

Damages Valuations of Trade Secrets: Evidence from the Economic Espionage Act of 1996

Abstract

This paper reports on an analysis damages valuations of Trade Secrets used in prosecutions under the U.S. Economic Espionage Act (EEA) of 1996. It considers the Income, Cost and Market based models used to make these calculations and their relative merits. A statistical analysis of the EEA data demonstrates that damage calculations are highly diverse and that courts use the lower end of the value range. Finally, it considers the policy implications of this evidence.

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1. Introduction

The value of Trade Secrets remains elusive due to their intangibility and inherently secret nature. These characteristics obfuscate the true value of Trade Secrets and have hampered their study. Despite these obstacles to academic observation, Trade Secrets play an important practical economic role in protecting innovation and strategic business information. Unlike their more formal counterparts, patents, Trade Secrets offer innovators a means of protecting innovation without a formal approval process, disclosure or time limit as noted in Scotchmer (2004).

Given the obstacles to their study, it is not surprising that Trade Secrets have remained relatively neglected in academic research as in Lerner (2001). However, developments in U.S. criminal law have opened the door for further study. In 1996, amidst concerns of lack of legal protection against foreign economic espionage, the U.S. enacted the Economic Espionage Act (EEA.)¹ The act unified Trade Secret law at the federal level and criminalized the theft of Trade Secrets. In this paper, data from 12 years of prosecutions (1996-2008) have been gathered and these data provide a rich source on the use, theft and value of Trade Secrets. This paper seeks to investigate the value of Trade Secrets using evidence from EEA prosecutions. Given the data collection challenges surrounding Trade Secrets, the EEA prosecution data represent a unique empirical source for the analysis Trade Secrets.

Academics and practitioners alike have long sought to determine the value of ideas and innovation protected by Trade Secrets (see Eaton and Kortum (1995) and Helpman (1993)). Accurate valuation of ideas is challenged by their quasi public good and intangible nature. Like a pure public good, ideas are non rival; however, they are not strictly non-excludable as their communication and dissemination can be limited. Intellectual Property Rights (IPR) enhance the excludability of ideas, transforming them into collective (or club) good.² In the case of patents, the information remains non-rival, but the application of the information into processes and products is limited. As noted in Noam (2004), “The difficulty of estimating the demand for public goods is a major problem for public resource allocation. Unlike private

¹ 18 U.S.C. § 1831–1839

² A “collective” or “club” good is a good which is non-rival but excludable.

goods, public goods are not traded in a market, and no mechanism exists which relates quantities with their price.” These difficulties also spill over to the valuation of collective goods (see Graves (2009) for a discussion.)

The intangible nature of the ideas Trade Secrets seek to protect also poses challenges to the valuation of Trade Secrets. Direct valuation of an idea itself is difficult, as the demand for ideas is actually the demand for the processes it improves and the products it creates, rather than for the idea itself. Traditional means of valuation (such as cash flow analysis, replacement cost and comparison to benchmark assets to establish a market value) are compromised by the intangibility of ideas. The attribution of future cash flows to an idea is dependent on many other, both tangible and intangible, inputs. Unlike other inputs, an idea does not necessarily depreciate with consumption. The life expectancy of an idea is also uncertain as it may prove long lasting (e.g. the idea of the wheel) or short lasting (e.g. the idea for the portable c.d. player.) A costing of the inputs used in the creation of the idea is also hampered as ideas stem from various creative processes and may be the result of years of work, or of an instantaneous flash of genius (Zwillinger and Genetski (2000)). Sales of benchmark assets are difficult to establish, due the unique nature of each new idea. These issues, and others surrounding the valuation of Trade Secrets, and the ideas they protect, will be further explored in this paper.

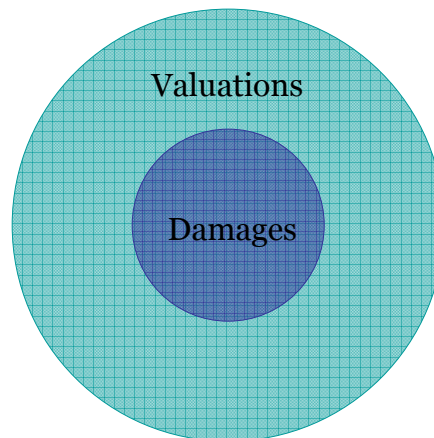
Researchers have attempted to overcome some of the difficulties associated with IPR valuations when determining the value of patents (Bloom and Van Reenan (2002)). The valuation of Trade Secrets stems from the models created for the valuation of patents. Legally, more secure, better defined and publicly disclosed, patents are a clearer form of IP than Trade Secrets. One clear advantage which the valuation of patents has over the valuation of Trade Secrets is that patents have a well defined expiration date of twenty years. While this date may be tempered slightly by market obsolescence, cumulative innovation and invalidation, the fact that patents have a terminus greatly strengthens the validity of their valuation, for example, through methods such as discounted cash flow or options modeling. However, these, and other models, lose accuracy when applied to Trade Secrets, because of the greater legal ambiguity of Trade Secrets, and their lack of an expiration date. Additionally, the very secrecy itself of Trade Secrets means that empirical evidence of Trade Secrets is limited. Patents, on the other hand, benefit from publication and disclosure which enhances the evidence available to researchers. As Anson, in Halligan and Weyland (2005)

notes, “The value of the Trade Secret is an implied value with no tangible proof that the value would have or could have been realized.” (Anson and Weston (ed.) (2005), p. 84)

Discussions of the valuation of Trade Secrets, or of any intellectual property, via their estimation arising from court assessed damages must inevitably confront the ambiguity between damages and valuations. Valuations seek to determine a market value or an asset whereas damages generally seek to assess the value lost as a result of the harm created. As seen in the Venn diagram in Figure 1, all damages estimates can be considered valuations, but not all valuations can be considered damages estimates. As Smith and Par (2005, p. 615) note, “Infringement damages are yet another measure of value under unique circumstances.” That is, damages are a proper subset of the more general category of valuations.

Figure 1

Damages as a subset of Valuations



Firms often use traditional economic valuation methods, such as discounted cash flow methods, for internal valuation and accounting purposes (Block and Hirt (2002)). However, for external business valuation methods or acquisition underwriting, the more conservative damages approach may be more appropriate. Firms may find it more prudent to think of Trade Secrets in terms of what would be the value in a legal dispute rather than what would be the value of it to the company internally. The test of value becomes not one of an internal firm dialogue, but ultimately of what value will stand up in court. As noted by Anson in the introduction to Halligan and Weyland (2005, p. 84),

“...because the context of value for a Trade Secret is usually done in litigation (and far less often in a business transaction), the definition of value is equal to damages, which in turn is equal to loss of future income or loss of current and competitive value. The authors emphasize a key point: a Trade Secret can only be validated in a litigation environment. As

to the conclusions of value for Trade Secret, the context again is different, since value is usually established in a litigation context.”

For the purposes of this paper, I will use both the terms “damages” and “valuation” with the intent that “damages” (along with “damages estimate” and “damages calculation”) refers specifically to court valuations of Trade Secrets and “valuation” to the more general concept of determining a monetary value for an asset.

The paper further develops these ideas in the light of evidence from the EEA. Section two provides a brief literature review of the multidisciplinary research on Trade Secret valuations. Section three examines the principle of damages and dispute valuations. Section four introduces the various models used to assess damages in Trade Secrets. Section five presents a statistical analysis of the evidence collected from the EEA prosecutions and finally, section six concludes the paper.

2. Literature Review

The study of intellectual property is inherently interdisciplinary. The economic need to encourage innovation is given structure by the legal framework that establishes IPR. These rights are then managed ideally through good business and management practices. Hence, using and understanding intellectual property involves a mix of economics, law and management, which is further complemented by philosophical discussions of its origins and the accounting principles guiding its application. For the purposes of this paper, the review of the literature will concentrate on the legal and economic research. Within these broad disciplines, further development of Trade Secret valuation is achieved via forensic economics, the economics of crime, case law analysis, competition law and tort law.

The development of Trade Secrets valuations has rested firmly on the economic and legal tools developed by the valuation of patents (Sickles and Ayyar in Slottje ed. (2006)). However, as noted earlier, the patent literature has reached a level of maturation not yet attained by the Trade Secrets literature. As the Trade Secret literature borrows heavily from the patent literature, it is prudent to begin with a discussion of the patent literature.

The economics literature addressing patent valuation and damages falls into three main categories: damages models and incentives to innovate, theoretical comparison of models and development of modeling and calculation methods.

Shankerman and Scotchmer (2001) look at the fundamental question of how damages affect the competitor's decision to infringe. The authors determine that infringement will not occur in equilibrium. More importantly, the authors note the circular relationship of license payments and damages. Damages based on expected license payments (Reasonable Royalty) dictate the maximum a licensee will be willing to pay a licensor as the licensee always has the outside option of infringement. On the other hand, damages based on Reasonable Royalty calculations, by definition, should not exceed the theoretical amount agreed with a willing licensor and a willing licensee. The option of infringement becomes an implicit or coerced license as the owner of the patent becomes an unwilling licensee. This circularity increases the uncertainty of rewards to innovators and thereby reduces incentives to innovate.

While Shankerman and Scotchmer restrict their analysis to a research tool with no non-infringing substitutes, their paper provides the basis for further research. Anton and Yao (2007) build on their model to include how damages calculations affect the competitor's decision to infringe. The authors model a patented cost reducing process innovation. The competitor must decide whether to infringe in light of the potential damages payments. Anton and Yao's paper further Shankerman and Scotchmer's work by including infringing and noninfringing options in the market. That is, the competitor can choose to infringe the patent or use an alternative, non infringing option. Under the Lost Profits³ doctrine and given the presence of a noninfringing substitute process, the competitor will always choose to infringe as the competitor will mimic the outcome of the noninfringing option and thus generate no Lost Profits. Alternately, the infringement may generate some Lost Profits which will be transferred to the owner of the patent leaving the patent owner in the same position as without infringement. Thus, infringement will always occur in equilibrium.

Anton and Yao further this analysis by examine the implications for incentives to innovation. As infringement always occurs in equilibrium, the Lost Profits doctrine generates an infringing option for the loser of a patent race. In essence, the Lost Profit doctrine reduces

³ Method by which damages are assessed as the profits lost due to the infringement.

the losses associated with losing a patent race and therefore reduces the relative benefit of winning a patent race and, hence, the incentive to innovate. Anton and Yao also extend their analysis to other measures of damages including Reasonable Royalties and Disgorgement (Unjust Enrichment⁴). They find that Reasonable Royalties create an implicit licensing deal with the owner of the patent and that, in equilibrium, infringement will always occur. Their findings with Disgorgement are consistent with those of Lost Profits. On the whole, the authors find that, “The analysis of these alternative damages measure illustrates that infringement is induced when a damage rule shifts the imitator’s best-response function toward higher output while the innovator’s best-response function remains unaffected or shifts toward lower output.” (Anton and Yao (2007) p. 202)

In developing a theoretical comparison of models, Henry and Turner (2007) examine the threat points created by valuation models and find that Lost Profits is the strongest for encouraging innovation. They model the decision to infringe in a differentiated duopoly setting and examine the payoffs to players. They find that, given strong patent enforcement, Reasonable Royalty generates the highest incentives and is the only regime which will deter infringement. However, if patent enforcement is uncertain, then Lost Profits generates the highest incentives to innovate for valuable patents. The authors are highly critical of the Unjust Enrichment regime which they find does not deter infringement. Rather importantly, the authors note, “In practice, setting a damage award for Lost Profits is as much of an art as it is a science but it clearly relies on economic benchmarks.” (Henry and Turner (2007) p. 31)

Choi (2006) also compares models but does so by emphasizing the probabilistic nature of patents. Patents are often described as probabilistic rights in that their legal strength can be challenged by invalidation and market obsolescence. Rather than being an ironclad guarantee, patents represent a probability that the innovation will maintain its legal monopoly over the course of legal challenges or market changes. In introducing the probabilistic nature of patents, Choi ties together research themes found in the damages papers here and papers such as Lemley and Shapiro (2005) addressing probabilistic patents. Using an oligopolistic model of competition between the patent owner and a potential infringer, Choi finds weakly in favor of Lost Profits. If, and only if, the infringer is more efficient than the patent owner, Lost Profits is superior to Unjust Enrichment in terms of social welfare.

⁴ Method by which damages are assessed as the profit the infringer unjustly gained as a result of the infringement.

Finally, there is a body of quasi economics literature oriented to the more practical application of the methods and calculations used in damages valuations. The following are illustrative of this genre: Slottje (2006, ed.) develops a handbook of papers written by various experts detailing the methods used for a variety of IPR. Glick, Reymann and Hoffman (2004) develop a comprehensive handbook for practitioners with an emphasis on the theory underpinning the models. Hall and Lazear (2000) contribute to a handbook for forensic economists as a reference guide for estimating damages in IPR cases. Werden, Froeb and Langenfield (2000) examine the application of merger simulation methods to modeling patent damages. Merger simulation methods use an antitrust logit model to model the market for a good with and without a merger; when applied to patents, the model examines the market with and without infringement. These practitioner-oriented works provide a comprehensive catalogue of the methods used in patent valuation. They depart significantly from the Anton and Yao (2007) and Scotchmer and Shankerman (2001) in their practitioner-focused, interdisciplinary approach.

The legal literature examines the various regimes of damages for the accuracy and fairness of damages payments in patent cases. Tomlin and Merrell (2005), in a paper borrowing themes from economics, examine the application of the Lost Profits doctrine. The authors note that the Lost Profits doctrine leaves wide berth for manipulation and inaccuracy. The authors highlight the highly subjective application of seemingly objectively derived models. However, the strength of their theoretical arguments is weakened by their quasi-economics approach which fails to substantially address the basic economic models which could underpin their arguments.

Blair and Cotter (2001) also develop a regime comparison of the valuation models. The authors conclude that the ideal model is the greater of either Lost Profits or Unjust Enrichment. They argue that, from the point of view of fairness, the legitimate owner of the patent should be entitled to at least their Lost Profits and, at the same time, the infringer should not be entitled to maintain any Unjust Enrichment arising from the infringement. The authors detail the history of the development of damages in IPR cases and argue for a reliance of precedents established in tort law as a basis for damages principles. The Blair and Cotter paper represents a purely legal argument which does not include incomplete interdisciplinary arguments.

In addressing Trade Secrets damages calculations, the economic literature is not as well developed as the law literature. The economics literature focuses on the application of patent models to Trade Secrets, cases rather than developing Trade Secrets models independently. The three handbooks mentioned previously, Slottje (2006) and Glick, Reyman and Hoffman (2004), and Smith and Parr (2005), include discussions of this kind. It should be noted, however, that these handbooks are not pure economics books but are intended for an interdisciplinary audience.

In another handbook, Halligan and Weyland (2005) present an analysis that develops Trade Secret valuation methods independently of the patent valuation models. The authors, a lawyer and a technical Trade Secrets expert, provide practitioners with a financial and legal analysis of Trade Secret valuation. Relying heavily on discounted cash flow models, the authors present a practical approach to valuing Trade Secrets and note that Trade Secret valuation often occurs in the context of litigation (Halligan and Weyland (2005), p. 84).

The economics literature lacks a body of empirical research of Trade Secrets valuation. In contrast, the empirical examination of patents is much broader and more established. At the time of writing, Lerner (2006) and Zwillinger and Genetski (2000) are the only identified empirical papers addressing Trade Secrets valuation. In contrast, the patent literature has a large body of developed literature including key papers such as Shankerman and Pakes (1986), Lanjouw and Shankerman (1997), Lanjouw (1998), Gallini (2002) and Hall, Jaffe and Trajtenberg (2005).

Carr and Gorman (2000) examine the financial impact on a firm's stock prices following an announcement of the firm being a victim in an EEA case. While the paper is not specifically devoted to the valuation of the stolen Trade Secrets, the authors estimate the value of eleven of the relevant Trade Secrets via a survey of relevant players (lawyers, firm executives etc.) and note that the values varied depending on the point of view of the player. Like this paper, the authors, chose to use the lower of the range of values for a particular Trade Secret in order to achieve a more conservative estimate.

Lerner (2006) examines approximately 500 litigation cases from two states known for their innovation, Massachusetts and California. Lerner notes that the probability of winning a trade

secrecy lawsuit is less than 40% and only 9% result in damages. This compares to a roughly two-thirds success rate in patent litigation. The damages awarded in the survey averaged \$1.5 million which is roughly one-third of the average patent litigation award (Lerner (2006), p. 13). Lerner highlights the fact that Trade Secrets are an empirical area ready for exploration. The Lerner paper represents a significant advancement in the body of trade secrets economic literature and is the only economics paper identified which, like this paper, uses empirical evidence from court cases for Trade Secrets research.

The law literature addressing Trade Secret damages shows heavy influence from economics. The handbooks noted earlier represent a mixture of law and economic scholarship. Zwillinger and Genetski (2000) present a comprehensive catalogue and legal analysis of the damages methods used in EEA cases. As this paper will argue, the authors conclude that, while no method is ideal in all cases, Reasonable Royalty presents a fair method to use in EEA cases. The Zwillinger and Genetski paper departs from the previous body of EEA literature (e.g. Mossinghoff, Mason and Aoblon (1997) Carr, Morton and Furniss (2000) and Effron (2003)) by analyzing the actual EEA cases and the practical application of the damages methods.

Finally, Smith (2002) analyzes the legal application of patent damages principles to Trade Secrets. Smith develops the legal arguments of patent damages and logically bridges the gap between patents and Trade Secrets. The author, like others, notes that the law concerning Trade Secrets, particularly Trade Secrets damages, is “comparatively underdeveloped” when compared to patents (Smith (2002), p. 821). In practice, as Smith outlines, lawyers in Trade Secrets cases borrow from the more established body of patent case law. This theme of basing Trade Secrets damages analysis on the models established for patents can be found throughout the literature as in Glick, Reymann and Hoffman (2003) and Zwillinger and Genetski (2000).

3. Principles of Damages and Dispute Valuation

The principles and justification of damages are central to the legal arguments in the application of damages. While economic scholarship pays less attention to these philosophical justifications, these principles are important as they dictate the function of damages calculations. Damages assessments have two primary goals: one, to make the victim whole “but for” the infraction and two, to strip the perpetrator of any unjust enrichment gained from the infraction. In some cases, “enhanced” damages may go even further as to financially punish the perpetrator and create a disincentive for would-be perpetrators. These goals are clearly seen in civil litigation cases in which the perpetrator can be liable for up to three times the damages caused.⁵

Another important legal distinction is that between criminal and civil cases. A civil case is a dispute between two private parties in which the party bringing the complaint is referred to as the plaintiff and the other party is the defendant. Criminal cases are legal disputes in which the state seeks to prosecute a party for breaking the law. In this case, there are three major players: the prosecution (the state), the victim (party suffering from the criminal offense) and the defendant (the party accused of committing the offense.)

Cotter and Ulen (2004, p. 446) note five characteristics that distinguish criminal law from civil law:

1. “The criminal *intended* to do wrong, whereas some civil wrongs are accidental.
2. The harm done by the criminal was public as well as private.
3. The plaintiff is the state, not a private individual.
4. The plaintiff has a higher standard of proof in a criminal trial than in a civil suit.
5. If the defendant is guilty, then he or she will be punished.”

In addition to some counterfeiting crimes⁶, the theft of Trade Secrets is the one of few criminally prosecutable IP legal offenses. Other IPR disputes are civil and covered by a combination of contract, tort and other laws. This distinction makes the EEA prosecutions unique as they are not disputes between two parties but the state seeking to criminally prosecute Trade Secrets thieves. Civil Trade Secrets cases seek financial compensation and

⁵ Quinn, Gene (2009), “Patent Infringement Damages,” *IP Watchdog*, available from <http://www.ipwatchdog.com/patent/advanced-patent-topics/patent-infringement-damages/>

⁶ 18 U.S.C. § 2320

may be strategic market maneuvering by the parties involved.⁷ Criminal cases, on the other hand, focus on prosecuting those who have violated the law and creating a disincentive for would-be criminals.⁸ As Cotter and Ulen (2004, p. 452) succinctly report, “... criminal punishment aims to deter intentional harms, not to compensate for them.”

In EEA cases, sentencing guidelines⁹ link the alleged value of the stolen property to recommended fines and imprisonment. Like civil cases, the involved parties are likely to differ in their opinions as to the value of Trade Secrets. Victims will seek higher values to maximize their potential restitution payment whereas defendants will seek lower values to minimize punishment. The result is that one Trade Secret may have many alleged values depending on the goal of the valuation. However, the burden of proof in criminal cases necessitates theoretically sound valuations despite the upward or downward biases of the parties involved.

4. Value Estimation of Trade Secrets in EEA Cases: Catalogue

The multitude of values is further impacted by the variety of models that can be used to calculate the value of the Trade Secrets. While these models share solid economic reasoning, their outcomes may vary significantly. Further empirical analysis will develop this theme in Section Five. Following Zwillinger and Genetski (2000), the models are grouped under three general titles: Income, Cost and Market models. While there is significant overlap amongst the groups, their division is useful for the purposes of discussion.

Often, the estimation is based not on the Fair Market Value, (the value a willing buyer and a willing seller would agree on), of the Trade Secret but the losses suffered by the victim (Zwillinger and Genetski (2000), p 324.) As the fair market value of the Trade Secret in EEA cases cannot be measured directly (due to information asymmetries, lack of a willing seller and a willing buyer etc.), loss estimation often provides a close substitute. In this section, the estimation methods used in EEA cases are described and their diverse results analyzed. In the

⁷ For a discussion on the decision to file a lawsuit, see Crampes and Langinier (2002)

⁸ A discussion on the development of the criminal prosecution of trade secrets can be found in Mossinghoff et al (1997)

⁹ 2008 Federal Sentencing Guidelines Manual Chapter 2, Part B Basic Economics Offenses, available from <http://www.ussc.gov/2008guid/TABCON08.htm>

EEA cases reported here, the valuations have been obtained from a combination of court documents, media reports and academic papers.

Due to the diverse nature of the valuations, a high and low value (as in Carr and Gorman (2001)) of the Trade Secrets was collected for the EEA cases. These values are reflected in Table 1. Due to the lack of a consistent official source for these estimates, estimates are only available for one third of the EEA cases.

Table 1

Value Estimates for Stolen Trade Secrets EEA Cases 1996-2008		
	Low Estimate	High Estimate
Mean	\$4,471,000	\$26,338,000
Median	\$576,000	\$1,916,000
Minimum	\$6,000	\$12,000
Maximum	\$39,376,000	\$271,736,000
Standard Deviation	9,540,000	66,651,000
Number of Cases	29 (2 outliers removed)	

Expressed in 2008 values

Note that the range of estimates from \$6,000 to \$272M is large. The mean of the “Low” estimates, which are more conservative than their “High” counterparts, is \$4.5M albeit with a relatively high standard deviation of 9.5M.

4.1 Income Models

The Income models, Unjust Enrichment, Lost Profits and Reasonable Royalty, all base the valuation of the Trade Secret on calculations of past and future sales and a subsequent cash flow analysis.

Unjust Enrichment and Lost Profits are two prominent Income models. From a fairness perspective, Unjust Enrichment and Lost Profits are appealing as they either strip the infringer of any profits gained illegally or return the Trade Secret owner to the situation “but for” the theft. In either case, the goal is to return the parties to the same state without the theft, *certus parabis*. This perceived fairness makes them legally attractive doctrines in addition to the fact that they are based on well established cash flow valuation models (Block and Hirt (2002)). However, these methods rely heavily on the vagaries of those involved and

are not independent valuations of the Trade Secret. That is, they are valuations based on market structure and the resulting cash flow and not on the intangible innovation itself.

4.1.1 Unjust Enrichment

Under the doctrine of Unjust Enrichment, the value or loss estimation is determined by the profits gained by the defendant from the use of the stolen Trade Secret. The goal is to determine the thieves' financial gain from the theft. According to Zwillinger and Genetski (2000) this is typically used when the victim suffered no actual loss or the loss does not fairly represent the value of the Trade Secret (Zwillinger and Genetski (2000), p. 331.) The difficulty is determining the amount directly related to the Trade Secret as the Trade Secret is unlikely to be used independently of other inputs (e.g. marketing, other intellectual property, raw materials etc.) Courts can either determine all profits related to the Trade Secret as tainted or attempt to estimate what portion of the profits were directly related to the Trade Secret.

4.1.2 Lost Profits

Calculating the victim's Lost Profits is another standard valuation method (Smith and Parr (2005). Under the Lost Profits doctrine, the damages (losses) are calculated as the financial disadvantage (measured in profits) the Trade Secret owner suffered as a result of the theft. Restoration of these profits makes the owner whole but for the theft. This estimation requires predicting the counterfactual (profits without the theft) and comparing this to the factual (profits with the theft.) Under specific market conditions, it is possible for Lost Profits to equal Unjust Enrichments (Zwillinger and Genetski (2000), p. 331.)

As Sullivan (2006) identifies, lost profits consist of multiple components; two dominant elements are price erosion and loss of market share. Market share starts with a defined market and assumes that, "but for" the infringing product, the consumption of the good would be divided amongst existing competitors based on their market share. Price erosion assumes a downward sloping demand curve and accounts for the decrease in price resulting from the increased quantity available to consumers.

4.1.3 Reasonable Royalty

A final Income method of determining values and damages in IP cases in the principle of reasonable royalty. This method estimates the damages by calculating the amount for which the Trade Secrets would have been licensed. The royalty is “based on the amount that a willing buyer would have paid a willing seller to license the stolen Trade Secret.”(Zwillinger and Genetski (2000), p. 332) This method differs from previous valuation methods as it focuses on an ex ante scenario. However, as pointed out in Shankerman and Scotchmer (2001), there is a circularity in the fact that damages are determined by reasonable royalty while, at the same time, royalties are affected by the damages assessed. If a royalty exceeds expected damages sufficiently, a potential licensor may find it more profitable to steal, rather than license, the Trade Secret.

4.2 Cost Models

The Cost models, Research and Development, Replacement Costs and Actual Damages, are based on the idea that the Trade Secret is worth the amount it cost to develop/redevelop or the amount it cost to protect.

Cost models have an advantage over other methods in that they are, in general, based on documented accounts. This minimizes the need for conjecture on the part of expert witnesses and provides judges with relatively well-documented evidence as to the alleged value of the Trade Secret. However, rational investors will invest in innovation with the intention of generating a profit not included in the cost method approach. Thus, cost models may not reflect the value of the Trade Secret to its owner.

4.2.1 Research & Development

According to Research & Development costs, the value is the amount invested by the Trade Secret owner to develop the Trade Secret. The replacement cost is the amount the defendant would have spent to independently develop the Trade Secret. These two techniques can vary as the defendant had the option of reverse engineering the Trade Secret and therefore saving on research costs; whereas, the legitimate owner may have started from a blank canvas and invested in other costly but failed projects before the successful project. Additionally,

development costs may not accurately reflect the value of the Trade Secrets. A brilliant flash of insight may cost a Trade Secret owner very little while an arduous process of developing a new formula, for example, may incur years of salaries and inputs. As Zwillinger and Grenetski (2000) note,

“Research and development overstates the loss because when someone steals a Trade Secret, the theft rarely deprives the owner of the Trade Secret from the full value of the stolen technology... Conversely, research and development costs understate the fair market value of stolen Trade Secrets because rational actors will not invest \$5 million to develop information that will be worth only \$5 million. Instead, a company invests \$5 million only with the expectation of producing a significant return on the investment.”(Zwillinger and Grenetski (2000), pp 344-345)

Thus these costs may not account for the added value of a Trade Secret to its owner.

It is also important to note that R&D costs represent a sunk cost to the owner of the Trade Secret. According to traditional theory, sunk costs are not incorporated into short term decision making processes once they have been incurred. R&D costs do not accurately reflect the value of the Trade Secret to the owner and instead are only a measure of the resources committed to its creation. The rational agent will value the Trade Secret on the basis of future expected value rather than on retrospective costs. Despite this, however, anecdotal evidence suggests that judges favor the use of R&D costs in valuing Trade Secrets (Green, Savage and Mulhern (2000), p. 266).

4.2.2 Actual Damages

Actual Damages reflect the sum of direct cost stemming from the theft. Actual Damages share some features with Lost Profits, but rather than representing income not earned due to the theft, it represents the costs incurred. Actual Damages are the sum of the costs in detecting and investigating the theft in addition to any loss of property and assets. For example, this can include the sum of extra labor hours required internally to investigate, legal expenses, cost of systems down time etc.

4.3 Market Models

The Market Models, a broad category, seek to define a Fair Market Value of the Trade Secret. The Fair Market Value is the value that the Trade Secret would command in a transaction between a willing buyer and a willing seller. A variety of tools can be employed

to determine this including the use of benchmark sales and surveys of industry members. However, one advantage of Trade Secrets is that they derive value from their secrecy and are therefore unlike to be available on the open market. Additionally, the owner of the Trade Secret, by definition, will have more complete information regarding the Trade Secret and its value than a potential buyer. These information asymmetries and secrecy hampers efforts to identify benchmark sales and substitute goods.

It should be noted that Fair Market Value is a fairly broad concept which often overlaps with Income and Cost models. In this paper, however, Fair Market Value will be used to categorize those cases in which a market value was achieved without the specific use of the other models.

5. Statistical Evidence and Analysis

5.1 Database construction

At the time of writing, there have been 147 defendants in 95 cases involving the EEA. These cases have been identified using two sources: the Department of Justice (DOJ) Compute Crime and Intellectual Property website¹⁰ and the Public Access to Court Electronic Records (PACER) system. From the DOJ, two sources were used: a table of EEA prosecutions¹¹ from 1999 to 2005 and the DOJ press releases.¹² This method identifies high profile cases and can identify Trade Secrets cases in which the defendants were not ultimately charged with EEA offenses. The second method, using PACER, requires searching each federal court by prosecution code 1832¹³.

Once identified, each case was then investigated via docket reports, court documents and online media coverage. The docket reports were the most consistent source of quantitative information and provided filing and termination dates, sentences, fines and conviction codes.

¹⁰ Press releases available from <http://www.usdoj.gov/criminal/cybercrime/index.html>

¹¹ Table of EEA Prosecutions, DOJ, Available from <http://www.usdoj.gov/criminal/cybercrime/eeapub.htm>

¹² Intellectual Property News Releases, DOJ, Available from <http://www.usdoj.gov/criminal/cybercrime/ipnews.html>

¹³ 1832 is the prosecution code for the theft of Trade Secrets, 1831 for Economic Espionage.

Linked to some docket reports were court documents (e.g. plea agreements and the original criminal complaint) which contained qualitative information about the defendant, the alleged crime, and the victim.

Media reports often provided details on the victim's relationship to the defendant, alleged value of the stolen Trade Secrets and parallel civil actions. Further information was gathered from academic papers related to the EEA.¹⁴ Depending on the court, official documents are only available from more recent cases; in some courts, the documents are only available for cases since 2004.

The use of prosecution data in economics must address the issue of adverse selection. Prosecutors select cases based on the severity of the crime and the likelihood of successful prosecution.¹⁵ Thus, the sample set is unlikely to include minor thefts and more likely to include major thefts leading to a negative skew in the distribution of the prosecuted thefts in comparison to actual thefts. Prosecutors are also more likely to seek prosecution in cases where the evidence is strong and a conviction is likely.

5.2 Statistical Analysis: Overall Data

As noted earlier, the estimates of the value of the stolen Trade Secret are grouped into low and high estimates; the "low" estimates form the basis of most of the analysis. This method of addressing the diverse nature of the values and using the more conservative, lower estimate follows Carr and Gorman (2001). For consistency, the values of the Trade Secrets, both low and high estimates, have been deflated to reflect 2008 values. A histogram of all of the low estimates demonstrates a lognormal distribution as seen in Figure 2. The majority (79.3%) of the stolen Trade Secrets are worth less than \$5 million. A probability plot, as seen in Figure 3, confirms that the data fit a lognormal distribution as all of the data points are within the 95% confidence interval indicated by the two lines surrounding the data.

¹⁴ Particularly Effron (2003), Carr, Morton and Furniss (2000), Carr and Gorman (2001), Zwillinger and Genetski (2000) and Nasheri (2005).

¹⁵ The majority of prosecutors is elected and therefore has an incentive to keep their conviction rates high to appeal to voters.

Figure 2 Histogram of Low Estimates expressed in 2008 Values

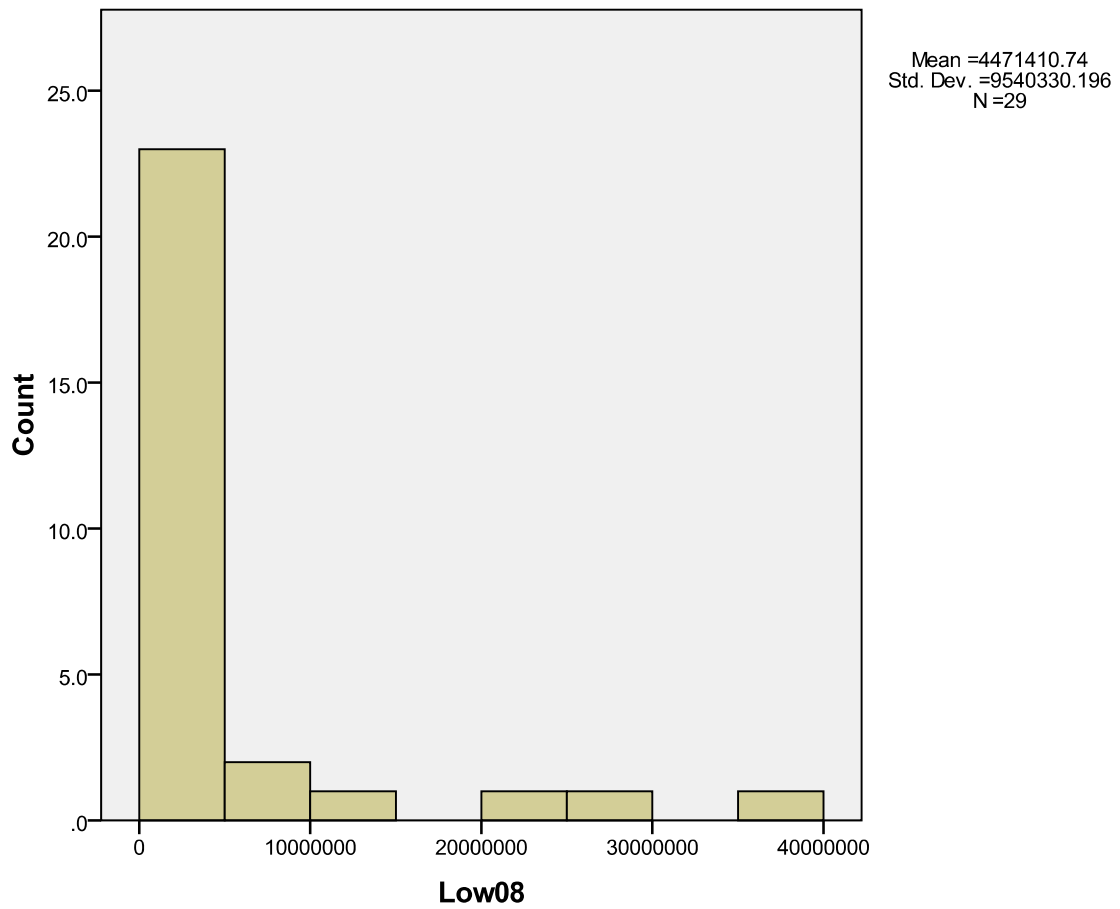
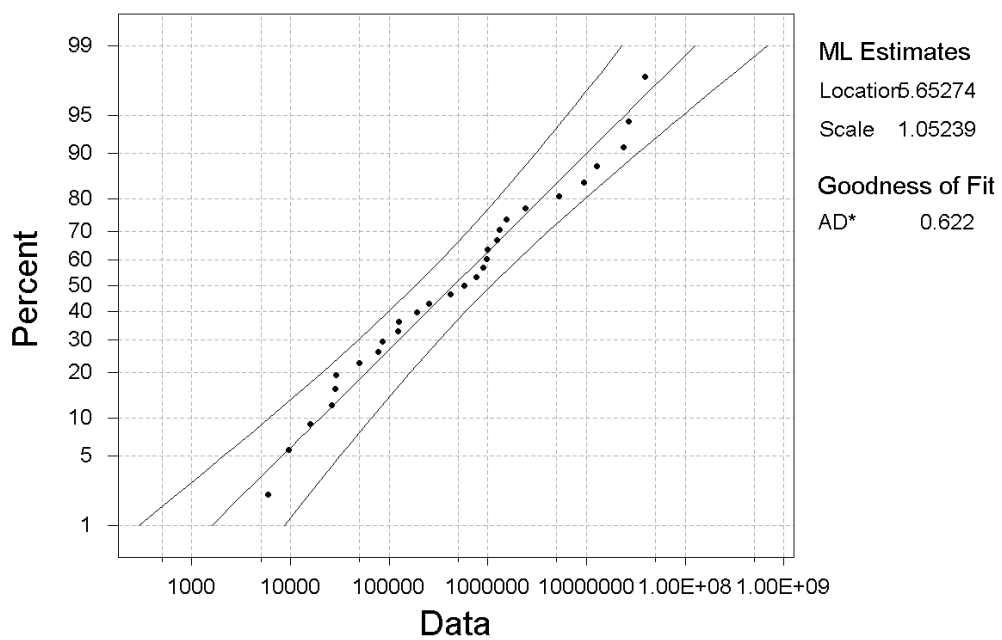


Figure 3

Lognormal base 10 Probability Plot for Low08

ML Estimates - 95% CI



The same is true for the high estimates. Figure 4 is the histogram of the high estimates which shows a lognormal distribution. Notably the range of the high estimates (with two outliers removed) is greater than that of the low estimates. Figure 5 again shows a probability plot of the high estimates against their expected lognormal distribution and confirms that all estimates are within the 95% confidence interval.

Figure 4: Histogram of High Estimates expressed in 2008 Values

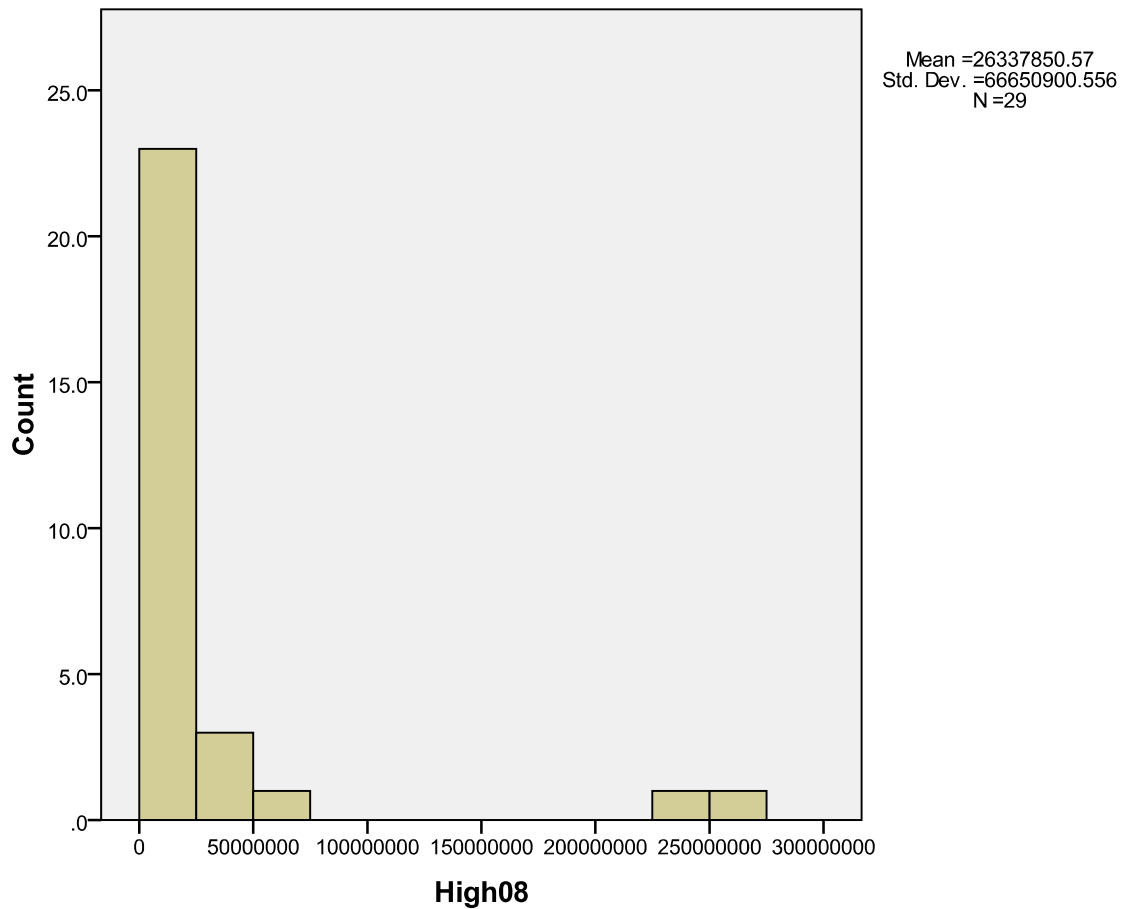
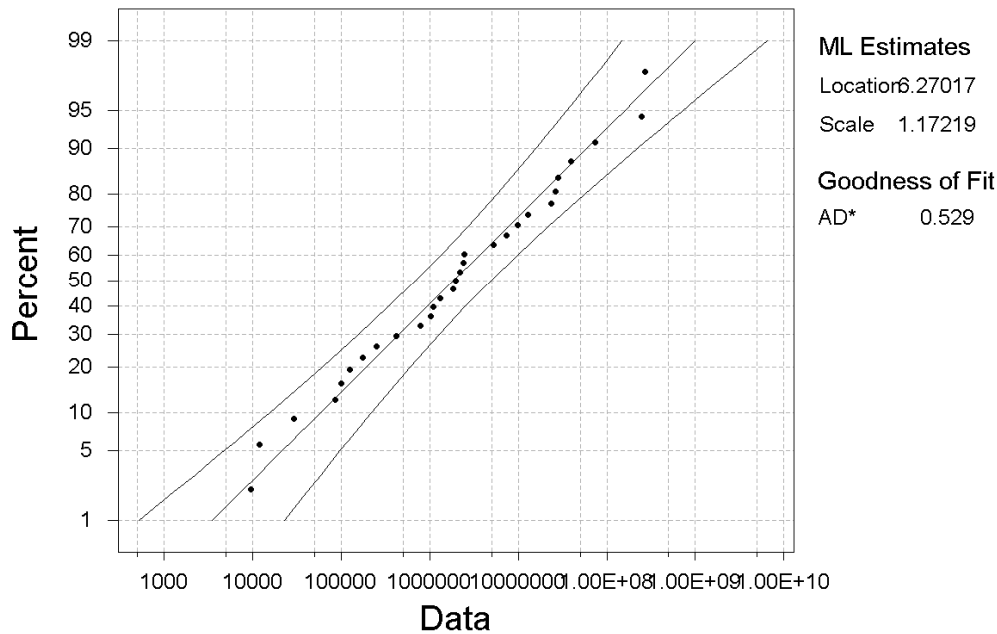


Figure 5

Lognormal base 10 Probability Plot for High08

ML Estimates - 95% CI



The lognormal distribution of the EEA data points to a situation in which the majority of Trade Secrets are relatively modest in value (in the case of the low estimates, less than \$5 million), while a few Trade Secrets are very valuable. As noted in Limpert et al (2001), the lognormal distribution is often seen in income distributions. This commonality between income and the value of the Trade Secret underscores the idea that Trade Secrets are worth what they can earn; that is, that the value estimates generated by the various models behave in a manner similar to what we would expect to see in values based purely on the potential income of the Trade Secret. While the various cost and market models are actually capturing measurements not directly based on income, they do capture income indirectly. Cost models will address the potential income of a trade secret as the rational firm will invest in positive correlation with the expected income of the innovation. The “flash of genius” phenomenon aside, firms will be willing to invest more in developing Trade Secrets with higher expected income. The same can be said for the market models as the market may chose to value a Trade Secret based on its income. Another comparison can be drawn with gold deposits which are also, as noted in Limpert et al (2001), lognormally distributed. The value of Trade Secrets follows the distribution of gold with lots of small nuggets and a few large ones.

5.3 Statistical Analysis: Methods

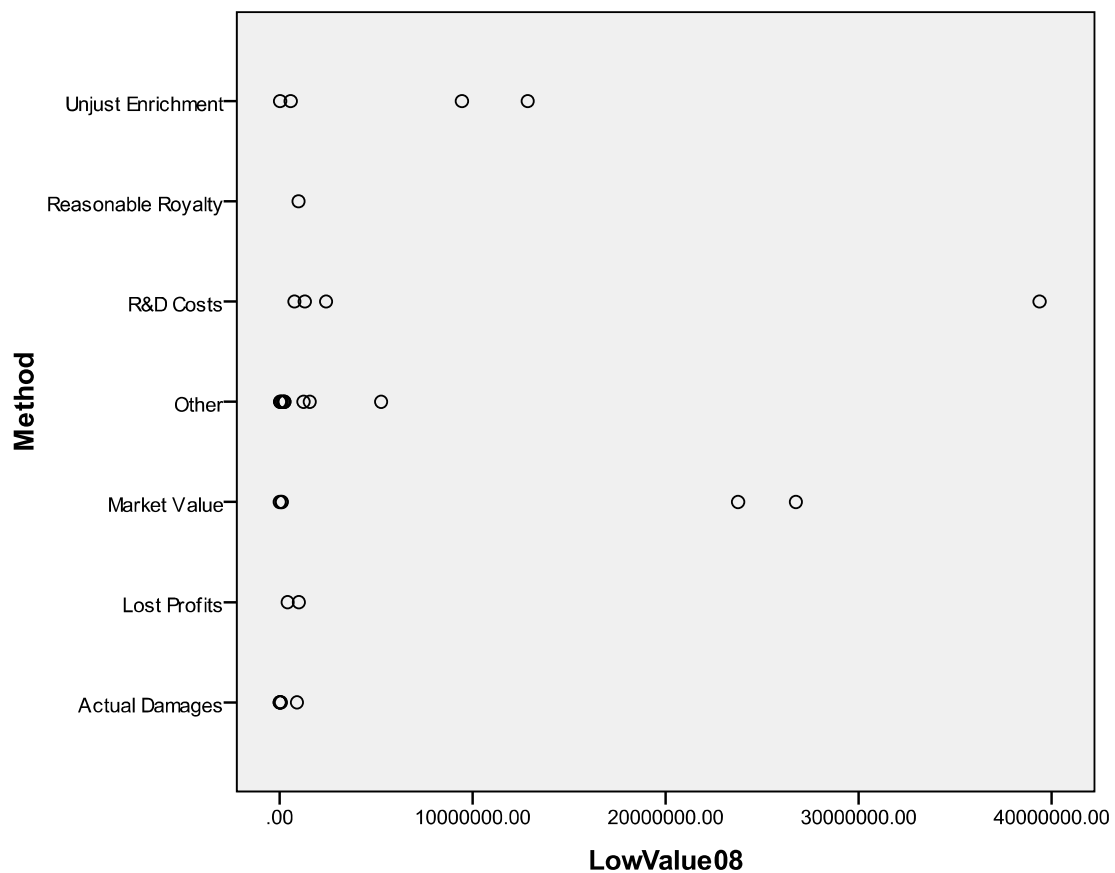
In Table 2, the cases have been tabulated by estimation method using the low estimates. The estimation method was identified in roughly two-thirds of EEA cases where an estimate of the stolen Trade Secret was published. One outlier using the Market Value method has been removed. The sample size is small with only 21 observations among six estimation methods as shown in Table 2. Additionally, the sample size is noisy with the Standard Deviation being, on average, 44% greater than the mean among the identified cases (when the sample includes cases in which the estimation method has not been defined, this Standard Deviation is 113% greater than the mean.)

Table 2

Estimate of TS by Estimation Method* EEA Cases 1996-2008						
	Unjust Enrichment	Lost Profits	Reasonable Royalty	R&D	Actual Damages	Market Value
Mean	\$5,728,000	\$708,000	\$1,000,000	\$10,968,000	\$207,000	\$10,145,000
Standard Deviation	\$6,422,000	\$411,000		\$18,950,000	\$390,000	\$13,832,000
Number of cases	4	2	1	4	5	5 (1 outlier removed)

A dot plot of the values by method, as seen in Figure 6, shows the clustering of values on the lower end of the scale.

Figure 6 Dot Plot of Low Values of Stolen Trade Secrets (in 2008 values) by Method



Student t-tests for differences between the means of the various methods are inconclusive. That is, there is no statistical proof for differences between the average values generated by the different methods as noted in the ANOVA in Table 3. The tests are conducted using the logarithmically transformed observations to account for the lognormal distribution. Grouping the estimation methods by income, cost and market models also failed to detect a difference between the means as seen in Table 4.

Table 3 ANOVA test for statistical differences between the methods

ANOVA					
LowValue08					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.755E14	6	9.592E13	1.109	.388
Within Groups	1.990E15	23	8.653E13		
Total	2.566E15	29			

Result: As the test statistic is not significant at even the 10% level, the assumption of different means is rejected.

Table 4 T-Test for statistical difference between the values generated by Cost models and Income models

Independent Samples T-Test					
	Model	N	Mean	Mean Difference	Significance
Cost and Income Models	Cost	9	4.9897E6	1.37323E6	.796
	Income	7	3.6165E6		
Cost and Market Models	Cost	9	4.9897E6	-5.15519E6	.498
	Market	5	1.0145E7		
Cost and Income Models	Income	7	3.6165E6	-6.52842E6	.275
	Market	5	1.0145E7		

Result: The test fails to prove a difference between the mean values generated by the models. None of the differences are significant at the 10% level.

There are two plausible explanations for lack of observed differences between the various models. One is that no difference between the methods exists. However, anecdotal evidence suggests otherwise. The other explanation is that the sample size remains too small to detect the differences. The inability to detect a difference is possibly due the highly noisy sample and the small sample size per method (particularly in the case of Reasonable Royalty, which has only one observation).

5.4 Comments on the use of Models

The statistical analysis of the data highlights some important issues regarding the application of the damages models.

5.4.1 Income Models

Despite their theoretically robust foundations, income models are only used in one third of all cases. This is surprising as the discounted cash flow analysis at the heart of these models is a standard tool in financial analysis. This suggests that not only will firms be more familiar

with these methods, but their long established and well researched status makes the use of these models a stronger legal tool.

Further support for the use of income models can be found in the Uniform Trade Secrets Act (UTSA). The UTSA is the state legislation which regulates civil Trade Secrets cases. The act pre-dates the EEA but is only used in 43 states; however the general principle of the act is used nationwide.¹⁶ The act states:

Damages can include both the **actual loss** caused by misappropriation and the **unjust enrichment** caused by misappropriation that is not taken into account in computing actual loss. In lieu of damages measured by any other methods, the damages caused by misappropriation may be measured by imposition of liability for a **reasonable royalty** for a misappropriator's unauthorized disclosure or use of a Trade Secret.¹⁷

(emphasis added)

The UTSA's use of the phrase "actual loss" can be interpreted to include Lost Profits and/or Actual Damages. The use of the Income models in UTSA cases further underscores the well established foundations of these models. In addition, it provides legal practitioners with a body of case law.

Reasonable Royalty is a particularly appealing model as it can be implemented regardless of the actions of the thief. Unlike Unjust Enrichment and Lost Profits, which both require that the thief actually use the Trade Secret, Reasonable Royalty can be more universally applicable. Zwillinger et al (2000) argue for the use of Reasonable Royalty in EEA cases as being most in line with Sentencing Guidelines. They argue "When ascertainable, this [Reasonable Royalty] measure values stolen information at the moment and in the context of the misappropriation, and it takes into account, but does not exclusively rely upon, the defendant's intention to exploit information." (Zwillinger et al (2000), p. 342) Despite these arguments, the EEA data shows only one identified case of the use of Reasonable Royalty. This suggests that, despite its theoretical popularity, the method is not popular with prosecutors and defendants.

¹⁶ Notes on the Uniform Trade Secret Act available from <http://www.ndasforfree.com/UTSA.html>

¹⁷ Uniform Trade Secrets act, available from <http://nsi.org/Library/Espionage/usta.htm>

5.4.2 Cost Models

The cost models are used in approximately one third of identified EEA cases. Innovative firms are likely to keep good accounts as to the Research & Development costs which makes the model appealing for its ease of application. As Glick et al (2004) argue, "... the owner's investment in the Trade Secret can be used as a proxy for the Trade Secret's minimum value."(Glick et al (2003), p. 337) Despite this, the lack of statistical difference between the values generated by using Cost Models in EEA cases indicates that R&D investment may not represent the minimum value.

Actual Damages are used in five cases which represents roughly 17% of the EEA cases with identified Trade Secret values. Despite its lack of theoretical robustness, as damages associated with the theft could be independent of the Trade Secret value, it presents a fairly straightforward legal approach. The relative popularity of this method is like due to the fact that the damages value is restricted to those damages incurred directly as a result of the theft.

5.4.3 Market Models

The Market Models have the widest range of the three types of models. This wide range is likely explained by the relatively subjective nature of the measurement of Fair Market Value when compared to other models. Unlike the Cost models, which rely on past expenditures and the Income models, which rely on past and projected income, the Fair Market Value models encompass the somewhat nebulous value placed by the theoretical seller. The reported range actually represents a conservative estimate as the removed outlier (\$108 million) was calculated using Fair Market Value. The possibility exists that some cases identified as Market Models may have, in fact, used other models to obtain the estimate.

5.5 Statistical Analysis: High versus Low Estimates

As mentioned previously, each Trade Secret included in the analysis has at least one estimated value and, in many cases, has two values – one low estimate and one high estimate. To test for a statistical difference between the two samples, a paired t-test is performed and the results are shown in Table 5. The sample size is restricted to only those cases in which the high estimate differs from the low estimate. This reduces the sample size to 16 but the test results are consistent with the unreduced sample. The test is run on the logged values of the estimates to reflect the sample's lognormal distribution.

Table 5 Paired T-Test for Difference between Low and High Estimates

Paired Sample Statistics						
	Mean	N	Std. Deviation			
LogLow	5.3563	16	.88517			
LogHigh	6.4738	16	1.18555			
Paired Sample Correlations						
	N	Correlation	Sig.			
LogLow & LogHigh	16	.462	.072			
Paired Samples Test						
	Paired Differences			df	Sig. (2-tailed)	
Log low-Log HighMean	Std. Deviation	95% Confidence Interval of the Difference				
		Lower	Upper			
	-1.11750	1.10458	-1.70609	-.52891	15	.001

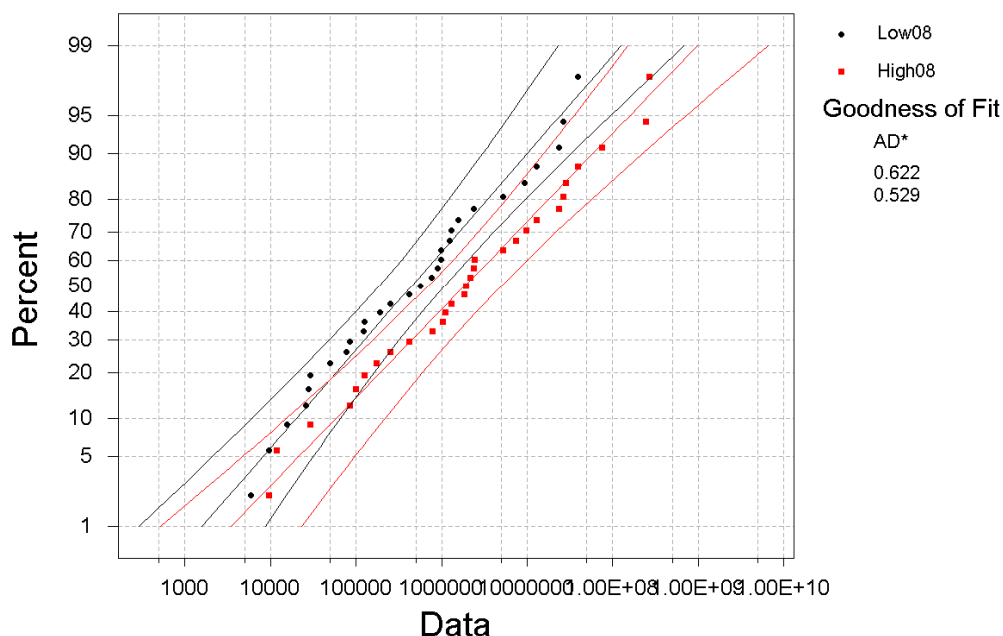
While the low and high values are correlated (coefficient of correlation is 0.462 and is significant at the 10% level), the t-test indicates that the two samples are statistically different. The mean of the Log of the Low Values is -1.11750 lower than the mean of the Log of High Values; this is significant at the 1% level. Roughly speaking, this corresponds to a difference of \$39.6 million based on the untransformed means. A non-parametric test, the Wilcoxon test, confirms the statistical difference between the two samples.

A visual representation, Figure 7, in the form of a probability plot of both the Low and High Estimates also demonstrates the differences between the two samples.

Figure 7

Lognormal base 10 Probability Plot for Low08...High08

ML Estimates - 95% CI



The implications of this statistical difference between the estimates are far-reaching. Reporting of Trade Secret theft,¹⁸ the decision to prosecute¹⁹ and sentencing decisions are all based at least partially on the alleged value of the stolen Trade Secrets. Given the differences in estimations for the same Trade Secret, this increases uncertainty for owners of Trade Secrets and presents a problem for achieving justice when sentencing thieves.

5.5.1 Statistical Analysis: Cross Referencing Method

Following Zwilling and Genetski (2000), the values of the Trade Secrets in EEA cases are estimated in a cross referencing method using a combination of actual sentences and sentencing guidelines. The guidelines associate the offence level with a corresponding loss figure. Starting with a base offence level of six to reflect the base level recommended by the

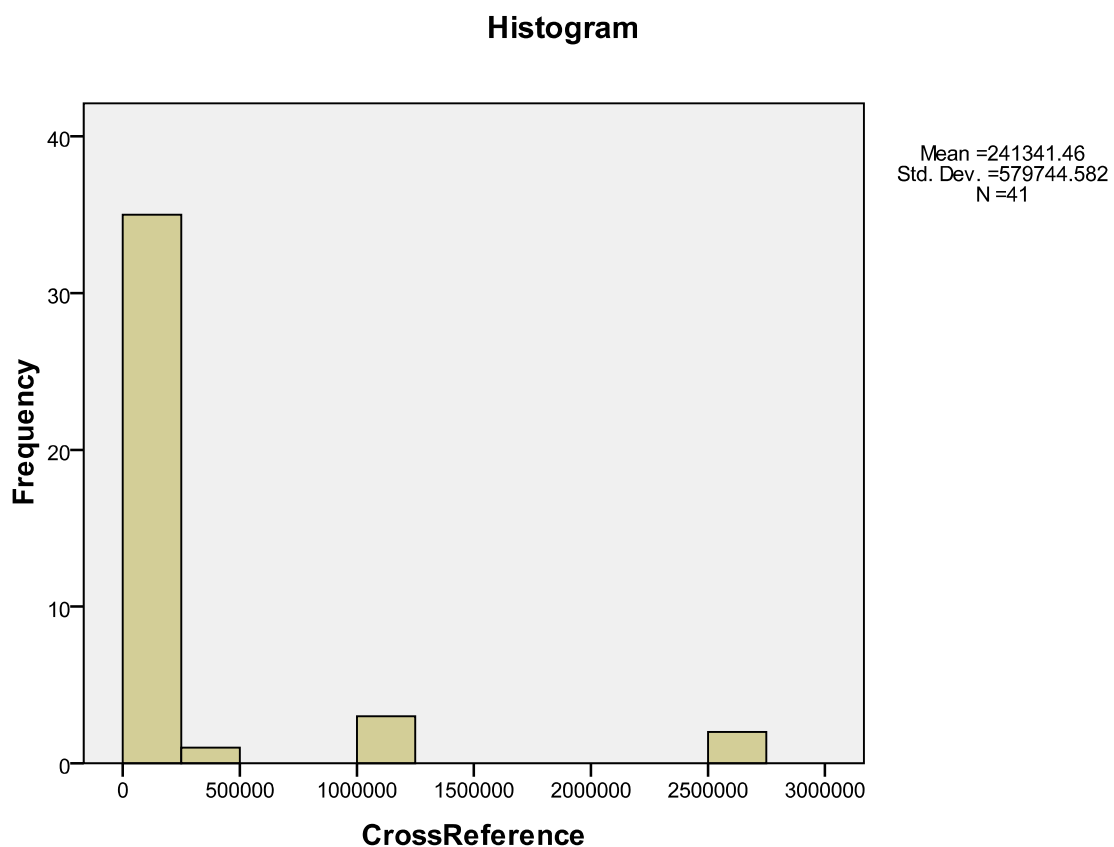
¹⁸ Victims are required to estimate the value of the Trade Secret when reporting the theft. See Reporting Intellectual Property Crime: A Guide for Victims of Counterfeiting, Copyright Infringement, and Theft of Trade Secrets Department of Justice document available from <http://www.usdoj.gov/criminal/cybercrime/AppC-ReportingGuide.pdf>

¹⁹ FBI Assistant Direct Chip Burrus “likened the FBI’s current fraud-enforcement policies – in which losses below \$150,000 have little chance of being addressed – to “triage.” Even cases with losses approaching \$500,000 are much less likely to be accepted for investigation than before 9/11.” As reported in Shukovsky, Pual, Johnson, Tracy and Daniel Lathrop, April 11, 2007, “The FBI’s terrorism trade-off,” *The Seattle Post-Intelligencer*, accessed September 09, 2008 from http://seattlepi.nwsourc.com/printer2/index.asp?ploc=t&refer=http://seattlepi.nwsourc.com/national/311046_fbiterror11.html

Department of Justice,²⁰ the figure was adjusted up by two levels for convictions including Economic Espionage or crimes committed by defendants considered insiders to the company. Using the incarceration period obtained via docket reports and the offence level, the corresponding loss estimate was obtained using the 2008 Sentencing Guidelines for consistency.²¹

Using this method, loss estimates were obtained for 41 cases as seen in the histogram in Figure 8. This method suggests a lognormal distribution however, as seen in Figure 9, the data demonstrates some departure from the lognormal distribution.

Figure 8 Histogram for Loss Estimates Calculated via Cross Referencing Method Using Sentencing Guidelines



²⁰ Based on base offense of 6 level from the D.O.J. Prosecuting IP Crimes Manual, available from <http://www.usdoj.gov/criminal/cybercrime/ipmanual/08ipma.html>

²¹ For consistency, the values used in this method all reflect 2008 values and have been calculated using the 2008 Sentencing Guidelines.

Figure 9: Histogram of Logged Loss Estimates via Cross Referencing Method Using Sentencing Guidelines with Normal Distribution Curve

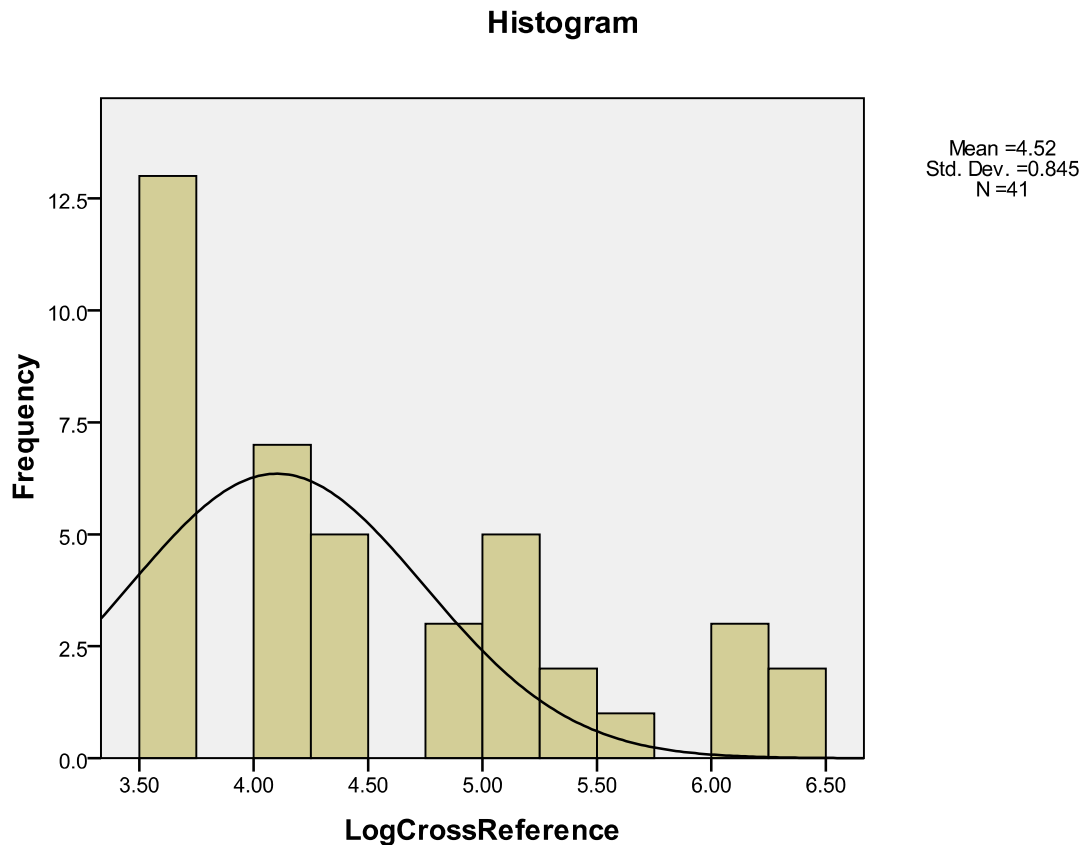


Figure 9 shows that the logged values of the Cross Referencing method do not exhibit a normal distribution and are skewed to the left.²² This is due to the clustering of values at the lower end of the range (\$5,000) which is the lowest value available in the Sentencing guidelines. This suggests that the values used in sentencing are lower than that of those in the High and Low estimates.

A statistical analysis of the data indicates that the loss estimates used in sentencing are statistically lower than both the high and low estimates as noted in Table 6 and Table 7.

Table 6 Paired Sample T-Test of Log of Cross Reference Method and Log of Low08

Paired Sample Statistics	

²² If the data were lognormally distributed, we would expect to see a normal distribution of the logged observations.

	Mean	N	Std. Deviation	
Log XRef Method	4.5684	18	8.5844	
LogLow08	6.0634	18	.95096	
Paired Sample Correlations				
	N	Correlation	Sig.	
Log XRef Method & LogHigh08	18	.417	.085	
Paired Samples Test				
	Paired Differences		df	Sig. (2- tailed)
	Std. Deviation	95% Confidence Interval of the Difference		
Log XRef Method - Log High08 Mean		Lower	Upper	
	-1.49503	.98020	-1.98247 -1.00759	17 .000

Table 7 Paired Sample T-Test of Log of Cross Referencing Method and Log of High08

Paired Sample Statistics: Log of Reverse Method and Log of High08 Estimate			
	Mean	N	Std. Deviation
Log XRef Method	4.5684	18	8.5844
LogHigh08	6.7353	18	1.07193
Paired Sample Correlations			
	N	Correlation	Sig.

Log XRef Method & LogHigh08	18	.432	.073			
Paired Samples Test						
	Paired Differences			df	Sig. (2-tailed)	
Log XRef Method - Log High08 Mean	Std. Deviation	95% Confidence Interval of the Difference				
		Lower	Upper			
	-2.16690	1.04411	-2.68613	-1.64767	17	.000

The Paired Samples test indicates that the Cross Referencing method and the Low and High estimates are statistically different samples and this is highly significant (at the 1% level.) The evidence suggests courts are using considerably lower values than the Low estimates. Statistically, the evidence shows -1.49503 difference in means in the logged variables which corresponds to difference in means in the paired Cross Referencing Method – Low 08 sample of \$6.45 million of the untransformed variables.

The correlation coefficient of 0.417 to 0.432 between the Cross Referencing method and low/high methods is of the expected sign. The values used in sentencing should be positively correlated with the values argued during the progression of the case. However, the coefficient of correlation between the Cross Referencing method and the low/high methods is slightly lower than that of the correlation between the high and low methods (0.462).

5.5.2 Implications of Difference of Statistically Different Valuations

The statistical difference between valuations of the same Trade Secret is cause for concern both in terms of the impact of the economic policy and the prosecution of Trade Secret crimes in the justice system.

As Zwillinger and Genetski (2000) note, “Because the loss analysis in an EEA case largely determines whether the defendant is going to prison, slight variations in the loss amount are quite meaningful.”(Zwillinger and Genetski (2000), p. 341) The evidence demonstrates that incarceration periods may be lower due to courts choosing to use lower valuations. This

could be due to the defendants' successful arguments for the application of the lower values. Considering that the defendant and prosecution are on opposite ends of the bargaining relationship, the statistically lower values used in sentencing guidelines suggests that this may be the case. It also suggests that courts may recognise the difficulties facing the valuation of Trade Secrets and are maintaining a conservative approach by using lower values.

While the evidence indicates a favourable environment for would-be Trade Secret thieves, it lowers the incentives to innovate. Given the wide variability of the calculation methods and the evidenced use of lower values, the Trade Secret owner faces increased uncertainty as to the strength of the protection provided by Trade Secrets. Thieves face lower disincentives to steal and the Trade Secret owner is confronted with diverse estimates of value. This inherent uncertainty therefore reduces the value of Trade Secrets to owners as a weakly protected Trade Secret has lower expected value to its owner. While Shankerman et al (2001) argue that infringement and damages payments may be beneficial for the patent owner, their argument is based on a patent protected research tool. Trade Secrets, unlike patents, by definition derive value from their secrecy. The weaker this value is protected, the lower the rewards to innovation. Thus, the increased uncertainty associated with the protection of Trade Secrets decreases incentives to innovate.

The EEA sought to increase the overall protection for Trade Secrets, unify the legal status at the federal level and provide protection against foreign Economic Espionage. The evidence uncovered regarding the damages calculations indicates that the EEA is not being used to its full strength. Legal scholars, including Carr et al (2000) have raised concerns that the EEA may go too far in increasing the strength and definition of trade secrets. The use of lower values by courts could be a deliberate move to balance out some of the controversy surrounding the increased legal power of Trade Secrets created by the EEA.²³

6. Conclusion

The value created by Trade Secrets indicates that they play an important economic role; albeit one that has received limited academic attention. The body of Trade Secrets research rests on the precedents set by the patent scholarship. A catalogue of the methods used to assess

²³ See Carr et al (2000) for a discussion on the goals and controversy of the EEA.

damages in Trade Secret cases demonstrates that the methods rely heavily on those used in patent cases. However, their application to Trade Secrets cases is challenged by the secret nature and legal ambiguity of Trade Secrets.

The EEA prosecution data provides a unique opportunity for empirical analysis of the use of Trade Secrets and their value. The analysis of the damages valuations demonstrates that the valuations are highly diverse. The loss estimates used in sentencing are significantly lower than those argued in the media and courts. The high variability of these values undermines the legal protection for Trade Secrets and ultimately decreases the incentives to innovate.

Trade Secrets remain a rich source for future research. A cluster analysis of the Trade Secrets used in EEA data may uncover commonalities across innovations. Investigations into the sample bias of cases chosen for prosecution may further illuminate the practical use of Trade Secrets. The patent damages models used in Trade Secrets require further exploration and may result in the development of models specifically for Trade Secrets. As empirical evidence of Trade Secrets is limited, the development of further empirical sources is a promising area.

To conclude, a quote from the movie *Duplicity*:

“We’re here because it’s no longer enough to have the best ideas or the best manufacturing, or the best pipeline to deliver your product. We’re here today because we find ourselves in a world where duplicity and theft are tested daily as replacements for innovation and perseverance.”²⁴

²⁴ Tom Wilkinson as CEO Howard Tully in *Duplicity*. Produced by Laura Bickford, Jennifer Fox, John Gilroy and Kerry Orent. Directed by Tony Gilroy. Starring Clive Owen, Julia Roberts, Tom Wilkinson and Paul Giamatti. DVD. Universal Pictures. 2009.

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