

USING SURVEYS
TO EVALUATE THE EFFECT
OF NON-INFRINGEMENT ALTERNATIVES
ON PATENT-INFRINGEMENT DAMAGES

Lawrence Wu
Senior Consultant

Presented at
Intellectual Property Dinner Seminar Series:
The Law and Economics of “Acceptable Non-Infringing Alternatives”
“21” Club
New York, NY
June 3, 1998
and
The Jefferson
Washington, DC
October 28, 1998

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LAWRENCE WU

INTRODUCTION

Your client is a leading manufacturer of running shoes that recently introduced a new and ingenious design of its shoes. Suppose, hypothetically, that your client has just received a letter putting it on notice that it may be infringing upon a patent that is held by Saucony. Is Saucony likely to be able to prove substantial damages from lost profits and price erosion? As is often the case, the answer hinges on whether there are acceptable non-infringing alternatives to the patented product. If there are no practical alternatives at all, then every allegedly infringing sale was one that potentially could have been made by the patentee. On the other hand, if there are many acceptable alternatives in the marketplace, then Saucony's damages are likely to be small – had there been no infringement, the patentee probably would not have gained much in sales and the price that the patentee could have charged probably would not have been much higher. With these extreme scenarios in mind, the challenge is to estimate *how many* additional sales Saucony would have obtained had your client's product not been in the marketplace. In other words, what we want to know is this: “is the patented feature so important to consumers that it is unlikely consumers would switch to alternative products that don't have the patented feature?”

There are a number of practical ways to get the answer to this question, and the option that I discuss here is the one of designing and analyzing a consumer survey. Because this is a relatively new and innovative approach, but one with which NERA has had a good deal of experience, I will describe in some detail the value of survey data, show you what is involved in doing a consumer survey, and give an illustrative example of how we would analyze a hypothetical patent infringement case involving two athletic shoe manufacturers. When I'm finished, I hope you will see that a well-designed survey is indeed a tool which has powerful uses.

Before I describe our hypothetical case study in greater detail, I know you have a few questions. One of the first questions that you probably have is, “Am I in a situation where I need an economist to design and analyze a consumer survey?” Your second question is probably, “Don’t survey firms usually call during the dinner hour and can I really rest my case on data collected like that?” Your instincts serve you well because before you do a survey, the answer to both of these questions should be “yes.” What I would like to suggest is that the answer is “yes” to both questions more often than you might think.

For example, the answer is often “yes” to both questions when market data are not available, a situation common to industries that are innovative and dynamic. Indeed, one of the great advantages of conducting a survey is that it is unparalleled in getting a present-day snapshot of the competitive environment.

A survey is also useful whenever it is important for you to understand the tradeoffs that consumers make when they shop. Transaction data from the marketplace cannot always tell you whether consumers are switching products on the basis of price or the presence of some patented feature. The reason, of course, is that what happens in the marketplace is not the outcome of a controlled experiment.

In contrast, a well-designed survey *is* a controlled experiment. The survey, which is *designed* with certain tradeoffs in mind, forces consumers to weigh the benefits of one product against the benefits of another and to choose the best one. This, of course, is exactly what you did when you filled out the survey form we sent you, which asked you to compare and rank four running shoes, each with a different price and each with its own set of features. A copy of a survey form that was sent and returned is shown in Figure 1. When evaluating the choices, each of you had to make some tradeoff, whether it was paying a higher price for the brand name you wanted or whether it was getting the cushioning system you wanted, but in a shoe that was heavier. As in the real world, these are the same issues that you would have considered had you actually been in a store shopping for shoes.

MEASURING THE EFFECT OF NON-INFRINGEMENT ALTERNATIVES

How do we get from the surveys you filled out to some measure of the effect of non-infringing alternatives? Well, to put it simply, we rely heavily on estimating the responsiveness of the market to changes in price. For instance, consider a running shoe that has a patented cushioning system. Suppose further that the manufacturer of this product increases its price. Do many consumers continue to buy the product or do they switch to alternatives? If there are many non-infringing alternatives, then customers would be more inclined to forego buying the product. In other words, demand for the patentee's shoe would be quite responsive to price. In general, the responsiveness of consumer demand for a product to changes in its price is directly related to the number of alternatives available in the market. If consumers do, in fact, consider other products to be practical alternatives, then an increase in price is likely to lead to a relatively *large* drop in sales rather than a *small* drop in sales.

This responsiveness to price is what economists call the *elasticity of demand*. It is the percent decline in the quantity purchased that is induced by a one percent increase in price. Market demand for a product is more *elastic* when the product has many economic substitutes or many practical alternatives. Market demand for a product is *inelastic* when there are few available alternatives for the product.

So, when we evaluated your survey responses, one of the things we looked at was the total market response to changes in price for any given shoe. Suppose, for instance, that the survey results were such that Nike, with its patented air cushioning system, was the most popular shoe in the market at \$112. How many of you would continue to rank that shoe as your most preferred shoe if its price were to increase relative to the others? As another example, suppose, for some reason, that Nike could not use its patented cushioning system and that it had to use an EVA (i.e., ethylene vinyl acetate) cushioning system instead. If that were the case, how many of you would continue to rank *that shoe* as your first choice? By using the survey, which can help us to better understand actual consumer behavior, we can estimate the extent to which demand for a particular product is responsive to price and the extent to which demand is responsive to the presence (or absence) of a particular patented feature.

Now, you may be wondering how we actually did this. That's a good question, so what I want to emphasize up front is that the survey form that we use is very different from the conventional survey questionnaires that you may have been asked to fill out in the past.¹ What is different is that not all of you were asked the same question. Some of you were asked to consider a Saucony shoe priced at \$80 relative to other shoes, while others were asked to consider a Saucony shoe priced at \$70 relative to other shoes. By varying the prices, we can see how the probability of choosing a particular brand changes as the price changes, which is precisely the experiment that enables us to measure consumers' *preferences* with respect to brand, features, and price. Once we know what consumer preferences are, we can then estimate the *probability* that a particular brand will be chosen.² Once we have the probability distribution of brands, we have an estimate of each brand's "*market share*," which would be the *outcome* or *realization* of this statistical model.

Can we get precise estimates? We can because for a survey of 500 consumers or so, we would have created a hundred or so different sets of choices like the one each of you received, which is probably enough to give us the variation we need. As a result, it turns out that you don't need to survey too many people to get relatively precise estimates of the price elasticity of demand.

A HYPOTHETICAL PATENT INFRINGEMENT CASE

With that as background, it's full speed ahead to our hypothetical patent infringement case.

Recently, design engineers at Saucony patented a cushioning system called the Ground Reaction Inertia Device or GRID. Prior to that time, the basic problem facing runners and

¹ The survey is also different in that respondents are not given any hint of what aspect of the shoe is being investigated. This is to avoid response bias.

² For instance, if we assume that consumer demand can be modeled by a *logit demand* function – which is based on a random utility model in which consumers make a discrete choice from a set of alternative products – then the probability that any one consumer will select brand A out of a set of *i* brands is given by the following formula:

$$\Pr(A | A \in i) = a_{A,i} = \frac{e^{b'X_A}}{\sum_i e^{b'X_i}}$$

designers was an apparent tradeoff between good shock absorption and good shoe control. Putting better shock absorption material in the sole of the shoe is “good” in that it makes the inner sole squishier, but it is “bad” in that it means that the shoe is less rigid, which means the foot gets less support.

The GRID system is basically made up of interwoven strings not unlike the strings of a tennis racket. The strings are in a cassette that is inserted into a gap hollowed out in the heels of Saucony shoes. And it works like this: when the runner’s heel hits the ground, the interwoven strings bend to the shape of the heel, absorbing the shock. At the same time, the midsole compresses, which helps to give the runner better stability. What I have described so far is straight from product information about Saucony’s shoes.

Now for the hypothetical part. Since its introduction, the GRID feature was an exclusive Saucony feature. Exclusive, that is, until (in our imaginary scenario) Fila, *your* client, came along with its own version of a GRID. Fila, as you know, is a well-known manufacturer of running shoes. And before Fila introduced its own (imaginary) impact reaction inertial device, the cushioning system in Fila’s shoes was also made of an elastomer material, but in the form of pads rather than interwoven strings. Thus, Fila’s (imaginary) new device might be regarded simply as an innovation on a feature the company was already making.

So, suppose, *hypothetically*, that Saucony files a complaint against Fila, the defendant, *alleged* infringer, and your client, for infringing on its GRID cushioning system.³ What would you do? Well, one of the first things you might do is to look for publicly available data or data contained in the two companies’ documents. If you suspect that there is not enough information out there to accurately estimate how well Saucony would have done had Fila not introduced its allegedly infringing shoe, then a consumer survey may be very helpful.

How quickly can we do this? Well, pretty quickly. If this were a real case, the survey we would have designed would have been a little more complicated than the survey form that we sent to you. For instance, we probably would have asked for some background information about each respondent and we probably would have included more brands in the survey to get a

complete set of alternative products. And although a survey would have involved the services of an independent, outside survey research firm to preserve the admissibility of the data in court, we could probably have the survey designed and the data analysis completed in a matter of weeks.

That aside, let's turn now to the survey that we did do. We can start with the world as we would have seen it, that is, the world in which there has been an alleged infringement. The results of the survey, which are shown in Table 1, suggest that in a world *with the alleged infringement*, Fila's share of the market would have been 29 percent, while Saucony's would have been 22 percent. In comparison, Nike's share would have been 24 percent and Reebok's 21 percent. Although these numbers may suggest that Fila's share is unrealistically high and Nike's share is unrealistically low, that's expected because Fila does not, in fact, actually offer a shoe with a GRID cushioning system. If this were an actual case rather than a hypothetical one, the shares obtained from a full-scale survey should be similar to the shares that we observe in the real world.

What would Saucony's share have been had there been *no* infringement? Well, it seems to depend quite strongly on whether there was any price erosion following Fila's entry into the marketplace. As shown in Table 1, assuming no change in Saucony's price, the survey suggests that in the *but-for* world of no infringement, Saucony's share would have been 26 percent. In other words, Saucony's share would have been 4 percentage points higher. Using this change in share along with an estimate of Saucony's profit margins, my calculations suggest that Saucony would have earned 21 percent more profit absent infringement.

But what if there are claims of price erosion? Suppose that Saucony actually finds it profitable to raise its prices in a world where Fila no longer sells a shoe that has a GRID cushioning system. Well, with respect to market share, the conclusions would be dramatically different. If Saucony's prices are higher in the but-for world, then its share is likely to be 23 percent, not 26 percent. In other words, at higher prices, sales of Saucony's shoes would be much lower! Thus, the data in Table 1 suggest that Saucony would have gained an additional one percent market share rather than an additional four percent had there been no infringement.

³ Like the "accused" feature, the "complaint" against Fila is purely hypothetical. I have chosen to illustrate

Of course, in estimating damages, what matters is not the increase in Saucony's share, but the additional profit that Saucony would have earned. What I found was that it would have been optimal for Saucony to raise its prices by about 4 percent. However, raising prices would have reduced Saucony's sales. Thus, it appears that price erosion would have increased damages by only about 2 percent.

Is there an explanation for these results? Without the hypothetical GRID cushioning system, Fila's share falls. Two offsetting forces account for this drop in share. On the one hand, Fila's share drops because Fila no longer offers a shoe with the GRID feature. On the other hand, Fila's share rises because the price that Fila would charge for a shoe that doesn't have the GRID feature will be lower.⁴ The data show that on balance, Fila's share drops from 29 percent to 15 percent. Clearly, the GRID feature explains to a large degree Fila's success.

Does Saucony make every sale that Fila made? No. It appears that rather than turn to Saucony's shoes, the consumers we surveyed would have turned instead to the other non-infringing alternatives in the marketplace – Nike increased its share by 7 percentage points and Reebok increased its share by 6 percentage points. Thus, contrary to our hypothetical plaintiff's claims, the presence of non-infringing alternatives in the but-for world is such that Saucony would not have made every sale that Fila had made.

There is another reason why Saucony would not have made every sale that Fila made. The reason is that Fila's brand name matters. In other words, due to the strength of its brand name, Fila would have had some sales regardless of whether its shoe had the GRID system or not. The survey shows that without the GRID cushioning system, Fila's share would have been 14 percent and not zero, a fact that you would surely want to bring to the attention of the court.

We also found that in a world where Fila's product does not contain the allegedly infringing feature, Saucony would have found it profitable to increase its prices by 4 percent.⁵ What does this

my analysis with a real company rather than an imaginary one simply to make the analysis more "realistic."

⁴ For simplicity and for purposes of illustration, the analysis assumes that Fila does not also sell a non-infringing product. Simulations show that Fila's optimal price in the but-for world would be 3 percent lower, assuming that the prices of all other products are unchanged.

⁵ Simulations show that Saucony's optimal price in the but-for world would be 4 percent higher. Fila's price is assumed to be 3 percent lower and the prices of all other products are assumed to be unchanged.

do to Saucony's profits? Again, there are two offsetting forces. On the one hand, higher prices mean higher margins. On the other hand, higher prices mean fewer sales. In the end, damages to Saucony are due largely to lost profits on lost sales at the same price. In other words, although there is some additional damage due to price erosion, it does not amount to much in relative terms.⁶

While the results here show how survey methods can be used to directly estimate damages, they can also help you identify the competitive importance of non-infringing alternatives. This is, of course, something of interest to both defendants and plaintiffs. For example, in this case, Asics did not win or lose share significantly as a result of the alleged infringement or price erosion. Without the survey, this may not have been evident.

CONCLUSION

We have had considerable experience in using these survey techniques, especially in markets where relevant market data were not available. As you know, this is often the case in markets that are characterized by innovation and invention. Of course, a survey is not applicable in all circumstances – it certainly is not a “one size fits all” solution. On the other hand, because the analysis can be used to get an independent and more accurate estimate of the elasticity of demand and the likely effect due to the presence of non-infringing alternatives, use of the survey method that I just described can be a very powerful tool. As you well know, an accurate accounting for the presence of non-infringing alternatives can be decisive.

⁶ These damage estimates are roughly 17 percent of the damages that would have been estimated assuming Saucony made all of Fila's sales. My damage estimates are roughly 55 percent of the damages that would have been estimated using the *Mor-Flo* methodology.

September 29, 1998

Dear Survey Participant,

Thank you for participating in this survey. We are conducting a brief survey to ask you about running shoes. The survey should only take a few minutes of your time, and all responses are absolutely confidential. The choices shown in the survey are not necessarily based on actual market data.

Step-By-Step Instructions:

- Step 1: Attached to this document is a sheet with two sets of four “choice cards.” Each of the cards describes a particular combination of attributes that you as a consumer may consider when deciding to purchase running shoes. Please begin by reading the definitions of these attributes, so that you are familiar with each of the terms used on the cards.
- Step 2: Look at the four choice cards contained in Set A. We would like you to rank the cards in order from your most preferred to your least preferred option. For each card, please take note of all of the information shown, i.e. brand name, price, weight, and cushion system. We understand that you may not actually want to buy any of the options shown; we are only asking for your relative ranking of these options.
- Step 3: Report your preferences by writing down your ranking at the bottom of each card (from 1 for your most preferred card to 4 for the least preferred). Please repeat the exercise for Set B.

Attribute Definitions

Brand Name: The name of the company that manufactures the running shoe. For purposes of this survey, please assume that the running shoes on the cards are available in the colors and color combinations that you like.

Price: Actual price, before taxes.

Weight: The weight of the shoe.

Cushion System: There are five possible options:

Air: Pressurized air pads provide lightweight cushioning.

EVA: Durable, aerated foam (ethylene vinyl acetate) provides lightweight cushioning and good stability.

Gel: Encapsulated, semi-solid silicon gel provides light yet effective cushioning.

Impact Reaction: Interwoven strands of elastomer polymer units provide excellent cushioning as well as excellent stability.

None

1. Please rank the four running shoes in Set A.
 1 = your most preferred shoe; 4 = your least preferred shoe.

SET A

Brand: Asics	Brand: Saucony	Brand: Nike	Brand: Reebok
Price: \$100	Price: \$94	Price: \$112	Price: \$73
Weight: 12 oz.	Weight: 12 oz.	Weight: 12 oz.	Weight: 9 oz.
Cushion System: EVA	Cushion System: Gel	Cushion System: Air	Cushion System: None
Ranking: <u> 2 </u>	Ranking: <u> 4 </u>	Ranking: <u> 1 </u>	Ranking: <u> 3 </u>

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2. Please rank the four running shoes in Set B.
 1 = your most preferred shoe; 4 = your least preferred shoe.

SET B

Brand: Asics	Brand: Nike	Brand: Reebok	Brand: Fila
Price: \$100	Price: \$83	Price: \$99	Price: \$69
Weight: 12 oz.	Weight: 9 oz.	Weight: 12 oz.	Weight: 9 oz.
Cushion System: Air	Cushion System: EVA	Cushion System: None	Cushion System: Impact Reaction
Ranking: <u> 2 </u>	Ranking: <u> 1 </u>	Ranking: <u> 3 </u>	Ranking: <u> 4 </u>

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3. Please fax this response sheet as soon as possible to:
 Esther Parker
 Fax: 914-448-4144

Table 1

Estimated Market Shares under Three Scenarios

<u>Brand</u>	<u>With Alleged Infringement</u>	<u>No Infringement (Assuming Saucony's Price Is Unchanged)</u>	<u>No Infringement (Assuming Saucony's Price Is Higher)</u>
Saucony	22 %	26 %	23 %
Fila	29	14	15
Nike	24	29	31
Reebok	21	26	27
Asics	4	5	5

Summary: Estimated Change in Saucony's Share Had There Been No Infringement

Assuming Saucony's Price Is Unchanged	22% to 26%
Assuming Saucony's Price Is Higher	22% to 23%