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BRAND NAMES BEFORE THE INDUSTRIAL REVOLUTION

Gary Richardson

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Brand Names Before the Industrial Revolution
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ABSTRACT

In medieval Europe, manufacturers sold durable goods to anonymous consumers in distant markets, this essay argues, by making products with conspicuous characteristics. Examples of these unique, observable traits included cloth of distinctive colors, fabric with unmistakable weaves, and pewter that resonated at a particular pitch. These attributes identified merchandise because consumers could observe them readily, but counterfeiters could copy them only at great cost, if at all. Conspicuous characteristics fulfilled many of the functions that patents, trademarks, and brand names do today. The words that referred to products with conspicuous characteristics served as brand names in the Middle Ages. Data drawn from an array of industries corroborates this conjecture. The abundance of evidence suggests that conspicuous characteristics played a key role in the expansion of manufacturing before the Industrial Revolution.

Gary Richardson
Department of Economics
University of California, Irvine
Irvine, CA 92697-5100
and NBER
garyr@uci.edu

Introduction

In medieval Europe, manufacturers seeking to sell merchandise to anonymous consumers in distant markets had to overcome the obstacles of adverse selection and counterfeit goods. These obstacles arose because purchasers of defective products lacked legal recourse and because intellectual property, such as patents and trademarks, lacked legal protection. Adverse selection particularly afflicted markets for durable merchandise – such as textiles and metalware – with attributes that consumers could not observe before purchase. In these markets, sellers knew more than buyers about the quality of their wares. Manufacturers could cheat consumers and had an incentive to do so. Fear of being cheated deterred consumers from purchasing durable products. Exchanges that should have occurred because they were mutually beneficial did not occur because buyers worried that sellers would deceive them.¹

Counterfeiting impeded efforts to overcome the problem of adverse selection. Today, counterfeit products account for a significant share of world trade.² During the Middle Ages, counterfeit products probably accounted for at least as large a share of the market and perhaps much more. The staples of medieval manufacturing – textiles, tools, housewares, and military equipment – were commonly counterfeited. Recent research reveals striking examples. Much of the pottery produced in Europe before the Industrial Revolution was sold under false pretenses. The forgeries were so sophisticated that they fooled consummate consumers like

¹ This note defines terms used in this essay whose definitions vary across disciplines. Throughout this essay, a reputation is a belief held by consumers about the characteristics of products that cannot be detected before purchase. Economists often label these characteristics as experience, hidden, or unobservable attributes. Quality is the true state of attributes that cannot be detected before purchase. A high-quality product has unobservable attributes that consumers prefer and is said to have few hidden defects. A low-quality product has unobservable attributes that consumers dislike and is said to have many hidden defects. Synonyms for quality such as superior merchandise and shoddy products also refer exclusively to unobservable attributes. A manufacturer with a good reputation is known to sell high-quality products. A manufacturer with a bad reputation is suspected of selling shoddy merchandise. Synonyms for good reputations, such as well regarded, widely known, reputable, and good names, refer exclusively to consumers' beliefs about the unobservable attributes of manufacturers' merchandise.

² Recent estimates indicate the value of illicit goods exceeds \$300 billion each year or 5% of the value of international shipments of manufactured merchandise (*Business Europe* 1999, Freedman 1999, Porter 1996). The share is highest in developing nations. In China, approximately 20% of all consumer durables are fake (Simone 1999). In the rest of Asia, Africa, and Latin America, the figure ranges from 5% to 25%. Floods of inferior merchandise drive genuine goods from many venues including the markets for recorded music in Brazil, videotaped motion pictures in Eastern Europe, computer software in China, and designer clothing in former Soviet republics. The hardest hit industries include software, clothing, cosmetics, footwear, movies, music, pharmaceuticals, publishing, and sporting goods. The Internet exacerbates the problem. Between one-in-ten and one-in-five web sites, accounting for a substantial share of e-commerce, sell counterfeit goods or misuse manufacturers' trademarks (Freedman 1999 and Nicholson 1998).

medieval aristocrats and modern collectors. Chemical analyses of swords that scholars believed to be archetypical Damascus steel blades show that 1 in 4 were convincing counterfeits.³

One reason for counterfeiting's prevalence was the lack of legal protection for intellectual property. Patents and trademarks arose initially in Italy during the fourteenth century, spread to industrial centers in the Low Countries during the fifteenth century, and reached England during the sixteenth century.⁴ These inchoate legal forms fell far short of modern standards, which evolved in the centuries following the Industrial Revolution. Enforcing modern standards across international boundaries became possible only in recent decades and remains far from perfect today.

While fourteenth-century manufacturers lacked twentieth-first-century techniques for overcoming counterfeiting, insufficient protection for intellectual property did not preclude the expansion of long-distance trade. Commerce in consumer durables expanded steadily from the eleventh through sixteenth centuries, a period known as the *Commercial Revolution of the Middle Ages*.⁵ Initially, durables were scarce, expensive, and seldom sold over long distances. People purchased textiles, tools, and tableware from local artisans, if they purchased them at all. At the end of the Middle Ages, durables were abundant and affordable. People purchased quantities of cloth, equipment, and furniture that would have amazed their ancestors four-hundred years earlier. The exchange of merchandise spanned enormous distances. Textiles manufactured in England made their way to the Middle East. Weapons manufactured in Italy appeared in markets in Moscow. Distribution channels became increasingly complex. Artisans sold most of their merchandise to merchants who resold it to retailers hundreds of miles away. Chains of middlemen transferred products from point of production to point of sale. Manufacturers ceased to have direct contact with ultimate consumers.

Manufacturers formed cooperatives now known as manufacturing guilds.⁶ Members of these associations lived in the same town, worked in the same industry, and sold standardized products. These artisanal alliances operated in most towns and industries. Guilds specialized in the production of particular

³ Verhoeven, Pendray, and Dauksch 1998.

⁴ Copyrights developed later, spread less rapidly, and did not arrive in the United Kingdoms for another two hundred years.

⁵ Lopez 1994

products. Successful guilds produced quantities far beyond local or regional needs and exported ever-increasing quantities from their hometowns to rural villages, distant towns, and foreign nations. Guilds from distant towns competed against each other in those markets, where the preponderance of the population lived and where guilds sold most of their merchandise.⁷

Medieval manufacturing guilds, this essay argues, employed a two-step technique to cure the twin afflictions of adverse selection and counterfeit goods. Step one involved intensive efforts to control quality. Guilds of manufacturers inspected members' merchandise, prohibited sales of shoddy products, and punished members caught selling defective output. These efforts enabled the organizations to consistently sell defect-free merchandise and establish reputations for doing so. Good reputations assuaged consumers' fears about purchasing products with hidden defects and encouraged consumption of manufactured merchandise.⁸

Step two involved selling merchandise with conspicuous characteristics. Examples of these unique, observable traits included cloth of a distinctive color, fabric with an unmistakable weave, and pewter which when tapped with a spoon resonated at a particular pitch. These attributes identified merchandise made by particular guilds because consumers could observe them readily, legitimate manufacturers could produce them inexpensively, and counterfeiters could copy them only at great cost if at all. Guilds maintained a cost advantage by keeping manufacturing methods secret, using techniques that required local resources, and selling merchandise whose manufacture required significant investment in specialized equipment. The uniqueness of conspicuous characteristics communicated reputations from producers to consumers. Communication occurred even when products passed through the hands of numerous middlemen between point of production and point of

⁶ Medieval men and women referred to these organizations by a variety of names including brotherhoods, companies, confraternities, fraternities, and mysteries.

⁷ The previous paragraphs compiled from Bridbury 1962 and 1982, Britnell 1986 and 1993, Cameron 1993, Cantor 1993, Cipolla 1980, Cunningham 1890, Dyer 1994, Hatcher and Miller 1995, Hilton 1995, Jardine 1996, Keen 1990, Lopez 1994, McKisack 1991, Moky 1990, Munro 1994, Myers 1991, Pirenne 1937 and 1952, Postan 1972 and 1987, Pounds 1994, Rorig 1967, Rowley 1986, Salzman 1923, Swanson 1989, Thrupp 1962 and 1963, Unwin 1908, Waugh 1994, and Zacour 1976.

⁸ Medieval efforts to overcome adverse selection focused on the same issues as modern efforts. In both eras, manufacturers try to communicate accurate information about their products' unobservable attributes and to enable consumers to distinguish legitimate goods from inferior imitations. Modern mechanisms for signaling quality include trademarks, brand names, warranties, advertising, *Consumer Reports*, and the Food and Drug Administration.

sale. The phrases with which medieval men referred to products with conspicuous characteristics were the brand names before the Industrial Revolution.

The foundation for this paper's hypothesis can be found in the work of George Akerlof, who introduced the issue of adverse selection to academic economists; Bo Gustafson, who first linked the issue and medieval markets; and historians, such as Richard Britnell and Robert Lopez, who seconded Gustafson's suppositions.⁹ These historians documented an important point. Guilds standardized the observable attributes of consumer durables. Why guilds did that is unknown. Some scholars have suggested that standardization was a mechanism for monopolizing markets, but recent research questions that conjecture.¹⁰ Other scholars have speculated that standardization was a method of encouraging commerce, but their speculations remain unsubstantiated.¹¹ No work documents the information asymmetries that engendered adverse selection or the way in which standardization alleviated that affliction. Whole industries have been ignored. The incentives of craftsmen and consumers have not been explored. Little effort has been made to collate the data or assess the scope and scale of the evidence. No work reveals how manufacturers established reputations, prevented counterfeiting, and disseminated information about unobservable attributes.

This essay fills those gaps in the historical record. It examines the principal industries of the British Isles, continental Europe, and Levant during the thirteenth through sixteenth centuries. A list of these industries and occupations appears in Table 1. Evidence comes from many sources. Court records reveal defects in manufactured merchandise. So do artifacts studied by archeologists, antique collectors, and museum curators. Legal codes reveal the structure of property rights and the effectiveness of enforcement. Other government documents – including tariff lists, tax accounts, inventories of property, and tax lists of municipal governments and the royal household – provide information about the nature of guilds, durable goods, and good names. Commercial documents illustrate the value of reputations and the mechanisms that transmitted information from craftsmen to consumers. Linguistic and literary studies confirm these conclusions. Guilds' internal documents illuminate their goals, structure, and activities. So do returns surviving from England's guild census of 1388.

⁹ Britnell 1993, Gustafsson 1987 p. 13, Lopez 1994 p. 129

¹⁰ Richardson 2001a and 2001b.

The number and variety of sources reflects the nature of the argument. Many types of evidence are required to substantiate the analogy between medieval markets for manufactured merchandise and modern models of adverse selection. No single source contains enough information to corroborate the hypothesis of this paper.

The following four sections present the essential evidence. Section 1 shows conditions conducive to adverse selection pervaded markets for manufactures. Section 2 describes the methods that craftsmen used to control quality, create conspicuous characteristics, communicate with consumers, and protect reputations from counterfeiters. Section 3 presents examples of guilds that successfully established reputations and evidence that those reputations influenced the decisions of consumers, price of products, and profits of manufacturers. Section 4 discusses the implications of these findings. By alleviating the afflictions of adverse selection and counterfeiting that plagued medieval markets for manufactures, the conspicuous characteristics created by manufacturing guilds facilitated the expansion of anonymous exchange at the heart of the commercial revolution of the Middle Ages.

Section 1: Information Problems Besetting Medieval Markets for Manufactured Merchandise

Medieval markets for manufactured merchandised possessed the six precursors of adverse selection. First, manufactured merchandise had attributes that consumers could not observe before purchase such as durability, safety, and effectiveness. Examples abound. Leather's life span depended on its water content.¹² Steel's strength depended on its carbon content.¹³ Gold's value depended on the ratio of precious to base metal in its alloy. Furniture's durability depended on the materials used in its construction. Chairs and chests made with unseasoned wood warped, split, and cracked. Cloth's longevity varied with the length of its fibers, the thickness of its thread, the density of its weave, and the chemical composition of its coloring. Inexpensive dyes ran in the rain and faded in the sun. Fabric impregnated with wool-processing chemicals gave its wearer an itchy rash.

¹¹ Gustafsson 1987

¹² Swanson 1989 p. 54

¹³ Blair and Ramsay 1991 p. 168

Second, ordinary men and women could not afford to replace defective purchases. Table 2 emphasizes that fact by comparing prices of products and incomes of consumers. The table reveals the large percentage of typical incomes spent on durable goods. Cheap tunics cost 15% of a craftsman's and 20% of a laborer's annual disposable income. Coats that an artisan could wear with pride cost approximately 25% of a craftsman's and 35% of a laborer's annual disposable income. For perspective, consider these analogies. During the Middle Ages, buying a cart with fittings, tackle, and iron bound wheels was like purchasing an automobile today. The cost of replacing defective merchandise must have been on men's minds. Everyone must have wanted clothing, shoes, tools, and tableware to last as long as possible. Durability must have been a pressing concern.¹⁴

Durability was not the only issue. Anxieties included safety, effectiveness, comfort, and resale value. Product failures could have catastrophic consequences. Craftsmen could be injured when their tools shattered or cauldrons cracked. Knights and men-at-arms could die if their arms and armor failed during a battlefield test. Yeoman could be poisoned if their tableware contained mercury or lead. Cultivators could starve when faulty bindings allowed cattle to wander into fields and consume crops. One-in-six accidental deaths recorded in the coroners' roles studied by Barbara Hanawalt occurred on the job in agricultural fields, construction sites, and craft workshops.¹⁵ Medical treatment, when available, was at best ineffective and often counterproductive. The effectiveness and safety of tools and equipment must have been a cause of concern.

Table 3 illuminates these facts by indicating the unobservable attributes of the principal products produced during the Middle Ages. A row refers to a group of products with similar characteristics. Column 1 indicates the industry. Column 2 specifies the type of product. Columns 6 through 8 provide explicit examples of products and potential hidden defects. Columns 3 through 5 describe the intensity of apprehension concerning three attributes that consumers had difficulty observing before purchase. Effectiveness answers the question: "will this product fulfill the functions that I intend for it?" For textiles, leather, and wooden goods, effectiveness was a secondary concern, because casual observation revealed much about the uses of a particular piece of cloth, although some aspects, such as heat retention, depended on unobservable factors, such as the tightness of the

¹⁴ Dyer 1994 pp. 174-177, 205, 208

¹⁵ Hanawalt 1988 pp. 269-274

weave and the composition of the fibers. For metals and military equipment, effectiveness was the primary concern. Hidden flaws spawned sudden failures. The possibility existed whenever metal was stressed. Alloys that minimized the probability of failure were more effective than alloys that did not. Durability answers the questions: “for how long will a product be effective? Will its effectiveness diminish over time? How quickly will its effectiveness decline?” For textiles, leather, and wooden goods, durability was the key concern, because they were made from perishable materials. The manufacturing process delayed inevitable decomposition. The length of the delay was difficult to determine without the test of time. For metals, durability was less of an issue, because alloys corroded slowly when protected them from the elements. In a few cases, however, durability did take center stage. Repeated use weakened iron with a low carbon content. Leaching altered the color and accelerated the corrosion of pewter and precious alloys that contained lead and other contaminants.

Purchasers alone bore the consequences of defective purchases, because of the third characteristic of medieval markets. People who purchased defective merchandise had few remedies. Unhappy purchasers had little recourse in courts of law.¹⁶ Lawsuits were long and costly affairs. Claims regarding quality were hard to prove. Sellers usually had to be sued in their hometown. Judges insisted *caveat emptor*, buyer beware. That legal doctrine placed liability for poor product performance on consumers, the burden of proof on the plaintiff, and the presumption of innocence on the defendant, which impeded unsatisfied consumers from successfully suing manufacturers. In medieval England and many other places, warranties were uncommon, uneconomic, and unenforceable. Courts refused to enforce warranties because the common law considered them deceptive.¹⁷ Sellers did not offer warranties because indemnification against product failure discouraged the maintenance of durable products. Sellers could not monitor the behavior of buyers. So warranties generated moral hazard. Warranties were also expensive to write and record. The expense probably exceeded the stake in many situations. Thus, sellers had little incentive to offer warranties, and consumers had little reason to trust promises about future performance.

¹⁶ Baker and Milson 1986 p. 614, Hastings 1947 p. 157, Milson 1985 p. 129

¹⁷ Baker and Milson 1986 p. 614, Milson 1985 p. 129.

Consumers also lacked the ability to retaliate against sellers of defective wares. Men and women rarely knew who made the products they purchased. People usually bought manufactured merchandise from itinerant merchants, whom they seldom saw again, or at fairs that operated for a few days each year. Merchandise seldom leapt directly from manufacturers' workshops to consumers' hands.¹⁸ Even if buyers knew who manufactured defective merchandise, they could not punish them by refusing to buy their wares in the future. Consumers purchased durable products infrequently. People purchased shoes, clothing, and similar articles when old possessions could no longer be patched or repaired. Families purchased pots, pans, tools, tableware, and similar items once in a lifetime and often passed them from one generation to the next.

Consumers' lack of recourse left them in a precarious position. They bore the costs of defective purchases. Craftsmen reaped the benefits. That imbalance encouraged craftsmen to take advantage of inside information. Informational asymmetry was the fourth characteristic of medieval markets. Craftsmen knew much about the quality of their merchandise. Consumers knew little. The quality of finished goods depended on the raw materials and workmanship that went into them. Better inputs yielded better outputs. Craftsmen controlled those inputs. They knew when they cut corners and when they did not. Moreover, by manipulating the manufacturing process, craftsmen could conceal severe defects from consumers' eyes. Examples abound. Cloth makers could substitute coarse wool for fine fiber and conceal this substitution by soaking the wool in solutions containing water-soluble powders. The wool absorbed the water, the water evaporated, and the powder crystallized, smoothing the surface of the fibers until the cloth was rinsed repeatedly and the crystals washed away. Cloth makers could replace superior dyes with inferior inks of the same color that faded in the sun, bled when wet, putrefied, or attract insects. For example, the dye logwood produced a glorious blue, but could not be fixed to cloth. Similarly, oak galls, sumac, and other tannin-bearing dyes produced dark blues, but did not last. Orchil, a dye derived from lichens, produced a reddish purple, but faded unless mixed with a longer lasting dye.¹⁹ Tanners, who converted animal hides to leather by submerging the hides in a chemical woaze that replaced the moisture in them with a stable solvent, could accelerate this transformation by making their

¹⁸ Bagley and Rowley 1966 pp. 74-75, Blair and Ramsay 1991 p. xxx, Hilton 1995 pp. 32-34, 55, 85-87, Lopez and Raymond 1990 pp. 78-89, Pooley 1947 p. 20, Swanson 1989 pp. 44, 46, 130, 141.

“woozes too strong or by applying heat, whereby the entire process could be advanced from nine months to a startling six weeks.”²⁰ Such shortcuts resulted in leather that looked normal initially, but whose useful life was limited, especially when exposed to the elements, because the leather hardened and cracked as evaporation extracted the remaining moisture. Pewterers, who sold pewter cups, bowls, and plates, could add lead to the tin and copper in their alloy. Leaded and unleaded pewter looked identical initially. But over time, lead leached from adulterated alloy, changing its color from silver to gray, spoiling the taste of food and drink, and poisoning those who consumed it.²¹

Evidence of these deceptions and craftsmen’s superior knowledge appears in innumerable sources. Guild records describe defects that could not be detected before purchase.²² Government documents refer to the problems posed by shoddy products.²³ Court rolls detail customers’ complaints about defective merchandise and deceptive business practices.²⁴ Historians who have studied medieval industry have rediscovered methods that produced superior and inferior merchandise.²⁵ Antique collectors and archeologists have documented subtle quality differences in arms, armor, tableware, and other manufactured merchandise.²⁶ Manuals of business practice cautioned merchants to mistrust “everybody else.”²⁷ A thirteenth century text entitled *Advice to a Norwegian Merchant*, written by a father for his son, warned:

You must also be careful to examine the wares that you buy before the purchase is finally made to make sure that they are sound and flawless.²⁸

Giovanni Morelli, in his *Cronica*, admonished:

In the wool or French-cloth business ... [trade] with trustworthy persons who enjoy good reputations and credit who have something to show by their name.... Do not exercise any trade or business in which you have no experience. Do what you are able to do and beware of everything else, for otherwise you will be cheated.²⁹

¹⁹ Blair and Ramsay 1991 pp. 334-336, Fisher and Jurica 1977 pp. 177-178

²⁰ Swanson 1989 p. 54

²¹ Blair and Ramsay 1991 pp. 57-80, Cotterell 1929, Gale 1909, Hedges 1964, Michaelis 1955, Swanson 1989 pp. 76-81, Verster 1958

²² Ffoulkes 1988 pp. 169-172, Michaelis 1955 pp. 2-5, L. Smith 1902 p. 209, Swanson 1989 p. 55

²³ Fisher and Jurica 1976 pp. 188-189, Thrupp 1976 pp. 20-21

²⁴ Bridbury 1989 p. 82, Farley 1946 pp. 145, 151

²⁵ Cherry 1992 pp. 55-60, Manier 2001, Swanson 1989 p. 54

²⁶ Brownsword and Pitt 1984 pp. 237-244

²⁷ Lopez and Raymond 1990 p. 408

²⁸ Ross and McGloughlin 1977 p. 145

²⁹ Lopez and Raymond 1990 p. 422

While craftsmen's inside information gave them the ability cheat consumers, what gave craftsmen the incentive to do so was the high cost of manufacturing high-quality merchandise. Those costs were the fifth transcendent characteristic of medieval markets. A rough estimate indicates cloth makers could cut costs 15% by replacing fine wool with coarse wool, since wool amounted to one-third of cloth's cost, and expensive wool's price was double that of its cheaper substitute. Another approximation suggests cloth makers could cut costs between 5% and 35% by replacing expensive dyes with cheaper substitutes. Dyes amounted to one-twentieth of the cost of common-colored cloth and one-half of the cost of fashionably colored cloth, while inferior inks that mimicked those colors could be purchased for pennies.³⁰ A rough estimate suggests pewterers could cut costs up to 20% by putting lead in their alloy, since lead was half the price of more expensive metals, and pewter could hold up to 40% lead.

Additional estimates appear in last column of Table 4, which presents evidence concerning craftsmen's incentive and ability to conceal hidden defects. Each row of the table describes a potential defect. The fourth column indicates the length of time that the flaw took to manifest itself after purchase. Textiles, leather, wood, and pewter products deteriorated gradually. Deterioration accelerated when the product was used. The acceleration was greatest for textiles, which degraded rapidly when worn and washed, and for pewter, which leached lead into acidic liquids such as tomato juice. Iron alloys often failed without warning. A bell might show no symptoms of internal weaknesses until it cracked. A knife might snap suddenly along the line of an internal fracture. Column 5 indicates the difficulty of detecting such flaws before purchase. Detecting internal flaws in metallic merchandise was not possible during the Middle Ages and remains difficult even today. Detecting the adulteration of precious metals was possible for experts with the appropriate tools and training. Experts could often detect flaws in textiles and leather goods if they took the time to examine them thoroughly. On occasion, consumers could detect these flaws if they possessed appropriate knowledge and experience. Column 6 indicates the methods that craftsmen used to conceal hidden defects from consumers' eyes. I have discovered six examples in historical documents, despite craftsmen's obvious reluctance to leave written records of deceptive

³⁰ Munro 1994 V pp. 14-15, 39-45, Tables 3.4 to 3.11

activity. Column 7 indicates potential profits from selling low-quality merchandise at high-quality prices. The appendix details the calculation of these estimates.

Together, Tables 2, 3, and 4 demonstrate that conditions conducive to adverse selection existed in all industries that expanded rapidly during the Middle Ages. The severity of that affliction cannot be measured in statistical terms. Insufficient evidence exists about the volume of trade and the counterfactual volume that would have existed in the absence of adverse selection. Since the data does not exist, theory must suffice. In theory, adverse selection's severity increases when the damage done by hidden defects and consumers' aversion to risk increase. Both must have been high during the Middle Ages. Hidden defects could have catastrophic consequences including poverty, injury, and death. Medieval men lived on the edge of subsistence and had few financial reserves. Brief spells of bad luck could push them into the abyss. Such circumstances must have made men wary of spending significant sums and impeded the expansion of commerce.

The existence of adverse selection provided manufacturers with a moneymaking opportunity. Consumers would pay more for merchandise they knew would perform as promised than for products they worried would not. Manufacturers that developed good reputations could sell their wares at higher prices, in larger quantities, and farther from home than manufacturers without good names. As a manufacturer's good name spread, it would be able to sell its merchandise even farther afield to consumers who would not purchase their products otherwise. Demand for its wares would rise, prices would increase, and profits would follow.

Consumers' confidence may have been most important benefit of reputations for product quality, but manufacturers had many other reasons for establishing brand names. Reputations freed craftsmen from local merchants' monopolistic clutches. Reputable manufacturers attracted merchants from many places. Wholesale merchants came since they could sell well-known wares at international fairs. Itinerant merchants came since they could sell well-regarded merchandise to rural customers. Reputations altered the balance of power in the traditional chain from manufacturer to wholesaler to retailer. Highly regarded manufacturers could reject unacceptable offers by local merchants secure in the knowledge that merchants from other towns would distribute their merchandise. Well-known manufacturers could punish dishonest distributors by refusing to sell wares to them in the future. Craftsmen valued this control because manufacturing and mercantile interests

seldom coincided. Merchants wanted to pay craftsmen as little as possible and dreamed of expropriating the surplus generated by industrial activity. Merchants were not loyal to particular manufacturers. They sold goods made in many places, and they would not push products that competed with the merchandise on which they made the greatest profit.

In sum, medieval markets for manufactures possessed characteristics conducive to counterfeiting and adverse selection. These problems presented moneymaking prospects. Desire to capitalize on that lucrative opportunity motivated manufacturers to establish respected reputations and communicate them to consumers. How did they do so?

Section 2: Mechanisms for Establishing and Communicating Reputations

From the ordinances of London's guild of pewterers
Rules regarding quality adopted in 1348

So many persons make vessels not in due manner to the damage of the people and the scandal of the trade, that three or four of the most true and cunning in the guild [should] be chosen to oversee the alloys and the workmanship of all ... be it understood, that all manner of vessels shall be made of fine pewter with the [proper] proportion of copper to tin, and no one of the guild shall in secret places [make] vessels of lead or of false alloy to sell out of the city at fairs or markets to the scandal of the City and the damage of the good folk of the guild ... and if anyone is found carrying such wares to fairs or markets or anywhere else in England ... for the first default let them lose the material so wrought; upon the second default let them lose the material and suffer punishment at the discretion of mayor and the alderman; and if a third time they shall be found offending, let them forswear the guild for evermore.³¹

Medieval manufacturers established reputations for selling high-quality merchandise with a two-step technique. The first involved intensive efforts to control quality usually under the aegis of an association of artisans who lived in the same town, worked in the same industry, sold standardized products, and regulated the quality of members' merchandise. These guilds of manufacturers established good reputations by adopting rules regarding quality and enforcing these rules vigorously. The quote above is an example of the rules enacted by typical English guilds. It defines quality, *vessels made with the proper proportion of copper to tin*; establishes a mechanism for monitoring quality, *three or four master craftsmen will monitor the quality of all*; prohibits

³¹ Michaelis 1955 pp. 2-5. I have modernized the vocabulary, spelling, and punctuation of this quote and removed some superfluous words without marking these removals by ellipses.

members from selling substandard products, *vessels made from impure alloy*; prohibits members from using inferior inputs, *lead* in particular; and specifies punishments for members caught violating these rules, *for the first default let them lose the material so wrought; upon the second default let them lose the material and suffer punishment at the discretion of mayor and the alderman; and if a third time they shall be found offending, let them forswear the guild for evermore.*

To enforce such rules, guilds inspected members' merchandise, and in some cases, their shops and homes. Guild officers called searchers carried out these inspections.³² Searchers ensured members' merchandise met guild standards by testing the quality of finished goods and by surreptitious stores of inferior inputs and similar signs that members used inappropriate manufacturing methods.³³ For example, searchers for goldsmiths' guilds looked for piles of base metals lying about members' shops and tested the purity of members' alloy with a touchstone, a fine-grained, abrasive, black rock that allowed a scraping taken from a suspicious alloy to be compared with the color and consistency of samples taken from alloys of known composition.³⁴ Similarly, searchers for tanners' guilds looked for signs that members heated their vats, made their woozes too strong, or used the hides of unsuitable animals.

To facilitate searchers' efforts, most guilds prohibited work after dark, when – as many ordinances asserted – mistakes could be more easily made and deceitful practices more easily concealed.³⁵ Many guilds also required members to set up shop in the same neighborhood and keep an eye on each other's work. Personal relationships among members probably facilitated enforcement. Members attended the same church and gathered frequently for feasts and festivities. They were friends, colleagues, and relatives. Such close contacts must have made it difficult for one guild member to deceive another.

Members caught selling shoddy products were subjected to an escalating series of punishments. First-time offenders were punished lightly and repeat offenders harshly. Punishments varied from guild to guild, of course. Typical guilds confiscated first-time offenders' shoddy products, forced second-time offenders to pay

³² L. Smith 1902 p. 209

³³ Blair and Ramsay 1991 pp. xxiv, 337, Keen 1990 p. 103

³⁴ Cherry 1992 pp. 55-60

³⁵ Blair and Ramsay 1991 pp. 184-185, Cantor 1994 pp. 278-279

monetary penalties, and expelled third-time offenders from the organization.³⁶ Expelled members lost the business benefits of guild membership and much more. They lost friends, colleagues, and access to their guild's social services. All guilds held frequent feasts, festivals, and gatherings. Most hired priests, financed parishes, supported the poor, buried the dead, prayed for the salvation of members' souls, opened schools, staged plays, extended credit, established liveries, participated in public processions, insured members against the risks of everyday life, and provided social standing in class-conscious medieval society. Fear of losing these fringe benefits was the glue that held guilds together.

Monitoring members' behavior was only half of the battle. Guilds also had to prevent outsiders from counterfeiting their wares. In England, keeping outsiders from copying guilds' wares was difficult to do because the common law protected neither trademarks nor techniques. Patents were not granted until Elizabeth's reign. Trademarks were not protected until the 1700s. Goodwill did not become legal property until the nineteenth century. Before then, courts consistently ruled that manufacturers' marks were no more their property than their last names, and courts granted guilds only limited rights to reputations. A guild had a claim to its good name, and therefore, could sue outsiders who passed inferior wares off as guild merchandise, if they could catch the culprit, because this deception besmirched the guild's reputation. But, a guild did not have a claim to its good names' pecuniary benefits, and thus, a guild could not sue those who sold merchandise identical to its own, because perfect copies gave consumers no reason to think less of guild products. Perfect copies did not defame a guild's good name.³⁷

Similarly, almost everywhere outside of England, laws did little to protect the reputations of manufacturers. No nations protected intellectual property at the beginning of the Middle Ages. Few states protected it at the end. The exceptions were the industrial centers in Italy, which began protecting trademarks and techniques in the thirteenth and fourteenth centuries, and the industrial centers in the Low Countries, which began protecting intellectual property one hundred years later. In those locales, trademarks conveyed information about product's unobservable attributes and consequently had value. The legal protection

³⁶ Blair and Ramsay 1991 p. 73, Cherry 1992 p. 54, and Thomas 1926 p. 264

underlying that value, however, did not extend far from a town. Trademarks from one municipality had no legal protection in other towns or the hinterland where most of the population lived. Thus, the problem that bedeviled industry in regions lacking protections for intellectual property also bedeviled manufactures in regions possessing such protections. Everyone lacked legal protection for intellectual property when they sold merchandise in the wider market.

Since the law did little to protect guilds' reputations, guilds had to defend their own good names. The principal defense was making merchandise that was difficult to duplicate. Guilds accomplished this task in various ways. Most kept manufacturing methods secret. Many used techniques that required local resources. The latter method worked well for smiths and clothmakers, since small differences in raw materials greatly affected the characteristics of metals and textiles. Ore's carbon content determined iron's strength. Contaminants in furnace fuels affected metal's malleability. Heat and humidity affected wool's weave. Chemicals in soil and water affected the dyeing, fulling, and spinning of cloth. All of these factors varied from place to place, preventing the transplantation of metallurgical and clothmaking methods from one town to another.³⁸

An apt example is Damascus steel, which was harder but less brittle than other iron alloys. Blades made from Damascus steel were stronger, sharper, and sturdier than others made at the time. Manufacturing Damascus steel required iron ore infused with traces of vanadium and other impurities. Repeated heating and beating formed bands of vanadium as the metal cooled and hardened and filled "those bands with hard, carbon-rich steel, surrounded by softer, springier metal."³⁹ That combination made the metal strong and flexible. It also yielded metal with a dull blue color laced meandering lines. The pattern, now known as damask or damascene, was the conspicuous characteristic that revealed the identity of the steel. Smiths outside of Damascus could not copy it because they lacked (a) iron ore with the appropriate impurities and (b) techniques for transforming that ore into Damascus steel. The metalworkers' guild of Damascus devised those techniques and imported pre-smelted ingots of vanadium-infused ore from mines near Hyderabad in southern India. Scholars only recently

³⁷ Baker 1995 pp. 511-512, 522-523, Baker and Milsom 1986 p. 614, Blair and Ramsay 1991 p. xxv, Phillips 1982 pp. 71-79, Strasser 1989 pp. 43-44

³⁸ Cipolla 1980 pp. 185-192, Ffoulkes 1988 pp. 13-14

³⁹ Manier 2001

rediscovered these techniques after years of chemical analysis, metallurgical research, and practical experimentation.⁴⁰

Another method of impeding duplication was selling merchandise whose manufacture required significant investment in specialized equipment. The largest medieval industry, textiles, provides apt examples. Cloth's dimensions depended on the machines used in its manufacture. Looms, tents, and tubs of a particular size produced rolls of fabric with a particular length, width, and weight. This dependence made duplicating the dimensions of another guild's cloth a costly task. Duplication required the appropriate, expensive machinery. The cost of duplication allowed cloth's dimensions to communicate its origin to consumers. Each cloth-making town in England and the Low Countries "adopted its own measure or 'muison' [which was] jealously controlled by the guild and considered a form of trade mark and guarantee to the buyer."⁴¹ "A merchant who wanted to purchase cloth manufactured in distant places had to know its exact quality and length. Guilds in each city required all members to standardize their products, so ... that they would have characteristics different from [cloth] woven in other towns."⁴²

Evidence appears in numerous sources. One is a letter from the merchants of Douai to the king of England.

They requested [the king] to permit them to import into the realm cloth of the same measure as that sold in the fairs of Champagne, Franche-Comte, and Burgundy, arguing that these measurements, that is '24 a laune de Engletene en lice et en corde de long' were duly controlled by the eswardeurs of the town, so that no cloths that did not fulfill the requirements could be exported, they also maintained that these measurements were recognized as a characteristic of Douai cloth and were therefore a form of trade mark. Finally, they added if permission were not given to them, they would be unable to import any cloth at all because the necessary changes to be made to the tenters and other manufacturing processes could only be done at great expense and loss.⁴³

Another source is Peglotti's manual for merchants, *The Practice of Commerce*, which describes cloth from towns such as Ypres, France where

all covertures of any sort are [in length] 21 ells apiece. All rays of any color are 42 ells apiece. White *tiree* of any sort, 36 ells apiece. Dyed cloth and imitation Malines medleys, 36 ells

⁴⁰ Verhoeven, Pendray, and Dauksch 1998

⁴¹ Buyse 1965 p. 235

⁴² Lopez and Raymond 1990 p. 123

⁴³ Buyse 1965 p. 228

apiece. Quality white cloth of Ypres is weighed and not measured by the ell ... and all [cloth of Ypres] is sold there are so many gold royaux apiece [according] to the quality.⁴⁴

Fabric's dimensions conveyed such valuable information that many municipalities required imported cloth to be measured publicly (or by public officials) before it was cut for the first time. Buyers often paid premia for the first piece removed from an uncut roll of cloth.

Cloth's dimensions, like other conspicuous characteristics, could be called technological trademarks. Guilds' one-two punch of technological trademarks and quality control gave them the ability to establish reputations, while consumers' concerns about hidden defects gave them an incentive to do so.

Why did guilds do this rather than individuals or families? Guilds succeeded where individuals failed for good reasons. Guilds possessed advantages that individuals lacked. First, establishing reputations was expensive. Quality had to be consistent. Hidden defects had to be eliminated. Conspicuous characteristics had to be created. Consumers had to be convinced of the connection between observable and unobservable attributes. Convincing consumers of this connection was an expensive and time-consuming task. Manufacturers had to sell superior merchandise at moderate prices until satisfied customers spread the word that the product's value exceeded its cost. Guilds pooled members' talents and resources. Pooling reduced the costs born by individuals and increased the returns that they received from investments in human and physical capital. Pooling permitted groups to afford investments that individuals could not.

Second, guilds survived for centuries. Individuals lived for decades. Typical careers lasted less than twenty years. Typical families survived for a few generations.⁴⁵ Artisans wanted their children to climb the social ladder. Whenever possible, craftsmen in common trades apprenticed sons into higher-paying, more-prestigious professions.⁴⁶ High mortality and upward mobility meant that individuals and families had time horizons of twenty years at most and often considerably shorter. The longevity of guilds meant that their time

⁴⁴ Lopez and Raymond 1990 pp. 123-124

⁴⁵ These generalizations are based on the following figures. Roughly, one-in-ten twenty-year olds died before age thirty. One-in-three died before age forty. Only one-in-two celebrated their forty-fifth birthday. One-in-three families left no descendants, and half lacked surviving sons. For these figures, see Cipolla 1980 pp. 145, 164, Hatcher 1973 p. 27, Hilton 1995 p. 17, Russell 1948 pp. 176-180, 240-242, and Waugh 1994 pp. 48-49.

⁴⁶ From 1387 to 1534 in York, for example, only half of the artisan's sons who took out the freedom did so in their father's occupation. Most of those had fathers practicing lucrative crafts such as goldsmithing and metal working (Swanson 1989 p. 165).

horizons extended across generations. Since the returns from investments accumulated over time, guilds' longevity encouraged the creation of reputations.

Third, the longevity of guilds had another effect. It reduced the cost of establishing reputations. Reputations arose in repeated games when buyers believed that sellers earned more from consistently selling superior products than from cheating consumers. The former paid large returns in the long run since reputable manufacturers earned quality premia. The latter paid large returns in the short run when unscrupulous manufacturers sold low-quality products at high-quality prices. Longevity increased the attractiveness of long-run returns and cooperative behavior relative to short-run returns and uncooperative behavior. Consumers knew this. Therefore, they demanded less proof of guilds' good intentions before believing guilds' claims concerning quality.

Guilds also possessed advantages that governments and merchants lacked. Bureaucrats lacked the knowledge, skills, and resources needed to detect hidden defects. So did merchants, who bought and sold commodities of all types, and lacked in depth insights into the unobserved characteristics of the wide array of goods in which they dealt. The typical tools of regulatory authorities had little influence over wider markets. Limited geographic jurisdictions handicapped public employees. Towns could only inspect merchandise that passed within their walls. Kings could only inspect merchandise sold within their realms. No monarch could control the quality of products in international commerce. Most could not even regulate the quality of products within their own borders. That is why governments and merchants initially addressed the affliction of adverse selection by assimilating, allying, or cooperating with craft guilds. Government officials did inspect some manufactured merchandise. Agents examined observable attributes such as length, width, color, and weight of certain types of manufactures. These inspections facilitated the collection of customs duties and other taxes, whose value often depended on the aforementioned attributes. But, government agents neither sought hidden defects, nor punished those who sold defective merchandise, nor protected consumers from unscrupulous craftsmen.

Section 3: Evidence of Effort, Success, and Influence

Evidence of guilds' ability and intent forms the foundation of a strong circumstantial case that guilds established reputations for product quality, but circumstantial evidence cannot prove the point beyond a reasonable doubt. An ironclad conclusion requires indisputable evidence that guilds tried to establish reputations. Guilds succeeded (at least occasionally). And, guilds' good names influenced the decisions of consumers, prices of products, and profits of craftsmen.

Several types of evidence indicate guilds tried to establish reputations. One was discussed earlier in the essay. Innumerable guilds possessed rules regarding quality. These guilds operated in towns throughout Europe and in most manufacturing sectors. Local and legal historians have documented another salient fact. Guilds enforced their rules vigorously. Evidence of enforcement can be found in extant guild documents and the archives of towns such as Winchester, London, and Salisbury. In those municipalities, guilds could not punish members for violating rules-regarding quality without holding public hearings. Winchester's court records reported weavers penalized for selling shoddy cloth and candle-makers punished for selling underweight candles.⁴⁷ London's Plea and Memorandum Rolls described pewterers fined for selling vessels made from lead and tanners punished for selling improperly processed hide. Salisbury's court rolls recorded similar prosecutions and penalties.⁴⁸ Comparable evidence exists for towns on the continent, where municipal governments helped guilds enforce rules regarding quality.⁴⁹

Well-known examples demonstrate that some guilds successfully established reputations for consistently selling high-quality merchandise. For example, in the second half of the fourteenth century, London's guild of pewterers, developed a European-wide reputation for selling pewterware with a low lead content. Evidence comes from several sources. The pewterers' records describe their efforts to control quality. London's legal records reveal their efforts to prevent others from passing-off leaded wares as London pewter. Tariff records show that London pewter sold at a high price. Tax records indicate that London pewterers earned

⁴⁷ Farley 1946 pp. 145, 151

⁴⁸ Bridbury 1989 p. 82

⁴⁹ Lopez 1994, Munro 1994

high incomes which suggests London pewter earned a quality premium. Scientific studies confirming the lead content of London pewter was lower than the lead content of its competitors.⁵⁰

Additional examples abound. In medieval England, everyone knew clothmakers in Beverly, Coventry, Colchester, Kersey, Lincoln, Norwich, Oxford, Salisbury, Stamford, Winchester, and York sold superior cloth. Weavers in York made moderately priced, durable woolens. Weavers from Norwich sold durable worsteds. Clothmakers from Salisbury sold well-made woolen rays. Artisans from Shrewesbury sold fine flannel. York's armorers' sold sturdy chain mail. London's armorers' assembled rugged plate armor from imported Italian steel plates. The most durable canvas came from Newcastle. Wire drawn in Coventry was the most malleable in the realm. Other well-regarded products included Bristol's leather goods, Gloucester's iron, Hanley's pottery, Shrewesbury's furs, Haverford's gloves, Lincoln's scarlet, Stamford's hauberge, Beverly's burnet, Aylesham's linen, Colchester's russet, Corfe's marble, Lincoln's scarlet, Pontefract's bows, and Thaxted's knives.⁵¹ Similar examples come from the continent. Good white wine came from Champagne. A tasty cheese came from Parma.

The last example – Parmesan cheese – illustrates a linguistic convention that concisely conveyed information about products' attributes: the type-town product name. A type-town name was an appellation like London pewter. When medieval men said, "London pewter," they associated a product (pewter) with a producer (London's guild of pewterers). Variations existed in the type-town scheme. Well-known regional terms occasionally replaced obscure place names. For example, wine made in the vineyards of Cote' d'Or, Yonne, and Saone-et-Loire was known as Burgundy wine (hence the modern word burgundy meaning in American English a dry red wine or a dark purple color). Swords made in Haute Savoy were called Burgundy swords.⁵² Paper made in the town of "Fabriano, in the Marche region," was known as paper from Marche.⁵³ Well-known place names also replaced terms for product types. These replacements occurred in cases where a town's fame for producing a particular product spread so widely that it became a byword for that product. This situation could generate type-town names composed of two town's names. One indicated the product type. The other indicated

⁵⁰ Blair and Ramsay 1991 pp. 57-80, Cotterell 1929, Encyclopedia Americana 1994 v. 21 p. 842, Gale 1909, Hedges 1964, Michaelis 1955, Swanson 1989 pp. 76-81, Verster 1958

⁵¹ Blair and Ramsay 1991 p. 73, Holmes 1962 p. 151, Rothwell 1975 pp. 881-884, Swanson 1989 pp. 71, 80

⁵² Ffoulkes 1988 p. 12

⁵³ Lopez and Raymond 1990 pp. 109-114

the town of production. Examples include ‘worsted from Ipswich’ and ‘cordovan from Bristol.’ Such composites often appeared in merchant’s records. In 1320, for example, the Florentine company of Francesco del Bene recorded in its account books the purchase of white Malines-style cloth made in Malines to distinguish it from Malines-style cloth made in other towns.⁵⁴

Mercantile records demonstrate that merchants used type-town product names regularly. Type-town names appeared in commercial correspondence. For example, on November 29, 1265 Andrea de’ Tolomei wrote from the fair of Troyes to Tolomeo de’ Tolomei, his second cousin and business partner, that “wax of Venice [cost] d.23 per pound [and] wax of Tunis, d. 21 ½.” Type-town names also appeared in financial ledgers. For example, between 8 May and 25 May 1331, Maitre Ugo Teralh, a drapier from Forcalquier, recorded purchases and sales of canet [cloth] from Carcassonne, blue [cloth] from Saint-Pons, checkered cloth from Toulouse, saffron cloth from Carcassonne, medley cloth from Saint-Toulouse, and camlet cloth from Montolieu. In 1320, among other transactions, the Florentine company of Francesco del Bene recorded purchases of white Malines-style cloth made in Malines, white cloth made in Saint-Omer, wool cloth from Moulin, white cloth from Ghent, felt from Ypres, as well as cloth of various colors and styles produced in Brussels and Aalst.⁵⁵ Type-town names also appeared in Genoese notarial documents; accounts of the Alberti, Covoni, Datini, and Peruzzi firms; Peglotti’s handbook for merchants, *La Practica della Mercatura*; Parliamentary edicts; purchase records from Henry VI’s royal wardrobe; and English, Italian, Polish, and Spanish customs accounts.⁵⁶ Type-town names were even translated from one language to another. Table 5 illustrates that fact by listing English, Persian, and Cumanic terms for twelve types of linen fabric taken from a trilingual medieval dictionary.

Lexicographic evidence indicates ordinary individuals uttered type-town names in everyday speech at least as often as merchants wrote type-town names in mercantile records. Linguistic research reveals a persuasive pattern. Many type-town names evolved into modern words. An example is *worsted*. Worsted originally meant fabric woven in the parish of Worsted, England. Later, it meant fabric woven anywhere in the Worsted style. Today, it means a woven wool cloth with a smooth, hard surface. Worsted’s metamorphosis from

⁵⁴ Lopez and Raymond 1990 pp. 123, 364

⁵⁵ Lopez and Raymond 1990 pp. 362-363, 364-370, 393, 400.

town name to product type to modern word occurred for the same reason Kleenex means facial tissue and Xeroxing means copying. Names of popular products become associated with similar products made by other manufacturers, acquire broad connotations, and enter the vernacular. Other modern words descended from medieval product names include cordovan (from Cordoba, Spain), drab (from Drab-de-Berry), pistol (from Pistoia, a town in Tuscany), muslin (from Mosul, Persia), and the names of innumerable fabrics, wines, cheeses, and preserved meats.⁵⁷ The definitive English-language source on this topic is the *Oxford English Dictionary*. It indicates that before the end of the sixteenth-century, the names of 14 English towns became bywords for types of cloth. The names of 3 English towns became bywords for types of cheese. The names of other English towns became bywords for a kind of cord and a diamond-like gem.⁵⁸

The type-town linguistic convention also appears in medieval literature. Authors used type-town names in their prose and poetry. An example is Chaucer, who used the terms cloth of Tars in the “Knight’s Tale” and cloth of Reynes in the “Book of the Duchess.” (circa 1369).⁵⁹ The former also appeared in *Peirs Plowman* (year 1377) and *Morte d’Arthur* (circa 1400).⁶⁰ The latter appeared in the *Play Sacram* (circa 1460) and the *Paston Letters* (year 1489).⁶¹ Cloth of Tars was a fine silk made in Tarsia in Turkestan. Cloth of Reynes was a fine linen fabric made in Rennes in Brittany.

The use of type-town names should not be surprising. The type-town convention conformed to the medieval custom of identifying objects and individuals with descriptive suffixes. Commodities were classified by place of production such as “wax of Montenegro, wax of Ragusa, wax of Byzantium, Bulgarian wax, wax of Spain, wax of Poland, and wax of Riga,” and individuals were distinguished by surnames indicating occupation, residence, or birthplace such as Thomas the clerk, Thomas of London, and Thomas Becket.⁶² Surnames supplemented forenames, which were usually the names of apostles or saints. Guilds also had Christian names.

⁵⁶ Munro 1994 VII

⁵⁷ Mokyr 1990 pp. 41-42, *Oxford English Dictionary*

⁵⁸ In the *Oxford English Dictionary*, see Worsted, Kendal, kersey, Stafford, Taunton, Lincoln, Stockbridge, Tavistock, Molton, Penistone, Bridgewater, Kentish, Chessyre, Dunster, Bristol, Shropshire, and Worcester.

⁵⁹ Davis *et al* 1979 p. 27

⁶⁰ “tars, tarse” *Oxford English Dictionary*

⁶¹ “Raines” *Oxford English Dictionary*

⁶² Becket probably means born in the village of Beck. Barlow 1986 p. 12

They used them in legal documents and on ceremonial occasions.⁶³ Guilds usually named themselves after the patron saint of their craft or a popular Christian persona. The former practice gave similar Christian names to all guilds in an occupation, since everyone in an occupation had the same patron saint. The latter practice gave similar Christian names to several guilds in one town, since guilds outnumbered popular Christian namesakes.⁶⁴ Because devotional designations did not distinguish one guild from another, medieval consumers and modern scholars employed another convention: the profession-town guild names. These appellations appeared in the form “the guild in industry X from town Y.” Table 6 illustrates this convention by presenting the religious and professional labels of occupational organizations appearing in the guild census 1388.

In most cases, the juxtaposition of profession-town guild names and type-town product names unambiguously associated producers and products. Guild X from town Y made product Z from town Y. The monopsonistic tendencies of medieval craftsmen facilitated this convention. In many towns, all artisans who wove wool joined one guild and all those who cobbled shoes joined another. Type-town names could cause confusion, however, in towns where multiple guilds, unaffiliated artisans, and itinerant merchants sold similar products. That created quandaries such as: was cloth from York woven by members of York’s wool-weavers’ guild, by members of some other guild in the city, by independent Yorkshire craftsmen, or by craftsmen somewhere else in the world whose cloth happened to be sold by a merchant from York? Evidence of this confusion and the institutions the English created to clarify it proves the point. Artisans argued incessantly about overlapping type-town designations. Disputes often spilled into town councils, mercantile courts, and the halls of Westminster. The royal government typically settled these disputes by selling charters that allowed the purchaser to impose quality standards on all merchandise of a particular type sold in a particular place or by requiring local governments to enforce such standards. The ubiquity of type-town names and the reputations that they conveyed indicates many guilds established widely known reputations.

Five classes of evidence demonstrate that reputations for quality influenced the decisions of consumers, prices of products, or profits of manufacturers. The first is the judicial record. Court transcripts demonstrate that

⁶³ Pooley 1947 p. 9

hundreds of guilds engaged in costly legal battles to defend their reputations, which suggests hundreds of guilds thought their reputations were worth defending. Court records also show outsiders tried to pass-off shoddy wares as guild merchandise, which suggests many guilds had reputations worth exploiting.

The second is evidence indicating that guilds profited from goods reputations. Economists call these profits quality premia. Price variation unrelated to products' tangible attributes is prima facie evidence of quality premia. Such variation appears in commercial records, tariff schedules, and aristocratic account books. For example, in the tenth year of Henry IV's reign (30 September 1408 to 30 September 1409), the royal wardrobe purchased dyed long broadcloths measuring thirty by one and three-quarter yards from various towns. Meticulous records report no differences among these broadcloths except the town of manufacture, yet the cloths' prices varied substantially. The most expensive cost ten-and-a-half pound sterling, the cheapest only six. In other years, prices varied by even wider margins.⁶⁵

The third class is evidence that trademarks were bought and sold once they became legal property. Genoese notarial documents report many such sales. Here is an example. On Wednesday, 10 June 1383, Ser Pietro Preda sold to Ser Petrolo Tanzio

[a] trademark ... suitable for marking fustians on top and over the fold of every piece [and recorded in] a copybook [kept] by the provosts of the society and community of the Art of Fustian in Milan ... the right of using the said mark ... [and] all rights, suits, and advantages in and from these marks and on account of or by reason of them.⁶⁶

Such transactions suggest trademarks and the reputations that they represented possessed monetary value.

The fourth class is scholarly studies concluding guilds' reputations influenced the demand for particular products. Ffoulkes, for example, found armor's price depended on its producer's reputation because "personal safety in the field was of the utmost importance."⁶⁷ Epstein argued "the international market for wool cloth valued products according to the town of origin," and craftsmen "producing goods for a wider market ... understood that the reputation of their wares was the most important factor

⁶⁴ For example, all goldsmiths' guilds in England were named for St. Dunstan, and all goldsmiths' guilds on the Continent were named for St. Eligius. Cherry 1992 p. 52

⁶⁵ Munro 1990 V p. 67

in determining the price and prestige of their cloth.” Bridbury stated that “the reputation of products made or finished ... in some [English] towns carried well beyond the neighborhood, or even the region, in which the town lay ... Sometimes the reputation of these products carried beyond the shores of England.”⁶⁸ Their demand depended on “the quality of the craftsmanship and material which had gone into its making.”⁶⁹

The fifth class is medieval documents that attribute shifts in economic fortunes to changes in reputations for product quality. An example is the fifteenth-century *Act for the Improvement of Worsted Making*, which lamented that:

in the city of Norwich, as elsewhere within the county of Norfolk, diverse persons which do make untrue wares of all manner of worsteds, not being of the assize length nor in breadth, nor of good stuff and right making as they ought to be, and of old time were accustomed, and the sleyes and yarn pertaining to the same not well made and wrought, in great deceit as well of denizens as of strangers inhabiting or repairing to this realm, which have used and so use to buy such merchandise, trusting that they were within as they seemed without, where indeed it is contrary: and for that the worsteds in times past were lawfully wrought, and merchandise well liked, and greatly desired and esteemed in parts beyond the sea; now because they be of no right making, nor good stuff, they be reported and esteemed deceitful and unlawful merchandise, and of little regard, to the great damage of our lord the king, and great prejudice of his loyal subjects.⁷⁰

The *Act for the Improvement of Worsted Making* is as close as one can come to an eyewitness account of the relevant issues. It stresses reputations’ importance in international markets, recalling that when worsteds were of *good stuff and right making* they were *greatly desired and esteemed in parts beyond the sea*, but when worsteds were *not within as they seemed without*, they were deemed *deceitful and unlawful merchandise of little regard*, and consumers would not buy them *to the great damage of our lord the king, and great prejudice of his loyal subjects*.

This account illustrates the argument advanced by this essay. Medieval manufactures tried to establish reputations for selling defect-free merchandise by controlling quality. Conspicuous characteristics communicated these reputations to consumers. These reputations influenced consumers’ decisions, products’

⁶⁶ Lopez and Raymond 1990 p. 124 from *Notaio Marcolo Golasecca*.

⁶⁷ Ffoulkes 1988 p. 13.

⁶⁸ Epstein 1991.

⁶⁹ Bridbury 1982 p. 6.

prices, and manufacturers' profits. Men and women referred to these reputations with type-town product names. These appellations served as the brand names before the Industrial Revolution.

Section 4: Discussion

This argument's implications become clear when one considers Adam Smith and Henry Pirenne's dictum that the expansion of long-distance trade propelled economic progress before the Industrial Revolution. According to the Adam Smith, the division of labor increased output per worker, because specialization allowed manufacturers to do what they did best, enabled workers to engage in particular tasks, created economies of scale, encouraged investment in product-specific skills and machinery, and focused inventors on particular problems, rather than dissipating creative energies on an array of ill-defined and unrelated tasks. Combining Smith's paradigm and this paper's hypothesis – that manufacturing guilds served as branding mechanisms – yields a clear conclusion. By mitigating adverse selection and fostering commerce, guilds encouraged economic progress.

Before accepting this conclusion wholeheartedly, a potential drawback of improving quality should be considered. In theory, increasing durability might have inhibited commerce. If goods lasted longer, people may have purchased fewer products. But, medieval society's structure suggests that increasing durability did not reduce the volume of trade. During the Middle Ages, durability was correlated with other desirable attributes such as safety and effectiveness. Demand for durables was large, elastic, and growing. Product innovation outpaced process innovation. Manufacturers lacked economies of scale. Consumers wanted to be on the cutting edge of fashion and technology. Products were expensive. Consumers bore the costs of hidden defects on their own. The costs were high and could be catastrophic. Under these conditions, economic theory indicates increasing durability would encourage, rather than discourage, innovation and trade.

The manufacturing-guilds-as-branding-mechanisms hypothesis also resolves several riddles of industrial organization in late-medieval Europe. One concerns the spatial distribution of industrial activity. Guilds of manufacturers were organized town by town. Norwich had a guild of weavers. York had a guild of weavers.

⁷⁰ Act for the Improvement of Worsted Making, 1467 (9 Edward IV, c. 1, Statutes at Large, II (1763), pp. 20-21) from

Salisbury, London, and hundreds of other towns had guilds of weavers. Those guilds seldom, if ever, included weavers from other towns and often, but not always, included all local weavers. Guilds were also organized industry by industry. For example, a town might have a guild of weavers, a guild of shoemakers, and a guild of armorers. But, towns contained few (if any) active manufacturing guilds whose members worked in multiple industries. The guilds-as-brands hypothesis suggests this pattern of industrial organization reflected the costs of creating and maintaining reputations. The large up-front costs of creating conspicuous characteristics generated economies of scale in the formation of reputation. Guilds spread the fixed costs amongst members of a craft. However, diseconomies of distance existed. Communications were costly and few men knew how to read and write. Monitoring the behavior of colleagues living far away was difficult if not impossible. So, guilds segmented themselves along geographic lines. Diseconomies of scope also existed. Some involved the production process. For example, techniques varied so much across industries that learning how to manufacture one product provided few insights into how to manufacture another product. Other diseconomies involved social and religious activities. For example, guilds worshipped patron saints and patron saints differed across occupations. So, manufacturing guilds naturally segmented themselves along occupational and geographic lines.

Another mystery of medieval manufacturing was the relentless shifting of industrial leadership among guilds, towns, regions, and nations in late-medieval Europe. In one decade, certain manufacturers in particular towns flourished. During the next decade, the leaders failed and followers took their place. Years later, hitherto obscure manufacturers reached the forefront, and a few former leaders regained the van. Sometimes these changes occurred cyclically. At other times, they occurred haphazardly. The manufacturing-guilds-as-branding-mechanisms hypothesis suggests two phenomena that may have produced these patterns. One is an inverse relationship between reputations and innovations, which has the potential to generate cycles of industrial leadership. Medieval Europe's largest industry, textiles, provides an example. During the fifteenth century, Italian and French clothmaking guilds encouraged product development but discouraged the adoption of labor-saving machinery. At the same time, English clothmakers enthusiastically adopted labor-saving devices but seldom developed new products. These dissimilar strategies could have been the best responses to each region's

Fisher and Jurica 1976 pp. 188-189.

reputation. Italian and Flemish clothmakers were known for selling expensive, luxurious, and defect-free textiles. Since early versions of labor-saving machines, such as water powered fulling mills, could not make cloth of consistent quality, Italian and Flemish clothmakers may have benefited from resisting mechanization and retaining their reputations. English clothmakers may have been benefited from the opposite strategy, because mechanization cut costs but did little to lower their second-rate reputations.

A second potential explanation for cycles of industrial leadership lies in the discovery and depletion of unique resources. The creation of counterfeit-proof conspicuous characteristics often required access to raw materials with one-of-a-kind chemical properties. Industrial centers flourished when access to unique resources expanded. Industrial centers waned when access ended, either after overuse exhausted supplies or because political events disrupted trade routes linking point of extraction and point of production.

The decline during the seventeenth and eighteenth century of Damascus's metalworking industry provides an apt example.⁷¹ The production of Damascus steel had three requirements. One, iron ore had to come from a deposit with significant traces of the elements Chromium, Molybdenum, Niobium, Manganese, or Vanadium. Ingots of this ore came from the area around Hyderabad in southern India. Two, craftsmen had to know heat-treating techniques that decarburized the exterior "in order to produce a ductile surface rim adequate to contain the hot-sort interior regions." Three, craftsmen needed knowledge of a finishing process that produced surface patterns characteristic of Damascus steel. Master craftsmen could teach apprentices the second and third requirements, but the first was mysterious and irreplaceable. Ingots with the necessary trace elements appeared identical to ingots without them.

... during several generations all of the ingots from India were coming from an ore body with the proper amount of minor elements present, and blades with good patterns were being produced. Then, after a few centuries, the ore source may have been exhausted or become inaccessible to the smithing community; therefore, the technique no longer worked. With time, the smiths who knew about the technique died out without passing it on to their apprentices (since it no longer worked), so even if a similar source was later found, the knowledge was no longer around to exploit it.⁷²

⁷¹ Verhoeven, Pendray, and Dauksch 1998

⁷² Verhoeven, Pendray, and Dauksch 1998 pp. 64

This quote suggests a link between European colonial expansion and the decline of Islamic industry. European invasions of Arabia and India disrupted trade routes throughout the region, preventing manufacturers from important the resources that they needed, decreasing the value of their skills, and eventually driving them from business.

The manufacturing-guilds-as-branding-mechanisms hypothesis also has implications for the history of patents. Scholars often portray England's adoption of a patent system in a favorable light. Patenting encouraged inventive activity to such an extent that it was an important impetus for industrialization. Patents alleviated a debilitating ailment, the counterfeiting of consumer goods, whose only cure was government intervention. Scholars also believed that medieval English guilds monopolized markets for manufactured merchandise. Recent research, however, reveals that medieval English guilds lacked legal and natural monopolies.⁷³ English guilds acquired limited monopolies in local venues only in Tudor times. That acquisition coincided with the evolution of legal protections for intellectual property, a concept that England imported the continental concept during Elizabeth I's reign. The concept originally linked a quid, disseminating information about new inventions, and a quo, receiving monopoly rights over markets for the invention for a limited period of time. Monopolies over markets for manufactures, which were previously prohibited by common and statutory law, arose as clever lawyers and greedy courtiers expanded the connotations of the quid, enabling clever courtiers and powerful politicians to claim many things long in existence as a new and useful invention. The initial interpretation returned only after repeated reforms of the system during the seventeenth and eighteenth centuries.

These facts and the manufacturing-guilds-as-branding-mechanisms hypothesis suggest modifying the conventional academic wisdom. Rather than a panacea to a pervasive problem, the introduction of patents may have instigated centuries of political intrigue and monopolistic machinations that impeded the evolution of alternative methods of protecting intellectual property. In other words, patents may not have been a prerequisite for industrialization. Before patents existed, conspicuous characteristics allowed manufacturers to keep technologies to themselves and to defend their reputations. Physical and economic forces complicated the

process of counterfeiting merchandise made by reputable manufacturers and the process of transplanting technology from place to place. In many ways, of course, patents and conspicuous characteristics were complements. Manufacturers could use both to safeguard intellectual assets. Evidence indicates that many early-modern manufacturers did so, just as manufacturers do today. Thus, the adoption of patents probably increased incentives for innovation, although the influence of patents may have been smaller than conventionally claimed.

This deduction suggests that patents may have influenced economic progress through other channels. One was by shifting the costs of enforcing intellectual property rights from the private to the public sector. In the world before patents, manufactures invested time and money to create goods with unique, observable attributes. In modern economies, governments bear the costs of protecting reputations and innovations. The judiciary prosecutes counterfeiters. Criminal courts compensate victims of counterfeiting. Entrepreneurs need not invest large sums in conspicuous characteristics.

A second channel was the time-profiles of profits from innovation. In the world before patents, returns from inventive activity accrued over long periods. Profits from successful innovations, conspicuous characteristics, and respected reputations accrued over generations. The ability to capture intergeneration returns may have been a principal reason that guilds formed the nexus of innovation and commerce before modern times. Since the creation of patents, returns from innovation accrue for limited periods, usually 14 years or less. Front-loading revenues makes innovation more attractive to individuals, families, and firms with limited life spans, which have been the nexus of commerce and innovation in the modern era. Thus, the emphasis on the short-run returns seems to influence the optimal method of organizing industry.

A third channel was by changing the types of intellectual property that could be protected. In the world before patents, protection existed only in industries with natural or technical barriers to entry. After the establishment of patents, intellectual property could be protected in industries without innate barriers. This protection may have been particularly important due to the Scientific Revolution. The spread of scientific knowledge facilitated entry into many industries. Science revealed relationships between conspicuous characteristics and local resources and lowered the costs of duplicating technological trademarks. Science also

⁷³ Richardson 2001a and 2001b

accelerated the diffusion of industrial technology. Chemistry, biology, physics, and engineering explained how to adjust manufacturing methods to local conditions. A fourth channel was by transforming private information into common knowledge. In the world before patents, innovators strove to keep ideas to themselves. Success at keeping secrets enabled entrepreneurs to earn large returns from exclusive markets. Technology often disappeared when bad luck beset those who held key pieces of information in their minds. Today, to receive a patent, an inventor has to describe an idea, what it does, and how it works. The description becomes part of the public record and available to all interested parties. Public revelation has several benefits. Ideas were less likely to be lost when those in the know fail to pass them along. Other entrepreneurs can build upon bright ideas. Parallel applications may exist in unexpected places of which original innovators are ignorant. After a patent expires, the technology becomes public property, and everyone can employ it freely.

In addition to illuminating the history of patents, the manufacturing-guilds-as-branding-mechanisms hypothesis contributes to at least three fields of academic literature that use the past as a laboratory for pondering the present. The first investigates the foundations of impersonal markets and the origins of anonymous exchange. Greif, Milgrom, North, and Weingast explore these issues in a series of articles that examine the infrastructure underlying the late-medieval Commercial Revolution. Their work illuminates institutions that supported long-distance commerce. Muslim and Italian trading associations linked local wholesalers with overseas agents.⁷⁴ Merchant guilds protected members who traveled abroad from the exploitative impulses of foreign authorities.⁷⁵ The community responsibility system enforced commercial obligations and facilitated inter-community exchange.⁷⁶ The Champagne Fairs disseminated information about merchants' reputations, ensured contract enforcement, and encouraged impersonal exchange.⁷⁷ Together, these institutions enabled chains of merchants to ship goods from point of production to point of sale. This essay complements that conclusion by revealing the methods manufacturers used to transmit information about product quality through distribution chains.

⁷⁴ Grief 1989, 1993, 1994

⁷⁵ Grief, Milgrom, Weingast 1994

⁷⁶ Grief 1999

⁷⁷ Milgrom, North, Weingast 1990

The second school of scholarship examines the role of cooperative institutions in the early stages of industrial development and sectors plagued by information and incentive programs. Typical studies focus on credit, debt, and insurance markets. Examples include the work of Banerjee, Besley, Coate, Guinnane, and Kimball.⁷⁸ This essay alludes to those applications and demonstrates that, in the past, cooperatives operated in a wider array of industries than they do today. Manufacturing cooperatives dominated most medieval industries. Associations of artisans invented many of the products and foodstuffs consumed in modern times. A short list – textiles, dyes, perfumes, eyeglasses, books, watches, clocks, wines, beers, liquors, and cheeses – tells but a fraction of the tale. The success of cooperative manufacturing during Europe’s economic development suggests ways in which cooperatives can aid the developing world today.

The third field of literature studies methods of marketing merchandise when protections for intellectual property are lax or nonexistent. The theoretical foundation of this literature rests on the work of Grossman and Shapiro who describe the positive and normative effects of the counterfeit-product trade.⁷⁹ The empirical literature appears in business journals, trade publications, news articles, government reports, and history texts. A common theme is that only deterrence can stop crimes against intellectual property.⁸⁰ Judicial authorities deter counterfeiting by prosecuting in criminal courts. Private parties discourage counterfeiting by suing in civil courts. Political pressure enhances these actions by closing offshore havens where illicit manufacturers can avoid the long arm of the law. All three approaches are enhanced by the use of new tagging technologies such as color-coded micro-fibers hidden within manufactured merchandise, which allow legal authorities and legitimate manufacturers to identify illicit articles. The success of medieval manufacturers suggests a similar strategy that enlists consumers to combat crime. Use technology to create characteristics that customers can observe but counterfeiters cannot duplicate. These conspicuous characteristics will, like hidden tagging technologies, facilitate law enforcement, and have an additional benefit. They will involve individuals in the anti-

⁷⁸ Banerjee, Besley, and Guinnane 1994, Besley, Coate, and Loury 1993 and 1994, Coate and Ravallion 1993, Fafchamps 1992, Kimball 1988

⁷⁹ Grossman and Shapiro 1988a and 1988b

⁸⁰ Borrus, Bradford, Elliot, O’Donnell, and Weiner 1985, Business Marketing Digest 1993, Checkett 1998, Economist 1996, Globeman 1988, Granzin and Olsen 1992, Harvey 1987, Long 1995, Mohl 1995, Newland 1998, Strasser 1989.

counterfeiting crusade by providing the public with the ability and an incentive to distinguish legitimate goods from low-quality look-alikes.

This method is already used for the world's most important commodity: money. Governments go to great lengths to prevent counterfeiting of currency. The United States Treasury recently redesigned the five, ten, twenty, fifty, and one-hundred dollar bills. New security features complicate duplication of these denominations, making it easier for cashiers and consumers to distinguish real bills from fake funds. The security efforts of countries around the world often dwarf those of the United States. Latin and Asian nations revise currencies frequently. European nations and former British colonies use multiple colors, metal security threads, and miniature holograms. Whether these methods may be applied to other industries depends on cost conditions. Conspicuous characteristics impede counterfeiting only if consumers can observe them readily, legitimate manufacturers can produce them inexpensively, and counterfeiters can copy them only at great cost if at all. This cost structure may exist in many industries, but probably far fewer than during the Middle Ages. Scientific progress has swept away the ignorance and inability that once reinforced conspicuous characteristics. Modern knowledge enables manufacturers to reverse engineer competitors' merchandise and learn the secrets of its success. Conspicuous characteristics are likely to have sizeable impacts only in regions lacking first-world levels of education and industry. Conspicuous characteristics may have a significant role to play in those regions, since those places often also lack first-world protections for intellectual property.

Table 1
 Manufacturing Guilds by Industry, Specialty, and Occupation

Industry	Specialty	Occupation
Textiles	Wool Cloth	Weavers, Fullers, Dyers, Tenters, Shearers
	Other Fabric	Burrelers, Cappers, Felters, Knitters, Linen-weavers
Leather Goods	Processing	Tanners, Tawwers
	Finishing	Curriers, Painters, Stainers
	Apparel	Corversers, Girdlers, Glovers
	Shoes	Cobblers, Cordwainers
	Equipment	Pouchmakers, Saddlers
Metallic Goods	Luxuries	Goldsmiths, Silversmiths
	Housewares	Bronzsmiths, Coppersmiths, Cutlers, Founders, Pewterers
	Miscellaneous	Bellmakers, Blacksmiths, Lorimers, Lockyers, Ironmongers, Nailmakers, Pinmakers, Spurriers, Wire drawers
Wooden Goods	Furniture	Cabinetmakers, Coffermakers, Carpenters
	Equipment	Coopers, Joiners, Wheelwrights
Military Equipment	Arms	Bladesmiths
	Armor	Armorers, Malemakers, Helmetmakers, Shieldmakers
	Archery	Bowyers, Fletchers, Stringers
	Accessories	Scabbardmakers

Note: This table lists the occupations of guilds with rules regarding quality found in the sources listed in the bibliography. Most of these guilds were founded in the fourteenth century. A few were founded in the twelfth, thirteenth, and fifteenth.

Sources: Data compiled from books and articles listed in the bibliography.

Table 2
Prices of Products versus Incomes of Consumers

Industry	Product	Price (pence)	Price as Percent of Monthly Income		
			Laborer	Craftsmen	Merchant
Textiles	Wool, first quality - 4 sq. yards	78	124.8%	78.0%	15.6%
	Wool, second quality - 4 sq. yards	42	67.2	42.0	8.4
	Blanket - 4 sq. yards	35	55.2	34.8	7.2
	Linen, shirting - 4 sq. yards	25	39.6	24.0	4.8
	Canvas, coarse - 4 sq. yards	15	24.0	15.6	3.6
	Tunic, plain	3	52.8	33.6	7.2
	Sack, large	12	19.2	12.0	2.4
	Cap, Knitted	7	10.8	7.2	1.2
Leather	Saddle	175	279.6	175.2	34.8
	Boots	49	79.2	49.2	9.6
	Saddle Bags	19	30.0	18.0	0.0
Metal	Copper cauldron, 20 gallon	400	639.6	339.6	80.4
	Brass pot, 5 gallon	71	112.8	70.8	14.4
	Scythe	26	42.0	26.4	4.8
	Iron skillet	20	32.4	20.4	3.6
	Lock and chain	10	15.6	9.6	2.4
	100 large nails	6	9.6	6.0	1.2
Wood	Boat, small rowboat	216	345.6	216.0	43.2
	Cart, body without fittings or wheels	40	63.6	39.6	8.4
	Table, long	32	51.6	32.4	6.0
	Vat for malt	25	39.6	25.2	4.8
	Chest	24	38.4	24.0	4.8
	Wheelbarrow	15	24.0	15.6	3.6
	Ladder	12	19.2	12.0	2.4
Military	Armor, breast plates and gorget	240	384	240.0	48.0
	Helmet, iron	48	76.8	48.0	9.6
	Gloves, plated with iron	45	72.0	45.6	9.6
	Crossbow	25	39.6	25.2	4.8
	Sword	25	39.6	25.2	4.8
	Longbow	12	19.2	12.0	2.4
	Shield	9	14.4	9.6	2.4
Misc.	Wheel for wagon, iron bound	352	562.8	351.6	70.8
	Bed with mattress and quilt	340	543.6	339.6	68.4
	Pestle and mortar, stone	80	128.4	80.4	15.6
	Wheel for wagon, wooden	74	118.8	74.4	14.4
	Hand-mill, stone	27	43.2	27.6	6.0
	Bushel measure, iron bound	24	37.2	24.0	4.8
	Axe	10	15.6	9.6	2.4

Sources: See Appendix.

Note: Prices rounded to the nearest pence. Percentages rounded to tenths of a percent.

Table 3
Unobservable Attributes of Manufactured Merchandise

Industry	Product	Unobservable Attributes			Examples	Defect	Consequences
		Effectiveness	Durability	Resale Value			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Textiles	Wool Cloth	○	●	○	Worsted	Coarse substituted for fine wool	Fabric irritates skin. Irritation gradually increases
	Wool Cloth	○	●	○	Broadcloth	Cloth insufficiently fulled	Cloth shrinks when wet and tears easily
	Wool Cloth	○	●	○	Scarlet	Dyes unfixed or unstable	Coloring fades, runs, or putrefies
	Other Fabric	○	●	○	Sailcloth, Burlap	Poorly woven from fragile fiber	Sales tear, sacks split, garments rip
Leather	Footwear	○	●		Shoes and boots	Improperly tanned leather	Leather hardens, cracks, putrefies, and/or smells
	Garments	○	●	○	Gloves and belts	Colored with inferior stains	Coloring fades or runs.
Wood	Furniture		●	○	Tables, chests, chairs	Made with unseasoned wood	Wood warps, joints loosen, furniture breaks
	Tools	●	●	○	Wagons, Plow frames	Inferior adhesives and joints	Equipment fails often
Earthenware	Housewares	●			Dishes, containers	Glaze permeable or poisonous	Dishes deteriorate or contaminate food
Metal	Precious Metals	○		●	Silver dishes	Base substituted for precious metals	Gold and silver less valuable than anticipated
	Jewelry	○		●	Silver brooch with gems	Glass substituted for gems	Jewelry worth less than anticipated
	Pewter	●	○	○	Dishes and housewares	Lead in alloy	Lead contaminates food and discolors dishes
	Alloys of Iron	●		○	Hammer, horseshoes	Excessive carbon content	Brittle metal shatters when struck
	Alloys of Iron	●		○	Knives, tools	Insufficient carbon content	Soft metal. Blades dull quickly
	Alloys of Iron	●	○	○	Ploughshares, nails	Internal fractures	Metal snaps when stressed
	Cast Metal	●		○	Bells, hammer heads	Internal cavities	Metal deforms under pressure
Military	Metallic Weapons	●		○	Swords, daggers, axes	Imperfections in metal (see above)	Sword breaks during combat. Owner endangered
	Metallic Armor	●		○	Plate and chain mail	Imperfections in metal (see above)	Armor penetrated by opponent. Owner dies
	Leather Armor	●	●	○	Corset or jerkin	Substandard leather (see above)	Leather hardens and cracks. Armor weakens
	Accessory Armor	●		○	Helmets	Inferior materials and assembly	Weak joint along crest. Helm cracks when struck

Sources: See appendix.

Key: “●” indicates principal concern of purchasers. “○” indicates secondary concern of purchasers.

Table 4
Craftsmen's Ability and Incentives to Conceal Defects

Industry (1)	Product (2)	Defect (3)	Gestation (4)	Detect (5)	Method of Concealment (6)	Profits (7)
Textiles	Wool Cloth	Coarse wool substituted for fine wool	Gradual	○	Soak wool in water soluble powder	15%
	Wool Cloth	Cloth insufficiently fulled	Gradual	○		5%
	Wool Cloth	Dyes unfixed or unstable	Gradual	○	Reinforce easily examined edges	5% to 35%
	Other Fabric	Poorly woven from fragile fiber	Gradual	○		15%
Leather	Footwear	Improperly tanned leather	Gradual	◆	Paint or stain exterior	10%
Metal	Gold jewelry.	Base substituted for precious metals	When detected	◆	Cover with veneer of precious metal	80%
	Silver jewelry with gems	Glass substituted for gems	When detected	○	Place colored foil behind glass baubles	80%
	Pewter housewares	Lead in alloy	Gradual	■	Cover edge with thin sheet of steel	30% to 45%
	Iron alloys	Excessive carbon content	Sudden	■		30% to 45%
	Iron alloys	Insufficient carbon content	Sudden	◆		30% to 45%
	Forged metals	Internal fractures from improper forging	Sudden	■		30% to 45%
	Cast metals	Internal cavities due to improper casting	Sudden	■		30% to 45%

Sources: See appendix.

Key: “■” indicates detection before purchase impossible in most circumstances. “◆” indicates experts with appropriate tools and techniques may detect hidden defects but probably not all of them. “○” indicates with effort, experts can detect many defects. Laymen may spot flaws, but doing so requires knowledge, experience, and effort.

Table 5
Equivalent Labels in Three Languages

Latin	Persian	Cumanic
linen of Champagne	ketan y jonban	yionban chetan
linen of Reims	ketan y rusi	russi chetan
linen of Germany	ketan alamani	ketan chetanj
linen of Orleans	chetan soltanj	orlens chetan
linen of Novara	sansda chesi	sasda chesi
linen of Cremona	dras chesi	dras ches
linen of Lombardy	chetan lombardi	lonbardi chetanj
linen of Asti	chetan astexa	astexan chetanj
linen of Ostuni	chetan ostume	ostume chetanj
linen de Novo	keta begonia	bergonia katanj
linen of Bergamo	keta bgamasce	bgamasce ketanj
linen of Fabriano	aracli	aracli

Source: Lopez and Raymond 1990 pp. 347-348.

Table 6
 Guilds' Christian and Profession-Town Names

Town	Fraternity of ...	Guild of ...
Boston	St. John the Baptist	cordwainers
Cambridge	St. Katharine	skiners
Holbeach	Assumption Nativity of the Blessed Virgin Mary	tilers shepherds
Great Yarmouth	Holy Trinity	cobblers and tanners
Lincoln	St. Nicholas Holy Cross St. John the Evangelist Blessed Virgin Mary Holy Cross All Saints Blessed Virgin Mary Corpus Christi Corpus Christi Corpus Christi Exaltation of the Holy Cross	clerks archers barbers cordwainers fullers masons merciers tilers sailors tailors weavers
London	St. John the Baptist St. Lawrence Our Lady of St. John Annunciation and Assumption Blessed Virgin Mary and Saint Luke All Hallows, London Wall All Hallows, London Wall	tailors ironmongers carpenters pouchmakers painters whittawyers brewers
Lynn	Ascension Exaltation of Holy Cross Nativity of St. John the Baptist St. William Great Gild of Holy Trinity	coifmakers shipmans young merchants young scholars gilda mercatoria
Norwich	St. Mary's in the Carmelites Church St. Mary's and All Saints St. John the Baptist Holy Trinity St. Michael St. William Ascension	candlemakers saddlers and spurriers barbers carpenters artificers peltiers tailors

Sources: Guild Census 12 Richard II (1388), Public Record Office, Miscellany of Chancery Collection: C 47.38 to C 47.36. Pooley 1947 p. 9, and Westlake 1915 pp. 138-238.

Appendix: Construction of Tables 2, 3, and 4

Table 3 proves products' were large fractions of consumers' incomes. Data for the table has been taken from the last decades of the fourteenth century and the first decades of the fifteenth century. Those decades witnessed the peak of post plague popularity when real incomes rose to the highest levels and real prices fell to the lowest levels ever before the Industrial Revolution. Thus, the choice of those decades minimizes biases that might undermine the message of the table and ensures the moral arises from historical reality and not spurious manipulations of the evidence. The data underlying the table is described below.

Craftsmen's yearly income ranged from 900 to 1250 pence, and laborers' ranged from 540 to 750 pence. Those approximations are based on the following figures. During the second half of the fourteenth century, skilled craftsmen earned five pence a day and laborers three. The Sabbath and numerous religious holidays limited artisans with steady employment to about two hundred fifty working days per year. Typical laborers worked approximately one hundred eighty days per year. The table assumes laborers worked 250 days each year, for the reason stated above, to bias the results as far as possible against the conclusions drawn by the author. Typical individuals spent at least three-quarters of total income on necessities such as food, clothing, rent, and taxes, leaving just one-quarter as spendable surplus. Relative to this disposable income, durables were expensive.

The incomes for this table have been calculated using data from England from the late-fourteenth and early-fifteenth centuries. Evidence on daily wage rates comes from Phelps-Brown and Hopkins and Dyer (See Phelps Brown and Hopkins 1957 and 1962, Dyer 1994 pp. 215-217, 226-229). Estimates of the number of days worked comes from Hoskins and Dyer (see Hoskins 1988 pp. 111-113 and Dyer 1994 pp. 222-223, 226). Comparisons with similar calculations undertaken by other scholars have confirmed the conclusions here (Epstein 1991 p. 113, and Swanson 1989 pp. 152-155).

Most price data in the table comes from Thorold Rogers' *History of Agriculture and Prices in England volumes 1 through 4*, John Munro's *Textiles, Towns, and Trade*, and Christopher Dyer's *The Standard of Living in the Middle Ages*. In some instances, the average prices calculated by Thorold Rogers have been used. The averages have flaws. They are not based on random samples. They are not weighted by the quantities recorded in the transactions (so that 1 nail purchased for 1 pence receives the same weight in the average as 1000 nails purchased for 50 pence). They do not account for geographic and quality variation. But, the averages do serve the purposes of the table. They allow quick comparisons of average incomes and average prices that roughly reveal the costs of purchasing defective products. In other cases, raw data collected by Rogers has been used to calculate average prices of particular products. Details appear below.

The comparisons assume individuals earned as much as the most affluent urban laborers, craftsmen, and merchants without deducting for food, shelter, and other necessities. That assumption biases the estimates downwards. Evidence on incomes and prices comes from late-fourteenth and early-fifteenth century England. During those centuries, real incomes were higher and real prices were lower than at any other point in the Middle Ages. In the Anglo-Saxon homeland, the people were among the poorest in Europe. Thus the data used in the table also biases the estimates downwards (detailed descriptions of the data and calculations appears in the appendix). The downward bias is appropriate. It makes corroborating the claims of this author more difficult. The difficulty, however, does not stand in the way of demonstrating.

Textiles

- Blanket material. Price of 34.7 pence is average of 3 transactions: (1) 1387, Southampton, 1s. per yard. Rogers vol. 2 p. 342. (2) 1392, Heyford Warren, 6d. per yard. Rogers vol. 2 p. 342. (3) 1394, Oxford, 8d. per yard. Rogers vol. 2 p. 342.
- Caps. Price of 7 pence is based on one transaction. 1388, Oxford, 2 caps at 7d. each. Rogers vol. 2 p. 342.
- Tunic. Price of 12.1 pence is average of 3 transactions. (1) 1385, Southampton, 1 tunic for carter 2s. 6d. Rogers vol. 2 p. 342. (2) 1392, Oxford, 4 winter tunics for wardens at 2s. 9d. each. Rogers vol. 2 p. 342. (3) 1398, Oxford, 4 winter tunics for wardens at 3s. each. Rogers vol. 2 p. 342.
- Textiles: prices for coarse canvas, linen, first-quality wool, and second-quality wool from 1391-1400 averages in Rogers vol. 1 p. 595. Averages converted to prices for four square yards by dividing price for dozen ells (~12 yards long by 1 yard wide) by 3 and pannus of cloth (~24 yards long by 2 yards wide) by 12.

Price of 1 s. per yard for blankets the average of ten transactions from 1325 to 1394 from Rogers vol. 1 p. 576.

- Sacks. Price of 33 pence is based on 7 transactions: (1) 1401, Heghtredebury, one sack of four bushels and one sack of five bushels, total 1s. 1d., Rogers vol. 3 p. 544 (2) 1401, Hornchurch, four sacks of seven bushels each, 1s. 2d. each. Rogers vol. 3 p. 544 (3) 1403, Horchurch, 6 new sacks, 1s. 4d. each. Rogers vol. 3 p. 545 (4) 1403, Hornchurch, 2 five bushel sacks at 11d. each. Rogers vol. 3 p. 545 (5) 1407, Lullington, 3 sacks at 1s. 4d. each. Rogers vol. 3 p. 545 (6) 1407, Takely, 2 sacks for total 2 s. Rogers vol. 3 p. 545 (7) 1408, Stert, 2 five bushel sacks at 11d. each. (8) 1409, Alton Bates, 2 five bushel sacks at 10.5d. each.. Rogers vol. 3 p. 545.

Leather Goods

- Boots. Price of 49.3 is average of 4 transactions. (1) 1356, superior dyed leather boot, 4s. a pair, Rogers vol. 2 p. 575, (2) 1358, superior dyed leather boot, 4s. a pair, Rogers vol. 2 p. 575, (3) 1379, standard boot, 2s. 4d. per pair, Rogers vol. 2 p. 575 (4) 1383, fancy boot with spurs bought, 6s. 8d. per pair, Rogers vol. 2 p. 575.
- Saddle. Price of 174.7 pence is average of four transactions. (1) In 1394, a ‘warden’ in Oxford purchased a saddle for 20 s. 4 d. (2) In 1410 in Jarrow, an individual bought a saddle and bridle for 10 s.. (3) In 1411 in Finchalk, an individual bought a saddle, girths, bit and bridle for 13 s. 4 d.. (4) In 1412 in Oxford, and individual bought a saddle for 11s.. Rogers vol. 2 p. 575 and vol. 3 p. 546.
- Saddle bags. Price of 19 pence based on 1 transactions. Rogers vol. 1 p. 648.

Metallic Goods

- Base metals. Lead’s average price per 112 pounds = 5s. 4.5d. (a wey is 2 cwts is 224 pounds). Pewter’s average price per 112 pounds = 30s 4d.. Brass’s average price per 112 pounds is 26s 3d. Pewter, brass, and copper had similar prices throughout the Middle Ages. Averages over period 1351-1400. Rogers vol. 1 p. 605.
- Brass pot. Price of 70.5 pence comes from Rogers vol. 1 p. 552 which notes that the average price of 5-gallon brass pots (9 of which were purchased from 1301-1400) was 5s 10.5 d (i.e. 70.5 pence). Supporting evidence comes from Rogers vol. 2 p. 574 which notes that in 1388 in Radcliff, an individual spent 6 s. 8 d. on two brass pots (dimensions unrecorded) and Rogers vol. 1 p. 605 which notes the average price of a one gallon brass pot from 1381-1390 was 1s. 8d..
- Copper Cauldron, 20 gallons. Price derived from cost of copper (noted above as equal to that of brass) and the average price per gallon of metal container (noted above as 20 pence per gallon).
- Iron skillet. The price of 20 pence is based on one transaction. In 1409 in Heyford, an individual purchased an iron skillet for 1 s. 8 d. Supporting evidence comes from Rogers vol. 1 p. 553 which states that the the average price paid for pans in six transactions from 1301 to 1400 was 1s 10d and Rogers vol. 3 p. 546 which reports the purchase of a frying pan for 1 s. 2 d..
- Lock and chain. The price of 10 pence is based on 6 transactions. (1) 1401, Alton Barnes, granary lock, 1s. Rogers vol. 3 p. 544 (2) In 1392 in Drayton, and individual paid 2 s. 6 d. for 2 padlocks and chains. Rogers vol. 2, p. 575. (3) In 1399, a farmer in Alton Barnes paid 10½ d. for a chain and padlock to use it to lock his horse in the pasture. Rogers vol. 2, p. 575. (4) 1401, Takeley, 3 fetterlocks for horses in pasture, 1s. 7.5d., Rogers, vol. 3, p. 546, (5) 1402, Takely, 2 fetterlocks for houses, 1s. 3d. Rogers, vol. 3, p. 546, (6) 1406, Takely, fetterlock, 6d., Rogers, vol. 3, p. 546.
- Scythe: The price of 26 pence is based on the average of six transactions between 1348 and 1400, as stated by Rogers v 1 p. 541 ... Rogers v4 p. 413 in 15th century, scythes generally cost about 2 shillings, “The scythe was a more expensive tool.”

Wooden Goods

- Boat, small rowboat. 1408, Jarrow, 18s. Rogers vol. 3 p. 545.

- Cart body without wheels or fittings. The price of 40 pence is the average of 2 transactions: (1) 1401, Heghtredebury, Cooper's cart, 3s. 4d., Rogers vol. 3 p. 544 (2) 1401, Hornchurch, cart body, 3s. 4d., Rogers vol. 3 p. 544.
- Chest, wooden: The price of 24 pence is based on one transaction. In 1409 in Heyford, an individual purchased a chest for 2s. Rogers vol. 3 p. 546.
- Ladder: The price of 12 pence is based on 2 transactions. (1) In 1411 in Cambridge, an individual bought a ladder for 1s. 1d.. (2) In 1410 in Oxford, an individual bought 3 new ladders for 1s. each. Rogers vol. 3 p. 546.
- Table, long: The price of 32 is based on one transaction. 1410, Wye, long table, 2s. 8d.. Rogers vol. 3 p. 546.
- Vat for malt. Price of 25 pence is based on one transaction. In 1388 in Alton Barnes, an individual spent 4s. 2d. on 2 malt vats. Rogers vol. 3 p. 546.
- Wheelbarrow. Price of 15 pence average of two transactions. (1) 1411 Cambridge 1s. ½d.. (2) 1391 1s. Rogers vol. 1 p. 551. In the 15th century, "There are fourteen entries for wheelbarrows, at prices ranging from 2s. to 7d.. The general price is about 1s. 3d." Rogers vol. 4 p. 414.

Military Equipment

- Armor, plate. Price of 240 pence for upper body armor based on two transactions. (1) 1312, Tikhill, 1 pair plates and gorget for 20s. Rogers, vol. 2, p. 559, (2) Corset, iron. 1312, Tikhill for 13s. 4. Rogers vol. 2 p. 559. Note: 1 pair plates refers to a breastplate and a backplate. A gorget is a piece of armor that protects the neck, shoulders, and upper torso. A corset is a close fitting, sleeveless, metal shirt that protects the middle and lower torso.
- Crossbow. Price of 25 pence based on one transaction. 1312, Tikhill, 12 for 2s. 1d. each. Rogers vol. 2 p. 559.
- Gloves, plated with iron. Price of 45 pence based on two transactions. (1) 1369, Oxford, 1 pair plate gloves 5s. Rogers vol. 2 p. 559. (2) 1385, Southampton, 1 pair plated gloves 2s. 6d. Rogers vol. 2 p. 559.
- Helmet, iron. Price of 48 pence based on two transactions. (1) 1308, Framlingham Castle, 9 capellae feratae for 4s. each. Rogers vol. 2 p. 559. (2) 1312, Tikhill, 1 bacinet for 4s. 6d. Rogers vol. 2 p. 559.
- Longbow. Price of 12 pence based on two transactions. (1) 1382, Southampton, 1 bow for 1s., Rogers, vol. 2, p. 559, (2) 1385, Southampton, 2 bows with arrows for 4s. 2d. Rogers vol. 2, p. 559.
- Shields. 1308, Framlingham Castle, 8 shields for 6s. total. Rogers vol. 2 p. 559.
- Sword: 1296, 1 sword for 2s. 2d.. Rogers vol. 1 p. 649. (2) 1368, Dengmarsh, 6 swords at 2s. each. Rogers vol. 2 p. 559.

Miscellaneous

- Axe: The price of 10 pence is derived from four transactions. In 1382 in Donyngton, and individual spent 9 d. on an axe. In 1390 in Oxford, an individual spent 2 s. on an axe. In 1398 in Hornchurch, and individual spent 5 d. on an axe. In 1413 in Daventry, an individual bought an axe for 8 d.. Rogers vol. 2 pp. 574-5 and vol. 3 p. 546. Five axes purchased post plague averaged 11.5 pence each. Rogers vol. 1 p. 551
- Bed (including mattress and quilt): Average price of 340 pence from two purchases made by a college warden in Oxford 1345, 25s.; 1374 33s. 4d. Rogers vol. 1 p. 581.
- Bushel measure, iron bound: The price of 23.5 pence is based on two transactions. In 1384 in Oxford, an individual spent 1 s. 10 d. on a bushel measure bound with iron. In 1396 in Drayton and individual spent 2 s. 1 d. on a bushel measure bound with iron.. Rogers vol. 2 pp. 574-5.
- Hand-mill stones: The price of 27 pence is derived from a single transaction. In 1395 in Drayton, an individual paid 4 s. 6 d. for 2 hand-mill stones. Rogers vol. 2 p. 575. Also millstone for mustard purchased in Oxford in 1388 at 7s. Two hand-mill stones bought at Hornchurch in 1395 at 2s 3d each.
- Pestle and mortar, stone (for kitchen): Average price 80 pence. Transactions: 1399, 6s 8d for the monastic kitchen at Bicester. Rogers vol. 1 p. 552.
- Wheel for wagon, wooden. 74 pence. Average for 1391-1400 from Rogers v. 1 p. 567.
- Wheel for wagon, iron bound. 351.5 pence. Average for 1391-1400 from Rogers v. 1 p. 567. Sum of wheels (ad ferr) and ligatures, i.e. sum of wheel with attachment points and iron to be attached to them.

- The category of various implements includes dung pots, ox-yokes, spades, sickles, pea hackers, sieves, harrows, hoes, shovels, saws, sickles, spoons, picks, pincers, utensils, and cheap tablewear. Their prices range from 4 to 12 pence. See Rogers vol. 4 pp. 411 to 430. Prices for lanterns range from 6 to 18 pence Rogers vol. 4 pp. 411 to 430. Pestle and mortar, for kitchen (wooden). Average price 5 pence. Rogers vol. 1 p. 552.

Table 3 relies heavily on Thorold Rogers' collection of prices, while Table 2 and 4 draws data from a wider array of sources. All appear in the bibliography. Several should be mentioned here. Invaluable descriptions of merchandise and manufacturing methods appear in Blair and Ramsay's *English medieval industries*, Swanson's *Medieval Artisans*, and Salzman's *English Industries*. Almost anything there is to know about medieval clothmaking appears in Munro's *Textiles, Towns, and Trade*. Detailed descriptions of medieval metalworking appear in Cherry's *Medieval Craftsmen, Goldsmiths*, Cotterell's *Old Pewter*, Gale's *Pewter and the Amateur Collector*, Hatcher's *English Tin Production and Trade before 1550*, Michaelis's *Antique Pewter*, Verster's *Old European Pewter*, and Ffoulkes's *The Armourer and his Craft*. Those texts supply most of the facts found in Table 2, columns 6 to 8, and Table 4, columns 3 to 6. Those texts also supply the technical information underlying the estimates in column 8 Table 4, column 7. Information about the prices of raw materials comes from three other sources: Thorold Rogers' *History of Agriculture and Prices in England volumes 1 through 4*, John Munro's *Textiles, Towns, and Trade*, and Christopher Dyer's *The Standard of Living in the Middle Ages*. The estimates in Table 4, column 7 are calculated as follows.

Textiles

- a) By replacing fine wool with coarse wool, cloth makers could cut costs 15%, since wool amounted to one third of cloth's cost, and expensive wool's price was double that of its cheaper substitute. (Munro 1994 V pp. 14-15, 39-45, Tables 3.4 to 3.11 and Rogers vol. 3 p. 704).
- b) By using unwashed wool, which contained chemicals used to treat sheep scab and other skin ailments and the oils used to comb and card the wool, Clothmakers could cut costs by an amount less than 3%. That percentage is an upper bound. Studies show the cost of preparing wool for weaving by washing, carding, and combining it amounted to just under 3% of total costs. What proportion of that amount was composed of the costs of washing is uncertain. A safe guess might divide the costs equally among the three steps, suggesting that using unwashed wool saved about 1% of total costs. (Munro 1994 V p. 52 Table 3.12).
- c) By insufficiently fulling fabric, cloth makers could cut costs by up to 5%, since fulling charges amounted to about 5% to total costs. (Munro 1994 V p. 52 Table 3.12).
- d) Cloth makers could cut costs between five and thirty-five percent by replacing expensive dyes with cheaper substitutes. Dyes amounted to one-twentieth of common-colored cloth's cost and one-half of the most fashionably colored cloth's cost, while inferior inks that mimicked those colors could be purchased for pennies. (Munro 1994 V pp. 14-15, 39-45, Tables 3.4 to 3.11).

Leather Goods

- e) Calculating the savings from speeding the tanning process is a tricky task. The savings arose because speeding the process permitted tanners to make better use of fixed capital. They could process more hides with fewer vats and chemicals. Tanners could speed the process by a factor of six, reducing the time it took to convert hides to leather to six from 36 weeks. Since fixed costs amounted to something like 60% of total tanning costs, speeding the tanning process reduced costs by approximately 50%. If those savings were passed on to craftsmen father down the production chain, such as saddlers or cobblers, whose efforts amounted to about 80% of the value of finished products (the other 20% being the cost of the leather), the savings from total costs of finished goods amounted to approximately 10%. (See Swanson 1989 p. 54 for details).

Metalware

- f) Cherry suggests most, perhaps 80%, of the value of gold and silver articles was the value of the precious metal within them. If consumers could be fooled by base metals, most if not all of that cost could be saved. Rogers vol. 4 p. 488 shows that silver's value exceeded that of base metals by 200 times and gold's value exceeded silver's by factor of almost 20.
- g) Pewterers could cut costs up to one third by putting lead in their alloy, since lead was one sixth the price of pewter, and pewter could hold up to forty-percent lead. (Prices from Rogers vol. 1 p. 605).
- h) Rogers vol. 1 p. 473 shows the price ratio of steel to iron as 4 to 1. Rogers vol. 4 p. 410 shows the price ration of wrought iron to raw iron as 2.3 to 1 (specifically, 112 pounds of wrought iron in 1401-1410 had an average price 18s. 2³/₄d. and 112 pounds of raw iron had an average price of 7s. 9³/₄d). Thus, assuming the price of metal amounted to half the cost of an article forged by a smith (the other half consisting of their fixed, fuel, and labor costs), then a smith who substituted raw for wrought iron could cut their costs by 30% and a smith who substituted raw iron for steel could cut their costs by 45%.

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