BUILDING TRUST AND INNOVATION: THE EFFECTS OF HARMONIZING TRADE SECRECY LAWS ON THE EU INNOVATION ECONOMY

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Abstract

Trade secrets are used as appropriation methods by all innovative businesses either at early stages of innovation or throughout the whole innovation cycle. The European Union plans to establish an Innovation Union in the future, and they will need efficiently conducted cross-border innovation activities to reach that end. However, the current legal environment is so diverse and inefficient on an international scale that innovative businesses are highly discouraged from entering intra-EU cross-border and, in numerous countries, even domestic innovation-related transactions. This thesis proves that trade secret law harmonisation in the EU would lead to efficient private and social changes in the innovation economy by incentivising businesses to make efficient decisions in their relationships with other parties in innovation related transactions. Three scenarios are chosen for analysis, which are the most important building blocks of international innovation and in which trade secret laws influence efficiency: strategic R&D alliances, know-how licensing, and contracts with knowledge employees. By evaluating the changes in parties' incentives with and without efficient trade secret law harmonisation, this thesis finds that harmonisation would nurture collaboration, trust and optimally designed contracts in all three scenarios. The main message of this work to EU policymakers is that harmonisation is needed urgently, and their focus should be on including clear, pragmatic and flexible substantive definitions, and on ensuring maximum confidentiality during legal proceedings, along with effectively designed minimum civil liability rules.

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Table of Contents

Chapter 1: Introduction	1
Chapter 2: The Economics of Trade Secrets	5
Chapter 3: Comparing Trade Secret Laws and Innovation Economies in the EUUSA	J and the 9
3.1 Comparative Analysis of EU and US Trade Secrecy Laws	9
3.2 Comparison of the Innovation Economies of the EU and the USA	22
Chapter 4: How Trade Secret Laws Affect EU Innovation	27
4.1 Horizontal Transactions	29
4.2 Vertical Transactions	
4.3 Employee Non-Compete Covenants	46
Chapter 5: Discussion and Conclusion	56
5.1 Implications of the Analyses and Recommendations to EU Policymakers	56
5.2 Conclusion	61
Works Cited	64

List of Figures

Figure 1 - Means of protection methods employed by firms in 14 EU countries in 2000
Figure 2 - The difference between receipts and payments for intellectual property, 2005-2012 24
Figure 3 – An extensive form game of contracting for licenses, with ineffective trade secret protection4
Figure 4 - An extensive form game of contracting for licenses, with adequate trade secret protection

List of Tables

Table 1 - A simple 2x2 game model of alliances with no effective trade secret protection	36
Table 2 - A simple 2x2 game model of alliances with one-sided trade secret protection	37
Table 3 - A simple 2x2 game model of alliances with effective trade secret protection	38

List of Abbreviations

CAGR: Compound Annual Growth Rate EEA: Economic Espionage Act IP: Intellectual Property UTSA: Uniform Trade Secrets Act WIPO: World Intellectual Property Organisation WTO: World Trade Organisation

CHAPTER 1: INTRODUCTION

A trade secret is a piece of information with some inherent value that is retained from the information being hidden from others,¹ and it usually refers to some production know-how, blueprint, business strategy, or customer list.² Trade secrets are most often not accepted as property by the law, unlike patents; the legal protection of the right of the owner to such information usually stems from numerous branches of law, including contract, trespass or criminal law.³ About 75% of all innovative firms believe that trade secrets are either important or vital for their businesses;⁴ numerous other empirical studies also claim that secrecy is preferred to patenting at least in cases of process innovations and at the early stages of any invention's product lifecycle.⁵

Therefore, trade secrets are key to the development of the innovation economy. Yet, while the United States introduced a federal law that includes consistent definitions, actions, procedural issues and liabilities in 1996,⁶ the biggest economies of the European Union do not even have a formal definition of what a trade secret is.⁷ This mirrors a larger image: there are significant differences among Member State laws regarding the scope of protection for trade secrets, the protection of secrets in litigation proceedings, and available remedies. What does this mean? The most integrated economy in the world protects the cornerstone of innovative activities through a fragmented network of laws that differ among jurisdictions and branches of law. To innovative firms, this means that while doing business within the European Union with companies or

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¹ Richard A. Posner and William M. Landes, "The Economics of Trade Secrecy Law," in *The Economic Structure of Intellectual Property Law* (Harvard University Press, 2003), 354.

² David D. Friedman, William M. Landes, and Richard A. Posner, "Some Economics of Trade Secret Law," *The Journal of Economic Perspectives* 5, no. 1 (1991): 61.

³ Mark A. Lemley, "Surprising Virtues of Treating Trade Secrets as IP Rights, The," Stan. L. Rev. 61 (2008): 312.

⁴ Study on Trade Secrets and Confidential Information in the Internal Market, Impact Assessment Study (Baker & Mckenzie, April 2013), 135, http://ec.europa.eu/internal_market/iprenforcement/docs/trade-secrets/130711_final-study_en.pdf.

⁵ Katrin Hussinger, "Is Silence Golden? Patent versus Secrecy at the Firm Level" (Governance and the Efficiency of Economic Systems, March 2005), 23.

⁶ The Economic Espionage Act of 1996, 1996.

⁷ Study on Trade Secrets and Confidential Information in the Internal Market, 24–26.

employees from other Member States, they can never be sure which law, to what extent, and under what circumstances will protect their sensitive industrial know-how.

This thesis hypothesises that solving this problem can lead to better results in innovative activities in the EU: the EU's innovation efficiency and its position in the global innovation economy could be improved by harmonising trade secret laws across Member States and by introducing minimum standards across the EU.

Given the importance of the European Union in both political and economic aspects, and the extent of the problem that fragmented laws cause in the innovation economy, it is most surprising that literature on the subject is almost non-existent. The scarcity of previous research on the topic of EU trade secrecy law harmonisation and its economic effects has two dimensions. First, existing research is limited in its geography to the United States: the works of Searle,⁸ Cohen et al.,⁹ and Levin et al¹⁰, among others concern only US economics, with a few exceptions, such as Arundel. ¹¹ Second, most researches are preoccupied with the effects of a mere introduction of legal protection into efficiency-maximising models, including Oxley,¹² Bechtold and Höffler,¹³ and Gilson,¹⁴ who all give great accounts of the impact of intellectual property protection, but who fail to take into account how harmonising laws would help reaching optimal outcomes. This thesis, therefore, gives a unique insight into how harmonisation would directly

⁸ Nicola Searle, "The Criminalization of the Theft of Trade Secrets: An Analysis of the Economic Espionage Act," *IP Theory* 2, no. 2 (2012): 2.

⁹ Wesley M. Cohen, Richard R. Nelson, and John P. Walsh, *Protecting Their Intellectual Assets: Appropriability Conditions and Why US Manufacturing Firms Patent (or Not)* (National Bureau of Economic Research, 2000), http://www.nber.org/papers/w7552.

¹⁰ Richard C. Levin et al., "Appropriating the Returns from Industrial Research and Development," *Brookings Papers* on *Economic Activity*, 1987, 783–831.

¹¹ Anthony Arundel, "The Relative Effectiveness of Patents and Secrecy for Appropriation," *Research Policy* 30, no. 4 (2001): 611–24.

¹² Joanne E. Oxley, "Institutional Environment and the Mechanisms of Governance: The Impact of Intellectual Property Protection on the Structure of Inter-Firm Alliances," *Journal of Economic Behavior & Organization* 38, no. 3 (1999): 283–309.

¹³ Stefan Bechtold and Felix Höffler, *An Economic Analysis of Trade-Secret Protection in Buyer-Seller Relationships*, Preprints of the Max Planck Institute for Research on Collective Goods (Max Planck Institute for Research on Collective Goods, October 17, 2007), http://hdl.handle.net/10419/26929.

¹⁴ Ronald J. Gilson, "The Legal Infrastructure of High Technology Industrial Districts: Silicon Valley, Route 138, And Covenants Not To Compete," *New York University Law Review* 74, no. 3 (June 1999): 575–629.

affect the innovation economy in the European Union, filling the described gap in both dimensions.

Three types of cross-border economic transactions are defined that are essential building blocks of intra-EU innovation. The impact of legal harmonisation shall be evaluated through efficiency analyses of the outcome of strategic games in all three scenarios. This thesis finds that the harmonisation of trade secrecy laws would have a significant positive effect on the efficiency of cross-border economic relations within the European Union, thus making the EU more competitive in the global innovation economy.

The analyses and findings of the thesis build on two assumptions. Firstly, that the laws of the Member States of the European Union are so fragmented and ineffective that they make it sometimes prohibitively costly for innovative companies to engage in intra-EU cross-border activities with other parties. Secondly, that the innovation economy of the EU operates inefficiently, which is why it is currently lagging behind that of its most important peer, the USA. Both assumptions are proven later; this opens the way to analysing how policymakers could influence the state of the badly performing EU innovation economy through the law.

The tool used throughout this work for evaluating policy options is efficiency, a measure widely used in the economic analysis of law. Economic efficiency has been defined many ways; this thesis shall use the meaning as defined by Zerbe:¹⁵ a legal rule is efficient if there is no other rule that would lead to higher Kaldor-Hicks efficiency, counting transaction costs of economic transactions (but not of the legal change); an option is Kaldor-Hicks efficient if such a redistribution of lump-sum amounts is possible that would make everybody better off and no one worse off, i.e., if the sum of all gains is higher the sum of all losses.¹⁶

¹⁵ Richard O. Zerbe, "The Nature of Inefficiency," in *Economic Efficiency and Economics* (Edward Elgar Publishing, 2002), 65.

¹⁶ Richard O. Zerbe, "History of the Concept of Economic Efficiency," in *Economic Efficiency and Economics* (Edward Elgar Publishing, 2002), 5.

The results of the efficiency analysis of this thesis shed light on how harmonized protection of business secrets would lead to greater willingness to share knowledge intra-EU both horizontally (via alliances) and vertically (via technology licensing), and to more efficient cross-border employee contracts within the Community: all in all to increased competitiveness of the Common Market *vis-à-vis* non-EU economies.

This thesis, however, has its limits in terms of space, time and resources. The analysis in this work is limited to theoretical models and to the issue of inefficiencies in the trade secrecy law environment in the European Union, i.e., those areas of legal harmonisation that, due to the shortcomings of many of the national legal systems, lead to substantial welfare losses; a deeper analysis of all factors of legal harmonisation and economic effects would require dwelling into all the individual national laws of the Member States, and further evaluation of both theoretical models and real-life data on the company level.

The thesis shall be laid out as follows. Chapter 2 will give an introduction to what trade secrets are from an economic viewpoint, and to why they are important to the innovation economy. Chapter 3 will underpin the hypothesis of this thesis, validating two important assumptions, i.e., the diversity of EU trade secrecy laws and the underperformance of the EU's innovation economy through a comparative analysis, juxtaposing the EU with the USA in order to evaluate the situation of the former in an international context. In Chapter 4, the interaction of trade secrecy law harmonisation and the strategic behaviour of economic agents shall be analysed in three types of intra-EU relationships that have a highlighted role in creating innovation within the EU: horizontal transactions (R&D alliances), vertical transactions (non-patented technology licensing) and employment contracts of knowledge workers. Finally, in Chapter 5, this thesis gives recommendations to policymakers of the EU (namely, the European Commission) regarding what areas to focus on while harmonising trade secret laws across the European Union in order to reach maximum efficiency and help the innovation economy improve.

CHAPTER 2: THE ECONOMICS OF TRADE SECRETS

Kenneth Arrow¹⁷ in his path-breaking paper notes that innovation would lead to the optimal utilisation of resources only in case the price of new information would be set to zero, since marginal costs are near zero after the innovation activity has produced its product. This, however, would leave no incentive to innovators to invest in producing new information, which ultimately leads to positive information prices, and thus a suboptimal market condition.¹⁸ How firms appropriate returns on innovation is therefore a cornerstone in how the innovation economy will operate.

There are numerous ways, so-called appropriability regimes¹⁹, which allow firms to reap economic rents from information: the tacit nature of productive knowledge in organisations²⁰, the legal protection vested in intellectual property rights²¹, the negative spaces of IP that occur in the form of self-governing communities and community norms in specific industries²², contracting²³, and the more technical ways of relying on competitive advantages arising from lead time and learning curve efficiencies²⁴. Trade secrecy belongs to two such regimes: to IP rights (especially in countries where it is explicitly regarded as an IP right) due to the explicit legal protection that is given to intellectual property, and to contracting, since it is most commonly protected in the form of non-disclosure agreements and non-compete covenants.

Trade secrets are very important appropriation tools, and they will often prove to be the backbone of a country's innovation economy. While trade secrets are the obvious way to go in

¹⁷ Kenneth Arrow, "Economic Welfare and the Allocation of Resources for Invention," in *The Rate and Direction of Inventive Activity* (Princeton University Press, 1962), 617.

¹⁸ Arrow, "Economic Welfare and the Allocation of Resources for Invention."

¹⁹ Pia Hurmelinna-Laukkanen and Kaisu Puumalainen, "Nature and Dynamics of Appropriability: Strategies for Appropriating Returns on Innovation," *R&d Management* 37, no. 2 (2007): 95–112.

²⁰ David Teece and Gary Pisano, "The Dynamic Capabilities of Firms: An Introduction," *Industrial and Corporate Change* 3, no. 3 (1994): 537–56.

²¹ Ibid.

 ²² Jacob Loshin, "Secrets Revealed: How Magicians Protect Intellectual Property without Law," *Available at SSRN* 1005564, 2007, http://faculty.winthrop.edu/kosterj/WRIT510/readings/intellectualproperty%26magic.pdf.
 ²³ Hurmelinna-Laukkanen and Puumalainen, "Nature and Dynamics of Appropriability."

²⁴ Ibid.

case of lesser innovations that could not be patented, Friedman et al.²⁵ identify two cases when patentable innovations are also kept secret rather than patented: first, an inventor may rather keep a patentable innovation secret if it has modest economic value, and if it would take an imitator as long as the patent's term would be to reinvent the innovation, due to the lower costs of secrecy compared to fixed costs of patenting. Second, if the inventor believes it will take others longer than the patent period to reinvent the innovation, they may keep it secret if they think the added benefit of owning a monopoly for a longer period outweighs the benefit of having stronger protection with a patent. Therefore, trade secrecy is an appropriation method that the lawmaker needs to take into account if they wish to develop the innovation economy.

Despite this inherent logic, it is also important to see whether trade secrets have real practical use to innovation businesses. The more they rely on trade secrets as appropriation methods, the higher the impact policymakers can reach with trade secrecy laws. Hence, the following section will investigate to what extent trade secrets are used as appropriability methods by innovative businesses.

The use of different innovation appropriation methods

Many studies have tried to evaluate the use of patents and other methods of innovation appropriation. Most of the empirical research focused on the differences in how companies employ different methods, and how company characteristics, such as size and type of innovation (product or process), have an effect on these. Contrary to popular belief, companies heavily rely on trade secrets, and much less on patents.

The earlier works of Levin et al.²⁶ and Cohen et al.²⁷ surveyed US companies, inquiring about their use of appropriation methods, and they found that patents were deemed a less effective appropriation method than secrecy in terms of process innovation; however, product innovation

²⁵ Friedman, Landes, and Posner, "Some Economics of Trade Secret Law," 63-65.

²⁶ Levin et al., "Appropriating the Returns from Industrial Research and Development."

²⁷ Cohen, Nelson, and Walsh, Protecting Their Intellectual Assets.

was more effectively appropriated by patents than by secrecy. Levin et al.²⁸ explain this difference with the fact that firms are incentivised to advertise the advantages of new products, thereby displaying the details of their innovation, as compared to process innovation, where, according to the authors, firms tend to maintain secrecy about their innovation. However, a simpler explanation would be that at the time of the survey, processes were reliable not to be granted a patent, which left businesses with secrecy.²⁹

The reasons for the generally lower importance of patents for process innovation can be understood by the analysis of the responses given to the survey of Cohen et al.:³⁰ a lot of innovations would not pass the test of novelty with the Patent Office, while the rest would be easy to invest around using other methods that do not infringe the patent but lead to a structurally similar innovation.

In the EU, empirical research has built on the harmonised EU-wide survey on innovation activities, the Community Innovation Survey (CIS), ³¹ which was extensively evaluated by Arundel;³² he calculated the micro data of the survey that led to results similar to that found by US peers: secrecy outranks patent protection in its importance to businesses as an appropriation method. Whereas secrets are more important in the case of both product and process innovations, the difference compared to patents is much higher in the case of the latter.

Even though the above-mentioned researches are based on older data, time has no effect on the importance of trade secrets. Figure 1 reveals how secrecy, on average, was still preferred to patents as an appropriation method in a later CIS survey: whereas 12.2% of firms on average employ secrecy, patents are used by only 7.9% of them.

²⁸ Levin et al., "Appropriating the Returns from Industrial Research and Development," 795.

²⁹ Keith Sawyer, "Can You Patent a Process?," Creativity & Innovation, June 15, 2009,

http://keithsawyer.wordpress.com/2009/06/15/can-you-patent-a-process/.

³⁰ Cohen, Nelson, and Walsh, Protecting Their Intellectual Assets.

³¹ "Community Innovation Survey (inn) Reference Metadata," *Eurostat*, accessed March 20, 2014, http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/en/inn_esms.htm.

³² Arundel, "The Relative Effectiveness of Patents and Secrecy for Appropriation."





Source: Own calculations based on Eurostat, Community Innovation Survey (CIS) 2000;³⁴ Eurostat Structural Business Statistics (SBS);³⁵ European Commission Small Business Act (SBA) Fact Sheet for Iceland³⁶ and Malta,³⁷ 2012

Therefore, trade secrecy is a vital appropriation method for innovative businesses, and they are widely used across EU Member States for the protection of technological innovations. This suggests that the legal protection provided for secrets can have a large impact on the innovation activities of businesses, as later chapters will prove.

First, however, two assumptions need to be validated: whether the trade secrecy law environment of the EU is scattered and ineffective enough for policymakers to be able to make an impact on the innovation economy through the law, and whether the innovation economy is in such a state that it needs improvement. The following chapter will introduce descriptive analyses of these two assumptions, putting EU results into an international context to better highlight the most relevant issues.

³³ Since a simple mean of country data distorts results, because it does not take into account the difference in size in the number of businesses in different countries, a mean value weighted by the number of companies in the respective countries shall be used instead.

³⁴ Eurostat Community Innovation Survey (CIS) 2000 (Eurostat, March 27, 2009),

http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database.

³⁵ Eurostat Structural Business Statistics Database (Eurostat, March 13, 2014),

http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database.

³⁶ SBA Fact Sheet 2012: Iceland (European Commission, 2012), http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/files/countries-sheets/2012/iceland_en.pdf.

³⁷ SBA Fact Sheet 2012: Malta (European Commission, 2012), http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/files/countries-sheets/2012/malta_en.pdf.

CHAPTER 3: COMPARING TRADE SECRET LAWS AND INNOVATION ECONOMIES IN THE EU AND THE USA

Both of the comparative analyses in this chapter juxtapose the EU to its most important peer in the world economy, the United States of America, because of the well-defined legal framework of trade secrecy laws and the eminent position the USA has in the global innovation economy. In the years 2005-2011, the USA made up on average 51% of the world's total receipts of intellectual property licence payments,³⁸ and the average spending on R&D in the country also indicates strong innovation activity, with 31% and 43% higher spending on a GDP basis in the period 2005-2011 than the world and EU figures, respectively.³⁹

This chapter will first summarise the basic concepts of trade secrecy laws in general, and then the state of divergence of EU laws shall be examined via a comparative analysis of EU and USA laws. Afterwards, the two innovation economies will be described using various statistics.

3.1 Comparative Analysis of EU and US Trade Secrecy Laws

Basic concepts

Trade secrets have been important throughout history, but they have not always been recognised by legislators as a separate branch of law; even today, trade secrecy law is not an unambiguous concept in either common or civil law countries. Roman law already offered protection to trade secret owners against the misappropriation of their confidential information to some extent; also statutes enacted during the industrial revolution highlighted the importance of industrial secrets.⁴⁰ However, modern concepts of trade secret laws appeared relatively late. Even though one of the first English cases where trade secrets are protected against misappropriation dates back as far as 1851,⁴¹ and the Penal Code of France of 1863 punished the theft of industrial secrets by

³⁸ Own calculation based on: World Development Indicators, Database (World Bank, n.d.),

http://databank.worldbank.org/data/views/variableselection/selectvariables.aspx?source=world-development-indicators.

³⁹ Ibid.

⁴⁰ Lemley, "Surprising Virtues of Treating Trade Secrets as IP Rights, The."

⁴¹ Morison v. Moat

employees with relatively harsh prison terms of two to five years,⁴² trade secret protection in 19th century was not based on any recognition of the need for protecting innovation, but rather on grounds of confidentiality and employment relationships.

The boundaries of modern trade secrecy law in both common and civil law can be built on the requirements that need to be fulfilled for the subject matter to be protected by courts.

Firstly, as mentioned earlier, a trade secret is information: virtually any piece of information that can be used in the course of business. This includes innovations, such as blueprints, formulas, production or other business methods and recipes.⁴³ According to the Economic Espionage Act (EEA) of the USA, "all forms and types of financial, business, scientific, technical, economic, or engineering information"⁴⁴ are to be protected against misappropriation. This also includes, for instance, customer lists, although their case is controversial: while some authors claim they are generally not protected by trade secret laws (as it often is the case)⁴⁵, some courts do protect customer lists as trade secrets if there is any evidence of valuable information compilation and of the effort put into making it.⁴⁶ In Europe, most courts recognize not only customer lists, but also supplier, cost and price information as protectable commercial secrets.⁴⁷ Furthermore, some courts also argue that trade secrets should be of value⁴⁸ and in continuous use.⁴⁹

Once information is found to be a trade secret, it must also be made actually *secret* in order for protection to be given to it, in a sense that it is not generally known to the public.⁵⁰ However, total secrecy is not necessary for legal protection. A certain trusted circle of owners of the secret

⁴² Barclay Thomas, "Patents for Inventions," in The Law of France Relating to Industrial Property, 1889, 33-71,

http://heinonlinebackup.com/hol-cgi-bin/get_pdf.cgi?handle=hein.beal/lfraindp0001§ion=1.

⁴³ Ramon Klitzke, "Trade Secrets: Important Quasi-Property Rights," *The Business Lanyer* 41, no. 2 (February 1986): 555–70.

⁴⁴ The Economic Espionage Act of 1996.

⁴⁵ Cristopher Cole, "The Elusive Trade Secret Known as a 'Customer List': A Brief 'How-to Guide," June 25, 2013, http://www.sheehan.com/publications/good-company-newsletter/The-Elusive-Trade-Secret-Known-as-a-Customer-List-.aspx.

⁴⁶ Neal Bookspan and Jaburg Wilk, "Not All Customer Lists Are Trade Secrets," August 27, 2013,

http://www.jdsupra.com/legalnews/not-all-customer-lists-are-trade-secrets-08581/.

⁴⁷ Study on Trade Secrets and Confidential Information in the Internal Market.

⁴⁸ Lemley, "Surprising Virtues of Treating Trade Secrets as IP Rights, The."

⁴⁹ Klitzke, "Trade Secrets: Important Quasi-Property Rights."

⁵⁰ Study on Trade Secrets and Confidential Information in the Internal Market.

can be made privy to the secret for the necessary purposes⁵¹, such as sharing information with employees or suppliers, or disclosing information to potential buyers or investors,⁵² without the information losing legal protection.

The requirement of secrecy is closely connected to the precautions the owner of a secret must take to be eligible for protection. If no precautionary requirement was set by law, firms could go around and share secrets with their competitors and sue them afterwards for using their secrets.⁵³ Precautionary measures need only be reasonable,⁵⁴ i.e., there is no need for extreme measures that would unjustly make trade secret owners incur expenses and would therefore make trade secret laws completely worthless, as the case of *duPont vs. Christopher*⁵⁵ demonstrates. Christopher was commissioned to take aerial photographs of a construction site of a new plant of duPont in order to get to know secrets about the production process of duPont. Judge Goldberg in his opinion argued against senseless precautions: "To require DuPont to put a roof over the unfinished plant to guard its secret would impose an enormous expense to prevent nothing more than a school boy's trick."⁵⁶ Reasonable precautionary measures can therefore take many forms, from physical protective tools (fences, gates, etc.), to procedural safeguards (check-in procedures, employee monitoring), to non-disclosure clauses in a supply contract.

Unlike patents, trade secrets are not safe from reverse engineering,⁵⁷ i.e., from "the process of extracting know-how or knowledge from a human-made artifact."⁵⁸ Case law shows that courts have argued in favour of reverse engineering for two reasons: first, they claim that allowing reverse engineering can lead to additional innovation either by improving upon the existing product or by pushing the trade secret owner to create an innovation that is patentable and to

⁵¹ Klitzke, "Trade Secrets: Important Quasi-Property Rights."

⁵² Robert G. Bone, "A New Look at Trade Secret Law: Doctrine in Search of Justification," *California Law Review*, 1998, 241–313.

⁵³ Lemley, "Surprising Virtues of Treating Trade Secrets as IP Rights, The."

⁵⁴ Study on Trade Secrets and Confidential Information in the Internal Market.

⁵⁵ E.I. duPONT v. Rolfe CHRISTOPHER (United States Court of Appeals for the Fifth District 1970).

⁵⁶ Ibid. §16

⁵⁷ Posner and Landes, "The Economics of Trade Secrecy Law."

⁵⁸ Pamela Samuelson and Suzanne Scotchmer, "The Law and Economics of Reverse Engineering," *Yale Law Journal*, 2002, 1577.

register it as a patent; second, courts have claimed that reverse engineering is the price trade secret owners pay in exchange for keeping information secret, instead of patenting it and disclosing it to the public: if reverse engineering was not allowed by trade secrecy laws, trade secret owners would enjoy patent-like monopoly rights for an unlimited time.⁵⁹

The last (and in practice, usually first) requirement of trade secret protection to be fulfilled is that the secret is misappropriated through improper conduct.⁶⁰ The Uniform Trade Secrets Act of the USA to give a straight definition of such actions: "theft, bribery, misrepresentation, breach or inducement of a breach of a duty to maintain secrecy, or espionage through electronic or other means"; 61 however, judicial decisions lack a common interpretation and a well-developed analytical model for deciding what constitutes unlawful misappropriation.⁶² The issue is especially blurry in some special (but not uncommon) cases. In the course of pre-contractual negotiations, for example, as concluded in RTE vs. Coatings, the owner of the secret must prove that the other party has or should reasonably have known that the information gained during arm's length negotiations was a trade secret and it was disclosed in confidence.⁶³ Another peculiar matter is that of employees who gain insight into secrets of their employers and then found their own firms or start working for competitors. Here the distinction between what makes a trade secret of the employer and what is the employee's own skill or expertise developed in the course of their employment is what causes controversy. As a rule of thumb, gained knowledge and expertise belong to the employee even after the termination of employment, while information that is known to the employee through memorization shall be regarded as a trade secret of the employer.⁶⁴ Even though misappropriation seems to be a straightforward requirement of trade secret law, courts have no easy job deciding about these frequently occurring cases.

⁵⁹ Samuelson and Scotchmer, "The Law and Economics of Reverse Engineering."

⁶⁰ Study on Trade Secrets and Confidential Information in the Internal Market.

⁶¹ Uniform Trade Secrets Act with 1985 Amendments, 1985, 4.

⁶² William E. Hilton, "What Sort of Improper Conduct Constitutes Misappropriation of a Trade Secret," *Idea* 30 (1989): 287.

⁶³ RTE Corporation v. Coatings, Inc. (Supreme Court of Wisonsin 1978).

⁶⁴ Klitzke, "Trade Secrets: Important Quasi-Property Rights."

An analysis of how these requirements work in the current legislation of the EU will reveal whether trade secret laws nurture economic efficiency in the Single Market. For the purposes of this analysis, EU laws shall be evaluated in an international context, using the USA as a basis for comparison, to more easily highlight crucial points.

Five-pronged comparison between EU and USA trade secrecy laws

The Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS Agreement), to which all EU countries⁶⁵ and the US are signatories, framed some general requirements in Article 39 for the protection of undisclosed information that is used contrary to honest commercial practices.⁶⁶ The TRIPS therefore builds on commercial honesty and not explicit IP rights, contract law, labour law or competition law; it also lays the foundations of the trade secret laws of its signatories: according to the Agreement, countries need to protect information if it is not generally known industry-wide, if it has commercial value, and if reasonable steps have been taken to protect its secrecy.⁶⁷

However, due to lack of detail, countries went into quite different directions when implementing both the narrower attributes of the TRIPS, and what was left uncovered by its provisions, such as the question of confidentiality during judicial proceedings.

The following analysis will account for these differences through five prongs that characterise trade secrecy laws both substantively and procedurally, aligning to a top-down logic: how the law defines trade secrets, what constitutes lawful appropriation, what constitutes misappropriation, what the most salient features of trade secret litigation procedures are, and what remedies are offered by law in case of misappropriation.

Definition of trade secrets

⁶⁵ S. Subramanian, "EU Obligation to the TRIPS Agreement: EU Microsoft Decision," *European Journal of International Law* 21, no. 4 (February 1, 2011): 997–1023, doi:10.1093/ejil/chq075.

⁶⁶ I. Neel Chatterjee, "Should Trade Secret Appropriation Be Criminalized," *Hastings Comm. & Ent. LJ* 19 (1996): 859.

⁶⁷ "Agreement on Trade-Related Aspects of Intellectual Property Rights" (World Intellectual Property Organisation, 1994).

The two continents are as far from each other in this aspect as they are in geographical distance: whereas the USA defines trade secrets in a consistent manner, by means of non-exhaustive lists provided by the EEA and the Uniform Trade Secrets Act (UTSA), 18 out of the 27 EU Member States⁶⁸ do not have a formal definition of what trade secrets are, while only three countries have specific laws that offer a definition of trade secrets. ⁶⁹ However, despite the differences in statutory rules, some similarity can be noted among Member States regarding jurisprudential practices: business-related information with economic value is generally protected if it is not known to the public and its appropriation by another party would cause detriment to its owner.⁷⁰

Despite the usual judicial practice, however, the lack of a uniform statutory definition among Member States leads to legal uncertainty, since the type of information that shall fall under protection in different jurisdictions is unclear to businesses, which increases their risk and therefore their transaction costs.

Lawful appropriation

The peculiarities of what constitutes lawful appropriation in trade secrecy cases are of utmost importance from an optimality viewpoint, since they are decisive to determining which actions trade secret owners are protected against.

In the United States, the EEA offers an exhaustive list of unlawful conducts, implying that conducts not included are lawful under the statute.⁷¹ The Restatement of Torts, however, gives a non-exhaustive list of proper means of appropriation, including parallel inventions, reverse engineering and licencing.⁷²

In the EU, exceptions to misappropriation are less clearly articulated. In Germany, for example, reverse engineering can be considered an unfair practice if substantial effort or investment is

⁶⁸ Croatia is not part of this analysis, as the study was conducted before its accession to the EU.

⁶⁹ Study on Trade Secrets and Confidential Information in the Internal Market, 24–26.

⁷⁰ Ibid., 26.

⁷¹ The Economic Espionage Act of 1996. §1831

⁷² Restatement of Torts (Second), n.d., http://www.lrdc.pitt.edu/ashley/RESTATEM.HTM. §757

needed to discover the secret technology behind a product;⁷³ by contrast, in the United Kingdom, reverse engineering of lawfully acquired products is only restricted to the extent of a confidential relationship between the parties.⁷⁴

Such diversity of laws in the EU makes cross-border activities in the Single Market riskier for businesses, leading to lower levels of trust among individual parties and to a chilling effect, because of the uncertainty about what actions will be deemed legal and which ones will be unlawful.

Misappropriation

It is not sufficient, however, to define the lawful ways of acquiring information; to minimise legal risks, actions that constitute misappropriation also need to be adequately articulated.

US laws, in general, operate with specific lists of conducts that constitute unlawful appropriation of secret business information, with criminal (EEA) provisions also punishing attempts of misappropriation. In the EU, what constitutes unlawful appropriation will depend on the branch of law the suit brought by the plaintiff falls under.⁷⁵ There is an important difference between the two continents in terms of selectiveness: US laws punish only conducts done in full knowledge or awareness of acquiring or owning misappropriated information; in the EU, most jurisdictions go the same way, but some EU countries offer remedies even if the secret was appropriated unlawfully in good faith,⁷⁶ e.g., if a third party acquires a trade secret believing it was sold to them under lawful title. Furthermore, the importance of protecting domestic or inter-market information against foreign activities more tightly is also something almost all EU Member States turn a blind eye to: only Austria has specific criminal law provisions for espionage serving foreign

⁷³ Ansgar Ohly, "Reverse Engineering: Unfair Competition or Catalyst for Innovation?," in *Patents and Technological Progress in a Globalized World*, MPI Studies on Intellectual Property, Competition and Tax Law (Berlin: Springer, 2009), 543.

⁷⁴ Richard M. Assmus et al., "Competitive Intelligence Acquisition and Reverse Engineering," May 20, 2010, 18–19, http://www.mayerbrown.com/public_docs/Webinar_CompIntell_052010_FINALSLIDES.pdf.

⁷⁵ Study on Trade Secrets and Confidential Information in the Internal Market.

⁷⁶ Ibid.

purposes, ⁷⁷ whereas the EEA in the USA consistently sets higher punishment for misappropriation for the sake of foreign entities or governments.

To sum up, uncertainty about what constitutes misappropriation stems not only from the diverse laws of Member States in the EU, but also from the numerous branches of laws that separately regulate trade secret law cases in each country. The very cornerstone of trade secret cases, i.e., what actions of appropriation are unlawful, is one of the most important issues for trade secret owners, and therefore a lack of harmonisation may exponentially increase transaction costs within the EU internal market.

Litigation

The litigation process itself is a factor that can be a game-changer: surveys and empirical evidence show that confidentiality during the litigation process may influence a company's decision on whether or not to report a trade secret misappropriation.⁷⁸

In the United States, courts employ two types of confidentiality orders during trade secret proceedings in order to ensure that confidential information of the parties is not leaked to the public: a lower level of protection is given to information that is marked "confidential"; a more restricted form is information marked as "lawyer's eyes only" (LEO). Such a restriction makes information available only for counsels and their staff, and experts. Nevertheless, during proceedings, courts and lawyers will still have a hard time trying to keep confidential information hidden while trying to evaluate whether it has been misappropriated.⁷⁹ Courts have the discretion to decide what parts of the proceedings, and to what extent, to make public. Secret information is usually kept in a vault separated from public evidence and records, or protected by electronic

⁷⁷ Ibid.

⁷⁸ Searle, "The Criminalization of the Theft of Trade Secrets," 48.

⁷⁹ Andru H. Volinsky, Ned Sackman, and Christopher G. Aslin, "Business Law & Business Litigation: Trade Secret Litigation: Protecting the Secret Sauce," December 16, 2011, http://www.bernsteinshur.com/wp-content/uploads/2011/12/Volinsky-Sackman-Aslin-Trade-Secret-NH-Bar-News-12-16-2011.pdf.

means if it is in digital form; the time and extent of such confidentiality can also be limited by court order, however.⁸⁰

In the European Union, some countries that have provisions for protecting confidential information during court proceedings have implemented somewhat similar, but not coherent practices; however, these countries are a minority within the EU: only 11 Member States allow for private or *in camera* proceedings to preserve confidentiality of party information, while 4 Member States specifically reject such restrictions on public access; the rest follow a wide range of inconsistent practices. In those countries that do have such provision, such restrictions range from prohibiting public access and the party's recording of the proceedings to LEO orders combined with interim injunctions. In practice, however, these precautions have been quite ineffective in protecting leakage of confidential information during proceedings.⁸¹

Trade secret owners, therefore, should be concerned about two issues: first, their domestic courts might not have the power or the will to prevent the leakage of their trade secrets during proceedings; second, in case it comes to cross-border litigation, additional transaction costs will occur to them due to the fragmented nature of procedural laws EU-wise.

Redress

Finally, when it comes to means of reparation in litigation, there are two aspects that need to be analysed: the type of liability imposed on misappropriators and the type of remedies available to the potential victims.

Trade secret misappropriation may engender civil and/or criminal liability. In the United States, since the introduction of the EEA in 1996, misappropriation is a federal crime;⁸² however, in case of economic espionage not benefitting foreign entities or governments, criminal liability is only imposed for the misappropriation of trade secrets related to products or services used or sold, or

⁸⁰ Robert Timothy Reagan, "Sealing Court Records and Proceedings: A Pocket Guide," 2010, http://www.fjc.gov/public/pdf.nsf/lookup/Sealing_Guide.pdf/\$file/Sealing_Guide.pdf.

⁸¹ Study on Trade Secrets and Confidential Information in the Internal Market, 34.

⁸² On the state level, however, trade secret misappropriation is criminalised only in very few states: ibid.

intended to be used in interstate or foreign commerce.⁸³ Even though the definition of trade secrets in the EEA broadens the scope of protection for product-related information,⁸⁴ the EEA's language can restrict the scope of protection in case of non-product-related information, such as customer lists or business methods.

The case of the EU is similar regarding criminal sanctions: almost all Member States, excluding Bulgaria, Ireland and the UK, have criminal sanctions in their laws for trade secret misappropriation; these provisions can often (in the case of 8 Member States) be found in both criminal codes and unfair competition laws.⁸⁵

Once liability is defined, the next question is how consistent and strict remedies are. The EEA in the USA is straightforward regarding criminal liability in federal cases: the theft of trade secrets is punishable with up to 10 years imprisonment (which can, at the court's discretion, be substituted with a fine) in case of individuals, and with a fine of at most \$5,000,000 for organisations. Punishment is more severe in case a foreign entity benefits form the misappropriation, however: in such cases, individuals can be fined up to \$5,000,000 or punished with up to 15 years in prison, while companies can be fined up to \$10,000,000 or 3 times the loss caused by misappropriation (whichever is higher).⁸⁶ Hence, it is clear that the legislator puts a much higher emphasis on cases involving foreign espionage.

EU Member States offer a much more scattered image. The extent of fines and prison sentences varies in a very wide range even among countries with criminal provisions, strengthening uncertainty and increasing expected enforcement costs to trade secret owners: fines are maximised by statute in 11 Member States, with a standard deviation of €125,030, or 61% of the

⁸³ Theft of Trade Secret Clarification Act of 2012, 2012.

⁸⁴ Searle, "The Criminalization of the Theft of Trade Secrets."

⁸⁵ Study on Trade Secrets and Confidential Information in the Internal Market.

⁸⁶ Foreign and Economic Espionage Penalty Enhancement Act of 2012, 2013.

average,⁸⁷ in a filtered sample;⁸⁸ prison terms show no better picture with a standard deviation of 1.77 years, or 49% of the average, in a filtered sample of 21 countries.⁸⁹

A company involved in cross-border transactions will therefore be subject to a widely varying range of criminal remedies, which leads to high risks, bargaining costs and expected enforcement and monitoring costs.

In case of civil remedies, on the other hand, the difference in the cohesiveness of laws is much lower between the two jurisdictions. In the USA, the UTSA⁹⁰ and the Restatement of Unfair Competition⁹¹ award both injunctions and monetary damages with possible accumulation. The former needs to last for a reasonable time and it can also take the form of compulsory licencing: royalties can be awarded to the owner of the secret in order to eliminate the unfair commercial advantage; damages can be awarded for both losses and unjust enrichment (separately or cumulatively).⁹² The Restatement of Unfair Competition⁹³ goes further and offers a framework for choosing the optimal scale of remedies, based on the interest of the parties or the public, the nature of the appropriation, any misconduct or undue delay on the part of the plaintiff and the practicality of the remedy in case of injunctive relief.

EU countries have a similar framework: both injunctions and damages are available reliefs for plaintiffs, but there are five Member States that do not offer cumulative relief, i.e., those countries allow for one or the other.⁹⁴ Fair royalties to the plaintiff are awarded in only 8 out of

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⁸⁷ Own calculations based on ibid.

⁸⁸ The Czech Republic has a great distortion effect on the standard deviation with a €1,500,000 maximum fine and therefore it has been excluded from the above calculation to give a more realistic image.
⁸⁹ Slovakia would distort this number with a maximum of 12 years in prison, therefore it has been filtered out of the calculations.

⁹⁰ Uniform Trade Secrets Act with 1985 Amendments. Section 3.

⁹¹ The American Law Institute, Restatement Third, Unfair Competition, 1995. §45

⁹² Uniform Trade Secrets Act with 1985 Amendments. Section 3.

⁹³ The American Law Institute, Restatement Third, Unfair Competition. §45

⁹⁴ Study on Trade Secrets and Confidential Information in the Internal Market, 29.

the 27 Member States. Furthermore, only 12 Member States of the EU give remedy for unjust enrichment,⁹⁵ evidencing both scattered and weak trade secret protection.

All in all, the five-pronged analysis above proves the first assumption of this thesis: whereas the United States have a coherent framework, strict remedies and the necessary powers given to courts to keep trade secrets confidential, the legal diversity in EU Member States substantially decreases the effectiveness of trade secret protection in cross-border transactions.

Why is the diversity of EU laws important for the economy? As the next section shall explain, there are numerous negative effects that such diversity brings about, and these stand also for the innovation economy and trade secret related economic activities.

The economic effects of legal diversity

How the lack of legal harmonisation affects the economy can differ according to which branch of law one talks about; trade secret law, as discussed earlier, belongs to numerous branches, and therefore harmonisation could have economic effects in a number of different fields. Studies on contract law, ⁹⁶ IP law⁹⁷ and on the diversity of EU laws in general⁹⁸ all point in the same direction: the lack of legal harmonisation leads to social welfare losses.

A diverse legal environment within the European Union first of all affects the efficiency and costs of doing business: it harms the efficiency of contractual interactions;⁹⁹ it increases the ownership risk of foreign assets, including intellectual property;¹⁰⁰ last, but not least, it increases

⁹⁵ Ibid.

⁹⁶ Fernando Gomez, "The Harmonization of Contract Law through European Rules: A Law and Economics Perspective," *European Review of Contract Law* 4, no. 2 (2008): 89–118.

⁹⁷ EMMANUEL HASSAN, OHID YAQUB, and STEPHANIE DIEPEVEEN, "Intellectual Property and Developing Countries: A Review of the Literature," 2009, http://north.patent.gov.uk/ipresearch-ipdevelop-200912.pdf.

⁹⁸ Paolo Cecchini, Michel Catinat, and Alexis Jacquemin, *The European Challenge* ("Cost of Non-Europe" Steering Committee of the EU Commission, 1988),

http://ec.europa.eu/economy_finance/emu_history/documentation/chapter12/19880301en127eurochallenge92_a.pdf.

⁹⁹ Gomez, "The Harmonization of Contract Law through European Rules."

¹⁰⁰ HASSAN, YAQUB, and DIEPEVEEN, "Intellectual Property and Developing Countries: A Review of the Literature."

transaction costs in the internal market.¹⁰¹ Furthermore, a lack of harmonisation increases costs of legal reform; a certain portion of the costs of legislation are fixed, i.e., they occur regardless of the number of those subject to the law in question, and therefore a harmonised law can diminish average costs through economies of scale. A lack of harmonisation, on the other hand, can lead to additional fixed legislative cost on an EU level, eliminating the possible positive effects economies of scale.¹⁰²

Hence, legal harmonisation within the Union decreases transaction costs. These costs are the expenses of exchanges in the economy: these include the costs of searching for partners and goods, the costs of bargaining and the costs of enforcing performance or punishing a breach.¹⁰³ It is straightforward that a scattered legal system in Europe leads to their increase. In the context of trade secret laws, the uncertainty regarding the legal protection offered in different countries increases search costs, because one may not be willing to reveal owning a trade secret to anyone in order to mitigate the legal risk. Diversity in laws also leads to higher bargaining costs through an increased price of information,¹⁰⁴ and due to the effects of the Information Paradox of Arrow: if there is no (or not sufficient) legal protection of property in information, the potential buyer will only pay for it if they get to know what he/she is buying, but then they have already acquired it for free.¹⁰⁵ Enforcement costs are naturally higher, since one needs to adapt to all different legal systems, incurring extra costs in each jurisdiction. All in all, empirical findings show that there are enormous costs of legal diversity for businesses involved in cross-border transactions.¹⁰⁶ These costs are assessed and priced by businesses ex ante: uncertainty about contract law rules relating to the breach of contract or the choice of law, for example, can lead to extra provisions in contracts or higher contract prices that make up for the increased risk of contracting; diverse laws of

¹⁰¹ Gomez, "The Harmonization of Contract Law through European Rules."

¹⁰² Ibid.

¹⁰³ Robert B. Jr. Cooter and Thomas Ulen, Law and Economics, 6th ed. (Prentice Hall, 2011).

¹⁰⁴ George A. Akerlof, "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism," *The Quarterly Journal of Economics* 84, no. 3 (August 1970): 488–500.

¹⁰⁵ Arrow, "Economic Welfare and the Allocation of Resources for Invention."

¹⁰⁶ Cecchini, Catinat, and Jacquemin, The European Challenge.

property ownership can also lead to an increased risk in assets, which would again lead to excess safety precautions by the parties that aim at protecting ownership rights.

As for trade secret laws in the EU, these extra costs have important implications: harmonisation, if coupled with effective minimum standards, is a tool that can increase trust in cross-border economic activities, and that can decrease the expected costs of parties from different nationalities, while also correcting the inefficiencies of national legislations in domestic transactions. Hence, the final result is socially and privately optimal intra-EU transactions.

The first assumption of this thesis, regarding the legal diversity of European trade secrecy laws, has therefore been proven valid: they are inefficiently designed and diverse among Member States, and therefore they are counterproductive. The following section will prove the second assumption valid: the EU's innovation economy works inefficiently and lags behind other economies, which is an urgent call to policymakers to act.

3.2 Comparison of the Innovation Economies of the EU and the USA

In order to prove the hypothesis of this thesis, the second element that needs to be established is that the EU's innovation economy operates inefficiently in the international arena, and lags behind its direct peers, such as the United States.

While there are many factors that could be taken into account to analyse innovation economies, this paper takes a closer look at two main groups of variables, as described earlier: firstly, the ones describing international revenues arising from licencing IP rights; and secondly, patent statistics in both terms of volume and their relationship with other economic indicators.

International licensing of intellectual property relates to international payments for the use of patents, copyrights, trademarks and trade secrets: this indicator therefore reflects the international flows of production-ready technologies from one country to others;¹⁰⁷ its usefulness has been

¹⁰⁷ "OECD Science, Technology and Industry Scoreboard 2011 - Technology Flows," *OECD Library*, accessed April 10, 2014, http://tinyurl.com/krdxhyk.

utilised in the empirical research of Athreye and Cantwell,¹⁰⁸ who used – among other indicators – the royalty and licence fees a country's residents receive from non-residents for the use of intellectual property among other indicators to analyse the effects of globalisation on innovation in emerging economies. However, this thesis goes further, and analyses the trends in licensing receipts in relation to payments and R&D investments. Even though know-how licensing cannot be separated from other IP licensing, due to a lack of data, these numbers give an indicative measure of the international competitiveness of an economy's innovations and of its success in generating returns on its R&D activities.

As for patent statistics, their use is more intuitive, but also less pragmatic: they indicate research successfulness, and they have been used in numerous research on globalised innovation¹⁰⁹ and cross-country comparative studies.¹¹⁰ Nonetheless, they can be distorting: on the one hand, they do not represent a homogeneous level of innovative activities, since patents differ in their quality and usefulness; on the other hand, not all inventions are patented, either due to patentability regulations or to IP strategies of firms.¹¹¹ However, some specific aspects of the data available and the interrelationships of patent statistics with other variables give a comprehensive image of a given country's innovation environment and productivity.¹¹²

The balance of licencing payments and receipts in the USA and the EU

Comparing the United States and the European Union external trade data (extra-Union) in the period 2005-2012, the obvious lesson mirrored in Figure 2 is that the US is a strong net IP creator, while the EU was a net importer of intellectual property during the same period.¹¹³

¹⁰⁸ Suma Athreye and John Cantwell, "Creating Competition?," Research Policy 36, no. 2 (March 2007): 209–26, doi:10.1016/j.respol.2006.11.002.

¹⁰⁹ Ibid.

¹¹⁰ Thomas L. Powers and Ricardo P. Leal, "Is the U.S. Innovative? A Crossnational Study of Patent Activity," *Management International Review* 34., no. 1. (1994): 67–78.

 ¹¹¹ Zvi Griliches, "Patent Statistics as Economic Indicators: A Survey," in R&D and Productivity: The Econometric Evidence (University of Chicago Press, 1998), 287–343, http://www.nber.org/chapters/c8351.pdf.
 ¹¹² Ibid.

¹¹³ Own calculations based on World Development Indicators.

Figure 2 - The difference between receipts and payments for intellectual property, current \$M, 2005-2012



Source: Own calculation based on World Bank World Development Indicators data and World Trade Organization Trade Statistics data Returns on investment are also relatively low in the EU in this period: even though the continent fared close to the world average, it performed worse compared to the OECD average with royalty and licence receipts of IP rights peaking at 15.05% of total R&D expenditures in 2011,¹¹⁴ whereas the USA reached a much higher number of 28.06% in 2011 with a positive trend in the

years before that.¹¹⁵

Patent statistics

The first and most obvious trend to look at is the number of patent applications, success rates and patents in force in a given year originating from a certain country, for it indicates the success of R&D activities in the given economy.¹¹⁶ The number of patents on its own does not reveal valuable information, since the figures can reflect different populations, demographics, or economic situations.

The success rate of patent applications, i.e. the ratio of patent applications that actually turn into a valid patent at the end of the pendency period, is a more revealing measure, since only inventions that pass the usual requirements of novelty and non-obviousness are granted patents.

¹¹⁴ "World Trade Organization Statistics Database," accessed April 23, 2014,

http://stat.wto.org/StatisticalProgram/WSDBStatProgramHome.aspx?Language=E.

¹¹⁵ Own calculations based on World Development Indicators.

¹¹⁶ Given variables are described in detail at "WIPO Intellectual Property Statistics Data Center," *World Intellectual Property Organization*, accessed March 15, 2014, http://ipstatsdb.wipo.org/ipstatv2/ipstats/patentsSearch.

According to the forum of the five leading IP Offices of the world, ¹¹⁷ the weighted average of grant lags amounts to 31.7 months in Europe 30.5 months in the USA. Therefore, given the yearly data of patent applications, the best estimate can be reached by comparing granted patent numbers to patent applications three years earlier.

Applying these lag years to the patent grant data, the EU and the USA both show very similar patent success rates as countries (regions) of origin: for the period 2007-2012, patents from the EU averaged at 47.67%, while the USA figure came out at 45.29%.¹¹⁸

Given similar qualities, the international flow of innovation stock, i.e., granted patents in one economy originating from the other, can be a good indicator of the attractiveness of the two innovation economies. Comparing the number of patents granted in the USA to EU applicants and vice versa mirrors the innovation balance between the two sides of the Atlantic. This balance reveals a patent gap between the EU and the United States that appeared in 2005 and that increased at a CAGR of 17.9% until 2012. This gap refers to EU nationals becoming more willing to apply for patents in the United States, while US nationals are becoming less willing to apply for patents in the EU.

The same trend can be recognised when patent flows in a wider global context are analysed.¹¹⁹ Even though world trends show that the internationalisation of patenting is becoming increasingly important, with non-resident applications around the world growing with an average rate of 3.3% between 2005-2012, the EU seems to be losing out on its position in attracting these incoming patent applications: its share in the world's incoming patent applications decreased by 2.5% year-on-year in the same period, while the US managed to grow in importance by almost the same rate annually. All in all, EU countries are losing out to the US, and even the rest of the

¹¹⁷ Own calculations based on "Patent Activity at The IP5 Offices" (The Five IP Offices (IP5)), accessed March 20, 2014, http://www.fiveipoffices.org/stats/statisticalreports/chapter4.pdf.

¹¹⁸ Own calculations based on "WIPO Intellectual Property Statistics Data Center."

¹¹⁹ Incoming patents refer to all patent applications in the given country from outside of the country; outgoing patents refer to patent applications originating in the country, but submitted outside of it.

world, in terms of attracting patent applications from abroad, while its inventors heavily rely on applying for patents at foreign offices.¹²⁰

Even though there are numerous ways an innovation economy can be evaluated, and statistical regression models may offer more precise correlations, the variables chosen for the above analysis all point into the same direction: the indicators prove the second assumption of the hypothesis of this thesis correct. The EU innovation economy needs improvement in terms of efficiency and its most important peer, the United States, maintains a superior innovation economy in terms of attractiveness, and the trends show that the balance is moving against the EU over time. EU decision makers therefore need to strengthen the position of the EU in the world innovation markets by incentivising innovative activities in the Single Market.

The EU has an Innovation Union in mind,¹²¹ which requires EU-wide economic co-operation and cross-border innovation transactions: uncertainty and ineffective legislation in a huge number of Member States hinder all these activities, which means that policymakers could make a change by focusing on reducing uncertainty, enhancing legal efficiency and bring about economic benefits eventually. Since national patent laws are relatively closer to each other thanks to the numerous patent treaties and agreements, and as trade secrets are at the core of innovation activities, as it was proven earlier in this thesis,¹²² policymakers could make a large impact in the innovation economy of the EU by harmonising trade secrecy laws and establishing effective minimum standards to correct national inefficiencies.

As decisions of trust and of entering into such activities are made on a micro level, this thesis shall now analyse how individual economic agents can be incentivised by the law to make choices that are in line with the socially optimal outcome.

 ¹²⁰ Own calculations based on "WIPO Intellectual Property Statistics Data Center."
 ¹²¹ "Innovation Union Introduction," *European Commission Website*, February 9, 2013,

http://ec.europa.eu/research/innovation-union/index_en.cfm?pg=intro. ¹²² Supra, 8.

CHAPTER 4: HOW TRADE SECRET LAWS AFFECT EU INNOVATION

In order to examine how optimal outcomes can be reached through legal changes in the innovation economy, a model had to be found that enables the study of how legal changes would affect decisions of economic agents on the individual level, because it is the individual businesses that will – and need to – be influenced by these changes. Since conducting an EU-wide empirical survey of innovative companies is beyond the scope of this thesis, standardised models of players and their decisions need to be set up, with some general assumptions in mind; the best method to examine normative behaviour this way is that of game theory.

Game theory offers a way to build models of strategic behaviour of given players with given costs and benefits depending on their decisions.¹²³ What needs to be defined in the model is who the decision-makers or players are; what they decide upon, i.e., what is their strategic portfolio; and lastly, what influences their payoffs, or how their payoff function is constructed.¹²⁴ For a model to be robust, it needs to be simple, but complex enough to grasp most of the possible factors that affect decisions and payoffs of the players. To achieve that, this thesis builds game theory models of two players with simple strategic portfolios, where the effect of the law is reflected in their payoff functions: the impact of legal changes will therefore directly affect the decisions of players, since all models will assume that players are rational decision-makers, maximising their private benefits. From an efficiency point of view, maximal total private benefits shall be deemed efficient for the purposes of this work, but social payoffs will also be kept in mind and referred to.

Lemley ¹²⁵ mentions three practical cases where trade secrecy laws play a role: business intelligence, transactions and employees leaving the firm; this thesis seeks to analyse situations where a change in EU trade secret laws can directly lead to an increase in innovation activities

¹²³ Randal C. Picker, "An Introduction to Game Theory and the Law" (University of Chicago, April 20, 1993), 2–3, http://www.law.uchicago.edu/files/files/22.Picker.IntroGame_0.pdf.

¹²⁴ Joseph Harrington, "Building a Model of a Strategic Situation," in *Games, Strategies and Decision Making* (Worth Publishers, 2009), 36.

¹²⁵ Lemley, "Surprising Virtues of Treating Trade Secrets as IP Rights, The," 9–10.

through lower transaction costs and higher certainty, i.e., this thesis wishes to cover the *ex ante* economic effects of trade secret regulation.

Even though Posner and Landes¹²⁶ analyse cases of business intelligence in their research, these cases are not as relevant from an efficiency viewpoint as the other two, because protection and misappropriation costs are virtually irrelevant compared to the social welfare losses in the other two scenarios. Besides having a higher impact and a more immediate effect, these are also the practical scenarios that are listed by the association of the biggest innovative UK companies as the most important policy issues regarding the Commission's proposal on trade secret law.¹²⁷ These scenarios involve possibilities for trade secrecy law harmonisation to have a direct effect and that, due to their cross-border nature, affect intra-EU innovations. The cases selected for further study in this thesis are not only intuitively important, but the Impact Assessment for the EU Commission's proposal also found that these three cross-border scenarios are of high priority to the EU's innovation economy.¹²⁸

First, business transactions can be thought of in both a horizontal and a vertical way in the supply chain, with the following taxonomy to be used for the purposes of this thesis: horizontal transactions refer here to intra-EU knowledge-sharing joint ventures and alliances (strategic R&D alliances) with parties on the same level in the supply chain, while vertical transactions are those that involve the licensing or sale of information to another party in another Member State for their own purposes. In both cases, trade secrets are important *ex ante*: the negative effect stems not from stealing the secret, but from parties not collaborating or transacting at all.

Second, departing employees themselves pose an interesting issue not when they depart from, but when they arrive at the company: non-compete covenants with nationals of another Member

¹²⁶ Posner and Landes, "The Economics of Trade Secrecy Law."

¹²⁷ "IP Federation Comments on the Proposed EU Trade Secrets Directive" (IP Federation, February 26, 2014), www.ipfederation.com/document_download.php?id=2111.

¹²⁸ Impact Assessment Accompanying the Document "Proposal for a Directive of the European Parliament and of the Council on the Protection of Undisclosed Know-How and Business Information (Trade Secrets) Against Their Unlawful Acquisition, Use and Disclosure," Commission Staff Working Document (European Commission, November 28, 2013), 28–36, http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013SC0471&from=EN.

State will have substantial effects on knowledge workers' mobility and knowledge transfer within industries across Member States; again, the effect of laws occurs *ex ante*, before the transaction even happens.

The rest of this chapter analyses the economic effects of legal changes in these strategic scenarios, and it seeks to find how the law can change the incentives of private parties so that they make decisions that are in line with the socially optimal outcome; as noted earlier, game theory models shall be used to analyse individual decisions. Both the models and real-life case studies shall prove that the diversity of laws coupled with inefficient national protection in a lot of jurisdictions lead to suboptimal decisions; these are the decisions that can therefore be influenced by policymakers through the law.

4.1 Horizontal Transactions

Cost-benefit framework of R&D alliances and the effects of trade secrecy laws on the framework

A success story of a strategic joint venture is that of the Czech firm of TPCA, a joint venture of Toyota and PSA Peugeot Citroën, which pulls resources of both firms, producing cars on the same platform for each maker. The cars are all built for the purpose of being useful in everyday driving situations in city cruises, while achieving low fuel consumption.¹²⁹ The venture was started in 2005, with the agreement of the two companies to pull resources together in order to cut costs.¹³⁰ However, the development of the car itself was done by Toyota, and the production system used is also Toyota's infamous Toyota Production System (TPS),¹³¹ while purchasing and suppliers are under the control of PSA.¹³² This leads to Toyota's production methods and other trade secrets being officially hidden from PSA, while the latter has in fact a great window of opportunity for taking a glimpse into how Toyota makes its cars. Even though car sales have not

¹²⁹ "TPCA Website," TPCA, 2014, http://en.tpca.cz.

¹³⁰ "Three of a City Car Kind," *Autocar*, accessed April 16, 2014, http://www.autocar.co.uk/car-news/new-cars/three-city-car-kind.

¹³¹ "TPCA Website."

¹³² "Three of a City Car Kind."

fared the best for the past few years, the success of the co-operation itself is mirrored in the annual one billion dollar investment of the two companies.¹³³

However, international alliances can also pose threats to the allying parties. Trust and the certainty of being able to retain one's own intellectual property is an essential element of entering any alliance; this can prove especially hard when companies are based in countries with substantially different laws on IP rights. Such a situation is illustrated by the case of the US company Fellowes, Inc. The company produces paper shredders designed for business use, allowing businesses to dispose of secretive information.134 The family-owned business employs around 2,800 people,¹³⁵ nearly 10% of all workers in the US document management services industry.¹³⁶ Their productivity, measured as revenues per employee, also exceeds the US industrial average by as much as 30%, which may very well be due to their innovative production solutions.¹³⁷ The company teamed up with Chinese company Shinri Machinery Co. (Shinri) in 2006 to start a joint venture in China,¹³⁸ with substantial operations: the number of employees at the Chinese factory (1,600) is more than half as much as the number of total US employees of Fellowes.¹³⁹ However, after a change in ownership, Shinri demanded different conditions, which Fellowes did not agree to; this refusal led to Shinri closing up the factory in 2010, keeping all employees outside, and seizing all production tools and assets. The Chinese court Fellowes turned to dissolved the joint venture in 2011, and they auctioned all of the venture's assets out:¹⁴⁰ this auction allowed Shinri to legally own all the manufacturing equipment embodying Fellowes'

^{133 &}quot;TPCA Website."

^{134 &}quot;Fellowes About Us," Fellowes, Inc., accessed April 17, 2014,

http://www.fellowes.com/us/en/aboutus/Pages/overview.aspx.

¹³⁵ Fellowes, Inc. Company Profile (InsideView), accessed April 17, 2014,

http://www.insideview.com/directory/fellowes-inc.

¹³⁶ Own calculation based on *Document Management Services in the US: Market Research Report* (IBISWorld, September 2013), http://www.ibisworld.com/industry/document-management-services.html.

¹³⁷ Own calculation based on ibid.

¹³⁸ T. Augustine Lo, "ICT Votes to Proceed With Section 337 Investigation on Fellowes Paper Shredders," King & Spalding Trade & Manufacturing Alert, March 2013,

http://www.kslaw.com/library/newsletters/TradeManufacturingAlert/2013/March/article5.html.

¹³⁹ "Trade Secret Theft: Managing the Growing Threat in Supply Chains" (Center for Responsible Enterprise And Trade (CREATE), 2012), http://www.create.org/sites/default/files/CREATe_White-Paper_Trade-Secret-Theft_Final-e.pdf.

¹⁴⁰ Lo, "ICT Votes to Proceed With Section 337 Investigation on Fellowes Paper Shredders."

know-hows at a bargain price.¹⁴¹ Fellowes estimates that its losses amount to more than \$100 million, which arises from both their investments in China (seized by Shinri) and from their losses in European and other markets that Shinri has already entered, using Fellowes' technology;¹⁴² this amounts to almost a fifth of Fellowes' yearly revenues.¹⁴³

The important lesson is that R&D alliances can benefit all parties, but huge differences in national ways of IP protection lead to high uncertainty regarding these benefits and the appropriability of one's own IP rights. Such a legal risk, as described in the Fellowes case, surely leads to increased transaction costs among parties, which can lead to unrealised opportunities altogether.

The above case studies also teach us is that trade secrets are inevitable parts of such alliances, and they are maybe the most important assets companies contribute to an alliance. Their use also poses a bigger puzzle than the use of patents, since the international protection of trade secrets is diverse and controversial, as it has been established earlier. Therefore, most of the benefits and also the risks of R&D alliances stem from the sharing of or the easy access to trade secrets.

As for benefits, strategic innovation alliances can confer substantial benefits on the parties. Upstream collaboration and downstream competition has been a basic characteristic of many industries for the past two decades, ¹⁴⁴ and they allow parties access to new technologies, economies of scale and shorter development time for their innovations. ¹⁴⁵ Co-operation agreements or alliances lead to firms sharing technological capabilities, knowledge and often marketing efforts.¹⁴⁶

¹⁴⁵ Rachelle C. Sampson, "Organizational Choice in R&D Alliances: Knowledge-Based and Transaction Cost Perspectives," *Managerial and Decision Economics* 25, no. 6/7 (September 2004): 421–36.

¹⁴¹ "Trade Secret Theft: Managing the Growing Threat in Supply Chains."

¹⁴² Ibid.

¹⁴³ Own calculation based on Fellowes, Inc. Company Profile.

¹⁴⁴ Christopher Palmberg and Olli Martikainen, "Pooling Knowledge - Trends and Characteristics of R&D Alliances in the ICT Sector," in *How Revolutionary Was the Digital Revolution?*, ed. John Zysman and Abraham Newman (Stanford University Press, 2006).

¹⁴⁶ Ibid.
Cost reduction and higher productivity has been found to be significant effects of R&D collaborations,¹⁴⁷ with not only labour productivity growth, but also sales growth being affected by cooperation among competitors.¹⁴⁸ Not only market performance, but innovativeness also improves: companies achieve higher R&D intensity, and product innovation is also more likely in an alliance than individually.¹⁴⁹ Finally, and most importantly to the European Union's Single Market, strategic alliances can be especially important internationally, since firms can tap into the different country-specific know-how and other advantages of their partners.¹⁵⁰

However, R&D alliances also have their own risks. There are three factors that eventually decide the efficiency of an alliance: governance structure, the scope of shared activities, and the type of partners present in the alliance.¹⁵¹ Any of these factors can degrade or improve the results of the alliance. The risk of leakage of intellectual property of the partners' affects all three factors, and this risk is exemplified in case of cross-border alliances with different standards of national laws.¹⁵²

Firstly, governance refers to the organisational structure of the alliance, and it can range from simple contracting to equity-based joint ventures. Oxley¹⁵³ notes that a risky environment will lead to higher transaction costs, since the higher the risks of contracting, the more parties will eventually move towards equity-based forms or the more safety valves they will include in the contract.¹⁵⁴ Higher exposure to risk therefore leads to lower efficiency of alliances due to a shift in their governance structure.

¹⁴⁷ P. Mariti and R. H. Smiley, "Co-Operative Agreements and the Organization of Industry," *The Journal of Industrial Economics* 31, no. 4 (June 1983): 437–51.

¹⁴⁸ René Belderbos, Martin Carree, and Boris Lokshin, "Cooperative R&D and Firm Performance," *Research Policy* 33, no. 10 (December 2004): 1477–92, doi:10.1016/j.respol.2004.07.003.

 ¹⁴⁹ Wolfgang Becker and Jürgen Dietz, "R&D Cooperation and Innovation Activities of Firms—evidence for the German Manufacturing Industry," *Research Policy* 33, no. 2 (March 2004): 209–23, doi:10.1016/j.respol.2003.07.003.
 ¹⁵⁰ Luis Miotti and Frédérique Sachwald, "Co-Operative R&D: Why and with Whom?," *Research Policy* 32, no. 8 (September 2003): 1481–99, doi:10.1016/S0048-7333(02)00159-2.

¹⁵¹ Dan Li et al., "Friends, Acquaintances, or Strangers? Partner Selection in R&D Alliances," *The Academy of Management Journal* 51, no. 2 (April 2008): 315–34.

¹⁵² Oxley, "Institutional Environment and the Mechanisms of Governance."

¹⁵³ Ibid., 288.

¹⁵⁴ Oxley, "Institutional Environment and the Mechanisms of Governance."

A similar relationship can be discovered in case of alliance scope, which refers to a wide range of variables, from geography, to product focus, to customer focus, to the amount of shared assets and knowledge. Khanna¹⁵⁵ highlights that the timing and nature of benefits to partners are influenced by both the common choice of alliance scope and the parties' individual choice regarding the resource they commit to the alliance. Since a broader scope leads to higher exposure to another party's resources and knowledge,¹⁵⁶ it follows that a higher risk of losing control of these resources leads to a reduced alliance scope (e.g., older technologies being shared) or an equity-based form of governance enforced by the parties, which leads to higher transaction costs.¹⁵⁷

Last, but not least, the choice of partners also has a substantial impact on the efficiency of an alliance, as Li et al.¹⁵⁸ prove in their pioneer research. The ability to predict behaviour is very important in deciding whether to team up with older partners or to dare to reach out to unknown companies and form new alliances. Uncertainty leads to partners strengthening their ties to previous partners, choosing them over newer allies.¹⁵⁹ If new alliances lead to the benefits described above, the opportunity cost of choosing older partners over new ones will probably outweigh the benefits of continuing existing partnerships, especially since returns to scale are decreasing in innovation sharing over time.¹⁶⁰ Therefore, higher risks of losing valuable intellectual property lead to efficiency losses through a lower number of new R&D alliances.

Strategic scenario analysis

To illustrate how the uncertainty of parties regarding the national protection in different countries of one's IP rights changes the chances of forming R&D alliances, a simple, symmetric,

¹⁵⁵ Tarun Khanna, "The Scope of Alliances," Organization Science 9, no. 3 (1998): 352.

¹⁵⁶ Li et al., "Friends, Acquaintances, or Strangers? Partner Selection in R&D Alliances."

¹⁵⁷ Oxley, "Institutional Environment and the Mechanisms of Governance."

¹⁵⁸ Li et al., "Friends, Acquaintances, or Strangers? Partner Selection in R&D Alliances."

¹⁵⁹ Christine M. Beckman, Pamela R. Haunschild, and Damon J. Phillips, "Friends or Strangers? Firm-Specific Uncertainty, Market Uncertainty, and Network Partner Selection," *Organization Science* 15, no. 3 (June 2004): 259–75, doi:10.1287/orsc.1040.0065.

¹⁶⁰ Rachelle C. Sampson, "Experience Effects and Collaborative Returns in R&D Alliances," *Strategic Management Journal* 26, no. 11 (November 2005): 1009–31, doi:10.1002/smj.483.

two-player strategic game shall be introduced. In the game, the differences in national laws play an important role, and are represented by their influence on parties' payoffs: in accordance with the previous discussion, transaction costs increase and the willingness of parties to co-operate decreases as uncertainty grows parallel to the extent of differences between national laws of protection; this in turn leads to different outcomes of the game.

What should be kept in mind is that the game only embraces the direct payoffs of the parties involved; whereas these alone can prove whether different policy decisions lead to efficiency, the social impact of R&D alliances, namely, the advance in innovation and higher-quality products or cheaper solutions, probably mean that efficiency is even higher in case R&D alliances are successful than the game suggests.

In order to convey robust results, the following scenario will be considered: two companies of approximately equal size, in the same industry, located in two different Member States of the EU, are considering pulling resources together in order to develop a new product that would be more expensive to develop individually than in an alliance, while their results may also lead to further product innovations in the future, building on the previous product.

For both companies, their payoffs in the game can be described as benefits of access to information and costs of giving access to information. The former can be thought of as benefits from accessing the capabilities and know-how of the other party for the purposes of the joint venture; there can be other general knowledge, too, that the company can incorporate into its own practices, but they do not constitute trade secrets: turning back to practical cases, the practices of Toyota's lean management system used in TPCA surely confer new knowledge on PSA, such as PSA's procurement methods can offer new information to Toyota.

As for the costs, they arise from one party giving access to their knowledge to a competitor who gains advantage in the product market. Trade secret laws come into play at this point: scattered laws lead to uncertainty, which in turn leads to a risk of increased costs. This uncertainty arises from the difference within the EU in the substantive and procedural legal factors: definition of trade secrets, lawful appropriation, misappropriation, secrecy during litigation, and remedies offered by courts. The greater the differences within these variables among the Member States, the greater uncertainty is for companies.

The sensitivity of the parties and their payoffs to such uncertainty, of course, depends on the value of the secret, on how difficult it would be to obtain it without having access to the joint venture, and on the extent of the difference in national laws. For the purposes of the game, however, it is sufficient to suppose that these factors are all present highly enough for both parties to be highly sensitive to uncertainty.

In a simple scenario, consider that only one of the parties has trade secrets that they share. In that case the payoff function of this party is the following:

$$B_A - C_A(\bar{x}, t) \tag{1}$$

s.t.: $\bar{x} \ge 0$, $t \ge 0, B_A > 0$

where B_A is the summed benefits from the alliance, and C_A is the total cost of the party to the alliance, and it is a positive function of two variables: a fixed sum \bar{x} , which constitutes the costs that occur regardless of trade secret misappropriation, such as capital costs, labour costs and costs of increased competition in the product market; and some transaction cost t, which has a positive relationship with the gap in trade secrecy laws between the two countries.

It is evident then that if both parties aim at maximising their payoffs, and their benefits and direct costs are not variable, transaction costs can be prohibitively high: if trade secrecy laws are diverse enough between the two countries, transaction costs will be so high as to render the benefits worthless, causing the parties not to start an alliance at all, causing welfare losses, not only through the unrealised net private benefits, but also because of the unrealised higher competition and product quality in downstream markets. Let us assume a situation where both parties have trade secrets that are easily accessible to the other party, trade secrecy harmonisation is in effect, and it reduces the level of transaction costs to a marginal amount, which can therefore be assumed to be close to zero: t = 0. Note that this is the same as saying that the two parties are located in the same country: the findings are also applicable to domestic companies in an EU country with no effective trade secrecy regulation. Let us also assume that $B_A - C_A > 0$. If both parties decide to misappropriate the other's secret, and the secrets are of different value, the payoff function of player 1 can be given as such:

$$B_A^1 - C_A^1(\bar{x}, t) + B_{TS}^1 - C_{TS}^1$$
⁽²⁾

where B_{TS} refers to the benefits of misappropriating the other's secrets, while C_{TS} is the cost of the misappropriation of one's own trade secrets by the other party. One can also assume that $C_{TS}^1 > B_{TS}^2$, i.e., the costs of one's own secret being misappropriated are higher than the benefits of these secrets to the other player, due to losses in reputation, losses in the stock market,¹⁶¹ or to the higher efficiency the original owner could use the trade secrets with. Furthermore, suppose that there is no penalty to any party by the law, because they either do not turn to court due to fears of further leakage through litigation and its additional reputation costs or because the doubtful regulation of commercial secrets leads to expected remedies of near-zero value.

A simple game model explains the decisions of the two parties, given equally valuable trade secrets. Let as assume that for both parties $B_A - C_A = 4$.

Let $B_{TS}^1 = B_{TS}^2 = 3$, $C_{TS}^1 = C_{TS}^2 = 4$. Then the game can be modelled in a simple payoff matrix as:

1	Table 1	l - A	simpl	e 2x2	2 game	e model	ofa	alliances	with	no ef	ffective	trade	secret	protection	l

		Player 2		
		Steal secret	Do not steal	
		Stear secret	secret	
Dlavor 1	Steal secret	3, 3	7,0	
r layer 1	Do not steal secret	0, 7	4, 4	

¹⁶¹ Chris Carr and Larry Gorman, "The Revictimization of Companies by the Stock Market Who Report Trade Secret Theft Under the Economics Espionage Act," *The Business Lanyer* 57, no. 1 (November 2001): 52.

The Nash Equilibrium of the game can be found by assuming rational strategic behaviour on both sides: parties will misappropriate each other's secrets, leading to a suboptimal outcome. If the resulting losses are high enough (imagine higher costs to Player 2), they may even outweigh the general net benefits $(B_A - C_A)$ of one or both of the parties, so that one or both of the payoffs become negative: this then leads to no alliance in the first place.

What changes with the introduction of effective trade secret law remedies, with parties daring to reveal the misappropriation at court if the litigation process keeps confidentiality? A new factor, D represents the amount of damages payable by the misappropriating party. Therefore, the payoff of Player 1 now will be:

$$B_A^1 - C_A^1(\bar{x}, t) + B_{TS}^1 - C_{TS}^1 - D^1$$
(3)

Assume that compensation is perfect, i.e., damages paid equal the loss of the other party: $D^1 = C_{TS}^2$ and vice versa. Assume also, however, that only one player's (Player 2) country offers the necessary litigation procedure and remedies, and therefore Player 1 can effectively sue Player 2 and receive damages while Player 2 cannot expect to sue successfully, or can expect damages only with a certain probability p < 1. Assuming now that p = 0, this changes the previous game in the following way:

Table 2 - A simple 2x2 game model of alliances with one-sided trade secret protection

		Player 2		
		Steal secret	Do not steal	
		Stear secret	secret	
Dlarrow 1	Steal secret	7, -1	7,0	
Flayer I	Do not steal secret	4, 3	4, 4	

The game leads to a lopsided and inefficient result, because Player 2 is deterred from misappropriation, while Player 1 can expect not to pay any damages, but receive damages for whatever has been misappropriated by Player 2.

Finally, let us consider a situation with harmonisation across the EU and effective minimum standards as for remedies and the litigation procedure. This brings about perfect compensation and equal deterrence in both countries:

		Player 2		
		Steal secret	Do not steal	
		Stear secret	secret	
Dlavor 1	Steal secret	-1, -1	3, 4	
r layer 1	Do not steal secret	4, 3	4, 4	

Table 3 - A simple 2x2 game model of alliances with effective trade secret protection

Solving the game for a Nash Equilibrium again reveals that the introduction of an effective minimum standard of remedies and the litigation procedure leads to a socially optimal outcome: neither parties will misappropriate the other's secret, and the general benefits will therefore surely outweigh the losses due to misappropriation (which are zero).

Hence, trade secret law harmonisation can lead to a socially optimal outcome in the way companies in the EU form cross-border R&D alliances in two ways: first, the harmonisation of laws itself leads to lower transaction costs, and therefore incentivises the forming of alliances with efficient scope, form and choice of partners, not only leading to higher private gains of the allying companies, but also to additional social gains; second, a minimum standard, if high enough, enables that both parties are deterred by law from stealing the other's secret, eliminating the possible losses of misappropriation, and encouraging parties to form alliances, both internationally within the EU and domestically.

4.2 Vertical Transactions

Cost-benefit framework of vertical transactions and the effects of trade secrecy laws on the framework

A widely used method of sharing know-how with another party is selling one's technology or knowledge for a lump sum payment, for royalty payments, or for the combination of both.¹⁶²

¹⁶² Young Jun Kim and George Clarke, "Determinants of Inter-Firm Technology Licensing in the EU," *Applied Economics* 45, no. 5 (February 2013): 651–61, doi:10.1080/00036846.2011.610746.

As it shall be discussed later in this section, there are a number of reasons for firms to license their secret technologies to other parties, who are more often than not their competitors. A practical case of such a licence, which has been present for the past 130 years, can give a glimpse into how valuable such licences can be. Dr J. J. Lawrence signed a licence contract with J. W. Lambert in 1881 for the sale of the formula of the oral mouthwash product, Listerine. The parties agreed to a payment of six dollars per gross (144 units) to Dr Lawrence or his heirs, binding Lambert and his heirs or assigns to the payment according to the quantity of Listerine they sold. The later assignee, the Warner-Lambert Pharmaceutical Company filed to declaratory judgment action some 75 years later, since, as they claimed, the formula to Listerine was no longer a trade secret, but the court decided that the contract was not conditional upon the formula being kept secret, and therefore there was no reason for Warner-Lambert not to keep on paying the royalty fees for the sale of each gross of Listerine.¹⁶³

Warner-Lambert was acquired by Pfizer, the pharmaceutical giant, in 2000,;¹⁶⁴ in turn, Pfizer's Consumer Healthcare division was bought six years later by Johnson&Johnson; the deal included the Listerine product line.¹⁶⁵ Listerine sales were assessed at around \$180 million in 2011 in the USA alone,¹⁶⁶ which, with an average retail price of \$5 per 250 ml pack,¹⁶⁷ led to an approximate number of 36 million sales units in the USA, or 250 thousand gross units.¹⁶⁸ This left the heirs or assigns of Dr Lawrence with an annual royalty of \$1.5 million in 2011 for US sales alone.

¹⁶³ R. Mark Halligan, "Trade Secret Licensing: The 'Listerine' Formula Case," *The Trade Secrets Homepage*, 1998, http://tradesecretshomepage.com/license.html.

¹⁶⁴ Melody Petersen, "Pfizer Gets Its Deal to Buy Warner-Lambert for \$90.2 Billion," *The New York Times*, February 8, 2000, http://www.nytimes.com/2000/02/08/business/pfizer-gets-its-deal-to-buy-warner-lambert-for-90.2-billion.html.

¹⁶⁵ "Johnson & Johnson to Acquire Pfizer Consumer Healthcare; Combination Creates World's Premier Consumer Health Care Company," Company Website, *Johson& Johnson Investor Relations*, (June 16, 2006),

http://www.investor.jnj.com/releasedetail.cfm?ReleaseID=201875.

¹⁶⁶ Antoinette Alexander, Brushing up Sales by Touting Value, Ease (Drugstorenews.com, March 14, 2011),

http://www.drugstorenews.com/sites/drugstorenews.com/files/CR_Beauty_OralCare_031411.pdf.

¹⁶⁷ 'Yahoo! Shopping Listerine Mouthwash Prices," Webshop aggregate, *Yahoo! Shopping*, accessed April 24, 2014, https://shopping.yahoo.com/oral-care/listerine--brand/mouthwash--oral-care-

type/;_ylt=AiATYhf5SIWa3nz_EMvWWuMPB8Yu?sortby=priceD&b=17.

¹⁶⁸ Own calculations based on Alexander, Brushing up Sales by Touting Value, Ease.

The Listerine case leads to two important conclusions: firstly, a trade secret licence can be upheld indefinitely even if the trade secret is not a secret anymore, making trade secret licences quite different from patent licences;¹⁶⁹ secondly, trade secret licences can be very valuable, especially due to their not being tied to specific timing, unless the parties wish to do so. Furthermore, licensing can lead to higher efficiency through the optimal allocation of resources, as Dr Lawrence probably had no capacity to produce Listerine on his own, and often to increased competition, with buyers being either present or potential future competitors.

Therefore, for a firm, licensing know-how can offer two main advantages: the optimal use of resources¹⁷⁰ and reaching untapped or otherwise unavailable markets.¹⁷¹

A firm or research institute may lack the capital or resources to produce and market their own innovation, and they are therefore forced to license it; even if they do have the necessary resources, however, they may be unwilling to take the risk of investing capital into marketing a new innovation.¹⁷² As Gallini and Winter¹⁷³ proved, incentives to license exist under both symmetric and asymmetric cost structures of contracting firms, but these incentives differ according to how far cost structures are from each other. With similar costs structures, firms will be incentivised to license their know-how because of their ex post perceptions of the economic rents they can achieve. On the other hand, with costs being far from each other, low-cost firms have an *ex ante* incentive to provide higher-cost firms with licensed technology, in order to ensure that those firms will not invest more into finding solutions that would turn out to be superior compared to the technology of the low-cost firm; high-cost firms have the obvious incentive of renting know-how from low-cost firms instead of investing into expensive R&D processes.¹⁷⁴

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¹⁶⁹ Halligan, "Trade Secret Licensing: The 'Listerine' Formula Case."

¹⁷⁰ Nancy T. Gallini and Ralph A. Winter, "Licensing in the Theory of Innovation," *The RAND Journal of Economics* 16, no. 2 (1985): 237, doi:10.2307/2555412.

 ¹⁷¹ Vincent D. Travaglini, "Industrial Property Rights-Licensing and Joint Ventures Abroad," *Law. Am.* 1 (1969): 48.
 ¹⁷² Elizabeth Miller, "Antitrust Restrictions on Trade Secret Licensing: A Legal Review and Economic Analysis," *Law and Contemporary Problems* 52, no. 1 (1989): 183, doi:10.2307/1191902.

¹⁷³ Gallini and Winter, "Licensing in the Theory of Innovation."

¹⁷⁴ Ibid.

As for international licensing: firms can reach markets that would either be completely unavailable to them without licensing, due to legal restrictions, or that would be prohibitively costly or risky to enter.¹⁷⁵ It might not only save large capital expenditure for firms to license their technology to foreign entities, however, but it can also help them to test the market before deciding whether to enter through future investments, and to build an image for the company through the technology licensed. Licensing also enables companies to reach markets that would be costly to reach due to high tariffs or quotas, or that prohibit foreign ownership.¹⁷⁶

Licensing can also lead to social benefits besides private gains. The use of another's technology can induce the licensee's own innovation processes, since the new know-how will bring with it tacit knowledge and skills that do not constitute trade secrets or IP, but which are valuable additions to the knowledge stock of any firm. If cost structures are close, as noted earlier,¹⁷⁷ firms that benefit from royalties will have the incentive to invest in R&D activities, since they will realise higher benefits if they can license them in the future, and they will also be able to use the income from licensing to support further research.¹⁷⁸ Hence, social welfare is increased through the creation of both tacit knowledge and new innovations.

Licensing, however, integrates risks and costs, as well. Whereas these can include the costs of loss of reputation due to the fault of the licensee,¹⁷⁹ it is more important that legal risks and diversity of national laws lead to high transaction costs, which can make licensing prohibitively costly altogether, or inefficient even if owners of know-hows do choose to license.

The issue in licensing relationships arises *ex ante*, similarly to alliances: legal uncertainty increases transaction costs, and when it reaches extreme amounts, it will render licensing deals worthless, leading to a loss due to unrealised private and social benefits. The owner of the know-how may not be willing to release information that is not absolutely necessary to release, in fear that the

¹⁷⁵ Miller, "Antitrust Restrictions on Trade Secret Licensing," 188.

¹⁷⁶ Travaglini, "Industrial Property Rights-Licensing and Joint Ventures Abroad," 50.

¹⁷⁷ Supra 40.

¹⁷⁸ Gallini and Winter, "Licensing in the Theory of Innovation," 238.

¹⁷⁹ Travaglini, "Industrial Property Rights-Licensing and Joint Ventures Abroad," 51.

other party may misappropriate secrets and make no contract eventually.¹⁸⁰ This leads to a holdup situation that the famous Arrow Information Paradox captures: the buyer has no exact information about the value of the know-how until they get to know the know-how itself, but then they acquired it free of charge already; the unknown nature of information will lead to a suboptimal allocation of know-how, since the buyer will have to rely on what little information they have, usually taking into account average market prices for such type of know-how, which will be influenced by countless factors, and therefore it will seldom lead to an optimal purchase.¹⁸¹ On the other hand, buyers will want just enough of information and no more: in case negotiations fail eventually, and they acquire a similar or the same technology from another source or they develop it themselves, they could easily be accused of misappropriation, and therefore it is in their interest to get to know only as much as necessary for an efficient purchase.¹⁸²

Diverse laws protecting the intellectual property underlying licenses thus lead to a vicious cycle: licensors will demand stringent conditions in the licensing contracts, which leads to higher transaction costs; however, if these conditions are restrictive enough, the licensees will not be willing to sign them, leading to more caution on the side of the licensors, and to no license at all,¹⁸³ which causes inefficiency in unrealised social and private benefits, assuming that a license would be efficient.

Strategic scenario analysis

To model the effect of EU laws in licensing contracts, imagine a simple, two-player strategic game in a pre-contracting situation, with parties from different Member States negotiating about a license incorporating a trade secret and its price. The two players are the licensor, who has to decide whether to reveal the secret so that the potential buyer can agree to the transaction, and

¹⁸⁰ David Bender, "Licensing Trade Secrets Including Software," Preventive L. Rep. 4 (1985): 17.

¹⁸¹ Arrow, "Economic Welfare and the Allocation of Resources for Invention."

¹⁸² Bender, "Licensing Trade Secrets Including Software," 18.

¹⁸³ Hans Verhulst, "International Trade in Technology - Licensing of Know-How and Trade Secrets" (World Intellectual Property Organisation, January 7, 2009),

http://www.wipo.int/export/sites/www/sme/en/documents/pdf/trade_technology.pdf.

the licensee (the potential purchaser), who can only strike an optimal deal with the trade secret known to him or her, and who can later on decide whether to misappropriate the secret. Initially, however, this latter assumption is not present, and the licensee has no intention or option unlawfully use the information acquired.

The licensor's (Player 1) payoff function integrates the sum of his or her monetary benefits from royalties, and from the freed production and research capacity; costs are incurred because of increased competition in the product market and to the transaction costs of legal uncertainty:

$$B_{L}^{1} - C_{L}^{1}(\bar{x}, t)$$
s.t.: $\bar{x} \ge 0, t \ge 0, B_{L}^{1} > 0$
(4)

where B_L^1 is the total gains of the licensor from the license, while C_L^1 denotes the sum of costs to the licensor that occur due the licensing transaction and it is dependent on two variables: \bar{x} , the sum of the fixed expenditure of higher rivalry and fixed transaction costs; and t, a variable that incorporates legal differences between jurisdictions; the higher the diversity of laws, the higher the additional transaction costs. An inherent assumption of the model is that the revelation of the secret will surely lead to a license contract, i.e., the license *ceteris paribus* would benefit both parties. Assuming that $B_L^1 - C_L^1(\bar{x}, t) > 0$ at t = 0, it is evident that if these transaction costs reach a high enough extreme, there will be no incentive left for the licensor to reveal the secret in the pre-negotiation phase, which leads to no license being made; this means not only to unrealised private benefits, but also lost social opportunities that increased R&D intensity and freed capacity would have meant.

On the other hand, the licensee's (Player 2) payoff function integrates the benefits of increased sales in the product market, the improved R&D and production capabilities due to the spill-over effect of the know-how (i.e., the added skills and knowledge that are not secret), and the expense of paying the royalty or lump sum amount to the licensor:

$$B_L^2 - C_L^2(\bar{x}, t) \tag{5}$$

where B_L^2 refers to the sum of all private gains of the licensee, while C_L^2 incorporates the total costs of the transactions and it depends on two variables: the fixed royalty payments of \bar{x} and the transaction costs of t, which occur due to the diversity of laws protecting the underlying intellectual property; the higher the uncertainty, the higher the costs of bargaining and contracting, and therefore the higher the chilling effect.

The following condition therefore holds on the side of the licensee, as well: given that $B_L^2 - C_L^2(\bar{x}, t) > 0$ at t = 0, transaction costs can be prohibitively costly, leading to an abrupt ending of negotiations and no licensing contracts, i.e., unrealised private and social benefits.

Now, assume that there is effective harmonisation of trade secrecy laws among EU Member States, i.e., t = 0, and therefore the license would be efficient to contract for both privately and socially. This is the same as saying that both parties are located in the same country, and therefore the following findings will be valid in case of an EU Member State with inefficient trade secret laws, as well. Therefore, assume that there is no effective minimum standard of remedies offered by courts, nor is the necessary level of secrecy in litigation procedures, provided that the licensee, intends to misappropriate the commercial secret of the licensor, which would give the licensee an additional benefit of B_{TS}^2 , and which would cause the licensor an extra cost of C_{TS}^4 . Given the extra reputational and organisational costs to the licensor, and the probable inefficiency in the use of the know-how by the licensee, it is valid to assume that $B_{TS}^2 < C_{TS}^1$.

In such a case, given that $C_{TS}^1 > B_L^1 - C_L^1$, the licensor would incur losses if he or she entered a licensing contract with the licensee even with trade secrecy law harmonisation effective in the EU, and therefore there will be no license contract made. The following extensive form game tree demonstrates such a situation:

Figure 3 – An extensive form game of contracting for licenses, with ineffective trade secret protection



Given the above assumptions, even harmonised trade secret law with an inadequately low minimum standard would lead to licensees being incentivised to misappropriate secrets after those are revealed to or contracted for with them. Solving the game in Figure 3 using backward induction proves that misappropriation would be beneficial to licensees, and would lead to inefficiency, since $C_{TS}^1 > B_{TS}^2$; the solution of the game, however, does not allow for such an option, because the first decision lies with the licensor, who would not reveal trade secrets to a possible licensee when they are not adequately protected, and when the losses from misappropriation are higher than the net benefits of the license otherwise.

If there is an effective minimum standard, which induces the licensors to sue licensees, and which also provide adequate compensation, there is a new element in the players' payoff function: Dstands for damages, and assuming that compensation is perfect, $D = C_{TS}^1 > B_{TS}^2$. This will lead to a modified game and to a new, efficient solution.





The solution in Figure 4 leads to the efficient outcome, both privately and socially, because the licensor is deterred enough by law from stealing the secret, and both parties are incentivised to reveal information and sign a contract.

Thus, EU policymakers can have an impact on the innovation economy through trade secrecy laws in two ways: firstly, if legal uncertainty among different countries, and therefore transaction costs are lower, control over the transaction will be lower by the licensor, leading to an efficient outcome and increased social benefit; secondly, tighter regulations will reduce the incentives of licensees to misappropriate secrets, leading to higher willingness of licensors to license and therefore higher social and private benefits.

4.3 Employee Non-Compete Covenants

Cost-benefit framework of non-compete covenants and the effects of trade secrecy laws on the framework

Kai Fu Lee, former Corporate Vice President of Microsoft's Natural Interactive Services Division, decided to join Google as President of Google China in 2005, accepting the offer for the job while still at Microsoft. When Lee left the company, Microsoft sued both Lee and Google for breaching Lee's non-compete agreement with Microsoft:¹⁸⁴ a clause in Lee's employment contract that restricted Lee's ability to work for Microsoft's competitors or to start his own business in the same field.¹⁸⁵ The court eventually ruled that Lee could work for Google, but only in fields unrelated to his previous work at Microsoft.¹⁸⁶

The case highlights the increased importance of employee mobility and trade secrets in innovative industries, and it also sheds light on how companies can restrict the freedom of employees with non-compete clauses to work for competitors or start their own business. This section will first give a short evaluation of non-competes from an economic viewpoint;

¹⁸⁵ Sampsa Samila and Olav Sorenson, "Noncompete Covenants: Incentives to Innovate or Impediments to Growth," *Management Science* 57, no. 3 (March 2011): 425–38.

¹⁸⁴ Michael J. Garrison and John T. Wendt, "The Evolving Law of Employee Noncompete Agreements: Recent Trends and an Alternative Policy Approach," *American Business Law Journal* 45, no. 1 (2008): 107–86.

¹⁸⁶ Garrison and Wendt, "The Evolving Law of Employee Noncompete Agreements."

afterwards, the impact of harmonised trade secret laws across Member States will be evaluated in strategic game scenarios.

The foremost reason usually cited for non-compete clauses is that of efficiency: parties are free to contract, and therefore, in general, they should have the right to enter any contract that they consent to mutually, and there is no need for the regulator or for courts to interfere with the free choice of the parties.¹⁸⁷ The efficiency argument is further supported by claims that non-competes ensure investment in human capital and R&D: employers invest heavily in training their employees, and their incentives to invest would be hugely diminished if employees could freely roam among companies, getting jobs and working for competitors using the knowledge and skills that the original employer taught them;¹⁸⁸ companies will also be less willing to spend on innovation activities if employees can go and offer the former employees' know-how to competitors.¹⁸⁹

It is true that, in certain situations, the use of non-competes can be efficient: these clear-cut cases are referred to as those of inevitable disclosure, and they occur when a former employee had access to certain type of information at their previous workplace, and the information will surely be of value to them in their new position at a competitor.¹⁹⁰ A landmark case in the United States that is mainly responsible for the widespread use of the doctrine nowadays was that of PepsiCo vs. Redmond in 1995. Redmond was a key employee of PepsiCo and he took part in the strategy formation and creation of business plans of PepsiCo for the following year in the sports drink market, but he was later offered a job at one of PepsiCo's competitors where he would be making decisions relating to the business strategy of his new employer in the same market. Even though Redmond had no intention of sharing any secrets with the competitor, his decisions as

¹⁸⁷ Viva R. Moffat, "The Wrong Tool for the Job: The IP Problem with Noncompetition Agreements," *William and Mary Law Review* 52, no. 3 (2010): 873–922.

¹⁸⁸ Norman D. Bishara, "Covenants Not to Compete in a Knowledge Economy: Balancing Innovation from Employee Mobility against Legal Protection for Human Capital Investment," *Berkeley J. Emp. & Lab. L.* 27 (2006): 287.

¹⁸⁹ Garrison and Wendt, "The Evolving Law of Employee Noncompete Agreements."

¹⁹⁰ Ryan M. Wiesner, "State-by-State Analysis of Inevitable Disclosure: A Need for Uniformity and a Workable Standard, A," *Marg. Intell. Prop. L. Rev.* 16 (2012): 211.

manager there would inevitably be influenced by his knowledge of PepsiCo's strategy. The court therefore issued an injunction, enjoining Redmond from working for PepsiCo's competitor due to the inevitable disclosure that would occur if he had started working there.¹⁹¹ Such an injunction, unlike that in the Google case, leads to efficiency: the doctrine relates to memorisable information, and not skills¹⁹² learned by the key employee, and said information will be used to the benefit of the new employer without them investing in acquiring it (other than the employee's wages), incentivising firms either to disinvest or to make suboptimal decisions: disperse knowledge among employees or impose stronger covenants on them, leading to a chilling effect.

However, non-competes can actually hinder the innovation economy and lead to social and private inefficiency. Non-competes, as described in the Microsoft case, can be overly restrictive, sometimes enjoining employees from utilising their skills in the same industry for numerous years. This does not only lead to private losses from unrealised gains, but it also brings about social losses in two ways: in reducing the knowledge spillover effect of mobile employees, and in preventing efficient employee-employer matches in the industry by restricting employees' movements among competitors.¹⁹³ Firstly, non-competes may lead to a sub-optimal allocation of resources, since they hinder employees from utilising the tacit knowledge and skills they gained, which does not constitute a trade secret or other IP of the firm and from commercialising those aspects that the firm failed to build upon. There is also a chilling effect: possible lawsuits can hinder employees from starting their own businesses or from taking new jobs at competitors' even in case there is no breach of the covenant.¹⁹⁴ Furthermore, a certain trial-and-error process has to be gone through by most employees before they find the company that best matches their

¹⁹¹ "The Famous Case of 'Inevitable Disclosure' Doctrine – PepsiCo, Inc v. Redmond," *Traverse Legal*, February 25, 2012, http://tradesecretattorney.info/inevitable-disclosure-doctrine-pepsico-inc-v-redmond/2012/02/.

¹⁹² Wiesner, "State-by-State Analysis of Inevitable Disclosure," 8.

¹⁹³ Samila and Sorenson, "Noncompete Covenants: Incentives to Innovate or Impediments to Growth.", 8

¹⁹⁴ Garrison and Wendt, "The Evolving Law of Employee Noncompete Agreements.", 25

skills. If they are not allowed to work for competitors for some time, that lost period may lead to a suboptimal use of their skills.¹⁹⁵

Therefore, from an efficiency point of view, two major types of non-compete covenants can be distinguished: those that lead to optimal outcomes socially by hindering competitors from taking advantage of the intellectual assets of the firm, and those that are overly restrictive, either because of the company's fears of trade secret misappropriation or because of its competitive strategy. This thesis will disregard strategy-related covenants, however, because they only work with key employees, who are few, and not with knowledge workers in general.

Probably the best example that supports the argument against harsh non-compete covenants is that of Silicon Valley (California, USA), which, as it is evident from the examples of Apple, Google, Facebook, Netflix and the other stars of today's high-tech industry, is a global game changer. The top 150 listed companies of the Valley generate a total yearly revenue of more than \$700 billion, and they spend around 10 per cent of it on R&D.¹⁹⁶

The reasons for the Valley's success has been discussed in a number of papers, some considering culture as a key success factor¹⁹⁷, while others tie it to the free-spirited job-hopping that has evolved in the cluster.¹⁹⁸ While the two opinions may approach the issue from different angels, they are inevitably intertwined, since the free movement of employees around Silicon Valley is a demonstration of the entrepreneurial culture that the valley itself has created for its own purposes.¹⁹⁹ What has been established by Gilson²⁰⁰ is that the entrepreneurial connections along with the high turnover and inner circulation of employees within the Valley leads to knowledge

 ¹⁹⁵ Samila and Sorenson, "Noncompete Covenants: Incentives to Innovate or Impediments to Growth.", 10-11
 ¹⁹⁶ Daniel J. Willis and Jack Davis, "SV 150: Searchable Database of Silicon Valley's Top 150 Companies for 2014,"

Silicon Valley, April 14, 2014, http://tinyurl.com/p3gf57r.

¹⁹⁷ Nicole Pohl and Günter Heiduk, "Silicon Valley's Innovative Milieu: A Cultural Mix of Entrepreneurs," *Erdkunde* 56, no. 3 (September 2002): 251.

¹⁹⁸ Bruce Fallick, Charles A. Fleischman, and James B. Rebitzer, "Job-Hopping in Silicon Valley: Some Evidence Concerning the Microfoundations of a High-Technology Cluster," *The Review of Economics and Statistics* 88, no. 3 (August 2006): 472–81.

¹⁹⁹ Pohl and Heiduk, "Silicon Valley's Innovative Milieu: A Cultural Mix of Entrepreneurs," 251.

²⁰⁰ Gilson, "The Legal Infrastructure of High Technology Industrial Districts: Silicon Valley, Route 138, And Covenants Not To Compete," 596.

spillovers that constitute the key element of its success. When comparing the organisational structure and the legal environment of Silicon Valley and its predecessor among high-technology agglomerations, Route 128 in Massachusetts, USA, Gilson²⁰¹ argues that knowledge spillovers resulting from employee mobility are the decisive factor that led to the demise of Route 128 and the success of Silicon Valley. From a legal point of view, two branches of law could explain such a difference in employee mobility: laws protecting IP and law governing labour relations. Trade secret laws are similar in the two jurisdictions, and those laws do not effectively cover intangible property carried by employees to competitors when changing jobs; however, there is a huge difference in the way courts treat non-compete covenants in the two jurisdictions, with California courts almost never enforcing them, while Massachusetts courts almost always do.²⁰² This forced companies in the Valley to cooperate and compete at the same time, letting their employees roam freely, knowing that the added value to the agglomeration will lead to higher benefits to individual firms, as well.²⁰³

The message of the analysis of the legal framework and the organisational structure of the Valley is clear. Knowledge spillovers resulting from high mobility of employees are essential for success, and that requires a legal environment that is suitable for allowing such high mobility, leading companies to simultaneous cooperation and competition. The EU innovation economy can achieve this end in two ways: either by giving no weight to non-compete covenants, or by designing trade secrecy laws in a way that they effectively protect the intellectual property of employers even in case of departing employees. Doing the former would be unreasonable in two ways: first, it would be virtually impossible to establish such a legal environment in the whole EU, given that non-competes currently are enforced to largely variable extents in different countries;²⁰⁴ second, as the case of PepsiCo demonstrates, there are circumstances, under which it

²⁰³ Ibid., 612.

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²⁰¹ Ibid.

²⁰² Ibid., 600.

²⁰⁴ "Top Ten Considerations for Non-Compete Clauses in Europe" (L&E Global, June 2013), http://tinyurl.com/kb3qgmw.

is efficient to enforce non-compete clauses, provided that they are not unreasonably restrictive. Hence, it is trade secrecy laws that can be used by EU policymakers: if employers can rely on trade secret laws, they will use non-competes only to an efficient extent, such as in the case of inevitable disclosure.

The next section shall assess how trade secret laws could be used in strategic intra-EU scenarios to incentivise employees to opt for efficient non-competes.

Strategic scenarios

There are two basic scenarios where cross-border employment relationships are affected on an intra-EU level: employees working abroad and multinational EU companies employing local employees in another Member State. Both cases are not only intuitively, but also practically important within the EU.

The issue of intra-EU mobility of European employees has been on the agenda in the European Parliament and in Western European countries for the last couple of years, with some expressing discontent,²⁰⁵ and some seeing an opportunity for higher productivity in migrating employees.²⁰⁶ Despite general belief, immigrant workers provide their skills not only in low value-added industries, but they play a key role in the innovation economy also: in the United Kingdom in 2010, at least 4.8% of employees in strategically important sectors, including oil and gas extraction, chemicals, aerospace manufacturing and computer engineering, were immigrants from the European Economic Area.²⁰⁷ Furthermore, the flow of employees within the EU is directed from countries with lower levels of innovation to those with the highest levels:²⁰⁸ the labour force weighted mean of the ratio of science and technical workers is 57% in the top five destination of

²⁰⁵ Alison Little, "150,000 Say No to EU Migrants: Daily Express Readers Demand Block on Migration Tidal Wave," *Express Online*, November 25, 2013, http://www.express.co.uk/news/uk/444985/150-000-say-no-to-EU-migrants-Daily-Express-readers-demand-block-on-migration-tidal-wave.

²⁰⁶ "Germany Welcomes Immigrants from Europe's South," EurActiv, February 4, 2013,

http://www.euractiv.com/socialeurope/germany-welcomes-immigrants-euro-news-518833.

²⁰⁷ Anitha George et al., *Skilled Immigration and Strategically Important Skills in the UK Economy* (National Institute of Economic and Social Research, February 7, 2012),

http://niesr.ac.uk/sites/default/files/publications/290212_151752.pdf.

²⁰⁸ Free Movement of Workers: Commission Improves the Application of Worker's Rights – Frequently Asked Questions (Brussels: European Commission, April 26, 2013), http://europa.eu/rapid/press-release_IP-13-372_en.htm.

migrant EU employees, while the same figure reaches only 41% in the top five origin countries on average.²⁰⁹

As for the case of EU companies holding affiliates or a controlling share in companies abroad, where they employ local workers, statistics are revealing: around 110 thousand R&D workers in the EU are employed by close on 130 thousand companies that are controlled from other EU Member States. To put this into context: in the top five controlling Member States, the average of R&D personnel employed by foreign affiliates from these countries reaches 7.8% of the total in these countries, with the top controlled countries reaching an even higher 11.6% of all domestic R&D personnel.²¹⁰

These two scenarios will be evaluated as one, keeping in mind the distinction between the two types of covenants described above: a non-compete can be efficient (regardless of the harmonisation of trade secrecy laws) or overly restrictive (too high liquidation damages or too long restricted periods).

In intra-EU cross-border employment relations, a strategic scenario, regardless of whether the employee moves abroad or works for a multinational innovative business, involves two parties, the employer (the employing company) and the R&D employee, both of whom originate from different countries: a typical example would be a Hungarian researcher or technical worker taking a job at an aerospace company in the United Kingdom or at the German companies of Audi AG or Mercedes AG in Hungary.

Let us assume a situation where the employee has no intention to steal trade secrets or has no direct access to them, but has the possibility to make efforts and misappropriate them. The employing firm benefits from the employee's knowledge and skills, assuming that their salary is set so that they add net value to the firm's operations; in case an employee leaves, however, the

²⁰⁹ Own calculations based on "Eurostat Statistics Database," accessed February 3, 2014,

http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database. $^{\rm 210}$ Ibid.

firm has to face the expected cost of the general skills of an employee, which the firm invested heavily in,²¹¹ being used elsewhere to the benefit of competitors; furthermore, the firm faces additional expected transaction costs (mostly enforcement costs) that stem from the diversity of trade secrecy laws in the EU. These costs and benefits can be summarised as:

$$B_E^1 - C_E^1 - p \times C_F^1(\bar{x}, t) \tag{6}$$

where B_E^1 comprises the benefits of employment to the company, C_E^1 is the salary paid to the employee, and C_F^1 refers to the costs of an employee leaving the firm and starting their own business or joining a competitor, and it depends on the fixed costs of the skills of the employee being used at a competitor (\bar{x}) and on the additional transaction costs of t that occur due to the diverse laws protecting trade secrets within the EU; the last element, p, is the probability of the employee leaving, which can be estimated based on industry and company turnover averages and employee-specific characteristics.

The employee, on the other hand, benefits from gaining new skills and a salary (disregarding present opportunity costs); he or she can also incur gains from possible future employment in the industry, made possible by the skills that they acquire through their current employment; however, in case the employer has a reason to introduce overly strict non-compete covenants, these benefits are offset by the costs of the employee being restricted from competition. The employee's payoff function can therefore be described as:

$$B_E^2 + p \times (B_F^2 - C_F^2)$$
(7)

where B_E^2 refers to the benefits of the employee from current employment, while B_F^2 is the expected benefits of future possibilities, and C_F^2 is the expected legal cost imposed by the current employer in case the employee works for a competitor in the industry; p is the same measure of probability of the employee leaving the firm as in the employer's payoff function.

²¹¹ Bishara, "Covenants Not to Compete in a Knowledge Economy," 302.

Let us now assume the present situation of trade secret laws being diverse across the EU. This leads to high transaction costs for the employer, who will then turn to another legal tool: noncompete clauses. The company will force a very broad and restrictive covenant on the employee to make up for the higher transaction costs and reduce risk; this decreases the expected costs of the company, C_F^1 , but it in turn increases the expected costs of the employee, C_F^2 , which can then be so high that the employee will not dare to change jobs at all; this is a suboptimal result: first, privately, assuming that the employee is not a key employee, and that therefore $B_F^2 > C_F^1$ (since only key employees leaving would confer very high costs on the employing firm;, second, socially, because no knowledge spillovers occur, and the most efficient employment match is also not guaranteed.

Imagine now, however, that trade secret laws are harmonised within the EU. Assume that very harsh covenants that themselves bring about future reputational and hiring costs to the firm, and therefore the employee has an incentive to change jobs if benefits of the new jobs are higher than the current gains he or she enjoys; the company is therefore not incentivised to use harsher non-competes if they are not vital for protecting trade secrets.

What if the employee intends to steal secrets? Assume that there is perfect harmonisation within the EU, i.e., t = 0 (which is the same as saying that the two parties are located in the same country, and therefore the following findings will hold in domestic situations in EU countries with currently inefficient trade secret regulations, as well), but there is no effective minimum standard as to secrecy through the litigation procedure or the remedies offered in court. This will modify the payoff functions of both parties: the employer has an additional expected cost of stolen secrets (C_{TS}^1), while the employee has the additional benefit derived from misappropriation (B_{TS}^2). The new payoff functions of the employer and the employee, respectively, will therefore be:

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$$B_E^1 - C_E^1 - p \times [C_F^1(\bar{x}, t) + C_{TS}^1]$$
(8)

$$B_E^2 + p \times (B_F^2 - C_F^2 + B_{TS}^2) \tag{9}$$

The company, given the lack of effective minimum standards, will be forced to turn to restrictive non-competes to deter the employee from starting employment with a competitor in the first place through contractual means. This will lead prevent the loss of the secret, but it will also lead to a suboptimal result, both privately and socially.

If there is an effective minimum standard in trade secrecy laws across the EU, however, then law can reach the same deterrence effect by introducing damages (D). In case of perfect compensation, i.e., when $D = C_{TS}^1$, the departing employee will not be incentivised to misappropriate the trade secrets, which will result in the employer imposing less restrictive covenants to minimise the reputational and hiring costs; hence, the socially optimal outcome can be reached by effective minimum standards.

All in all, the harmonisation of trade secrecy laws in the EU can lead to higher efficiency in the innovation economy through optimal use of non-competes, because it reduces transaction costs and, with an effective minimum standard, increases the deterrence of departing employees from stealing secrets, therefore employers will not be induced to force highly restrictive non-competes for the protection of their trade secrets. This brings about additional social benefits, for two reasons: firstly, the higher mobility of employees leads to knowledge spillovers that are essential for the development of innovation; secondly, the allocation of resources can only be optimal if knowledge employees in general are allowed to change jobs, trying to be employed where their skills can be utilised in the most efficient way.

CHAPTER 5: DISCUSSION AND CONCLUSION

5.1 Implications of the Analyses and Recommendations to EU Policymakers

The previous analyses of three strategic scenarios point out that there are two main implications for EU policymakers: firstly, harmonised trade secret laws reduce the uncertainty surrounding transactions in the innovation economy, bringing about trust among parties from different Member States; secondly, the harmonised laws must include efficient minimum standards for remedies, in order to deter the parties not yet privy to given trade secrets from misappropriating them. Even though the analysis in this thesis is concerned with cross-border situations within the EU, with the aim of highlighting the benefits and importance of a Common Market, trade secret law harmonisation can lead to improvements in the innovation economies of Member States because of the positive effects of an efficiently designed regulation and optimal minimum standards, given that these were missing in certain countries.

When deciding on the manner of harmonisation, it is important first of all to decide on the tool used for harmonising laws. Even though a regulation would lead to relatively high consistency across Member States,²¹² i.e., to lower uncertainty, trade secret laws in the medium run could not be effectively harmonised in a regulation, as there is need for higher flexibility,²¹³ since so many currently different (to various extents) interwoven branches of law are involved in trade secret legislation (including labour law, antitrust law and unfair competition law); therefore, a directive would mean the best solution, just as it has been proposed by the Commission.²¹⁴ Within the directive, it is crucial to make provisions for the elements of trade secret laws that were analysed earlier. First, a well-defined definition of trade secrets will cover all the possible types of information that may constitute a secret, but it is not too broad, lest protection be restrictive and lead to suboptimal results: that is why the widely applied principles of reasonable efforts to

²¹² "What Are EU Directives?," FindLaw UK, accessed May 9, 2014,

http://www.findlaw.co.uk/law/government/european_law/basics/500358.html. ²¹³ Impact Assessment, 66.

²¹⁴ "Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the

Protection of Undisclosed Know-How and Business Information (trade Secrets) against Their Unlawful Acquisition, Use and Disclosure," *EUR-Lex*, November 28, 2013, http://tinyurl.com/o2w5req.

maintain secrecy, and reverse engineering and parallel development need to be allowed for as lawful ways of appropriation. It is crucial, furthermore, to cover precisely the conducts of misappropriation in case of alliances, licensing transactions and employment relations: in all three cases, ambiguity in the law about what constitutes misappropriation may lead to blurry lines between lawful and unlawful appropriation methods, which would impose uncertainty and higher costs on trade secret owners, and it would lead to inefficient results. Last, but not least, not only substantive, but also procedural rules of Member States have to be harmonised, because a large extent of the unwillingness of EU companies to transact with trade secrets may come from their fears of even higher levels of public disclosure during litigation. Empirical evidence shows that stock markets and investors are sensitive to trade secret misappropriation cases;²¹⁵ companies may have fears about the secrecy of the litigation procedure, and they may decide not to report theft at all.²¹⁶ Hence, if secrecy requirements during litigation are harmonised at an insufficiently low level, efficiency may not change at all; in fact, it may even worsen, since some countries may drop their previously higher standards to adapt to the lower standards set by EU legislation.²¹⁷

One final area remains, in which, similarly to litigation, not only harmonisation, but setting minimum standards is the key: remedies. As it has been established earlier, there are significant differences among Member States in the EU in the use of criminal law (both in actual use and in the extent of penalties); it has also been highlighted that the USA introduced criminal sanctions already in 1996 in the form of the EEA. It is still questionable, however, whether a directive for harmonising should include only civil or also criminal sanctions as a minimum standard.

From an efficiency point of view, the basis for comparison should be first of all the deterrence effect of the two liability systems. In order to promote innovation in the three scenarios this thesis dealt with earlier, the deterrence effect needs to be high enough to lead to higher levels of

²¹⁵ Carr and Gorman, "The Revictimization of Companies by the Stock Market Who Report Trade Secret Theft Under the Economics Espionage Act," 52.

²¹⁶ Searle, "The Criminalization of the Theft of Trade Secrets," 48.

²¹⁷ "Transposition Guidance: How to Implement European Directives Effectively" (Government of the United Kingdom, April 2013), 6, http://tinyurl.com/n62usbu.

trust and optimal choices for all players involved. From such a perspective, criminal law seems to offer a more efficient solution than civil liability.

Comparative institutional analysis suggests that criminal law has three main advantages over civil law in terms of deterrence. Firstly, it shifts the focus of the law to individual bad acts, allowing for a stricter and clearer standard than in case of tort cases with different standards, such as negligence;²¹⁸ this higher standard can be associated with higher levels of punishment, which makes stealing secrets costly compared to reverse engineering or parallel development, encouraging companies to innovate through these channels, which results in the development of the innovation economy.²¹⁹ Secondly, criminal law allows for centralised decision making as opposed to civil litigation.²²⁰ Lastly, and most importantly, criminal law solves the problem of the injurer being judgement proof,²²¹ i.e., not having the necessary amount of money or assets to make up for the damages.²²² Criminal law would therefore solve a major problem with trade secret litigation in practice, namely that information has a feature that tangible property does not: once information is leaked, there is no way to make it unknown to the misappropriating party;²²³ that is why theft needs to be prevented *ex ante* by increasing the deterrence effect of the law.

A procedural analysis also highlights that there are important differences between the two liability systems, which influence their efficiency. The standard of proof is higher for criminal prosecutions, which is a necessary condition, because of the huge social and private losses that can arise due to judicial mistakes.²²⁴ Such a requirement, on the other hand, can lead to inefficient results of the litigation procedure, because it can be too costly or impossible to provide enough

²¹⁸ Neil K. Komesar, *Imperfect Alternatives: Choosing Institutions in Law, Economics, and Public Policy* (Chicago, USA: University of Chicago Press, 1997), 175.

²¹⁹ Searle, "The Criminalization of the Theft of Trade Secrets," 42.

²²⁰ Komesar, Imperfect Alternatives: Choosing Institutions in Law, Economics, and Public Policy, 175.

²²¹ Ibid.

²²² Antony Dnes, "Criminal Law and Torts," in *Criminal Law and Economics*, by N. Garoupa (Edward Elgar Publishing, 2009), 116.

²²³ Jack Ellis, "Doubts Raised over Benefits of EU's Trade Secret Harmonisation Plans," *Intellectual Asset Management Magazine Online*, October 4, 2013, http://www.iam-magazine.com/blog/detail.aspx?g=7712877f-1c40-4f20-8383-e0ebb029f43b.

²²⁴ Dnes, "Criminal Law and Torts," 112.

evidence to obtain the desired level of proof, even though the burden is borne by the state, not the victim.²²⁵ Furthermore, unlike in civil litigation, the prosecution must prove the presence of *mens rea* or a guilty mind (which can also manifest in gross negligence).²²⁶ For the purposes of trade secrecy laws, this creates the requirement that the misappropriating party must reasonably have known that they were in fact unlawfully using a secret.²²⁷ This, however, is in perfect line with the usual requirement of trade secret law of reasonable care: if reasonable care is taken to keep the information hidden, the misappropriating party can reasonably be expected to have known about the protected nature of the information at hand. Lastly, as opposed to tort cases, the harm caused needs to have a public element: there is wider social concern in criminal procedures than in tort cases, given the possibility of future harm to other members of society and the wastefulness that criminal acts cause through imposing extra precautionary and protection costs on society.²²⁸ The often-examined element of trade secret laws is exactly that of wasteful costs: in most economic analyses, the legal protection of trade secrets results in higher efficiency due to lower costs of prevention.²²⁹

However, from an efficiency point of view, a number of questions arise regarding the efficiency of criminal laws being harmonised across countries. The Impact Assessment accompanying the Commission's current proposal ²³⁰ mentions concerns about the basic principles of proportionality and subsidiarity, frictions may be caused in the individual legal systems of Member States, due to significant differences in criminal law legislations and to the fact that patent and trade secret cases are often prosecuted together, which can lead to high uncertainty about the outcome of trials. Most importantly, however, criminal sanctions can create a chilling effect, which would exactly offset the open and trusting environment that trade secret harmonisation is supposed to achieve: companies may be unwilling to team up in research

²²⁵ Impact Assessment, 60.

²²⁶ Dnes, "Criminal Law and Torts," 113.

²²⁷ Searle, "The Criminalization of the Theft of Trade Secrets," 41.

²²⁸ Dnes, "Criminal Law and Torts," 114–117.

²²⁹ Posner and Landes, "The Economics of Trade Secrecy Law."

²³⁰ Impact Assessment, 64–65.

activities with others or to license technology from them, just as employees may be incentivised not to change jobs or engage in self-employment later on, given the possibility of criminal trials against them.

A more practical issue is the question of enforceability of criminal sanction in different Member States: can criminal law remedies be harmonised in the EU? In two out of the three cases, the possible offenders are obviously companies: business partners or licensees of confidential information or technologies; when it comes to employee non-competes, the involvement of corporations might be less intuitive, but, as the cited Microsoft case shows, the new employers tend to be sued along with employees, especially if they can be expected to have reasonably known about the non-compete and its relevance to the new employment contract. Therefore, it is a crucial question whether there is divergence among EU Member States regarding the criminal liability of companies: the higher the diversity of such criminal provisions, the lower the effectiveness and applicability of harmonised criminal sanctions in trade secret cases. A comparison of the legal systems of criminal liability reveals that there is a great level of divergence among the most influential civil law systems, i.e., Germany and France, and the common law of the UK, with Germany applying only administrative law to criminal liability of corporations, while even France lags behind the UK in terms of criminal liability of corporations.²³¹

What can be deduced from an efficiency point of view is, therefore, that introducing harmonised criminal sanctions in a trade secret law directive is risky: due to the questionable efficiency effect, and the divergent nature of criminal law, and especially the criminal liability of corporations in different jurisdictions, it can be concluded that criminal sanctions should not be included in a directive harmonising trade secret laws in the EU; this is also in line with the more pragmatic

²³¹ Anca Iulia Pop, "Criminal Liability of Corporations - Comparative Jurisprudence" (Michigan State University College of Law, 2006), 5–6, http://www.law.msu.edu/king/2006/2006_Pop.pdf.

stakeholder-focused Impact Assessment that supports the Commission's proposal on harmonisation.²³²

As for civil remedies: they should be high enough to cause substantial deterrence among possible misappropriators, but they should not be too harsh as to create a chilling effect and refrain businesses and employees from investing in partnerships, reverse engineering, new product development and hiring the best employees or joining the most fitting companies. From a practical viewpoint, however, clear definitions and secrecy during litigation can be more important to businesses, since the difficulties of evaluating the value of trade secrets and the possible judgement proof being of misappropriators make remedies less useful for businesses in protecting their information than pragmatic and flexible substantive and procedural rules.²³³

5.2 Conclusion

This thesis hypothesised that the harmonisation of trade secrecy laws within the European Union would support the development of the EU's innovation economy. Trade secrets constitute the most important appropriation tool for innovative businesses, which gives ground for paying special attention to them. This thesis established that the laws protecting trade secrets are currently scattered within the EU, not only among different branches of law, but also among different Member States. Selected indicators also point out that the knowledge economy of the EU does not function efficiently, and it lags behind that of the EU's most important peer, the United States of America.

After establishing the current situation, this thesis asked how trade secret laws could affect the innovation economy of the EU; the answer found is that intra-EU innovation activities involve transactions relating to trade secrets, and policymakers can influence the functioning of the innovation economy through increasing the efficiency of these transactions. Three such scenarios were identified: horizontal transactions, where firms form cross-border R&D alliances; vertical

²³² Impact Assessment, 64–65.

²³³ Ellis, "Doubts Raised over Benefits of EU's Trade Secret Harmonisation Plans."

transactions, where a licensor gives access to his or her trade secrets to a licensee from another country; and, lastly, cross-border employment contracts of knowledge workers. The strategic behaviour of parties was examined through simple models of game theory and private payoff functions, focusing on how the law can change the decision patterns of individuals, so that they align to the socially optimal outcome.

In all three scenarios, it was found that harmonised trade secrecy laws would reduce transaction costs to the parties involved, which would incentivise them to take part in cross-border innovative activities; not only private benefits, but also social welfare can be maximised this way, not to mention the increased competitiveness of the EU's innovation economy. This work also finds, however, that harmonisation alone is not enough to achieve the highest efficiency: there is also need to introduce effective minimum standards, with special regards to confidentiality during litigation, and to the remedies offered.

The most important message to policymakers of the EU is that trade secret law harmonisation is a must, and the best way to do so is introducing an EU Directive to leave space for legislators to adapt national laws in the most effective way. There is a need for clear definitions and the highest level of secrecy possible in litigation procedures; as for liabilities, the current legal environment of the EU does not make is possible to implement criminal actions in the foreseeable future, but civil liabilities need to be designed so that they efficiently deter misappropriation.

While this thesis fills a gap in the current literature on the topic of trade secrets, there is much space left for analysis, which this work could not fill due to a lack of resources and space. Even though a comprehensive impact assessment has been made at the Commission's request on the topic, further, empirical, and academic research is also needed with regards to how businesses would react to a Trade Secrets Directive; this would be necessary for empirically supporting the models introduced here, and also for helping the policymakers decide on subtitles of the law that cannot be grasped in simple models. All in all, this thesis highlights how trade secrets have undeservedly been neglected in EU policymaking; it also welcomes the proposal of 2013 of the Commission on the matter, and it pushes for the implementation of the recommendations in this thesis in order to boost intra-EU innovation activities, leading both to higher social welfare and competitiveness in global markets.

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