DEFINITIVE VERSION

European and Chinese Mutual Open Innovation

How the European perception towards China limits cooperation on technology development

Universiteit Leiden

Master Thesis

Submitted to:

Leiden University

MASTER ASIAN STUDIES

East Asia Track

Martin Kuijper
Nr. 1704877

11 June 2019

Supervisor
Dr. Jue Wang

Abstract

China desires to gain knowledge that is required to sophisticate its economy. This primarily involves investments in strategic sectors in Europe, which is increasingly received with anxiety and scepticism by European leaders. Therefore, an alternative for China to attain significant technological insights is open innovation. This research argues that this is a useful way of obtaining mutually profitable research and development. However, such a partnership requires confidence that is currently lacking. Therefore, this research answers the question: To what extent does the EU's perception of China impede the Sino-EU cooperation on innovation? This dissertation examines this issue by analysing how the EU view on China influences trust towards this partner, and what this entails for open innovation. It is found that present preconceived negative notions on China lead to distrust. On certain issues, control mechanisms compensate for this lack of trust. However, more trust or control remains to be needed in order for future open innovation in this bilateral relationship to blossom.

Table of Contents

Introduction

The contemporary rise of China is characterised by the desire to sophisticate its economy and climb up the value chain. Moreover, the ambition is to "become the leader among the world's manufacturing powers" (State Council, 2015). One way of realising this intention is obtaining insights from incumbent technologically advanced countries. The consequent interplay between Western and Chinese innovative ambitions provoke significant tensions, as well as opportunities for cooperation. As stated by Merics: "Global industry is at the brink of the next technological revolution" (Wübbeke et al. 2016, 11). For this revolution to occur, China invests heavily in European knowledge, which often results in acquisitions of high-technology firms. The anxiety of European politicians about unfair competition that results from this, is expressed in recently implemented screening mechanisms (Hanemann, Huotari and Kratz 2019, 11-21).

This tight monitoring of Chinese companies is a direct consequence of arguably aggressive acquisitions from the side of Beijing, and a substantial amount of distrust on the side of Brussels. The reason for this is that taking over companies is just one of many ways to obtain technological insights from an external party. Other examples of gaining knowledge are mutual innovative networks or formed strategic alliances (Chesbrough 2006, 1-4). Because many of these necessitate trust that is absent in this case, there is little alternative for China than to compensate for this distrust through acquisitions financed by "bottomless wallets" (Tartar, Rojanasakul and Scott Diamond 2018, n.p.). This is arguably a pitiful situation because the European Union and China possess great complementary skills regarding innovation, which could lead to a very lucrative partnership (Farnell and Crookes 2016, 122). The Chinese side enjoys an enormous market and therefore a fruitful testing ground, low-priced scientists, government assistance, an entrepreneurial spirit and a rapidly growing Internet industry (Yip 2014, n.p.). These characteristics can well be coupled with Europe's advantage in knowledge-rich sectors, which can assist China in developing technology and cause a potential strategic alliance to be profitable (Farnell and Crookes 2016, 123). The partnership between Siemens and the Chinese government illustrates this case, whereby the German technology firm provided knowledge in exchange for market access (Sun 2015, 648-655; Scheuer and Höpner 2017, n.p.).

Such innovative partnerships are a mutually advantageous way of further developing the Chinese economy (Li 2017, 1-5). This requires trust and confidence, especially in the politically and economically sensitive high-technology sector (Das and Teng 1998, 491-512; Farnell and Crookes 2016, 123). To illustrate, the perception of China as a rising military power provokes fear of defence-related utilisation of dual-use technology, which causes export restrictions for such products (Stumbaum 2009, 1-33; European Commission 2018, 4). This example illustrates that the concept of perception could directly have implications for fruitful cooperation on innovation. Hence, the corresponding notion of trust is something that is frequently addressed by Chinese and European leaders in regards to their cooperation (France24 English 2019, 15:29-30:50)

For China to obtain its ambition to technologically take the lead, access to European knowledge is of great importance (Wübbeke et al. 2016, 1-23). Likewise, for the EU it is essential that the Chinese innovative rise is transferred from a threat and challenge to an opportunity of open innovation. For this to happen, it is among the real political issues between these parties, such as IP protection, important to take into consideration the European perception and trust towards China.

Hence, this thesis intends to study the collaboration in innovation between China and the EU because it wants to find out to what extent the European perception on China limits this partnership. Consequently, this research will assist the academic field in understanding what the European view on China means for the collaboration between these parties. Next to that, the thesis will therefore identify the problems for Sino-EU cooperation so these can be solved by policymakers or further investigated by scholars. In order to be cognizant of this matter, the research question that will be answered in this dissertation is: *To what extent does the EU's perception of China impede the Sino-EU cooperation on innovation?*

In this question, the EU is selected because there has been relatively little research on EU-China relations in comparison with the United States and China, and would therefore contribute to the academic field (Dagué-Nevers 2017, 71-72). Furthermore, the United States is more politically and militarily involved with China than the European Union, making potential strategic alliances more sensitive. For this reason, the U.S. actively pressures and influences the EU-Sino bilateral relationship,

which will be taken into consideration in this thesis (Farnall and Crookes 2016, 199-212).

The objective of the research question is to discover '*to what extent'* the EU perception on China limits cooperation on innovation, because the phrase *'how'* would inevitably imply that the EU is the active party that limits collaboration. Nevertheless, the research will solely view the European perception towards China and not vice versa, because that would be beyond the limited scope.

I addition, the concept of *perception* will be made methodologically applicable in this research in the theoretical framework. The European perception on China determines the degree of trust, for example the defence related applications of dual-use technologies (Bräuner 2013, 457-482). Next to that, this thesis will distinguish perception from real matters. By looking at, for example, the case of dual-use technologies, it will be clear whether the European concerns are based on perception and trust or reality.

1: Setting the Scene for the Sino-EU innovative partnership

In an article of *Foreign Affairs* in March 2019, Andrew Small reports the recent transformation of Europe's open view on China towards a more sceptical and defensive attitude (Small 2019, n.p.). The intention of this thesis is to provide an understanding of this trend, specifically the role of Europe's perception in this relationship. This chapter will provide insights that are needed for this research. In order to understand the role of perception in the cooperation on innovation between China and the EU, one ought to be cognizant on current developments and existing frameworks. Hence, the Sino-EU investment relations will be observed in this chapter, coupled with the opinions of European leaders. Thereafter, the complementary comparative advantages will be observed in relation to innovation. Finally, the existing policy framework on cooperation will be examined.

Chinese investment in Europe

The Chinese ambition to sophisticate its economy requires knowledge, which specifically could be obtained from European companies. One significant way of attaining these strategic innovative insights are (primarily state-supported) cross-border mergers and acquisitions (Du and Boateng 2015, 230-234). The Chinese motivation to invest in Europe in order to gain important insights is reflected in the sectors where the purchases take place. Namely, more than one-third of the investments are made in the technology sector (Hanemann and Huotari 2018, 33). The increase in Chinese FDI in Europe is illustrated in Figure 1.1.

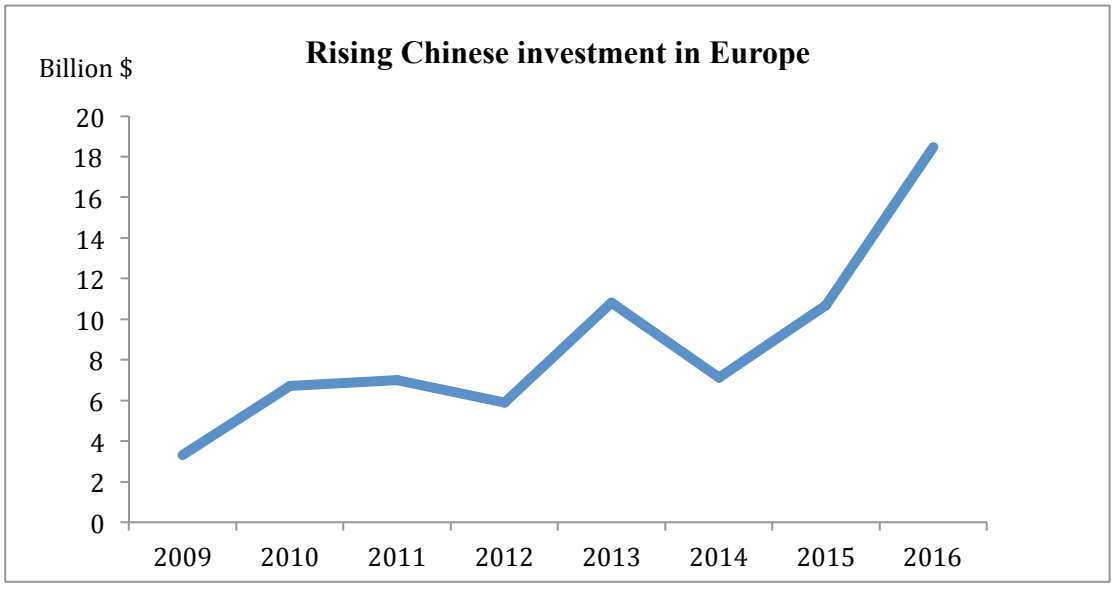

Figure 1.1 (National Bureau of Statistics of China 2019) compiled by author.

European leaders frequently compare the openness of these investments with limited market access in China (Hanemann and Huotari 2018, 9-11). As stated by the European Parliament: "the EU has concerns about the lack of reciprocity and market access as well as a level playing field in China for foreign investors, while Chinese investments in the EU are free and flows are increasing" (Saarela 2018, 12). In addition, there are increasingly more voices from member states that express concern on the Chinese FDI in Europe. To illustrate, in 2017, this unease prompted Berlin, Paris and Rome to submit a letter to the European Commission that propagates for protectionist measures in order to guarantee a level playing field (Bundesministerium für Wirtschaft und Energie 2017, 1-2). Dutch Prime Minister Rutte argued that "[Europe] should not be naïve [because China] is also pursuing its national interest" (Brzozowski and Valero 2019, n.p.). Moreover, Commission President Juncker stated that the relationship with China "is not excellent" (Brzozowski and Valero 2019, n.p.).

These statements made by European officials are mirroring a recent alteration of the European attitude towards China, which is primarily caused by the argued lack of reciprocity. One could recognise this shift in the strategy reports of the European Union. Although the strategy on China of 2016 did address the lack of reciprocity, it has a very positive and welcoming sentiment on Chinese investments (European Commission 2016, 3-7). In addition, the report states: "A top EU priority is to promote reform and innovation in support of transforming China's growth model". This supportive attitude is substituted by a more protectionist stance, which also is expressed in the strategic outlook on China of 2019. In this document, China is perceived as "an economic competitor in the pursuit of technological leadership", "a systemic rival promoting alternative models of governance" and therefore the EU should have "a principled defence of interests and values" (European Commission 2019a, 1). According to Merics director Pieke, these phrases are wrongly chosen, "because it implies that these parties could never cooperate and there will be a single winner, while we should prevent there will be two separate worlds" (quoted in Alonso and Chin-A-Fo 2019, 2, translated from Dutch). Specifically the Chinese investments in high-tech sectors are contentious in Europe, due to the strategic advantage that is arguably lost in these purchases (Wübbeke et al, 14-59). Especially the state support, which is very difficult to track, causes concern (Wübbeke et al, 53).

Sino-EU cooperation on innovation

The previous paragraph examined the Chinese method of obtaining European knowledge through acquisitions, and the European response. In contrast, this paragraph observes the cooperative framework for a strategic alliance between these parties, in lieu of the Chinese purchase of know-how.

China and the European Union have great potential in the collaboration on innovation, due to their complementary strengths. As argued by Farnell and Crookes, "they have many common interests and compatible talents which would argue for closer cooperation" (2016, 121). The relative newcomer in the field of innovation is China, which tremendously increased its technological capabilities (Zhu and Euchner 2018, 11-13). Zhu identifies three main comparative advantages where China has its strengths (Zhu and Euchner 2018, 11). First, it created a "sophisticated manufacturing system", which allows new ideas to be marketed at a rapid pace. Second, the country invests heavily in research and development, which exceed that of the EU. According to Yip, this is due to the state support that makes China strong in innovation (Yip 2014, n.p.). The third point highlighted by Zhu is China's entrepreneurial climate that aims to satisfy the demands of local consumers (Zhu and Euchner 2018, 11). Yip argues that in addition to this lively business spirit, China has an advantage in the rapidly evolving Internet industry coupled with an enormous market, which could serve as a testing ground (Yip 2014, n.p.). This huge consumer base "makes it easy to introduce new products and services without having to displace incumbents" (Yip

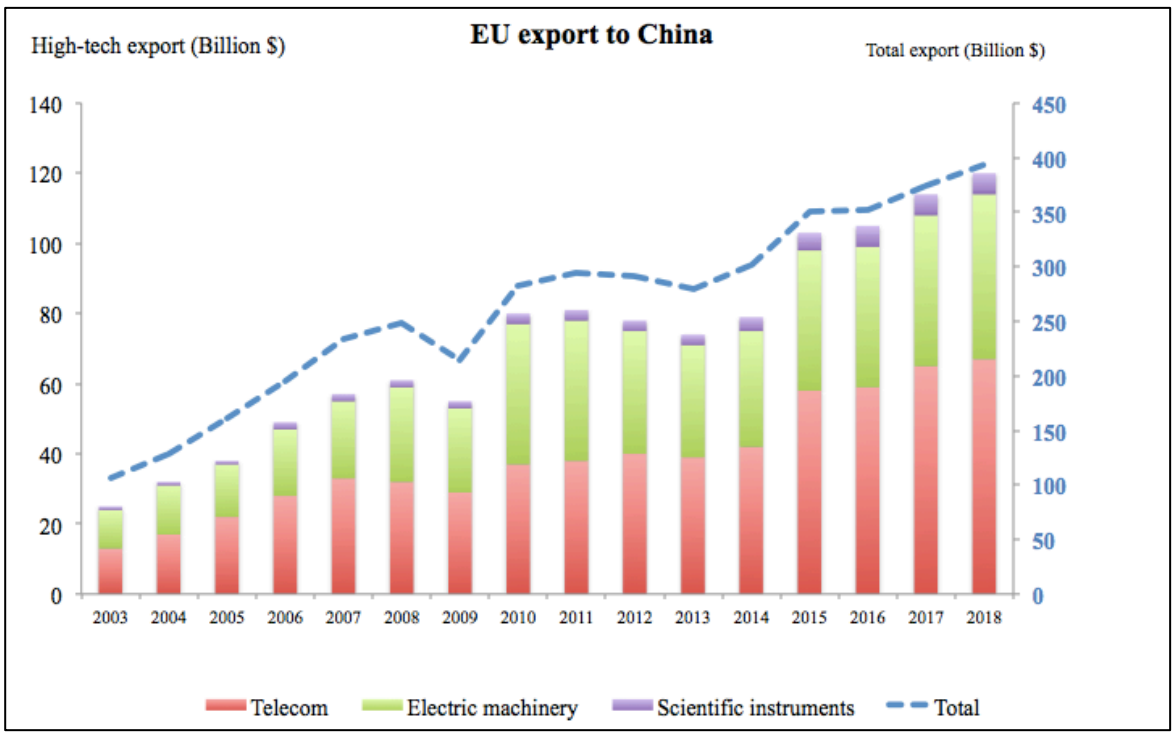

Figure 1.2 (Eurostat 2019, DS-018995) compiled by author

2014, n.p.). Furthermore, this big market encourages risk-taking and experimentation, especially because "Chinese consumers are relatively forgiving" (Yip 2014, n.p.).

These strengths and rapid improvement and sophistication of Chinese innovation could very well be coupled with the existing expertise and experience of the European Union (Farnell and Crookes 2016, 123). A conventional approach to such collaboration is a European company providing knowledge and expertise in exchange for lucrative contracts and market access (Sun 2015, 645-655; Scheuer and Höpner 2017, n.p.). Another way in which the European expertise in high technology is reflected is the trade data in this sector. This is visualised in Figure 1.2, where one can perceive the increase of the significance of the EU-28 high-tech exports to China.

Organisational framework

In order to comprehend the existing cooperation between China and the EU, it is useful to observe the existing institutions that address this matter. According to Farnell and Crookes, a relevant organisation for the cooperation and competition with China is the 'Open Innovation Strategy and Policy Group' (OISPG) (2016, 123). Farnell and Crookes argue that the primary intention of this institution is to maintain the EU's comparative advantage of knowledge (2016, 123). In contrast, the mission of the OISPG as stated on its website is to unite "industrial groups, academia, governments and private individuals to support policies for open innovation" (European Commission 2019c, n.p.). Another significant factor in the Sino-EU cooperation identified by Farnell and Crookes is the 'Agreement for Scientific and Technological Cooperation' that is signed by the EU and China (2016, 123). This agreement was signed in 1998 and outlines the foundation of cooperation on research and innovation between these parties (Official Journal of the European communities 2000a, 40-43). An example of such cooperation is the research fund targeting Chinese participants in the EU's 'Horizon 2020' research and innovation programme. To illustrate, the EU funds were worth more than 100 million euros (Farnell and Crookes 123-125; European Commission 2019c, n.p.). The priority areas on research and innovation cooperation are reviewed yearly in the EU-China summits and 'Innovation Cooperation Dialogues' as well as in the Joint Committee meeting of the science and technology Agreement (European Commission 2018a, 2-4).

2: Literature Review

The intention of this literature review is to identify the current developments in the field of international cooperation on innovation. More specifically, the contributions on this topic related to China and the European Union are of importance to observe. By doing so, this literature review will reveal existing gaps in the literature that are concerned with this issue. Subsequently, this chapter outlines the existing knowledge so that the research builds upon and contributes to the field. This will therefore correspond with the research question that this thesis aims to answer: *To what extent does the EU's perception of China impede the Sino-EU cooperation on innovation?* In order to precede the research on this question, it is essential to formulate the current stance of the academic field on this issue.

The first concept in the research question that requires an analysis of the literature is the concept of open innovation. The reason this model is selected is because it has great significance for the way the EU promotes cooperation on innovation (Farnell and Crookes 2016, 123). An alternative concept could be, for example, the idea of 'strategic alliances', as researched by Das and Teng (1998, 491-512). Because this approach focuses more on different kinds of partnerships between enterprises, the 'open innovation' model is chosen, as that accurately describes collaborative exchange of specifically innovative insights. It is essential to observe the academic stance on this theory prior to utilising it in the research. In order to obtain a solid understanding of the academic developments on this issue, it is important to examine the contributions of Henry Chesbrough, who invented this concept. Thereafter, secondary sources are selected to critically evaluate his theory.

After the discussion of open innovation has been perceived, this review will cover the academic contributions on the cooperation between China and the EU on innovation. In this way, the academic stance on if and how these countries 'openly' innovate becomes clear. The resources of this issue are selected according to their relevance and age, because dated articles can no longer be fully accurate considering the rapid change in Chinese knowledge. In addition to academic literature, reports from think tanks or public institutions are also relevant for this section.

The third essential aspect of the research question for which an examination of the field is needed, is the notion of perception. This paragraph will cover the

definition of perception in the context of international relations. For this section, academic articles are selected that are relevant to the notion of perception.

The concept of open innovation

Open innovation will serve as an important theory in this thesis to evaluate the Sino-EU cooperation on innovation. In order to attain an understanding of the current stance of the literature regarding this concept, this paragraph will observe the academic contributions concerning open innovation. This will be performed by firstly observing the academic understanding of open innovation. Thereafter, literary contributions will be analysed that apply this concept beyond the field of business studies, in order to establish whether there is a gap in this field.

Open innovation and business efficiency

Henry Chesbrough describes cooperation in research and development as open innovation (2006, 1). This concept originates from the field of business studies and is addressed to company managers, in order to enhance the efficiency of technological advancements (Chesbrough 2006, 3). As argued by Chesbrough, "open innovation processes combine internal and external ideas into architectures and systems" (2006, 1). Hence, open innovation is considered the opposite of internal 'closed' innovation, whereby companies possess their own internally focused R&D departments (Chesbrough 2006, 1; OECD 2008, 24). To illustrate, a firm that openly innovates attracts required knowledge from outside its own organisation, and sells irrelevant developments for its own market to external parties (Chesbrough 2006, 3). This increases efficiency because internally researched 'spillovers' are turned into revenue (Chesbrough 2006, 3-6). As a consequence, "a crucial goal of Open Innovation is to capture external knowledge that flows between organisations, allowing firms to be more successful at innovation than firms that close off such flows" (Simard and West 2006, 220).

Simard and West contribute to the academic understanding of open innovation by identifying the role of innovative networks in value creation. Joining such a network provides advantages for a company, because under the conditions of open innovation, this firm can obtain essential knowledge rapidly without high internal costs (Simard and West 2006, 223). In addition, these authors identify two types of connections within these networks: formal and informal ties. Formal ties are

cooperative frameworks between companies that are contractually agreed upon, for example licenses or acquisitions (Simard and West 2006, 222-24). Informal ties however are not bounded to a contract, for example employees who switch between employers and thereby transfer knowledge (Simard and West 2006, 224). It should be noted that although these networks primarily exist in knowledge-intensive industries, insights do not necessarily have to be technological (Simard and West 2006, 223). For example, important knowledge can also consist of important market insights, product application or customer preferences (Simard and West 2006, 223).

Open innovation beyond observing the firm

According to the OECD, the notion that businesses could operate their R&D openly instead of in isolation has been around for decades (2008, 24). What makes the concept of open innovation different is that it is an "integral part of a companies' innovation strategy and business model" (OECD 2008, 24). The report of the OECD is useful in order to understand the international dimension of open innovation, however the OECD paper remains focused on the private sector. When open innovation is an explicit part of a companies' business model, could it also be part of a government's strategy? Regarding the public sector, several authors outline the role of the government in open innovation. According to Simard and West, an important role of a national government is to promote knowledge exchange through national innovation systems or schemes (2006, 220-224). In addition, Lee, Hwang and Choi contribute to this issue by analysing how governments can further facilitate a preferable climate for open innovation (2012, 1-22). By looking at a government's policy in technologically advanced countries, these authors analyse how the public sector promotes open innovation in their respective countries, but also how the governments utilise open innovation themselves (Lee, Hwang and Choi 2012, 1-18). Although this analysis is useful to obtain more understanding of the public sectors' role in open innovation, it is solely observing government initiatives at a domestic level for knowledge flows within the state.

The concept of open innovation and the corresponding literature above are useful to understand cooperation on innovation. The current literature primarily focuses on the private sector, and the public sector is mostly perceived as the benefactor for innovative networks. This behaviour of the public sector is analysed

by looking to what extent a state assists the creation of knowledge networks (Lee, Hwang and Choi 2012, 1-22). To illustrate, governments can promote and facilitate open innovation by national innovation systems and subsidised research. While these insights are valuable, the current academic literature on this issue does not succeed in explaining open innovation between states.

Sino-EU cooperation on innovation

The research question inherently assumes that a profitable open innovation relationship could be to some extent 'impeded' by the European Union's view towards China. Therefore, it is essential that this literature review will observe arguments in the literature that claim there can be a profitable innovation relationship in the first place. Hence, this paragraph will observe contributions on the lucrative potential that innovative cooperation between China and the EU can have. The scholarly knowledge on this issue will be reviewed as follows. First, the literary contributions on the comparative advantages of the EU and China will be examined. Thereafter, the main mutual advantages for cooperation according to the literature will be observed.

The Chinese and European comparative advantages in innovation

Logically, the profitability in Sino-EU cooperation lies in the complementary characteristics of their respective economies. Namely, Ricardian theory prescribes that when two parties specialise in their competitive advantages and exchange their expertise, the accumulated wealth will increase (Ruffin 2002, 729-743). Farnell and Crookes emphasise that China and the European Union are very well able to mutually profit from an innovation relationship because of the complementary skills (2016, 141, 231). More specifically, these authors argue that European knowledge and inventions match the Chinese desire to innovate its economy (Farnell and Crookes 2016, 141, 231). On the Chinese side, the country possesses an enormous complementary advantage based on its substantial consumer base (Yip 2014, n.p.). According to Yip, these consumers provide the opportunity to test innovations without taking much risk (2014, n.p.). Besides this advantage that fosters rapid introductions of innovative products, the government also supports initiatives that utilise new knowledge (Yip 2014, n.p.). Next to that, Chinese ICT is also becoming increasingly more technologically advanced, partly because of the growth of its

companies in these sectors (García-Herrero et al. 2017, 36). These authors accurately summarise the current consensus on the field regarding this issue; namely, Europe possesses the know-how, China is the fast follower that requires this knowledge, which can be tested and commercialised on its large market (García-Herrero et al. 2017, 36K).

The advantageous innovation relationship

China and the European Union are very suitable partners for mutual innovation because they do not solely have complementing comparative advantages as described above; they also face common challenges that can be solved together (Farnell and Crookes 2016, 218-221). There has been extensive academic research on the grounds for cooperation that are mutually profitable for China and the European Union. To illustrate, Farnell and Crookes argue that climate-related innovation could best be jointly approached as both parties face environment challenges (2016, 218-219). In addition to such sustainable technology development, Kwok, Lau and Summers point out that industries such as agriculture and high-tech manufacturing are also profitable avenues for potential collaboration (2018, 2). The importance of this relationship is underlined by the frequent visits of Xi Jinping in Europe to discuss innovation and signing deals (Kwok Lau and Summers 2018, 8-9). According to Li, the diverse knowledge that derives from different countries results in research and development outcomes that could not have been reached without international technology cooperation (Li 2017, 3). In the Asian context, Su argues that East Asian countries benefit from internationalising innovation, as that allows complementing knowledge that is domestically available (Su 2016, 226). On the basis of this literature, one can argue that there is a positive sentiment on the profitability and opportunities that intensive Sino-EU cooperation could offer. However, the European Union itself is in its report less optimistic on the Chinese involvement in the continent's industrial and technological capacity (Prevost et al. 2011, 9). The reasons provided in the report are the European trade deficit with China, a lack of reciprocity in terms of market access and Chinese firms "scrambling" for influence in European companies (Prevost et al. 2011, 1-9).

The concept of perception

As the report of the European Parliament illustrates, not all actors involved are positive about the way in which China and the EU commonly innovate (Prevost et al. 2011, 1-9). According to Farnell and Crookes, an intensive partnership between China and the EU can be very profitable because of the matching complementary advantages; however, political obstructs stand in the way (2016, 221). The influence of politics in the Sino-EU cooperation on innovation has been widely researched (Farnell and Crookes 2016, 1-244; Kwok, Lau and Summers 2018, 1-21; Bound et al. 2013, 1-111). This research will add to that by looking at perception. Specifically, which aspects or concerns are *real* and which are *imagined* as a consequence of 'othering' (Chaban and Holand 2019, 3-9) In this paragraph, the concept of perception in the context of international strategic alliances will be observed. In this way, this review ensures that the theoretical framework builds upon existing literary understandings on this relationship.

The importance of perception in strategic alliances

Das and Teng contribute to explaining the role of trust and control in strategic partner alliances (1998, 491-512). These authors argue that cooperation in research and development is a form of such an alliance, wherein the parties ought not to perceive each other with suspicion (Das and Teng 1998, 491). It should be noted that similar to the concept of open innovation, Das and Teng write their article in the context of business studies and firms (1998, 491-512). Nevertheless, the analysis is useful in order to understand the importance of trust and confidence in cooperative research and development between states. Similar to open innovation, perception in strategic alliances is also applicable to public international relations (Chaban and Holland 2019, 2-4). According to Chaban and Holland, China is one of the strategic partners of the European Union (2019, 3). This is a relationship that deteriorates when the respective partners have mutual preconceived negative perceptions by viewing the partner as the "Other" (2019, 7). The introduction to the book *Shaping the EU Global Strategy* by Chaban and Holland is a useful contribution because it draws the line between the business strategic alliances of Das and Teng with public affairs (1998, 491-512).

In evaluating the relationship between China and the European Union, Pan provides a useful analysis that applies constructivist theories of identity formation on

this relationship (2012, 37-55). This author argues that the Sino-EU relation and the corresponding European policy towards China are harmed by " a false premise that the Chinese Other ought to and be transformed into the European Self" (Pan 2012, 45). This "othering" of China occurred since the end of the 20th century, which "have made China less an opportunity than a competitor or even threat" (Chaban and Holland 2019, 7; Pan 2012, 38). The authors presented here provide a useful contribution to understanding the role of perception in international relations and the Sino-EU partnership in particular. There has been little to no research on how the European perception towards China would limit the cooperation on innovation, which is the gap this research will attempt to fill.

Statement of the field

The goal of this review is to examine the academic literature in order to understand the scholarly context of this research. Therefore, it ensures that this research builds upon existing knowledge and fills the gaps identified in this review.

It is found that the scholars observed argue that actors more efficiently perform research and development if this is done openly. There is a substantial amount of research that justifies this claim for businesses. In terms of the public sector, the literature has produced understanding of how governments can promote domestic open innovation. In contrast to that, there is very little to no research on international open innovation between states.

Regarding the Chinese and European cooperation on innovation, there is extensive research available that analyses this issue. This literary body is useful for this research to build upon because the complementary advantages of China and the EU are known. In contrast, it has not been researched what the influence of perception is on this partnership.

The literature points out that trust, confidence and perception are not only important for business relationships, but also for international cooperation between states. By 'othering' the partner in strategic alliances, the other party can be perceived as a threat.

On the basis of this literature review, this research will contribute by applying the concept of open innovation to cooperating states. The major different of state-to-state cooperation in comparison with business-to-business is the security concern and political issues. The influences of politics and security in international cooperation

have been researched, and these factors are not isolated. Therefore, this research will observe the notion of perception and the European perception towards China that limits this cooperation. This will consequently contribute to the gap on how open innovation works in cooperation between states, and the role of perception in Sino-EU collaboration on research and development. Namely, as presented above, there has been extensive research conducted on the open innovation and the economic relationship between China and the EU. However, open innovation has not been observed on macro-level between states rather than companies. By adding this unique approach to growing and currently very relevant field of the Sino-EU innovative relationship, this research contributes to this globally significant issue. How this thesis intends to perform this research is outlined in the following chapter.

3: Theoretical Framework and Methodology

Theoretical framework

This framework aims to identify the main theories that are applied in this thesis. In addition, it will provide solid definitions of the main concepts so that they can be utilised in this research. It is essential that the linkages between these concepts are clarified so that a theoretical foundation is established on which the research can be built. First, this theoretical framework will identify the main definitions of perception that shall be utilised in this research. Thereafter, this will be related to the notions of trust and control, which are essential in any successful partnership (Das and Teng 1998, 491-512). The third paragraph provides definitions of open innovation so that it is clear how this concept is understood in this thesis. Finally, a conceptual model will illustrate the complete theoretical framework.

The theory of perception

Regarding the European view towards China, this research will divide the comprehensive concept of 'perception' into three components: perceiving China as the 'other', 'imagining' China and the influence of the United States. The European 'othering' of China is determined by the way Europe perceives itself (Pan 2012, 45). According to Pan, European self-construction "serves to reinforce that self-identity through its implicit goal of transforming a Chinese other" (2012, 45). This results in mirroring values as democracy on the 'other' and thereby desiring to transform China towards the European 'self' (Pan 2012, 45-56). This discursive perception is an essential theoretical angle for this research, as it directly relates to European policy towards China (Wong 2012, 111).

Chaban and Holland propose a theory that adds to this, which is the *image* created of another country as a result of perceiving it as the 'other' (2019, 9). Thus, 'imagining' causes a country to be "seen as friendly or hostile, capabilities as powerful or weak, and status as inferior or superior. Yet, the 'reality' of perceptions is less clear-cut" (Chaban and Holand 2019, 9). These authors add to this that "the same international actor could be seen as capable and friendly in one issue-area, yet perceived very differently in another - an argument consistent with the theory of othering" (Chaban and Holland 2019, 9). To illustrate this theory, it can mean that

China is perceived as a friend by Europe in the area of economics, while the country is seen as a military threat. This imagining of the country by Europe into for example the 'China threat' is therefore relevant to analyse in this research in relation to innovation. The theory of Chaban and Holland is valuable in this matter, as it requires paying attention to which perception is *real* and which is *imaged* and not proven.

The third theoretical angle that is significant for analysing perception is the influence that originates from third parties. This external influence is in this research primarily observed by looking at the role of the United States on the Sino-EU bilateral relationship, which is of great significance (Farnell and Crookes 2015, 199-212).

Trust and control in strategic alliances

This research aims to analyse the role of perception in a Sino-EU partnership. It should be noted that not all forms in partnership involve trust, and are therefore arguably irrelevant to the notion of perception. For example, Chinese acquisitions of high-tech companies do not involve perception if the other party's trust is bought-off by a huge sum of capital.

In contrast to acquisitions, the theory of Das and Teng addresses strategic alliances, where trust and confidence are required for a successful partnership (1998, 491-512). These authors define strategic alliances as "interfirm cooperative arrangements aimed at achieving the strategic objectives of the partners" (Das and Teng 1998, 491). Examples of such arrangements are "joint ventures, minority equity stake, co-production and joint research and development" (Das and Teng 1998, 491). In strategic alliances, the confidence in a successful partnership is determined by the degree of trust and control (Das and Teng 1998, 491-498). Control is defined as "a regulatory process by which the elements of a system are made more predictable through the establishments of standards in the pursuit of some desired objective or state" (Leifer and Mills 1996, 117). Therefore, a party in a strategic alliance can build control mechanisms in order to prevent the partner from pursuing their own interests (Das and Teng 1998, 493-494). The second source of confidence in a partnership is trust, which is understood as "one's belief and expectation about the likelihood of having a desirable action performed by the trustee" (Das and Teng 1998, 494). The difference between these two concepts is that trust means which expectation one has

about the other party's motives, while control is about the mechanisms that guarantee that desired behaviour (Das and Teng 1998, 491-494). Together, trust and control determine the degree of confidence in a strategic alliance, which is the "perceived level of certainty that the partner will behave in a desirable manner" (Das and Teng 1998, 494). In the context of this research, this means the extent to which Europe has confidence in Chinese conduct in open innovation. The relation between trust and control is that they "contribute jointly to the total level of confidence one has in partner cooperation" (Das and Teng 1998, 495). Hence, when there is a high degree of trust, there is no need for a high control mechanism; similarly, when there is little trust, control becomes more important (Das and Teng 1998, 495).

Theoretical base on open innovation

As stated above, the combination of trust and control leads to a potentially effective strategic alliance (Das and Teng 491-495). However, this research does not regard this sort of partnership as the end-goal. Rather, open innovation is selected as the concept that describes a profitable relationship, because this notion is more inclusive when it comes to innovation specifically (Chesbrough 2006, 1-4). The applicability of the concept of open innovation between states instead of among businesses is a major gap in the literature that this research aims to fill. This thesis argues that open innovation is also conducted by states through innovative formal and informal ties. The theory of Chesbrough on open innovation and that of Simard and West on innovation ties are significant for the argument of this thesis. The definition of open innovation that this research aims to apply on China and the European Union is as follows: "Open Innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively" (Chesbrough 2006, 1). It is the "antithesis of the traditional vertical integration model" and it "treats R&D as an open system" (Chesbrough 2006, 1).

Another theory that is useful for the operationalisation of this issue is the dichotomy between formal and informal innovation ties. Simard and West argue that formal ties are contractually agreed upon, for example license agreements or official alliances (2006, 223). As mentioned in the previous paragraph, some formal ties such as acquisitions are *theoretically* forms of open innovation but do not involve

confidence. In contrast to formal ties, informal ties are unplanned knowledge spillovers and occur when two parties are a member of the same research and development network (Simard and West 2006, 224). Although Simard and West observe these ties in relation to businesses, this thesis argues that states are also part of an innovative network. In order to make this argument, the theories presented in this paragraph will be applied in this research.

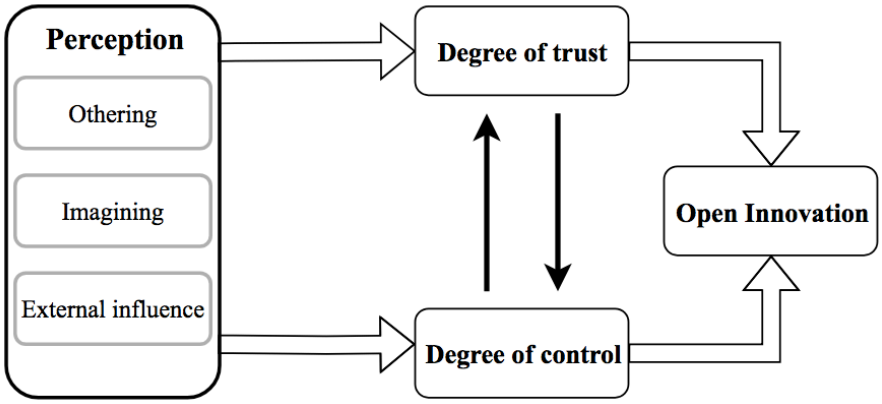

Figure 1.1

The conceptual model

In Figure 1.1, the framework presented above is illustrated. One can see that perception is shaped through 'othering', 'imagining' and external influence (Pan 2012, 45-56; Wong 2012, 111). The perception of the European Union then determines the degree of trust towards Chinese conduct in a *voluntary* innovation partnership. When the trust is high, control is most likely low and vice versa (Das and Teng 1998, 495). Together, these two indicators determine the degree of confidence in open innovation. In case both trust and confidence are low, there is not enough certainty that the other party will not pursue its own interest. Hence, in this case, there will be no strategic partnership. In this model, one can see that the independent variable is perception, which is related in this thesis with open innovation. Trust and control serve as intermediate variables as they are indispensable in this equation, because these two are most relevant in the creation of a profitable partnership (Das and Teng 1998, 491-504).

Methodology

This research will utilise the conceptual model presented above in order to understand to what extent the European perception towards China limits open

innovation between these parties. In doing so, data will be gathered that allow for further analysis on each of the indicators in the conceptual model. The methods of gathering this data and the corresponding analytical tools that are used will be observed in this paragraph.

The first two indicators that determine the concept of perception as presented in the conceptual framework are ‘othering’ and ‘imagining’, for which this research will perform a discourse analysis on primary resources while acknowledging the existing academic contributions on this matter. As stated in the theoretical framework, the difference between these two is that ‘othering’ is more concerned with perceiving China as a substantially different ‘other’ through political discourse. This leads to ‘imagining’ where threats or challenges are perceived that are either overestimated, not proven or simply unreal. Therefore, this research compares evident cases with the discursive elements in primary resources. These include official statements and interviews with European professionals who work on innovation with China on a daily basis. In order to obtain a solid insight on how these two indicators practically evolve, this research includes a case study on the European stance towards the high technology appliances of Huawei. The third indicator on the conceptual model is the influence of the United States on the perception of the European Union towards China. The role played by the U.S. in this bilateral relationship will be analysed by looking at official statements and policy documents. Such observations will reveal the U.S. pressure that is imposed on the European Union. Specifically, the role of the United States in this matter could be understood by observing the list of European trade embargos on trade with China. This could then be analysed in relation to American lobbying and influence on these trade restrictions.

Thereafter, the concepts of trust and control will be applied to the European perception towards China. Regarding trust, the interviews that are conducted add valuable insights to the expectation that China will restrain from opportunistic behaviour in this bilateral relationship. In order to comprehend the degree of control that the European Union exercises on the cooperation on innovation, this research will observe official documents. These include embargos, agreements, treaties, contracts and screening mechanisms.

Finally, these indicators determine the extent to which the European perception towards China influences the mutual open innovation between these parties. This is measured by looking at the extent to which these parties cooperate on innovation.

Attention will be devoted to formal and informal ties between these two parties. On the basis of the previously researched indicators, it will be analysed to what extent efficient cooperation is limited.

4: The European perception towards China

This chapter aims to apply the initial three concepts of the theoretical framework about perception on China. As can be observed in the conceptual model, 'perception' consists of three elements. Namely, seeing China as the 'other', 'imagining', and the external influence from third parties. Together, these factors determine a significant aspect of the degree of trust in this bilateral relationship and therefore the likelihood of a strategic alliance to succeed (Das and Teng 1998 491-512). This chapter will observe each of these three concepts, and apply them to the Sino-EU relationship in the context of scientific cooperation.

Othering

As described in the theoretical framework, 'othering' entails the way in which Europe perceives itself, and consequently reflects this self-identity on China (Pan 2012, 45). This directly results in policy towards China, whereby European values are expected to be upheld by the other party in this bilateral relation (Wong 2012, 110-112). Therefore, this paragraph will analyse the European self-identity as well as the way in which this is mirrored onto China.

The European self-identity

Prior to analysing the self-identity that is potentially echoed onto China, it is essential that the principles that construct this identity are solidly identified. These core values that determine the European perception on itself are to be found in official documents and press releases from the EU. The three most prominent beliefs that are relevant in relation to China are human rights, multilateralism, and free world trade including reciprocity (Official Journal of the European Communities 2000b, 1-22; Wong 2012, 106-111; European Union 2019, n.p.). This research acknowledges that there are more components of the EU's self-identity than these three. Despite this, these beliefs are considered the most prominent in the international relations of the EU. In addition, an extensive constructivist analysis on the European Union's self-perception would be beyond the scope of this research.

A cornerstone of the European self-identity is the support and advocacy of human rights (Official Journal of the European Communities 2000b, 1-12). In the

context of technological development and innovation, this includes ethical codes of conduct when performing research wherein humans are the objects of study (Official Journal of the European Union 2013, article 19). This includes matters as the "protection of personal data" and "physical and mental integrity of a person" (Official Journal of the European Union 2013, article 19). In addition, this document highlights that research on modifying human genes or cloning is not supported by the Horizon 2020 programme of the EU (Official Journal of the European Union 2013, article 19).

Another key value is multilateralism and the adherence of nation states to a 'rules-based international order' (European Commission 2019a, 2; European Union 2019, n.p.). This is expressed in policy documents of the EU, as well as during a press conference in Paris given by Macron, Merkel, Juncker and Xi Jinping at the end of March 2019 (France24 English 2019, 5:10-13:50).

Finally, an important element in the European self-identity is the promotion of global free trade and a competitive level playing field (European Union 2019, n.p.; France24 English 2019, 5:10-13:50).

Reflecting values on China

The EU's self-image constructs the Chinese 'other' by mirroring the main values of the European Union onto China (Pan 2012, 45). In this paragraph, the three previously identified beliefs will be applied to this bilateral relationship.

One way in which the European Union is 'othering' China as described by Pan is through reflecting the human rights value on China, which is a political factor that is continuously addressed in this bilateral relationship (Wong 2012, 106-111). For instance, the European Union states: "the human rights situation in China is deteriorating, notably in Xinjiang and regarding civil and political rights" (European Commission 2019a, 2). Consequently, the EU regards human rights as "an important measure of the quality of the bilateral relationship" (European Commission 2019a, 2). Specifically in the context of scientific and technological cooperation, the EU states that research ethics in scientific development as stated in the previous paragraph is of importance in this relationship, as can be found in the Horizon 2020 programme (Official Journal of the European Union 2013, 104-173; Chaban and Holland 2019, 5).

The second major component that is expected to be upheld by China is the rules-based international order and multilateralism, which are two terms frequently used by Macron, Merkel and Juncker in the press conference after the state visit of Xi Jinping in France (France24 English, 8:50-33:30). These leaders expressed the significance that China cooperatively participates in these sorts of multilateral dialogues (France24 English 8:50-33:30). The European Commission recognises in its strategic outlook towards China that the country "expressed its commitment to a fair and equitable global governance model" (European Commission 2019a, 2). However, the Commission argues that China's understanding of a rules-based international order is different from that of the EU (European Commission 2019a, 2). Moreover, the strategic report states: "Selectively upholding some norms at the expense of others weakens the sustainability of the rules-based international order" (European Commission 2019a, 2).

Finally, the level playing field of global free trade is frequently argued to be lacking on the Chinese side, because European companies in China allegedly do not enjoy the same rights as Chinese companies in Europe (France24 English 26:10-28:13). This issue of reciprocity and balancing the Sino-EU economic relationship is of significance in the policy reports and strategic outlook on China of the EU (European Commission 2019a, 2).

Such promotions of European values towards China are according to Pan a "mission impossible"; moreover, this author argues, "From the outset, this policy is based on a false premise that the Chinese Other ought to and can be transformed into the European Self" (Pan 2012, 45).

Constructivist analysis of the Chinese 'other'

The three factors above illustrate how the Chinese 'other' is supposedly aimed to be transformed into the European 'self', as proposed by the perception literature of Pan (2012, 45). However, it should be noted that it is difficult to prescribe this as a constructivist discourse towards China because these values are also for a large extent politically and economically motivated. Therefore, in addition to the applied framework of Pan above, it would be useful to analyse the discursive language utilised by Europe when describing China. Together with projecting the European

self onto China, the discourse around this potential partner is also an important element of the 'othering' concept in the theoretical framework.

In a telephone interview, the EU Delegation in Beijing who daily works on science and technology cooperation, argued that Europe should have a better understanding on Chinese culture, and know how to deal with Chinese entrepreneurs and researchers (Minister Counsellor, 19 April 2019). These claims do not entail that the EU is 'othering' China; rather, it is an expression of the notion that there are cultural differences of which Europe ought to be aware of.

It is notable that the language of the EU portraying China is shifting, for example in light of Chinese investment. This was something that was usually welcomed in Europe but is currently increasingly regarded with scepticism (European Commission 2019a, 2-5; European Commission 2016, 3-7). An example is the Dutch Prime Minister who informed journalists in Brussels that the EU should "not be naïve" regarding China (Brzozowski and Valero 2019, n.p.). Correspondingly, the utilisation of the word 'rival' is remarkable in European policy statements. An illustration of this is the recent strategic outlook wherein China is depicted as a "systemic rival" who is an "economic competitor in the pursuit of technological leadership", as examined in Chapter 1 (European Commission 2019a, 2). Furthermore, the French President Macron argued in a recent press conference with Xi Jinping that the EU and China "have differences of view, exercising power. We are also rivals and we are not naïve" (France24 English, 8:30-8:50). European Commission president Juncker similarly expressed this altering European attitude by commenting in this press conference: "I have learned that some Chinese people don't like us to say that we see China as a rival but it's a compliment, because it describes our common interests and necessary and innovative competition. It describes the spirit of our relations" (France24 English, 33:00-34:00). One could argue that these sorts of comments are discursively creating a Chinese 'other'. For example, it is very difficult to find similar language being used towards Europe's bilateral relation with the United States is a 'rival'. Despite this, it is hard to argue that the U.S. does not have "common interests" and "competition" as expressed by Juncker with the EU in many fields.

On the basis of this analysis, it is clear that Europe indeed mirrors its own values onto China as argued by Pan (2012, 42-54). In addition, an interview with a European diplomat pointed out that this bilateral relationship would profit from a

better understanding of Chinese culture by European policymakers. Furthermore, it is notable that the European discourse is increasingly depicting Chinese other as a 'rival'.

Imagining

The image theory of Chaban and Holland is understood as the "perceived intentions, capabilities and cultural and political status" of an international actor, in this case China (2019, 9). In addition, this theory prescribes that "The same international actor could be seen as capable and friendly in one issue-area, yet perceived very differently in another" (Chaban and Holland 2019, 9). This is applicable to the recent press conference in Paris where the European leaders express friendliness regarding the One Belt One Road project while being sceptical on economic reciprocity (France24 English 25:00-33:00). Regarding this imagining theory, it is essential to distinguish between *perceived* intentions of China, and *real* or proven ambitions which are therefore not a perception but reality. The intention of this paragraph is to apply the theory of Europe's perception on technological cooperation with China.

Research integrity

As mentioned above, a significant component of the technological cooperation between these parties is human rights and ethics when conducting scientific research (Official Journal of the European Union 2013, article 19). An example when such matters came into the foresight was the gene-edited twins last November (Wee and Chen 2018, n.p.). This is indeed evidence of an occurrence that conflicts with European values; however, it was against Chinese law as well (Xiao and Li 2019, n.p.). Nevertheless, Chinese legislation could be improved concerning research ethics, which provides opportunities for further cooperation between China and the EU (European Commission 2019a, 5-8; European Commission 2016, 2-9).

Imagined Huawei threat

Another example of 'imagining' is the alleged threat posed by the technological company Huawei in Europe. The prejudice towards this business mainly includes espionage, close links with the Chinese government and the People's Liberation Army (The Economist 2012, n.p.). On the basis of these grounds, a large number of

European countries have investigated Huawei or even warned their citizens against the use of its products (Cillufo and Cardash 2018, n.p.). These persecutions are denied by the company, which claims not to have links with the Chinese army and "never researched, developed, manufactured or sold any technology or product for military applications" (Arnold and Kirchgaesser 2011, n.p.). In addition, there is a lack of public proof for the before-mentioned accusations, as it is hard to find evidence establishing the links between Huawei and the Chinese government (Cillufo and Cardash 2018, n.p.). Therefore, this is an example of an *imagined* intention of a Chinese actor, with the absence of evidence.

Therefore, imagining does shape the perception of Europe towards China. This does not mean that it is solely a negative perception or prejudice. Namely, as can be seen in the case of research integrity, this provides a good opportunity for bilateral scientific cooperation.

External influence

In the case of Huawei above, it is remarkable that the U.S. heavily lobbied European policymakers to shape the perception on this Chinese company, which is not an isolated case of foreign influence on Europe's view on China (Yun Chee and Emmott 2019, n.p.). It would be beyond the scope of this research to observe all external influences on this relation. Hence, the intention of this paragraph is to provide understanding of the influence of the United States in the Sino-EU bilateral relation. The focus is on the U.S. because this is a significant determinant for the European perception towards China (Farnell and Crookes 2016, 192-203).

According to Farnell and Crookes, the influence of the United States is inevitably connected to the perception of the EU towards China, as it is an important partner of both (2012, 199). Angela Merkel also emphasised this triangular relationship as essential for the cooperation between Europe and China (France24 English, 30:15-33:00). Furthermore, Farnell and Crookes argue that the involvement of the United States provokes a dilemma for Member states of the EU to choose sides between China and America (2012, 203-204). Although in some security-related issues such choices are required to be made, there can be a positive perception towards both the U.S. and China.

In addition, according to Stumbaum, the United States is the "elephant in the room" in the bilateral relationship between the EU and China (2009, 19). The reason for this is that America is anxious about the Sino-EU cooperation on technological development (Stumbaum 2009, 19). This suspicion reached a highpoint in 2004 when Europe under the French President Chirac and German Chancellor Schröder wanted to lift the arms embargo to China (Wong 2012, 103). In this period of greater mutual rapprochement, the Chinese ministry of foreign affairs wrote: "The EU should lift its ban on arms sales to China at an early date so as to remove barriers to greater bilateral cooperation on defence industry and technologies" (Chinese Ministry of Foreign Affairs 2003, n.p.). In light of this statement and the rapid improvements of Sino-EU relations, the European Commission undertook significant effort to lift the embargo (Griffin and Pantucci 2004, 164-165). Because the U.S. feared that one day it would face European weaponry in a military conflict with China, the American response was boisterous (Griffin and Pantucci 2007, 165). This is expressed in the U.S. House of Representatives resolution 57, which states that if this European conciliation continues, Washington would "necessitate limitations and constraints in the [transatlantic security and defence cooperation] that would be unwelcome to both sides of the Atlantic" (House of Representatives 2005, H.Res57). Griffin and Pantucci describe the European response to the U.S. as "This perceived combination of American paranoia and hypocrisy confused many Europeans", not solely because the EU saw the chance of a Sino-US war over Taiwan highly unlikely, but also due to the previous American dual-use and arms sales to China (2007, 166). Nevertheless, the EU maintained the arms embargo facing this diplomatic crisis (Griffin and Pantucci 2007, 160-167).

This triangular political problem is an illustration that the U.S. does not solely shape the perception of Europe towards China as argued by Farnell and Crookes, and Yun Chee and Emmott, but also directly influences EU policy (2016, 192-203; 2019, n.p.). However, this does not entail that Europe always gives in to the American demands, as seen in the case of Huawei. In addition, this paragraph has demonstrated that the elements of 'othering', 'imagining' and 'external influence' do not operate in isolation; rather, they shape and influence each other. An example of this is the American lobbying that arguably attempts to perform 'othering' China as the common enemy.

5: Trust and control in the innovative partnership

The previous chapter analysed the European perception towards China, which determines the degree of trust and control that is required for a successful open innovation partnership. According to Das and Teng, these two concepts are each other's substitutes (1998, 491-512). Namely, these authors argue that when there is a high degree of trust, there is no need for establishing tight control mechanisms (Das and Teng 1998, 495). Likewise, when two parties intend to have a strategic alliance and the trust level is low, control systems become significant as a replacement of trust (Das and Teng 1998, 495-496). The previous chapter demonstrated that in some areas, Europe perceives China as a 'rival', which together with imagined threats and influence of the U.S. leads to China-sceptic attitudes. This has a direct influence on the degree of trust because this 'rival' could potentially pursue its own interests, which is described as 'opportunistic behaviour' (Das and Teng 1998, 498-506). The intention of this chapter is to analyse the repercussion that the previously analysed perception has on trust and control.

In the context of scientific and technological development, this chapter will firstly observe the European degree of trust towards China. Thereafter, control systems will be observed to fill up the potential vacancy in the required trust level.

Trust

Das and Teng define trust as "one's belief and expectation about the likelihood of having a desirable action performed by the trustee" (Das and Teng 1998, 494). An important aspect of this is the notion of risk, because the trusting party leaves itself vulnerable to actions of the trustee, specifically in a "risky exchange situation" (Das and Teng 1998, 494). As seen in the previous chapter in the cases of dual-use technologies and Huawei, science and high technology particularly provoke anxiety among European politicians due to the *perceived* risk of handing over sensitive information to China. The three concepts observed in the previous chapter directly influence the degree of trust. To illustrate, when China is perceived as a threat or rival in some areas due to a negative discourse or external influence, this decreases trust and increases the likelihood of control mechanisms to be implemented. For example, when the European Union due to 'othering' and 'imagining' and 'external influence' feels threatened due to the Chinese aspiration to be a technological leader,

it is almost inevitable that Huawei's advance in 5G is perceived with distrust. Similarly, when the recent strategic outlook on China depicts the country as a 'strategic rival', it is no surprise that in a press conference during a state visit to France the leaders frequently address the lack of trust (France24 English 2019, 15:00-31:00).

Perceived risk

The degree of perceived risk and therefore the extent to which Europe is daring to leave itself vulnerable could be partially analysed by looking at the EU's attitude towards data gained by Huawei's activities. A European Parliament report acknowledges the risks associated with this Chinese telecom giant, and its 5G ambitions specifically (European Parliament 2019, 1-2). This report states that due to the Chinese regulation to which Huawei is obligated to adhere to, "it is not just about trusting Huawei or ZTE but about trusting China's one-party regime. In this regard the unique nature of the Chinese authoritarian political system, which lacks the rule of law and democratic oversight" (European Parliament 2019, 2). This way of describing the Chinese government is telling enough about the European degree of trust in this matter. However, if one is not yet convinced that this is low, some European actions will, such as the Dutch, Norwegian and Czech governments warning their population about the risks associated with Huawei (European Parliament 2019, 2). Therefore, this report illustrates that to a large extent the degree of trust is low due to a *perceived* risk as a consequence of a different political system.

This distrust is addressed in the Paris press conference on 26 March, where Macron proposed the development of "strategic trust" in the Sino-EU cooperative partnership (France24 English 3:37-3:50). Similarly, Merkel added: "there needs to be confidence and trust in order to have a win-win situation" (France24 English 30:15-30:50). These statements clearly imply there is currently a lack of trust, which is a source of frustration on the Chinese side. Namely, at times of European division on the attitude and policy towards China, Xi Jinping repeatedly enquired the EU to cease regarding his country with suspicion, as he argues "there needs to be a decrease in distrust" (Viscusi, Donahue and Fouquet 2019, n.p.; France24 15:49-23:00).

The 'trust gap'

In addition to these primary sources that exemplify the present distrust, the research of Scott further analyses this phenomenon (2014, 21-34). According to this author, the different political structure and values of China, paired with its economic rise provokes a negative perception (Scott 2014, 23-32). This has implications for trust in China, which directly influences the profitability of a political strategic alliance (Scott 2014, 23-32). As expressed by a former European ambassador to China, there is a 'trust gap', which is a "gaping hole" underneath the "sugar coated" diplomatic talks (Ebermann, quoted. in Wang 2012, n.p.). An example where trust is missing and is leaving a gap is arguably the intellectual property rights issue. In the absence of solid control mechanisms, European companies could leave their knowledge vulnerable to theft. Although China is making progress on this issue, protection and enforcement of intellectual property rights are issues on which much work ought to be performed (European Commission 2019a, 5-8; European Commission 2016, 2-9; Minister Counsellor, 19 April 2019).

As seen in the cases presented above, the European perception towards China and its government system does influence trust. The interviewed European diplomat similarly argued that there is in addition a lack of cultural understanding. According to this interviewee, "you cannot trust anybody if you do not know them" (Minister Counsellor, 19 April 2019).

Control

As presented above, there are certain areas in the Sino-EU cooperation on innovation where there is a lack of trust. Despite this, China and the EU could collaborate on these issues by replacing trust with solid binding agreements (Das and Teng 1998, 496-502). The intention of this paragraph is to apply the concept of control on mechanisms related to science and innovation that are in place or desired to be implemented in the future. In order to observe the established rules to foster cooperation, this paragraph will firstly observe the control mechanisms aimed to fill in the 'trust gap' on reciprocity. Thereafter, the more general framework on scientific cooperation will be analysed, which includes the lack of trust in intellectual property enforcement.

Reciprocity

A significant topic in the bilateral relations between China and the European Union is reciprocity. According to the European Union, the investment relations between China and the EU are not reciprocal due to uneven market access (European Commission 2019a, 5-8; European Commission 2016, 2-9). This professional argued that a level playing field is essential for future blossoming collaboration (European Commission 2019a, 5-8; European Commission 2016, 2-9). One could argue that this issue is economic in nature, and does neither involve perceptions nor trust that should be compensated for through control. However, Hanemann and Huotari state "The European debate about reciprocity is often guided by emotions and preconceived notions of an unfair China. There has not been much systemic effort to collect empirical evidence of reciprocity gaps" (2018, 10). An explanation for the lack of proof is the complexity of the investment schemes that hide the involvement of the Chinese government in investments in Europe (Wübbeke at al. 2016, 50-56). Because of this (perceived) risk and the lack of trust, screening mechanisms are established that aim to control investments (Hanemann and Huotari 2018, 1-21). This policy is not isolated to Chinese investments but applies to incoming foreign direct investments from all countries (Minister Counsellor, 19 April 2019). Nevertheless, it is primarily motivated because of the Chinese acquisitions and anxiety on its state guidance, and the control system "affects Chinese investors in particular" (Hanemann and Huotari 2018, 18). In addition to this balancing of market access and fair investments in strategic sectors, the European Commission outlines that both sides "confirmed their commitment to improving framework conditions, notably reciprocal access to Science and Technology and Innovation resources" (European Commission 2018a, 5). This further development of framework conditions would be an effective way to fill in the 'trust gap' existing in the context of science and technology. Similar to the screening policy, such a framework could function as a control mechanism to compensate for the lack of trust in these areas.

Control framework

If a party does not expect a partner to behave as desired, control mechanisms are implemented in order to deter opportunistic behaviour (Das and Teng 1998, 496-502). The legal base of the EU that outlines both the internal and external rules on

conducting scientific research is the Horizon 2020 "Framework Programme for Research and Innovation" (Official Journal of the European Union 2013, 104-173). As mentioned before, this document for example outlines the human rights obligations when performing research funded by Horizon 2020 (Official Journal of the European Union 2013, article 19). Although this document is drafted for the internal European Union Horizon 2020 programme, the EU expects partners who cooperate with this innovation plan to follow the prescribed codes of conduct; in this case, this includes China and its accountability to human rights (Official Journal of the European Union 2013, 104-173).

A very significant component of this Horizon 2020 document, specifically in regard to the European bilateral relationship with China, is the policy framework that controls the behaviour on intellectual property rights (Official Journal of the European Union 2013, article 27). This article expresses the expectation that potential research and innovation partners have "a fair and equitable dealing with intellectual property rights" (Official Journal of the European Union 2013, article 27). According to the interviewed European Union professional who works on scientific cooperation with China, this legal framework on intellectual property is present; however, there is room for improvement on the enforcement of this control mechanism (Minister Counsellor, 19 April 2019). According to the EU roadmap for scientific and technological cooperation with China, intellectual property enforcement is one of the "framework conditions" for bilateral collaboration that could be improved (European Commission 2018a, 18).

The previously mentioned Horizon 2020 legal document and the European Commission roadmap on scientific and technological cooperation with China are two important mechanisms. Although there are numerous joint declarations that express the willingness to further cooperate, these lack solid legal control agreements (Joint Declaration 2012, 1-2; Official Journal of the European Communities 2000a, 40-45). Therefore, the interviewees both argued that it would be beneficial Sino-EU cooperation on science and technology if there is enforcement of the abovementioned intellectual property rights (Minister Counsellor, 19 April 2019).

6: Sino-EU Bilateral Open Innovation

In order to answer the research question, it is important to be cognisant of the current open innovation relationship between China and the European Union. The term open innovation is invented by Henry Chesbrough, and entails that entities gain more insights if they do not produce knowledge in an isolated matter (2006, 1). That is, a firm performs more efficient research and development if this is done in conscious or 'accidental' exchanges of knowledge spillovers with other businesses (2006, 1-4). This research looks beyond the business context, and argues that open innovation is relevant for the Chinese desire to gain knowledge. As mentioned in the theoretical framework, this can be done through formal or informal ties. Formal ties are planned, part of a strategy and often contractually agreed on; in contrast, informal ties are unintended shared knowledge spillovers, for example through the mobility of human capital (Simard and West 2006, 220-226). This chapter will observe the current open innovation between China and Europe in light of the findings presented in the previous chapter. First, formal ties will be analysed by looking at official joint research and development initiatives. Thereafter, the informal ties will be examined. Both of these ways of open innovation will be related to the notions of trust and control in order to understand the indirect influence of perception on cooperation.

Formal ties

The Chinese share of European internationally co-authored publications is very marginal, which is also the case the other way around (García-Herrero et al. 2017, 38). In order to improve the partnership on science and technology, the EU and China repeatedly express the desire to improve scientific cooperation (European Commission 2019a, 11; Official Journal of the European Communities 2000a, 40-45). These official ambitions and agreements are examined in this paragraph.

Agreements under the Horizon 2020 framework

Among the Sino-EU common initiatives, both parties prioritise certain sectors that are described as "flagship initiatives" (European Commission 2017, n.p.). These are food and agriculture, sustainable urbanisation, surface transport, aviation and biotechnology for health and the environment (European Commission 2017, n.p.). In these areas, formal agreements are established that aim to foster research and

innovation actions in these areas. Such collaborative projects are funded by the 'Co-Funding Mechanism', which is an initiative of the Chinese government that falls under the framework of the Horizon 2020 programme (European Commission 2018b, 1-2). Because the Chinese researchers ought to participate in the Horizon 2020 programme, this case is exemplary of how such a mechanism could lead to research and innovation cooperation. The Minister Counsellor in Beijing described the "cycle" in which such formal ties are created (19 April 2019). First, there is agreement on the political level on the flagship initiatives described above. Thereafter, steering committees will be formed in order to formulate the precise areas of cooperation. Consequently, experts from both sides will be assembled and discuss on these topics to produce recommendations, while holding into account the stakeholders and interests of the EU. This cycle and the commonly identified priorities are exemplary of formal research and innovation collaboration, because it is inherently part of the Horizon 2020 strategy and formally agreed upon with China.

Joint-innovation centres

Other important formal ties between China and the EU are joint research and development centres, which are often commonly funded by governments, companies and universities (ZhongDe Metal Group 2016, 1-10; Bouter and Tuentler 2019, 13). After the EU Member State concerned or the Chinese government identify a strategic sector, funding is gathered in order for companies or universities to geographically centralise and exchange knowledge. An example of this is the "Sino-German Metal Eco City", which is an enormous project that literally consists of the construction of a science city (ZhongDe Metal Group, 1-25). Arguably, this case serves as the embodiment of Sino-EU Member State formal innovation ties carried out in Disneyland-like architecture. Another innovation centre is the Wageningen University that is selected by the Chinese government to be a partner of the new Agriculture Innovation Centre (Bouter and Tuenter 2019, 13). Although these projects are contractually agreed upon and therefore are instances of formal open innovation ties, it is expected that the geographic closeness of the research centres within these artificial towns accelerate informal ties through knowledge spillovers.

Trust and control in relation to formal ties

In answering the research question, it is important to know how the intermediary variables trust and control affect open innovation. This part will analyse this relationship for formal ties; informal ties will be analysed below.

The formal ties presented above do for a large extent automatically hold the existing control mechanism into account. To specify, as mentioned above, all flagship initiatives inevitably comply with the Horizon 2020 regulations. The large amount of aerospace-related publications for the Sino-EU project illustrates the successfulness of open innovation under this programme (Eco Compass 2019, n.p.). Nevertheless, there remains a lack of trust in some areas due to the negative perception to China as observed in Chapter 4. For example, Bouter and Tuenter report on the extensive cooperation on agriculture between Wageningen University and China (2019, 13-14). This university did not find any risks after screening their partner, as stated by Rector Mol on cooperating with China: "you must not be naïve, I do not find the discussion nonsense. But for us it is way less relevant than for ICT or outer space" (quoted. in Bouter and Tuenter 2019, 14). Therefore, in some sectors formal open innovation ties are flourishing. However, one could argue that there needs to be more trust or control in areas where Europe has a more negative perception on China, which could discourage the establishment of formal ties in those industries.

Informal ties

Another way of open innovation is the 'accidental' exchange of knowledge spillovers. In contrast to formal ties, they are not bound by certain contracts, which make control mechanisms as the Horizon 2020 programme less relevant. Therefore, one could argue that trust is more important in informal open innovation ties.

Informal open innovation ties between China and the EU

Informal ties are unplanned and occur when research and development are performed in a network or relatively open system (Simard and West 2006, 220-224). Many forms of informal ties occur accidentally or when one is not aware of it, which leads to little documentation of this spontaneous form of open innovation. Nonetheless, with the assistance of the theory of Simard and West and the available reports on this

issue, this paragraph identifies four informal relationships between China and the EU (2006, 220-239).

First, many informal investment links derive from Chinese investments in Europe. Although this FDI flow is currently declining, in 2017 China possessed 2000 firms in the EU (Hanemann, Huotari and Kratz 2019, 9-10; Plewa and Stermšek 2017, 59). These investments themselves are forms of formal innovation ties; however, Simard and West state that unintended research and development connections frequently derive from links that are initially formal in nature (2006, 224). From the ownership of Chinese companies in Europe derive two forms of indirect informal open innovation ties. Namely, these investments create long-term business relationships with other companies in Europe (Plewa and Stermšek 2017, 59). In addition, Chinese ownership of European companies creates migration of skilled workers. According to Simard and West, such labour force mobility cause unintended exchanges of knowledge (2006, 220-224).

Second, informal innovation occurs when the vast amount of Chinese students in Europe return their acquired skills back to their home country (Bouter and Tuenter 2019, 14). These unintended knowledge ties increase rapidly, as the amount of these students increased tenfold between 1999 and 2017 (Plewa and Stermšek 2017, 61).

Third, the labour migration from China to the EU is an essential part of the unofficial exchange of knowledge (Simard and West 2006, 220-224; (Plewa and Stermšek 2017, 49-60). As argued by Plewa and Stermšek, skilled Chinese migrants are interested in Europe because of its "dynamic and innovative economies" that "offer significant prospects for workers to develop their skills through access to some of the world's leading technologies" (2017, 49). Particularly Chinese researchers enjoy the opportunities in Europe (Plewa and Stermšek 2017, 60). Consequently, these researchers create new networks and build international knowledge links (Plewa and Stermšek 2017, 60). This is inherently the formation of new informal open innovation ties.

Finally, another unintended form of open innovation is reverse engineering and imitating products. According to Zhang and Zhou, this way of gaining knowledge is a form of open innovation that is particularly present in countries that wish to technologically catch up (2016, 2012). These authors argue that China is the largest emerging economy, which among others utilises imitation and reverse engineering for technological advancement (Zhang and Zhou 2016, 212-222).

Trust and control in relation to informal ties

As mentioned above, these rather spontaneous forms of open innovation are not bound by contracts or official strategies. Therefore, there are fewer control mechanisms involved in these informal ties. As examined in the four links above, neither of these must comply with control in order to compensate for trust. Therefore, the presence of trust is significant for informal open innovation to occur. In certain areas, distrust prevails, and there is no enforcement of control mechanisms to fill up this 'trust gap'. Specifically, the reverse engineering causes concern about intellectual property among Western observers and businesses (Zhang and Zhou 2016, 212-222). In the absence of trust, and enforcement on IP rules, businesses will be hesitant on cooperating with China, which in turn limits profitable open innovation. This case can be illustrated by a businessman who produces agricultural machines (Van Bokkum 2019, 6). This person was hesitant to export a lot to China, as that would make him too dependent on the country (Van Bokkum 2016, 7). He argues that the risk of being copied is too high, and if there are imitated versions of his product, including the brand name, "you should not be surprised" (Veenhuis, quoted. in Van Bokkum 2016, 7). This example illustrates that the European perception on China, which in turn influences trust and control, could limit avenues for profitable open innovation.

In addition, the findings of this paragraph reveal the implications that derive from the formal and informal open innovation dichotomy. Namely, informal ties lack control mechanisms, which makes trust more important. In case there would be a formal control mechanism implemented, the informal tie becomes inevitably formal because it becomes planned and bound to contracts. Therefore, formal ties require diplomatic and political effort but are able to compensate for distrust through rules and agreements. In practice this leads, for example, the agricultural businessman mentioned above to be hesitant to operate in China, because there is no Horizon2020 plan to deal with his concerns, as it is an informal tie.

Conclusion

In order to obtain more understanding of the Sino-EU cooperation on research and development, this research answers the question: *To what extent does the EU's perception of China impede the Sino-EU cooperation on innovation?* This question contributes to the discussion on the cooperation between the EU and China, which is lively present among scholars and policymakers. In the academic field, this research contributed by analysing concepts from business studies as 'open innovation', 'trust' and 'control' in macro-international affairs. The national security issues that come into play are examined by observing cases of Huawei and dual-use technologies. Next to that, this research examines the bilateral relationship from a constructivist point of view by utilising the notion of perception. Therefore, this research contributes to the academic understanding of the Sino-EU joint research and innovation by adding this discursive element.

It is important when performing such an analysis, that the comprehensive concept of perception is solidly identified so that it is methodologically manageable. Furthermore, this also applies to the relationship between perception and bilateral cooperation. This research made this viable by utilising two intermediate variables between the independent variable of perception and the dependent variable 'open innovation'. These two are trust and control, which are influenced by perception. This European view on China is made workable by splitting it into the categories 'othering', 'imagining' and external influence.

Regarding this concept of perception, it is found that Europe projects its own values on China, which due to a different political system is frequently depicted as a rival by the EU. This rivalry with the Chinese 'other' leads to imagining, whereby it is expected that this country incorporates European values like human rights when conducting research. Moreover, regarding the other party as a 'systemic rival' arguably leads to allegations towards companies in the absence of public evidence, which is seen in the case of Huawei. This is exacerbated by the United States, which influences the European perception on China through lobbying and diplomatic pressure, which in the past directly affected EU policy. Due to this perception, there is a high 'perceived risk' of cooperating with China. In order to compensate for this distrust, there are control mechanisms implemented. However, these frameworks and agreements are inadequately enforced in sensitive issues like intellectual property.

Therefore, perception in some areas leads to distrust, which is not always compensated for through bilateral controlling agreements. Thus, formal open innovation is less present in more precarious sectors, such as dual-use technologies. Regarding informal ties, this is something that is flourishing between the EU and China. Despite that there are for example increasingly more Chinese students in Europe and labour mobility allows for knowledge to be exchanged, better enforcement of control systems or an increase in trust would further improve this open innovation. Hence, EU policymakers arguably should further prioritise the development of control frameworks with China through formal agreements. However, this is already high on the agenda and therefore does not change due to this research. Instead, this study contributes to the European self-awareness of preconceived negative notions that do limit efficient open innovation. Although the EU is open to China and expresses the desire to cooperate, there *is* distrust in some areas, which is arguably a consequence of prejudice.

The limitation of this research is that the scope did not allow for close investigation on which specific areas encompass negative notions and distrust. Although this is the argument for overall open innovation, one could rightly argue that this does not exist because of the wide variety of sectors. This study contributed by addressing this issue and providing a useful conceptual model on which further research could build. Namely, this theoretical framework could be applied to sector-specific open innovation studies.

When the academic field succeeds in addressing the specific sectors, this becomes more workable for policymakers in order to improve this bilateral open innovation. This does not only serve the Chinese desire to sophisticate its economy, but also the European interest. Namely, this could lead to other ways of gaining knowledge than acquisitions, which are increasingly unwelcome on the continent. Therefore, blossoming open innovation is a fruitful alternative strategic alliance and a chance that Europe reconsiders its perception on China as a ‘systemic rival’ in the future.

Bibliography

Alonso, Stéphane and Hanneke Chin-A-Fo. 27 April 2019. "Het groeiende ongemak over economische macht China [The Growing Discomfort on China's Economic Power]." *Newspaper: NRC.*

Arnold, Martin and Stephanie Kirchgeasser. 2011. "US Sais to Have Pressed Huawei Suppliers." *Financial Times*. Retreived 20 April 2019 from: https://www.ft.com/content/932795e2-386c-11e0-959c-00144feabdc0

Bound, Kirsten, Tom Saunders, James Wilsdon and Jonathan Adams. 2013. *China's Absorptive State*. London: Nesta.

Bouter, Sara and Geertje Tuentler. 27 Aptil 2018. "Hongerig naar voedseltech [Hungry for Foodtech]." *Newspaper: NRC*.

Bräuner, Oliver. 2013. "Beyond the Arms Embargo: EU Transfers of Defense and Dual-Use Technologies to China." *Journal of East Asian Studies* 13: 457-482.

Brzozowski, Alexandra and Jorge Valero. 2019. "'Don't be Naïve with China', EU Leaders Tell Italy." *Euractiv*. Retreived 11 April 2019 from: https://www.euractiv.com/section/economy-jobs/news/dont-be-naive-with-china-eu-leaders-tell-italy/

Bundesministerium für Wirtschaft und Energie. 2017. *Proposals for ensuring an improved level playing field in trade and investment*. Letter from Berlin, Paris and Rome to the European Commission.

Chaban, Natalia and Martin Holland. 2019. "Introduction: Partners and Perceptions." In *Shaping the EU Global Strategy*. London: Palgrave McMillan.

Chesbrough, Henry. 2006. "Open Innovation: A New Paradigm for Understanding Industrial Innovation." In *Open Innovation: Researching a New Paradigm,* edited by Joel West, Wim Vanhaverbeke and Henry William Chesbrough. 1-12. Oxford: Oxford University Press.

Chinese Ministry of Foreign Affairs. 2003. *China's EU Policy Paper.*

Cillufo, Frank J., and Sharon L. Cardash. 2018. "What's wrong with Huawei, and why are countries banning the Chinese telecommunications firm?" *The Conversation.* Retreived 20 April 2019 from: http://theconversation.com/whats-wrong-with-huawei-and-why-are-countries-banning-the-chinese-telecommunications-firm-109036

Dagué-Nevers. 2017. “China and Soft Power: Building Relations and Cooperation.” *Contemporary Chinese Political Economy and Strategic Relations: An International Journal* 3.1: 71-101.

Das, T.K. and Bing-Sheng Teng. 1998. “Between Trust and Control: Developing Confidence in Partner Cooperation in Alliances.” *The Academy of Management Review.* 23.3: 491-512.

Du, Min and Agyenim Boateng. 2015. “State ownership, institutional effects and value creation in cross- border mergers & acquisitions by Chinese firms.” *International Business Review* 24.3: 430- 442

Eco Compass. 2019. “Publications and Presentations.” *Eco Compass.* Retreived 6 May 2019 from: http://www.eco-compass.eu/publications-presentations-15

European Commission. 2016. *Elements for a New EU Strategy on China.* Brussels: European Commission.

European Commission. 2017. “EU-China Summit: New Flagship Initiatives in Research and Innovation.” *Ec.europa.eu*. Retreived 2 May 2019 from: https://ec.europa.eu/research/index.cfm?pg=newsalert&year=2017&na=na-020617

European Commission. 2018a. *Roadmap for EU-China S&T Cooperation.* Brussels: European Commission.

European Commission. 2018b. “Questions and Answers: EU-China Co-Funding Mechanism for Research and Innovation Cooperation.” *Ec.europa.eu.* Retreived 2 May from: https://ec.europa.eu/research/iscp/pdf/most_faq_cfm_en.pdf

European Commission. 2019a. *EU-China – A Strategic Outlook.* Strasbourg: European Commission

European Commission. 2019b. “The Open Innovation Strategy and Policy Group.” *Ec.europa.eu.* Retreived 12 April 2019 from: https://ec.europa.eu/digital-single-market/en/open-innovation-strategy-and-policy-group

European Commission. 2019c. “H2020 Funded Projects.” *Ec.europa.eu*. Retreived 11 April 2019 from: https://ec.europa.eu/info/fundingtenders/opportunities/portal/screen/opportunities/horizon-dashboard

European Parliament. 2019. *5G in the EU and Chinese Telecoms Suppliers.* Brussels: European Parliament.

European Union. 2019. "The EU in Brief". *Europa.eu*. Retreived 28 April from: https://europa.eu/european-union/about-eu/eu-in-brief_en

Eurostat. 2019. "DS-018995, EU Trade Since 1988 by SITC". *Eurostat.*

Farnell, John and Paul Irwin Crookes. 2016. *The Politics of EU-China Economic Relations: An Uneasy Partnership.* London: Palgrave Macmillan.

France24 English. 26 March 2019. "Xi Jinping in France: Watch the full press conference with Xi, Macron, Merkel and Juncker." YouTube Video. France24 English 37:57. Retreived from: https://www.youtube.com/watch?v=Zn1bYpe_kUo

García-Herrero, Alicia, K.C. Kwok, Liu Xiangdong, Tim Summers and Zhang

Griffin, Christopher and Rafaello Pantucci. 2007. "A Treacherous Triangle? China and the Transatlantic Alliance." *SAIS Review of International Affairs* 27.1: 161-170.

Hanemann, Thilo and Mikko Huotari. 2018. "EU-China FDI: Working Towards Reciprocity in Investment Relations." *Merics* 3 update: 1-39.

Hanemann, Thilo, Mikko Huotari and Agatha Kratz. 2019. "Chinese FDI in Europe: 2018 Trends and Impact of New Screening Policies." *Merics:* 1-25.

House of Representatives. 2005. *H.Res.57: Urging the European Union to Maintain its Arms Embargo on the People's Republic of China*.

Joint Declaration. 2012. "Joint Declaration on the European Union-China Innovation Cooperation Dialogue." *15th EU-China Summit*: 1-3.

Kwok, K.C., Lawrence J. Lau and Tim Summers. 2018. "EU-China Innovation Relations: From Zero-Sum to Global Networks." *Catham House* 1-21.

Lee, Sang, Taewon Hwang and Donghyun Choi. 2012. "Open Innovation in the Public Sector of Leading Countries." *Management Decision* 50.1: 147-162.

Leifer, R. and P. K. Mills. 1996. "An information Processing Approach for Deciding upon Control Strategies and Reducing Control Loss in Emerging Organizations." *Journal of Management* 22: 113-137.

Li, Ling. 2017. "China's Manufacturing Locus in 2025: With a Comparison of 'Made-in-China 2025' and 'Industry 4.0'." *Technological Forecasting & Social Change* 1-9.

Minister Counsellor of the EU in Beijing. 19 April 2019. Telephone interview with author.

National Bureau of Statistics of China. 2019. "11-19 Overseas Direct Investment by Country or Region." *China Statistical Yearbook.* Retreived 10 March 2019 from: http://www.stats.gov.cn/tjsj/ndsj/2018/indexeh.htm

OECD. 2008. *Open Innovation in Global Networks.* Paris: OECD Publishing.

Official Journal of the European Communities. 2000a. "Agreement for scientific and technological cooperation between the European Community and the Government of the People's Republic of China." *Official Journal of the European Communities*: 40-45.

Official Journal of the European Communities. 2000b. "Charter of Fundamental Rights of the European Union." *Official Journal of the European Communities:* 1-22.

Official Journal of the European Union. 2013. "Establishing Horizon 2020 – the Framework Programme for Research and Innovation (2014-2020) and Repealing Decision No 1982/2006/EC." *Official Journal of the European Union.* 104-173.

Pan, Chengxin. 2012. "Problematizing 'Constructive Engagement' in EU-China Policy." In *Europe and China: Strategic Partners or Rivals?,* edited by Roland Vogt, 37-58. Hong Kong: Hong Kong University Press.

Plewa, Piotr and Marko Stermšek. 2017. "Labour Migration from China to Europe: Scope and Potential." *International Labour Organization* 1-136.

Policy Officer European Commission. 17 April 2019. Telephone interview with author.

Prevost, Denise, Leïla Choukroune, Rogier Creemers and Jean-Francois Huchet. 2011. *EU-China Trade Relations.* Brussels: European Parliament.

Ruffin, Roy. 2002. "David Ricardo's Discovery of Comparative Advantage." *History of Political Economy* 34.4: 727-748.

Saarela, Anna. 2018. *A new era in EU-China relations: more wide ranging strategic cooperation?* Brussels: European Parliament.

Scheuer, Stephan and Axel Höpner. "Siemens is Automating its Future in China." *Handelsblatt Global* September 15, 2017. Retreived 9 April 2019 from: https://global.handelsblatt.com/companies/siemens-is- automating-its-future-in-china-827291

Scott, David. 2014. "Trust, structures and Track-2 Dialogue in the EU-China relationship: resetting and resettling a 'strategic partnership'?" *Asia Europe Journal* 12: 21-34.

Simard, Caroline and Joel West. 2006. "Knowledge Networks and the Geographic Locus of Innovation." In *Open Innovation: Researching a New Paradigm,* edited by Joel West, Wim Vanhaverbeke and Henry William Chesbrough. 220-240. Oxford: Oxford University Press.

Small, Andrew. 2019. "Why Europe Is Getting Tough on China." *Foreign affairs*. Retreived on 11 April 2019 from: https://www.foreignaffairs.com/articles/china/2019-04-03/why-europe-getting-tough-china

State Council. 2015. "Made in China 2025." *IoT One*. 1-38. Retreived 13 April 2019 from: http://www.cittadellascienza.it/cina/wp-content/uploads/2017/02/IoT-ONE-Made-in-China- 2025.pdf

Stumbaum, May-Britt U. 2009. "Risky Business? The EU, China and Dual-use Technology." *European Union Institute for Security Studies* 80: 1-35

Su, Hsin-Ning. 2016. "Collaborative and Legal Dynamics of International R&D-Evolving Patterns in East Asia." *Technological Forecasting & Social Change* 117: 217-227.

Sun, Zhe. 2015. "Technology Innovation and Entrepreneurial State: the Development of China's High- Speed Rail Industry." *Technology Analysis & Strategic Management* 27.6: 646-659.

Tartar, Andre, Mira Rojanasakul and Jeremy Scott Diamond. 2018. "How China is Buying Its Way Into Europe." *Bloomberg*. Retreived on 1 April 2019 from: https://www.bloomberg.com/graphics/2018-china-business-in-europe/

The Economist. 2012. "Who's Afraid of Huawei?" *The economist*. Retreived 26 April 2019 from: https://www.economist.com/leaders/2012/08/04/whos-afraid-of-huawei

Van Bokkum, Milo. 27 April 2019. "Met Mestmachines van Raalte naar China [With 'van Raalte' Fertilizer Machines to China]." *Newspaper: NRC.*

Viscusi, Gregory, Patrick Donahue and Helene Fouquet. 2019. "As Europe Wrestles With How to Handle China, Xi Suggests: Trust Me." *Bloomberg*. Retreived 28 April 2018 from: https://www.bloomberg.com/news/articles/2019-03-26/xi-says-trust-me-as-europe-wrestles-with-how-to-handle-china

Wang, Zhengxu. 2012. "EU, China Need to Bridge the 'Trust Gap'." *China Daily*. Retreived 26 April from: http://www.chinadaily.com.cn/a/201205/25/WS5a29f9d9a3101a51ddf8e0dc.html

Wee, Sui-Lee and Elsie Chen. 2018. "In China, Gene-Edited Babies Are the Latest in a String of Ethical Dilemmas." *The New York Times.* Retreived 10 May from: https://www.nytimes.com/2018/11/30/world/asia/gene-editing-babies-china.html

Wong, Rueben. 2012. "An Anatomy of European and American Perspectives on China in the International System." In *Europe and China: Strategic Partners or Rivals?,* edited by Roland Vogt, 95-112. Hong Kong: Hong Kong University Press.

Wübbeke, Jost, Mirjam Meissner, Max J. Zenglein, Jaqueline Ives and Björn Conrad. 2016. "Made in China 2025 The making of a high-tech superpower and consequences for industrial countries." *Merics* 2: 1-73.

Xiao, Sisi and Li Xiongying. "广东初步查明'基因编辑婴儿事件' [Guangdong Begin Investigating the 'Gene Edited Baby Event']." *Xinhua News*. Retreived 23 April from: http://www.xinhuanet.com/local/2019-01/21/c_1124020517.htm

Yansheng. 2017. "EU-China Economic Relations to 2025: Building a Commen Future." *Bruegel, Catham House, China Center for International Economic Exchanges joint report*. 1-78.

Yip, George. 2014. "China's Innovative Advantage." *Forbes*. Retreived From: https://www.forbes.com/sites/ceibs/2014/06/20/chinas-innovation-advantage/#274aadd14129 1/5

Yun Chee, Foo and Robin Emmott. 2019. "Exclusive: EU to drop threat of Huawei ban but wants 5G risks monitored – sources." *Reuters.* Retreived April 29 from: https://www.reuters.com/article/us-eu-huawei-tech-exclusive/exclusive-eu-to-

drop-threat-of-huawei-ban-but-wants-5g-risks-monitored-sources-idUSKCN1R32K3

Zhang, Gupeng and Jianghua Zhou. 2016. "The effects of forward and reverse engineering on firm innovation performance in the stages of technology catch-up: An empirical study of China." *Technological Forecasting & Social Change* 104: 212-222.

ZhongDe Metal Group. 2016. "Sino-German Metal Eco City." *ZhongDe Metal Group:* 1-32. Retreived 20 March 2018 from: https://www.ihk-kassel.de/solva_docs/sino_germanmetalecocity_brochure11.pdf

Zhu, Hengyuan and Jim Euchner. 2018. "The Evolution of China's Innovation Capability." *Research-Technology Management* 61.3: 11-15

Appendix

Information on the interviews

The interviewees preferred to remain anonymous. This thesis is revised according to the suggestions of both interviewees.

The first interview

The interview was conducted through phone communication between The Hague and Brussels.

The author conducted the interview with a Policy Officer, who works on scientific and technological cooperation with China.

The interview was conducted on 17 April 2019.

The second interview

The interview was conducted through phone communication between The Hague and Beijing.

The author conducted the interview with a Minister Counsellor who works on scientific and technological cooperation with China.

The interview was conducted on 19 April 2019.