Combe and Monnier (2007)	–
		Levenstein and Suslow (2011)	+*/–* [E]
		De (2010)	–
Compensation	No	Levenstein and Suslow (2011)	+*
		De (2010)	+/–
Concentration	Yes	Jacquemin, Nambu and Dewez (1981)	–
		Marquez (1994)	+*
	No	Zimmerman and Connor (2005)	+*
		Levenstein and Suslow (2011)	+/–
Economic growth	Yes	Dick (1996)	–*
		Jacquemin, Nambu and Dewez (1981)	–*
		Marquez (1994)	–
		Suslow (2005)	+*
	No	Feinberg, Kim and Park (2016)	+/–
		Zimmerman and Connor (2005)	+*
		De (2010)	–*
		Levenstein and Suslow (2011)	+/–
		Choi and Hahn (2014)	+/–
Foreign firms / market dimension (global/national)	Yes	Dick (1996) [C]	+*
		Jacquemin, Nambu and Dewez (1981)	+*
		Suslow (2005) [D]	–
	No	Zimmerman and Connor (2005)	+*
		Combe and Monnier (2007)	+*
		Feinberg, Kim and Park (2016)	+*
		Brenner (2009)	+

Table 5.2: Overview cartel duration explanatory variables (*continued*)

Type	Legal	Study	Result
Foreign firms / market dimension (global/national)	No	De (2010)	+
Homogenous product	Yes	Jacquemin, Nambu and Dewez (1981)	+*
Market sharing	Yes	Suslow (2005)	+/–
		Hyytinen, Steen and Toivanen (2017)	+*
	No	De (2010)	+*
		Levenstein and Suslow (2011)	+*
Number of goods	Yes	Suslow (2005)	-*
Number of participants	Yes	Hyytinen, Steen and Toivanen (2017)	+*
		Dick (1996)	+*
		Suslow (2005)	–
	No	De (2010)	+
		Posner (1970)	+
		Levenstein and Suslow (2011)	+/– [E]
		Zimmerman and Connor (2005)	–*
		Brenner (2009)	–
		Combe and Monnier (2007)	–
		Feinberg, Kim and Park (2016)	–
		Choi and Hahn (2014)	+/–
Number of restrictive elements	No	De (2010)	non-linear*
Price agreements	Yes	Hyytinen, Steen and Toivanen (2017)	+
		Dick (1996)	–*
	No	De (2010)	–
Overcharge	No	Zimmerman and Connor (2005)	–*
Quotas	Yes	Hyytinen, Steen and Toivanen (2017)	–
		Suslow (2005)	+/–
Tender agreements	No	Zimmerman and Connor (2005)	+*
		Feinberg, Kim and Park (2016)	–
		Choi and Hahn (2014)	+/–

Source: Table is based on De (2010: 40–41) and updated

Notes:

+ Positive impact on duration based on main analyses and dominant frequency of results.

– Negative impact on duration based on main analyses and dominant frequency of results.

** Significant impact on duration based on main analyses and dominant frequency of results.*

A Measured as recidivism.

B Measured as common sales agency.

C Measured as cross-market linkages.

D Measured as number of countries.

E '+' for cartels that died a natural death; '–' for cartels that were terminated by an antitrust intervention.

Another variable which is present in multiple studies is the presence of a central body. Again, we observe rather ambiguous results. For legal cartels, a central body, measured as a common sales agency, facilitates cartel duration but is only in one of the two studies actually significant. The only significant result for illegal cartels regards the study of Levenstein and Suslow (2011). This result is particularly interesting because it finds contradicting results for cartels that are detected versus cartels that died a natural death. In the latter case, they find a positive relation, e.g. a central body helped a cartel to survive. In the cases that cartels were detected, they report a negative relation. There appears to be some kind of trade-off: a central body may reduce monitoring problems, but may also be too active and thereby get noticed.

Besides the variables that were discussed above, there are many other important variables adopted in the research design of the empirical studies such as reported in table 5.2. For instance, specific types of agreements (e.g. price agreements, agreements on quotas, agreements on tenders), which will be discussed in detail in section 5.3, or cartel experience, the overcharge and buyer concentration. However, the most important conclusion that can be drawn from table 5.2 is that there are few to no consistent empirical results in the academic literature. Our research is able to complement the empirical findings and might increase the level of consistency of certain cartel duration explanatory variables.

Cartel duration is often used as a proxy for cartel success. An alternative indicator for cartel success is its overcharge. Overcharge measures whether the goal of collusion, increased profits, is actually realized.[73] However, it does not necessarily take into account the overall durability of those profits.[74] Studying duration on itself is rather worthwhile because cartels with longer lifespans but small overcharges might ultimately be more harmful than those lasting only one or two years while imposing high overcharges. Moreover, each year of cartel survival is a surprising success because it conflicts with the game theoretical assumption that cartels are inherently unstable.

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[73] Noteworthy calculations of the overcharges were executed by amongst others Connor and Lande (2005), Connor and Bolotova (2006), Van Bergeijk (2008), Connor and Helmers (2007), Bolotova (2009) and Smuda (2014), Boyer and Kotchoni (2015).

[74] The relation between duration and overcharge is not clear-cut. For instance, relatively high overcharges signal profitable industries and attract market entrants which could destabilize the cartel. Still, small overcharges might also increase the probability of termination, if the cartel profits do not cover the cartel's organizational costs (Bolotova, 2009). Nevertheless, more experienced (i.e. longer lifespan) cartels may become more effective and able to attain higher overcharges. The empirical literature signals a positive relation between overcharge and duration. For instance Connor and Bolotova (2006) and Bolotova (2009) analyse approximately 400 cartel episodes and find a positive relation of duration on overcharge, though with a small level of overall explanatory power. Whether the cartels were legal or illegal had no significant impact on overcharge.

5.3 Variables explaining duration

This section presents the variables that are adopted in our cartel duration analysis. Section 5.2 discussed the empirical literature. We observed that there are many variables used to explain cartel duration. For the purpose of this research we selected twelve relevant cartel variables which can be derived from the dataset that was constructed with the Dutch cartel register (see chapter 7 of this thesis). Table 5.3 provides an overview of these twelve variables. The variables are categorized in four groups: (i) agreement type, (ii) organization, (iii) external and (iv) coverage. In the column 'Empirical literature' from table 5.3 we report whether the variable is empirically studied before in a duration analysis, and if so, whether this regarded a legal or illegal-cartel study.

Nine of our twelve variables were analysed in previous empirical studies from table 5.2. Due to data restrictions we were not able to study all the listed indicators from table 5.2 and were limited to these nine variables. Still, the four most researched indicators from table 5.2 are included in our analysis. These concern the presence of foreign firms, economic growth, the presence of a central body and the number of participants. Furthermore, we include three variables that are not as such studied in previous empirical work (cartel-file size, number of involved industries and number of parallel agreements in industry). Nevertheless, they are considered valuable for explaining cartel duration and the findings will contribute to creating new empirical literature. Below, we discuss the variables of duration analysis in detail and the hypothesized effect on cartel duration.

Table 5.3: Variables in this research

Category	Variable	Empirical literature
Agreement type	Market allocation agreements	Yes: legal & illegal
	Price agreements	Yes: legal & illegal
	Agreements on quotas	Yes: legal
	Agreements on tenders	Yes: illegal
Organization	Number of restrictive elements	Yes: illegal
	Number of participants	Yes: legal & illegal
	Central body	Yes: legal & illegal
	Cartel-file size	No
Coverage	Foreign firms	Yes: legal & illegal
	No. of involved industries	No
External	GDP growth	Yes: legal & illegal
	No. of parallel agreements	No

5.3.1 Explained variable

First of all, our key variable of interest is cartel duration. We measure duration by the number of years the cartel agreement had been in operation. Note that a cartel can consist of various episodes, for instance due to periods of inactivity or temporary break-ups. Some empirical studies also examine separate cartel episodes within a single cartel (e.g. Suslow, 2005 and Dick, 1996). In our analysis we concentrate on the total duration of a single cartel agreement, which is defined as an entry in the Dutch cartel register.

5.3.2. Agreement type

Some types of competitive restrictions that are arranged in a cartel agreement may be more effective in terms of duration than others. As said, gravity and duration are two important determinants for the economic harm caused by cartels and the calculation of the fines. By testing whether the agreement type is a determinant for cartels we gain insight in the relation between gravity and duration. Here, gravity is approached from a so called 'object' angle. An 'object approach' differs from a so called 'effects approach' in the sense that one implicitly assumes that the agreed restriction is effectively (i.e. harmfully) implemented by the firms.[75]

We examine the impact of four common competitive restrictions on duration: (i) agreements relating to market division, (ii) agreements on quotas, (iii) agreements that relate to prices and (iv) agreements on tenders. Please note that these do not necessarily concern hard-core cartel restrictions. Not each price agreement regards a horizontal price-fixing agreement. Instead, it may also refer to recommended prices or margins. Another important notion is that the competitive restrictions are not mutually exclusive. This means that a cartel can arrange multiple competitive restrictions into one agreement. For the purpose of this research the variables are constructed as dummy variables.

Market division agreements

Let us first consider agreements that relate to market division. Specific markets are allocated to cartel members and within these markets, members are free to operate. As long as each member commits to its market, no further coordination is required in theory. Illustratively, Motta (2004: 141) states about market division that *"(…) prices can change without the collusive outcome being disrupted*". Stigler (1964: 46) suggests that assigning buyers, for instance through geographical division, to cartel members is an effective method to collude compared to avoid secret price-cuts in price agreements. Still, it comes with some problems. If the size of some of the assigned customers changes, it may require a review of the market allocation and new coordination. He also argues that market-division agreements result in

[75] See: European Commission, Guidance on restrictions of competition "by object" for the purpose of defining which agreements may benefit from the De Minimis Notice, 2014.

patterns that are easily detected, which is actually only problematic in an illegal-cartel setting. This latter statement is however not in accordance with empirical literature. Levenstein and Suslow (2011: 479) find that market division prolonged duration of cartels that were ended by an antitrust intervention, but do not find an effect for cartels which ended by a natural death. In addition, De (2010: 51) concludes that market division arrangements have a longer duration than other illegal arrangements.

The empirical results on legal cartels from Hyytinen, Steen and Toivanen (2017) report a positive and significant effect of market allocation on duration. Suslow (2005), however, finds mixed results for exclusive territories. We expect that for both cases, either legal or illegal cartels, market division is expected to reduce problems of coordination to a minimum. Based on the positive tendency of empirical results, we a priori expect a positive relation between market division and duration of cartel agreements.

Price agreements

Agreements relating to prices, most often imply that firms are free to sell where and when they want for a predetermined or recommended price. Yet, the difficulty with price agreements is that shocks in demand or input costs require price adjustments to maintain the profits. Hence, agreements upon prices may demand more coordination than for instance market sharing agreements. This might especially be a problem for illegal cartels. The more coordination and contact is required, the higher the risk of getting noticed. Another practical difficulty with agreements on prices, which applies to both illegal and legal cartels, is that firms often sell more than one product, and in addition these are not necessarily homogenous or perfectly comparable. It may be a rather complex exercise to agree upon prices and monitor them for all the individual products that are sold (see also Stigler, 1964). In addition, in the case of illegal cartels, perfectly identical prices or identical movements might get noticed and may raise suspicion. For legal cartels, this is not expected to be a problem.

For legal cartels, Hyytinen, Steen and Toivanen (2017) empirically show that cartels in Finland that used price clauses were more durable than those without price clauses, but the result remained insignificant. Dick (1996), on the other hand draws an opposite conclusion, and argues that legal cartels with the prime purpose of price fixing are shorter-lived. We consider the results from empirical illegal-cartel studies less representative, because price agreements are prone to getting noticed due to the excessive amount of monitoring and coordination activities. Given the mixed empirical results, the hypothesized sign for our analysis remains undecided.

Agreements on quotas

The third type of competitive restrictions is agreements relating to quotas. Quotas are allocated to the conspirators and relatively simple to interpret. Stigler (1964: 46) suggests that

fixing market shares (which he considers similar to quotas) is "*probably the most efficient of all methods of combating secret price reductions* (…) *unless inspection of output is costly or ineffective (as with services), this is the ideal method of enforcement, and is widely used by legal cartels. Unfortunately for oligopolists, it is usually an easy form of collusion to detect, for it may require side payments among firms and it leaves indelible traces in the output records".* So according to Stigler (1964), quotas are effective if monitoring of sales is not too costly. The fact that they are easily detected is not relevant for our study.

As regards the empirical literature on legal cartels a negative but insignificant effect of quota's on legal cartel duration is reported by Hyytinen, Steen and Toivanen (2017). Suslow (2005) also measures the effects of export and production quotas on legal cartels, though her analysis shows mixed and weak results on duration. There are no examples from the empirical illegal-cartel literature. Given the absence of strong empirical results, we follow Stigler (1964) and expect that quotas are effective competitive restrictions with regard to cartel duration.

Agreements on tenders

Tender related agreements is the fourth type of competitive restrictions that we explicitly adopt in our duration analysis. In our study, tender agreements include all the arrangements that relate to bids, the notification of participation, the exchange of bids and even the level of the bids. We expect that tender agreements demand extensive coordination because each tender entails a new competitive process. Moreover, it might require extensive coordination to identify and agree with all the possible competitors. It is not necessarily the case that each tender attracts the similar group of competitors. Furthermore, in the case of bid-rigging, compensation schemes have to be designed and executed in practice (Levenstein and Suslow, 2006b). Still, Levenstein and Suslow (2006b) and Zimmerman and Connor (2005) argue that because the outcomes of tenders are published, detection of deviation becomes easier and therefore cheating becomes less likely which improves stability. In addition, Zimmerman and Connor (2005) claim that bid-rigging markets usually entail large transport costs and hence smaller submarkets and lower enforcement costs.

There is no literature that studies the effects of tender agreements on the duration of legal cartels. Research to illegal cartels (Feinberg, Kim and Park, 2016, Choi and Hahn, 2014 and Zimmerman and Connor, 2005) find mixed results. Given (i) the mixed empirical results, (ii) the lower likelihood of cheating in tender agreements, (iii) extensive coordination activities, the expected sign remains undecided.

5.3.3 Organization

The variables that belong to the category of organization are: (i) the number of sub-agreements, (ii) the presence of a central body and (iii) the file-size of the registered cartel.

Number of competitive restrictions

When each competitive parameter is agreed upon, markets are completely regulated. Hence, defections due to anticipation on unexpected circumstances are less likely. De (2010: 51) argues that it may help the cartel to monitor the agreement efficiently. On the other hand, more restrictions require more intense monitoring and coordination. This would be especially problematic for illegal cartels. Nevertheless, De (2010: 60) reports a non-linear relation. Illegal cartels with up to and including three dimensions have a longer duration. When the number of dimensions exceeds three, the relationship becomes negative. To our knowledge there are no other studies that examine the impact of this variable on cartel duration. We argue that if multiple restrictions may even work in illegal cartels (with the risk of detection), they are also well-able to organize legal cartels.

We expect that cartels arranging more competitive restrictions are more stable. We start with testing a linear relationship and will include the square of the number of competitive restrictions in a first robustness check (similar to De, 2010). In a second robustness check we include both, the number of competitive restrictions as well as the square of the number of competitive restrictions. We define the number of competitive restrictions as the sum of the eleven types[76] of elements that we distinguished. Those eleven types include the four competitive restrictions as well as other restrictions such as conditions, discounts, agreements on marketing, buy and sell combinations etc. (see: Petit. 2016, chapter 3 of this thesis).

Number of cartel participants

According to economic theory, cartels with fewer participants are more stable (e.g. Stigler, 1964; Motta, 2004). For instance cheating is less likely and profitable in a duopoly than an oligopoly with five firms. Firstly, the potential profits from cheating compared to cartelization increase with every additional cartel member. As there are more firms, their market share will be lower, consequently deviations become attractive and punishment costly (Grout and Sonderegger, 2004). Secondly, monitoring problems are more easily solved with only a few firms to monitor (Stigler, 1964). Empirical legal-cartel studies particularly produce positive relations between duration and the number of cartel participants. Hyytinen, Steen and Toivanen (2017) and Dick (1996) find positive and significant relations. Suslow (2005) finds a negative non-significant result. We consider the empirical results of illegal-cartel studies not particularly representative for legal cartels, because coordinating and solving monitoring problems with multiple firms might increase the probability of detection and hence decrease expected cartel duration.

[76] We classified the competitive restrictions into eleven distinctive categories. These are: clauses on prices, agreements on quotas, clauses relating to market division, clauses on tenders, conditions and terms, agreements on licenses, buy and sell combination, clauses on delivery and production, clauses on marketing and ancillary agreements

In conflict with economic theory, but in line with the significant empirical results for legal cartels, we hypothesize that larger cartels are more durable. The number of firms represents the maximum number such as listed in the cartel-file (similar to De, 2010). The number of cartel participants is re-expressed as the natural logarithm to eradicate high values (similar to Hyytinen, Steen and Toivanen, 2017 and Choi and Hahn, 2014 using the logarithmic value). As a robustness check, a distinction is made between small (up to five members) and large (from five members) cartels (see: Selten, 1973). A second robustness check includes both, the number of participants and the squared number of participants to check for a possible parabolic (bell-shaped) relation.

Presence of a central body

A central body can act as a facilitator for cartels. Martin (2001: 64) states that trade organizations often serve "(…) *as a forum for activities that restrict competition*". Such an organization can initiate and monitor agreements and represent firms' interests. Dick (1996: 275) empirically found that "[legal] *cartels that organized as common sales agencies were longer-lived on average*". The role of a sales agency in legal cartels was also assessed by Suslow (2005). Though, she found inconsistent and insignificant relations. Interesting results as regards illegal cartels were found by Levenstein and Suslow (2011). First, the presence of an active trade association decreased the probability of breaking up on its own, but second, it increased the probability of a termination by an antitrust authority. This underlines that a trade association can be effective in general, but may increase the likelihood of getting noticed in an illegal-cartel setting. Other empirical illegal-cartel studies produce ambiguous results (see also table 5.2).

Since we study legal cartels, we hypothesize a similar positive relation such as found by Dick (1996). Although Levenstein and Suslow (2011) study illegal cartels, we argue that the positive result for cartels that broke up by their own (i.e. despite antitrust interventions) is also representative for our expected results because they helped cartels, that died on their own, to survive. The presence of central bodies is measured as a dummy variable. As a robustness check we also estimate the impact of the interaction of a central body with the natural logarithmic value of the number of members.

Cartel file size at the Ministry

The size of the cartel file at the Ministry of Economic Affairs might serve as a proxy for the degree and complexity of organization. Information about the cartel (e.g. prices, statutes of the cooperation, contracts, details on participants) was sent to the Ministry and archived in the files. We are unaware of any examples from the literature that examine this or a related variable in duration analyses. On the one hand, voluminous files may point at more paperwork and a better organization or frequent adjustments to changing circumstances. On the other hand, a larger cartel file may also indicate a more problematic agreement

requiring more explicit administration (i.e. monitoring). E.g. much correspondence between the Ministry and the firms has taken place and a simple (gentlemen's) agreement did not suffice. Still, a small file may also be caused by poor registration of the Ministry.

We distinguish between two types of files: a small file is classified as a cartel agreement that consist of a single file; a large file is defined as a cartel agreement that regards a bundle of several separate files (see also chapter 7 of this thesis). Due to the wide range of explanations for a file to be extensive, the hypothesized sign remains undecided. Cartel-file size is also constructed as a dummy variable: large files versus small files. The file size is determined by using the classification of the National Archives.

5.3.4 Coverage

The category coverage comprises two variables. First, we determine whether agreements also include foreign firms. Second, we measure how many separate industries are involved in the cartel agreement.

Presence of foreign firms

International cartels have to deal with diverse business cultures. They may "*face unique challenges posed by cultural and linguistic differences, exchange rate fluctuations, and trade preferences*" (Levenstein and Suslow, 2011: 457) that are believed to make them less durable (Zimmerman and Connor, 2005: 11). Still, if foreign firms are involved with the prime purpose to refrain from entering the domestic market, it may be effective because the cartel protects itself from competitive threats from abroad. This is expected to be relatively simple to coordinate and does not involve extensive cultural or trade problems. The preceding arguments would pertain to both, illegals as well as legal cartels. Therefore we do not expect a difference between the results for empirical legal or illegal-cartel studies.

Dick (1996: 272) analysed the (foreign) cross-market linkages and reports that "[legal cartels] *that negotiated a side agreement had (…) nearly three times the average longevity of cartels that did not coordinate efforts with foreign producers*". The inclusion of foreign firms helped a cartel to survive. Jacquemin, Nambu and Dewez (1981) find a similar result. Zimmerman and Connor (2005: 29) and Combe and Monnier (2007) observe that global illegal cartels, spanning more countries, had a positive association with cartel duration. A similar but insignificant result is found by Brenner (2009). In addition, Feinberg, Kim and Park (2016), observe that the presence of at least one foreign firm improves duration. Finally, De (2010: 57) finds a weak positive influence on duration for illegal cartels operating at a global instead of a national level. Suslow (2005: 724), on the other hand, finds a negative but insignificant effect of the number of countries involved in legal cartels.

For our study we leave the hypothesized sign undecided. On the one hand, cartels with an international dimension are expected to be typically complex to enforce, but the empirical results, on the other hand, typically point at a positive relation. The presence of

foreign firms in Dutch cartels is constructed as a dummy variable. If at least one foreign firm is mentioned in the cartel application, we reported an international dimension. This is in line with the definition of Levenstein and Suslow (2011: 457) and Feinberg, Kim and Park (2016).

Number of industries involved

A cartel can include multiple distinctive industries. The inclusion of various industries can have different types of impact on cartel's duration. First of all, inter-industry cartelization may enhance duration by way of cartel interdependency. Including more parties from the supply chain implies that interdependencies increase, for instance, by means of hub-and-spoke cartels (Sahuguet and Walckiers, 2016). Hub-and-spoke systems can facilitate credible punishments by the threat of exclusion (e.g. input foreclosure), which mitigates risk of cheating. In addition, inter-industry cartels are well able to reduce monitoring problems, because downstream and upstream firms have access to different and complementary information. Two examples are the Bromine cartel (Levenstein, 1993) and the railroad and oil refinery case (Granitz and Klein, 1996). The downstream firms distributed information through the cartel members and even foresaw in punishment mechanisms. Still, in inter-industry cartels, there may be conflicting interests. For instance, the cartel profit that is earned by upstream firms is on the expense of downstream firms and vice versa (Sahuguet and Walckiers, 2016). We are not aware of other empirical studies which examine the impact of the number of industries on duration. Yet, slightly comparable is Suslow (2005), she reports a negative impact of the number of products covered by the agreement for legal cartels. The author suggests that complexities of cartel enforcement have had a negative impact on its duration.

Although it might be that inter-industry cartelization and hub-and-spoke monitoring might help cartels to survive, the related result of Suslow (2005) points into another direction. Therefore, we leave the hypothesized sign undecided. We measure the number of separate industries involved by counting the number of unique three-digit ISIC industries per agreement.[77]

5.3.5 External

Up until here, the variables that were discussed, primarily captured the characteristics that cartels can organize and regulate by themselves. Nevertheless, it is also important to take account of external factors that affect the probability of cartel survival or failure. Hence, we include two variables that fall beyond the cartel's scope of influence. First, we investigate

[77] An important remark concerns the discussion of relevant markets. We count the number of cartels within a three-digit ISIC industry, assuming that those cartels are active in similar or related markets. However, the three-digit ISIC classification does not necessarily capture the relevant product or geographic markets. In case the most detailed reported level was a two-digit industry we considered this as one industry.

the impact of GDP growth on cartel duration. Second, we study whether the number of other cartels within the same industry contributes to survival.

GDP growth

Studies that investigate cartel stability stress the importance of macroeconomic conditions on cartel duration. There exist three well-known theoretical papers that relate macroeconomic conditions to cartel stability. Under the assumption of uncertain unobservable demand fluctuations, Green and Porter (1984) claim that cartels are more prone to collapse during an unexpected downturn because firms cannot distinguish between defecting members or demand shocks. Rotemberg and Saloner (1986), allowing for perfectly observable demand fluctuations, state that cheating (and thus cartel instability) is more likely during economic booms than busts. During booms, profits of deviation rise while the costs of punishment – incurred during the subsequent period of lower demand – are relatively low. Nevertheless, Haltiwanger and Harrington (1991: 89), also assuming perfectly observable demand, but now with cyclical demand, claim that cartels face stability issues during recessions because the discounted loss of cheating is lower once further decline of demand is foreseen in the future. Conversely, when firms move towards a phase of growth, stable collusion is more likely.

We expect no significant differences between the results for illegal or legal cartels. Empirical results for illegal cartels may be as representative for legal cartels, and vice versa. Both, illegal and legal cartels, face similar challenges with regard to cheating cartel members in periods of growth or decline. Overall, the empirical findings for legal cartels provide ambiguous results. Dick (1996: 273) finds that legal export cartels are more stable during domestic downturns, he states that "*[d]omestic and export business cycles tended to have opposite effects on cartels' stability*". Similar conclusions are drawn by Jacquemin, Nambu and Dewez (1981) and Marquez (1994) using the growth rate, where the latter result is insignificant. Zimmerman and Connor (2005) report that downturns harm illegal cartel duration; and according to De (2010) demand growth has a negative impact on illegal cartel duration. Suslow (2005), on the contrary, observes that economic downturns destabilize legal cartels. Levenstein and Suslow (2011: 483) find no significant impact on illegal cartel stability from demand shocks or measures of business cycles. Finally, Feinberg, Kim and Park (2016) and Choi and Hahn (2014) report inconsistent and limited effects of economic growth.

Since the theoretical predictions are as mixed as the empirical results, the hypothesized sign remains undecided. In our study we use the annual percentage of real GDP growth as a proxy for macroeconomic effects. As a robustness check we also estimated possible nonlinear effects. We include both, the GDP growth and the square of GDP growth to test for a bell-shaped relationship.

Number of parallel cartels

The second type of external variable is the total number of cartels in the industry. A large number of parallel cartels within the same sector may affect cartel duration in different manners. First of all, there may be a learning effect from the existence of parallel cartels. Firms can imitate successful behaviour of other active cartels in the industry (Waring, 1993: 77). Second, a large number of parallel cartels may simply signal a cartel-friendly industry, where the conditions and culture are such that cartels are profitable and accepted (by buyers or suppliers). Third, a firm within a cartel may also be dependent on other cartels within the industry. Parallel cartels may increase interdependency across cartels. Illustratively, Edwards (1955: 335) suggests that "*[t]he anticipated gain to such a concern from unmitigated competitive attack upon another large enterprise at one point of contact is likely to be slight as compared with the possible loss from retaliatory action by that enterprise at many other points of contact*". For our study this would mean that cheating in one cartel might have a negative effect on the presence or future presence in other cartels within the industry. Still, Bernheim and Whinston (1990: 3) argue that the costs and benefits of deviation may increase proportionally so "(…) *if it decides to cheat, it will do so in every market*. We are not aware of any empirical studies that examine the impact of the existence of parallel cartels on duration.

Based on the discussion above, we a priori expect a positive relation between the number of other existing cartels and duration. We measure the total number of agreements that is active per year in the industry by using the three-digit ISIC industry classification.[78] When a cartel concerns multiple three-digit industries we chose to compare the 'number of agreements' of each involved three-digit industry and keep the maximum value for the calculations.[79]

5.3.6 Control variables

In addition to the twelve variables that were discussed in the preceding, we adopt a control variable that captures the industry effects. Industry specific elements are important for cartels in general. For instance, in industries with high barriers to entry (e.g. capital investments), there is a smaller risk of market entry and cartel agreements may be easier to maintain. Also, cartels in industries producing homogenous goods might be easier to maintain, because differentiation requires coordination on quality, style, etc. (Dick, 2004). By distinguishing between various types of industries, we can adjust for unobserved industry specifics. Industry specific determinants are broadly examined at two levels.

First, a distinction can be made between manufacturing and non-manufacturing industries. Hyytinen, Steen and Toivanen (2017) adopted an industry dummy in their

[78] In case the cartel was said to be active in a two-digit industry the totals of the three-digit industries were taken. And the observation was added to all the underlying three-digit industries.

[79] Ibid.

analysis, and ran separate regression analyses for (non) manufacturing industries. Second, a distinction can be made at more detailed industry levels. See for instance: Levenstein and Suslow (2006b), Suslow (2005), Combe and Monnier (2007), Brenner (2009), De (2010), and Zimmerman and Connor (2005), Choi and Hahn (2014) and Feinberg, Kim and Park (2016). In our analysis we control for manufacturing (SBI codes 0-4) and non-manufacturing (SBI codes 5-9) industries by adopting a categorical variable in the regression (manufacturing, non-manufacturing or both). In a robustness check we will estimate the model with dummy variables for each of the one-digit industries.

5.4 Model and data

5.4.1 Model

To estimate the effects of the twelve cartel characteristics on cartel duration a Cox proportional hazard survival analysis is employed (Cox, 1972). A survival analysis is a convenient model as it measures to what extent the explanatory variables contribute to the probability of an extra year of the cartel's survival. We employ a Cox proportional hazard model in STATA to estimate the hazard rate (probability) of survival in a specific cartel year. This model was also used in various other studies from table 5.1.[80]

The hazard function for cartel *i* is specified as:

$$h_i(t_i) = h_0(t) * \exp(\beta x_{ik})$$

Where *t* represents the number of elapsed years since the agreement was established. *h0(t)* is the baseline hazard function which dependents on β and X_{ik}. β is the vector of coefficients determining the effect of the cartel characteristics. X_{ik} is the vector of the included cartel *(i)* characteristics and *k* represents values for a specific calendar year. Positive values of the vector β indicate that the cartel characteristics increase the hazard of cartel failure in a specific year. Equation (5.2) specifies our regression.[81]

[80] For instance: Dick (1996), Suslow (2005), Zimmerman and Connor (2005), De (2010), Levenstein and Suslow (2011), Choi and Hahn (2014) and Feinberg, Kim and Park (2016).

[81] In our analysis we try to explain duration by a predefined model. Should the prediction of duration be a goal and there is no specified model, it might be interesting to apply (unsupervised) machine learning techniques on the data such as cluster analysis. This is however beyond the scope of our analysis.

$$\begin{aligned} Duration\,(t_i) = h_0(t)^* exp(\; & b_1\,(price\ agreement_i) \\ & + b_2\,(market\ sharing_i) + b_3\,(quota\ agreement_i) \\ & + b_4\,(tender\ agreement_i) + b_5\,(nr.\ restrictive_i) \\ & + b_6 ln\,(nr.\ members_i) + b_7\,(central\ body_i) \\ & + b_8\,(foreign_i) + b_9\,(file\ size_i) + b_{10}\,(nr.\ industries_i) \\ & + b_{11}\,(GDP\ growth_{ik}) + b_{12}\,(Parallel\ cartels_{ik}) \\ & + b_{13}\,(industry\ type_i)\,) \end{aligned} \qquad \textbf{Equation (5.2)}$$

5.4.2 Data sources

The foundation of this research is the legal-cartel dataset that is constructed with primary data from the cartel register. Please note that the register was primarily established for administrative purposes, not particularly to perform economic analyses. Therefore the measures derived from the register and the corresponding results should be interpreted with caution. Chapter 7 of this thesis thoroughly describes the characteristics and construction of the legal-cartel dataset.

From 1941 until 1998 cartels were permitted in the Netherlands and registered in the cartel register. Under the so called 'abuse legislation' cartels should register themselves at the Ministry of Economic Affairs. All the registrations were stored in the cartel register. The abuse legislation implied that cartels that were in conflict with public interests could be prohibited by the government. The Ministry decided on a case-by-case basis whether public interests were at stake (see also: Petit, Van Sinderen and Van Bergeijk, chapter 2 of this thesis). Though, prohibition occurred only in a small minority of the cases. Cartels generating interstate effects were, however, already prohibited from 1958 under Article 85 of the Treaty of Rome. Earlier work on the cartel register analysed the representativeness of the register for the cartel population in the Netherlands (see Petit, 2016, chapter 3 of this thesis).[82] Various factors benefit (e.g. the confidentiality of the register or fines in case of non-notification) or jeopardize (e.g. low esteem of the duty to notify or low control on the duty to notify) its completeness.

For the purpose of a representative timeframe, our sample includes agreements that were active in or from 1980 onwards and established before 1991. In the following we discuss the two determinants for this timeframe. First of all, the dataset that is constructed with the primary data from the cartel register starts from 1980. Only for those cartels detailed cartel characteristics were constructed.[83] Thus, cartels which ended before 1980 are not analysed

[82] A first econometric exercise with the register examines the impact of cartelized industries on productivity growth (Petit, Kemp and Van Sinderen, 2015; chapter 4 of this thesis).

[83] The cartel register covers over 109 meters of shelve space. In order to keep the analysis manageable, cartels which ended before 1980, according to the administration of the National Archives, fell outside the scope of the detailed analyses. Studying cartels active in or from 1980 is convenient because for the

and the analysis starts at 1980. Second, for the purpose of a representative timeframe, we chose to restrict the analysis to the cartel years up to 1991. This also implies that cartels established after 1991 will not be studied. It is important to exclude cartel-activity after 1990, because the transition from the abuse regime (legal cartels) to the prohibition regime started in the early 1990s. In 1991 the transition to a new prohibition regime became definite; it became clear that the current abuse system was outdated and that soon cartels were to become prohibited. Knowing that the system was about to change, might have caused a destabilizing effect on the active cartels. Keeping the incentive constraint from equation (5.1) in mind, the discounted future cartel profits will be decreasing (due to the introduction of the prohibition regime) and hence cheating becomes more attractive. Furthermore, the announcement of the new regime might have provided an incentive for existing cartels to terminate their official registration and continue their activities below the surface. As a prelude to the new regime various types of restrictive agreements became prohibited from the early 1990s. A general prohibition against vertical price agreements (1991); a prohibition of horizontal price agreements (1993); and a prohibition of market sharing agreements and tender agreements (1994). Again, firms may have ceased their official registration (or correspondence with the Ministry) and continue their activities below the surface. Eventually, from 1998 all cartels became prohibited in the Netherlands according to Section 6 of the Dutch Competition Act. Cartel notification and hence the cartel register came to an end. Cartels could therefore last no longer (i.e. officially registered) than 1998. So, in order to avoid that these factors result in biased duration estimates, cartels from 1980 are analysed up to 1991.

Besides the restriction of the timeframe, we chose to exclude some other observations that are prone to bias our estimation results. First, we excluded franchise agreements. Those agreements were notified, but no further action from the Ministry was taken on these. In many of these cases the file was closed in the same year as it was registered, while it became evident from the information in the file that the agreement would continue. Including these agreements would result in severely biased duration figures. Second, agreements without any clearly defined competitive restriction were excluded from the analysis. This information is crucial to estimate the effects of the four specific restrictive arrangements and the total number of restrictions in the duration analysis. Third, some cartels report a particular long duration (see Petit, 2016, chapter 3 of this thesis). A couple of these cartel agreements were even established prior to the introduction of the first competition law (i.e. before the Business Agreements Act of 1935). We chose to exclude the observations exceeding the 95th percentile. Fourth, agreements tended to include many participants. Hence, we chose to exclude observations exceeding the 95th percentile. Finally, only cartels that were registered for more than one year (i.e. the year of entry does not correspond with the exit year) were

purposes of other analyses, those that rely on industry data, cross-section industry data are only available from 1980.

adopted in our analysis. In addition to the legal-cartel dataset, we gathered data from Statistics Netherlands. We use the annual percentage of GDP growth from Statistics Netherlands as a proxy for the macroeconomic effects.[84]

5.4.3 Descriptive statistics

Duration

Cartel duration is our key variable of interest. We measure duration by the number of years the cartel had been registered. The cartels' entry and exit date represent respectively the date the agreement became in operation and the last date of content that was observed in the cartel file (see chapter 7 of this thesis). Figure 5.1 provides a histogram of the duration of cartel agreements. It depicts the frequency (y-axis) of cartel duration (x-axis) for cartels active (still) after 1979 and established before 1991. Please note that we corrected for the outliers such as described in the preceding section. Noticeably, the histogram shows a distribution that is skewed to the right. The right tail is longer than the left tail of figure 5.1. The mean value of duration is therefore, on itself, unrepresentative for describing the duration. The standard deviation of our sample is approximately 60 percent of the mean duration. By way of comparison, Levenstein and Suslow (2006a) present an overview of cross-section studies of cartel duration. In four out of the six comparisons, the standard deviation exceeds 80 percent of the mean duration. So, this appears a common characteristic of cartel duration.

Figure 5.1: Histogram of cartel duration

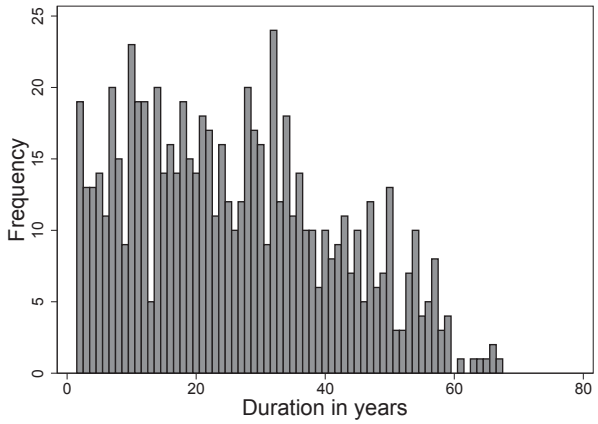
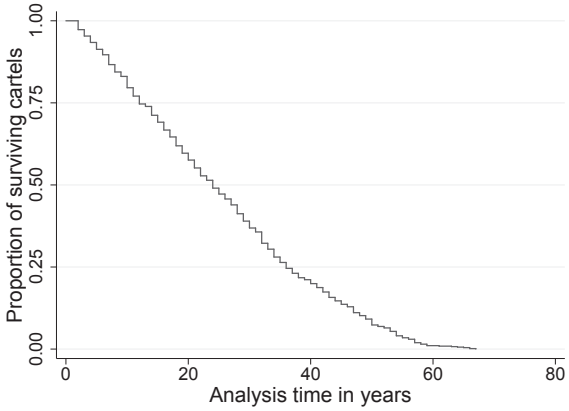


Figure 5.2 shows the Kaplan-Meier survivor function of cartel duration. The survivor function depicts the proportion of surviving cartels compared to the total sample of car-

[84] Data retrieved from Statistics Netherlands www.cbs.nl at April 1st 2017.

Figure 5.2: Kaplan-Meier survivor estimate for duration in years



tels up to analysis time (t). The function illustrates that the proportion of surviving cartels steadily, almost linearly, decreases up to a survival time of 40 years. Approximately 75% of the sample of cartels has died before reaching the age of 40. The annual amount of dying cartels was broadly similar in each year up to 40 years. Once an agreement has survived more than 40 years, the marginal probability of dying is slightly decreasing. And after 60 years, a cartel has a high probability of lasting even longer; there is almost no difference in the decrease of the probability of survival.

Variables in regression

Table 5.4 provides the descriptive statistics from variables adopted in the analysis and their expected sign such as thoroughly discussed in section 5.3. After the correction for outliers, our sample included 667 cartels. Compared to the duration figures from the studies from table 5.1, our average and median duration such reported in table 5.4 can be classified as rather long, despite the fact that we have already corrected for outliers. Market division, agreements on prices, allocation of quota's and agreements on tenders were present in respectively 19, 46, 18 and 10 percent of the cases. The competitive restrictions are not mutually exclusive, we identified eleven restrictive agreements and one agreement may arrange multiple elements. On average an agreement contained 1.8 competitive restrictions. The maximum number of competitive restrictions is 6 in our dataset. The number of members in dataset shows an average of 67, with a large variation, even despite the fact that we excluded outliers exceeding the 95th percentile. This confirms the logarithmic transformation of the number of members. Organizing bodies were involved in 58 percent of the agreements and voluminous files were present in 23 percent of the agreements. Foreign firms were involved in 10 percent of the agreements. An agreement involved generally 1.1 industries. Recall that we used the three-digit industries to count the number of industries. GDP growth and parallel cartels are calculated based on the extended dataset, where each

Table 5.4: Descriptive statistics

Variable	Description	Obs.[A,B]	Mean	Median	Std. Dev.	Min.	Max.	Type	Exp. Sign
Duration	Years the cartel was active	667	26	24	16	2	67	Integer	
Market division	One if the agreement related to market division, zero otherwise	667	0.19	0	0.39	0	1	Dummy	+
Prices	One if agreement related to prices, zero otherwise	667	0.46	0	0.50	0	1	Dummy	?
Quotas	One if agreement related to quotas, zero otherwise	667	0.18	0	0.39	0	1	Dummy	+
Tender	One if agreement regarded tenders, zero otherwise	667	0.10	0	0.31	0	1	Dummy	?
No. restrictions	Total number of competitive restrictions	667	1.8	2	1.0	1	6	Integer	+
Members	Number of cartel members	667	67	20	126	2	950	Integer	+
Ln members	Natural logarithm of number of members	667	3.1	3	1.5	0.69	6.9	Ln (Integer)	+
Many few	One if members > 5, zero otherwise	667	0.78	1	0.41	0	1	Dummy	+
Central body	One is a central body was involved, zero otherwise	667	0.58	1	0.49	0	1	Dummy	+
File type	One if the agreement covered a large file at the Ministry, zero otherwise	667	0.23	0	0.42	0	1	Dummy	?
Foreign	One if at least one foreign firm was reported, zero otherwise	667	0.10	0	0.30	0	1	Dummy	?
No. of industries	Number of three-digit industries that were part of the agreement	667	1.1	1	0.27	1	3	Integer	?
GDP growth [C]	Annual percentage of Gross Domestic Product growth	4525	1.6	2.1	1.7	−1.2	4.4	Continuous	?
No. of parallel cartels [D]	Total number of cartels in the industry per year	4525	19	11	18	1	81	Integer	+

Notes:

A The cartels that were still active in or from 1980 and not established after 1990 are included in the descriptive statistics.

B Excluding outliers as regards duration and the number of participants and corrected for franchise agreements, agreements without a clearly defined competitive restriction and those that lasted one year.

C Obs. represents the number of cartels multiplied by the years they were active and GDP growth was available in the period 1980-1990.

D Obs. represents the number of cartels multiplied by the years they were active in the period 1980-1990.

year of cartel-activity between 1980 and 1990 represents a separate observation. That implies that the total number of observations equals the number of cartels multiplied by the years they were active (between 1980 and 1990). Appendix 5.1 (figure 5.4) shows a graph of the annual GDP growth in the Netherlands from 1980 through 1990. We observe that on average, 15 cartels were active within a three-digit industry in a specific year, the median value of 16 points at a symmetric distribution. Overall, from table 5.4 it becomes clear that there exists a high degree of heterogeneity of the Dutch legal cartels from the cartel register.

Figures 5.3a through 5.3h provide the Kaplan-Meier survivor estimate functions for the eight variables that are transformed into dummy variables to explain cartel duration (for the total lifespan of the 667 agreements). Note that the number of members is transformed as a dummy variable for the purpose of a robustness check (equal to zero for five cartel members or less; and one for more than five members). We observe from figure 5a that cartel agreements that involve a central body come with a higher proportion of cartels that survives up to analysis time (t). This means that 50 percent of the cartels without a central body died before reaching the age of about 20 years, whilst 50 percent of the cartels with a central body before reaching the age of approximately 30 years. We observe a broadly similar pattern for cartels agreements involving a small number of members, compared to cartels that involve more than five members (see figure 5.3b). Approximately 50 percent of the cartel agreements was terminated before reaching the age of about 20 when a small number of firms was involved, whilst for the larger cartels the same was true, but, before reaching the age of approximately 30. Figure 5.3c depicts the two survivor functions for agreements that include foreign firms versus agreements that only included domestic firms. Note that a small minority (i.e. 10 percent) of the agreements included foreign firms. The function of foreign also shows somewhat more variation than the non-foreign function. In general the survivor estimate of foreign is higher than that of non-foreign. We observe that around the age of 20 and 40 a cartel agreement is not likely to fail if it includes foreign firms, the proportion of survival broadly remains unchanged. The two different functions for small (=0) and large (=1) cartel files are depicted in figure 5.3d. Before reaching the age of 35 approximately 75 percent of the small-file cartels failed, whilst for large-file cartels only 50 percent had failed before reaching the age of 35.

As regards the competitive restrictions, the division of markets (figure 5.3e), agreements related to prices (figure 5.3f) and agreements on tenders (figure 5.3h) reveal higher survival estimates than agreements without those competitive restrictions. From figure 5.3f follows that from the age of 40 the annual proportion of cartel failure does not differ for agreements with or without clauses on prices. The survivor function for agreements on quotas show a steep decrease in the proportion of cartels that fails between the age of 20 and 30, approximately 25 percent of the total sample of cartels dies within this period. Between the age of 40 and 50 only a marginal proportion of agreements that arrange quotas fails. After 50 years, there is no difference in the proportion of failing cartels between quota and

non-quota agreements. Agreements on tenders have in the beginning (i.e. up to 20 years) an equal chance of survival. Yet, after twenty years, they are more successful than other agreements. Illustratively, 75 percent of the non-tender agreements failed within about 40 years, whilst 75 percent of the tender agreements only failed after 55 years.

Overall, figures 5.3a through 5.3h suggest that our dummy variables, except for the one on quotas, positively contribute to the probability of survival. In section 5.5, our duration analysis combines the twelve explanatory variables and is able to draw conclusions based on statistical inference about the impact on duration.

The work of Hyytinen, Steen and Toivanen (2017), Choi and Hahn (2014) and Feinberg, Kim and Park (2016) show the most similarities with the structure of the present study. The duration figures from Choi and Hahn (2014) and Feinberg, Kim and Park (2016) show the most similarities with our data. Furthermore, the overlapping timeframe, legal framework and source (cartel register) from Hyytinen, Steen and Toivanen (2017) are more comparable to our structure.[85] Three studies also analyse a single country, whilst using a large sample of cartels. Whether our results also correspond with theirs, will be examined in the next section.

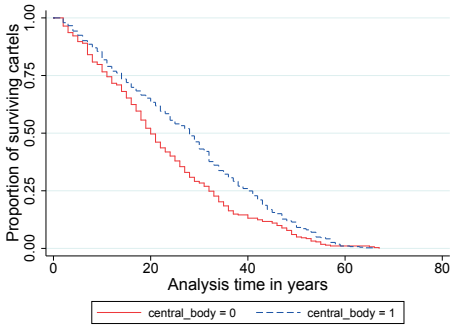
5.5 Results

This section discusses the results of the Cox proportional hazard survival analysis and interprets the findings. Tables 5.5 and 5.6 report the regression results of our analysis. We present ten different estimations. We start with a general model and move via robustness checks to a specific and robust model. Table 5.5 starts with the baseline model (estimation 1) and continues with various robustness checks by using different specifications of explanatory variables (estimations 2–4). Table 5.6 continues with robustness checks (estimations 5–9) and finally presents the core model that renders all the hazard ratios significant (estimation 10). Recall that we performed a time survival analysis using a three-digit industry level including cartels (still) active after 1979 and established before 1991 for the timeframe 1980-1990. Please note that the coefficients (i.e. hazard ratios) should be interpreted counterintuitively in a Cox proportional hazard survival analysis. Hazard ratios below one decrease the likelihood of cartel failure with one minus the coefficient. Conversely, hazard ratios exceeding one increase the likelihood of failure with one minus the coefficient. Appendix 5.2 (table 5.7) presents the bivariate correlation matrix of the included variables. At first sight there appear no extreme correlations amongst the variables that will be included simultaneously in the regression. The highest bivariate correlation between variables that are included simultane-

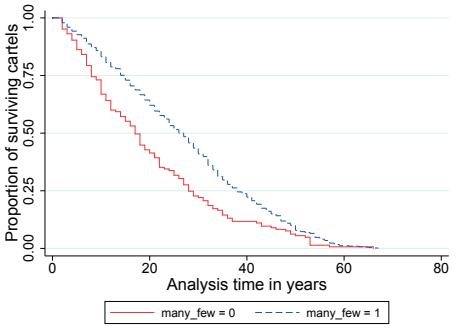
[85] A number of other countries employed a cartel register in the twentieth century (see: Fellman and Shanahan, 2016). To our knowledge a duration analysis was only conducted with data from the Finnish register.

Figure 5.3: Kaplan-Meier survival estimate for dummy variables

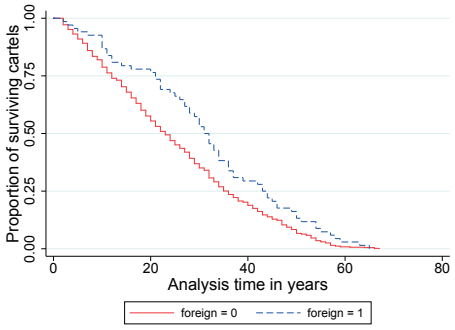
5.3a – Central body



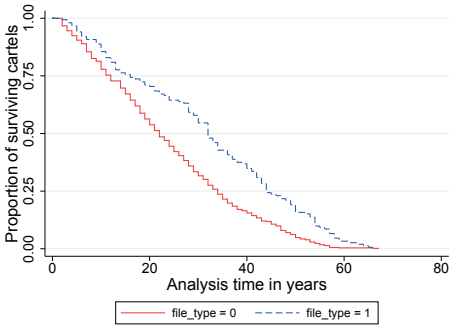
5.3b – Many or few firms



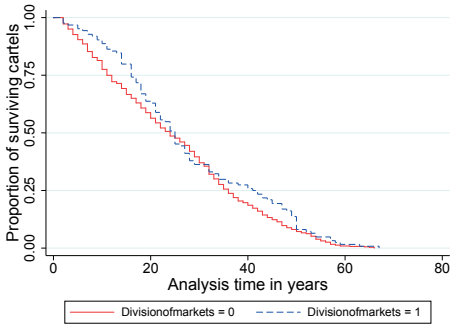
5.3c – Foreign firms



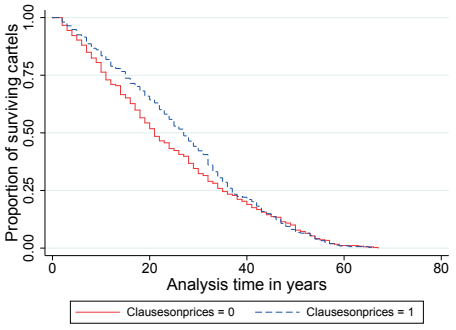
5.3d – File type



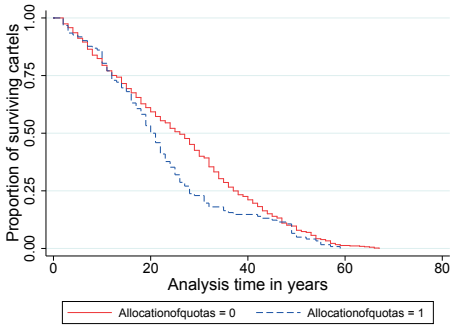
5.3e – Division of markets



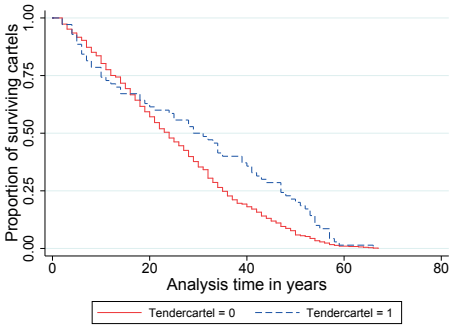
5.3f – Clauses on prices



5.3g – Allocation of quotas



5.3h – Agreements on tenders



ously appears between the presence of a central body and respectively the Ln Members (0.48) and Many vs. Few Members (0.45).[86]

5.5.1. Baseline estimation

Column (1) from table 5.5 shows the regression including all the variables that are discussed in section 5.5. These variables are hypothesized to be important explanatory variables for cartel duration. We observe that the variables that are related to the nature of the agreement show rates below one and only one variable enters significant. Agreements that relate to market division point at a positive relation with duration; the sign is below one and enters significant. This is according to our expectations. Price agreements, agreements on quotas and tender agreements also show a hazard rate below one, implying a positive relation with duration, but insignificant.

Three of the four explanatory variables that relate to the organization of the cartel agreement typically exhibit a positive relation with cartel duration. However, among these, only the *Ln Members* and *File Type* enter significant. The more cartel members, the higher the likelihood of surviving. This is similar to our expectations and to the findings of Hyytinen, Steen and Toivanen (2017) and Dick (1996). Furthermore, we observe that larger files come with a higher probability of survival compared to smaller files, which is also according to our expectations. The involvement of a central body enters slightly below one (i.e. positive impact on duration) but is insignificant. The hazard rate of the number of restrictions enters slightly above one, but is also insignificant.

The third category of variables relates to the coverage of the cartel agreement. Both, the presence of foreign firms and the inclusion of multiple industries enter below one (i.e. positive relation with duration). Only the number of industries produces a marginally significant result. Indicating that including more industries contributes to cartel survival. Our finding is not in accordance with the empirical results of Suslow (2005), with regard to the number of products that are arranged within an agreement.

The variables that belong to the category of external factors both enter significant. GDP growth contributes to cartel failure instead of cartel survival. Higher growth rates imply a higher probability of failure. Furthermore, the more agreements are arranged within the industry, the more likely a cartel is to survive an extra year. Before we proceed with the interpretation of the findings, we discuss the results from various robustness checks.

[86] We analysed the VIF scores after a simple OLS regression of all the variables from table 5.5 (Model 1, excluding GDP growth and the number of agreements per year defined as the static value of the total number of agreements) on duration to estimate problems of multicollinearity. The mean VIF score was 1.7 and the highest individual VIF score is 3.5.

5.5.2. Robustness checks

The remainder of table 5.5 shows the results of various robustness checks as regards the number of participants. First of all, the interaction effect of a central body and the number of cartel participants is also worth investigating, because trade associations are said to be especially useful in large cartels (Levenstein and Suslow, 2006a: 60; Hay and Kelley, 1974: 28). The interaction between cartels members and a third party was empirically assessed by Zimmerman and Connor (2005: 22), but no robust results were found. Column 2 of table 5.5 includes this interaction effect. In accordance with the result of Zimmerman and Connor (2005), no significant effects are found. Hence, we decided not to further include this interaction effect in other estimations. As a robustness check, the number of participants is also defined as a dummy variable. A distinction is made between small (up to 5 members) and large (from 5 members) cartels (see: Selten, 1973). Column 3 of table 5.5 replaces the *Ln Members* by the variable *Many vs. Few*. The hazard rate enters below one, pointing at a positive relationship between many members and duration and exhibits a significant effect. In addition we tested for a nonlinear, parabolic, relation between the number of members and the cartel duration. We included the number of members and the square of the number of members in the regression such as presented in column 4 of table 5.5. As far as we are aware, this is uncommon in the empirical literature. Only the number of members enters significant, but the hazard rate is equal to one, so it has no actual effect. Noteworthy is that up until here, the results of the unchanged variables in columns 2 through 4 remain broadly similar. We notice that the direction of hazard rate of the number of competitive restrictions flips in column 3, but the effect remains insignificant. A similar pattern is observed for the allocation of quotas in column 3, 4 and 5.

Table 5.6 continues with other robustness checks. Instead of the number of competitive restrictions, we included the square of the number competitive of restrictions in column 5 of table 5.6. Again, the coefficient remains insignificant. In addition, we tested for a parabolic (bell-shaped) relationship by including the number of restrictive elements as well as the square of the number of restrictive elements in column 6 of table 5.6 (see: De, 2010). Both coefficients enter insignificant. Furthermore, we estimated a possible parabolic relation between GDP growth and duration. As far as we are aware, this is uncommon in the empirical literature. In column 7 of table 5.6 we included both, the GDP growth and the squared value of GDP growth. Interestingly, we find a rather significant effect of both variables on cartel duration. Hence, we decided to keep both variables in further estimations. The interpretation of this effect will be further discussed in section 5.5.3.

Columns 8 and 9 of table 5.6 investigate the effects of the control variable for the different industries. Up until here, we included categorical dummies for cartels that were (i) manufacturing, (ii) non-manufacturing or (iii) both. The control variable does not produce significant results. In column 8 we included separate dummies for the industries based on the first digit of the relevant industry. The estimations in column 8 show that the analysis is

Table 5.5: Regression results on cartel duration in years [A,B]

	Base model1 [C]			Model 2 [D]			Model 3 [E]			Model 4 [F]		
	Hazard Rate	Sign.	Prob.	Hazard rate	Sign.	Prob.	Hazard rate	Sign.	Prob.	Hazard rate	Sign.	Prob.
Allocation of markets	0.78	**	0.04	0.77	**	0.04	0.80	*	0.07	0.78	**	0.04
Clauses on prices	0.86		0.14	0.86		0.14	0.90		0.31	0.87		0.16
Allocation of quotas	0.98		0.91	0.98		0.91	1.05		0.73	1.03		0.84
Tender agreement	0.79		0.18	0.79		0.18	0.79		0.17	0.78		0.16
No. of restrictions	1.01		0.79	1.02		0.77	0.99		0.92	1.01		0.85
No. of restrictions^2												
Ln Members	0.86	***	0.00	0.87	**	0.01						
Members										1.00	*	0.09
Many vs. Few							0.70	***	0.00			
Members^2										1.00		0.50
Central body	0.98		0.81	0.98		0.75	0.92		0.44	0.87		0.15
Central_body * Ln Members				1.04		0.87						
File type	0.49	**	0.00	0.49	***	0.00	0.47	**	0.00	0.48	***	0.00
Foreign	0.85		0.29	0.85		0.29	0.81		0.16	0.85		0.28
No. of inds	0.59	*	0.09	0.60	*	0.10	0.59	*	0.09	0.60	*	0.10
GDP growth	1.65	***	0.00	1.65	***	0.00	1.65	***	0.00	1.65	***	0.00
GDP growth^2												
Parallel cartels	0.99	***	0.01	0.99	**	0.01	0.99	***	0.01	0.99	***	0.01
Dum_inds (non_ man)	1.03		0.76	1.03		0.78	1.00		0.98	0.99		0.91
(non_man and man)	2.01		0.14	1.98		0.15	1.89		0.17	1.84		0.19
Industry dummies (0–9)	no			no			no			no		
No. of observations	4525			4525			4525			4525		
No. of subjects	667			667			667			667		
No. of failures	576			576			576			576		
Log likelihood	−2339			−2339			−2342			2344		
LR chi2	348			348			342			340		
Probability>chi2	0.00			0.00			0.00			0.00		

Notes:

*A In this table, * denotes significance at the 10-percent level, ** at the 5-percent level, and *** at the 1-percent level.*

B Grey area represents the variables that are adjusted compared to base model 1.

C Column 1: Base model.

D Column 2: Test for interaction between central body and ln(members).

E Column 3: Test for dummy variable number of members > 5.

E Column 4: Including number of members and quadrate of number of members to test for nonlinear effects.

not particularly affected by the change of this control variable, the results remain robust. In column 9 we did not account for any industry effects at all. Again, the results remain broadly similar, only the variable number of industries loses significance.[87] Since the results are not really affected by the inclusion of another or no control variable we do not see any reason to control for industry effects in further estimations.

5.5.3 Core model

Up until here, we conducted some robustness checks with various variables. We found that the results of the coefficients remained broadly similar in each of the estimations. Only the significance of the number of involved industries showed some fluctuations. We chose to present a final analysis in a reduced form. Column 10 of table 5.6 shows the estimations of this core model. Compared to the baseline model of column 1 from table 5.5 we decided to also include the square of GDP growth, because the inclusion of this variable proved significant in the previous estimations. A nonlinear relationship in the shape of a U-curve or an inverted U-curve may combine the theoretical predictions of Green and Porter (1984), Haltiwanger and Harrington (1991) and Rotemberg and Saloner (1986). Where the former two expect a higher risk during downturns, the latter expects a higher risk during economic boosts.

We subsequently excluded the variables that showed insignificant results, starting with those the highest p-values until all the remaining variables become significant. Our core model consists of five explanatory variables. We tested whether the proportional hazard assumption was met for this estimation, based on unscaled and scaled Schoenfeld residuals test. We found that the model in general and the individual predictors did not violate this assumption. Typically, all the significant variables from column 1 from table 5.5 are part of our core model, except for the number of industries which was only marginally significant. Below we discuss the impact of these variables on duration.

First, we observe that an important duration determinant is file size. Larger cartel files tend to positively affect the probability of survival. This may suggest that a lot of documentation at the Ministry stabilizes cartels. It may even be the case that the Ministry acted as an enforcing third party. However, this needs to be analysed further before drawing conclusions. A second important determinant is GDP growth. We observed that there appears a significant nonlinear relation between GDP growth and cartel duration. If we transform the hazard ratios into coefficients, the coefficient for *GDP growth* becomes 0.30 and the coefficient for *GDP growth^2* becomes 0.06. At first sight, this seems to result in an inverted-U curve for the relation between GDP growth and the probability of cartel survival.

[87] The VIF scores for the categorical dummy for (non-)manufacturing and the number of industries were the two highest scores (see footnote 86). Excluding the categorical dummies might have had an influence on the number of industries.

Table 5.6: Regression results on cartel duration in years [A,B]

	Model 5 [C]			Model 6 [D]			Model 7 [E]			Model 8 [F]			Model 9 [G]			Model 10 [H]		
	Hazard Rate	Sign.	Prob.	Hazard rate	Sign.	Prob.	Hazard rate	Sign.	Prob.	Hazard rate	Sign.	Prob.	Hazard rate	Sign.	Prob.	Hazard rate	Sign.	Prob.
Division of markets	0.78	**	0.04	0.78	**	0.04	0.76	**	0.02	0.77	**	0.04	0.76	**	0.03	0.80	**	0.04
Clauses on prices	0.87		0.16	0.86		0.13	0.85		0.11	0.87		0.20	0.85		0.11			
Allocation of quotas	1.00		0.98	0.98		0.90	0.94		0.65	0.95		0.71	0.93		0.58			
Tender agreement	0.80		0.19	0.78		0.16	0.77		0.13	0.77		0.16	0.73	**	0.06			
No. of restrictions				1.13		0.48	1.02		0.73	1.00		0.97	1.02		0.69			
No. of restrictions^2	1.00		0.98	0.98		0.51												
Ln Members	0.86	***	0.00	0.86	***	0.00	0.86	***	0.00	0.86	***	0.00	0.86	***	0.00	0.86	***	0.00
Members																		
Many vs. Few																		
Members^2																		
Central body	0.97		0.80	0.97		0.79	0.97		0.76	1.00		0.96	0.97		0.78			
Central_body * Ln Members																		
File type	0.49	***	0.00	0.49	***	0.00	0.47	***	0.00	0.49	***	0.00	0.48	***	0.00	0.46	**	0.00
Foreign	0.86		0.30	0.86		0.32	0.83		0.23	0.85		0.30	0.84		0.25			
No. of inds	0.59	*	0.09	0.59	*	0.09	0.58	*	0.08	0.67		0.24	0.83		0.26			
GDP growth	1.65	***	0.00	1.65	***	0.00	1.33	***	0.00	1.33	***	0.00	1.33	***	0.00	1.35	***	0.00
GDP growth^2							1.06	***	0.00	1.06	***	0.00	1.06	***	0.00	1.06	***	0.00
Parallel cartels	0.99	**	0.01	0.99	**	0.01	0.99	**	0.04	0.99	***	0.01	0.99	**	0.06	0.99	**	0.04
Dum_inds (non_man)	1.03		0.76	1.03		0.77	1.02		0.83									
(non_man and man)	2.01		0.14	2.03		0.13	2.03		0.13									
Industry dummies (0–9)	no			no			no			yes			no			no		

Table 5.6: Regression results on cartel duration in years [A,B] *(continued)*

	Model 5 [C]			**Model 6** [D]			**Model 7** [E]			**Model 8** [F]			**Model 9** [G]			**Model 10** [H]		
	Hazard Rate	Sign.	Prob.	Hazard rate	Sign.	Prob.	Hazard rate	Sign.	Prob.	Hazard rate	Sign.	Prob.	Hazard rate	Sign.	Prob.	Hazard rate	Sign.	Prob.
No. of observations	4525			4525			4525			4525			4525			4525		
No. of subjects	667			667			667			667			667			667		
No. of failures	576			576			576			576			576			576		
Log likelihood	−2340			−2339			−2333			−2328			−2334			−2338		
LR chi2	348			349			361			371			359			351		
Probability>chi2	0.00			0.00			0.00			0.00			0.00			0.00		

Notes:

*A In this table, * denotes significance at the 10-percent level, ** at the 5-percent level, and *** at the 1-percent level.*

B Grey area represents the variables that are adjusted compared to base model 1.

C Column 5: Includes quadrate of number of restrictions, test for nonlinear effect of number of restrictions.

D Column 6: Includes number of restrictions and quadrate of number of restrictions, test for nonlinear effect of number of restrictions.

E Column 7: Includes GDP growth and quadrate of GDP growth, test for nonlinear effects of GDP growth.

F Column 8: Includes multiple industry dummies.

G Column 9: No control variables.

H Column 10: Subsequently removed the insignificant predictors with highest p-value until all coefficients enter significant.

The probability of cartel survival shows a positive relation with GDP growth up to growth levels of −2.65. From growth levels of −2.65 the relation between GDP growth and duration becomes negative, i.e. the more growth the higher the probability of failure. However, table 5.4 reports that minimum value of the GDP growth rates is −1.2, this implies that the positive relationship does not apply for the cartels in our sample. So, for the cartels in our sample we observe a negative relation between duration and GDP growth. Our results correspond with the theoretical predictions from Rotemberg and Saloner (1986), cartel failure due to cheating is more likely during economic booms than busts. Furthermore it corresponds with the negative relation that was exhibited for legal cartels by Dick (1996) and Jacquemin, Nambu and Dewez (1981).

Third, the hazard ratio of the dummy on market division agreements points at a positive impact on the probability of survival. This appears the only agreement-type related determinant for cartel duration. Initially, we hypothesized a positive relation with duration which is confirmed by the analysis. The result contributes to the literature in a sense that this finding is in line with the positive tendency of previous results. Fourth, we observe that the number of cartel members is an important determinant for cartel duration. Our result corresponds with our expected sign and with the results of Hyytinen, Steen and Toivanen (2017) and Dick (1996). This variable contributes to the legal cartel literature by confirming the positive tendency of the relation between cartel members and duration. In addition, it underlines the difference of results with legal and illegal cartels. Legal-cartel studies tend to find positive results, whilst studies with illegal cartels typically find a negative relation. Finally, the variable parallel cartels. A higher number of cartels within the same industry contributes the cartel's survival probability. This result is according to our expectations. Other cartels might signal a cartel-friendly industry, but might also point to interdependencies across cartels within the same industry.

Appendix 5.3 (table 5.8) provides the results of two alternative estimations. First, we execute the estimation for the core model by using a two-digit industry level instead of three-digit industries. This particularly affects the variable parallel cartels and the number of industries that are involved in the agreement. The results are broadly in line with the preceding conclusions, however, we observe that the variable *Parallel Cartels* becomes insignificant in this estimation. Second, if we include the outliers with regard to duration and members, we observe that the results of the core model remain robust.

5.6 Conclusions

The present study explored characteristics of legal cartels in the past in relation to their duration using the cartel register from the Netherlands. The register was primarily established for administrative purposes; our duration analysis is one of the first econometric exercises with

the cartel register. We analysed a sample of 667 legal cartels active in the period 1980–1990 for the timeframe 1980-1990. Studying historic and legal cartels produces relevant insights for today's prohibition environment as this study avoids many biases that come with illegal cartels. First, we can analyse a comprehensive and large dataset of legal cartels not restricted to the small subset of detected cartels. Second, we are able to study duration detached from the involvement (and threat) of a competition authority. Duration and gravity are important determinants for the economic harm caused by cartels. In this study we concentrated on cartel duration, but we also tested whether gravity (the type of agreement) is a determinant for duration.

Our empirical results revealed that GDP growth has a negative exponential relationship with cartel duration. Furthermore, larger files are associated with more durable legal cartels. As regards the gravity of agreements, measured by the type of competitive restriction, we observe that market division agreements, appeared to be a successful formula for a durable cartel. In addition we found that a higher number of parallel legal cartels within the same industry fostered duration. The results for the number of participants indicate that larger legal cartels last longer. Organizational characteristics such as the presence of foreign firms or an organizing body do not significantly affect cartel duration. Our various robustness checks exhibit that the results are rather robust.

The results have several policy implications, in particular for competition authorities. First of all, it became clear that legal cartels do not randomly dissolve by their selves. This means that an authority should actively pursue cartels. Second, knowledge about type of agreement can be useful for prioritization matters. Should a competition authority consider to allocate its scarce capacity for further investigation to a possible market division cartel or other types of suspected infringements, the first might be (ceteris paribus) the most (potentially) harmful one in terms of duration. Economic growth also appeared a relevant variable. In periods of growth legal cartels seem more prone to collapse. Perhaps a single antitrust intervention or activity during a period of growth might further destabilize some cartels and bring them to the surface or trigger leniency. Finally, the size of the cartel files at the Ministry of Economic Affairs, which serves as a measure of the complexity of organization. We found that larger files produce longer duration rates. Given this result it is well worth the effort for an authority to complicate written communication for conspirators. For instance by closely and explicitly monitor potential platforms for information exchange.

This research showed how duration of legal cartels can be explained by primarily using insights from the Dutch cartel register. We think that it is important to increase country coverage and analyse more in-depth what can be learned from similar cartel registers in other countries. Finland already executed a duration analysis, but also countries such as Germany, Norway, Denmark and Sweden have had a register (Shanahan and Fellman, 2016).

5.7 Appendices

Appendix 5.1

Figure 5.4: Percentage of annual GDP growth in the Netherlands

Source: Statistics Netherlands

Appendix 5.2

Table 5.7: Correlation matrix explanatory variables

	Duration	Price agreements	Quotas	Market division	Tender agreements	No. restrictions	No. restrictions^2	Ln Members	Members	Members^2	Many vs. Few	Central body	Foreign firms	File type
Duration	1.00													
Price agreements	0.07	1.00												
Significance	0.08													
Quotas	−0.12	0.15	1.00											
Significance	0.01	0.00												
Market division	0.09	0.03	0.05	1.00										
Significance	0.03	0.42	0.23											
Tender agreements	0.10	−0.29	−0.10	−0.09	1.00									
Significance	0.02	0.00	0.01	0.03										
No. restrictions	0.15	0.40	0.40	0.32	−0.01	1.00								
Significance	0.00	0.00	0.00	0.00	0.75									
No. restrictions^2	0.16	0.37	0.40	0.32	−0.03	0.97	1.00							
Significance	0.00	0.00	0.00	0.00	0.48	0.00								
Ln Members	0.17	−0.12	−0.30	−0.03	0.10	−0.05	−0.05	1.00						
Significance	0.00	0.01	0.00	0.46	0.02	0.20	0.23							
Members	0.08	−0.09	−0.18	0.05	0.04	0.01	0.00	0.75	1.00					
Significance	0.07	0.03	0.00	0.25	0.39	0.84	0.95	0.00						
Members^2	0.06	−0.05	−0.10	0.08	0.04	0.03	0.02	0.49	0.91	1.00				
Significance	0.18	0.23	0.01	0.05	0.39	0.41	0.61	0.00	0.00					
Many vs. Few	0.18	−0.04	−0.23	−0.01	0.10	−0.03	−0.02	0.70	0.28	0.13	1.00			

Table 5.7: Correlation matrix explanatory variables *(continued)*

	Duration	**Price agreements**	**Quotas**	**Market division**	**Tender agreements**	**No. restrictions**	**No. restrictions^2**	**Ln Members**	**Members**	**Members^2**	**Many vs. Few**	**Central body**	**Foreign firms**	**File type**
Significance	0.00	0.30	0.00	0.74	0.01	0.49	0.61	0.00	0.00	0.00				
Central body	0.16	−0.08	−0.19	−0.15	0.26	−0.06	−0.06	0.48	0.22	0.10	0.45	1.00		
Significance	0.00	0.07	0.00	0.00	0.00	0.16	0.15	0.00	0.00	0.01	0.00			
Foreign firms	0.10	0.08	0.04	0.05	−0.06	0.11	0.11	0.06	0.17	0.18	−0.06	−0.01	1.00	
Significance	0.02	0.07	0.38	0.26	0.16	0.01	0.01	0.16	0.00	0.00	0.14	0.90		
File type	0.18	0.03	0.06	0.02	0.06	0.26	0.25	0.21	0.19	0.13	0.15	0.19	0.11	1.00
Significance	0.00	0.50	0.18	0.72	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	
No. of industries	0.06	−0.03	−0.05	0.06	0.06	0.04	0.04	0.11	0.16	0.13	0.07	0.06	−0.02	0.03
Significance	0.12	0.49	0.26	0.13	0.16	0.38	0.29	0.01	0.00	0.00	0.09	0.13	0.64	0.49

Appendix 5.3

Table 5.8: Reduced model based on two-digit industries and including outliers

Cox proportional hazard survival analysis [A]	Reduced model [B]			Reduced model [C]		
	Hazard ratio	Significance	Probability	Hazard ratio	Significance	Probability
Division of markets	0.79	**	0.03	0.82	**	0.05
Ln Members	0.86	***	0.00	0.87	***	0.00
File type	0.47	***	0.00	0.45	***	0.00
GDP growth	1.34	***	0.00	1.37	***	0.00
GDP growth^2	1.06	***	0.00	1.05	***	0.00
Parallel cartels	1.00		0.29	1.00	*	0.06
No. of observations	4525			5101		
No. of subjects	667			734		
No. of failures	576			619		
Log likelihood	−2339			−2487		
LR chi2	348			385		

Notes:
*A *** represents a significant coefficient at the level of 1 percent; ** represents a significant coefficient at the level of 5 percent; and * represents a statistical coefficient at the level of 10 percent.*
B The reduced model is estimated based on markets that are defined at two-digit industry levels timeframe 1980-1990.
C The reduced model is estimated including outliers, based on markets that are defined at three-digit industry levels timeframe 1980-1990.

6 Summary and Conclusion

This thesis looked into cartels in the Netherlands in the 20th century. The overarching research question was:

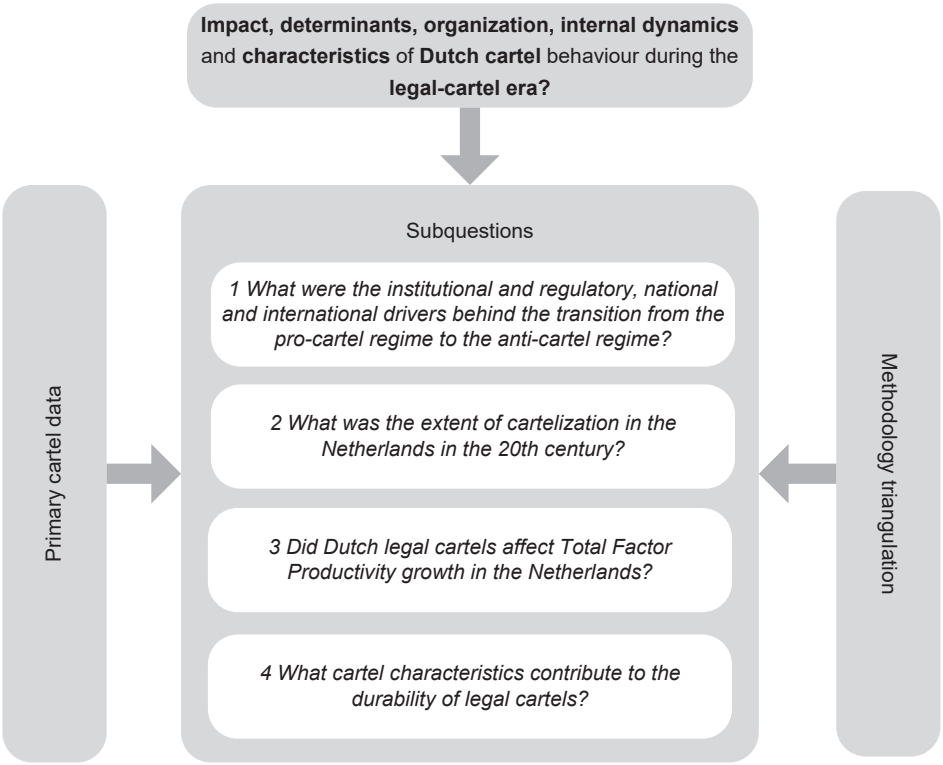
What were the impact, determinants, organization, internal dynamics and characteristics of Dutch cartel behaviour during the legal-cartel era?

We concentrated on the legal-cartel era defined as the period 1935–1998 wherein the legislation was cartel friendly. The first explicit cartel-friendly legislation dates back to 1935. From 1998 cartels became prohibited according to Section 6 of the Dutch Competition Act (Dutch cartels with interstate effects already were prohibited as of 1958 according to Article 85 from the Treaty of Rome). It took four decades, but since 1998 the principles of perfect competition are incorporated in the Dutch legislation in line with the common view that cartels harm economic welfare. Although the legal-cartel era belongs to the past, a great deal can be learned from the study of cartelization during that era. In this thesis we sought to unravel the characteristics of the legal-cartel era. Four sub-questions (article/publication-based chapters) contributed to addressing the overarching research question. Figure 6.1 illustrates the structure of this thesis. The disclosure and use of primary data from the Dutch cartel register to shed light on the legal-cartel era in the Netherlands are the foundation and one of the main contributions of this research. The data from this register are the empirical base of chapters 3, 4 and 5. Chapter 7 describes the methodology of data collection, encoding and verification: we discuss how the primary data are treated and how we produced a dataset that is suitable for quantitative research.

Empirical research on cartels during the legal-cartel era in the Netherlands using primary cartel data (i.e. the original source material) does not exist. The Dutch cartel register is confidential and the inaccessibility of these primary data was a barrier to the conduct of research in this field. Previous research into legal cartels was limited to secondary-data sources (i.e. aggregated data based on the original source material or a selection of cases that were published), which are inadequate for econometric analyses. Industry panel analysis and analysis at an individual cartel level were impossible.

Through methodology triangulation, the overarching research question was approached from several angles. The following methodologies were used in this thesis: academic-literature research, document analysis, data collection, verification and encoding, descriptive analysis, econometric analysis and interviews. In this chapter, we first present the main findings for each of the four sub-questions. Second, we present the most important avenues for further research.

Figure 6.1: Construction of thesis



6.1 Findings

Chapter 2 discussed the social, legal and economic transformation processes from the legal-cartel era in the 1930s to the anti-cartel regime in the late twentieth century. For four distinctive periods of the legal-cartel era ((i) cooperation and cartels, (ii) modification, (iii) institutional inertia and (iv) transformation), we examined national and international developments and institutional and regulatory change. The legal cartel-era started in 1935. That was when the first pro-cartel law came into force. The second law emerged in 1941, while amendments to the second law were enacted in 1951, and the third pro-cartel law dated from 1958. The cartel-friendly policy was entirely compatible with the deeply-rooted Dutch consensus culture. Furthermore, until the second half of the 20th century, the Dutch cartel policy had also been relatively consistent with cartel policy on the European continent. Various European countries implemented a local pro-cartel policy to regulate the deteriorating economic situation in the 1930s. From the second half of the 20th century, Dutch competition policy increasingly diverged from the path Europe was following. The prevailing Dutch laws, systems and the consensus policy appeared to offer no impetus for the cartel policy to

converge with Europe's direction. These three formed a significant institutional and cultural barrier to change. For instance, the criterion of public interest to block harmful cartels proved inadequate. In addition, the introverted cartel policy was not helpful. The confidentiality of the cartel register allowed limited opportunity to inform the public about the scope of cartel agreements. Important catalysts for change, on the other hand, were international and economic developments. From the start of the European Economic Community (EEC), competition was considered vital to ensuring market integration. The economic breakdown of the 1980s and the failure of alternative economic policies to combat these problems increased pressure for change. 'Europe 1992' provided still further momentum for integration. Cross-border competition was essential to the pursuit of the goals of European integration. In order to achieve a level playing field, convergence of national policies was essential, and the Netherlands was forced to catch up. During the legal-cartel era, there was an apparent lack of research into the economic impact of uncompetitive Dutch markets. It was only in the 1990s that research gathered pace and was able to convince politicians that the pro-cartel law was becoming obsolete, and that the economy urgently required increased competition.

Chapter 3 has shed light on the degree and nature of registered cartelization in the Netherlands in the 20th century. A quantitative substantiation of chapter 2 was provided in chapter 3. By studying the Dutch participation in international cartels in the 1930s, we concluded that the Netherlands, from an international perspective, were active in a relatively large number of international cartels. For the period 1960 until 1998, we studied material from the cartel register using (i) our legal-cartel dataset constructed with primary data (i.e. the original register material; see chapter 7), and (ii) information from secondary-data sources (i.e. aggregated data that was extracted from the original register material). We believe that the register is an appropriate resource for drawing a picture of cartelization in the Dutch economy. Furthermore, we found indications that the secondary data are broadly consistent with the (aggregated) primary data. Overall, the degree of national cartelization in the Netherlands, measured by the number of registered agreements, was relatively high in the 1950s, 1960s and 1970s in comparison to the 1980s and 1990s. Firms did not hesitate to establish cartels. As regards the nature of cartelization, we found that most Dutch cartels used many instruments that were adequate for avoiding competition. These included price-fixing agreements, coordination of conditions, the use of quotas, and market-sharing agreements. These restrictive elements, which are particularly effective in serving the firms' interests, are not in the consumers' interest. It was common for cartels to combine multiple competitive restrictions into a single agreement. The cartels themselves appeared highly resilient and well-organized. Compared with research on legal cartels in other countries, we observe that the duration, the degree of organization, the international scope, and the number of participants were all relatively high in the Netherlands in the period 1980–1998. A more stringent cartel policy that began in the late-1980s coincided with a reduced number of registered agreements, a reduced participant intensity and central

organization and less severe cartelization. Yet, the exemption requests, which were filed during the starting period of the Dutch Competition Act, show that industries still had a desire to continue competition limiting practices at the end of the legal-cartel era. This might signal that cartels did continue below the surface.

Chapter 4 contributed to the literature by estimating the effects of cartel activity on Total Factor Productivity (TFP) growth. The primary data from the cartel register served as the foundation for this research (see chapter 7). We used the legal-cartel dataset that we constructed using the primary data and secondary data from EU KLEMS and GGDC (Groningen Growth and Development Centre). Cartels are expected to curb productivity growth. They reduce the level of competition, thereby reducing the incentive to operate efficiently. A fixed effects panel analysis for 27 industries of the Dutch economy in the period 1982–1998 was conducted to test the hypothesis that cartels have no impact on Total Factor Productivity growth. Variables to explain Total Factor Productivity growth that were derived from the register related to cartel formation, cartel termination and cartel presence in the different industries of the Dutch economy. We used three control variables: (i) the technology gap measured as the Dutch performance in relation to the international frontier leader, (ii) the growth of this international frontier leader, and (iii) the level of human capital. Our research results refute the idea that cartel presence, as recorded in the cartel register, stimulate (respectively had no impact on) TFP growth at industry level of the Dutch economy in the period 1982–1998. The argument put forward during the legal-cartel era, that cartelization could protect the Dutch economy does not apply from this point of view. Instead, these findings suggest the urgency of the implementation of the 1998 prohibition legislation.

Chapter 5 examined the characteristics of legal cartels in relation to their longevity. Although many game-theoretical analyses brand cartels as inherently unstable constellations, there is also theoretical and empirical research showing that there are some factors that can assist survival over time. This chapter contributed to the literature by conducting a time survival analysis of the factors that help legal cartels survive in the Netherlands. Also in this chapter, the primary data from the cartel register served as the foundation for research (see chapter 7). We derived eleven cartel-related characteristics from the legal-cartel dataset. Furthermore, we linked secondary data from Statistics Netherlands on annual GDP growth to years in which cartels were active. An estimate was made of the impact of these variables on the duration of Dutch legal cartels that were active in 1980 or established after 1980 over the period 1980–1990. Our empirical results revealed that GDP growth tends to increase the probability of cartel failure rather than survival. It also became clear that cartel agreements that related to market sharing significantly increased the likelihood of survival. Furthermore, extensive cartel files tend to result in more durable cartels. In addition, we observed that the total number of separate cartel agreements within the same industry enhanced cartel duration. Finally, we found that the higher the number of cartel participants, the higher the

likelihood that they would survive. Overall, we conclude that there are particular factors that help cartels survive or fail, while there are also factors that have no particular impact on duration. Based on the data from the cartel register, we have observed substantial differences in duration performances, and in the way cartels organize themselves. We found that some apply a successful formula for survival, and others utilize instruments that do not particularly facilitate survival. In other words, surviving is not simply random chance.

Chapters 4 and 5 are complementary since they examined two important determinants for the harm caused by cartels: gravity and duration. Moreover, gravity was examined from two different angles: from an economic perspective (i.e. 'by effect') and from a legal perspective (i.e. 'by object'). Gravity was measured in chapter 4 as the meso-economic impact on the economy. So it was approached from a so called 'effects based' angle. Here, we studied the impact of an agreement detached from its duration. We found indications that cartels, in general, have a negative impact on the TFP growth in the period 1982–1998. This however, does not reveal information about the durability of the impact of agreements. Chapter 5 examined cartel duration as a second parameter for the economic harm caused by cartels. In this chapter we also adopted gravity as a determinant for duration. We concentrated on the nature of the agreement as an indication for gravity. This is related to the so called 'object approach' of an infringement, implicitly assuming that the agreed restriction is effectively implemented by the firms. We found a positive relation between gravity (in particular market division) and cartel duration. When determining economic harm one needs to consider both, duration and gravity of agreements.

6.2 Avenues for further research

Each of the separate chapters has proposed some suggestions for further research with the constructed legal-cartel dataset. Below, we discuss the six most important recommendations for further research.

First of all, the most important recommendation is expansion of the period covered by the legal-cartel dataset. In this thesis, the primary data from files open or opened after 1980 were studied and collated into the legal-cartel dataset. The cartel files from the cartel register that were closed before 1980 remained unstudied. We recommend the examination and disclosure of the material that fell outside the scope of this thesis. If we expand the dataset with the other cartel files, we will be able to paint a complete picture of the cartels from 1941 through 1998 based on primary data. Disclosing the entire register would provide a longer period for further research. In addition, a significant overlap between the secondary-data source and the primary-data source would be created. This would allow possible discrepancies between the secondary and primary data to be thoroughly examined and explained.

The second suggestion for further research concerns enriching the primary cartel dataset with additional cartel characteristics. In this research, we studied the seven characteristics that were considered to be the most important for addressing the research question. These were start date, end date, industry, number of participants, the presence of an organizing body, the presence of foreign firms, and the nature of the agreement. These variables are static in nature: we did not study the dynamics within a cartel file (i.e. changes in these variables). For further research we suggest investigating these dynamics, such as changes in the number of participants, or competitive restrictions. In addition, some static variables that would reward study are: the geographical scope of the agreement, the initiator and/or leader of the cartel, and market shares of the cartel members.

With regard to the duration analysis of cartels, it would be valuable to perform a similar duration analysis for illegal, detected cartels in the Netherlands. A comparison can be made between the research results of legal registered cartels and illegal detected cartels. By doing so, an insight could thus be gained in the representativeness of legal cartels compared to illegal cartels.

As regards the relationship between cartels and productivity growth, we would like to suggest an in-depth industry analysis or even an analysis at company level. In this thesis, we analyzed the industries of the Dutch economy at a comparatively high level of aggregation, particularly due to a lack of data on Total Factor Productivity at more detailed levels. It would be valuable to examine the possibilities of collecting more detailed data. One can study a specific industry, a limited number of industries or even a specific cartel as a subject for scrutiny.

In this thesis, the two econometric analyses explained respectively cartel duration and Total Factor Productivity growth. We did not look at the effects of cartels in terms of the mark-up on competitive prices. It would be interesting to study (i) whether, (ii) which, and (iii) to what extent permitted cartels are actually able to raise prices.

The value and originality of this thesis was the use of the legal-cartel dataset constructed with primary data at the micro level of a cartel, covering the entire Dutch economy. Nevertheless, it would be very useful to carry out qualitative case studies on the internal organization and dynamics of cartels with the primary data from the cartel register on legal cartels. For instance, one could study how enforcement systems within a cartel are arranged. The cartel contracts or statutes of trade associations might provide informative details about monitoring and punishment mechanisms. Furthermore it would be interesting to examine the developments of prices by studying files with enclosed price lists or calculation schemes.

7 Data appendix: Coding the Dutch cartel register

7.1 Introduction

The cartel register is the empirical basis of this thesis. Primary data from the register are disclosed into an anonymized dataset also suited for future research purposes: the legal-cartel dataset. In this chapter follows a detailed description of the data collection, encoding and verification (henceforth: DCEV) of the data from the cartel register.

The construction of our legal-cartel dataset regards the transformation from unstructured and/or semi-structured qualitative raw data from the cartel register to a structured quantitative dataset suited for econometric research. To date, there is no such large and uniform dataset based on primary data from the Dutch cartel register. Due to the confidentiality of the register, the primary data have never been used in academic research. The only publicly accessible material concerned aggregated cartel data produced in the annual reports of the Ministry of Economic Affairs. In one instance, in 1987, a static list of individual cartels and their corresponding industries was published by the Ministry. The dataset that is constructed in this thesis provides new possibilities for academic research to legal cartels. An important reason to transform qualitative raw data into a quantitative structured dataset is that it allows one to test hypotheses and draw general conclusions based on statistical inference. This contributes to validating or falsifying theories, or creating new theories. The construction of our legal-cartel dataset is based on the academic literature of content analysis. According to Neuendorf (2002: 10), an important contributor to the literature of content analysis, "*content analysis is a summarizing, quantitative analysis of messages that relies on the scientific method*". Content analysis is particularly useful to examine complex qualitative characteristics such as the intentions of communicators or the attitudes, interests and values of population groups. Our research does not particularly concentrate on attitudes or interests, but rather distilling and coding explicit cartel characteristics from unstructured and/or semi-structured files. That means that our research is less complex and less sensitive for interpretation issues compared to other content analysis exercises. Still, principles from the content analysis literature are applicable on our research.

This chapter is outlined as follows. First, we discuss the source of the data. Second, we describe the defined scope of the data. Third, the process of collection, encoding and verification of the data is thoroughly described. Fourth, we place some remarks at the process of the construction of the legal-cartel dataset.

7.2 Source

7.2.1 Central Archive Selection service

First, we introduce some noteworthy characteristics of the original data. The cartel register emerged in 1941 because the Cartel Decree required firms to notify their cartel agreements at the Ministry of Economic Affairs. According to a former employee at the Ministry Joop Winkel, handling the registration of the documents, the register was stored in eight filing cabinets, each weighing approximately 300 kilograms (interview Joop Winkel, 2014). As a result of the introduction of the Dutch Competition Act in 1998, the register was abolished after being in operation for almost six decades.

The register became stored at the *Centrale Archief Selectiedienst* (CAS; Central Archive Selection service) in Winschoten.[88] The entire archive of the Directorate Competition at the Ministry of Economic Affairs covered more than 150 meter of paper documents. A selection of relevant documents was made by CAS and eventually 109 meter was kept.[89] Jarig van Sinderen, Peter van Bergeijk and Lilian Petit, respectively promotors and PhD researcher, did a site visit to the Central Archive Selection service to inspect and verify the presence of the original material in July 2012 before the research with the data actually started. We received a tour from the account manager Aike van der Ploeg through the warehouse and were able to examine some original material. For illustrative purposes some photographs of our visit are included in figure 7.1.

7.2.2 Digitalization

The material sourcing fell beyond the scope of our research (see: Srnka and Koeszegi, 2007) because this was already done by CAS. In 2008, ten years after the new Competition Act came in effect, the CAS digitalized the documents in commission of the Netherlands Competition Authority (NMa)[90]. The NMa required this data primarily for administrative purposes. For instance to study the cartel history of certain firms or sectors. This resulted in 24 gigabyte of data, equal to 4,584 PDF documents. An indexation of the 4,584 electronic scans was compiled, containing the following characteristics: industry, opening and closing date of documents, number of participants, names and location of participants, description of documents, index number and the type of documents (large vs. small). We refer to this

[88] CAS is legally a temporary storage. Eventually, all the documents have to become stored at the National Archives. In general, this implies that the material becomes public. From 2011 CAS became part of a broader organisation Doc-Direkt.

[89] According to Aike van der Ploeg a part of the difference can be explained by re-packing the documents reducing the shelve space. The selection was based on 'Besluit vaststelling selectielijst neerslag handelingen beleidsterrein Economische Mededinging en Industrieel Eigendom vanaf 1946 (Minister van Volksgezondheid, Welzijn en Sport)' see: http://wetten.overheid.nl/BWBR0023245/2008-01-10#Bijlage

[90] As of April 2013: the Authority for Consumers and Markets (ACM).

Figure 7.1: Visit Archives Winschoten

Upper: storage of the cartel register; lower: documents from the cartel register, FLTR Peter van Bergeijk, Jarig van Sinderen and Lilian Petit

index as the 'CAS dataset'. The data were initially organized in a Microsoft Access database. The employees of the Archives that compiled the digitalization and indexation were not employed at the Archives anymore during the period of the construction of the dataset. Instead, account manager Aike van der Ploeg, was available for questions on the dataset.[91]

7.3 Scope

7.3.1. Terminology

For the purpose of defining scope and prevent confusion whilst reading, we will define five frequently used terms such as reported in table 7.1. The CAS dataset served as a starting point for the construction of our legal-cartel dataset. The material from the register was digitalized and resulted in 4,584 *electronic scans* or *PDF files*. The electronic scans or PDF files from the CAS dataset that regard a cartel agreement, instead of a merger, are referred to as *cartel-docs*. In approximately half of the cases a single electronic scan is a cartel observation on its own. All the information from the cartel is bundled in this electronic scan. We call this a *single-file cartel*. In other cases a bundle of electronic scans regards a cartel observation. In this case we refer to a *multiple-file cartel*. Both, the single-file and multiple-file cartels are considered a *cartel agreement*.

Table 7.1: Terminology

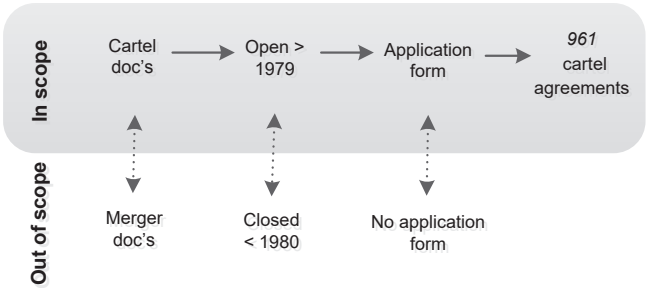
Terminology	Description
Electronic scan / PDF file	Single-file such as determined by CAS
Cartel-doc	An electronic scan / PDF file that regards a cartel according to CAS
Single-file cartel	A cartel with only one scan / PDF file / cartel-doc
Multiple-file cartel	A cartel with multiple scans / PDF files / cartel-docs
Cartel agreement	Single-file or multiple-file cartel

7.3.2 Selected material

We used the indexation from CAS as a starting point to construct the legal-cartel dataset. Figure 7.2 visualizes the selection of the material which is finally subject to analysis. According to the CAS dataset, a total of 3,826 from the 4,584 electronic scans regarded cartel agreements. The other electronic scans concerned merger applications and thus fell beyond the scope of our analysis. According to the CAS classification a file concerned either a cartel or a merger, not both.

[91] More than twenty e-mails were sent to the CAS in 2012, 2013, 2014 and 2017, the correspondence is archived.

Figure 7.2: Selection of documents

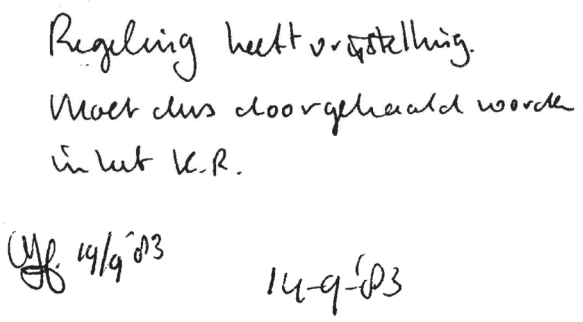


From the remaining 3,826 electronic scans a further selection took place. We selected cartel-docs containing material from 1980 or later according to the CAS. The three main considerations for this selection were described in chapter 1 of this thesis. First, a selection was necessary to keep the data work manageable. Second, the econometric exercise relating to sub-question 3 required only cartel observations from 1980. Third, because this would create the possibility to link the primary data from the register to the secondary data from the Ministry reports (which were produced up until 1985).

In order to keep data collection consistent, the data that was collected is primarily drawn from the application form. The application form is the official form the Ministry used for firms to notify their agreements. The form was filled in by the firms, signed and sent to the Ministry to complete the notification of their cartel. Through a searching tool on the computer we automatically searched the content of the PDF files and identified the cartel-docs containing text which was mentioned in the application form: 'Zijn buit' (*Are there also forei[gn]*); 'Wat is het karakter' (*What is the nature*); 'Welke natuurlijke' (*Which natural [persons]*); and 'Wie is belast' (*Who is in charge*). In order to be complete we also manually screened all the other cartel-docs (> 350 cartel-docs), where the computer search tool did not find an application form. This resulted in about 30 extra cartel-docs that were included in our analysis. Eventually we based our dataset on 1,379 cartel-docs representing 961 cartel agreements.

During our research we found some cases where the registered cartel (1) appeared no actual cartel after the Ministry's assessment or (2) did not fall under the duty to notify at the Ministry. For the purpose of consistency, we qualified these applications as cartel agreements. Example 7.1 includes an illustration of such a case.

Example 7.1: Exempted agreement



Document number 2305, p1: *"Arrangement is exempted. Remove from register 14/9/'83, 14/9/'83"*

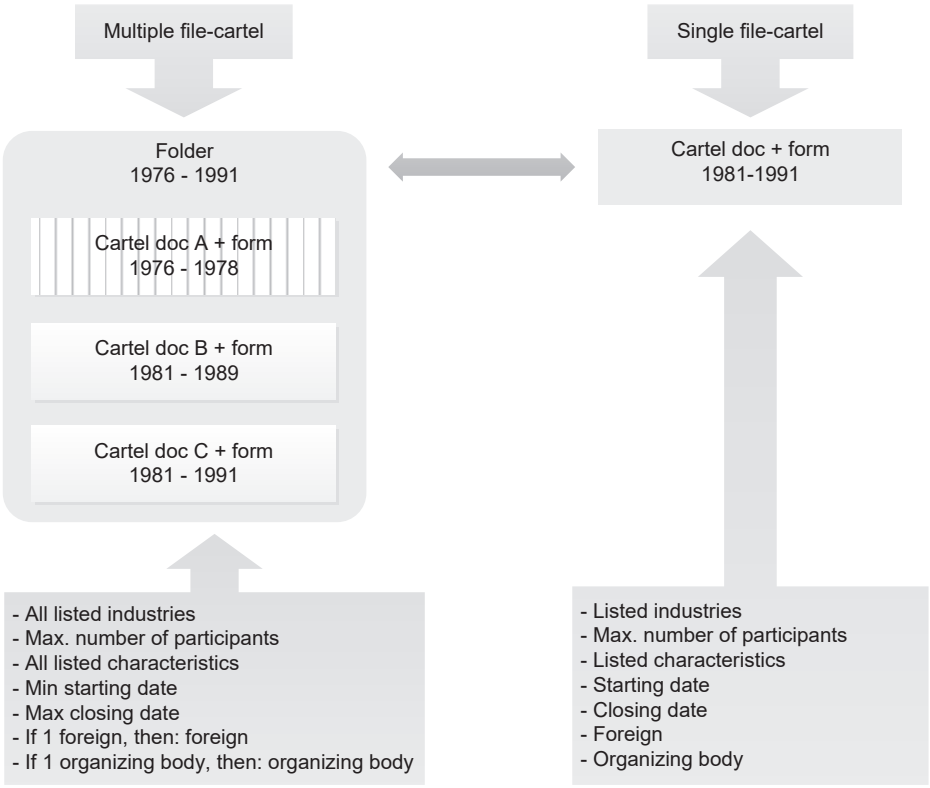
Chapter 2 of this thesis includes a first exercise to determine the overlap between the secondary and primary data sources. We compared the aggregated data (secondary data) with the primary data and found some minor discrepancies. Another source to indicate the overlap between our primary data and the data that were presented by the Ministry of Economic Affairs is the list of cartels that was published in 1987 by State Secretary Evenhuis (Tweede Kamer, 1987c). This is a static list of agreements that were said to be registered in the cartel register at that time. His list counts 547 cartel agreements in 1987. Based on our data 488 cartels were active in 1987 (started before 1988 and ended after 1986). We observe a difference of approximately 60 agreements (or 12 percent). Yet, a thorough look at the list of Evenhuis is able to explain this difference. In the primary data an overarching agreement might consist of various underlying agreements, for instance separate agreements per province. We consider this one agreement, while Evenhuis reported each of them as separate agreements. This also relates to the distinction between single-file versus multiple-files which is further explained in the next section (7.3.3). Approximately 50 records from the list of Evenhuis seem to belong to an overarching agreement.[92] Overall, we have indications that the primary data overlaps with the published secondary data.

7.3.3 Single-file versus multiple-file cartels

An important distinction for the process of data collection, encoding and verification (DCEV) is the difference between single-file and multiple-file cartels. Figure 7.3 depicts the distinction between those two types. A multiple-file cartel is a folder consisting of multiple cartel-docs / PDF files. We classify such a folder as a cartel agreement. The underlying documents are interrelated according to CAS. For the multiple-file cartels, all the constructed

[92] For instance in the list of Evenhuis (Tweede Kamer, 1987c) the Vimpoltu agreements (p. 1486), the HIBIN agreements (p. 1486a), the KVGO agreements (p.1486c) and the NBT agreements (p. 1486d) together represent 40 agreements. In the primary data these are considered to belong to only four agreements.

Figure 7.3: Single-file versus multiple-file cartels



and verified characteristics from the underlying selected cartel-docs were registered at document level and aggregated at the folder level such as depicted in figure 7.3.

In general, only cartel-docs that had an ending date after 1979 according to the CAS and containing an application form were studied. In figure 7.3 this means that '*Cartel-doc A*' remains unstudied. If some of the underlying documents open after 1979 did not contain an application form, the file was not opened or analysed.[93] In 22 cases, a folder still open after 1979, was not investigated because the application forms were absent in cartel-docs after 1979.

7.3.4 Content of a document

Various types of documentation can be found in a cartel-doc. A cartel-doc usually includes a cartel application form. Other content that can be found in a cartel-doc are for instance a note of continuation; a note of expiration; a copy of the covenant; a modification (a

[93] There was only one exception to this rule. In order to collect information about the closing date, we studied the cartel-doc(s) with the latest starting date, even if this file had no application form.

new registration form); correspondence between the government and the organizations concerning (e.g. the duration, amendments, completion of registration, etc.); investigation reports by the Economic Surveillance Authority or the Ministry of Economic Affairs, price lists, internal notes and minutes, newspaper articles. Except (notes from) telephone calls, all the written correspondence is adopted in the files (interview Joop Winkel, 2014).

7.3.5 Identification of application forms

We identified various types of application forms in the cartel-docs but they generally contained similar questions. Appendix 7.1 provides the content of a form used in 1950, the form used in the 1980s and the content of the form used in 1990. Table 7.2 lists the questions from the application forms which were visible in all the different types. Hence, it becomes possible to structurally collect and create data. We located the application forms by screening the file manually. In case of large files (over hundred pages), we sometimes automatically searched for the word "uitvoering" (*execution*). This word was mentioned in the heading of all the application forms.

Table 7.2: Reoccurring questions from cartel application form

Questions
1 What is the name of the competition agreement?
2 Is the competition agreement an agreement or an act?
3 Is the competition agreement an official document?
4 Who is in charge of the execution and monitoring of the competition agreement?
5 How many people and legal entities that are not an owner of an organisation nor a freelancer are involved in the competition agreement?
6 How many organisations or freelancers are involved in the competition covenant?
7 How many organisations or freelancers, outside the Netherlands, are involved in the competition covenant?
8 The date of establishment of the agreement:
9 The starting-date of the agreement:
10 The end-date of the agreement:
11 What goods or services is the competition covenant connected with?
12 What is the content of the competition covenant?
13 Is the competition agreement nation-wide (Yes/No)? If not, which parts of the Netherlands are involved?
14 What kind of additional characteristics are relevant for a better understanding of the competition agreement?

7.3.6 Missing material?

Our legal-cartel dataset, thus, studies 961 cartel files active between 1980 and 1998. As discussed earlier in this thesis, due to the fact that (1) cartels were legal, (2) the register is confidential and (3) registration was compulsory, we achieve a rather complete picture of the actual degree of cartelization. Former employee of the Ministry of Economic Affairs

(interview Joop Winkel, 2014) claims that there existed some unregistered, but active cartels. In addition, former Ministry employee Frank Vreedenburgh acknowledged that there might be cases of colleagues which kept files at their own administration and hence these might not be sent to the Archives in Winschoten. Furthermore, De Jong (1990) claims without providing evidence that only 50 percent of the cartels was registered in the cartel register. Overall, we should keep in mind that there is a risk of incompleteness when using and interpreting the material. The claims as regards the incompleteness remain unsubstantiated and difficult and perhaps even impossible to verify.

7.4 Variables and methodology

7.4.1 Introduction

The cartel register serves as the foundation to answer the overarching research question of this thesis: '*What were the impact, determinants, organization, internal dynamics and characteristics of Dutch cartel behaviour during the legal-cartel era?*' In the following we discuss the collection, encoding and verification of the variables. During the process of constructing the legal-cartel dataset, a master thesis was written on this topic at the ACM, also thoroughly describing the data (Van Twist, 2013). Below, we first present some general remarks on the methodology of constructing the dataset. Second, we describe the rules and definitions that were applied in order to collect the data as systematically as possible. Each variable is discussed separately.

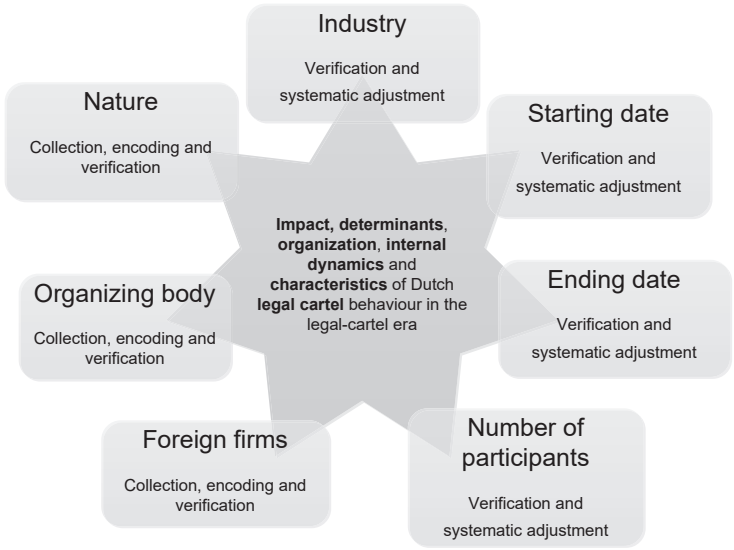
7.4.2 General methodological remarks

The data construction regarded seven cartel variables: (i) the relevant industry; (ii) starting date; (iii) file's closing date; (iv) number of participants; (v) international; (vi) trade association and; (vii) the nature of the cartel. These variables are convenient cartel characteristics and were crucial for the answering of our research question. In addition, academic empirical research to cartels usually collect and / or study these types of cartel characteristics. Some examples, basing themselves also on a cartel register, are: Haucap, Heimeshoff and Schultz (2010), Sandberg (2016), Hyytinen, Steen and Toivanen (2017), Shanahan, (2016), Larsson and Lönnborg (2016). Other examples are: Connor and Helmers (2007), Suslow (2005), Zimmerman and Connor (2005), Combe and Monnier (2007), Van Bergeijk (2008), De (2010), Levenstein and Suslow (2011) and Feinberg, Kim and Park (2016).

Figure 7.4 visualizes the seven variables of the legal-cartel dataset that are subject to collection, encoding and verification. Four variables (industry, starting date, closing date, number of participants) were already part of the CAS dataset.[94] The coding of these variables

[94] We received a brief instruction about the collection and encoding of these variables at CAS.

Figure 7.4: Contribution to the cartel register dataset



was subject to verification and systematic adjustment if necessary. The other three variables foreign firms, organizing body and nature were firstly constructed in this research; they were subject to collection, encoding and verification.

The PDF files served as the primary source data, we used an Excel spreadsheet to construct the legal-cartel dataset. The information from the primary data that was used is retraceable. By using Adobe Reader we highlighted most of the collected information in the PDF files. These modified PDF files are saved so the coding decisions can always be checked, retraced and justified. In addition, in our legal-cartel dataset, we added columns containing comments on decisions that were made.

For the construction of the dataset we made use of human coders. Srnka and Koeszegi (2007: 59) argue that "*The quality of the outcome depends to a great extent on how systematic the researcher is in analysing qualitative material*". Van Bergeijk (2008: 118) constructed a dataset from the administration of the construction fraud in the Netherlands, he points to the relevance of measurement and coding errors and typos for construction a dataset. In order to secure the reliability of the data, information was assessed at least two times and by different persons. This refers to the concept of stability reproducibility, where the material is coded by more than one person (Weber, 1990).The coding consisted of a construction round and a checking round. The researcher (Lilian Petit) studied all cartel-docs that were involved in this research at least once. During and after the process of construction sample checks were performed. The sample checks relate to the concept of stability reliability in content analysis (Weber, 1990). Stability reliability indicates to what extent the encoder is able to produce the same results if the encoding is performed again at a later moment.

In order to verify the reliability we also made some comparisons with the data from the secondary-data produced in reports from the Ministry of Economic Affairs. Chapter 2 of this thesis provides a first insight in the overlap of the two datasets. In addition, section 7.3.2. describes that our total number of agreements (primary data) is comparable to the list of agreements (secondary data) published by State Secretary Evenhuis in 1987. During the initial phase of the coding, there was direct guidance from the promotors. Later, there were regular discussions about coding. The promotors were familiar with the cartel register in their former and current positions at the Ministry of Economic Affairs, the NMa and ACM.[95]

7.4.3 Relevant industry

The variable relevant industry was initially constructed by CAS, so the variable was subject to verification and systematic adjustment if necessary. The ISIC industry classification (the Dutch equivalent is the SBI-classification (*Standaard Bedrijfsindeling*)) was used in the CAS dataset to allocate the agreement to one or multiple industries. We followed this coding scheme. For the purpose of consistency, the application forms served as a starting point. We systematically checked the relevant industry. We basically concentrated on question 11 from table 7.2. In the cases where the reported industry provided insufficient or unclear information we looked beyond the application form. For instance, lack of clarity could exist about the level within the supply chain. E.g. whether it concerned retailers, wholesalers or manufacturers. In these cases a screen of the remainder of the document could provide additional information. This decision was made to come closer to reality. In case there were vertical relations we looked at the relevant industries and applied to following rule: in case the agreement was relevant for only one upstream firm and multiple downstream firms, than we reported only the downstream industry. In case multiple upstream and downstream firms were involved and relevant, than both industry levels were reported. Table 7.3 presents the success rate of checking the relevant industry thereby providing an indication for the reproducibility reliability (Weber, 1990).

If we compare the adjusted industry classification to the original industry allocation from the CAS dataset, 73% of the cartel agreements remained unchanged; we agreed on the industry classification. A remainder of 27% percent was corrected. In those cases an industry was added, omitted or completely changed. About 55% of the corrected cartel agreements regarded single-industry agreements, meaning that only one industry was reported. In approximately half of the cases, the industry modification was only minor, meaning that the two digit codes remained the same. About 45% of the corrected cartel agreements

[95] By structuring this project as PhD research with two supervisors from different faculties and ensuring peer-review of all presented findings (three chapters have already been published) we ensured objectivity. Moreover, the encoding of the data involved various parties and persons that also ensure objectivity (see also: Morse and Mitcham, 2002).

regarded multiple-industry agreements. In approximately 90% of these amendments at least one industry (measured at a two digit code level) remained unchanged.

Table 7.3: Success rate checking relevant industry

Relevant industry	Percentage		
Uncorrected / agree	73%		
Corrected	27%		
• Corrected single-industry agreement		55%	
○ Unchanged at two digit level			50%
○ Change at two digit level			50%
• Corrected multiple-industry agreement		45%	
○ At least one two digit industry unchanged			90%
○ All industries changed at two digit level			10%

7.4.4 Starting date

The starting date was initially constructed by CAS, so this variable was subject to verification and systematic adjustment where necessary. In general CAS reported the opening date of a file, but we have a number of examples where CAS reported the actual starting date of the agreement. For the purpose of consistency, the earliest date that the cartel came into force according to the application forms was leading in our research (table 7.2, question 9). In case only the date of establishment was available, we registered that date. We did not distinguish between dates provided by the Ministry or the parties themselves if it was registered at the application form.

As said, for the purpose of consistency we used the dates according to the form, but when there was an obvious risk of a mistake, we chose to examine statutes or official contracts to gather additional information in order to come closer to reality. It could occur that information from the form was (1) incomplete or (1) presumably wrong. Example 7.2 provides an example of such an absent starting date.

Example 7.2: Starting date absent

4a. Wanneer is de mededingingsregeling tot stand gebracht?	a. vanaf oprichting B.V.
4b. Wanneer treedt zij in werking?	b. afhankelijk van contract.
4c. Tot wanneer is zij van kracht?	c. meestal 3 jaar.

Doc. no. 3589; p. 9; translation: "*4a. When was the competition agreement established: a. from establishment of organization; 4b. When does it come into force: b. depends on contract*"

In those cases a date had to be reported, so added statutes or contracts were analysed. Table 7.4 presents the success rate of the final dates compared to the dates reported by CAS. In the first round of checking it became clear that there existed discrepancies between

the data from CAS and our data. Illustratively in table 7.4 we observe a success rate of only 37%. Therefore, the checking stage consisted of two rounds; each starting date was checked twice.

Table 7.4: Success rate checking starting date

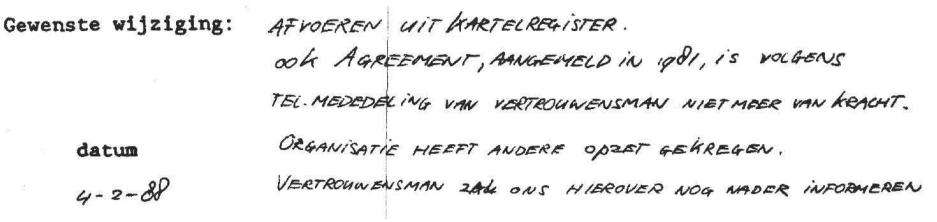
Starting date	Percentage
Uncorrected / agree	37%
1 or 2 years earlier or later	25%
3, 4, or 5 years later	11%
3, 4 or 5 years earlier	1%
6 or more years earlier	24%
6 or more years later	3%

Note: we calculated the differences at cartel agreement level (n=961)

7.4.5 Ending date

The ending date was initially constructed by CAS, so it was subject to verification and, if necessary, systematic adjustment. We systematically checked the ending date of the file. The ending date of the cartel agreement was not systematically reported as such in the cartel-docs. There are also examples of agreements that were already terminated, but only deregistered some years later. Example 7.3 shows that there might be discrepancies in the actual closing date and the registered closing date.

Example 7.3: Cartel exit date overestimated



Document number 4871 p.4; translation: "*Remove from cartel register. Also Agreement, that was notified in 1981, is according to telephonic announcement from trusted representative not active. Organisation has had another structure. Trusted representative will inform us later on this matter.*"; "*Date 4-2-88*".

For the purpose of consistently defining an ending date we chose to identify different proxies for ending dates. We chose to report the following characteristics from a file (i) the latest newspaper articles, (ii) the latest hand written notes from the Ministry, (iii) the latest typed (i.e. official) notes from the Ministry; (iv) the latest official letters from the Ministry, (v) the latest official letters from the applicants, and (vi) the latest consultation of the file. By distinguishing between different types of ending dates, we could afterwards assess the

impact of choosing a particular date and the differences therein.[96] We decided to register the latest date of added content.

Table 7.5 presents the discrepancies between the closing dates according to the Archives, compared to our registration. Table 7.5 shows that the reproducibility reliability is typically high, especially compared to the starting date. Appendix 7.2 (table 7.10) presents the distribution of duration if the starting and ending dates are combined. We observe a skewed distribution to the right.

Table 7.5: Success rate checking closing dates

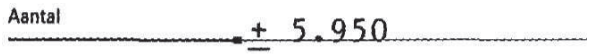
Closing date	Percentage
Uncorrected / agree	82%
1 or 2 years earlier or later	16%
3 or more years earlier	1%
3 or more years later	1%

Note: we calculated the differences at cartel agreement level (n=961)

7.4.6 Number of participants

This variable was initially constructed by CAS, so this variable was also subject to verification and systematic adjustment if necessary. For the purpose of consistency, the application forms served as a starting point. We systematically checked the number of involved firms provided by CAS. We used the answers to question 5, 6 and 7 (from table 7.2). In reality, the number of participants might be rather dynamic, because firms may enter or exit the cartel during its lifetime. Nevertheless, for practical purposes we chose to report a static variable and recorded the maximum number that was mentioned in the file. In case there were multiple folders, we registered the maximum number at the level of the cartel agreement. In some cases, the number was an estimate. Parties for instance reported: '*approximately 5.950 participants*', see example 7.4. In these cases we reported the approximate.

Example 7.4: Number of participants, a proxy



Document number 5387, p. 12; translation: "*Number + / - 5.950*"

A screen of the remainder of the document could provide additional information. Especially if parties referred to attachments, the number was absent or there was doubt. Again, this

[96] We performed this exercise for each single-file cartel. For the multiple-file cartels we applied the following rule: we studied the cartel-doc(s) with the latest closing date and those closed a year before the latest closing date according to CAS. As an exception to the remainder of the data collection, encoding and verification we also took into account cartel-docs without an application form if those were the cartel-docs with the latest closing dates.

decision was made to come closer to reality. We screened for lists of participants or stated figures about the number of participants. In case other documents within the cartel-doc provided other figures or lists with members (which were higher), we also took these into account.

Table 7.6 presents the success rate of checking the number of participants and provides an indication for the reproducibility reliability. If we allow for minor disagreements (+1 or −1 members), a total of about 20 percent shows a deviation with the original data from CAS. Appendix 7.2 (table 7.10) presents the distribution of the number of cartel participants, again we observe a skewed distribution to the right.

Table 7.6: Success rate checking number of participants

Number of participants	Percentage
Unknown (source data)	13%
Uncorrected / agree	64%
−1 / + 1 participant	4%
−2, −3, −4, −5 or +2, + 3, + 4, +5	6%
Difference >5	2%
Difference < −5	12%

Note: we calculated the differences at cartel agreement level (n=961)

7.4.7 International

The variable international was firstly constructed in this research. We determined whether the cartel agreement had an international dimension. For the purpose of consistency, we retrieved this information *only* from the application forms. Each variant of the application form included a question whether foreign firms were involved (question 7 from table 7.2). We used this answer to determine this. This variable could take two values YES (in the case of at least one foreign) and NO (in case there were no foreign firms). The success rate of the first round of construction compared to the second round of checking is around 99%.[97]

7.4.8 Organizing body

The variable organizing body was firstly constructed in this research. We determined whether there was an organizing body primarily based on the application form. We took into account the answers to questions 1, 4 and 5 from table 7.2. Sometimes it became clear from the name of the agreement, such as: 'Association for (…)'. A screen of the remainder of

[97] The rate of 99% is considered high. An explanation for this high rate of agreement is provided by Kolbe and Burnett (1991: 249): "*One weakness of the coefficient of agreement is the impact of the number of coding decisions on the reliability score. As the number of categories decreases, the probability of interjudge agreement by chance increases. For example, one would expect greater agreement with only two categories than with five categories because of the higher probability of chance agreements*."

the document could provide additional information in case the existence of an organizing body was doubtful. An accountants office, a buying or selling organization or a franchise issuer are generally not regarded as a central body. This variable could take two values YES (in the case of an organizing body) and NO (in case there was no organizing body). The success rate of the first round of construction compared to the second round of checking is around 99%.[98]

7.4.9 Disclosure of nature

For the disclosure of the nature of the agreement we had to deal with an apparent trade-off between consistency and reality. For the purpose of consistency we only took the application form into account. The remainder of the cartel-doc remained unexamined. Sometimes employees of the Ministry drafted separate notes about the actual nature of the cartel, but these were not taken into account. For the purpose of reality we screened for additional side-information that was mentioned in the application form.

The answer to question 12 from table 7.2 was the leading information for the disclosure of the nature. This question was adopted in all the registration forms. We kept as close to the original answer as possible. In most cases the exact text was copied. See for instance example 7.5, this is a straightforward description that can be easily copied. In some cases the nature was extensively described but obvious and unequivocal (see for instance example 7.6). In those cases, we distilled the most important elements. It could also occur that the description was too vague and the text was exactly copied. Hence, further assessment of the actual nature could occur later.

Example 7.5: Straightforward description of agreement

Welk karakter heeft de mededingingsregeling? **(Hierbij vermelden b.v. prijsregeling, leverings- en betalingsvoorwaarden, productiequotering, afzetquotering, etc.)**	Prijsregeling, leverings- en betalingsvoorwaarden, produktiequotering, afzet quotering

Document number 5440, p.21; translation: "*Price agreement, delivery and payment conditions, production quotas, selling quotas*"

Example 7.6: Extensive description

tegengaan van het geven van kortingen op
eenmaal genoemde offerteprijs,
tegengaan van misleidende advertenties,
inperking van het terugnemen van oude winkelinventarissen bij verkoop van nieuwe.

Document number 5407; p.193; translation: "*Preventing discounts on stated prices, preventing misleading advertisements, limit withdrawal of old shopping inventories during the selling of new ones.*" Recorded as: preventing discounts + preventing misleading advertisement + limit withdrawal of old inventories.

[98] See previous footnote.

During the process of obtaining the correct nature, we noticed that it was important also to report side-information from the application form for a better understanding of the actual nature. After the first round of construction and its evaluation, we decided to more systematically report the side-information. Hence, the methodology of reporting was slightly modified after the first round. Therefore, comparing the reproducibility reliability of the data becomes complicated. Nevertheless, we have indications that the success rate is approximately 80–85%.[99]

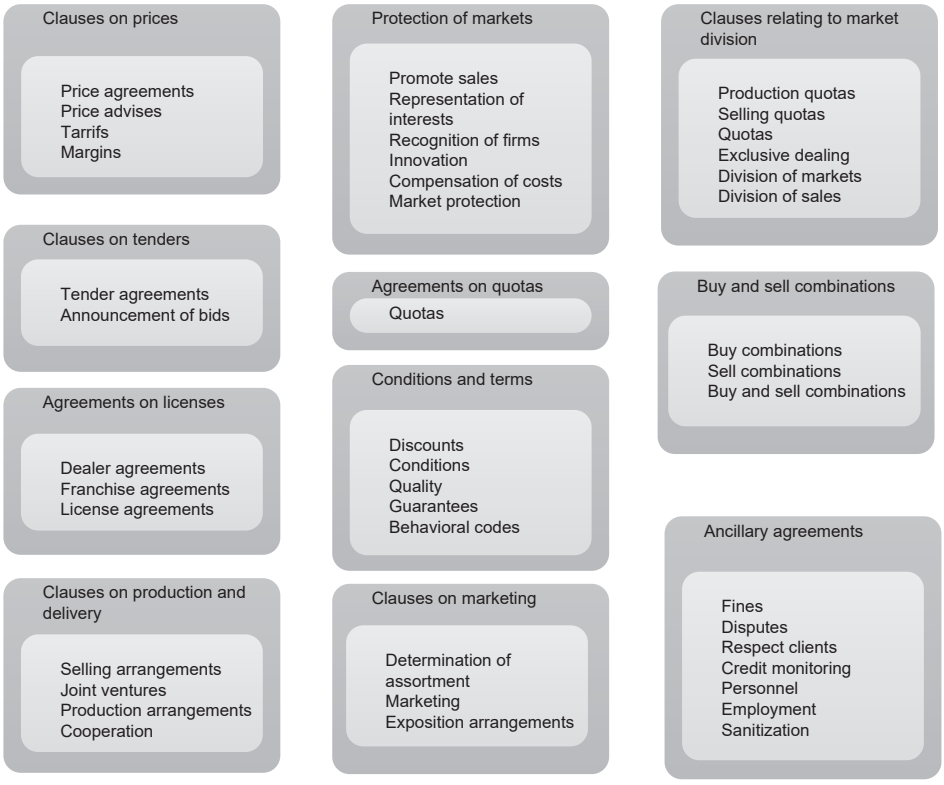
As said, question 12 from table 7.2 served as starting point, but sometimes the name of the agreement, additional notes or attachments provided additional information. In case the applicant provided additional information about the nature of the cartel in other parts of the application form we also registered that information, but explicitly recorded that it was side-information. We reported that information that was expected to significantly add value. In the subsequent step of categorization we decided which side-information was actually subject to encoding (see section 7.4.10). In case there was a handwritten completion at question 12, we also included these notes. This might well be written by employees of the Ministry, but we were not sure whether it was added by the firms or added by the Ministry employees. A handwritten completion elsewhere in the application form which clearly stated the nature such as: "price agreement" or "conditions", was also reported. The most recent application forms contained a specific field in which the nature of the cartel was numerically coded. We did not use this qualification by the Ministry.

7.4.10 Nature categorization

For the encoding of the nature we started with a bottom-level categorization. We encoded the raw text in categories that were frequently used in the cartel-docs. These concerned inferred categories, meaning that they emerged from the text (Insch, Moore and Murphy, 1997). The bottom-level encoding was aggregated to a top-level encoding. For the top-level encoding, we used assumed encoding, meaning that the categories were predefined (Insch, Moore and Murphy, 1997). We used the pre-defined categories from Sandberg (2016) as a starting point and made some minor amendments. Because we decided to firstly report the raw material from application form, we were always able to adjust the encoding and categorization afterwards. Indeed, cross-checks afterwards resulted in some amendments for the purpose of consistency.

[99] If we compare the final coding of the first round from Danny van Twist with the final round we find that 80% of the final coding had a similar coding in the first round. Conversely, 85% percent of the coding in the first round, was coded similarly in the final round. Given that this variable is most sensitive to interpretation and that the rules for disclosure sharpened after the first round, the success rate is considered sufficiently high.

Figure 7.5: Bottom-level and top-level encoding of nature



The nature was encoded into different categories. Figure 7.5 illustrates how the bottom-level encoding is further categorized into top-level encoding. The general rule was that each competitive restriction that was retrieved was encoded. However, we made a few exceptions. We decided that dealer agreements and franchise agreement were always dominating other types of competitive restrictions. So these received just one code. Furthermore, we decided not to code references to price arrangements in case an agreement regarded clauses on tenders. We explicitly reported the answers to other questions on the application form. We only encoded the side-information if it appeared a significant adding. For instance if there was no actual answer available to question 12 that could be encoded, we encoded the side-information. In addition, if the side-information revealed the presence of important characteristics such as prices, market sharing, quota's, tenders, franchises or dealerships we also encoded that information. Some descriptions and side information (approximately 6%) were too vague and were just left aside (they were classified as 'none').

Because we kept close to the original descriptions from the application form (section 7.4.9), we were able to adjust the coding and the according coding rules during the process. We did not consult the original source material again. In addition, we could modify the

allocation of the bottom-level and top-level categories. In November 2016, Marcelle de Waal, a data specialist in competition policy at ACM performed a check on the encodings. Approximately 4% was classified as debatable. The final decision was made by the PhD researcher.

7.5 Remarks on the process

7.5.1 Process

Altogether, the data process covered a period of about six years, starting with our visit to the archives in 2012 and finishing the final version of the legal-cartel dataset in 2017. Several people worked on the construction of the legal-cartel dataset and several expert informants provided information on the idiosyncrasies of the cartel register. In the following we describe the most important remarks on the process of collecting data.

7.5.2 Other data

In 2007 the NMa received a file from the Ministry of Economic Affairs containing an overview of documents from the register from its internal record management system 'Atl@s'. The dataset contained a description of the document, the document number and the opening and closing date.[100] Given the existence of this dataset we investigated whether there were other datasets of which we were unaware. I contacted the Ministry of Economic Affairs and inquired whether there were other datasets available. I had contact with Frank Vreedenburgh and Peter Dijkstra[101] from the Ministry of Economic Affairs. Both were unaware of other datasets containing information from the register.

Furthermore, we verified the completeness of the CAS dataset. During the visit to Winschoten we got informed that there were some additional documents which were not digitalized yet. In 2013 the digital versions of the additional documents were received, but this batch of documents actually fell outside the scope of our legal-cartel dataset and hence remained unused. After this second batch, all the information stored at the CAS was digitalized and received by the NMa.

7.5.3 People involved

The encoding was done by human coders. Table 7.7 presents an overview of the people that contributed to the construction of the legal-cartel dataset. Overall, if we would make a rough estimate of the total time invested in the data this would be around 0.7 FTE. Table 7.8 describes the allocation of the tasks of the people from table 7.7.

[100] This file was used to perform cross-checks.

[101] The correspondence took place in June, 2012.

Table 7.7: People involved in constructing the legal-cartel dataset

Period	Constructed	Notes
2008	CAS	This concerns the CAS dataset that was prepared for the NMa.
2013–2017	Lilian Petit	Researcher and author of this thesis.
2013	Danny van Twist	Internship; Master thesis on: disclosure of data, score: 9 Supervisor: Jarig van Sinderen (EUR)
2014	Simone de Boer	Internship bachelor student and later Master thesis on: Predictability of cartel register for successfulness of ACM cases, score: 8.4 Supervisor: Anne-Claire Hoyng (UU)
2016	Wouter Homburg	Bachelor student; internship
2016	Marcelle de Waal	Enforcement official at ACM since 2014, Cartel Detection Unit.

Table 7.8: Variables, construction and verification

Variable	Activity	Who	Part
Relevant industry	First construction	CAS	All
	Checking	Lilian Petit	All
	Sample checks	Lilian Petit	Sample
Starting date	First construction	CAS	All
	Checking	Danny van Twist	80%
	Checking	Wouter van Homburg	20%
	Checking	Lilian Petit	All
	Sample checks	Lilian Petit	Sample
Closing date	First construction	CAS	All
	Checking	Lilian Petit	80%
	Checking	Simone de Boer	20%
	Sample checks	Lilian Petit	Sample
Number of participants	First construction	CAS	All
	Checking	Lilian Petit	All
	Sample checks	Wouter Homburg	Sample
International	First construction	Danny van Twist	80%
	Checking	Lilian Petit	80%
	First construction	Lilian Petit	20%
	Checking	Wouter Homburg	20%
	Sample checks	Lilian Petit	Sample
Organizing body	First construction	Danny van Twist	80%
	Checking	Lilian Petit	80%
	First construction	Lilian Petit	20%
	Checking	Wouter Homburg	20%
	Sample checks	Lilian Petit	Sample

Table 7.8: Variables, construction and verification (*continued*)

Variable	Activity	Who	Part
Disclosure of nature	First construction	Danny van Twist	80%
	Checking	Lilian Petit	80%
	First construction	Lilian Petit	20%
	Checking	Lilian Petit	20%
	Checking	Marcelle de Waal	20%
	Sample checks	Lilian Petit	Sample
Nature categorization	First construction	Danny van Twist	80%
	Checking	Lilian Petit	All
	Checking	Marcelle de Waal	All
	Sample checks	Lilian Petit	Sample

Table 7.9: Expert informants

Type	Contact	Organization	Position	Date	Location
Interview	Joop Winkel	Former: Ministry of Economic Affairs	Archiving and administration	July 25, 2014	ACM, The Hague
	Frank Vreedenburgh	Ministry of Economic Affairs	Policy officer	April 3, 2012 [A]	Ministry of Economic Affairs, The Hague
	Erik Kloosterhuis	Former: Ministry of Economic Affairs; Currently: ACM	Policy officer	February 6, 2012	NMa, The Hague
Informal conversation	Aike van der Ploeg	CAS	Policy officer	Various	CAS, Winschoten
	Robert Still	Former: Ministry of Economic Affairs; Currently: ACM	Policy officer	Various	NMa, The Hague
E-mail and telephone calls	Frank Vreedenburgh	Ministry of Economic Affairs	Policy officer	Various	-
	Aike van der Ploeg	CAS	Policy officer	Various	-
Review chapters	Aike van der Ploeg [B]	CAS	Policy officer	May, 2017	-
	Erik Kloosterhuis [B]	Former: Ministry of Economic Affairs; Currently: ACM	Policy officer	June, 2017	-
	Robert Stil [C]	Former: Ministry of Economic Affairs; Currently: ACM	Policy officer	July, 2014	-

A: This was a structured and recorded interview.

B: Review of chapter 7.

C: Review of chapter 2.

Olsen (2012: 213) emphasizes the use of expert informants which is relevant for the process of collecting data. During the process of DCEV, the researcher (Lilian Petit) spoke with (former) employees of the Ministry of Economic Affairs that used to work with the cartel register at that time. Interviews and conversations can clarify possible points of interpretation Olsen (2012: 213). Table 7.9 provides an overview of the expert informants.

7.5.4 Ongoing work

The construction of the legal-cartel dataset was ongoing work. We encourage continuous improvement of the data. We worked on the legal-cartel dataset and kept improving it. The first version of the legal-cartel dataset was used for chapter 4, the second version of the legal-cartel dataset was used for chapter 3, 5 and 7.

7.6 Appendices

Appendix 7.1

Application form: Kartelbesluit (1941)

Prijs formulier 5 cent.

Ontvangen: 3 NO 1958
Geregistreerd: 7 1958

MINISTERIE VAN ECONOMISCHE ZAKEN

UITVOERING KARTELBESLUIT

FORMULIER VAN KENNISGEVING VAN BEDRIJFSREGELINGEN 1)

1a. **Welke naam draagt de bedrijfsregeling?**	a.
1b. **Welke rechtsvorm heeft zij?** (Hierbij vermelden b.v. overeenkomst, bindend verenigingsbesluit, etc.)	b.
2. **Welk karakter heeft de bedrijfsregeling?** (Hierbij vermelden b.v. prijsregeling, leverings- en betalingsvoorwaarden, productiequotering, afzetquotering, etc.)	Ingevolge artikel 2 van het Kartelbesluit ter kennis gebracht van het Ministerie van Economische Zaken op..... De registratie van een bedrijfsregeling houdt geen goedkeuring van de inhoud van deze bedrijfsregeling in. DE MINISTER VAN ECONOMISCHE ZAKEN voor deze: HET HOOFD VAN DE AFDELING DIVERSE ORDENINGSVRAAGSTUKKEN
3. **Op welke goederen of diensten heeft de bedrijfsregeling betrekking?**	
4a. **Wanneer is de bedrijfsregeling tot stand gebracht?**	a.
4b. **Wanneer treedt zij in werking?**	b.
4c. **Tot wanneer is zij van kracht?**	c.
5. **Welke zijn de namen en adressen van uitvoerende instanties, c.q. van verantwoordelijke of leidende personen?**	

1) Ingevolge artikel 1 van het Kartelbesluit zijn onder bedrijfsregelingen te verstaan: bepalingen regelende de mededinging tussen personen (die een bedrijf uitoefenen in enige tak van handel of nijverheid), waarvan althans één in Nederland is gevestigd. Onder bepalingen regelende de mededinging, worden mede verstaan bepalingen, regelende de financiële verplichtingen, welke aan de regeling van de mededinging voor de daarbij betrokkenen zijn verbonden.

25013 - '52 - 101

6. **Welke zijn de namen en adressen van de bij de bedrijfsregeling aangesloten Nederlandse ondernemingen?** (Indien bij de bedrijfsregeling meer dan 20 Nederlandse ondernemingen zijn betrokken, behoeft slechts het aantal te worden opgegeven).	
7. **Welke zijn de namen en adressen van de bij de bedrijfsregeling aangesloten buitenlandse ondernemingen?** (Indien bij de bedrijfsregeling meer dan 20 buitenlandse ondernemingen zijn betrokken, behoeft slechts het aantal te worden opgegeven).	

8. **Welke zijn de namen en adressen der buitenstaanders?** (Indien er meer dan 20 buitenstaanders zijn, behoeft slechts het aantal te worden opgegeven. Mocht dit niet nauwkeurig bekend zijn, zo mogelijk een geschat cijfer opgeven).	
9. **Hoe groot was de totale omzet (per product of groep van producten) in het laatste kalender of boekjaar?** a. van de aangeslotenen? b. van de buitenstaanders? (Indien de omzet niet nauwkeurig bekend is, zo mogelijk geschatte cijfers opgeven).	
10. **Welke verdere bijzonderheden kunt U mededelen, die tot een goed begrip van de bedrijfsregeling kunnen dienen?**	

11. Welke is de naam en het adres van de ondergetekende en in welke hoedanigheid ondertekent hij?	
12. Hoeveel en welke bijlagen zijn bijgevoegd?	

....., de .....

Ondertekening :

Application form: Wet Economische Mededinging 1980s

Ministerie van Economische Zaken
Uitvoering Wet Economische Mededinging

Formulier van Mededeling van Mededingingsregelingen [1])

POR/MF
Nr.: 1282/III/37
Ingek. - 7 JAN. 1982
Kl.: I η - 2c - 12
Retro: 1

GEDEPONEERD
15 JUNI 1982

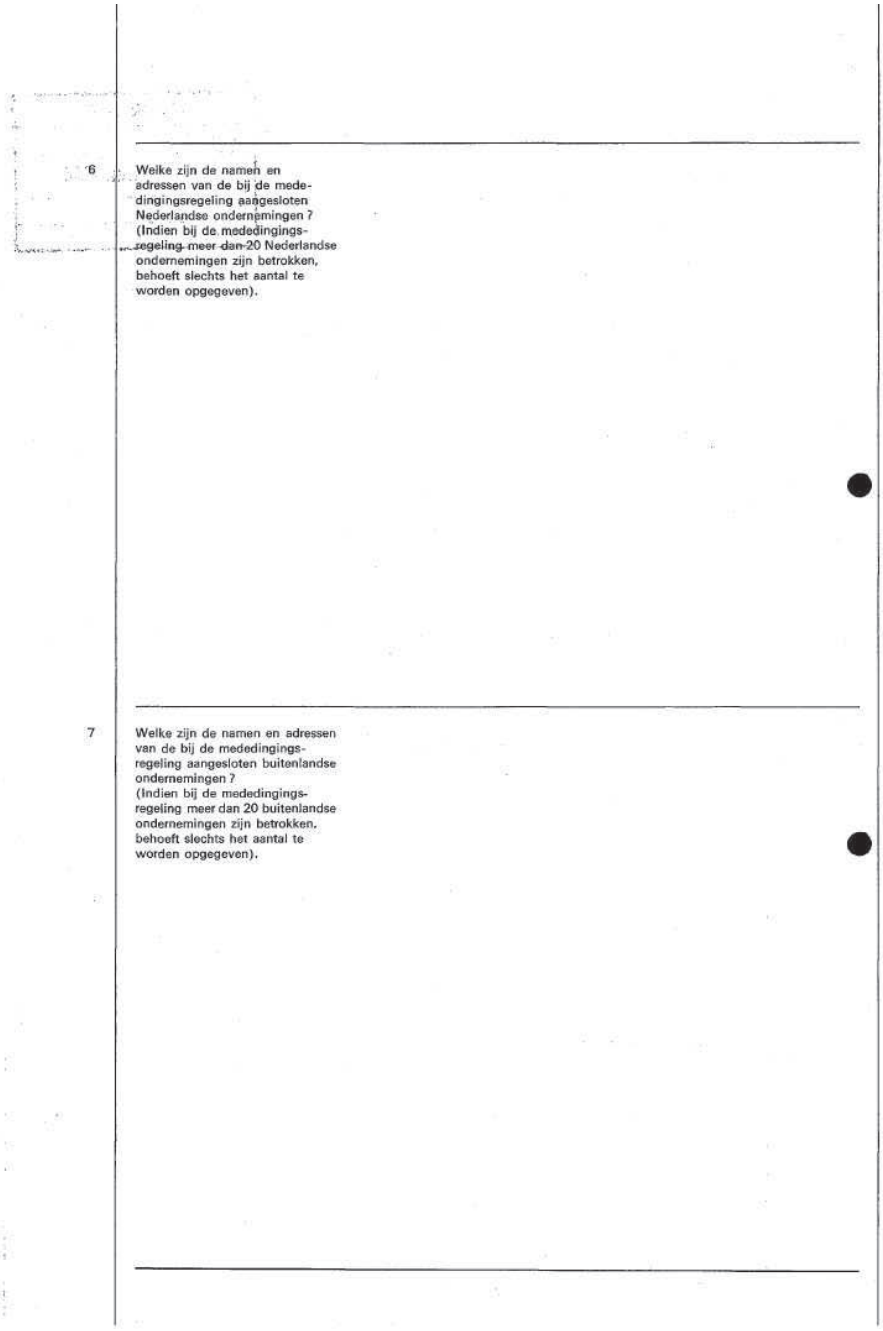
1a	Welke naam draagt de mededingingsregeling ?	a.
1b	Welke rechtsvorm heeft zij ? (Hierbij vermelden b.v. overeenkomst, bindend verenigingsbesluit, etc.)	b.
1c	Is de regeling schriftelijk aangegaan of vastgelegd ? (Zo ja, drie afschriften van de mededingingsregeling bijvoegen; zo neen, een opgave in drievoud bijvoegen van de zakelijke inhoud van de regeling).	c.
2	Welk karakter heeft de mededingingsregeling ? (Hierbij vermelden b.v. prijsregeling, leverings- en betalingsvoorwaarden, productiequotering, afzetquotering, etc.)	
3	Op welke goederen of diensten heeft de mededingsregeling betrekking ?	
4a	Wanneer is de mededingingsregeling tot stand gebracht ?	a.
4b	Wanneer treedt zij in werking ?	b.
4c	Tot wanneer is zij van kracht ?	c.
5	Welke zijn de namen en adressen van uitvoerende organen, c.q. van verantwoordelijke of leidende personen ?	

~~Ontvangen ten Departemente van~~
Economische Zaken op ~~d.~~ 7 JAN. 1982
De registratie van een mededingingsregeling houdt geen goedkeuring van de inhoud van deze regeling in.

BUREAU REGISTRATIE
MEDEDINGING EN
FUSIEAANGELEGENHEDEN

623273*-110

[1]) Bij dit formulier behoort een toelichting op de mededelingsplicht.



6 Welke zijn de namen en adressen van de bij de mededingingsregeling aangesloten Nederlandse ondernemingen ? (Indien bij de mededingingsregeling meer dan 20 Nederlandse ondernemingen zijn betrokken, behoeft slechts het aantal te worden opgegeven).

7 Welke zijn de namen en adressen van de bij de mededingingsregeling aangesloten buitenlandse ondernemingen ? (Indien bij de mededingingsregeling meer dan 20 buitenlandse ondernemingen zijn betrokken, behoeft slechts het aantal te worden opgegeven).

8 Welke zijn de namen en adressen der buitenstaanders ?
(Indien er meer dan 20 buitenstaanders zijn, behoeft slechts het aantal te worden opgegeven. Mocht dit niet nauwkeurig bekend zijn, zo mogelijk een geschat cijfer opgeven).

9 Hoe groot was de totale omzet (per product of groep van producten) in het laatste kalender- of boekjaar ?

a. Van de aangeslotenen ?

b. Van de buitenstaanders ?

(Indien de omzet niet nauwkeurig bekend is, zo mogelijk geschatte cijfers opgeven).

10 Welke verdere bijzonderheden kunt U mededelen, die tot een goed begrip van de mededingingsregeling kunnen dienen ?

11 Welke is de naam en het adres van de ondergetekende en in welke hoedanigheid ondertekent hij?

12 Hoeveel en welke, bijlagen zijn bijgevoegd?

_____, de _____ 19___

Ondertekening:

Application form: Wet Economische Mededinging 1990's

Formulier van mededeling van mededingingsregelingen

Uitvoering Wet economische mededinging
Raadpleeg voor het invullen de toelichting
Indienen in tweevoud

Ministerie van Economische Zaken

Directoraat-Generaal voor Diensten,
Midden- en Kleinbedrijf en Ordening
Postbus 20101
2500 EC 's-Gravenhage
Telefoon (070) 3 79 77 08
Telefax (070) 3 79 60 94

Deze ruimte is bestemd voor bureau Registratie — *Stempel*

Ontvangen bij Departement van Economische Zaken op 1 MAART 1991
De registratie van een mededingingsregeling houdt geen goedkeuring van de inhoud van deze regeling in.
BUREAU REGISTRATIE
MEDEDINGING EN
FUSIE AANGELEGENHEDEN

DMO	MF	M
Nr.: 9102166		
Ingek.: 1 MAART 1991		
Kl: 1.826.283	1045603	
Retro:		

Deze kolom niet invullen

1 Welke naam draagt de mededingingsregeling — *nr* *Bnr* / *mr* / *mmr* / *ur*

2a Is de mededingingsregeling — ☐ een overeenkomst ☒ een besluit — ☐ *O* ☒ *B*

2b Is de mededingingsregeling schriftelijk aangegaan of vastgelegd — ☒ Ja ☐ Nee — ☒ *Ja* *Nee*

3 Wie is belast met de uitvoering van de mededingingsregeling en de controle daarop.
(Zie toelichting op vraag 3)
(Indien KvKnummer en KvKdistrict worden ingevuld, behoeft geen adres te worden vermeld.)

Naam
Straat
Postcode/plaats
Postbus
Postcode/plaats
Telefoonnummer
KvKnr en district

4 Hoeveel natuurlijke personen en rechtspersonen die geen eigenaar van een onderneming noch vrije-beroepsbeoefenaar zijn, zijn bij de mededingingsregeling betrokken.

Aantal — *Aantal*

De gegevens van natuurlijke personen en rechtspersonen moeten op blz. 3 van dit formulier worden opgegeven dan wel op een in de Toelichting daarbij aangegeven wijze worden verstrekt.

5 Hoeveel in Nederland gevestigde ondernemingen of vrije-beroepsbeoefenaren zijn bij de mededingingsregeling betrokken.

Aantal — *Aantal*

De gegevens van deze ondernemingen of vrije-beroepsbeoefenaren moeten op blz. 3 en 4 van dit formulier worden opgegeven. (Zie toelichting op vraag 5.)

6 Hoeveel niet in Nederland gevestigde ondernemingen of vrije-beroepsbeoefenaren zijn bij de mededingingsregeling betrokken.

Aantal — *Aantal*

De gegevens van deze ondernemingen of vrije-beroepsbeoefenaren moeten op blz. 4 van dit formulier worden opgegeven. (Zie toelichting op vraag 6.)

7a Op welke datum is de mededingingsregeling tot stand gekomen — *J* *M* *D*

Datum

7b Op welke datum treedt zij in werking — Datum

7c Tot welke datum is zij van kracht — Datum

Deze kolom niet invullen

8 Op welke goederen en/of diensten heeft de mededingingsregeling betrekking.

9 Wat is de aard van de mededingingsregeling.

10 Heeft de mededingingsregeling betrekking op heel Nederland. Zo neen, op welk gedeelte van Nederland.

☒ Ja ☐ Nee — ☒ *Lan* ☐ *Reg* ☐ *Lok*

11 Welke nadere bijzonderheden kunt u meedelen die tot een goed begrip van de mededingingsregeling kunnen dienen.

12 Hoeveel en welke bijlagen zijn bijgevoegd

Aantal

In ieder geval moet een drietal exemplaren van de mededingingsregeling of van een schriftelijke mededeling van de zakelijke inhoud daarvan worden bijgevoegd.

Omschrijving bijlagen

13 Ondergetekende verklaart dat de hierboven en in de bijgevoegde bijlagen vermelde gegevens volledig zijn en naar waarheid zijn verstrekt.

Naam — *J M D*

Straat — *jma*

Postcode en plaats — *em*

Postbus — *ec*

Postcode en plaats — *inp*

Datum — Plaats — Handtekening

2

Appendix 7.2

Table 7.10: Distributions of duration and registered number of cartel participants

Percentile	*Duration*	*Participants*
1	0	2
5	0	2
10	1	3
50	18	20
60	24	32
70	31	50
80	39	107
90	49	290
95	60	743.5
99	90.8	5781

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Nederlandse samenvatting

Het legale karteltijdperk: impact, determinanten, organisatie, interne dynamiek en karakteristieken van kartels

Toegestane kartels, dat is iets waar men zich tegenwoordig nauwelijks iets meer bij voor kan stellen. Kartels zijn immers verboden in Nederland, net zoals in de meeste andere landen in de wereld. Artikel 6 van de Mededingingswet verbiedt "*overeenkomsten tussen ondernemingen, besluiten van ondernemersverenigingen en onderling afgestemde feitelijke gedragingen van ondernemingen, die ertoe strekken of ten gevolge hebben dat de mededinging op de Nederlandse markt of een deel daarvan wordt verhinderd, beperkt of vervalst*". Veel onderzoek toont aan dat kartels een onwenselijke uitwerking hebben op de economische welvaart. In de economische wetenschap ontstond dit inzicht al bij de grondlegger van de economische wetenschap: Adam Smith (1776). Kartels zetten allereerst de allocatieve efficiëntie op het spel, door tegen een hogere prijs, minder producten te leveren. Ten tweede zorgen kartels voor een verminderde prikkel om productiefactoren efficiënt in te zetten. Ook neemt de prikkel om te innoveren af bij kartelvorming.

In de twintigste eeuw floreerden kartels in Nederland. Toentertijd nam de Nederlandse overheid een tolerante en soms ook wel ondersteunende houding aan richting kartels. De pro-kartel wetgeving stond van 1935 tot 1998 kartelvorming in Nederland toe. Deze periode (1935–1998) wordt in dit proefschrift aangeduid als het 'legale karteltijdperk'. Alleen de kartels die aantoonbaar in strijd waren met het publiek belang konden in deze periode door de overheid verboden worden. Pas sinds de jaren negentig van de vorige eeuw zijn enkele typen kartels op voorhand in Nederland verboden. Dit terwijl de EEG (Europese Economische Gemeenschap) al in 1958 verbodswetgeving implementeerde ten aanzien van kartels met interstatelijke effecten zoals geregeld in Artikel 101 van het VwEU (Verdrag betreffende de werking van de Europese Unie). In 1998 kwam er uiteindelijk ook in Nederland een algemeen kartelverbod in lijn met de geldende EU-wetgeving.

Deze dissertatie behandelt de impact, determinanten, organisatie, interne dynamiek en karakteristieken van kartels in het legale karteltijdperk. Daartoe worden in deze dissertatie primaire data uit het kartelregister gebruikt en omgevormd tot een dataset. Het kartelregister bevat aanmeldingen van kartels in Nederland. Vanaf 1941 tot 1998 waren kartels verplicht zich aan te melden bij het Ministerie van Economische Zaken. Aan de hand van de

aanmeldingen beoordeelde het ministerie of kartels in strijd waren met het publiek belang. De informatie uit het kartelregister was, en is nog steeds, niet publiekelijk beschikbaar. In de bestaande academische literatuur zijn reeds diverse aspecten van kartels in het legale karteltijdperk in Nederland belicht. Maar vanwege het vertrouwelijke karakter van het kartel register waren deze analyses beperkt tot het gebruik van secundaire data over kartels. Dit zijn vooral rapportages die samengesteld zijn door het Ministerie van Economische Zaken ter verantwoording van het gevoerde kartelbeleid of een selectie/beschrijving van zaken die naar buiten gebracht werden. Een gedetailleerde empirische analyse van de rol en effecten van kartels in Nederland tijdens het legale karteltijdperk ontbreekt nog in de academische literatuur. Het kartelregister is een unieke bron van informatie die niet eerder als zodanig is gebruikt voor wetenschappelijk onderzoek. De bron is uniek omdat het een relatief complete set aan kartels bevat. Kartels die zich manifesteerden tijdens het legale karteltijdperk vormen een waardevolle bron van informatie. Kartelvorming kan met behulp van deze gegevens los van de inmenging van een toezichthouder bestudeerd worden. Daar komt bij dat de kennis over illegale Nederlandse kartels, die vanaf 1998 tot nu beschikbaar is gekomen, hoogstwaarschijnlijk slechts het topje van de ijsberg weerspiegelt. Dit zijn de kartels die er niet in geslaagd zijn om onder de radar te blijven. Oftewel: de gefaalde kartels. Terwijl het juist ook interessant is de bestaande verborgen kartels te begrijpen.

In het proefschrift worden de impact, determinanten, organisatie, interne dynamiek en karakteristieken van kartels gedurende het legale karteltijdperk onderzocht aan de hand van vier deelvragen. Het proefschrift is een verzameling van zelfstandig leesbare hoofdstukken waarvan een groot deel reeds internationaal en *peer-reviewed* gepubliceerd zijn. Allereerst wordt ingegaan op de transitie van pro-kartel naar anti-kartel. Wat waren de drijfveren en welke obstakels deden zich voor (hoofdstuk 2)? Ten tweede wordt in hoofdstuk 3 de mate van kartelvorming en de typen waarin ze voorkwamen beschreven gedurende het legale karteltijdperk. In hoofdstuk 4 wordt vervolgens onderzocht welke effecten kartels in de periode 1982–1998 sorteren op de Nederlandse economie. De ernst van kartelovertredingen is bovendien een belangrijke determinant voor de bepaling van de hoogte van de huidige kartelboetes (als indicator voor de economische schade) in Nederland en de EU. Hierbij richten wij ons in het bijzonder op de groei van de Totale Factor Productiviteit (TFP), de voor veranderingen in de inzet van productiefactoren gecorrigeerde productiviteit. Tot slot wordt bestudeerd welke factoren de duurzaamheid van kartels bepalen in de periode 1980–1990 (hoofdstuk 5). Welke factoren dragen bij aan de duurzaamheid van kartels? De duur van de overtreding is een tweede belangrijke parameter voor het bepalen van de hoogte van de huidige kartelboetes in Nederland en de EU. Dit proefschrift heeft een empirisch karakter en hanteert een zogenoemde meer-methoden (*multi-method*) benadering. Via verschillende methodieken worden de deelonderzoeksvragen en de uiteindelijke onderzoeksvraag beantwoord. Zo wordt gebruik gemaakt van (wetenschappelijk) literatuuronderzoek (alle hoofdstukken), kwalitatief beschrijvend onderzoek (hoofdstuk 2 en 3), kwantitatief beschrij-

vend onderzoek (hoofdstuk 3), econometrisch verklarend onderzoek (hoofdstuk 4 en 5), dataverzameling (hoofdstuk 7) en tot slot hebben interviews met ervaringsdeskundigen bijgedragen aan een beter begrip van de data.

Bevindingen per hoofdstuk

Hoofdstuk 2 behandelt de context en ontwikkeling van het karteldenken in Nederland in de twintigste eeuw. Dit is cruciaal om te kunnen begrijpen hoe kartels zich manifesteerden in het legale karteltijdperk. In het grootste gedeelte van de twintigste eeuw was kartelvorming in Nederland toegestaan. Het kartelbeleid sloot naadloos aan bij de Nederlandse poldercultuur van samenwerking, overleg en consensus. De eerste expliciete kartelwet dateert van 1935: de Wet op het algemeen verbindend en onverbindend verklaren van ondernemersovereenkomsten. In 1941 volgde onder de Duitse overheersing het Kartelbesluit en daarna, in 1958, werd de Wet Economische Mededinging ingevoerd. Deze laatste wet was gedurende circa vier decennia van kracht. Toegegeven, niet alle kartels waren toegestaan. Conform artikel 85 van het Verdrag van Rome werden kartels met interstatelijke effecten vanaf 1958 verboden en Nederlandse kartels die in strijd waren met het publiek belang konden verboden worden onder de Wet Economische Mededinging. Ook werden in de jaren negentig diverse verbodsbepalingen ingevoerd voor schadelijke vormen van kartels, zoals prijsovereenkomsten of marktverdelingsovereenkomsten. In een internationale context week het Nederlands kartelbeleid tot eind jaren vijftig van de vorige eeuw niet veel af van andere Europese landen zoals Duitsland, Engeland en Frankrijk. Echter, toen bij omringende landen het aandachtspunt van wetgeving en beleid verschoof richting mededinging, bleef het Nederlandse beleid achter. Het bleek lastig om verandering te bewerkstelligen in de Nederlandse consensuscultuur. Diverse partijen met uiteenlopende belangen konden moeilijk overeenstemming bereiken over aanpassingen in het mededingingsbeleid. Het criterium 'publiek belang', om kartels aan te toetsen, bleek in praktijk een ongeschikt instrument. Hoewel er in het buitenland steeds meer empirisch onderzoek werd verricht naar de voor- en nadelen van marktwerking, bleef dit soort onderzoek in Nederland lange tijd uit. Het gebrek aan empirische inzichten verhulde de noodzaak om het beleid kritisch te evalueren (hoofdstuk 4 draagt evidentie aan dat kartels in deze periode de Nederlandse economie metterdaad schade hebben toegebracht). Tegelijkertijd werd de noodzaak om te veranderen – met name door de globalisering – groter. Met de komst van de *Europe 1992* en de interne markt brak het inzicht door dat het kartelbeleid onhoudbaar en ongewenst was. Nederland moest veranderen. In relatief korte tijd is vervolgens het Nederlandse beleid onder economische en internationale druk veranderd van pro- naar anti-kartel.

Hoofdstuk 3 besteedt aandacht aan de aantallen en typen geregistreerde kartels in Nederland in de twintigste eeuw. De Nederlandse wetgeving stond gedurende deze periode

bijna alle kartels toe. De vraag rijst dan: hoe manifesteerden zij zich in deze kartelvriendelijke omgeving. In dit hoofdstuk worden diverse bronnen gebruikt om geregistreerde kartelvorming te analyseren, waarbij informatie uit het kartelregister de basis vormt. Aan de hand van gegevens over internationale geregistreerde kartels in de jaren 30 zien we dat Nederland relatief sterk vertegenwoordigd was in internationale kartels. De primaire en secundaire gegevens uit het kartelregister bieden een gedetailleerd inzicht in de aantallen en typen kartels in Nederland. De secundaire dataset lijkt goed aan te sluiten op de dataset die ten behoeve van deze dissertatie is samengesteld met primaire data uit het kartelregister. We zien dat Nederland in jaren 50, 60 en 70 relatief veel kartels had ten opzichte van de perioden daarna. In de jaren 60 schommelde het aantal geregistreerde kartels rondom 800, in de jaren 70 was dit aantal rond de 600 en vanaf de jaren 80 zien we een afnemende trend. Kartels die actief waren in en vanaf 1980 hadden een levensduur van gemiddeld 23 jaar, wat ten opzichte van andere landen met kartel registers relatief lang is. Zij regelden bovendien een scala aan mededingingsbeperkende aspecten, zo waren prijskartels het meest populair, hierna volgden kartels die (leverings)voorwaarden regelden en kartels die quota's en marktverdeling organiseerden. Kartels waren goed georganiseerd, vaak met een brancheorganisatie en met relatief veel deelnemers. Zo is de mediaan van het aantal deelnemers achttien bij kartels die actief waren na 1980. Eind jaren 80 veranderde de maatschappelijke beoordeling van mededinging en mededingingsbeperkingen. De registraties in het kartelregister veranderden ook. Er waren minder kartels, met minder deelnemers en ze bevatten bovendien steeds minder ernstige mededingingsbeperkingen. Dit zegt overigens niet meteen dat kartelvorming is verminderd of opgehouden. Aan de hand van afgewezen ontheffingsverzoeken die zijn ingediend in de startperiode van de Mededingingswet, zien we dat er nog bedrijven zijn die behoefte hebben aan (ongeoorloofde) kartelvorming.

Hoofdstuk 4 onderzoekt de relatie tussen kartels en productiviteit. Economische theorie stelt dat kartels schadelijk zijn voor de allocatieve, productieve en innovatie efficiëntie. Concurrentie zou in de meeste markten moeten leiden tot optimale marktuitkomsten. In hoofdstuk 4 staan de effecten van kartels op de productiviteitsgroei in Nederland centraal. In het bijzonder richten wij ons op de groei van de TFP. TFP is de voor veranderingen van de inzet van productiefactoren gecorrigeerde productiviteitsgroei die de efficiëntieverbetering of verslechtering van de ondernemingen weergeeft. We richten ons op de effecten van de aanwezigheid en de toe- en uittreding van geregistreerde kartels in 27 verschillende sectoren. We gebruiken drie controlevariabelen om de groei te verklaren. Allereerst wordt gekeken naar de voorraad van menselijk kapitaal in de specifieke sectoren. Ten tweede nemen we mee hoe goed de Nederlandse industrie presteert in internationaal perspectief. Ten derde kijken we hoeveel groei de internationale voorloper ervaart in een bepaald jaar. De primaire gegevens uit het kartelregister zijn gebruikt als verklarende variabelen. De dataset die is samengesteld uit de primaire en secundaire bronnen wordt gebruikt om kartelvorming in sectoren van de Nederlandse economie in kaart te brengen. De resultaten

van het empirisch onderzoek suggereren dat de aanwezigheid van kartels in de periode 1982–1998 de productiviteitsgroei, gemeten als TFP, met circa twee procent heeft beperkt. Een verhoging of een verlaging van de TFP groei vertaalt zich bovendien direct in de groei van de arbeidsproductiviteit.

Hoofdstuk 5 gaat in op de levensduur van kartels. Speltheoretici bestempelen kartels veelal als instabiele constructies. Elke deelnemer wordt namelijk blootgesteld aan de prikkel om af te wijken van de kartelafspraak om daarmee alle kartelwinsten naar zich toe te trekken. Toch zijn er kartels die lang leven. In dit hoofdstuk kijken we naar de determinanten van de duur. Het bestuderen van illegale kartels zou verstorende resultaten opleveren omdat deze informatie waarschijnlijk de tip van de ijsberg weerspiegelt. Daarbij komt dat de aanwezigheid van een toezichthouder het natuurlijk levensverloop van een kartel verstoort. Met data van legale kartels lossen we deze problemen op en zijn we in staat om de determinanten van de levensduur van kartels die niet blootgesteld worden aan ontdekking te identificeren. In dit hoofdstuk wordt bovendien ook aandacht besteed aan de invloed van de ernst (gemeten als type mededingingsbeperking) op de duur van een kartel. Hoofdstuk 5 bevat een econometrische analyse van de relatie tussen de levensduur van kartels uit het kartel register en determinanten. Theoretische en empirische inzichten worden in dit hoofdstuk getoetst om elementen te identificeren die van invloed zijn op de levensduur van kartels in het legale karteltijdperk in Nederland. De primaire gegevens van het kartelregister dienen als fundament voor de analyse. Het gegevensbestand is samengesteld op basis van de primaire data en wordt gebruikt om elf kartelgerelateerde eigenschappen te identificeren. Daarnaast gebruiken we de groei van het bruto binnenlands product als niet-kartelgerelateerde variabele om de kans op overleven te verklaren. We concentreren ons op de kartels die actief waren tussen 1980 en 1990. De geregistreerde kartels laten een grote diversiteit zien, zowel in eigenschappen als in levensduur. Niet alle kartels zijn even duurzaam geweest. Er blijken een aantal belangrijke factoren bij te dragen aan de overlevingskansen van de onderzochte kartels. Het type kartel (gerelateerd aan ernst) blijkt ook van invloed te zijn op de duur. Zo blijken afspraken die gaan over de verdeling van markten een succesvolle kartelformule. Ook nemen de overlevingskansen toe naarmate er meer spelers bij de afspraak zijn aangesloten. Verder heeft de totale hoeveelheid kartels in een sector een positieve uitwerking op de kartelduur. En daarnaast blijkt dat een omvangrijker karteldossier bij het Ministerie van Economische Zaken bijdraagt aan de overlevingskansen van een kartel. Ten aanzien van economische groei en de overlevingskans van kartels zien we een (non-lineair) negatief verband. Al met al vinden we dat kartels als duurzame constructies georganiseerd kunnen zijn en zijn de overlevingskansen niet door toeval bepaald.

De vier inhoudelijke hoofdstukken (2, 3, 4 en 5) behandelen ieder een deel van de overkoepelende onderzoeksvraag met een ondersteunende data appendix in hoofdstuk 7. In Nederland bestond gedurende lange tijd een ideale kartelcultuur. De overheid bood ruimte voor de merites van kartels. Dat is ook terug te zien het aantal kartels dat zich

voordeed en de organisatie van kartels in de twintigste eeuw. Economische en internationale ontwikkelingen hebben er uiteindelijk voor gezorgd dat er een verbodsstelsel werd geïmplementeerd. We zien dat er een negatief verband bestaat tussen de aanwezigheid van kartels en de TFP groei. Het argument dat een kartel ook van toegevoegde waarde kan zijn voor de Nederlandse economie, wordt niet bevestigd in dit proefschrift. Ook is duidelijk geworden dat levensduur niet door toeval is bepaald. De statische (jaarlijkse) impact van kartelvorming, gemeten als TFP groei, kan dus ook nog duurzaam worden georganiseerd. Ernst en duur zijn belangrijke determinanten voor het bepalen van de uiteindelijke schade van een kartel. Hoofdstuk 4 en 5 tonen aan dat het belangrijk is deze variabelen mee te nemen bij het beoordelen van de daadwerkelijke schade van kartels.

Curriculum vitae

Personal information

Name	Lilian Titia Dymphna Petit
Date of birth	20 September 1987
Place of birth	Naarden, the Netherlands

Education

2011–2017 Erasmus University Rotterdam, Erasmus School of Economics, Rotterdam.

- PhD 'Legal Cartels', supervisors: Prof. dr. J. van Sinderen and Prof. dr. P.A.G. van Bergeijk.

2005–2009 University of Amsterdam, Amsterdam.

- Master Organization Economics (completed cum laude).
- Bachelor Organization Economics (completed).

1999–2005 O.S.G. De Meergronden, Almere.

- Atheneum (pre-university education), topic areas: economics and society.

Professional experience

2014–Today *Economist at the Competition Department,* Authority for Consumers and Markets (ACM), The Hague.

2009–2014 *Economist at the Office of the Chief Economist*, ACM (until April 2013: The Netherlands Competition Authority (NMa)), The Hague.

Internships

May 2009–Oct. 2009 Netherlands Competition Authority, The Hague.

- Master thesis: 'Market definition in hospital mergers'.

Publications

- Petit L.T.D., J. Van Sinderen and P.A.G. Van Bergeijk (2016). How the Tortoise became a Hare: on the initial sclerosis and ultimate modernisation of Dutch competition policy. In S. Fellman and M. Shanahan (eds.), *Regulating Competition: Cartel registers in the twentieth-century world* (pp. 66–87). Abingdon and New York: Routledge.
- Petit, L.T.D. (2016). The Dutch cartel collection in the twentieth century: facts and figures. In S. Fellman and M. Shanahan (eds.), *Regulating Competition: Cartel registers in the twentieth-century world* (pp. 227–247). Abingdon and New York: Routledge.
- Petit, L.T.D., R.G.M. Kemp and J. van Sinderen (2015). Cartels versus productivity growth: an empirical investigation of the impact of cartels on productivity in the Netherlands. *Journal of Competition Law & Economics,* 11 (2): 501–525.
- Petit, L.T.D. (2013). Uitkomsten Economische Detectie: Het economisch detectie instrument toegepast op de Nederlandse economie in 2009 (*NMa Working paper No. 9*). The Hague.
- Petit, L.T.D, J. van Sinderen and K. Schep (2013). Thuiszorgmarkt in beweging. *Economisch Statistische Berichten,* 98(4652): 56–59.
- Petit, L.T.D. (2012). The economic detection instrument of the Netherlands Competition Authority: The Competition Index (*NMa Working paper No. 6*). The Hague.
- Petit, L.T.D. and J. van Sinderen (2011). Detectie van concurrentiegebrek in 2011. *Economisch Statistische Berichten*, 96(4604): 118–121.

PhD portfolio summary

Summary of PhD training and teaching activities

Lilian Petit
Erasmus School of Economics
Research School: Tinbergen Institute

PhD period: 2011–2017
Promotor 1: Prof. dr. J. van Sinderen
Promotor 2: Prof. dr. P.A.G. van Bergeijk

1 PhD training	Year
General academic skills	
• Integrity in Research (Erasmus Research Institute of Management (ERIM)).	2015
Courses	
• Promotiegroep 'Modern toezicht' (Rotterdam School of Management (RSM), supervisors: prof. dr. Muel Kaptein and dr. Martin de Bree).	2014–2017
Presentations	
• Petit, L.T.D. – The Empirical Economic Detection Instrument (EEDI) – Centre for European Economic Research (ZEW) conference, *Economic Methods in Competition Law Enforcement*. 2011.	
• Petit, L.T.D., R.G.M. Kemp and J. van Sinderen – Cartels vs. Productivity – Mannheim Centre for Competition and Innovation (MaCCI), *Annual Conference 2013*.	
• Petit, L.T.D. – The Dutch cartel collection in the second half of the 20th century: an era rich in cartelization – *18th Annual Congress of the European Business History Association (EBHA)*. 2014.	
• Petit, L.T.D. – Cartels: Existence, effects & detection – Erasmus School of Economics, *Brownbag staff lunch*. 2015.	
• Petit, L.T.D. – ACM's screening practices (in: Special Policy Session 1: Cartel Screening) – Competition and Regulation European Summer School (CRESSE), *11th International Conference on Competition and Regulation*. 2016	
• Petit, L.T.D. – Kartels enzo! – Promotiegroep 'Modern Toezicht', *Wetenschapsseminar 2015*.	
• Petit, L.T.D. – Detecting bid-rigging: the Dutch practise – Italian Competition Authority (AGCM), *ECN-seminar 'Screening for bid-rigging'*. 2016.	
Conferences	
• Competition and Innovation Summer School – Centre for European Economic Research (ZEW), Turunç/Marmaris.	2012
• Conference "Impact Assessment of Interventions of Competition and Consumer Authorities" – Autoriteit Consument en Markt, Amsterdam.	2016

Seminars

• Seminar 'Modern Toezicht' – Promotiegroep 'Modern toezicht', Belastingdienst, Utrecht.	2016

2 Teaching activities

	Year
Guest lectures	
• Cartel detection (Erasmus University Rotterdam – Seminar Competition Policy, Bachelor course).	2013, 2014, 2015, 2016, 2017
• Cartel detection (Utrecht University – Economics of competition law and policy, Master course)	2015, 2016
Supervising	
• Onno Dijt (Erasmus University Rotterdam, Bachelor thesis, official supervisor: dr. J. Kamphorst)	2013
• Danny van Twist (Erasmus University Rotterdam, Master thesis, official supervisor: prof. dr. J. van Sinderen)	2013
• Simone de Boer (Utrecht University, Master thesis, official supervisor: dr. A.C. Hoying)	2015