Increased standardization was a by-product of technical innovations during the Industrial Revolution. An unfortunate side effect of standardization was enhanced opportunities for theft and embezzlement. Two significant modern institutions radically evolved during the eighteenth to mid-nineteenth centuries to control these growing problems: criminal law and public police. These institutions strongly interacted with the pace of the Industrial Revolution. Our argument explains this evolution and is tested through an analysis of several historical facts: the role of early police, the fall of the watch system, the creation of improvement commissions, the removal of possession immunity, the rise and fall of factory colonies, and the fall and rise of court cases during the eighteenth century. (JEL N43, K14)
We examine this transition from private to public police and from civil to criminal law in light of the movement toward standardized goods.1 Standardized goods were the signature of the Industrial Revolution, and yet these goods were often mismatched with earlier legal institutions that were designed for more idiosyncratic commodities.2 We argue that the growth of criminal law and the emergence of public police are tied together by the growth of uniform, standardized goods that occurred during the Industrial Revolution.3 Our thesis is that as standardization developed, the gains from anonymous exchanges increased; however, along with these gains standardization facilitated theft and embezzlement, and the evolving law and police were responses to this.4

Section 2 of the article lays out a theory of how standardization of goods increases theft problems; it explains how this changed the optimal method of dealing with theft and argues that the Industrial Revolution was a watershed for the level of standardized goods. Sections 3 and 4 then describe the historical transitions of criminal law and public police and argue that these changes are consistent with changes in the standardization of goods. Of course, the changes to criminal law and police correlate with many factors changing at this time (population, density, income, mobility, transport costs, and technology). Section 5, then, offers several instances of historical observations that

1. Each of these evolutions has been documented elsewhere. Here we trace the changes, but our contribution is to provide an explanation of the change at a fundamental level: standardization. Thus, we provide an efficiency explanation for the institutional transition. This contrasts sharply with the social historical interpretation that views the changes in law, firms, and police as successful efforts of the wealthy to usurp the traditional customary rights of the working poor and enforce social control based on bourgeoisie values. See Becker (1983) or Linebaugh (2003) as examples. It also contrasts with the older Whiggish historical view (e.g., Radzinowicz 1948), which viewed the arrival of the police as a “logical” and “rational” progression toward a modern world.

2. Although we argue that the Industrial Revolution led to previously unparalleled increases in standardization, this does not imply that standardized goods did not exist previously. For example, loans had long been standardized and subject to anonymous exchange and court enforcement. Indeed, money was always relatively standardized.

3. This is not to say that other factors were irrelevant to the development of police and criminal law. Ours is a partial equilibrium analysis in which we examine a feature heretofore ignored. We also recognize that standardization was correlated with the other significant changes like population growth and urbanization. We attempt to identify the effects of standardization with the historical record in Section 5.

4. Legally embezzlement refers to an employee appropriating money or goods received by him on account of the employer. We use the term more generally to refer to any theft by employees. We use the term “theft” for items stolen between strangers.
are consistent with our theory. First, we show that our hypothesis is consistent with the activities of the new police. Second, we explain how the emergence of public police is consistent with the decline of the watch and ward system of private policing. Third, we document the rise of the improvement commissions which established watch and ward systems to monitor suburban streets. Fourth, we explain the switch in rights of possession for goods held by agents and employees. Fifth, our argument is consistent with the fall of civil litigation throughout the eighteenth century. Finally, we explain the early evolution of the factory in the form of isolated “factory colonies” which employed workers in a form of voluntary servitude. We do not argue that standardization explains everything during the Industrial Revolution, nor is our methodology designed to assign a quantitative contribution for standardization, but rather we argue it was an important and often ignored force in the evolution of several important institutions.

2. Standardization

In its pre-modern era, before the turn of the nineteenth century, Britain was a country laced with odd and old institutions like venal office holdings, dueling, public patronage, and private criminal investigation. One might ask: what critical event triggered our modern institutions? Why was the organization of life so different in 1750 compared to 1850, but hardly different between 1850 and our present day? Our short answer: increased uniformity and standardization.

Variability in the quality of goods has two sources: natural and man-made. Variability can be reduced by aggregating commodities, sorting them into different classes, or guaranteeing that a good will meet some level of performance. It can also be reduced by using more homogeneous inputs, better tools, more careful monitoring, and measurement of quality. However, the need to take such actions results from variability that arises in nature. The cost of human efforts to reduce variability is high because of large variances caused by nature. Prior to the Industrial Revolution, everything in life involved a large natural component—variance was everywhere, and this led to high variability in product quality.

Large roles played by variability meant that there were large opportunities for capture. If a load of wares headed for a distant market could be lost at sea or lost to pirates, it could easily be lost to opportunistic agents. Such problems were well known, and the pre-modern institutions were the means by which these problems were dealt with. The Industrial Revolution began to change the degree to which variability interfered in life. For the first time it

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5. As were other countries in pre-modern Europe. We focus on Britain because the Industrial Revolution had its origins there. Mokyr (2007: 26), in a similar spirit to ours, claims that Britain had a set of institutions which fostered investment in human and social capital which lead to their leading the way industrially. See Allen (2005) for a discussion of four of these pre-modern institutions.
became possible to leave nature outside the production process. Not perfectly, of course; indeed, by modern standards perhaps not very well at all. However, variability was reduced enough to allow sufficient measurement and reliable replication at a reasonable cost, that is, the beginning of standardization. Standardization is an important element of the Industrial Revolution and an important element to understanding the emergence of modern criminal law and police.

2.1 Measurement Costs, Theft, and Embezzlement
Standardization reduces the costs of measurement for identifying the attributes of a product and, as a result, lowers the costs of exchanging these commodities through formal contracts. Contracts, enforced by the state, are used for well-measured commodities, especially when standardized. Thus, standardization has enormous value and opens the door for large gains from anonymous market exchange. Improved uniformity enhances the use of machines, which in turn create even smaller variances in output. Standardization allows firms to alter their marketing methods and changes the way they organize their workforce. Without standardization, goods are more difficult to measure and are often evaluated subjectively. Under these conditions, exchanges will tend to be enforced informally through reputations. Disputes regarding such agreements must be resolved directly by the parties to the agreements as the courts are unlikely to know what the parties agreed to.

However, standardization brings with it new problems. With standardization, new opportunities for theft arise because the very feature of standardization that lowers the costs of exchange through markets and contracts also lowers the cost of fencing stolen goods and increases the costs of protecting goods from theft—including theft by employees. Standardization lowers the cost of fencing stolen goods for thieves because the thief selling a standardized good can transact anonymously and reduce his exposure. Standardized goods make those fencing and purchasing stolen goods less vulnerable to being caught. The opposite holds for artisan goods. Thieves selling artisan goods must use their reputation to get a good price. This requires them to identify themselves, increasing the chance of being caught. Furthermore, intermediaries and final consumers of stolen goods are more at risk of losing them when dealing with artisan goods that could be identified by their legitimate owner.

Legal owners of standardized goods then have higher costs in discovering, investigating, or prosecuting theft. There are several reasons for this. First, 

6. Greif (2006) argues that the emergence of widespread anonymous exchange is one of the key factors of modern growth.

7. For example, when a buyer who transacted by contract the purchase of 10 lb bags of sugar claims that the sugar is not up to specifications and the seller disagrees, the courts are reasonably able to adjudicate the dispute. On the other hand, when a buyer who commissioned a painting is displeased about its quality, he is unlikely to be helped by the courts and his only recourse is to tarnish the painter’s reputation. See Barzel (2004) for a discussion.
uniform quality of goods slightly hinders the owner from discovering a theft but drastically hinders him from investigating it. Second, when the transportation costs of standardized goods are low and their markets wide, owners are hindered because they have little knowledge of far away markets. Third, preventing the theft of standardized goods is a public good, at least in part. Any private effort to reduce theft and black market sales of standard goods provides a benefit to all owners of standardized goods, thus leading to an under provision of their private protection.

Contrast this with the protection and theft of artisan goods. Nonstandard, artisan goods are often identified with their owner and certainly are likely to be identified by their owner, that is, the owner has a comparative advantage in identification. This would hold true for both intermediate and finished goods. Thus, the legal owner of artisan goods will tend to be the efficient “protector/investigator” of the goods. Artisan owners are familiar with their goods, have asymmetric information over their legal status, are best able to determine when and what has been stolen, and are best able to recognize their goods when in the possession of others. These factors make them the efficient owners of the protection rights of the good. This comparative advantage of the artisan owner is enhanced when the markets for these goods are more local due to high transportation costs.8

Third party specialists (police) are unlikely to have any cost advantages over private owners in resolving thefts as standardization increases. Whether a good is standardized or not is almost irrelevant since the police are unfamiliar with the good. On the other hand, in other dimensions of investigating and prosecuting theft the police may have all manner of cost advantages, especially as markets broaden beyond the scope of any individual.

This simple argument is summarized in Figure 2, which shows two theoretical average cost functions for theft protection, with the variance of product quality on the horizontal axis. $V$ is the variance of product quality and measures the degree of standardization. Goods with low variance are considered standardized, whereas higher variance goods are more artisan. $AC_I$ is the average cost of resolving a theft by an individual owner and is falling with increased variance because of the reasons stated above. $AC_P$ is the average cost for a third party police resolving a theft, and this is constant across increased variance. $V^*$ is the critical level of standardization. The crossed hatched lower envelope shows the optimal supplier of policing services. Other things equal, when goods become more standardized than $V^*$, then it is efficient for theft to

8. Consider, for example, an extreme case of an artisan good: children. When a child is missing, the parent is the first to know. Likewise, seeing one’s child in the unauthorized possession of another adult is sufficient for the parent to know a theft has taken place. Parents, quite naturally, are still the primary “police” of their children because they have a strong comparative advantage in protection and because the value of their children to others is generally low. Third parties require much more information to identify a given stolen child and only become involved after the efforts of parents are unsuccessful or when the parents request their services.
be resolved by police. When goods are less standardized than $V^*$, private theft resolution by the individual owner is more efficient.

2.2 The Industrial Revolution Increased Standardization

The unprecedented increase in nineteenth-century income had its beginnings a century earlier. The effect of eighteenth-century technical innovations, both the great and the practical, has been analyzed at length.\(^9\) That there was a change in the rate of growth of output between 1760 and 1840 no one questions. Quite apart from the actual volume of production, another fundamental feature of the Industrial Revolution was the dramatic increase in the standardization of output and inputs of manufacture.\(^10\)

Technological improvements had been ongoing for a long time prior to the Industrial Revolution. However, until the late eighteenth and early nineteenth century, the role of variability in every productive process had been so large that it had been impossible for different workers to produce identical goods. Starting with the source and control of power, energy came from humans, animals, wind, or water. These natural sources were seasonal and varied considerably across space. Measurement instruments were often crude, and the hand tools mostly used led to a very artisan form of production and nonuniformity in final output. Given the high costs of transportation, inputs were often local and varied from one jurisdiction to another, leading to wide-ranging variation in output. No refrigeration, no dependable transportation, and often no reliable means of knowing where you were—especially at sea—meant that everything about life involved enormous elements of chance. Production supervision was minimal and small scale, leading to less specialization and less uniform products. Heaton (1965) notes the variability in the production of a simple product like yarn before the Industrial Revolution:

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\(^9\) See Mokyr’s (1999) extensive editor’s introduction for an excellent modern survey.

\(^10\) Though the topic is generally ignored, Szostak (1991) provides an excellent and extensive discussion of standardization during the Industrial Revolution.
It is well nigh impossible to secure uniformity of yarn. The clothier asked for a definite standard when giving out the wool to be spun, but the tendency would be for each house and each spinner to vary a little in the thickness and firmness of the yarn; some sent in hard-twisted, others soft-twisted, and it was very difficult to reduce the work to one standard. (p. 335)

The same could be said of virtually all production prior to 1700: standardization was uncommon.11 Throughout the eighteenth century and early part of the Industrial Revolution, a steady stream of new tools were developed that allowed standardization even in industries where artisan workmanship prevailed. Berg discusses how improvements in stamping technology, though not designed for mass production, improved the ability to manufacture uniform goods in engineering, cutlery, and hardware.12 As the Industrial Revolution progressed, the creation of steam power, continuous supplies of coal, and new methods of production meant that some industries could free themselves from the rhythm of natural power sources. Lower travel costs and road safety meant that markets became bigger, supplies more regular, and inputs more consistent across long distances. Thus, the increased division of labor, the increased use of machines, the use of nonseasonal sources of power, the better roads, and the use of standard inputs all led to increased standardization of products throughout the Industrial Revolution.13 At the same time that the types of goods available and their average quality increased, the quality variance decreased.

Szostak (1991) makes a compelling case that standardization was related to improvements in road and water transportation that increased market size and the method of distribution and that it was initiated not by technological changes alone. Better transportation led to more standardized goods, which allowed goods to be marketed and sold anonymously or by third parties. Early in the eighteenth century, sales by contract were uncommon and manufacturers traveled with their artisan wares to sell directly to buyers. By the end of the eighteenth century, a national network of common carriers had developed that allowed producers to sell at a distance by sample and by taking orders.14 This

11. High volume of production and standardization seem to be complementary. Mokyr (1999: 106) notes that “Standardization and uniformity demanded a special kind of quality control, which required continuous supervision and thus factories.” Langlois (1999) also notes that large volumes make investments in jigs and dies worthwhile, and these contribute to standardization.


13. In reference to iron, Szostak (1991: 127) states “... one of the major advantages of puddling and rolling was that it was capable of producing a homogeneous output ...” He also documents changes in weaving, bleaching, and supplies of clay that led to increases in the standardization of clothing, nails, and dishes.

increased sale of goods at farther distances required standardization.\textsuperscript{15} Thus, the initial and subsequent forces of standardization reinforced each other and accelerated the trend.

However, the arrival of standardization amid pre-modern institutions created new theft problems.\textsuperscript{16} Old institutions designed to deal with large roles of variability were often no longer appropriate for standardized goods because standardization allowed workers and thieves new opportunities for embezzlement and theft, while at the same time hindering property owners from protecting their goods. Based on Figure 2, as goods became more standard during the Industrial Revolution, the optimal method of theft resolution would have involved third party police and the laws regulating their authority. Since these did not exist in the pre-modern era, we argue that two major institutions were responses to the increased costs of identifying stolen goods brought about by increased standardization. First, standardization led to changes in the law with respect to the definition of crime and personal freedom. Past practices that had not been criminal were made so, and punishments and the form of punishment changed. Second, standardization led to the formation of public police forces.

3. The Evolution of Criminal Law

What constitutes a “crime” is a matter of state definition. Prior to the Industrial Revolution offenses were generally civil matters. An individual violating the property rights of another would most often be privately arrested, brought to a court to be privately prosecuted before a judge who owned the court offices, and if found guilty would generally pay restitution and court expenses. This system of torts, dating back before the Norman invasion, slowly and steadily evolved as many torts became classified as crimes against the King, punishable by either a fine, beating, possibly incarceration, transportation, or death. This evolution significantly accelerated throughout the eighteenth century—especially with respect to property crimes. The state increased its ability to search and arrest, offenses which had historically been torts began to be classified as crimes, and the number of capital offenses increased.\textsuperscript{17}

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\textsuperscript{15} Elsewhere Szostak (1989) states:

Of special importance here is the need for standardization. Selling goods face to face does not require a standardized product; selling by sample does. In order to take advantage of new and better methods of distribution, then, it was necessary to produce a standardized product. (p. 355)

\textsuperscript{16} Szostak (1989: 354–5) briefly discusses the role transport had on embezzlement. “As the number of materials increases, the cost of detecting foul play by inspecting the final good rises sharply. Thus the relative advantage of factories in this regard became increasingly important. Workers were not only watched while working, but could be, and were, searched when leaving. Direct supervision of employees in a centralized workplace would become increasingly attractive as the number of materials being dealt with increased.” See also S.R.H. Jones (1982: 129).

\textsuperscript{17} This transformation has been thoroughly documented by Becker (1983) in the context of embezzlement statutes and by Fletcher (1976) in the context of larceny.
3.1 Examples of Criminal Law Evolution

There are dozens of examples of torts or legal actions evolving into crimes during the second half of the eighteenth century. Suffice it here to mention a few. For example, gleaning evolved from a legal practice (which if excessive could be tortious) to a criminal one. In the early eighteenth century, it was common and lawful for workers to glean scrap material from production.\(^{18}\) These scraps could be assembled and resold or sold as inputs to someone else. These gleanings were considered perquisites and were acceptable to employers.\(^{19}\) If an employer felt the gleaning was carried too far, their only remedy was to sue for damages in a civil trial for breach of trust. As the century wore on, these practices were defined as crimes and made illegal.\(^{20}\)

In the eighteenth century, the legal status of gleaning evolved into pilfering or embezzling and might be called “clicking,” “bugging,” “scraping,” “chippings,” “vails,” “sweepings,” or even “cabbage” with the particular term depending on what industry was being referred to. These names often appear as the titles to legislation that criminalized the behavior.\(^{21}\) The Clicking Act of 1723 allowed a magistrate or agent to search the premises of a leather shoemaking journeyman who was suspected of clicking.\(^{22}\) The Bugging Act of 1749 criminalized the practice of substituting inexpensive fur for beaver pelts in hat making and introduced prison punishments for the crime. This and the Worsted Act of 1771 further increased the powers of search and made “ordinary tasks of the labour process such as sweeping out the room, snipping weft

\(^{18}\) For example:

The mates of the West Indianmen had a right to the sweepings of sugar and coffee from the hold of the ship; the gangsmen and coopers established a claim to the drainings of molasses and split sugar on the floor of the warehouse; .... At the Royal Yards, the shipwrights were allowed to take for firewood the chips that fell from the axe .... (Ashton 1966: 208)

The practice of gleaning extended beyond the employment relation. Between lord and peasant, there were gleaning rights to grazing (Common of Pasture), hay after harvest (Common of Shack), wood from forests (Common of Estover), and peat and turf (Common of Tubary) to name a few (Ditton 1977: 40). These rights were removed and made illegal (wood theft, poaching, trespass, etc.) through the enclosure acts. Linebaugh (2003: 264), in the context of silk production, states “These customs, latitudes or cheats arose either between the merchant and the master to whom the silk was put out for work, or between the master and his workers. Allowance was made for waste, or negotiated in either case. The techniques of production appeared to be highly wasteful.” See also Styles (1983a: 179).

\(^{19}\) Wage packages composed partly by moral hazard payments are inefficient compared to a first best scheme. If manufacturers could have reduced the gleanings at no cost, both real wages and gains to the manufacturer would have increased.

\(^{20}\) For example, see Hay (1980: 70–1) or Philips (1977: 188–9).

\(^{21}\) According to Soderlund (1998: 647), 14 acts covering 15 industries were enacted during the eighteenth century to convert gleaning to embezzlement.

\(^{22}\) As Linebaugh (2003: 234) puts it, although a historical practice, “clicking was criminalized.”
ends... potentially criminal offences.” These acts were designed to “put an end to the customarily acknowledged appropriations of workers.” The Truck Act of 1831 outlawed payment of wages in goods rather than cash. Indeed, there were eight different embezzlement statutes related to the woolen industry alone that extended criminal sanctions to what had earlier simply been normal practice or the civil wrong of breach of trust.

Gleaning was not the only criminalized action. Prior to 1692, it was not a crime to possess stolen goods. Throughout the eighteenth century, penalties were increased for “receivers” of stolen goods, and in 1827 possession of stolen property became a felony. Until 1799, it was the civil wrong of breach of trust, not a criminal offense for a servant to “convert to his own use money for goods received from a third person for his master.” After 1799, it was a crime. Indeed, by the early nineteenth century most embezzlement was prosecuted criminally as larceny. This avoided the complication of gleaning issues and matters of trust between masters and servants. By 1855, the Criminal Justice Act allowed a summary trial of indictable thefts of small value, which further extended the prosecution of embezzlement which was often of small individual values. Styles notes that during the eighteenth century, the burden of proof was often shifted to the accused and that this resulted from the difficulty of identifying embezzled materials.

3.2 Criminal Law and Standardization

The natural question to ask is: why would historical practices be made criminal in the eighteenth and early nineteenth centuries, and why would civil wrongs be converted to crime? Our answer is that the evolution of criminal law is

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23. Linebaugh (2003: 268). Elsewhere he points out that “The Bugging Act, like the Clicking Act preceding it or the Watch Scraping Acts following it, was designed to put an end to the customarily acknowledged appropriations of workers who had not yet been fully alienated from the means and materials of production.” (2003: 239).
27. Philips (1977: 225). Philips (1977: 189) notes how the creation of the factory assisted in this changing relationship:

. . . the development of the industrial system and the concentration in factories and workshops simplified the legal position on ownership and theft of raw material; there was no longer the legal problem which outwork posed, that while the ownership of the raw material remained with the master, the possession was with the outworker. Once all the material was worked up within the factory or workshop, this legal confusion disappeared.

29. Becker (1983: 1487) also notes that Parliament eliminated the grounds of proving that discovered materials were actually stolen. This further allowed property owners to attack the practice of embezzlement.
the consequence of the emergence of standardized goods. The theft of standardized goods, like currency, had always been criminalized.\textsuperscript{31} Goods that had always been artisan had their disputes remain in the civil courts. Rather, it was the standardization of the ordinary products of life that led to the changes in criminal law. Consider the question of gleaning. The practice of gleaning places some fraction of goods in the public domain, to be captured by workers. Historically, workers were limited in their ability to glean too much by the owners’ ability to identify stolen merchandize. Once inputs and outputs became standardized throughout the early Industrial Revolution, however, stolen goods become easier to fence and the costs to the owners of excessive gleaning increased considerably. Moreover, with the move to factories the scale of gleaning increased. Thus, “Embezzlement was rife in the manufacturing industries of eighteenth- and early nineteenth–century England.”\textsuperscript{32} At the same time, the ability of employers and owners to privately investigate and prosecute the theft of standardized goods fell. Black markets increased, and owners were unable to civilly litigate due to the failure in identification.\textsuperscript{33}

In earlier centuries, goods were idiosyncratic. Since the legal owner was the low cost identifier of these goods, the task of retrieving them when stolen was assigned to him, and the civil procedures allowed for restitution to compensate.\textsuperscript{34} The early changes to the law increased the legal authority of the few existing public officials (constables, justices of the peace, watchmen) to

\textsuperscript{31} Though coins could be clipped and counterfeited, they were relatively standard.

\textsuperscript{32} Randall (1990: 193–201). He documents the rise in complaints to Parliament between 1750 and 1840 and notes that this rise was not correlated with economic growth. He estimates that in the woolen industry, embezzlement amounted to about 2% of the finished cloth value (1990: 201). Ashton (1966: 208) puts it this way: “In each case the workers saw to it that the crumbs from the masters table were ample. Casks were handled not too gently; sacks were liable to burst open ... . The line of demarcation between the extension of established rights and barefaced robbery is difficult to draw.” In a contemporary account, Colquhoun (1795: 72) states that receivers of stolen property in the London area have “increased from about 300 to 3000 in twenty years.”

\textsuperscript{33} Embezzlers would sell purloined goods to networks of black market dealers, known in the wool industry as “slingers.” Randall (1990) notes how the introduction of standardized goods made prosecution difficult because “proof of ownership could not always easily be established” (p. 207). Knight (1995) discusses this problem in the context of a naval shipyard during the American War of Independence (p. 221). The existence of standard goods even hurt artisan ones. Colquhoun (1795: 78) notes that dealers in stolen goods would immediately melt down “... plate, pewter pots, and every kind of metal that can be identified.” He also notes (1795: 72) that “some of the dealers ... keep men employed in knocking the broad Arrow, or King’s mark, out of the copper bolts, nails, and bar iron ... to be resold back to the Crown.”

\textsuperscript{34} Again, Randall (1990: 208) provides an example in the woolen industry.

Occasionally it was possible for the victim of embezzlement to provide watertight evidence of fraud. Thus the wool bought from John Pobjoy by Thomas Blackburn, a small Bradford on Avon clothier, was readily recognized by its owner, John Cooper, as wool stolen from his slubbing shop because it was a peculiar German wool, finer than was common, and used by no other clothier in Trowbridge.
intervene in the form of searches and arrests and allowed them to avoid the tricky matter of breaching trust.\textsuperscript{35}

4. The Emergence of Public Police

In England, there was a steady decline in violent offenses from the middle ages on, and so the emergence of the public police in the first half of the nineteenth century was not in response to a sudden increase, or continuing high levels, in violent crime.\textsuperscript{36} Our conjecture is that the rise of police resulted from two factors. First, increased criminal law increased the demand for public police. With crimes, those found guilty were punished or fined, with the fine going to the treasury. A crime requires the investigation and prosecution by a public official because the absence of restitution and the public good nature of enforcement removed the major incentives for the private investigation and prosecution of a theft.\textsuperscript{37} Second, the reduced ability of private individuals

\begin{itemize}
\item \textsuperscript{35} In addition to the acts counted as crimes, the eighteenth and nineteenth centuries saw enormous changes to the nature of criminal punishment. Prior to this, conviction resulted mostly in restitution. The introduction of “crime” led to the removal of criminals from society. The Black Act essentially made all crimes capital offenses. By the turn of the nineteenth century, many of these were reduced to either transportation or, more likely, incarceration. After 1841, executions were carried out only for murder (Philips 1977: 47). It is beyond this article to develop a separate theory of the form of punishment. However, the general issue is a Coasean one: is it better to build a wall around the criminal or the victim? With public enforcement of criminal law, the former is optimal. Criminal prosecution means that the thief must be removed from society, either through death, transportation, or incarceration. To allow them to remain at large would mean individuals would have to privately protect themselves without recourse to restitution.

\item \textsuperscript{36} England in the thirteenth century was a rather violent country. Malcolm (2002: 21) estimates that the homicide rate was 18–23 per 100,000 population and that violent deaths accounted for 18.2\% of all criminal indictments. However, the trend in violence from this period until World War I is steadily downward. By the seventeenth century, homicide rates had fallen by half, and this continued throughout the eighteenth century until by 1890 “only three people in all of England and Wales were sentenced to death for murder committed with a revolver” (Malcolm 2002: 91). Malcolm notes that although all of this was done in the context of private provision of police and justice, violent crimes continually fell throughout the pre-modern and early modern period. This is confirmed as well by Beattie (1974: 61) who analyzed indictments in Surrey and Sussex from 1660 to 1800 and concluded that violent crime rates generally fell throughout the period, whereas property crimes rose. However, as discussed in Section 3, he recognizes that the rise in property crime was influenced by the changing definition of crime. Hay’s (1982) findings are similar.

\item \textsuperscript{37} Styles (1983b) provides an interesting examination of one aspect of criminal investigation that involves a public good: the dissemination of information on the incidence and character of offences. The eighteenth century saw an “information explosion” in the form of advertisements, newspapers, and handbills to replace the ancient hue and cry. Despite this, private efforts at criminal prevention and prosecution did not exploit the new technology. Styles (1983b: 132–4) points to four information problems with private investigation: criminals could easily “escape discovery by flight,” local magistrates were “profound[ly] ignoran[t] . . . of places and people . . . in distant parts of the country,” finding information was expensive and inconvenient, and there was no “official facility for distributing information.” It was not until the publicly funded magistrate, John Fielding of the Bow Street office, instituted his General Preventative Plan in 1772 that any attempt to forward criminal information was made. When his funding was cut, the practice was not taken up again until later in the next century.
\end{itemize}
to deal with the theft of standardized private property led to a demand for public police.

4.1 From Private to Public Police

Prior to the nineteenth century, there was no public police force as we know them today, and investigation, arrest, and prosecution were primarily the responsibility of private individuals, aided by owners of venal offices in the local court. Preventing crime was not exclusively an act of individual private citizens. Larger firms employed security guards and organized their firms to prevent theft. Groups within a community would form prosecution associations, hire private police patrols and investigative services, and use systems of rewards for capture. These private efforts dealt with the entire spectrum of criminal activity.

The public police did not arise out of a public vacuum, however. There were parish constables, watchmen, and justices of the peace. These were quasi-public offices, which assisted private individuals, and in the eighteenth century it often fell on them to enforce the growing number of criminal offences. Over the course of the eighteenth century, efforts were made to enhance these positions or find complementary means to assist in their police function. For example, the 1777 Worsted Act allowed an employers’ association to organize an industrial police force which could “regulate virtually every aspect of the production process. But their chief function was to detect and prosecute acts of embezzlement.” In addition, for a period in the 1760s London magistrates were paid out of Treasury funds to investigate crimes. The Bow street

38. There were no public servants in the pre-modern era. Court officials owned their office and charged fees for service. Two court officials would have been a constable and sheriff. Hay and Snyder (1989: 18) state: “In England in the eighteenth century apprehension was the task of the victim of crime, aided (where he could get such help) from a parish constable or town watchman.” For a discussion of the evolution of public service, see Allen (2005). Hay and Snyder (1989: 16) note how these officials were more dependent on the justices and private citizens than the future police.

39. For example:

Thus not only assaults, but virtually all thefts and even some murders were left to the general public. That meant that responsibility for the initial expense and entire conduct of the prosecution was thrown on the victim or his or her family. [emphasis added](Hay and Snyder 1989: 23)

Private crime prevention was often organized around horse thieves: “A number of the early societies were aimed specifically against horse thieves—horses being very valuable property which were easy to steal and easy to move away quickly,” (Philips 1989: 25).


41. Soderlund (1998: 647). Prior to the Worsted Act, various private organizations attempted to police embezzlement. In Yorkshire, for example, a group formed a voluntary association in 1764 to reduce short and false reeling. The voluntary force was funded through subscriptions based on enterprise size. Soderlund (1998: 654) notes that “Despite its success, however, the Yorkshire manufacturers’ undertaking remained vulnerable. In the end it failed, victim of inter-capitalist rivalry . . . .” By 1776 it was finished. Soderlund (1998: 661) concludes by noting that “For several
magistrates office formalized this into a force known as the “Bow Street Runners,” often considered London’s first professional constables. Though similar in function to private police and thief-takers, they were paid by the magistrate with government funds. Although not well funded toward the end of the century, the office kept criminal records and made public horse patrols to guard London roads.42

The system of private enforcement of law was clearly second best.43 Although it lasted for centuries, it slowly evolved into a public system. Public police forces were created through several pieces of legislation: the Metropolitan Police Act (1829), which established a paid police force in London; the Municipal Corporations Act (1835), which required all incorporated boroughs to have a police force; the County Police Acts (1839 and 1840); and the County and Borough Police Act (1856), which ultimately required all jurisdictions to be publicly policed. By the end of the nineteenth century, the system of public police, courts, and prosecutors had become completely entrenched.44 After centuries of no police, the transformation must have seemed revolutionary to the people of the time. And yet the new institution, once introduced, was accepted quickly. Indeed, the police existed on the “moral assent of most of the population to the role of a police force as enforcer of law and order.”45

4.2 Standardization and the Police

We hypothesize that the creation of the police was a response to the increased standardization of goods brought about by the Industrial Revolution. When communities were isolated, local, and most goods artisan, theft issues had been sufficiently handled without police. As the Industrial Revolution progressed, the ability of private individuals to investigate crimes declined because of their inability to identify stolen standardized property.

 decades the inspectors failed to fundamentally challenge the pattern of workplace appropriation practiced by thousands of woolcombers and handloom weavers.47
42. Linebaugh (2003: 221–2).
43. Of course, a public police and prosecution are hardly first best. Most notably police have less personal incentive to solve crimes and must be monitored. Because with police and public criminal prosecution there is no retribution to the victim, the victim also has a reduced incentive to prevent and prosecute. Starting with Becker and Stigler (1974), there have been several articles discussing the merits or shortcomings of a public police force. For example, Landes and Posner (1975) argue that private enforcement is unlikely to be efficient, whereas Friedman (1984, 1995, 2000) argues that a private system can be efficient. Our view is that, whereas both systems were second best, the private system, efficient in its time, was replaced by a public one when standardization became common.
44. As Philips (1977: 53–4) points out, the transition was quite fast:

   In 1835, there was no police force in the Black Country; in 1860, it possessed four police forces with a total strength of 262. It had changed from being an ‘unpoliced society’—where police functions were carried out (if at all) by citizens or their appointed constables, to a ‘policed society’ in which a paid police force operated.

Other factors also existed. First, there is the mere logistical problems of finding offenders. This problem was exacerbated with the improvement of roads in the eighteenth century. Second, the long-standing system of rewards provided an incentive to stage offenses or entrap others to commit them. However, had goods remained artisan, the problems of traveling thieves and collusion to collect rewards could still be managed by some type of private policing system. Standardization eliminated the private sector’s comparative advantage in policing.

5. Historical Evidence

We have argued that standardization was a by-product of industrialization. Standardization changed the costs and benefits of theft and protection, and we have argued that this led to the evolution of public police and criminal law. Of course, the evolution of criminal law and police may also be explained by any of the many other factors changing at the same time. During the Industrial Revolution, Britain’s migration from rural to urban communities dramatically increased. Urbanization may have changed the nature and level of crime to a point where modern criminal law and police were necessary. Factories began to emerge, and it is conceivable that these also led to changes in crime, independent of standardization, that could explain the emergence of modern crime and policing. Identifying the importance of standardization is difficult within the context of crime and history. However, in this section we buttress our theory by discussing evidence supporting our hypothesis and not implied by alternative models.

5.1 Policing in the Black Country

If public police emerged to enforce the new criminal law with respect to property crimes, then the activities of the early police should reflect this. Detailed evidence of what types of activities parish constables and the new police were up to is not readily available. However, Philips (1977) provides such a

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46. Philips (1989: 117) notes “… many property-owners had great difficulty finding and arresting offenders against them in the days before organized professional police forces—particularly if the offenders had traveled any distance from the scene of the crime.”

47. Consider the role played by bounty hunters called “thief-takers.” Paley (1989: 301–2) tells the tale of two young men on trial for highway robbery. However, it turned out that the two had been enticed into the crime by a thief-taker and his partners who staged the robbery. The “victim” identified the two, but before the reward could be collected the plot was uncovered. Bounties tended to provide an incentive to create crime, not only to detect it.

48. Consistent with this hypothesis is the emergence of police in Japan. Other non-European countries developed European police forces around the same time, but we cannot distinguish whether these are in response to the nature of the goods or just a colonial import. With Japan, the colonial explanation is absent. Prior to the Industrial Revolution, Japan had no public police. With the Industrial Revolution, standardized goods from Europe entered the country and a European style public police force was formed in 1874 (Aldous 1997: 19).

49. Colquhoun, writing a treatise in 1795 on police and criminal activity, provides a contemporary glimpse of criminal activities of the day. He estimated that there were 115,000 individuals
detailed account in his examination of virtually all indictable offenses brought to trial between the years 1835 and 1860 in an area known as the “Black Country.”

The Black Country, named such because of the intense coal mining and iron works of the area, stretches across 100 square miles just northwest of Birmingham. It held a population of 211,323 in 1831 and grew to 473,946 by 1871.

Philip’s study begins before the introduction of public police and prosecution, during the time when parish constables assisted private individuals in the investigation and prosecution of crime. He generally finds the constabulary effective in dealing with crimes where the “victim either knew, or had a fairly strong suspicion who the offender was” (1977: 60). On the other hand, he finds that parish constables were relatively inefficient at “... finding the perpetrators of crimes of which the victims could not name the offenders ...” (1977: 60). In the early days of the Black Country, Philips states that most larcenies were of the former type and that “all the constable had to do in such cases was take into custody the offender caught red-handed, or search the belongings of the suspected offender and, if the stolen property was found, arrest him.” (1977: 61). Presumably, the victim was able to identify the stolen goods because they had an artisan character.

Philips concludes “the system continued to work until the 1840s without any serious breakdown of law and order in those communities which relied on parish constables” (1977: 62).

Criminal activity in the Black Country changed with the continued growth of factories and larger mines. With the industrial growth came an increase in industrial theft. Philips reports that property crimes without violence accounted for 85% of the indictable committals handled by the new police and that 80% of these cases were larceny. Industrial theft consisting of inputs like coal, iron, and tools was the most common, accounting for 28.2% of all committals. The second highest category was theft of clothing, which accounted for 17.2% of committals.

Of the industrial thefts, Philips notes that the increase over time in this category stemmed from “the expansion of large-scale capitalist mining and manufacturing production” (1977: 180) and that

This offensive continued to gather momentum; over the period 1835–60, there was a continual and marked increase in industrial

engaged in “pursuits either criminal—illegal—or immoral.” He provides a 24-point list of various types, which is dominated by thieves, pickpockets, receivers of stolen goods, embezzlers, pilferers, swindlers, cheats, frauds, grubbers, and beggars to name a few (1969: vii–ix). Not making the list are murderers, kidnapers, or other violent offenders.

50. There is evidence that the police were more involved with property crimes than violent ones. As mentioned, violent crimes fell throughout this period. Crimes against property, however, were increasing. Linebaugh (2003: XXII), in his in-depth study of criminals hanged in London during the eighteenth century, states that most were hung for property crimes.


52. Randall (1990: 210) notes the same thing in the woolen industry. Local constables could search the home of a spinner or weaver suspected of embezzlement but were ineffective at dealing with the network of black market dealers. This trade was only stopped with the introduction of police.

The Evolution of Criminal Law and Police during the Pre-modern Era

Theft prosecutions—in absolute numbers, as a ratio per 100,000 population, and as a percentage of all prosecutions brought for any indictable offence and of all larceny prosecutions brought. (1977: 189)

A major problem with industrial thefts and theft of clothing was the inability of the original owners to identify their goods. Philips notes that with these items it was “easy to get at, easy to carry away, and relatively difficult for the owner to identify with certainty” (1977: 196, emphasis added). The activities of the new police in the Black Country are consistent with our hypothesis. The police were primarily involved in solving property crimes where the original owner had difficulty with identification and not in solving violent crimes.

5.2 The Watch and Ward System

A watershed moment in the development of private policing in pre-modern England was the Statute of Winchester, 1285. Among other things it created the Watch and Ward system. The watch was made up of as many as 16 men who patrolled and guarded the gates of walled towns during the night. All men of the town were on the roster to volunteer their turn and all were privately armed. Their chief duty was to arrest strangers when ‘they find cause for suspicion’ and deliver the stranger to the parish constable in the morning. If a stranger resisted arrest, then a hue and cry was made and everyone in the town was to assist in arrest. This system was in place until the end of the eighteenth century and lasted in some parishes well into the nineteenth century.

The watch was useful only to prevent theft of artisan goods. Prior to the Industrial Revolution, when most goods were artisan, a watchman could effectively police theft because they could likely identify goods in the possession of strangers—a horse, for example. However, with the coming of standardized goods (including the increased use of money payments rather than truck) the watchman was relatively ineffective in identifying stolen property. The watchman was a patrolman, on the lookout for strangers or strange activity. He was not an investigator or a detective. With standardized goods, the watchmen, along with the city walls they patrolled, ceased to be effective and were replaced by a professionalized police force.

54. Critchley (1978: 7) notes that it “... was the only general public measure of any consequence enacted to regulate the policing of the county between the Norman Conquest and the Metropolitan Police Act, 1829...”

55. These duties were called the “ward” when conducted in the daytime.

56. Until the mid-nineteenth century, rural New England resembled much of rural England in terms of crime. Towns were small and agriculturally based. The most common objects of theft were horses. Consistent with our model, there were no professional police in New England until late into the nineteenth century, horses were earmarked and registered, private protection societies were common, and towns used a watch and ward system. See Szymanski (2005: 407–12).
5.3 The Improvement Commissions

A short-lived institution called “improvement commissions” provides an interesting test of our hypothesis. During the eighteenth century, the urbanization of England began in earnest and created problems for the maintenance and safety of new small streets and roads. Roads legally belonged to the crown but were to be maintained locally. By the eighteenth century, major roads were maintained by a parish system or privately through turnpike trusts. Neither of these were suitable for dealing with the new small streets that were being developed in new suburbs. The results were streets laced with manure, impeded by signage and encroaching buildings, barely passable for muck holes, and dangerous due to the darkness and open cellar doors at the base of buildings. At night matters were only worse. The solution was found in the creation of “improvement commissions,” which were special statutory bodies with limited powers to collect rates to pay for paving, lighting, regulating, and watching of the roads in their jurisdiction. 57

An improvement commission was created by a specific Parliamentary statute for the specific purpose of making a town or suburb run better, and their focus was almost always at the street level. Between 1748 and 1835 there were almost 300 creations, with 100 of these in the greater metropolis of London. Commissioners were individuals of some stature who often sat for life. Some were elected by a small franchise, but most were not. These commissioners would collect rates and hire individuals to maintain and look after the streets. After the Municipal Act of 1835, they were amalgamated into the new elected bodies. From the historical record, it appears that the bulk of their activities were devoted toward paving the streets; however, every act we consulted mentioned some provision for establishing a street watch.

It is well agreed among historians that the commissions were a response to the problems of increased population and urbanization pressures on unowned roads and that any policing done involved duties “required to keep a place functioning” rather than “anti-crime activities.” 58 Had the modern police arisen because of the pressures of increased population, then it might be expected that the improvement commissions would have resembled early versions of the modern police. They could have, by the later eighteenth century, taken on a form similar to the Bow Street Runners. They could have been more involved in investigating or pursuing criminal activity. Yet, they were not. Instead they merely copied the watch and ward system that had been around for centuries,

57. Perhaps, the best discussion of these commissions is found in Webb and Webb (1963).

58. Williams (2000: 116). Within any given jurisdiction governed by an improvement commission, there was an evolution of watch duties over time, as our model would predict. For example, in the county of Chester the first watch was established in 1625, and the first permanent and paid watch in 1703. In 1762, Chester was granted an improvement act which allowed for 60 watchmen with no change in duties from the past. In 1803, a second improvement act was passed with increased rate authority. Still the watch was engaged in dealing mostly with strangers, petty theft, and fire duties. In 1835, the municipal act terminated the commission, and police duties began to expand into inspection and detection of crime (Barrow et al. 2005: 28–35).
and even with this their attentions were more directed at the civil and mechanical matters of street maintenance. Urbanization, on its own, is an unlikely cause for criminal law and police evolution. The watch system was adequate because the goods available during the early eighteenth century, when these commissions began to come into existence, were still relatively artisan. Since the improvement commissions were not a response to standardized goods, they did not form modern-like police forces. In 1835, with the passage of the Municipal Act, the improvement commissions began a relatively speedy amalgamation with the new local governments. Their watch systems were abandoned, and local administrations introduced modern police—well into the period of standardized products.59

5.4 Possession Immunity

One implication of the theft problem caused by standardization relates to the legal status of “possession.” Since owners of standardized goods are unable to identify one specimen from another and thus unable to identify goods sold legitimately or stolen, possession will tend to be synonymous with legal ownership. That is, if someone is in possession of a standardized good, he will be the presumed legal owner. The opposite is true about an artisan good. Someone in possession and claiming ownership of a nonstandard good will be required to have some type of proof of ownership beyond mere possession. This may be in the form of a title, registration, receipt, or perhaps local specific knowledge of ownership. Ownership is less likely to be linked to possession because individuals are known to be matched with particular assets. Although this may not help with the detection of crime, it greatly simplifies proof of a crime since witnesses could persuasively testify that an object belonged to a particular party. In the case of an artisan good, a legal owner is able to identify a specimen, stolen or not, even though the specimen is in the possession of someone else. For artisan goods, ownership and possession can be easily separated. When goods become standardized, this is no longer possible, and possession becomes a signal of ownership. Throughout the eighteenth century, as goods became more standardized, there were changes in the criminal law that reflected this.

For example, a long-standing common-law doctrine in master-servant relations was “possession immunity.” According to Fletcher, this meant “transferring possession of an object conferred immunity from the criminal law on the party receiving possession, for subsequent misuse or misappropriation of the entrusted object.”60 Possession immunity meant that a worker could receive

59. Urbanization and increased population were not universal across England during the nineteenth century. Many parishes had populations that either remained constant or declined in size. If the police arose in response to urbanization, then the watch and ward system should have remained in these static parishes. However, by 1856 all jurisdictions were required to have police. Of course, by the mid-nineteenth century the effect of standardized goods was being felt everywhere, and so their conversion to modern police is consistent with the hypothesis of this article.
60. Fletcher (1976: 472).
possession of working material, knowing that the owner could not lay criminal charges of theft. Possession immunity formalized in law the fact that ownership could be separated from possession in a time when goods were easily identified with their owner. Artisan goods that were stolen or embezzled could be identified and recovered through civil actions. The embezzlement acts of Parliament of the eighteenth century removed immunity in various industries, and Parliament finally eliminated it in 1857.\textsuperscript{61} With standardized goods, it is efficient to have possession identified with ownership, but this exacerbates the embezzlement problem with such goods, and thus it would make no sense to maintain the immunity provision.\textsuperscript{62} With the elimination of possession immunity came the other charges for possessing stolen goods.\textsuperscript{63}

5.5 The Pattern of Court Cases

Measuring the frequency of crime and civil disputes is never simple and doing so in the eighteenth and nineteenth century is even more problematic. However, studies have been conducted and some generalizations are possible. For example, Brooks (1989) comprehensively surveyed civil litigation in England between 1640 and 1830 and found a dramatic fall in litigation in both the King’s Bench and court of Common Pleas until the end of the eighteenth century, followed by an increase. Mokyr (2007) uses this as evidence that trust was increasing among Englishmen during the period. He notes that “Whether eighteenth century Britain was really becoming a kinder and gentler place is a difficult issue, but at least within the circles of commerce, finance and manufacturing, trust relations and private settlement of disputes seem to have prevailed over third party enforcement.”

This interpretation is difficult to reconcile with the increased legislation regulating thefts at places of employment and the steadily increasing amount of crime over the same period.\textsuperscript{64} We offer an alternative explanation. The steady increase in standardization meant that former civil law institutions were incapable of handling the rise in property violations. Local constables and

\textsuperscript{61} Fletcher (1976: 483).

\textsuperscript{62} Consistent with our theory is the phrase “possession is nine tenths of the law.” According to Garner (1995: 674), this layman’s phrase arose in the English setting between the seventeenth and nineteenth centuries. Presumably, prior to this the popular notion of ownership did not immediately follow from possession.

\textsuperscript{63} Styles (1983a: 195) notes that this reflected the difficulty of identification:

Another obstacle to detection was the difficulty of identifying embezzled materials. The 1749 act, the 1774 wool act and the 1777 general act created a range of catch-all offences out of mere possession of suspicious materials. The burden of proof was placed on the accused, reversing the normal relationship between prosecutor and defendant in later-eighteenth-century English law.

\textsuperscript{64} There were no criminal statistics kept at this time. However, Beattie (1974) conducted an enormous study of indictments in Surrey and Sussex over this time period and concluded that for property crime there was “a gentle rise over the course of the [18th] century.”
magistrates were less effective, and individual property owners less able to identify stolen goods. The result was less use of the courts to prosecute “crimes” through civil courts. As the criminal law was adapted, theft was dealt with through criminal courts with charges of larceny and this is reflected in the growth in criminal indictments.

5.6 The Transition of the Factory

Factory production began in the middle of the eighteenth century as a means of exploiting numerous technological and productivity innovations. The factory system itself was an innovation, and as mentioned, it no doubt increased the level of standardization. This led to a problem for early factory owners. As embezzlement increased over the eighteenth century, factory and other owners were left with carrying the extra burden of enforcement and prosecution. Protection, however, has a public good element, and the attempts to form private coalitions were unstable and, as Parliamentary testimony suggests, ineffective. Since private efforts to lower general theft and embezzlement problems often only helped one’s competitors, there was always an incentive to free ride on private enforcement of investigations that had public benefits. Consequently, as factory production was increasing, firms were on their own to deal with the immediate rise in theft and embezzlement. A major problem factory owners faced was a lack of jurisdiction outside the factory yard. As a result, resale markets flourished in areas where early factories formed.

Long-run solutions would eventually be found in the form of police and modern criminal law, but the first large firms did not have the luxury of using later institutional resolutions. The immediate, radical, solution was to move factories out of urban centers to create “factory colonies.” In a factory colony, workers and their families moved to an isolated part of the countryside where they could work and live together. This exploited the benefits of the factory system, while containing the problem of embezzlement.

For example, consider cotton factories, which are among the first associated with the Industrial Revolution. Though these and other factories eventually dominated the industrial cities of England, the first cotton factories were

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67. A factory colony was not possible for the Navy for obvious reasons. Instead, they attempted to deal with the problem in other ways. For example, the navy began selling scrap wood directly and used the funds to supplement wages. In 1767, the British Navy earned $100,000 doing this, “twice the cost of the wage increase” (Dobson 1980: 99). The navy also denied wives (who could steal material under garments) permission to come on-site to collect chips and deliver food to the workers. Finally, by 1805 the practice of chips [gleaning] was completely eliminated.

68. We distinguish between merely bringing groups of independent workers together to minimize transport costs and operating a factory where workers were controlled. Berg (1994: 226) documents how many artisan groups worked under a single roof in “workshops” or “proto-factories,” but the true factories were ones that controlled worker behavior to prevent embezzlement.
located in remote isolated parts of the country. For example, the Burrs Mill, established in 1801 in Bury, was 9 miles north of Manchester; the Styal Mill built by Samuel Greg in 1784 was in a location “with a very scanty population.” Isolated, the owners of these private communities erected houses, shops, churches, schools, and other amenities for their workers. Fitton and Wadsworth (1968) emphasize the private nature of these towns:

They were, it is easy to forget today, a deliberate creation, without assistance from the State or local authority and with no public services. The factory, the weirs and dams, the machine-shop, the roads and bridges, the inn, the truck-shop, the church and chapel, the managers mansion all were devised by and grew up under the owners eye. (p. 98)

Within these communities, there was friction among both skilled and unskilled workers, not just over long shifts and wages but also over the “insistence on close and continuous supervision of work by overseers.” Known as “factory discipline,” behavior within and outside the mill was monitored. Workers would sign contracts which committed them to work at the factory for several years. Failure to stay could lead to bounties advertised in local papers and to prosecution. Factory owners also instituted local forms of justice in the form of fines or “forfeits.” In the Strutt Mills, these were issued for offenses such as “absence from work without leave,” “destruction of mill property,” “failure to do work as required” (the largest category), “misconduct outside working hours,” and “theft of mill property.” In Fitton and Wadsworth’s reporting of these forfeits (1968: 234), the theft category includes “stealing packethread; having waste found on body; stealing candles, yarn, rolers, nails, pincers, etc.; and making good yarn into waste and pockiting (sic) it.” In some sense, the factory colony was like a voluntary prison. Workers accepted the

Both systems of production—artisan and capitalist—could, therefore, generate centralized production . . . But . . . factory systems . . . clearly differed in their social relations of production. . . . factories [were] founded . . . with the stated purpose of greater supervision, quality control and prevention of embezzlement. Contemporaries were clearly aware of a big distinction between the two types of establishment.

Others have also noted the role of the factory in solving theft problems. For example, see Williamson (1980).

69. Collier (1964: 14) in her detailed study of several early factories notes: “The factory system first made its appearance not in the large towns where it later became concentrated, but in the country districts.” Fitton and Wadsworth (1968: 106) note that the locations of many of the surviving buildings of these early factories are still remote.


71. Chapman (1972: 55) has a discussion on how common this was.

72. Chapman (1972: 54). Szostak (1989: 343–4) notes that “The individual factory labourer was almost always supervised by someone . . . supervision of production workers by foreman and capitalists, developed simultaneously with the shift to factories.”

73. Huberman (1996: 29) states that apprentice contracts in the colonies were for 7 years. See also Fitton and Wadsworth (1968: 233).
higher wages in exchange for a reduction in their civil liberties which reduced their ability to embezzle the firm.\footnote{Gregory Clark (1994: 132) points out that “A puzzling aspect of factory discipline was that instead of rewarding workers according to their output, it used behavior of workers as a measure of performance.” He concludes that firms had to act as a social coordinating device because workers lacked self control when they had personal freedom. Our interpretation is that the loss of civil liberties and ease of interacting with outsiders constrained employee theft.}

Though the factory colonies lasted well into the nineteenth century, there seems to be no evidence money was made on community development. Factory owners had no special cost advantages in building schools and churches. Indeed, “they found that the establishment of a new community was an expensive and often frustrating experience, and labour turnover continued at a very high rate.”\footnote{Chapman (1972: 55).} We venture that the gain must have been in the ability to supervise workers and prevent the sale of property stolen from the factory. The remote locations, the monitoring of behavior outside of working hours, the supply of shops, and the removal away from open markets all would have reduced the ability and benefits of individuals within the firm to steal. These drastic measures were necessary because the factory system gave workers access to large supplies of standardized inputs and outputs. Once beyond the factory gates, possession of the standardized good would have amounted to \textit{de facto} ownership. Without modern institutions to prevent theft, isolation was the best method of protection.\footnote{Large enterprises had occasionally existed prior to the Industrial Revolution and the arrival of the factory: the silver mines of Laurium in ancient Greece; the Roman silver mines in Rio Tinto, Spain; or the tremendous \textit{latifundia} landed estates of the Roman Empire. All these were run using slaves, prisoners, and indentured servants. Our interpretation is that this type of labor force prevented the workers from stealing the precious metals and other valuable goods.}

As effective as this must have been in reducing theft, the costs would have been enormous. These costs represent a minimum measure of the gains from the new organization of production and the eventual advantage of moving to cities. As a result of these costs, this colony form of organization was relatively sparse and short lived. By the middle of the nineteenth century, urban manufacturing had begun to dominate.\footnote{Chapman (1972: 57).}

From 1820 to the 1860s, the factory moved back to the city. The critical difference between the urban factory and its colony predecessor was their organization. Long-term contracts and indentured apprentices were gone, labor generally became less skilled and less family related, and the entire colonial community disappeared. Large plants were more likely to pay their workers in money than in kind. In particular, the paternalism shown by the colonies had started to wane.\footnote{... the scale and intensity of the textile masters’ involvement in the patronage of philanthropy and culture changed widely from the 1840s. ... Elsewhere the change came later. ... In all this, the factory owner was no longer confined to the role of patriarch superintending the welfare of his immediate band of workers ... (Howe 1984: 272).}
What allowed the factory to move back to the city, however, was the presence of a public police force that could investigate and reduce theft outside the factory gates. With the changes to the criminal law, the police could crack down on public markets where stolen property could be resold. Laws on search, the criminalization of gleaning, and cash payments over truck all helped to reduce theft problems at work and facilitate the modern urban factory to come into existence.  

6. Conclusion  
The institutional changes that took place between 1750 and 1850 are remarkable, and they separate our modern world from its pre-modern predecessor. The evolution of criminal law, the arrival of public police, and the transformation of the modern factory, though not alone, all stand as examples of this transition. Historians have often viewed the pre-modern era as one of graft and corruption and that the modern era embodies “progress” on the institutional front. But the Englishmen of 1700 were just as interested in wealth as their descendants 200 years later, and their actions and choices were just as rational. Thus, the institutions they designed have just as much economic logic as do modern ones, and our goal is to explain both the pre-modern and modern institutions, as well as their transition. Though others have documented the changes in criminal law and police, we have provided a theory for their simultaneous evolution. Our claim is that the enormous transition from artisan to

79. Our explanation of the rise and fall of the factory colony is contentious because of the existence of a more obvious alternative: water power. It is widely believed that early factories moved to remote locations in search of better water power. When steam power became more available, these factories moved back to urban centers. Occam’s razor is clear, stick with the simpler theory. Unfortunately, this alternative explanation has two problems. First, towns often grew up around the best sources of water power, which had been used since the time of the Romans. Indeed, at the time of the Domesday survey, there were over 5000 water mills in England. As a result, the urban centers were already often located with excellent water power. Second, although sources of water power would have played a role in colony location, water power alone fails to account for all the other institutional details and discipline of the colonies and for their removal when the factories moved back to the cities. Why were workers limited in movement to town centers while colony workers, but not when the factory moved back to the city? Why were workers required to enlist for periods of time on the colony, but not in urban factories? Why were nonworking hours and nonworking members of the household supervised on the colony, but not in the city? Heckscher (1955: 188) provides a nice description of these restrictions (even though his example is from France). “They . . . remind one more of a workhouse or a barracks or a prison than of a modern factory . . . This mill employed at different periods between 1200 and 1700 workers . . . It was surrounded on two sides by walls, and on the other two sides by moats filled with running water and fenced in. Keepers in royal livery guarded the entrances.” Clearly, there had to be more to colony existence than a source of water power.

80. It is also what separates the developed from the undeveloped world. Gabre-Madhin (2001) provides a fascinating report on Ethiopian grain trade and argues that a lack of standardization is a major contributor to poverty among Ethiopian grain farmers. She describes markets that are remarkably similar to English markets prior to the Industrial Revolution (2001: 36–7).
standardized goods led to increases in theft opportunities and that our modern institutions are the response to this reality.81

Our hypothesis may suggest an interesting line of future research. Economic historians have struggled to explain the growth in per capita income brought about by the Industrial Revolution. McCloskey (1994) not only demonstrates the slow take off in growth but also argues that traditional explanations fail to explain it. He summarizes that “industrialisation was not a matter of foreign trade, not a matter of internal reallocation, not of transport innovation, not investment in factories, not education, not science.” (1994: 253). Crafts and Harley (1992: 705) put it this way: “it seems impossible to sustain the view that British growth leapt spectacularly in one generation as a result of innovations in manufacturing.”

The fundamental problem is that any given industry is just too small to account for changes in aggregate growth. This has led many economic historians to look for “feedbacks” or “dynamic” effects to account for the Industrial Revolution. McCloskey (1994: 269) suggests that “free speech and an openness to persuasion leads to riches.” Mokyr (2007) argues that growing trust and social capital lead to leadership and growth. Finally, Clark (2007) provides a Darwinian argument that the Englishman of the eighteenth century had survived a selection process and ended up with strong middle class values of thrift and industry, which allowed for the Industrial Revolution.

Standardization provides another plausible and complementary explanation for the income growth of the Industrial Revolution. Although the technical innovations, improved transport and trade, and increased specialization are inadequate to explain the income growth of the time, they all increased standardization, which effected the entire economy through growth in anonymous exchanges. As we have argued, standardization led to an enhanced role for criminal law and the eventual emergence of the police. These two institutional developments efficiently mitigated the problems of property theft and embezzlement. Moreover, the presence of police further encourages innovations that led to more standardization. Standardization in general, unlike any specific innovation, effected the economy as a whole, and the institutional solutions to the theft problem had similar widespread effects. Thus, although the factory no doubt created enormous gains from complementaries in investments, supervision, and quality control (Geraghty 2007), these benefits could not be fully exploited until the full arrival of criminal law and public police.

Although this is a claim requiring future research, our argument suggests the Industrial Revolution would have been more modest had the creation of the modern police and the growth of criminal law not occurred along with the mechanical innovations. Without the appropriate legal institutions to support it, the Industrial Revolution may have been confined to the isolated factories

81. Our study parallels North’s (1968) classic study on the sources of productivity growth in ocean shipping. He found that the conquest of piracy in the Atlantic was more important than technical changes and best explains the expansion of shipping trade from 1600 to 1850.
in the countryside that emerged in the eighteenth century and continued to operate until the legal changes matured, but this is another story.

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**References**


