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Married Women's Property Laws and Female Commercial Activity: Evidence from United States Patent Records, 1790–1895

B. ZORINA KHAN

Nineteenth-century laws granted wives previously withheld rights to their own property and earnings as well as liability for debts and contracts. I use 4,198 women's patents to assess whether these laws encouraged greater female commercial activity. Patentees were motivated by potential profits and were responsive to market incentives. Women's patenting jumped significantly in states with legal reforms and was lowest in states without such laws. Much of the subsequent increase occurred in metropolitan centers where property rights were of greater concern. Thus, by reducing transactions costs and increasing expected benefits, legal reforms arguably stimulated women's investments in patenting and commercial activities.

It is scarcely thirty years since the first State protected a married woman in the use of her own brain property. Under these conditions, legally incapable of holding property . . . that woman has not been an inventor to an equal extent with man is not so much a subject of surprise as that she should have invented at all.

—Matilda Joslyn Gage (1883)¹

Economists attribute the increase in female market participation over the past century primarily to factors such as changes in real wages, improvements in the education of women, and technological progress. It is widely recognized, however, that these conventional economic variables do not entirely account for higher participation rates. Many economists would agree that social mores and legal policies have also contributed to the shift toward greater involvement in commercial activity and that, indeed, laws regarding earnings, contracts, and property in part define the boundaries of the market. On the other hand, scholars who are skeptical of the independent impact of the law contend that legal and institutional changes

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¹ Gage, "Woman," pp. 488–89.

are determined by fundamental economic forces. Others might argue, moreover, that statutes merely codify already pervasive cultural standards, or that individuals will pursue the same objectives regardless of the legal standards, for laws only affect the methods they use to attain their ends.²

Despite the significance of the issue, little systematic research has been directed towards quantifying the relationship between institutional changes and commercial activity by women, and it is still not clear whether the marked increase in married women's participation in the market economy over the past century owed in some measure to changes in their legal rights. Studies of the effect of changes in laws are especially important to our overall understanding of early industrialization. Ideally, one would like to know whether legal reforms influenced market participation in general and how different the paths of industrialization and economic growth might have been if the set of opportunities available to women had expanded earlier. Although such broad counterfactuals are both interesting and important, this article focuses on a narrower aspect of the problem—the relationship between married women's property rights laws and patenting activity—to explore and perhaps shed some light on the larger issues of the effects of legal reform on the role of women in the market economy.³

In an era when relatively few females remained single, the status and economic welfare of the majority of women were affected by laws regarding married women's rights.⁴ Under nineteenth-century common law, a married woman was bound by the rules of coverture, which vested her legal rights in her husband. A husband controlled his wife's earnings, as well as property she acquired before or after marriage. Married women were prohibited from entering into contracts without the consent of their husbands and from engaging in trade on their own account, as "sole traders." After 1830 states began to pass legislation that revised many of these restrictions. Statutory changes were initially directed towards creating separate estates for women, which were protected from creditors'

² For different views, see Friedman, *History*; Horwitz, *Transformation*; Snooks, *Portrait*; and Basch, *In the Eyes*.

³ I use the term "married women's property rights" in two senses: the first refers specifically to the right to own, control, and benefit from tangible and intangible property. The term is also used as a means of referring concisely to the following topics that affected married women's economic rights: the wife's right to hold her property separately, to control income from her labor, to own and manage a business, to engage in trade, and to bear independent responsibility for contracts.

⁴ According to Chambers-Schiller, *Liberty*, p. 3, the number of unmarried women was very low in the eighteenth century, and increased only slightly in the nineteenth century: 7.3 percent of women born between 1845–1849, 8.0 percent born between 1849–1855, 8.9 percent born between 1855–1859, and 11 percent born between 1865–1875, never married. Goldin, *Understanding*, p. 17, shows that married women's labor participation rate was 4.6 percent in 1890, with rapid growth only after World War II. Married women undoubtedly were also involved in business and commercial activity, but systematic research on this question is hampered by a lack of available data.

claims against their husbands. These early statutes did not, however, grant women economic rights, for their estates were still controlled by their husbands. Later legislation enlarged the ability of married women to own and control separate property (married women's property rights acts), to trade, write contracts or engage in businesses on their own account (sole trader laws), and to keep the earnings from their labor (earnings laws). Some scholars contend that these various acts did not significantly improve the economic status of women. But it might be expected that women would respond to changes in the legal system that expanded their property rights and offered greater access to income from their market participation. An alternative hypothesis is, then, that legal reforms affected behavior by altering the costs and benefits associated with market-related activity.⁵ My article tests these hypotheses by considering whether improvements in married women's property rights stimulated patenting by women inventors.⁶

Patent grants are secured by the U.S. Constitution and protected by the federal judicial and legal system.⁷ Nevertheless, women inventors confronted legal limitations at the state level that affected their ability to benefit from such rights. In the first place, potential patentees might have been deterred by laws that granted their husbands control of their intellectual property and its profits. Second, commercial exploitation of patent property depended on the right to sue and to enforce contracts, in order to produce the invented article, to assign (sell) or license the patented invention, and to deter infringers. By increasing the costs of transacting in the market economy, restrictions on women's economic rights may thus have reduced investments in patenting and other forms of commercial activity. Finally, many inventions are trade related—that is, participation in a profession enhances the inventor's ability to perceive demand and further promotes the skills required for invention.⁸ Thus,

⁵ This model was implicitly supported by feminists of the period who attributed the patterns of female patenting in the nineteenth century partly to the status of married women's property rights: "Nor is woman by law recognized as possessing full right to the use and control of her own powers. In not a single State of the Union is a married woman held to possess a right to her earnings within the family; and in not one-half of them has she a right to their control in business entered upon outside of the household. Should such a woman be successful in obtaining a patent, what then? Would she be free to do as she pleased with it? Not at all. She would hold no right, title, or power over this work of her own brain. She would possess no legal right to contract, or to license any one to use her invention. Neither, should her right be infringed, could she sue the offender (Gage, "Woman," p. 488). See also U.S. Department of Labor, *Women's Contributions*; and recent studies such as Macdonald, *Feminine Ingenuity*.

⁶ Patent records are imperfect measures of inventive activity, but they are still of value because they provide a consistent source of objective information about the market-related activities of women during a period for which only limited data are available. The patentee will rationally proceed to file a patent only if the expected value of the patent protection exceeds the costs of filing. Sokoloff and I found that most important inventors who wished to appropriate the returns from their discoveries found patent protection to be worthwhile and even necessary (Khan and Sokoloff, "Schemes").

⁷ See Khan, "Property Rights."

⁸ Khan and Sokoloff, "Schemes."

lower inventiveness might also have resulted from laws that prevented women from engaging in business or professions.

Of course, legal changes in economic property rights would be ineffectual if women's patenting were idiosyncratic or insensitive to economic factors such as expected returns. The second section of the article describes the data set and outlines the patterns of inventive activity by women, in order to establish whether their patenting responded to market incentives. A comparison of patterns of patenting by female inventors to those of male patentees also affords insight into the sources of their inventive activity. For if women filed patents in response to similar factors as male patentees, their patenting records should exhibit the same temporal and regional variations. The third section assesses the influence of changes in married women's property rights laws on female patenting rates at state and local levels. Multivariate regressions relate the log of total patents per woman to changes in the legal status of women, controlling for time trends and regional differences. Finally, I consider the relationship between legal reforms and the commitment of greater resources to inventive activity (as measured by the number of career patents filed by each individual).

The overall findings suggest that women who filed patents were motivated by the same general incentives as men, but that female patentees faced additional constraints. The findings further support the argument that property rights and sole trader laws encouraged higher patenting because women were better able to secure the returns from their efforts. In the absence of legal reforms, rural women were more active patentees than their metropolitan counterparts. But the influence of property rights laws was stronger in metropolitan areas, perhaps because concern about property rights was greater in more commercially developed markets. In general, the results imply that lower market participation rates by women owed in part to legal constraints that limited their ability to engage in commercial exchange.

Finally, the results provide insights into the institution of the family and the maximization process that informs household behavior. Family relationships in the nineteenth century were transformed by urbanization, demographic change, and the involvement of women and children in manufacturing and nonhousehold production. As yet it is not entirely clear whether women's commercial activities increased their share of household income or whether the intrafamily allocation of income was even relevant to the decision to participate in the market. A finding that married women responded to policies that granted them rights to property or earnings separately from their husbands would be consistent with a model in which individual, rather than household, utility was maximized. Conversely, the result that improvements in legal status were unrelated to behavior satisfies at least the necessary condition for a model in which household utility is jointly maximized.

CHANGES IN THE LEGAL STATUS OF WOMEN

So great a favourite is the female sex of the laws.

—Sir William Blackstone (1765)⁹

This is law, but where is the justice of it?

—Ernestine Rose (1851)

For much of the nineteenth century, married women were subject to the “disability of coverture,” which vested their rights in their husbands. According to a standard eighteenth-century legal reference, “by marriage, the husband and wife are one person in law; that is, the very being or legal existence of the woman is suspended during the marriage.”¹⁰ Granting a wife the right to control her own property, other authorities argued, would lead to an independence that threatened the institutions of marriage and the family. The court opined in *Cole v. Van Riper*: “It is simply impossible that a married woman should be able to control and enjoy her property as if she were sole, without practically leaving her at liberty to annul the marriage.”¹¹ Married women were explicitly barred from many occupations on similar grounds. *Bradwell v. Illinois* proposed that “the family institution is repugnant to the idea of a woman adopting a distinct and independent career from that of her husband. . . . The paramount destiny and mission of woman are to fulfill the noble and benign offices of wife and mother. This is the law of the Creator.”¹²

A market economy is based on the security of contracts, yet during this critical period when the American economic system evolved from farm-based production towards industrial capitalism, the majority of women could not legally enter into viable commercial contracts once they were subject to a contract of marriage. Single women (*femes soles*) benefited from the same property rights as men, but a married woman (*feme covert*) could neither devise nor sell her property, sue nor be sued. She could not file for bankruptcy, and her husband was liable for any debts incurred; conversely, the claims of her husband’s creditors extended to her property.¹³ Most women earned property in the course of marriage and did not simply inherit; yet married women had no right to any wealth or income they acquired, leading to dependence on the husband even if the wife was

⁹ “Even the disabilities which the wife lies under are for the most part intended for her protection and benefit: so great a favourite is the female sex of the laws” (Blackstone, *Commentaries*, p. 366).

¹⁰ Blackstone, *Commentaries*, p. 355.

¹¹ *Cole v. Van Riper*, 44 Ill. 58. For additional discussions of the legal standard, see Kelly, *Treatise*; Bishop, *Commentaries*; Wells, *Treatise*; and Cord, *Treatise*.

¹² *Bradwell v. Illinois*, 83 U.S. 130 (1872).

¹³ According to Bishop, *Commentaries*: “Being under the power of her husband, she can have no will of her own, and by reason of this lack of freedom of will she cannot contract” (p. 41). “Choses in action” or similar rights (including promissory notes, receivables, dividends, stocks, and bonds), however, did not automatically belong to the husband until he formally “reduced it to possession,” upon which he became the absolute owner.

involved in nonhousehold production.¹⁴ Prior to the changes in the law, the disabilities of married women extended to their rights to benefit from the sale, purchase, or commercialization of their patented inventions.

The reasons for reforms in women's economic rights are important because of their implications for the direction of causality between patenting (or commercial activity more generally) and changes in the law. Legislation in the 1830s and 1840s did not address the issue of women's involvement in market exchange nor women's right to hold income or property on their own account. Rather, the intent of these laws was to secure the property of a married woman from her husband's creditors in order to protect family assets during the economic downturn of the late 1830s.¹⁵ Control remained with the husband, and courts interpreted the legislation narrowly to ensure that ownership did not signify independence from the family. Mississippi's 1839 law, one of the first that was passed, typified this class of legislation, for it merely protected slave holdings of white married women from seizure by creditors. Southern states especially may have been more concerned with guarding the rights of debtors rather than the rights of women.¹⁶

These laws created commercial uncertainty, however, because the potential for fraud by debtor households towards creditors increased. This problem was ultimately resolved by granting wives the further right to control their separate estates.¹⁷ As *Small v. Small* noted, the legislature "saw that a married woman's coverture stood in the way of a full, free and

¹⁴ Sporadic laws recognized the economic independence of wives who found themselves in unusual circumstances, such as desertion or the absence of the husband at sea. Some exceptions to the doctrine of marital disability were also available through equity courts. However, solutions at equity were limited to a small class of the population, mainly the daughters of wealthy parents who established separate trusts through the courts to ensure the protection of settlements and bequests (see Salmon, "Women and Property" and *Women and the Law of Property*). Community property states—Arizona, California, Idaho, Louisiana, Nevada, New Mexico, Texas, and Washington—inherited a civil law tradition that nominally granted joint ownership to husbands and wives, but functioned initially like common law jurisdictions in granting effective control to husbands (see Schuele, "Community Property Law").

¹⁵ See Speth, "Married Women's Property Acts"; Chused, "Married Women's Property Law"; and Basch, *In the Eyes*, p. 207.

¹⁶ For instance, in Maryland, "the policy of the (pre-1860) legislation . . . was, not to take from the husband the ownership which the common law gave him; but to protect from his creditors what came to him from her, leaving the ownership with him as before" (Bishop, *Commentaries*, vol. 2, p. 521; see also Kelly, *Treatise*, p. 526; and Lebsack, "Radical Reconstruction," p. 207). One may speculate that downturns prior to the Panic of 1837 did not lead to such widespread debtor protection laws because they were different in character, agrarian-based, and more localized in effect.

¹⁷ Some 12,000 lawsuits between 1800 and 1995 relate to married women. A search of cases by time period indicates that 40 percent of married women's cases before 1830 involved fraud and creditors, compared to 21.8 percent between 1830 and 1879, and 5 percent after 1920. South Carolina's 1744 "Act Concerning Feme Covert Sole Traders" illustrates the expansion of married women's rights to counter such problems: "whereas feme coverts in this province who are sole traders do sometimes contract debts in this province, with design to defraud the persons with whom they contract such debts, by sheltering and defending themselves from any suit brought against them by reason of their coverture . . .," the colony therefore granted married sole traders the right to sue and correspondingly be sued. See also Siegel, "Modernization," p. 2142.

expeditious transaction of affairs, . . . that in order to make contracts with her legal and binding it was necessary for every mechanic and every tradesman to have a knowledge of the most intricate questions of law; and that to recover even the smallest account against her required the services of a skillful lawyer. These were the mischiefs they undertook to remedy.”¹⁸

Laws that subsequently granted women access to their earnings and promoted their participation in business arguably evolved from expansions in the scope of the earlier limited and specific legislation. Some researchers also focus on the efforts of prominent feminists, whereas others contend that married women’s property laws comprised a minor part of codification efforts to revise and simplify the law of property in general, in order to make access more democratic.¹⁹ Other arguments relate the statutory reforms to an emerging view in the mid-nineteenth century of a separate domestic sphere for women that accompanied their increased responsibility within the family.²⁰ Although no single explanation will suffice, the consensus from these studies appears to be that the married women’s laws were caused by forces besides increases in female nonhousehold production. This conclusion is reinforced by the finding that “massive industrial unemployment, particularly in the 1870s and 1890s, led many to question women’s right to labor,” which implies that legal reforms during this period were unlikely to have been caused by labor market pressures.²¹

Table 1 shows that statutory action progressed sequentially in terms of three broad categories between 1830 and 1890. First, many jurisdictions passed laws enabling married women to retain control over separate estates and property; second, in the 1860s and 1870s, laws granted married women the right to keep their earnings; finally, legislation permitted wives to engage in business on the same basis as single women or as “sole traders.” However, distinct regional differences were evident. One can detect a “frontier effect,” for example, in the finding that, by 1890 all

¹⁸ *Small v. Small*, 129 Pa. 336 (1889).

¹⁹ The codification movement was based on the realization that equity rulings would have to be rationalized if they were to benefit the vast majority of citizens. Elizabeth Warbasse, Norma Basch, and Amy Stanley relate the passage of statutes in New York, Massachusetts, Illinois, and other states to the efforts of feminists. However, it is telling that, three years before feminists gathered for the Seneca Falls Convention, the New York legislature enacted an 1845 statute that explicitly “secured to every married woman who shall receive a patent for her own invention, the right to hold and enjoy the same, and all the proceeds, benefits, and profits as her separate property . . . as if unmarried” (see Kelly, *Treatise*, p. 456). Up to this period, only ten patents had been granted to women residing in New York. Connecticut (1856) and West Virginia (1868) passed similar legislation. The statute that New York subsequently passed in 1848 extended separate property rights to all married women. Other states adopted the New York model, especially the Act of March 1860 that granted: “A married woman may bargain, sell, assign and transfer her separate personal property, and carry on any trade or business, and perform any labor or service on her sole and separate account, and the earnings of any married woman, from her trade, business, labor or services, shall be her sole and separate property.” See Rabkin, *Fathers*; Warbasse, *Changing Legal Rights*; Stanley, “Conjugal Bonds”; Cleary, “Married Women’s Property Rights”; Siegel, “Home”; and Basch, *In the Eyes*.

²⁰ See Chused, “Married Women’s Property Law.”

²¹ Goldin, *Understanding*, p. 53.

TABLE 1
WOMEN'S PROPERTY LAWS BY STATE IN THE 19TH-CENTURY UNITED STATES
(year of enactment)

State	Property Laws	Earnings Laws	Sole Trader Laws
Northeast			
Connecticut	1856 (patents)	1877	1877
Maine	1844	1857	1844
Massachusetts	1845	1874	1860
New Hampshire	1867	—	1876
New Jersey	1852	1874	1874
New York	1845 (patents)	1860	1860
Pennsylvania	1848	1872	—
Rhode Island	1848	1874	—
Vermont	1881	—	1881
South			
Alabama	1867	—	—
Arkansas	1873	1873	1868
Delaware	1875	1873	—
District of Columbia	1869	—	1869
Florida	—	—	—
Georgia	1873	—	—
Kentucky	—	1873	1873
Louisiana	—	—	1894
Maryland	1860	1860	1860
Mississippi	1871	1871	1871
North Carolina	1868	1873	—
Oklahoma	—	—	—
South Carolina	1870	—	1870
Tennessee	1870	—	—
Texas	—	—	—
Virginia	1878	—	—
West Virginia	1868 (patents)	1893	1893
Midwest			
Dakotas	1877	1877	1877
Illinois	1861	1861	1874
Indiana	1879	1879	—
Iowa	1873	1870	1873
Kansas	1868	1868	1868
Michigan	1855	—	—
Minnesota	1869	—	1874
Missouri	1879	1879	—
Nebraska	1881	1881	1881
Ohio	1861	1861	—
Wisconsin	1850	1872	—
West			
Arizona	1871	—	1871
California	1872	1872	1872
Colorado	1874	1874	1874
Idaho	1887	—	1887
Montana	1872	1874	1874
Nevada	1873	1873	1873
New Mexico	—	—	—
Oregon	—	1880	1880
Utah	1895	1895	1895

TABLE 1—continued
(year of enactment)

State	Property Laws	Earnings Laws	Sole Trader Laws
	West		
Washington	1889	1889	1889
Wyoming	1876	1876	1876

Notes: The table includes those acts that granted separate control over property to married women (Property), the rights to their earnings without need of the husband's consent (Earnings), and the ability to engage in contracts and business without need of the husband's consent (Sole Trader). The table does not include legislation based on restrictions such as the right to trade only if abandoned by the husband or if the husband were incapacitated or irresponsible, nor does it include legislation that was merely granted to afford relief from creditors. Married women's property right acts that were legislated primarily as debt relief include: Alabama, 1846, 1848; Arkansas, 1835, 1846; Florida, 1845; Georgia, 1868; Indiana, 1852; Kentucky, 1846; Maine, 1840, 1847; Maryland, 1841; Missouri, 1849; New York, 1849; North Carolina, 1849; Ohio, 1846; Oregon, 1857; South Carolina, 1868; Tennessee, 1825; Texas, 1845; Vermont, 1847; and West Virginia, 1868. Kelly, *Treatise*, notes that debt relief legislation did not create a truly separate estate for women because control was still vested in the husband. Other acts that incorporated caveats such as the requirement that husbands were irresponsible, imprisoned, or incapacitated, or appointed as trustees of their wives, include: Alabama, 1849; Arkansas, 1875; Connecticut, 1849, 1853, 1875; Delaware, 1865, 1873; Florida, 1881; Georgia, 1873; Idaho (no year mentioned); Illinois, 1874; Indiana, 1853, 1857, 1861; Kentucky, 1843, 1873; Louisiana, 1866; Maine, 1821; Massachusetts, 1835; Michigan, 1846; Minnesota, 1866; Mississippi, 1839; Missouri, 1865; Nebraska, 1881; New Hampshire, 1842, 1846; North Carolina, 1868, 1872, 1873; Ohio, 1868; Oregon, 1857; Pennsylvania, 1718, 1855, 1872; Rhode Island, 1880; Tennessee, 1835, 1858; Texas, 1865; Vermont, 1862, 1881; Virginia, 1876, 1877; West Virginia, 1868; and Wisconsin, 1850, 1878. The 1845 act of New York (Chap. 11), the 1856 act of Connecticut, and the 1868 act of West Virginia explicitly accorded women the right to "hold a patent for an invention, as if she were unmarried" (West VA. Code of 1868, Sec. 4).

Sources: Wells, *Treatise*; Kelly, *Treatise*; and Bishop, *Commentaries*.

midwestern and 82 percent of the western states had approved separate estates for married women and 91 percent of western states had dissolved trading restrictions, whereas 73 percent of them had passed earnings acts.²² A number of western and midwestern states, including Kansas, Nevada, and Oregon, protected women's property rights in their constitutions. This can be compared to the 71 percent of the southern states that had separate estates laws, the 47 percent that had sole trader laws, and the 41 percent that had earnings laws. Southern states also tended to interpret the statutes more conservatively; for instance, Alabama and Virginia passed statutes whose ambit was severely limited to special cases. Florida and Texas passed no effective women's rights legislation in the nineteenth century, whereas South Carolina formally barred married women from business partnerships in 1887.²³

²² Matsuda, "West," argues that the "frontier effect" owed to a number of factors including the relative scarcity of women. This position is supported by the record on women's suffrage, which several western states granted in the nineteenth century: Wyoming, 1869; Utah, 1870; Washington, 1883; Colorado, 1896; Idaho, 1896. California, Arizona, Kansas, Oregon, Montana, and Nevada also allowed women the vote between 1910 and 1915. See Buhle and Buhle, *Concise History*.

²³ Indeed, in some southern states, reforms occurred only in the twentieth century. According to Lebsack, "Radical Reconstruction," "major statutory changes in the married women's property laws

Legal historians have for the most part asserted that the consequences of married women's legislation were minimal. They argue that the antebellum property rights reforms increased the responsibility of women for the welfare of their families, without improving their economic status or their standing in the labor market.²⁴ For example, earnings laws were initially narrowly circumscribed in scope, their main intention being to protect women burdened with profligate and irresponsible husbands. Courts also typically interpreted the statutes as exempting any work that was conducted in the home or for the benefit of the family, because they feared the transformation of the family relationship into a market relationship.²⁵ More generally, "the married women's acts themselves did not legitimate any radical shifts in the economic status of women."²⁶ Norma Basch's study of the New York statutes similarly opines that "full legal equality for married women loomed as a threat to the entire economic structure. Consequently, the changes created by the statutes were either limited or illusory."²⁷ These assertions have not, however, been subjected to systematic tests for consistency with the evidence. Furthermore, the narrower question remains whether the existence of laws protecting individual property served as an incentive for women to alter their behavior.

TEMPORAL AND REGIONAL PATTERNS OF PATENTING

That upon the petition of any person or persons that he, she, or they, hath invented or discovered any useful art, . . . it shall be lawful . . . to cause letters patent to be made out in the name of the United States.

—United States Patent Act (April 1790)²⁸

Patent records present a valuable perspective on female inventive activity and market participation in an era when marriage meant the

in Alabama, Mississippi, Florida, Louisiana and Texas awaited the 1880s and beyond" (p. 215). Although Georgia passed separate estates legislation in 1873, it declared at the same time that the general contracts of married women were void. It was not until 1943 that Georgia allowed women the right to separate earnings. Wells, *Treatise*, points out that "the first movement of the Florida legislature . . . was the ungracious extending of the criminal code so as to provide that a married woman may be convicted of the crime of arson, by burning her husband's property. . . . It seems that here the whole business of legislating for married women stopped" (p. 15). Southern courts reinforced this tendency; as *Allen-West v. Grumbles*, 161 F. Cas. 461 (1908) pointed out, "the Supreme Court of Arkansas has constantly and rigidly held to the rule of the common law in construing the married women's statute."

²⁴ See Warbasse, *Changing Legal Rights*; Basch, *In the Eyes*; and Chused, "Married Women's Property Law."

²⁵ Stanley, "Conjugal Bonds," p. 57; and Siegel, "Modernization."

²⁶ Chused, "Married Women's Property Law," p. 1362.

²⁷ Basch, *In the Eyes*, p. 4.

²⁸ The U.S. Patent Act of 1790 was the first statute passed "to promote the progress of science and useful arts," in accordance with Section 1, Article 8 (clause 8) of the Constitution.

virtual “invisibility” of married women in terms of objective data.²⁹ In this section, I assess the distribution of women’s patenting across time, region, and industry. My aim is to test the hypothesis that appropriate legal and property rights institutions functioned as “enabling factors,” which were prerequisites for the expansion of women’s participation in the market. Even if the hypothesis is correct, however, the presence of such institutions was not a sufficient condition for inducing economic progress. One would not, for example, expect a response to legal changes that improved the returns from such activity if women’s inventive activity were idiosyncratic and unsystematic. Therefore, this section examines the extent to which patenting by women inventors varied systematically in correspondence with market factors such as the nature and extent of demand. The evidence indicates that male patenting responded to expansions in market demand and that women’s patenting behavior was similar to these overall regional patterns. At the same time, although women inventors were responsive to commercial incentives, they faced different constraints and opportunities, such as a comparative advantage in household inventions. The patenting rate (adjusted for population) reveals another difference between the male

²⁹ Patent records undoubtedly undercount the numbers of inventions by women, in part because some might have allowed male relatives to file the invention. However, the patent law explicitly voided patents not granted to the “first and true” inventor. It is far more likely that an undeserving male was listed as a co-inventor on the patent than as the sole inventor. Patent records also exclude a number of inventions, such as discoveries that do not meet the standard for patentability, or cases where the inventor does not wish to disclose her findings or is unable to finance the patent application. The nominal cost of filing varied little over the century, increasing from \$30 to \$35 in 1861. The total cost of patent searches, filing, and the services of a patent lawyer averaged \$100. Annual nonfarm earnings were \$423 in 1875 and \$446 in 1885 (U.S. Department of Commerce, *Historical Statistics*).

Towards the end of the nineteenth century, the U.S. Patent Office published a list of women patentees (U.S. Patent Office, *Women Inventors to whom Patents Have Been Granted by the United States Government, 1790 to July 1, 1888*) and two appendices that extended the coverage through 1 March 1895 [hereafter, *WIP*]. The publication included 3,975 patents filed either by women inventors alone or with co-inventors (both male and female), omitting patentees who used initials or who held androgynous names. *WIP* catalogs the patent number (available after 1836), the names of inventors, co-inventors, and assignees (if the patent right was transferred at time of issue), along with all patentees’ state and city of residence, a brief description of the invention, and the date the patent was issued. The list is incomplete, however, and should be regarded as a sample, rather than a complete census, of the population of female patents. The preconception that women invent few technically complex devices probably influenced the exclusion of some androgynous names. Nonetheless, in most cases, the omitted names are quite common, evidently female names, so the omissions appear to be the result of careless tabulation on the part of the patent office clerks drawing up the list. I found *WIP* omitted roughly 56 percent of patents issued to women in 1870. The omission of patents granted to women subsequently decreases, at least in the years I checked: 21.0 percent in 1876, 14.5 percent in 1888, 9.9 percent in 1889, 14.3 percent in 1890, and 9.8 percent in 1891. My sample, which totals 4,198, includes missing data drawn largely from 1888 to 1891. Results do not vary qualitatively when the data are limited to the original *WIP* list. The patent office records normally also include information on assignments that are made when the patent is issued. The data regarding assignments of women’s patents are unreliable for the earlier years and are entirely missing from *WIP* between 1 July 1888 to 1 October 1892. I did, however, retrieve most of the assignments for the entire period from the Patent Office reports and gazettes. I categorized inventions according to sector of final use, and also obtained information on the numbers of patents per person and the length of inventive career (defined as the period between the first and last patent up to 1895). City directories from 1875 to 1890 provided additional information on marital status and occupations for the inventors of some 900 patents.

and female patterns: the highest female per capita rates in the United States were achieved in the western areas that featured more liberal laws towards women's economic rights.

The first female patentee on record in colonial America was possibly Sybilla Masters, a native of Pennsylvania, whose husband obtained two English patents on her behalf in 1717.³⁰ The first U.S. patent to a woman was granted in 1808 to Hazel Irwin, a Boston resident, for a cheese-press invention, and the following year Mary Kies of Connecticut obtained a patent for weaving straw.³¹ According to Patent Office records, only 72 patents were credited to women inventors from 1790 through 1859, even though 4,773 patents were issued to male patentees in 1860 alone.³² In the centennial year of 1876, the cumulative total for women's patents amounted to just over 1,000, but 1,419 patents were issued to women in the five years from 1890 to 1894. Moreover, the decadal rate of increase for patents by women at this point was more than three times higher than the corresponding rate for men.

The Civil War and Reconstruction era proved to be a watershed both for legal reforms and for patenting by women inventors. The higher participation of women in nonhousehold production during the Civil War itself may have served as a precipitating factor. As Table 2 shows, more patents (86) were filed between 1860 and 1865 than within the entire 70 years from the beginning of the patent system in 1790. A total of 184 patents were granted over the next four years, amounting to an increase of 114 percent. Some of these inventions were clearly related to war efforts: Clarissa Britain of St. Joseph, Michigan, received nine patents, including an 1863 patent for an ambulance; Sarah Hussey of Cornwall, New York, patented a hospital table in 1865. Maryjane Montgomery of New York City (who would later consider herself a professional inventor) was granted a patent in 1864 for a "war vessel." However, as Claudia Goldin argued in her study of the economic history of women since 1790, women's work can only be understood in the context of life-cycle factors and persistent links with the family.³³ One finds the same to be true of patenting by women inventors, for the majority of their inventions were less heroic and included household articles, tools, and similar contrivances.

It is unlikely that the Civil War experience fully accounts for the rapid growth in patenting that occurred after the war. During this period, more information about prospects for patenting and marketing inventions was being disseminated to a wider audience. In the early 1870s, the Patent

³⁰ Bugbee, *Genesis*, p. 72, notes that one of the Masters's patents dealt with a method of curing corn, whereas the other was an invention for weaving straw into bonnets.

³¹ *WIP* incorrectly describes Mary Kies as the first woman to obtain a patent after 1790, and secondary studies tend to repeat the error.

³² See U.S. Department of Commerce, *Buttons*, which indicates that women's patents in the past decade still constitute less than 10 percent of patents filed by men.

³³ Goldin, *Understanding*.

TABLE 2
PATENTS GRANTED IN THE UNITED STATES, BY GENDER, 1790–1894

Period	Women Patentees			Male Patentees		
	Number	Percentage (1790–1894)	Percentage Change Over Previous Period	Number	Percentage (1790–1894)	Percentage Change Over Previous Period
1790–1859	72	1.7	—	32,362	6.1	—
1860–1865	86	1.9	—	25,056	4.7	—
1866–1869	184	4.4	114.0	46,492	8.7	85.5
1870–1874	434	10.3	135.9	59,456	11.1	27.9
1875–1879	515	12.3	18.7	64,346	12.1	8.2
1880–1884	532	12.7	3.3	86,420	16.2	34.3
1885–1889	956	22.8	79.7	107,546	20.2	24.4
1890–1894	1,419	33.8	48.4	111,535	20.9	3.7
Total	4,198	100.0		533,213	100.0	

Notes: The total number of patents for women in the 1890–1894 period include patents issued during January and February 1895. Some 244 of the patents that are attributed here to women included male co-inventors. The data include patent grants alone, because separate information is not available for patent applications by women.

Sources: The sources for women’s patents are described in the text and footnotes. Figures for male patentees were obtained by subtracting the total for women from the annual data in the U.S. Patent Office, *Annual Report*, for various years.

Office hired its first female patent examiner, possibly encouraging women to submit inventions that they might have feared would be viewed with less sympathy by other examiners.³⁴ Exhibitions such as the Philadelphia Centennial Exposition also reserved special pavilions for women inventors and thus alerted other women to the opportunities available in this sphere of activity.³⁵ Any conclusions reached regarding the role of legal reforms therefore need to be tempered by the realization that the reasons for this rapid growth in the numbers of women participating in invention undoubtedly comprise an admixture of social and economic factors.

Some researchers propose that inventive activity by all patentees varied with market size and expansion, even when disaggregated to the regional and county levels.³⁶ They conclude that patenting responded to economic incentives and was the output of individuals seeking to maximize expected returns to their efforts. The patterns for male patentees therefore partly

³⁴ Sarah J. Noyes, a specialist in chronological devices, served as a patent examiner for over three decades. She entered the Patent Office in 1873 and was appointed First Assistant Examiner of the Electrical Division. Other female examiners included Anna Nichols (1873), Amelia Tyler (1881), Frances Lybrand (who was appointed as an examiner in Civil Engineering in 1882), and Virginia Neagle (1882). See Morse, “Women.” Journals such as *Scientific American*, *Inventive Age*, and *The Patent Record* were dedicated to descriptions and analyses of patent activities, both in the United States and abroad, and occasionally included articles specifically advising women who wished to obtain patents and exploit their inventions. *Scientific American* in particular issued editorials that highlighted the commercial profitability of “small inventions,” such as household articles, that might seem technically undemanding.

³⁵ Warner, “Women Inventors.”

³⁶ Schmookler, *Invention*, pioneered investigations that systematically related patenting to changes in market demand. Sokoloff, “Inventive Activity,” likewise found that patenting varied pro-cyclically

reflected systematic responses to market factors. On the other hand, if women inventors applied for patents mainly for whimsical or eccentric motives, one might expect the following: 1) women's patenting would not be similar to patterns of male patenting; 2) there would be little systematic regional variation in the industrial allocation of women's patents; 3) few women would be granted more than one patent; and 4) women's patents would not be greatly valued in the market place.

Table 3 shows that women patentees tended to be located in the same regions as male patentees.³⁷ Almost one-quarter of all women patentees over the entire period resided in New York state, followed by Illinois (8 percent) and Massachusetts (7.5 percent). These states were dominant from the Civil War period in terms of patenting by both women and men, but they lost ground in subsequent years, when patentees from frontier areas such as Kansas, Michigan, Minnesota, Texas, and Wisconsin increased in relative and absolute numbers.³⁸ A striking congruence between the general and female patterns of patenting is likewise revealed in the fall in the percentage of patents from the New England area and the less marked decline in the Mid-Atlantic. Conversely, the midwestern states increased their share of patenting to 32 percent (women) and 35 percent (all patentees) by the 1890s.³⁹ Whatever the underlying reasons for these geographical patterns, the parallels between the results for female and male patentees suggest that, given the changes in the property laws, at the aggregate level women patentees were influenced largely by the same factors as male patentees.

The industrial distribution of patents filed by women also yields evidence of responsiveness to market demand and of job-relatedness.⁴⁰ For instance, prior to the end of the Civil War, 15.8 percent of all patents filed by women covered inventions such as improvements in bandages and contrivances for invalids. By the second half of the 1870s, this figure had fallen to 7.3 percent. Several women patentees directed their attentions to problems that proved commercially profitable. Mary Walton of New York patented a device in 1881 for silencing the noise of elevated railways that was used by several railway companies. Many of the inventors who were employed outside the home devised inventions that were related to their jobs. Physicians Elizabeth Shewell, Elizabeth French (an "electrotherapist"), and Mary Thompson, obtained patents for a skin remedy, electro-

with phases of economic activity during early industrialization and that areas with recent access to developing markets experienced a surge in patenting.

³⁷ Sokoloff and Khan, "Democratization," argue that the early national increase in inventive activity was mainly due to a "democratic process" characterized by an influx of new entrants into the market, rather than to greater numbers of patents per person.

³⁸ For overall patenting rates, see Sokoloff, "Inventive Activity"; and Lamoreaux and Sokoloff, *Location*.

³⁹ Lamoreaux and Sokoloff, *Location*, noted this phenomenon in their study of a sample of all patentees in the late nineteenth and early twentieth centuries.

⁴⁰ See Khan, "Not for Ornament."

TABLE 3
 FEMALE PATENTING, TOTAL PATENTING, AND POPULATION
 REGIONAL DISTRIBUTION, 1800–1899
 (percentages)

	Pre-1860	1860s	1870s	1880s	1890s
New England					
Female patents	26.0	19.2	19.0	11.7	9.9
Female population	10.2	9.8	9.1	8.5	8.2
Total patents	28.0	22.8	19.8	17.8	15.8
Total population	10.0	9.5	8.8	8.2	7.9
Middle Atlantic					
Female patents	62.0	43.6	39.3	34.4	32.2
Female population	24.0	23.8	22.8	22.1	21.7
Total patents	45.9	40.1	38.9	35.7	33.3
Total population	23.7	23.4	22.3	21.6	21.3
East North Central					
Female patents	4.0	20.3	20.8	24.2	23.0
Female population	21.4	22.4	22.5	22.2	21.9
Total patents	12.0	24.1	22.5	24.7	25.8
Total population	22.0	22.9	22.8	22.5	22.1
West North Central					
Female patents	0.0	4.5	6.5	11.1	14.0
Female population	6.6	7.9	9.4	11.0	12.0
Total patents	1.2	4.2	6.2	8.4	9.5
Total population	6.9	8.3	9.8	11.4	12.3
West					
Female patents	0.0	3.0	5.2	5.8	9.0
Female population	1.3	1.5	2.0	2.7	3.3
Total patents	0.3	1.9	3.0	4.1	5.6
Total population	2.0	2.2	2.6	3.3	3.9
South					
Female patents	8.0	9.4	9.1	12.8	12.0
Female population	36.6	34.6	34.2	33.5	33.0
Total patents	12.7	7.0	9.5	9.3	10.0
Total population	35.4	33.7	33.6	32.9	32.5

Notes: The female patent figures exclude 196 patents granted to foreigners and 40 patents for which no information was available. The decadal figures for 1890 are obtained by inflating the patents granted up to March 1895 by 1.9355.

Sources: Data for total patents at the regional level are computed from the U.S. Patent Office, *Annual Report*, 1891. For the sources of women's patents, see the text and footnotes. Population data are from U.S. Department of Commerce, *Historical Statistics*, computed at the decadal midpoint by exponential interpolation.

therapy, and a surgical needle, respectively. Cynthia Westover, who was employed by the Street Commissioner for New York City, invented a dumping cart in 1892. Margaret Knight, a factory worker for the Columbia Paperbag Company, produced a commercially successful paper bag machine that resolved the problem of making square-bottomed bags.

The regional decomposition in Table 4 lends further insight into the role of commercial incentives. The New England states and New York dominated in the production of clothing and related items, and by far the

TABLE 4
INDUSTRIAL DISTRIBUTION OF WOMEN'S PATENTS, BY REGION, 1800–1895

	Foreign	Mid-Atlantic	Midwest	New England	South	West	Total
Clothes							
Patents	39	332	280	205	75	38	969
Percentage	19.9	23.2	21.2	38.0	16.5	14.6	23.1
Health							
Patents	31	122	95	31	39	32	350
Percentage	15.8	8.5	7.2	5.8	8.6	12.3	8.3
Household							
Patents	61	533	642	182	217	117	1,752
Percentage	31.1	37.3	48.7	33.8	47.8	45.0	41.8
Machines & Tools							
Patents	41	242	162	67	68	31	611
Percentage	20.9	16.9	12.3	12.4	15.0	11.9	14.6
Transport							
Patents	8	62	32	10	17	13	142
Percentage	4.1	4.3	2.4	1.9	3.7	5.0	3.4
Miscellaneous							
Patents	16	138	107	44	38	29	372
Percentage	8.2	9.7	8.1	8.2	8.4	11.2	8.9
Total Patents							
Patents	196	1,429	1,318	539	454	260	4,196
Percentage	4.7	34.1	31.4	12.8	10.8	6.2	100

Sources: See the text and footnotes.

largest share of inventions in this industry occurred in the same regions.⁴¹ The popularity of activities such as bicycling and the need for less restrictive clothing meant that the market for new forms of apparel was expanding and profitable. However, although women, like men, responded to market incentives, the opportunities available to women were not the same, and their patenting behavior reflected these differences. Most women inventors, for example, focused on improvements in household machines, furniture, and utensils, in which they might be expected to have a comparative advantage.⁴²

In short, legal reforms might have stimulated the supply of women's inventions, but demand factors such as the nature of the market for female inventions in the West relative to areas such as the South are also likely to

⁴¹ For instance, Massachusetts inventors Susan Taylor Converse, Clara Clark, and Emmeline Philbrook all devised patented corsets that were manufactured by George Frost and Company of Boston. Foy, Harmon, and Chadwick of New Haven employed several hundred female workers to make patented articles by inventors such as Lavinia Foy of Massachusetts, whose 17 corset inventions brought her a reputed annual income of \$25,000. Catherine Griswold, a New York resident, produced some 20 clothing-related inventions, including garment supporters and corsets, some of which were made by the Worcester Corset Company.

⁴² The proportion of inventions related to "woman's work" increased over time: the share of household articles and furniture rose from 22.8 percent over 1800–1865 to 36.1 percent of all patents between 1890–1895. Women also patented household machines such as stoves, dishwashers, and devices to launder clothes (9.6 percent of all patents). Clothing and related items, including hats, shoes, sewing, and textiles, absorbed a fairly constant share of patent efforts (23 percent). U.S. Department of Labor, *Contributions*, reveals a similar pattern of specialization in the early twentieth century.

have been instrumental. According to David Katzman's study of the availability of domestic servants, white households in the South were less inclined to use household innovations, because of the surplus of low-wage black labor. Midwestern and western women, without the benefit of such a supply of readily available help, might have had a greater incentive to substitute devices to help in their household tasks.⁴³ From 1790 to 1895 household inventions amounted to 47.8 percent of patents granted to women in the South, 45.0 percent in the West, and 48.7 percent in the Midwest. Moreover, the share of household patents increased in the 1890s to 50 percent in the West and 53 percent in the Midwest, compared to 34.6 percent in New England during the same period. Among those receiving such patents, Margaret Colvin of Michigan invented a successful washing machine, and others, such as Hattie Adler of Colorado, Nella Balch of Wisconsin, Margaret Brass of Minnesota, and Ellen Dillon of Iowa, patented clothes driers, washboards and boilers, dishwashing machines, iron heaters, and other household improvements. Western and midwestern patentees of household patents were typically located in rural areas, whereas in other regions, the majority of such patents were granted to residents in metropolitan areas, lending support to the hypothesis that lack of access to household help partially accounted for regional differences in patenting.⁴⁴ This argument appears to be somewhat undermined by the fact that southern women also exhibited the same focus. However, the size of the female population in the South was approximately the same as in the western and midwestern states combined, implying that in the latter states, the per capita rate of patenting in the household category was four times higher than the equivalent rate for southern patentees. Thus, in per capita terms, the data are not inconsistent with the idea that the industrial composition of female patenting activity in these regions was at least partly due to market demand.

Table 5 adjusts the numbers of patents filed in a particular region for population size and highlights two additional exceptions to the result that patenting by women followed general trends. First, the table controls for local effects to some extent by assessing the within-region ratio of mean per capita patenting by women relative to men. The ratio increases over time, and the Civil War effect on women's patenting is still evident in all regions, with the smallest effect in the South. Perhaps surprisingly, compared to other areas, women in the Northeast were less inventive relative to men, even though that region had long dominated the patenting records and was rich in factors associated with higher levels of inventive activity. Second, the patenting rate, reported per million women, reveals that a rapid increase in patents relative to population occurred in the western states after the 1860s. Table 5 shows that patents per capita

⁴³ Katzman, *Seven Days*.

⁴⁴ Khan, "Not for Ornament."

TABLE 5
FEMALE AND TOTAL PATENTING PER CAPITA, BY REGION, 1800–1899
(per million residents)

	Pre-1860	1860s	1870s	1880s	1890s
New England					
Female	0.8	30.3	96.0	79.6	102.9
Total	102.1	484.4	725.3	820.2	698.4
Ratio (%)	0.8	0.2	13.2	9.7	14.7
Middle Atlantic					
Female	0.8	28.5	79.3	90.6	126.3
Total	70.4	346.7	561.3	626.4	547.0
Ratio (%)	1.1	8.2	14.1	14.5	23.1
East North Central					
Female	0.0	14.1	42.7	63.1	89.3
Total	19.9	212.7	317.0	417.3	409.4
Ratio (%)	0.0	6.6	13.5	15.1	21.8
West North Central					
Female	0.0	8.9	31.9	58.6	99.4
Total	6.1	102.6	204.0	277.9	269.2
Ratio (%)	0.0	8.7	15.6	21.1	36.9
West					
Female	0.0	30.1	120.5	126.7	231.5
Total	5.0	175.8	367.7	464.2	504.6
Ratio (%)	0.0	17.1	32.8	27.3	45.9
South					
Female	0.0	4.2	12.2	22.1	31.0
Total	13.0	41.9	91.5	107.0	107.6
Ratio (%)	0.0	10.0	13.3	20.7	28.8
United States					
Female	0.3	15.5	46.0	58.0	85.1
Total	36.4	202.4	322.1	379.1	349.8
Ratio (%)	0.8	7.6	14.3	15.3	24.3

Notes and Sources: See Table 3. The ratio comprises female patents per capita as a percentage of total patents per capita within each region. Decadal figures are obtained for the 1890s by inflating the patents granted up to March 1895 by 1.9355.

increased in all regions throughout the century, even in the lagging South, but the rate of increase as well as the absolute rates were highest in the West. This was not true of the per capita rates for the general population of patentees, because in their case, the absolute number of patents per capita filed in the West still remained behind that of the more technologically experienced Mid-Atlantic and New England regions. In short, western women (in per capita terms) held a greater absolute and comparative advantage over nonwestern women than men in that region held over nonwestern men. The regional difference is intriguing, for it mirrors the legal “frontier effect,” in which western states protected the rights of nineteenth-century women with more liberal policies than other jurisdictions.

In sum, the Civil War heralded statutory changes in married women’s property rights that increased the potential profits from their commercial efforts. The same period also marked a dramatic increase in per capita

patenting activity by women, especially in the frontier areas. Economic theory suggests that market participation will tend to vary with incentives that affect perceived returns. Women's patenting activity, like that for male patentees, exhibited systematic patterns across regions and industry, and these patterns appear to be correlated with factors such as the size and nature of the market. I conclude that women's patenting behavior responded to changes in net expected benefits, a result that is necessary (but not sufficient) to support the hypothesis that legal reforms affected women's commercial efforts and nonhousehold participation.

ANALYSIS OF PATENTING AND LEGAL CHANGES

What good are we to expect from the changes proposed in our customs and institutions?

—J. S. Mill, *The Subjection of Women* (1869)⁴⁵

Previous sections explored patent records to shed some light on the effects of legal and institutional changes on commercial nonhousehold activity by married women. This is obviously a difficult question to answer in any context, and one might expect that a number of other factors influenced women's patenting behavior, including the need to substitute for household help and other aspects of market demand and supply. This section examines the hypothesis that changes in the married women's laws stimulated an increase in women's investments in inventive activity and promoted greater efforts to obtain patent property. The tables show the association between per capita patenting (at the state level) and the different women's rights acts that were legislated in a particular state.⁴⁶ As previously noted, the western and East North Central states featured a liberal approach to women's rights and at the same time were prominent in per capita patenting. The findings reported in this section indicate that location-specific factors related to legal status accounted for part of the variation in patenting. Moreover, community property states (which granted joint ownership but ceded control of the community property to

⁴⁵ Mill, *Subjection*, p. 79.

⁴⁶ Ideally, one would want to compare the patenting record of married women patentees to unmarried patentees within the region in terms of changes before and after the laws. I was able to retrieve information from city directories for the patentees of almost 900 inventions. Of the 900 patents, 127 patents (14.3 percent) were filed by single women, 207 by married women, 233 by widows, and 52 by women whose marital status was either married or previously married. The remaining 267 patents were issued to women whose status was unknown. Unmarried women accounted for almost one-half (47.4 percent) of patenting in the New England states, compared to only 3.9 percent of patents in the Mid-Atlantic, 7.6 percent in the South, 14.6 percent in the West, and 15.5 in the Midwest. On the other hand, married women filed 35.1 percent of midwestern patents and 31.7 percent of western patents, compared to 19.7 percent in the South, 16.8 percent in the Mid-Atlantic, and 22.6 percent in New England. The data from city directories are too limited and biased to yield reliable conclusions, but the figures seem sufficiently distinct to warrant speculation that location-specific factors related to legal status might indeed account for some of the differences.

TABLE 6
 AVERAGE PER CAPITA PATENTING BY WOMEN IN RELATION TO LEGAL REFORMS,
 1860–1899
 (weighted by female population)

Category	1860s	1870s	1880s	1890s
Married Women's Property Rights				
Yet to pass law	6.0 (31)	16.1 (13)	36.2 (9)	53.1 (9)
Passed in current decade	11.1 (9)	22.4 (18)	48.1 (4)	— (0)
Law passed before	28.5 (9)	59.1 (18)	54.9 (36)	80.0 (40)
Sole Trader Laws				
Yet to pass law	9.9 (43)	24.2 (25)	34.1 (20)	48.8 (20)
Passed in current decade	40.0 (5)	39.3 (18)	50.1 (5)	— (0)
Law passed before	3.2 (1)	100.4 (6)	72.3 (24)	103.7 (29)
Earnings Laws				
Yet to pass law	12.4 (43)	18.9 (23)	29.6 (20)	44.6 (20)
Passed in current decade	24.1 (5)	47.7 (20)	52.6 (3)	— (0)
Law passed before	3.2 (1)	65.0 (6)	63.1 (26)	91.0 (29)
National average	15.5	43.3	52.1	75.9

Notes: States that passed laws in the 1890s decade are included in the first category. Per capita patenting figures are weighted by female population. The number of states in each category is included in parentheses, with missing data (that do not enter into the computations) in the early time periods, because some of the states did not yet exist. The 1890s patenting rates comprise those for the period up to March 1895, inflated by a factor of 1.9355.

Sources: See the text and footnotes.

the husband) did not experience higher patenting rates. This suggests that control over property, rather than mere ownership rights, was instrumental in increasing market participation. Finally, I consider multiple patenting and the assignment of patent rights, which have some bearing on the role of legal reforms in inducing sustained commitments to invention and to commercial activity.

Table 6 supports the view that legal reforms encouraged women to increase their investments in inventive activity. Average per capita patenting did rise over time in states that had yet to pass any women's rights laws, but in all instances where more than one state was involved, areas that had recently granted such rights showed higher patenting rates. States that had previously enacted married women's statutes sustained rates of patenting that surpassed both of the other categories. However, the information in Table 6 is dominated by a strong upward trend and might also reflect other features specific to a particular region. The table does not control for an

array of variables that might affect the relationship between passage of married women's laws and female commercial activity. For instance, other laws might have been passed, or judicial decisions and cultural attitudes might have prevailed, that modified the married women's property laws, including changes in "marriage bars" or social sanctions against women inventors. Commercially developed areas that were rich in factors conducive to patenting, such as higher literacy rates and access to capital, might also have tended to pass laws protecting women's rights. Systematic time series do not exist for these variables, but the level of urbanization (defined in terms of the presence or absence of cities within a county) is likely to be a good proxy.

Table 7 indicates that women's patenting was affected by the degree of urbanization, but the direction of influence is perhaps unexpected: in the period before property rights laws were passed, women in rural areas (counties without a town of more than 25,000 residents) achieved higher patenting rates than women in urban and metropolitan counties. Moreover, even after adjusting for population, the distribution of women's patenting was far more concentrated in rural areas than was the case for male patentees, especially in the Midwest and West.⁴⁷ The implication is that the typical urban advantages—access to education, information, and capital—were not critical to female inventive activity. However, Table 8 shows that patenting in metropolitan counties (containing a city of over 100,000 residents) increased significantly after changes in laws granting property rights to women, and to a greater extent than in rural areas. This increase might have occurred because concern about property rights was stronger in more developed markets, or perhaps because the property rights laws facilitated women's access to the urban advantages that had promoted men's patenting.

Similarly, the passage of sole trader laws is associated in rural and urban areas with increases in patenting that are roughly comparable to the effects of the property laws. An exception occurs in metropolitan areas, where laws that granted women the right to independent businesses and contracts are associated with higher patenting rates than is the case for property rights laws. For example, metropolitan areas in states that had legislated property rights laws in the 1870s experienced patenting rates of 2.9, whereas patenting in areas that had already passed property rights laws amounted to 42.4. The comparable figures for metropolitan counties in states that legislated sole trader laws in the 1870s were 13.6 in the current decade and 76.0 in states that had previously passed such laws. The higher

⁴⁷ Urban areas comprise counties that included a city with 25,000 to 99,999 residents. The results in Table 7 suggest that women inventors belonged to two distinct groups, who varied because of differences in their environment or in their personal characteristics. Rural women on farms and on the frontier may have had greater responsibility for household income, whereas one might speculate that urban women inventors were more likely to be single, better educated, and involved in proprietorships or businesses. See Khan, "Not for Ornament," for further discussion.

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TABLE 7
URBANIZATION AND PER CAPITA PATENTING BY REGION, MALE AND FEMALE
PATENTEES, 1860–1899

	1870s		1890s		1860–1895
	Women	All	Women	All	Women
East North Central					
No city	25.9	237.8	36.2	240.2	26.9
25,000	5.0	889.8	12.3	703.8	7.0
100,000	1.9	724.2	4.8	763.0	3.8
250,000	7.9	—	32.1	1,139.4	17.7
Total	10.2	312.2	21.4	429.9	13.8
West North Central					
No city	19.2	129.4	50.7	168.4	33.8
25,000	2.7	239.9	7.3	300.6	4.5
100,000	—	—	10.5	588.9	5.0
250,000	3.8	293.3	13.5	938.4	11.5
Total	6.4	146.5	20.5	248.7	13.7
New England					
No city	13.4	438.5	12.6	382.4	11.8
25,000	40.0	1,039.2	57.1	989.9	39.8
100,000	—	—	1.7	870.2	2.6
250,000	69.7	1,875.9	43.9	1,250.1	37.1
Total	30.8	775.8	23.8	772.0	22.8
Middle Atlantic					
No city	17.8	295.6	27.4	280.6	19.0
25,000	4.5	603.9	13.1	681.9	7.1
100,000	4.6	1,009.0	8.6	795.2	4.8
250,000	53.7	1,137.4	73.2	943.5	52.8
Total	20.2	563.4	30.6	607.0	21.0
South					
No city	6.1	53.2	15.4	63.5	10.4
25,000	0.5	266.4	4.4	452.5	1.9
100,000	0.5	563.8	1.2	434.2	0.7
250,000	0.6	492.8	3.5	421.8	2.1
Total	1.9	85.8	6.1	103.1	3.8
West					
No city	50.0	236.3	54.7	265.3	54.2
25,000	—	—	52.8	452.5	35.9
100,000	81.6	876.4	10.1	—	24.3
250,000	—	—	68.1	1,056.9	39.4
Total	32.9	366.7	46.7	381.6	38.4

Notes: The data for women refer to the entire decade of the 1870s and 1890s. The per capita figures for females are computed by dividing the number of patents within that urbanization category by total female state population. The columns for all patentees refer to the 1870/71 and 1890/91 periods respectively.

Sources: See the text and footnotes for the data on women. The data for all patentees are from Lamoreaux and Sokoloff, Location.

rates in metropolitan areas after passage of sole trader laws possibly reflect the greater potential for commercial activity and higher market demand in populous counties.

The rural/metropolitan differences arguably also shed some light on the relationship between law and culture and, in particular, on the view that

TABLE 8
PER CAPITA PATENTING, LEGAL REFORMS, AND URBANIZATION, 1860–1899

	1860s	1870s	1880s	1890s
Married Women's Property Laws				
Rural				
Yet to pass law	5.0	7.2	23.5	23.9
Passed in current decade	6.3	14.7	36.5	—
Law passed before	9.1	19.2	21.2	29.2
Total	7.6	17.7	21.4	28.9
Urban				
Yet to pass law	0.1	0.2	0.4	6.6
Passed in current decade	1.7	2.4	4.8	—
Law passed before	4.4	6.5	6.3	13.5
Total	2.8	5.3	5.9	13.0
Metropolitan				
Yet to pass law	1.0	1.8	2.7	3.3
Passed in current decade	3.5	2.9	0.0	—
Law passed before	17.3	42.4	40.8	52.9
Total	10.5	32.6	38.3	49.5
Sole Trader Laws				
Rural				
Yet to pass law	6.3	14.1	17.8	25.1
Passed in current decade	10.2	23.7	38.2	—
Law passed before	3.2	20.3	24.7	32.5
Total	7.6	17.7	21.4	28.9
Urban				
Yet to pass law	0.9	3.0	3.6	9.8
Passed in current decade	6.5	3.0	4.5	—
Law passed before	0.0	10.5	8.6	16.4
Total	2.8	5.3	5.9	13.0
Metropolitan				
Yet to pass law	3.9	12.7	17.7	20.3
Passed in current decade	23.5	13.6	0.0	—
Law passed before	0.0	76.0	60.5	78.9
Total	10.5	32.6	38.3	49.5

Notes: Rural refers to a location with fewer than 25,000 inhabitants; urban, between 25,000 and 100,000; metropolitan, 100,000 and above. The figures are computed by dividing the number of patents within that urbanization category by total female state population. Decadal figures are obtained for the 1890s by inflating the patents granted up to March 1895 by 1.9355.

Sources: See the text and footnotes.

laws merely reflect prevailing norms or attitudes. Some scholars might contend that married women's laws were a function of cultural changes that were also favorable to inventive or commercial activity by women: that is, both the observed increase in patenting and changes in the laws towards married women could have been caused by changes in the omitted cultural variable. However, the results in Table 8 do not provide strong support for this proposition. If cultural norms indeed influenced both legal change and patenting, one might perhaps explain the divergence between rural and metropolitan patenting behavior in terms of cultural differences between rural and metropolitan areas; but it seems unlikely that attitudes in urban

TABLE 9
REGRESSIONS OF PER CAPITA PATENTING IN RELATION TO LEGAL REFORMS
DEPENDENT VARIABLE: LOG OF PATENTING PER CAPITA WITHIN STATE,
BY DECADE

	(1) (unweighted) Property Laws	(2) (unweighted) Property Laws	(3) (weighted) Property Laws
Constant	-2.35*** (3.86)	-1.80*** (2.71)	0.93** (2.05)
<i>Time Trend</i>			
1870s decade	3.17*** (4.00)	3.27*** (4.13)	2.42*** (4.36)
1880s decade	3.34*** (3.74)	3.61*** (4.00)	2.71*** (4.61)
1890s decade	3.85*** (4.26)	4.17*** (4.54)	2.97*** (5.17)
<i>Legal Reforms</i>			
Prelaw	-1.87*** (2.34)	-1.91*** (2.40)	-2.48*** (3.94)
Postlaw	1.82*** (2.67)	1.36* (1.89)	0.65 (1.29)
<i>Regional Dummies</i>			
South		-1.01* (1.82)	-2.35*** (6.30)
Common (community property states)		-0.85 (1.16)	0.45 (0.64)
<i>N</i>	223	223	223
<i>R</i> ²	0.31	0.36	0.52

* = significant at the 7 percent level.

** = significant at the 5 percent level.

*** = significant at the 1 percent level.

Notes: The regressions exclude the District of Columbia, in which the Patent Office was located. The female population weights comprise the decadal midpoint, computed by exponential interpolation. Community property states in the nineteenth century were: Arizona, California, Idaho, Louisiana, Nevada, New Mexico, Texas, and Washington.

Sources: See the text and footnotes.

and metropolitan areas would differ sufficiently to account for patenting rates in urban counties that lagged behind both rural areas and metropolitan centers. Moreover, adverse views about married women's market participation were still in evidence in the late nineteenth century, and marriage bars existed even in the twentieth century, suggesting that cultural attitudes may have lagged behind female commercial activity and legal change.⁴⁸

Multivariate regressions support the finding that married women's property laws were associated with higher patenting rates after controlling for other factors. The regressions in Table 9 examine variation in the log of per capita patenting at the state level within each decade. A necessary condition for causality is that legal reforms preceded increases in patenting rates. The dummy variables Prelaw and Postlaw, respectively, represent

⁴⁸ See Goldin, "Marriage Bars."

states that had yet to pass married women's legislation and those that had enacted laws previously. The omitted category refers to states that passed laws in the current period. Regressions 1 and 2, which are unweighted, show a statistically significant association between per capita patenting rates by women inventors and legal changes affecting their property rights, even after controlling for the strong upward trend. The negative and significant coefficients on *Prelaw*, combined with positive coefficients on the *Postlaw* dummy, imply that per capita patenting was lower in states that had not yet passed any laws, then increased markedly afterwards.

Regression 2 includes a regional dummy for the southern states (excluding the District of Columbia) and for community property states. Southern states recorded lower per capita patenting rates than other areas, and the difference persists after accounting for time trends and changes in the law. Community property laws have been claimed to function in the same way as legal systems based on the doctrine of marital disability, because control of the common property was invariably vested in the husband.⁴⁹ The dummy variable *Common* supports this interpretation, for it indicates that community property jurisdictions had no special advantage in promoting patenting. Legal reforms clearly did not account for all of the variation in patenting at the state level over time, but it is difficult to control independently for regional factors, because they are correlated with the changes in the laws. The issue of causation would be more effectively approached by considering the record for individual states within each region.

The third regression is weighted by female population at the state level. A comparison of the weighted and unweighted regressions highlights the experience of the frontier states, where typically the female population was small. Per capita patenting was higher in the East North Central and western states after legal reform, contributing to the significantly positive coefficient on the *Postlaw* dummy in the unweighted regressions. However, when the state-level observations are adjusted for population, as in the weighted regression, the western states are overwhelmed by areas where population was larger and per capita patenting rates were lower. As a consequence, even though the *Prelaw* dummy remains significantly negative, the smaller weighting of the frontier states causes the *Postlaw* dummy to become only marginally significant.

Table 10 reports regressions with the log of the total number of patents awarded to each inventor as the dependent variable, to examine whether women increased their commitment to inventive activity after the laws changed. Moreover, a professional approach to invention is often linked to multiple patenting and the attempt to extract profits and income from one's discoveries.⁵⁰ The results indicate that multiple patenting was related

⁴⁹ See Schuele, "Community Property Law"; and Lebsack, "Radical Reconstruction."

⁵⁰ For instance, see Dutton, *Patent System*; and Khan, "Progress." Some 500 women patentees

TABLE 10
REGRESSIONS OF TOTAL CAREER PATENTS IN RELATION TO LEGAL REFORMS
DEPENDENT VARIABLE: LOG OF NUMBER OF PATENTS PER PERSON

	(1) Property Laws	(2) Sole Trader Laws
Constant	0.31 (4.65)	0.30 (4.69)
<i>Regional Dummies</i>		
New England	0.27 (5.60)	0.26 (6.00)
Mid-Atlantic	0.24 (6.36)	0.25 (6.66)
West North Central	0.06 (1.23)	0.07 (1.44)
East North Central	0.03 (0.70)	0.06 (1.42)
West	0.01 (0.16)	-0.01 (0.12)
<i>Time Trend</i>		
1870-1874	0.08 (1.39)	0.08 (1.45)
1875-1879	-0.03 (0.50)	-0.04 (0.68)
1880-1884	-0.07 (1.40)	0.08 (1.61)
1885-1889	-0.13 (2.67)	-0.14 (2.95)
1890-1894	-0.16 (3.28)	-0.17 (3.55)
Log (per capita patenting)	0.02 (4.42)	0.02 (3.87)
Patent assigned	0.16 (3.92)	0.16 (3.95)
<i>Industry</i>		
Industrial machines	0.27 (8.46)	0.27 (8.47)
Household machines	0.09 (2.26)	0.09 (2.27)
Apparel and textiles	0.15 (5.42)	0.15 (5.38)
<i>Legal Reforms</i>		
Property rights laws	0.02 (0.58)	
Sole trader laws		0.07 (2.75)
	$N = 4,000$	$N = 4,000$
	$R^2 = 0.10$	$R^2 = 0.10$

Sources: See the text and footnotes.

qualify as multiple inventors, including Eliza Murfey, who filed 23 patents dealing with packing materials for journal boxes (many assigned to the Manhattan Packing Manufacturing Company), Catherine Griswold (20 patents), Anna Dormitzer (16 patents, for window washing apparatuses), Helen Blanchard (16), Harriet Tracy (14, including a safety elevator), Margaret Knight (14, mainly for paper-bag machinery), and Maria Beasley (14, barrel-making machinery).

to proximity to markets, for the number of career patents was highest in the Mid-Atlantic and New England areas and increased in regions with greater per capita patenting rates. The dummy variable that captures patents assigned at time of issue indicates that patentees of inventions that were commercially more successful tended to invest in higher numbers of patents, as did inventors of clothing and related items, household machines (such as dishwashers and clothes driers), and industrial machines.⁵¹ The regressions suggest, however, that property rights legislation was not strongly related to the number of patents each woman filed. Thus, the property rights laws may have affected whether women engaged in patenting at all, but whether they chose to increase their investments in inventive activity seems more related to their ability to exploit their inventions. A relationship does exist between sole trader laws and the number of patents filed, but the exact nature of the link is unclear. Typically, women inventors of valuable patents formed businesses to exploit their inventions. Lavinia Foy, Margaret Knight, and Helen Blanchard were examples of women proprietors who also obtained more than ten patents each. A second possibility is that women who were granted independence in writing contracts or establishing businesses had a greater incentive to obtain multiple patents and to make sustained commitments to inventive activity.

Two cases illustrate how the laws protected the property, both tangible and intangible, of women attempting to profit from patent rights. Mrs. Sophia Bonesteel, the defendant in *Voorhees v. Bonesteel*, owned an interest in a patent license for making pavements.⁵² She also held 1,145 shares in the Nicholson Pavement Company, which was formed to exploit the patent in Brooklyn. Her husband's creditors tried to attach this property to pay for his debts. After ascertaining that no fraud was involved, the courts protected the rights of Mrs. Bonesteel against the creditors' claims, pointing out that the statutes permitted married women the rights to separate property and the profits from mercantile business. In *Fetter v. Newhall*, the defendant infringed a patent for drive screws, and tried to overturn the case by arguing that Mary Fetter, a married woman, had no right to assign the patent to the Fetter Drive Screw Company nor to sue for infringement, for "at common law a patent-right granted or assigned to a

⁵¹ See Khan, "Not for Ornament." Not all women attempted to exploit their inventions through businesses; some opted instead for royalties, outright sale of the entire patent, or retaining a share in the patent while transferring part of the right to another individual who might market and commercialize the invention in return. Patent rights could be assigned at any time during the patent's life, including at the time of granting, and 323 patents were assigned when issued. Logistic regressions indicate that the probability of assignment at time of issue was higher if individuals had larger numbers of patents or the patents were for industrial machines and clothing, whereas assignments were less likely in the West than in other areas. The likelihood that a patent would be assigned at time of issue was not significantly higher after changes in state laws. The results from the logistic regressions relate only to the small number of assignments that were made at time of issue and do not include those made during the life of the patent.

⁵² *Voorhees v. Bonesteel*, 83 U.S. 16 (1872).

married woman would be such personal property that her husband could, by virtue of his marital right, reduce it to possession and make it his own.” Judge Wheeler refused this plea in deciding for the plaintiff and issued an injunction: “The laws of congress, however, of which patents are creatures, give the right to a patent to the inventor, whether sui juris or under disability, and to the assigns of the inventor. . . . This is the whole requirement. A married woman, an infant, or a person under guardianship, might be an inventor, or the assignee of an inventor, . . . but [] *the ability to make the instrument, or the aids to the disability, must be found in the laws of the states where all such rights are regulated.* The laws of New York free married women from disability to make such instruments, and make their property distinctly their own. . . . She could make the instrument in writing by the laws of the state, and when she had made it, it fulfilled the requirements of the laws of the United States. Thus the drive screw company took by her assignment what she attempted to assign to them; and she could sue in her own name in this forum, for infringement of her rights.”⁵³

Women inventors thus appear to have benefited from legal reforms that were directed to different ends than the protection of women who wished to pursue the profits that they expected to gain from inventive activity. This raises the important question of the extent to which female inventors represented women in general. It is possible that this group was more motivated, more determined, or more able than other women, so that their response to changes in legal restrictions was unique and atypical of the female population. However, an examination of their biographies and occupations suggests otherwise.⁵⁴ Some were exceptionally qualified, as physicians and technicians, but the majority were “ordinary housewives” or single women without any special backgrounds, who attempted to use their comparative advantage to produce inventions that would satisfy perceived demand.

Lawsuits reinforce the suggestion that legal reforms enabled and encouraged married women in general to increase their commercial activity through several conduits. First, the maintenance of separate property and income afforded a measure of independence and control that mitigated uncertainty about the future.⁵⁵ Second, the ability to enter into

⁵³ *Fetter v. Newhall*, 17 F. Cas. 841 (1883). See also *Lorillard v. Standard Oil*, 2 F. Cas. 902 (1880).

⁵⁴ See Khan, “Not for Ornament.”

⁵⁵ Evidence of women attempting to attain financial and economic independence under the married women’s laws is abundant: for separate bank accounts, see *Fullam v. Rose*, 160 Pa. 47 (1894), and *Brown v. Brown*, 174 Mass. 197 (1899); for right of married woman to loan her own money for interest, see *Hinkle v. Landis*, 131 Pa. 573 (1890). In *Stickney v. Stickney*, 131 U.S. 227 (1889), Mrs. Stickney’s “repeated and express directions to invest the moneys for her benefit in her own name” were permissible only because of the statutes of the District of Columbia. Profits from “Mrs. F. B. Conway’s Brooklyn Theatre” were to be shared equally between husband and wife according to a contract they drew up with each other, *Scott v. Conway*, 58 N.Y. 619; Earnings from nursing were held as wife’s separate property, *Wren v. Wren*, 100 Ca. 276 (1893). Jane Anderson supported her 12 children from her separate earnings as a seamstress. Her claim that “she became and was entitled, under the Act of

partnerships, sign contracts, or to sue and be sued decreased the riskiness of independent ventures. It is significant that creditors, ever wary of “female pirates” who avoided liability behind the shelter of coverture, required the assurance of the statutes before providing funding. For instance, Mrs. Bornstein obtained a loan and became a shopkeeper in Philadelphia in accordance with the 1872 statutes: “After making the necessary inquiry and satisfying himself that her purpose was commendable, and that, under the law, her separate earnings were secured to herself, so that they could not be taken and applied to her husband’s debts, [Ellis Silberstein] loaned her \$1,500, with which she, in good faith, purchased a stock of goods and embarked in business on her own account.”⁵⁶ In contrast, decisions such as *De Graum v. Jones*, declaring that “a married woman has no contractual capacity and cannot bind herself personally,” indubitably tended to hinder market transactions.⁵⁷

CONCLUSIONS

Excepting the abolition of slavery, no laws have wrought such a revolution in society, or whose influence in the future will be so deep and so far reaching.

—Jonathan Smith (1884)⁵⁸

Married women have increased their participation in the labor market and in commercial activity in general during the past century, but it is not clear whether these patterns were affected by the removal of legal constraints on their market-related economic activity. Some scholars support the view that married women’s property laws exerted an independent influence and induced greater female participation in the market economy. Others argue that the law merely provides an index of cultural change and that cultural attitudes evolved over the course of the nineteenth century, affecting both the law and women’s involvement in

May 4, 1855, to all the rights and privileges of a feme sole trader” was supported by the courts, *Ellison v. Anderson*, 110 Pa. 486 (1885). In March 1881, Louisa Spering “presented her petition to the Court of Common Pleas of said county, under the Act of 3d April, 1872, entitled “An Act securing to married women their separate earnings . . . [to] be under her control independently of her husband.” Despite her husband’s insolvency later on, her business was able to expand to an establishment worth \$14,000 (*Spering v. Laughlin*, 113 Pa. 209; 6 A. 54 [1886]).

⁵⁶ In his testimony, Silberstein stressed the importance of the laws: “I asked her before I gave her the money if she had made application to the court. I said to her I knew she was not entitled under the law to her separate earnings unless she was a feme sole trader. . . . I saw the lawyer, Mr. Moyer, before I loaned the money, to see if it was all right. He said yes, he had drawn up the papers. Her husband had nothing to do with it. I would not have given him the money” (*Orr & Lindsley v. Bornstein*, 124 Pa. 311 [1889] Sup. Ct of PA). Similarly, in the New Jersey case, *Aldridge v. Muirhead*, 101 U.S. 397 (1879), the Supreme Court pointed out that the loan would never have been made “had it not been supposed that the money was to be used for the benefit of Mrs. Aldridge. . . . The wife and her separate estate furnished the only security the parties supposed they had for the money which was loaned.”

⁵⁷ *De Graum v. Jones*, 23 Fla. 83 (1887).

⁵⁸ Smith, *Married Women’s Statutes*, p. 29.

nonhousehold production. Legal historians have generally concluded that reforms in married women's property and sole trader rights were ineffectual because the laws failed to improve the economic status of women. The issue is obviously complex and unlikely to be settled definitively, both for conceptual reasons and because of the paucity of relevant data. The data I have analyzed in this article indicate, however, that the experience of nineteenth-century women inventors yields some insight into these questions.

Women's rights activists who organized the Women's Pavilion for the World's Columbian Exposition encouraged women inventors to submit improvements in the hope of proving that women's work extended to spheres far from the home. They were mortified to find that the submitted inventions were predominantly domestic in character.⁵⁹ But the data suggest that patentees' efforts responded to market incentives, and many attempted to gain income from their inventions. Patentees of household and clothing inventions were not insulated and separate from the market, because such inventions were more likely to prove commercially successful. Women inventors faced greater obstacles than men, but their patenting appears to have been motivated in part by the same influences. Overall regional patterns reflected that of male patentees, and their efforts were greater in areas where markets (as shown by per capita income) were expanding. On the other hand, female patentees in western states evinced significantly higher per capita patenting rates, a result that coincided with more liberal laws towards women in the frontier areas.

I have explored the possibility of a causal relationship between changes in married women's laws and patenting at the state level by considering per capita patenting rates before and after legislation that granted women separate property rights, the ability to act as sole traders, and the capacity to retain earnings from their nonhousehold labor. The tables and regressions indicate that patenting was significantly lower in regions that had yet to pass such laws and that patenting increased after legislation of married women's property rights. The poor record for antebellum patenting by women thus appears to have been partially due to legal limitations on the commercial rights of married women. When legal reforms protected their individual property rights, it seems plausible that inventive activity surged because women directed their efforts to devise and promote patented inventions with the objective of obtaining "fair compensation."⁶⁰

An important distinction exists when one compares patenting by men and women according to the degree of urbanization, for women in rural counties were far more likely to patent relative to women in cities, than their male counterparts. Indeed, before legal reforms, per capita patenting

⁵⁹ Weimann, *Fair Women*.

⁶⁰ Patentee Susan Taylor Converse, cited in Macdonald, *Feminine Ingenuity*, p. 115: "With all their zeal for woman, did they ever ask why one woman like myself should give of her head and hand labor, without fair compensation?"

in rural areas exceeded rates in both urban and metropolitan centers. However, inventive activity in metropolitan areas jumped dramatically after the passage of legislation that granted women the rights to separate property and to conduct business as sole traders. This evidence is susceptible to a number of interpretations, including the likelihood that women initially had limited access to the urban advantages that encouraged patenting by men, but property rights laws appear to have either removed those constraints or accompanied changes in access. The results are also consistent with a model of household behavior in which utility was not jointly maximized by the communal unit; rather, members were concerned about the extent and security of their separate claims on household income.

In general, the experience of women patentees supports the arguments of economists who emphasize the role of institutions such as legal and property rights systems in eliciting and encouraging the growth of markets. Patent grants were carefully protected at the federal level, but appear to have been deterred by state restrictions on usufruct. Although other factors such as market demand and supply have to be taken into account, individuals rationally responded to the incentives provided by state laws that removed restrictions on their rights to hold property and to engage in commercial activity. An assessment of changes in married women's property rights adds to our understanding of women's nonhousehold production and of their participation in the nineteenth-century market economy. The present legal system has progressed far beyond the 1872 view that such constraints on women's activities reflect "the law of the Creator," yet legal codes in many jurisdictions still exhibit inefficiencies based on the legal fiction of marital unity. Fully one century later, women still have not achieved equal status with men in either the social or economic sphere. The issue of the impact of nineteenth-century legal reforms thus deserves further attention, because it raises fundamental questions about the long-term consequences of arbitrarily excluding groups from participation in the market economy.

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