TITLE: American Rose Case Study: Did the Creation of Plant Patents Encourage Innovation?
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INTRODUCTION

This report uses a dataset from the American Rose Society trying to figure out whether the Plant Patent Act of 1930 helped to encourage the varieties of rose innovation. Before 1930, most of the new plants were the result of government-sponsored research or agricultural experiment stations. To improve the incentive for new plants' creation, the government came up with the Plant Patent Act of 1930, which is the first Act that created the property right for biological innovation and it retained the patent right for asexually propagated plants. Because asexual roses have properties that are easy to reverse-engineer, it cannot use other alternative mechanisms like secrecy to protect the property rights. So the creation of plant patents may encourage roses' innovation; however, our hypothesis tries to show that the impact of plant patent law on rose innovation may not be significant. The dataset matches the name of registered roses with the patent grants, and around 7% of the registered roses are patented from 1580 to 2008. We made the following adjustments to the data: First, this report narrowed the datasets down from 1580-2008 to 1900-2000. Second, this report dropped duplicate items by register ID, roses' name, and the patent number. For the duplicate data, this report did not delete all but the first recorded data. Third, we exclude the patents that happened later than 10 years when the registration proceeded and also excluded the situation that the register year happened after the patent year. The highlight of the dataset is that we use the registered roses to measure the rose innovation. To test the influence of the Plant Patent Act of 1930 on the innovation of roses is significant because most early patents are for roses. More importantly, we can understand the impact of plant patents on roses on other crops, especially those crops that are valuable to agricultural development and economy. Similarly, we could know whether the Plant Patent Act of 1930 encouraged domestic innovation and the development of a domestic plant breeding industry.

EMPIRICAL EVIDENCE AND DISCUSSION

To examine the effect of the Plant Patent Act of 1930 on the creation of new varieties, we could compare the differences between registered roses and patented roses before and after 1930. In

Figure 1, the patented roses are always laid below the registered roses, which indicates that there is only a small share of registered roses patented. From 1900 to 1920, the rose registration remained around 100 each year. From 1920 to 1930, the number of registered roses continued to increase above 200, and after WWII, the rose registration encountered a significant drop which fell below to 100. The rose industry recovered to its original level until 1960. After 1960, the number of registered roses increased stably. Figure 2 is the scatter plot of the registered roses per year, and we keep the trend using Lowess function as the red trend shows that the whole tread for roses' innovation is increasing and relatively stable. There is no obvious evidence that after the establishment of the Plant Patent Act, there exists an apparent increase in the creation of new varieties of roses. However, there exists a noticeable increase in patents per year around 1980, that may be related to the establishment of the Plant Variety Protection Act of 1970 which established the property right to "sexually" plants.

FIGURE 1. TIME SERIES OF PATENTED AND REGISTERED VARIETIES FROM 1900 TO 2000

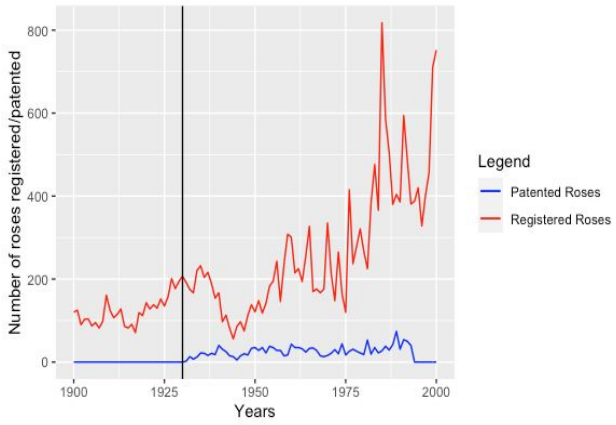
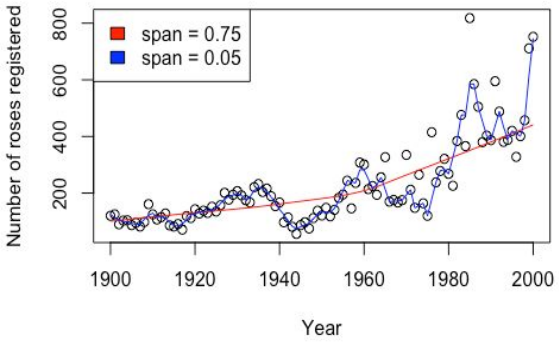


FIGURE 2. SMOOTH THE SCATTER PLOT OF REGISTERED ROSES BY LOWESS FUNCTION



Notes: Data on rose registrations per year from the records of the *American Rose Society*. Patent data combine all rose PP (plant) patents (USPTO). Figure 2 conducted by Lowess smoothing. Sources of data: Dataset from the American Rose Society are collected by Petra Moser (2011).

Figure 3 shows the share of varieties of roses that were patented per year; the overall share of varieties that were patented is less than 40% from 1900 to 2000. It also demonstrates that after the Plant Patent was established, the share of varieties increased significantly and after a period of time, for instance, after 1950, the share of varieties rose is relatively lower than the time before and much more stable except around 1975 there is a significant increase for the varieties for patented roses. The first significant increase in the share of patented varieties maybe because the breeders learned to use the patent system and become aware of the litigation. Furthermore,

for the change from between 1942 and 1952 may be caused by the speed of the patent examination process (Moser, 2011. p. 22). After the last most significant peak around 1975, the varieties of patented is decreasing every year. That may be related to the trade-off between the business value and the patent fees. The lag from application to grant may also matter.

FIGURE 3. THE SHARE OF VARIETIES WERE PATENTED PER YEAR

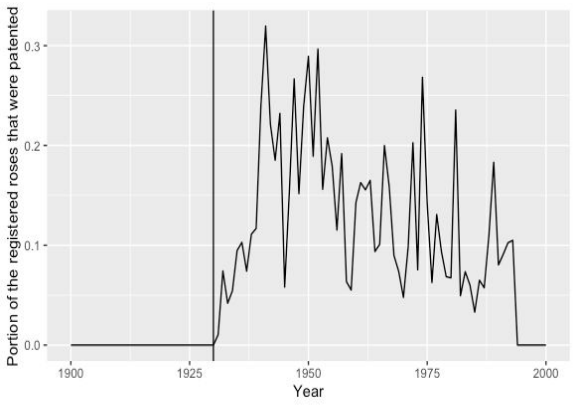
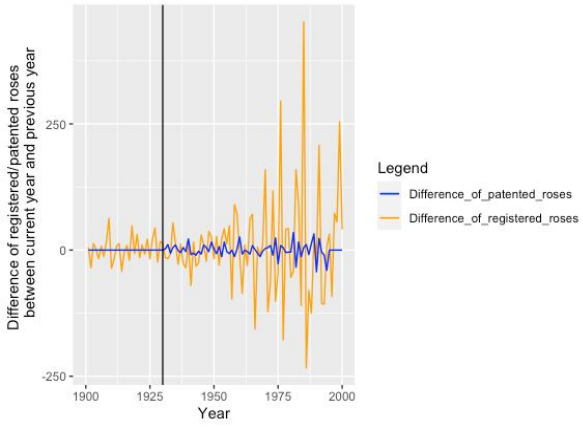


FIGURE 4. THE DIFFERENCE OF REGISTERED/PATENTED ROSES BETWEEN CURRENT YEAR AND PREVIOUS YEAR



Notes: Varieties for roses are patented denoted as the each year's patented roses divided by that years' registered roses. Difference of registered roses between current and previous is the current year's registered rose subtract the previous year's registered roses. Sources of data: Dataset from the American Rose Society are collected by Petra Moser (2011). Patent data combine all rose PP (plant) patents (USPTO).

Figure 4 shows the difference between the registered and patented roses between the current years and previous year. Comparing the difference, we could see that there is no noticeable difference for the registered roses before and after 1930 until 1950. After 1950, there existed specific peaks around 1970 which may be associated with the founding of the Plant Variety Protection Act in 1970 as we could see from the discussion above. So the yields of registered roses are unresponsive to the introduction of the Plant Patent Act, and small shares of roses are patented. However, did the Plant Patent Act have any impact on the colors or classes of the new roses invention? Were all the colors and classes of roses affected in the same direction? Figure 5 and Figure 6 give us a yes answer. In Figure 5, it shows how the number of roses registered in five colors (orange, pink, red, white, yellow) change with each year. We exclude the colors of brown and purple because they are insignificant in number to be meaningfully graphed alongside the other colors. The gap between each color represents the quantity of that color's rose. Through the trend, we could find that after 1930, all roses of different colors have roughly the same growth and decrease trends so that we could conclude that the Plant Patent Act influenced the registered roses of colors in the same way. In Figure 6, except the class for old garden roses have

relatively small numbers which did not affect so much, all other classes had the same trend after 1930. The black curve is the mean of four classes in each year, and we can see that the trend of different variables is roughly the same as the black line, so we can conclude that the impact of patents on the trends of all varieties is roughly the same.

FIGURE 5. AREA GRAPH FOR THE COLORS OF REGISTERED ROSES

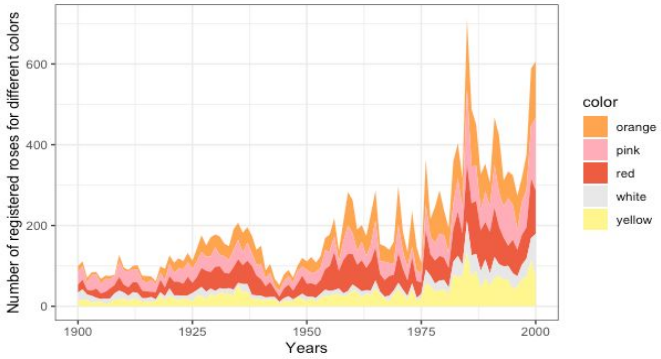
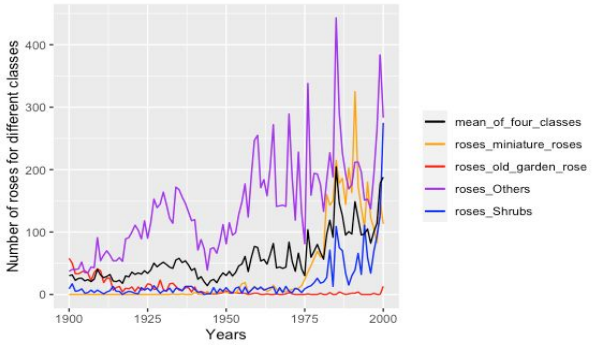


FIGURE 6. TIME SERIES GRAPH FOR THE CLASSES OF REGISTERED ROSES



Notes: In Figure 5, in total, there are seven colors which are orange, pink, red, white, yellow, purple, and brown. Each color category is paired with: White(w), Yellow(ly,my,dy,yb), Orange(ab, ob, op, or), Pink(lp, mp, dp), Red(mr,dr,rb), Purple(m), and Brown(r). In Figure 6, Four classes of roses are Old Garden Roses, Miniature Roses, Shrubs, and Other includes Hybrid Teas, Grandifloras, Floribundas, Polyanthas, Ramblers, and Climbers. Sources of data: Dataset from the American Rose Society are collected by Petra Moser (2011). Patent data combine all rose PP (plant) patents (USPTO).

FIGURE 7. TIME SERIES GRAPH OF THE REGISTERED ROSES AND REAL GDP PER CAPITA

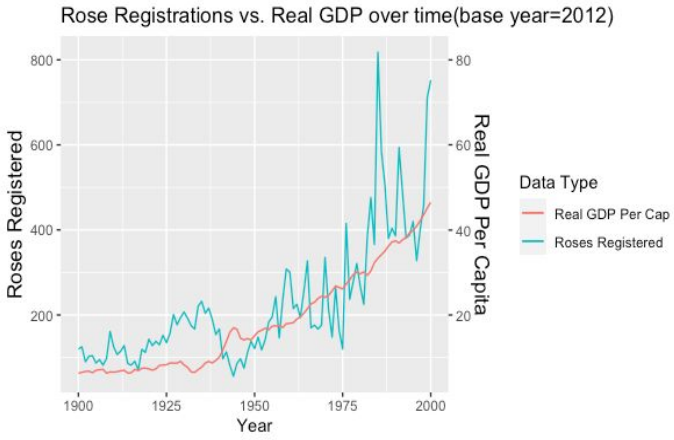
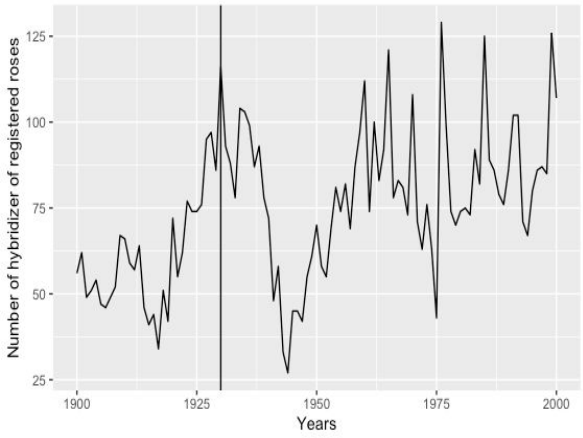


FIGURE 8. NUMBER OF HYBRIDIZERS OF REGISTERED ROSES PER YEAR



Notes: In Figure 7, for the real GDP per capita is in units of thousands of dollars and the base year is 2012. In Figure 8, we only count the non duplicate hybriser and only count once for the duplicate hybridizers in a certain year. Sources of data: Dataset from the American Rose Society are collected by Petra Moser (2011). Patent data combine all rose PP (plant) patents (USPTO).

In Figure 7, it shows us the changes in rose registration track and the changes in real GDP per capita. As the real GDP per capita increases, the trend for rose registration increases as well. The

real GDP per capita increase reflects the demand for goods and services, and the purchasing power increase. So as people have more purchasing power, the benefit of creating roses for consuming usage increases. That may explain why the increase shows the rose's registration as long as the increase with the real GDP per capita increase. To figure out whether the diversity of hybridizers has increased or decreased after 1930, we could look through Figure 8. From 1900 to 1930, the average number of roses is 60.2, and from 1930 to 2000, the average number of roses is 81.2. By comparing the average number, we could have a rough conclusion that after the publication of the patent, the diversity of hybridizers increased. Take ten years cut off to avoid WWII; we compared the year between 1920 and 1940. For ten years before the establishment of the Plant Patent Act, the average number of hybridizers was 81, and after the Act applied for ten years, the average increased to 101.1. So the observation of the diversity of hybridizers increased when the patenting was allowed is true.

CONCLUSION

This report uses data from the American Rose Society to explore the relationship between Plant Patent Act of 1930 and rose innovation, whether the establishment of patent law increases the creation and invention of new varieties of roses. From the empirical analysis above, we found that the Plant Patent Act of 1930 did not increase the roses innovation significantly. For all the registered roses, only a small group share of the registered roses are patented. The Plant Patent Act of 1930 has the same influence on different colors and classes for registered roses, and it increased the diversity of hybridizers slightly. Also, the rose innovation increased as the real GDP per capita increased. To answer the question of whether the Plant Patent Act helped to encourage the varieties of rose innovation more rigorously, we need to consider other factors like GDP, education levels, immigration policy, unemployment rate, technology development, so on and so for may also influence the varieties of rose innovation. To test this hypothesis, we need to find several years before and after the Plant Patent Law was introduced with all other factors remaining the same levels and comparing the difference in the varieties of rose innovation.

Work Cited

Moser, P., & Rhode, P. (2011, January 06). Did Plant Patents Create the American Rose? Retrieved September 29, 2020, from http://ssrn.com/abstract=1735015