

Breakthrough innovations occurred when women obtained the right to reap economic rewards from their inventions. **Ruveyda Nur Gozen** shows how such inclusive policies are a critical driver of economic growth.

Property rights empower women inventors

The under-representation of disadvantaged groups as innovators and entrepreneurs is a global challenge. This is particularly true of women. Despite making up half the population, they consistently participate less than men in entrepreneurial activities and produce fewer innovations. In some societies, women still face significant barriers, such as lacking the legal rights to run businesses independently, to own property or even to travel without their husbands' consent.

What difference to more inclusive economic institutions for women make to women's participation in innovation and overall innovation activities? And how does this influence the direction of technology and contribute to the overall dynamism of an economy?

Women's entrepreneurial rights in the 19th century

In the 19th century, women in the United States were not recognised as independent economic actors. This meant that their skills were largely confined to contributing to family income through household

production, such as baking, farming, managing livestock or making clothing. Marriage further restricted their rights, including the ability to own or control any property or to operate a business – rights that were instead held by their husbands.

In addition to tangible property such as houses and farms, women also had restricted rights to make use of intangible property independently, including patents, which convey the right for their owner to make or market an invention exclusively.

Although women were legally allowed to apply for and get patents for their inventions, they faced significant barriers in leveraging these patents economically. Women were often unable to sue for infringement, to run a business independently or to capitalise fully on the economic advantages of their patents. This lopsidedness – where women could patent but not effectively protect or monetise their inventions – substantially reduced the economic incentives and returns associated with entrepreneurial and innovative activities.

The importance of well-defined property rights cannot be overstated.

Securing the right to maintain monopoly rents from inventions – enabling the patent-holder to be the sole supplier of their product for a certain amount of time – is a powerful incentive to patent new innovations.

Anecdotal evidence highlighting the challenges of property rights for women during the period can be found in newspaper archives, where journalists documented the problems that women faced in case of getting a patent:

US states that reformed their property rights laws in the 19th century saw a big increase in innovations by women

Legal reforms gave women new economic incentives and rights

In the second half of the 19th century, states started enacting the Married Women's Property Rights Act, a pivotal legal reform that drastically altered women's property rights. These laws allowed women to own and control property, to enter contracts, to engage in business and to retain their labour and capital earnings independently. Crucially, these rights applied regardless of a woman's marital status, enabling them to use their assets as they saw fit.

These legal reforms opened new avenues for women to contribute to technological progress by providing economic incentives and rights that had previously been inaccessible. But how can we measure innovations?

While not all innovations are patented, patents serve as a widely used data source for economists to gauge innovative activity. In my research, I used the Comprehensive Universe of US Patents (Berkes, 2018), which is one of the richest patent datasets. Since gender information is not available in patent data, women inventors are identified based on name identification, using popular male and female names from the 19th century.

When comparing women in states that adopted these property rights laws to those in states that did not, we see a significant increase in innovations by women, without displacing those by men. This suggests that including a previously disadvantaged group in the innovation process not only boosts innovation within that group but also contributes to the overall volume of innovations in the economy.

Moreover, women were just as innovative as men in terms of breakthrough innovations – those that differ most from previous patents in terms of textual content and have a greater influence on subsequent patents (Kelly et al, 2021). On average, one out of five patents by women represented novel ideas that departed from previous inventions and influenced future inventors over the following decade.

Women and household innovations

So what did women invent during this period, and in which directions did their technological contributions flow? Based on our historical assumptions of social norms

a married woman is not reconized by law as possessing full right to the use and control of her own powers. Should she obtain a patent she would not be free to do as she pleased with it —would "possess no legal right to contract with or to license any one to use her inventions." Moreover, should her right be infringed she could not sue the offender.

Source: The New York Times; Apr 22, 1883, pg. 5.



Source: United States Patent and Trademarks Office.

One in five patents by women represented novel or breakthrough innovations

and gender roles, we might expect women to have focused primarily on innovations related to textiles or clothing. But when we examine the type of technologies patented, we find that women were more actively involved in innovations related to household appliances – areas requiring knowledge of mechanical engineering – such as dishwashers, refrigerators, ovens and more.

Even more notably, the share of breakthrough innovations in fields like human necessities, physics and mechanical engineering by women was comparable to that of men. This diversity in women's innovations challenges traditional assumptions and highlights their significant,

yet often overlooked, role in advancing a wide range of technological fields.

Women inventors, benefiting from the better property rights, could gain wealth, reputation and even social status. Josephine Cochrane was one of those women, the inventor of the first successful dishwasher, patented in 1886. She was born in 1839 in Ohio to an inventor and engineer father and was the granddaughter of an inventor of the first steamboat. But she could not pursue higher education, got married when she was 19 and had two children. After her husband passed away in 1883, she inherited a huge debt and had no income.

Cochrane was 45 years old when she invented the dishwasher. She also

presented her work and won an award at the World's Columbian Exposition in Chicago in 1893. After her successful invention, she established Cochrane's Crescent Washing Machine Company to produce this machine. As demand for her invention grew, she became very successful. Her company later became part of KitchenAid brand, owned by the Whirlpool Corporation.

This story of business success through innovation exemplifies the importance of revealing hidden talents in an economy with more inclusive institutions and economic incentives. Here, an idea transformed into an invention, a patent and a corporation that not only generated employment and an income stream but also influenced future inventors.

The importance of education and a level playing field

My findings highlight several broader implications for understanding who became an inventor as a result of these more inclusive institutions. I observe that 19th-century women inventors had higher levels of education compared to non-inventor women, suggesting that human capital accumulation was a significant channel for innovations in an environment where intellectual property and innovative activities were rewarded with well-defined property rights.

These findings align with contemporary studies, which suggest that higher levels of education are essential for creating innovations (Toivanen and Väänänen, 2016; Akcigit et al, 2024). In addition, the right to own property independently of their husband further allowed women to accumulate more wealth that could alleviate financial restrictions that inventors may face as innovations are often risky investments.

Second, creating an even playing field by eliminating social, economic or institutional barriers offers a vital opportunity to uncover hidden or lost talents within an economy. The fact that

the majority (almost 60%) of women inventors were married highlights the significance of the right to own property independently and the potential impact of compulsory education policies for children, which can provide further support for women's participation in innovation.

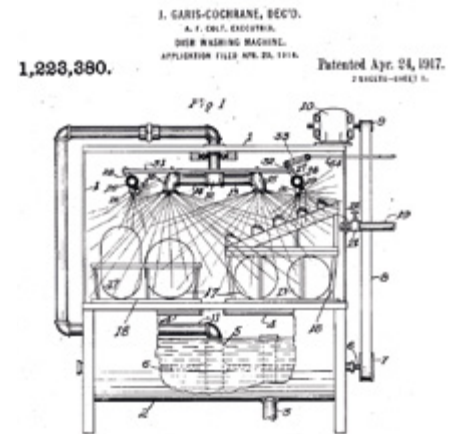
It is important to note that persistent gender inequality, norms and racism during this period might also have affected who became an inventor. A recent study finds far lower patenting rates among Black Americans in the South compared with those in the North (Andrews and Rothwell, 2023). Therefore, the impact of property rights could be weaker for Black women due to racial discrimination, marginalisation and a lack of institutional trust.

This is supported in my analysis, which finds that almost 99% of women inventors were white in the 19th century, suggesting that property rights reform did not have the same effect for Black women compared with white women in the 19th century.

How property rights reforms can drive innovation

The study of women's property rights in the 19th century provides valuable insights into how legal and economic reforms can drive innovation. By granting women the right to own and control property, the Married Women's Property Acts not only empowered women, but also led to significant increases in both the quantity and quality of innovations. This historical perspective emphasises the importance of inclusive policies that offer equal opportunities for all individuals to contribute to economic progress and technological advancement.

As we continue to strive for a more equitable society, the lessons from the 19th century remain highly relevant today. Ensuring that disadvantaged groups have the rights and resources necessary to innovate is not just a matter of fairness but also a critical driver of economic growth and technological progress.



This article is based on 'Property Rights and Innovation Dynamism: The Role of Women Inventors' by Ruveyda Nur Gozen, CEP Discussion Paper No. 2005 (<https://cep.lse.ac.uk/pubs/download/dp2005.pdf>). An earlier version appeared as 'Studying Women's Property Rights in the 19th Century Can Help Uncover the Missing Inventors' on *LSE USAPP*. (<https://blogs.lse.ac.uk/usappblog/2024/08/15/studying-womens-property-rights-in-the-19th-century-can-help-uncover-the-missing-inventors/>).

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Further reading

Ufuk Akcigit, Jeremy Pearce and Marta Prato (2024) 'Tapping into Talent: Coupling Education and Innovation Policies for Economic Growth', *Review of Economic Studies*.

Michael Andrews and Jonathan Rothwell (2023) 'Reassessing the Contributions of African American Inventors to the Golden Age of Innovation', available at SSRN.

Enrico Berkes (2018) 'Comprehensive Universe of U.S. Patents (CUSP): Data and Facts', working paper, Ohio State University.

Bryan Kelly, Dimitris Papanikolaou, Amit Seru and Matt Taddy (2021) 'Measuring Technological Innovation over the Long Run', *American Economic Review: Insights* 3(3): 303-20.

Otto Toivanen and Lotta Väänänen (2016) 'Education and Invention', *Review of Economics and Statistics* 98(2): 382-96.

Women were actively involved in innovations related to household appliances – areas that required knowledge of mechanical engineering