HERSTORY

The rise of self-made women

Arash Nekoei Fabian Sinn*

December 22, 2020

Abstract

We document the evolution of women's status across the globe and throughout recorded history. We first construct a new database of seven million notable individuals (Human Biographical Record). We then measure women's status as women's share among the most prominent fraction of population that allows comparison across time and space. The records show no long-run trend in women's share in recorded history. Historically, women's power has been a side-effect of nepotism: the more important family connections, the higher the women's share. But self-made women began to rise among the writers in the 17th century before a broader take off started with the 1800 birth cohort: first among artists and scholars, followed by elected politicians, and finally appointed politicians. The first wave among writers emerged when informal humanist education and new public spheres shaped a supply of literary women, who met the demand of a new female reading public. A strong writer wave predicts a stronger takeoff of self-made women in the 19th century. This effect has persisted and created cross-country divergence.

*IIES, Stockholm University: arash.nekoei@iies.su.se and fabian.sinn@iies.su.se. We have benefited from discussions with Arash Afraz, Marianne Bertrand, Konrad Burchardi, Raj Chetty, Mitch Downey, Mats Persson, Torsten Persson, David Schönholzer, David Strömberg, Noam Yuchtman, Ekaterina Zhuravskaya and Clara Zverina. We are grateful for help from the following colleagues at different stages of data construction for this project: Agneta Berge, Mattias Hallberg, Carolina Lindholm, Benedetta Lerva, Jonatan Ribert, Xueping Sun, Chih-Yu Tsou, and Yushi Wang.

"The degree of emancipation of women is the natural measure of general emancipation," wrote the mathematician Joseph Fourier 200 years ago.[1] Nevertheless, we lack a comprehensive approach to track this crucial measure of emancipation. Our understanding of the long-run patterns of women's status has been built on case studies of few women or macro analysis of women's legal position. Although powerful in depicting women's status at a given place and time, these methods face insurmountable difficulties in comparative exercises. Therefore, some fundamental questions remain unanswered to date: Is there a positive long-run trend in women's status? If so, when did it start, and what triggered it? Is the positive trend a global phenomenon?

To answer these questions, we have built a new database, the Human Biographical Record (HBR), that is distinguished from prior datasets in its span, completeness, and accuracy. HBR contains information about date and place of birth and death, gender, occupation, education, and family background for seven million individuals who made written history. HBR is constructed using machine learning techniques on Wikidata and *all* 292 language editions of Wikipedia. Entries are matched with other datasets, including traditional encyclopedias, e.g., Encyclopaedia Britannica. We use having an entry in these encyclopedias as an indicator of prominence and extrapolate to get an index of prominence for all seven million entries in HBR. We then rank all entries according to this index.

We propose a simple measure of women's status, namely the share of women among each birth cohort's most prominent individuals. Women's under-representation at the top of the social hierarchy is not just one of the most enduring aspects of gender discrimination; it also influences subsequent generations' ambition and self-esteem. In the same way, today's debate and research track our progress with the female share among business and political leaders.[2] To allow comparisons across time and space, we define women's share in a group whose size is a constant fraction of population, hereafter "women's share."[3]

The main advantage of our approach is to provide a simple, comprehensive, and homogeneous measure of women's status, covering the entire 5000 years of human recorded history across all regions and occupations. Combining the advantages of case studies and macro studies, we exploit millions of case studies to depict a macro perspective. Our approach is immune to the varying depth of our historical knowledge, as long as the within-birth-cohort ranking is preserved over time. Therefore, our main limitation is bias in those rankings, either present in contemporary accounts or created by historians. Despite this limitation, the strength and novelty of our approach is that it leads to a consistent measure of women's status across time and space.

The first striking fact we document is a trendless fluctuation of women's share over the long

[1] Fourier (1808), quoted in Marx and Engels (1845) p. 259, and Offen (1998) p. 329.

[2] E.g. Pande and Ford (2012), Bertrand (2018), Piketty et al. (2018). Mill (1870) uses for the first time women's share as a proxy for women's status and exploits it to compare India and Europe. See Beaman et al. (2009) and Beaman et al. (2012) for empirical evidence on women's share influence on attitudes and ambition of the next generation.

[3] Our primary focus is on the top one over one hundred thousand of population, i.e. "top one percentmille", emulating the concept of "top one percent", the focus of the inequality literature (Atkinson et al. (2011)).

run. The women's share throughout recorded history has always been low, averaging 10%. A more surprising observation is that no long-run trend has emerged, even in recent centuries. One might interpret this as an answer to a first-order question in the field of women's history, namely whether women's status has fluctuated or followed a trend in the long run (Bennett (1997)).

But there has been a fundamental transformation in the type of prominent women we observe in recent centuries. Studying a few cases in the micro-data of HBR, we encountered a rising prevalence of women who were not born into families or married to males with power and fame. To gauge this observation's quantitative importance, we define "self-made" as those more notable than their parents and spouse by taking advantage of HBR's information on family connections and our prominence index.[1]

The self-made women's share is tiny, averaging 3% across history, compared to 10% of the overall women's share. The probability that a prominent woman is self-made is 30%. For a man, this probability is 80%. In fact, self-made women are a rare phenomenon, not because of a low share of self-mades but rather due to a trivial women's share among the self-mades:[2]

$$\underbrace{P(W)}_{\text{Women's Share}} = \underbrace{P(\sim S)}_{\text{Non-Self made Share}} \times \underbrace{P(W|\sim S)}_{\substack{\text{Women's Share}\\ \text{of non-Self mades}}} + \underbrace{P(S)}_{\text{Self-made Share}} \times \underbrace{P(W|S)}_{\substack{\text{Women's Share}\\ \text{of Self-mades}}}$$

$$10\% \simeq 24\% \times 29\% + 76\% \times 4\%$$

As a thought experiment, if the women's share among self-mades had been 50%, the total women's share in recorded history would have been 45%, instead of 10%, while an equal gender share among the non-self-made would only increase the total women's share to 15%.

Not only on average, but always, women have been less present among the self-mades, $P(W|\sim S) > P(W|S)$. This fact has two significant consequences. First, it implies a positive relation between the women's share and the share of non-self-mades, $P(W)$ and $P(\sim S)$: women had a more salient role in societies where family connections mattered more. We show that this is true not only across time (in the time-series), but also across locations within a period of time (in the cross-section). Women's power was an unintended consequence of nepotism.

The second consequence concerns the future of women. The driver of the total women's share in the future will be women's share of self-mades, $P(W|S)$, owing to a high and increasing share of self-mades. This is the main reason why understanding the evolution of the women's share *among self-mades* is crucial, and thus, the focus of the second part of the paper.[3]

In contrast to the overall women's share, the women's share of self-mades does show long-run trends. When his-story of women stagnated, her-story took off.[4]

[1] Section 1 discusses alternative definitions.

[2] The averages here refer to the period of the 6th century BCE (Before Common Era) until the 20th century CE.

[3] Section 2.3 discusses our two additional reasons: self-made women are the preferred measure of women's emancipation and hold real power and recognition.

[4] Herstory is "history emphasizing the role of women or told from a woman's point of view", according to *Oxford English Dictionary*. We use it here as history of self-made women.

The first rise in women's share among self-mades is recorded among writers and poets born between 1620 and 1660. We document that it occurred in Protestant Europe, and reflects the birth of "the feminine reading market." This market emerged in the context of increasing the literacy and purchasing power of women. The women writers and poets who supplied this market were not educated at universities, which during this period were mostly closed to women, but by informal "household academies." These highly educated women flourished in new informal public spheres: salons and the Republic of Letters. During the same period, both the marriage and labor markets awarded a higher return to women's education. The new feminine reading market encompassed new genres, e.g., the novel, in a new language, vernacular, not Latin. The nature of book production, with low entry cost, and the book market structure, with many small buyers and less guild presence, may have played a significant role.[1]

Two hundred years later, in the early 19th century, the women's share among artists and scholars started to increase. Concurrently, the fraction of women who attended universities started to rise for the first time, three centuries after the men in the sample. The documented stagnation of the women's share during the Renaissance for writers, poets, artists, and scholars suggests that the answer to the celebrated question "Did women have a Renaissance?" is "No."[2]

To understand the evolution of women's representation among politicians, we first document that the historically largest subgroup of politicians - rulers and nobility - shrank in size as republics replaced monarchies and became the smallest subgroup of politicians in the last cohort. In support of historian William Monter's claim that republics reduced women's participation in politics (Monter (2012)), we find that republics attacked nepotism that reduced non-self-made women's roles. But we also show that republics did not impact self-made women negatively and had a positive long-term consequence. In fact, self-made women gradually rose within the new institutions, starting by winning new elected positions in the 19th century, and later filling appointed positions (cabinet members, judges, etc.).

In the aggregate, the takeoff of self-made women starts with the 1800 birth cohort. The takeoff is stronger, where women had played a larger role in the pre-1800 literary movement.To understand the mechanisms behind this correlation, we show that it is is robust to i) conditioning on other pre-1800 significant developments: women having access to universities, women holding the position of head of the state (queen), and the debate on the status of women;[3] ii) taking into account the serial correlation in the women's share of self-mades. In fact, the women's share is higher in the 19th century, where it was higher in the previous century. This is also true between the 19th and 20th

[1] Many invaluable works of historians informed the argument here; see section 3.2 that also discusses several pioneering women.

[2] Kelly-Gadol (1977), also Dialeti (2018) and references therein.

[3] The "*Quarelle des femmes*" was a literary debate on women's status starting from the 14th century (Kelly (1982), Karant-Nunn (1998), Wiesner-Hanks (2008), Wilkin (2019)). For the details of our construction of these proxies, see Section 3.3 and the Appendix.

centuries that demonstrates that the takeoff persisted and created cross country divergence;[1] iii) controlling for contemporaneous 19th-century women's access to education, feminist movements, economic development, and conflict, or conditioning on occupation.

This evidence is consistent with the pre-1800 rise of literary women causing a stronger takeoff, e.g. through improving the public perception about women's potential or inspiring new generations of women. An alternative interpretation is that the literary women rose where a persistent condition, favorable for women, was present and then supported the takeoff. Our evidence indicate that the latter interpretation is less likely since it would require that this persistent condition, while essential for literary women, was not significant for other relevant developments, e.g. improving women's university access and feminist movements.

The rest of the paper is organized as follows. Section 1 describes the data and the construction of the rank. Section 2 investigates on the long-run pattern of the women's share, and document the takeoff of the self-made women. Section 3 focuses on the takeoff waves and their correlates.

1 Data and Methodology

This section describes our data, explains how we rank individuals within each birth cohort, and places our methodology within the prior literature.

The Human Biographical Record (HBR) is constructed based on two innovations. First, HBR combines information from Wikidata and *all* 292 language editions of Wikipedia. Wikidata is a knowledge-base collaboratively edited by volunteers in a similar fashion to Wikipedia. Compared to the number of pages on Wikipedia of all languages combined, it contains around one magnitude more entries. Second, HBR integrates these sources with the help of machine learning techniques (Nekoei and Sinn (2020a)).

HBR contains information about date and place of birth and death, gender, occupation, education, and family background for 7,015,353 individuals. HBR is distinguished from other databases by the number of observations, the span of observations over recorded human history, and the amount of information collected for each entry, including the information on family relations (Nekoei and Sinn (2020a)). Moreover, entries in HBR are also matched to other sources, e.g. four traditional encyclopedias – the Encyclopedia Britannica, the Universalis, the Gran Catalana and the Great Russian Encyclopedia – and the China Biographical Database Project (Harvard University et al. (2019)).

HBR contains more than one over a million of the world population in each of the last 50 centuries, covering the entire recorded history (See Appendix Figure 7). With the emergence of the ancient Greek civilizations around the 6th century BCE (Before the Common Era), the number

[1] This finding adds to the growing empirical and theoretical literature on the persistent effects of past institutions and events, reviewed in Persson and Tabellini (2020) and Alesina et al. (2013) for empirical evidence.

of HBR observations passes ten over a million of the world population. From then onward, we observe a continuous rise in the share of the world population represented in HBR. To overcome this present bias and make our sample comparable across time, we restrict our analysis to the top share of the population *within* each birth cohort.

To achieve this, we rank individuals within each birth cohort in two steps. The birth cohort can be defined by century or decade of birth. The only exception is the 20th-century that only includes the 1900-1960 birth cohorts to ensure that all individuals have reached the peak of their careers.[1]

In the first step, we construct four proxies: (i) The page rank measuring the connectedness in a network (Brin and Page (1998)). This is calculated on a network of all (human and non-human) Wikipedia articles in all languages. The resulting network has about 49 million vertices and 2.5 trillion edges. (ii) The number of languages in which an entry is available on Wikipedia. (iii) The average length of articles about the individual across the 20 most common languages. We standardize each language's word counts using the word count of the Universal Declaration of Human Rights in that language. (iv) The date of creation of the first article across all languages.

In the second step, we predict the presence in one of the four traditional encyclopedias for the entire HBR based on the aforementioned four proxies using use Gradient Tree Boosting.[2] Some of these proxies have been alone used as the main measure of prominence in the prior literature, e.g. the number of languages by Yu et al. (2016). We aggregate all four proxies to get a single ranking: we predict the presence in traditional encyclopedias- 1% of HBR entries- and get a prominence index for the entire seven million HBR entries.

Weighted by century and considering the imbalance of the outcome variable, the out-of-sample accuracy is around 97%. More precisely, given two entries from HBR, one mentioned in the encyclopedias and the other not, we can predict with 97% accuracy which individual is represented in the encyclopedia. We then contrast our prediction power with an intuitive median of the four ranks. The median removes outliers - the drawback of using the rank components individually. In addition, the median is simple to construct, and unlike random forest predictions, does not require the choice of any training parameters. The two methods provide similar prediction power for presence in the traditional encyclopedia, so we use the median measure throughout the paper.

We test our ranking in two ways. First, we measure its harmony with the "vital entries" - the essential entries selected by Wikipedia editors (Wikipedia (2020)). Given two random articles, one vital and one not, our ranking orders the vital article higher in 96% of cases. Our second test compares our machine-made rank with ranks by three individuals (graduate students in economics) in a sample of random pairs stratified at the century level. Our rank is in harmony with human judgment 68% of the time, while the harmony between the human-made ranks is 70%.

With our ranking, we can now define top groups within a birth cohort – people born in a specific

[1] For example, politicians reach their career peak later than artists, so the latter is over-represented among the post-1960 generations.

[2] Friedman (2001),Chen and Guestrin (2016).

place during a specific period. The rest of the paper, unless otherwise stated, focuses on top-ranking individuals, comprising the one over one hundred thousand of population. We refer to this group as "top one percentmille", similar to "top one percent" in inequality literature (Atkinson et al. (2011)). A trade-off governs the choice of the threshold: the smaller the top groups, the lower the statistical power of our exercises, while the size of HBR bounds the larger threshold. Varying the threshold offers insight into women's status across social hierarchy, which we use to document the bottom-up rise of women. As an example, our primary analysis of the 19th century uses the top one percentmille, i.e. 12,000 highest-ranking individuals born in this century, given the world population of 1.2 billion. We also consider the 120,000 highest-ranking individuals, i.e., the top 10 percentmille.

When studying a specific location – country or regions–, the top group is among individuals born there, taking into account the population of the specific location. Countries are defined according to McEvedy et al. (1978) that provide historical population estimates for each country. Based on this definition of countries, regions are then defined as Asia, Americas, North Africa, Near East, and Western and Eastern Europe. In this way, each historical character is mapped to the country of birth from this list, providing us a consistent notion of country over a long span of time.

How does our methodology compare to the two current approaches to investigate women's historical role and status? The first approach is "to construct case studies on female lives, and let the accumulated evidence speak freely."[1] In practice, this means studying a few women of privileged backgrounds whose lives are relatively better documented. This approach has the same limitations as our approach, namely the bias of historical accounts.[2] The bias can be already present in contemporary accounts or have been created later by historians. Moreover, a question remains on whether case studies and our results on the top one percentmille represent women's status in the entire society. This depends on the relationship between women's status across social hierarchy.[3] The main advantage of our approach is its ability to compare across time and space, thanks to sample comparability and normalization by population size. The second approach studies women's legal position in historical settings. This method has the limitation that often practice differed from law and our knowledge of the difference is limited.[4]

[1] Crouch (2005) p. 313.

[2] Wickham (2016), James (2008).

[3] We have no definitive answer to this question. For two opposite views, see Bitel (1998), Levin (1998) and Wickham (2016) vs. Chojnacka (2001) and Bennett (2006). However, it is safe to say that women's status did filter downward and therefore influenced other society levels, but the relationship might vary by time and place.

[4] For the difference see Mill (1870), Staves (1990), Bitel (1998), Stuard (1998), Smith (2005), Drell (2013), for the discussion of our limited knowledge of the difference Rawson (1986) and Hughes and Hughes (2001), and for a concrete example of the difference, see Beard (2015). There is a third approach, using administrative data. This is not prevalent due to low availability of relevant data (Drell (2013)).

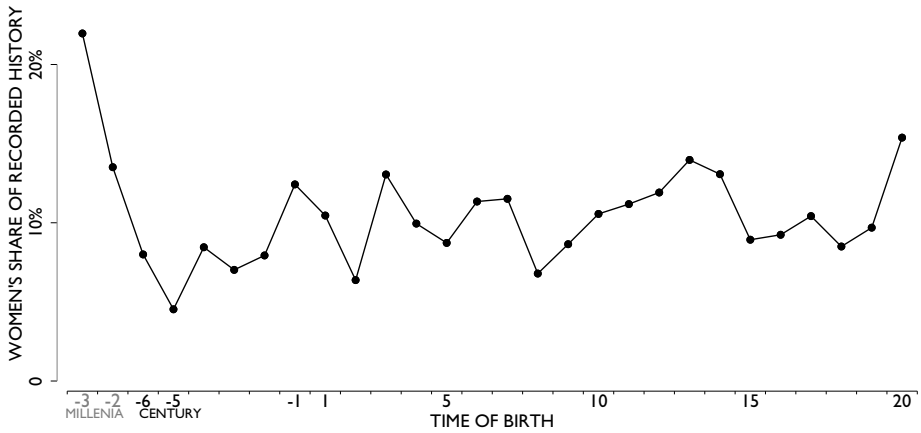


Figure 1: **Women's Share of Recorded History** The x-axis covers 5,000 years of human history. Women's share on the y-axis is women's share among the top one percentmille group (top 1 over 100 thousands of world population). An exception is the pre-700 BCE period, for which we use all observations in HBR divided into two segments of 3000-2000 BCE and 2000-700 BCE.

2 Long-run Patterns in Women's Share

In this section, we first document the absence of a long-run trend in women's share in recorded history. We then trace a long-run transformation in the type of prominent women we observe in recent centuries: the emergence of self-made women. The takeoff's timing suggests several potential causes that we discuss in this section and investigate further in the next.

2.1 HISTORY: Trendless Women's Share

Figure 1 shows the women's share among the top one percentmille group in HBR. The first striking fact is a trendless fluctuation of the women's share over recorded human history. A first-order question in the field of women's history is whether women's status shows a long-term trend ((Bennett, 1997)). The pattern of the women's share over 5,000 years of human history according to HBR, depicted in Figure 1, illustrates why this debate has not yet been settled. The answer depends on the time horizon. There is a substantial increase in women's share between the 19th and the 20th centuries, a clear positive trend. However, there is a definite decrease in women's share between the 17th and 18th centuries, leaving no clear long-run trend.

The first observation in Figure 1 reports a 22% women's share in the third millennium BCE. This outstanding women's share is due to a exceptional women's presence among Ancient Egypt's observations in HBR. This finding echoes women's exceptional status in Ancient Egypt documented by legal historians. Egyptian women had equal rights to men in many aspects. They could own and transmit property, receive an equal inheritance, initiate divorce, testify in court, make wills and marriage contracts in their own names, adopt heirs, free slaves, act as witnesses, sue in court, and even achieve immortality! Women would have to wait until the 20th century to

achieve such combinations of rights again.[1]

From 700 BCE to today, the women's share fluctuates around an average of 10%, ranging from 4.8% in the 5th century BCE to 15% in the 20th century. As a reference point for the women's share in antiquity, consider that the women's share is around 8% in both the Bible and Homer's Iliad and 12% in the Persian Book of Kings.[2] To put the 15% women's share in the 20th century into perspective, in 2017, 6% of heads of states and governments, 6% of CEOs, and 12% of world billionaires were women. From 1901 to 2018, the women's share of Nobel laureates was 6%, but if we concentrate on the post-2000 period, the share has been twice as high.[3]

2.2 HERSTORY: Rise of Self-made Women

These trendless fluctuations in women's share over human recorded history conceal a dramatic transformation in women's status beneath. A closer look at the micro-data reveals that most women in our sample are born into influential families or married into them. It suggest that they held power but did not create it.

To gauge this phenomenon's magnitude, we take advantage of the family relationships in HBR and the prominence index we constructed (Section 1). We define self-made individuals as those more prominent than their parents and spouse. In other words, they were more prominent than their relatives. An alternative would be defining self-made as individuals in the top group, who have neither parents nor spouse who are part of the top group. The drawback with this alternative definition is that it is sensitive to the degree of assortative mating since it excludes all so-called "power couples." Given our focus on women's agency, it is essential to capture the spousal relationships and their influence. We will use the alternative measure for specific exercises below.

Now we are equipped to investigate the evolution of self-made women's share. We decompose the women's share from Figure 1 into the share of self-made and non-self-made women and compare the 20th century CE and 5th century BCE, when the women's share reached its highest and lowest ever, respectively:[4]

$$\underbrace{P(W)}_{\text{Women's Share}} = \underbrace{P(W, \sim S)}_{\text{Non-self-made Women Share}} + \underbrace{P(W, S)}_{\text{Self-made Women Share}} \quad (1)$$

Average (s.d.)	10% (2.5%)	$\simeq$	6.8% (2.4%)	+	3.1% (2.4%)
5th Cent. BCE	5%	$\simeq$	3%	+	2%
20th Century	15%	$\simeq$	3%	+	12%

[1] Lesko (1998), Bridenthal et al. (1998), Hughes and Hughes (2001), Johnson (2002). Appendix Figure 1 compares women's share across ancient civilizations and contrasts women's legal positions in these civilizations with more contemporary societies.

[2] For the Bible (Bohmbach, 2000), for others, authors' calculation based on Rieu (2003) and Ferdowsi (2016).

[3] See (Union and Women, 2017; UBS and Wealth-X, 2017), Bertrand (2018), and (Nobel, 2019; Sherby and Odelberg, 2002), respectively.

[4] In this equation and in the rest of this discussion, the statistics reported are for the period of post-700 BCE.

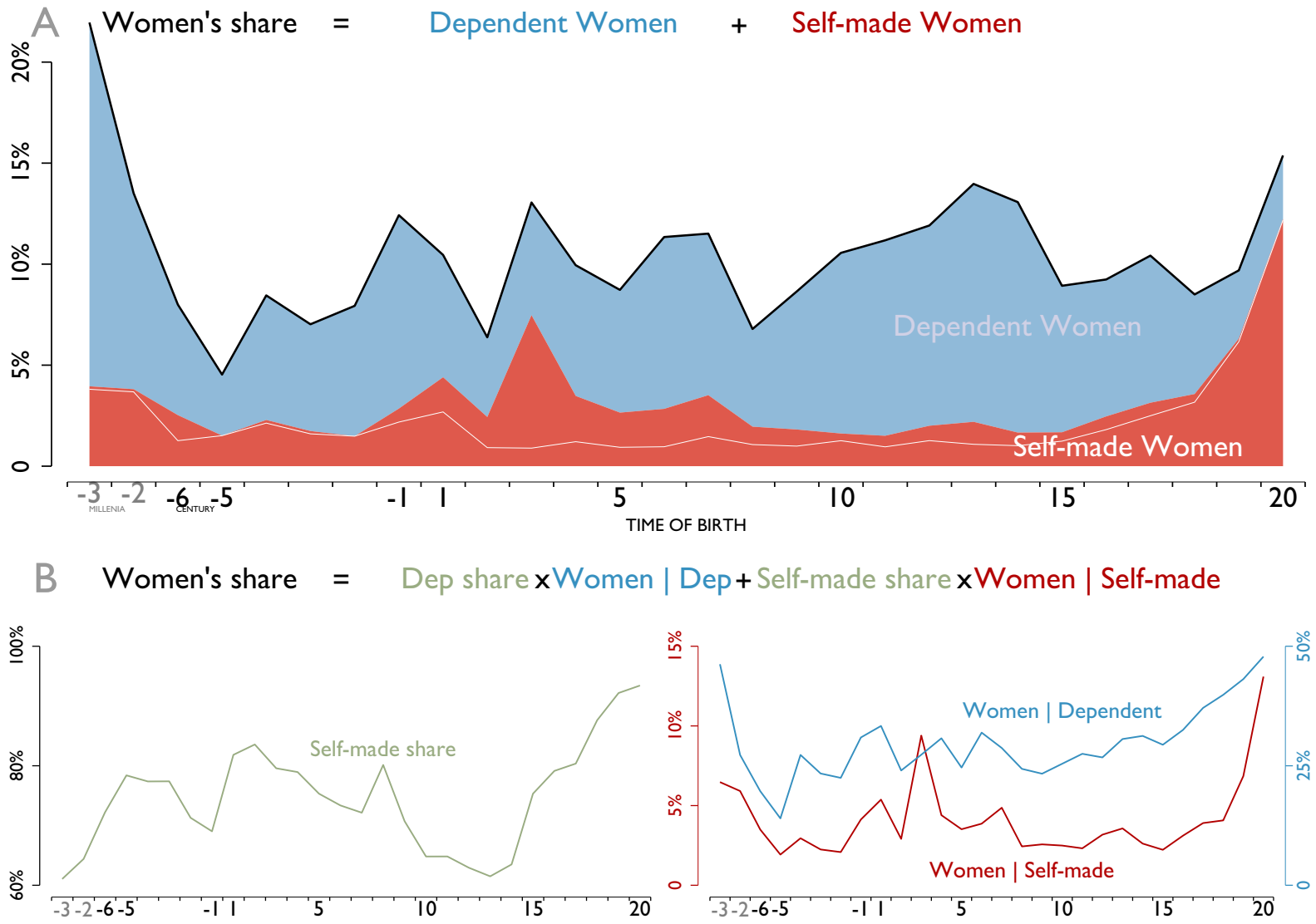


Figure 2: **Two Decompositions of Women's Share** of recorded history from Figure 1: **Decomposition A** The women's share written as the sum of the shares of self-made and dependent women. In addition, the solid white line shows the share of non-spiritual self-made women. **Decomposition B** LEFT: The share of self-made, i.e. those who have been more prominent than their parents and spouse. RIGHT: The women's share among self-made (left y-axis), and non-self made, i.e. dependent (right y-axis). The x-axis covers 5,000 years of human history, in two segments of 3000-2000 BCE and then 2000-700 BCE, and since 700 BCE in 100-year intervals. The baseline sample is the top one percentmille, which is defined as the group of top 1 over 100 thousands of world population.

The 19th and, in particular, the 20th century stand out with their exceptional self-made women's share. Figure 2, Panel A reports the evolution of components of the decomposition (1). It shows that, until the 19th century, self-made women were virtually non-existent except for a plateau between the first and seventh century CE. This plateau is related to the rise of Christianity and later Islam, as shown by the solid white line in Panel A. For example, the peek at the 3rd century marks Christianity's arrival in Europe.[1]

The higher share of self-made women relative to non-self-made women in the 19th and 20th centuries can be due to the rise of self-made individuals in general, or the rise of women among self-mades (Bayes rule):

$$\underbrace{P(W)}_{\text{Women's Share}} = \underbrace{P(\sim S)}_{\text{Non-Self made Share}} \times \underbrace{P(W|\sim S)}_{\substack{\text{Women's Share}\\ \text{of non-Self mades}}} + \underbrace{P(S)}_{\text{Self-made Share}} \times \underbrace{P(W|S)}_{\substack{\text{Women's Share}\\ \text{of Self-mades}}} \quad (2)$$

Figure 2 Panel B trace the evolution of the elements of this decomposition. The right sub-panel shows that the women's share among non-self-mades has been larger than among self-mades in every single century.

$$\underbrace{P(W|\sim S)}_{\substack{\text{Women's Share}\\ \text{of non-Selfmade}}} > \underbrace{P(W|S)}_{\substack{\text{Women's Share}\\ \text{of Selfmade}}} \quad (3)$$

Average (s.d.)	29%(7.2%)	>	4%(2.5%)
5th Cent. BCE	13%	>	2%
20th Century	48%	>	13%

While the average women's share among non-self-mades is 29%, and reaches close to 50% in the 20th century, their share among the self-made has always been below 5%, except in the 3rd century (due to the rise of Christianity in Europe) and during the post-1800 period.

Can we deduce from this finding that family connections helped women overcome gender barriers to high status throughout history? Not yet. We are a Bayes rule away from a "Yes" since we so far only showed that conditional on belonging to the top group family connections matter. We have not yet shown the opposite. The problem is that the Bayes rule requires an estimate of the self-made share of women who do not appear in HBR. This share is equal to half of the self-made share if we define self-made as having parents who do not belong to the top group and ignore the spouse.

The appendix Figure 3 implements this and shows that having a top parent increases the chance of belonging to the top. This fact is more pronounced for men but also valid for women. Moreover, it shows that throughout history, the relative likelihood of achieving high status has shown little variation among those whose parents did not have high status; most variation has been among those who were in a position to benefit from nepotism. These patterns broke down in the 20th

[1] There is a lag between the timing of events and our birth-cohort-based results (Figure 4).

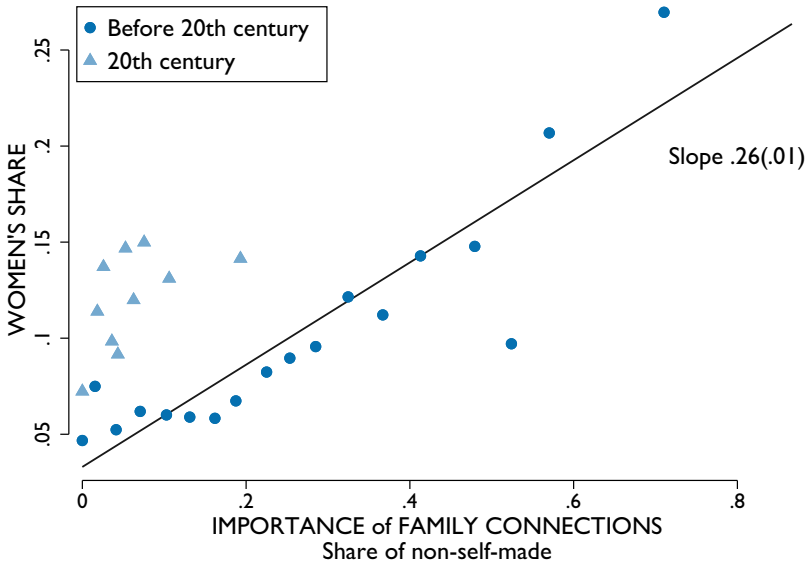


Figure 3: **Women's share vs. Nepotism** This figure tests the hypothesis that the women's share is higher where family connections matter more. It plots women's share against the share of non-self-made, $P(W)$ against $P(\sim S)$. 717 century-country observations from pre-20th century period are binned into 20 bins, and 81 20th-century observations into 10 bins. Appendix Figure 8 reports the stability of the slopes of this relationship across pre-20th century history.

century when, for the first time, daughters of average families made gains relative to their brothers. A caveat is that they do not take into account spousal relationships.

These findings that women's main road to the top has historically been the family connections warrant to rewrite equation (2) as

$$\underbrace{P(W)}_{\text{Women's Share}} = \underbrace{P(W|S)}_{\substack{\text{Women's Share}\\ \text{of Self-made}}} + \underbrace{\{P(W|\sim S) - P(W|S)\}}_{\text{Family matters}} \times \underbrace{P(\sim S)}_{\text{Share of Dep.}} \quad (4)$$

Average (s.d.)	10%(2.5%)	$\simeq$	4%(2.5%)	+	25%(5.8%)	×	24%(8.4%)
5th Cent. BCE	5%	$\simeq$	2%	+	12%	×	22%
20th Century	15%	$\simeq$	13%	+	26%	×	7%

There are two lessons from equation (4). The first is a positive correlation between the women's share and the share of non-self-mades: women had a more salient role in societies where family relationships mattered more.[1] This relationship also holds in the cross-section of countries. Regressing the women's share on the share of non-self-mades, Figure 3 reports a coefficient of .26(.01) based on 717 country-century observations in the pre-20th-century period. This point estimate is essentially the same as the one estimated based on the global women's share over time,

[1] An interesting example of this relationship appears in the late medieval period, where counter-intuitively primogeniture helps the rise of queens. "The growth of male-line lineage *actually increased* the number of queens- and countesses-regent for male children, who were all the more essential because there was less choice as to who could be a legitimate heir." P. 157 in Wickham (2016), emphasis ours.

equation (4). In the 20th century, this relationship weakened (Appendix Figure 8). Together these findings imply that, both across time (in the time-series) and across locations within a period (in the cross-section), nepotism had the unintended consequence of increasing women's power.

The second lesson from equation (4) regards the future of women. The main quantitative driver of future women's share will be the women's share of self-mades, $P(W|S)$, because women's share among non-self-mades is already high, and the share of self-mades is high and increasing. Despite the dramatic difference in the women's share by family connections, equation (3), a one-standard-deviation change in the self-made share creates only a two percentage point change in the women's share. This explains why the dramatic changes in the self-made share, for example between the 14th and 15th centuries depicted in the left sub-panel of Panel B, have not created a large change in the women's share.[1]

The quantitative importance of the women's share of self-mades explains why the rest of the paper attempts to document and understand $P(W|S)$.[2] There are two additional reasons for this choice. The first reason is normative. Self-made women are the true measure of women's status in society. Second, self-made women, instead of not-self-made women, are more likely to hold the real power and recognition.

2.3 Takeoff's Timing and Potential Causes

This section documents the takeoff of self-made women and discusses several potential explanations suggested by the takeoff's timing.

Figure 4 juxtaposes the evolution of women's share among the self-mades and critical events of the debate on women's status in society, the "*Querelle des femmes*", starting in the 14th century. The stagnation of women's share of self-mades for five centuries after the onset of the Querelle is shocking.[3] This period not only witnesses significant events - Renaissance, Printing Press, and reformation, the rise of absolute monarchies and then republics, to name just a few-. The debate also shifted during this period from the equal capacity of women's intellects to their equal right to education and political representation.

The debate started around 1360 with Giovanni Boccaccio compiling a list of exemplary women. The most influential book that followed this tradition was "The Book of the City of Ladies," by Christine de Pizan, finished in 1405. In addition to her list of exemplary women, she examines women's low status, rejects nature's role, and emphasizes nurture, particularly lack of education and economic dependence.[4]

[1] The history of social mobility is the focus of a companion paper (Nekoei and Sinn (2020b)).

[2] The focus on $P(W|S)$, instead of $P(W,S)$, allows us to isolate the forces that drive women's status from those that determines the self-made share. To make the comparative study possible, we focus on the women's share among the top one percentmille self-mades of each society.

[3] In contrast to previous figures and given our focus on more recent centuries, Figure 4 reports shares by decade-level birth cohorts, instead of century-level, to pin down the exact turning point.

[4] These two books are the first ones marked in Figure 4. See Kelly (1982), Karant-Nunn (1998), Wiesner-Hanks

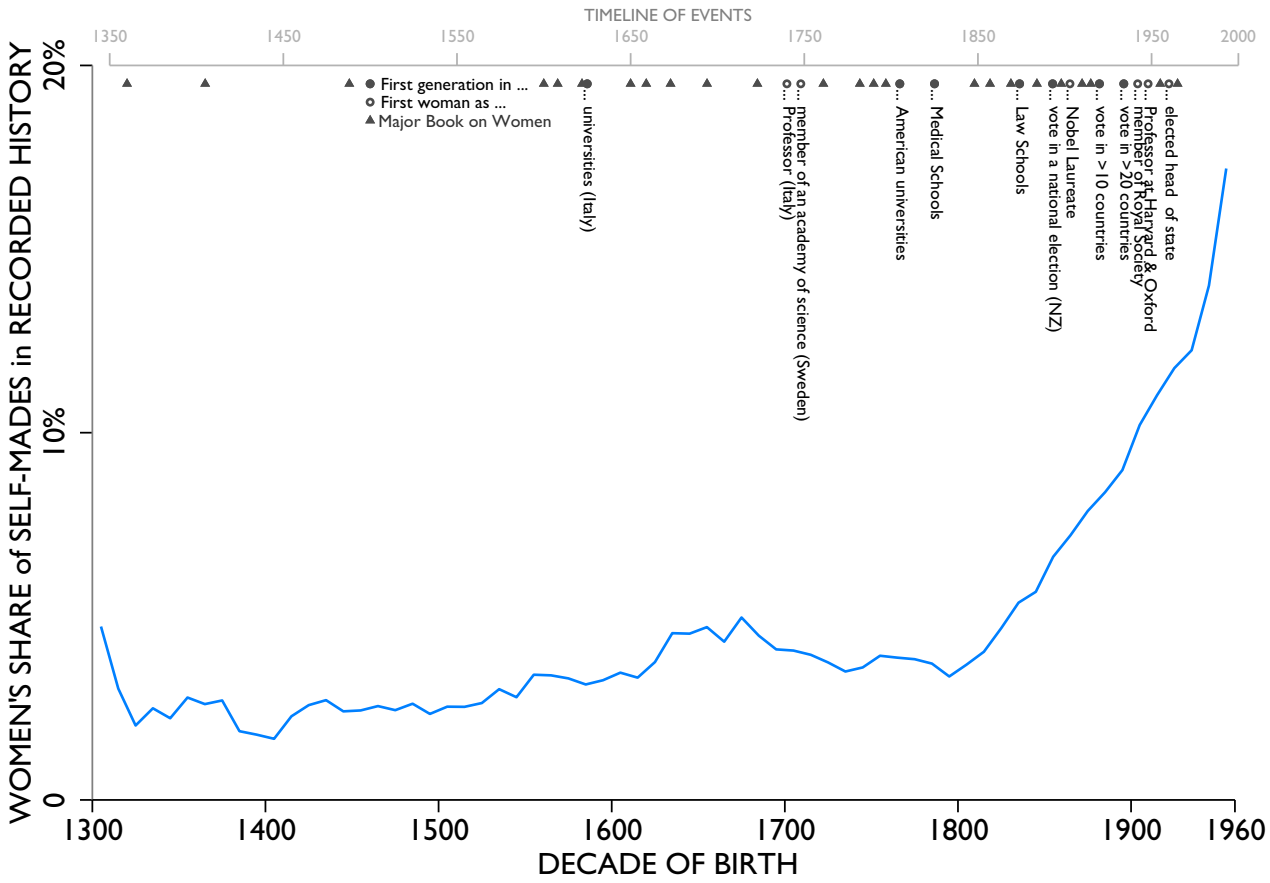


Figure 4: **A Historic Turning Point** Women's share of recorded history by decade since the onset of the *"Querelle des femmes"* (a debate on women). The top x-axis provides contextual background by indicating the main events in women's history. It is lagged by 40 years to accommodate the lag between an event's timing and the birth dates of individuals involved in it. "Major Book on Women" indicates the publication of a critical book concerning women's status as part of the Querelle. For the titles of the books, see Appendix Figure 7.

The debate's status at the end of the period is encapsulated in French mathematician Marquis de Condorcet (1743-94) advocated for gender-neutral universal education, voting rights, and access to all occupations. Contemporaneous Europe's self-image as civilized was built relative to the past and other continents "by historians who measured the civilization of a culture by the status of women in it."[1]

The historic turning-point began around the birth cohort of 1800 when the share of self-made women took off. This rise lasts until the 1960 birth cohort - the last cohort in our data-generating an unprecedented and relatively long-run trend. The remainder of our paper attempts to understand this unique takeoff of self-made women.

(2008), Frize (2013).

[1] p. 240, Goodman (1998). E.g. see Joseph Fourier's quote that this paper began with; or William Alexander wrote in 1779 "the rank…and condition in which we find women in any country, mark out to us with the greatest precision the exact point in the scale of civil society, to which the people of such country have arrived.", quoted in Hughes-Warrington (2012). For Condorcet, see Williams (2004).

The timing of the takeoff suggests several potential causes. The first is access to universities. From the late middle ages, when universities emerged as the new centers of scientific knowledge and the gateway to various professional careers, women were excluded. Figure 5 uses HBR to depict this fact and mark the turning point that turns out to be precisely in 1800. Before that, the proportion of women who attended universities stagnated at virtually zero until 1800, while the same proportion among men rose steadily and had reached almost 50% by then.[1]

A second cause is the improvement in the legal position of women. The contrast between the legal position of women born in 1800 and those born in 1960 shows the improvement since the takeoff. Women of the last cohort benefited from the set of legal rights that were exceptional if not unique (Section 2.1 and Appendix Figure 1). Before 1800, however, in many countries, the law of coverture approved male guardians for married women (*femme couverte*, literally "covered woman"), who did not have property rights over their own wages and could not sign contracts.[2] This was the "lowest point in women's history," but at the same time, women for the "first time stood up en masse and demanded an end to subjugation."[3] This observation brings us to the third potential explanation of the takeoff: the feminist movements that intensified and spread worldwide during the 19th century.[4]

The forth potential explanation is the Industrial Revolution, leading to unprecedented growth, usually dated 1830 or 1850.[5] If the takeoff's timing matches the previous explanations, its contrast to the end of the Queens' era in Europe is remarkable. According to Monter (2012), the last European woman to be head of a government, Catherine the Great, died in 1796, and Europe needed to wait almost two centuries for the next female head of state, Margaret Thatcher, in 1979.[6] Section 3.3 investigates these potential explanations.[7]

[1] Historical facts confirm these patterns from HBR. For instance, of the seventy universities in Europe around 1700, only the two Italian universities of Bologna and Padua awarded degrees to (few) women (DeRidder-Symoens (2004a), Frize (2013)). The pioneering Italian figure, Laura Bassi, received a doctorate of philosophy in 1732 and became the first female professor, see Figure 4 (Maschietto (1978) and Schiebinger (1989)). Starting from no participation in 1830, American women became 21% of the total undergraduate enrollment by 1870, and 47% in 1920. Europe was lagging with a 27% female share in the U.K. and with shares ranging from 20% in Italy to 4 % in Spain on the European continent. See footnote 2, p. 29.

[2] Kelley (2008), Wiesner (1998), Wiesner-Hanks (2008). For example, in England, several writers of this period observed that the status of women was lower than in the Anglo-Saxon era before the Norman invasion or lower than slaves in the Roman Empire or the Babylonian women according to Hammurabi's code (Thrupp (1862), Mill (1870), Gardner (1986), French (2008)).

[3] French (2008) P. 17, vol III.

[4] See e.g. ICW (1899), Sewall (1899), Sewall (1894), and Offen (1998) for a review.

[5] Allen (2009) and Lucas Jr (2018). For references on the impact on women, see Section 3.3.

[6] The Queens' era spanned 1300 to 1800, depending on the definitions of queen and polity. Differences in definition also result in varying numbers of queens: 20 between 1100 and 1600 vs. 30 between 1300 and 1800, according to Wolf (1986) and Monter (2011), respectively. For comparison, Seaxburh of Wessex was the only woman who ruled in her own right between 550-750 (Wickham (2009)). The rise of queens might be related to European aristocrats' acknowledgment of the prohibitions of divorce at the turn of the twelfth century (Ermakoff (1997)).

[7] Despite our attempt in Appendix Figure 1, we, unfortunately, lack a comprehensive measure of women's legal position in all 81 countries under investigation in Section 3.3.

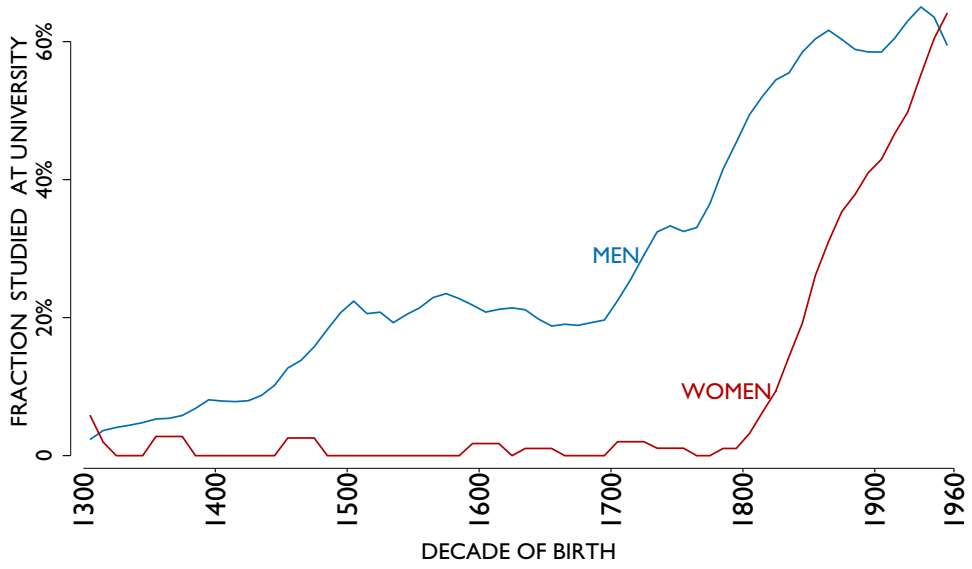


Figure 5: **Unequal Access to Universities** The fraction of self-mades who studied at a university is reported against the decade of birth among the top one percentmille (top 1 over 100 thousands of world population. The moving average over three decades is presented.

3 The Anatomy of the Rise of Self-made Women

To understand the 1800 takeoff, we first divide the individuals in HBR according to their occupation. We then document the rise of self-made women in each occupation, observing the variation in the takeoff's time spanning from the 17th to the 20th centuries. We show that takeoff took place in several waves that are connected and investigate the relationship between the takeoff and potential explanations discussed in Section 2.3: the debate on women, access to universities, legal changes, feminist movements, economic development, and having a woman as head of state.

3.1 Timing of Takeoff Waves for Self-made Women by Occupation

Both the five-century stagnation and the takeoff of women born after 1800 mask considerable variations in women's presence across occupations. To see this, we partition individuals in HBR into three occupational categories: i) people holding power within political institutions: rulers (kings and queens, emperors, etc.), nobility, appointed and elected politicians, military, revolutionary, political activists, etc.; ii) Religious and spirituals leaders (prophets, clergy, etc.); iii) the remaining category divided into artists, literary people (writers and poets), scholars, sport and business people. We refer to the last group as intelligentsia. An alternative label would have been "the private sector." Any such division is arbitrary, and the boundaries are unclear. Our division has similarities with the once-widespread three estates division of society, namely *oratores, bellatores, laboratores*: "those who pray", "those who fight", and "those who work" (Piketty (2020)). Our division adds to the second group, "those who govern". One can think of our two first groups

as dividing the pie that the last group creates. This interpretation is in the spirit of Murphy et al. (1991).

Figure 6, Panel A focuses on the aggregate occupation categories.[1] Self-made women's takeoff in 1800 stems from a takeoff among intelligentsia and a compositional shift – the increasing share of intelligentsia. A century later, a women's breakthrough among politicians further boosts the takeoff. Despite the lag, the women's share is almost identical among politicians and intelligentsia in the last birth cohort.

Given our post-1300 focus, we can vary the top groups' definition widely: from 0.5 a percentmille to 0.1 percent of the world population. The results, depicted in Appendix Figure 7, show that women rose from the bottom in politics: women took off among the top politicians broadly defined in 1800, whereas the takeoff occurred for the narrower top groups in 1900. The same is true, but to a lesser extent, among the intelligentsia. Therefore, the one-century lag between the takeoff of intelligentsia and politicians persists, independently of the top group definition. The bottom-up rise of women means the breaking through lower glass ceilings.[2]

Panel B shows that women's takeoff among rulers and nobility is less notable relative to other subcategories. If not for the focus on self-mads, the women's share among rulers and nobility would have peaked during the early modern period. This latter finding echoes the historian William Monter's claim that late medieval and early modern heiresses lived in the best period for female political participation and that women did better in monarchies than under the republics that replaced them (Monter (2012)). We complement this by showing that although republics reduce women's participation in politics, they did not change the share of self-made women, which has always been tiny. Moreover, we document that women rose gradually within these new political institutions, starting by filling the elected positions.

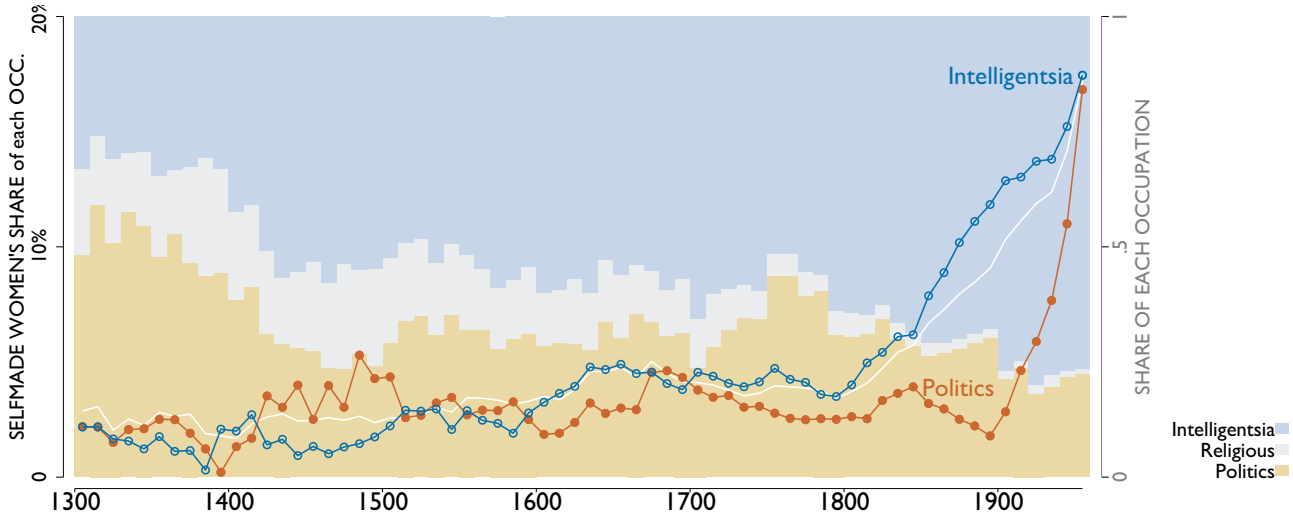
Progress started among the elected politicians in the 19th century, resulting from new opportunities for women to represent their constituents, e.g. in the U.K. and Canadian parliaments, the U.S. Congress and Senate, and local level executive positions such as U.S. state governors. The first female elected head of state, Golda Meir, Prime Minister of Israel, was born at the end of the 19th century.[3] By the 1960 birth cohort, women's share among elected politicians reaches an unprecedented record of 28%.

Appointed positions, in comparison, experienced a slower rise of women during the 19th century, before their takeoff in the early 20th century. Micro-data points to a few 19th-century front runners: Esther Morris (1812-1902) was the first woman to be appointed justice of the peace

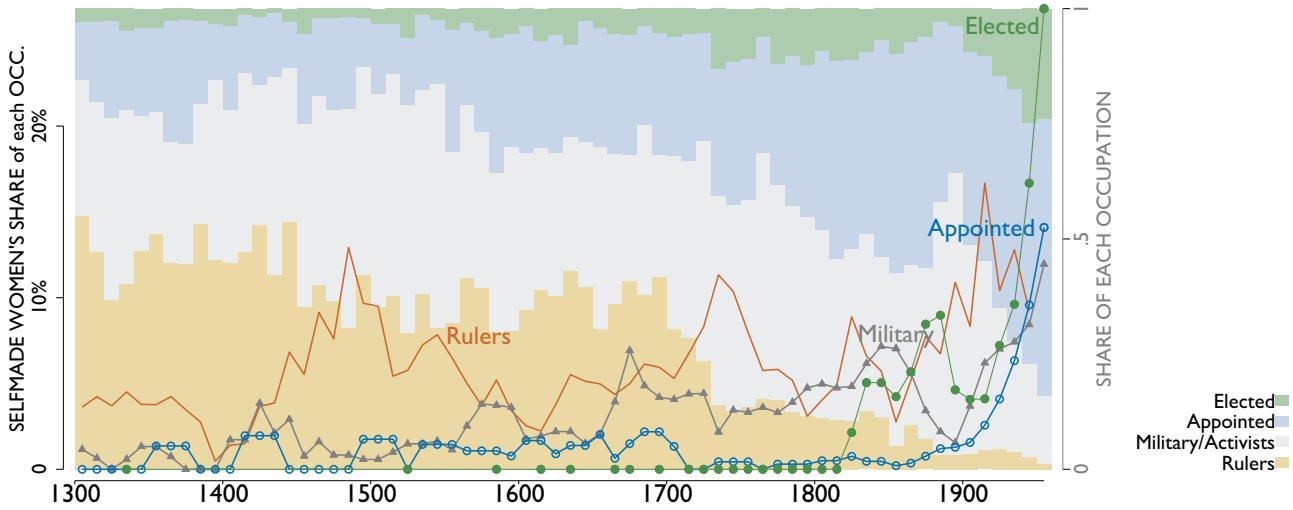
[1] The falling fraction of the spirituals throughout these seven centuries justifies our focus on politicians and intelligentsia.

[2] Appendix Figure 4 provides direct evidence for the bottom-up rise of women.

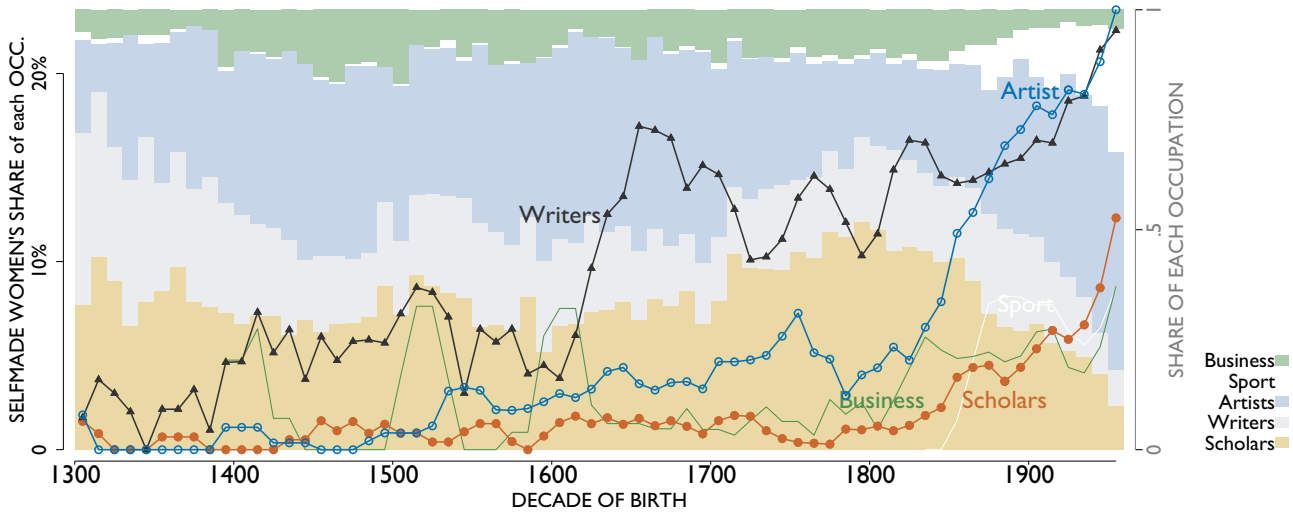
[3] "The first" is according to birth date. The first by election date is Sirimavo Bandaranaike, Sri Lankan prime minister. To the best of our knowledge, all these pioneering women were elected in elections where women voted. Before women's suffrage, in many cases women did run for office and did receive votes, but did not win (Chmielewski et al. (2013)). This is an issue worth extra attention, but stays beyond the scope of this paper.



(a) Aggregate Occupations



(b) Within Politics



(c) Within Intelligentsia

Figure 6: **Women's Share of Self-made by Occupation** 3-decade moving average, on the left y-axis. The shares are omitted for groups representing less than 1% of the sample or having fewer than ten observations. The solid white line in Panel (a) replicates, for comparison, the women's share of self-mades as from Figure 2. The right y-axis records the composition within each category. It is important to emphasize that the "military" subcategory includes political activists and revolutionaries with higher women's share relative to the official military group.

in 1870 in Wyoming, only a few months after Wyoming granted women the right to vote and hold public office. 19th century women also filled cabinet positions for the first time, e.g., in the U.K. and U.S. A trade union leader, Margaret Bondfield (1873-1953), became the first British woman to hold a cabinet position. Simultaneously, in the Eastern Block, women were appointed to high political positions, e.g., a secretary of the Central Committee and foreign minister.

The considerable presence of women among the military/activists category does not represent their rise among the official military. It instead represents their rise among political activists, militants, and revolutionaries. Together they made up only 18% of the military subcategory in this period, but had a remarkable 15% women's share.[1] This originated from women's role in feminist and socialist movements.

Two cases are illustrative. Marie Popelin (1846-1913) was the first Belgian woman to receive a doctorate in law but was denied admittance to the bar association. She spent the rest of her life fighting for women's rights, e.g., establishing the Belgian League for Women's Rights. The Russian revolutionary Catherine Breshkovsky (1844-1934) started as a political activist in the 1870s and became known as the "little grandmother of the Revolution." Later, she opposed the Bolsheviks after their 1917 victory and spent the rest of her life in Prague.[2]

Panel C of Figure 6 illustrates women's share among the intelligentsia – the non-political and non-spiritual category. The patterns of takeoff vary substantially for each subcategory. Women rose among writers and poets in the generation born around the year 1620. This was a shift in level, and a change in growth rate came only around the 1920s. The rise of literary women in the 17th century has been mainly a European and Protestant phenomenon (Figure 7).[3]

Before focusing on the rise of literary women in the 17th century, we describe self-made women's rise in other subcategories of the intelligentsia (Panel C). Businesswomen and the new category of sportswomen witness only a shift in level rather than a takeoff. Women artists experienced a cautious rise starting in the late Renaissance, with the birth cohort of 1530. A real takeoff had to wait until the generation of artists born around 1830. A similar pattern, albeit less pronounced, occurs among scholars. These patterns suggest that the answer to the much-discussed question of "Did women have a renaissance?", is "No" (Kelly-Gadol (1977)). But the later rise, starting from the early 17th century for literary women, supports the view that the doors opened slowly for a few exceptional women during the Enlightenment, despite the lack of access to universities and restrictive laws (Wiesner (1993)).

[1] Women's share among official military has been below 2%, reaching 2.5% in the 20th century. .

[2] Mossman (2006). A few decades earlier, in the U.S. of the late 1860s, women first began to attend law schools and gain admission to state bars.

[3] The share of American writers is small, around 6%, in the 17-18th centuries, and is not driving the global rise.

3.2 The First Wave: The Rise of Literary Women in the 17th Century

One striking finding of the previous section was the early rise of self-made literary women. Who are these pioneering women? How did they breakthrough? First, we present two of these leading figures, whose experiences feed into our framework of early literary women's rise.

★ Aphra Behn (1640-1689), dramatist, poet, and novelist, rose from a modest background. She marks a turning point as she "earned her living by her pen like a man."[1] Her life story is best summarized by Woolf (1929):

> And with Mrs Behn we turn a very important corner on the road. We leave behind, shut up in their parks among their folios, those solitary great ladies who wrote without audience or criticism, for their own delight alone. We come to town and rub shoulders with ordinary people in the streets. Mrs Behn was a middle-class woman with all the plebeian virtues of humour, vitality and courage; a woman forced by the death of her husband and some unfortunate adventures of her own to make her living by her wits. She had to work on equal terms with men. She made, by working very hard, enough to live on. The importance of that fact outweighs anything that she actually wrote ... All women together ought to let flowers fall upon the tomb of Aphra Behn, ... who earned them the right to speak their minds." P. 48

★ Sophia Brenner (1659-1730), poet and belletrist, was a merchant's daughter. She attended the German private school for boys in Stockholm to learn only vernacular. Latin, the language necessary for a professional career, was considered inappropriate for girls. When the Latin teacher spotted her assisting a fellow with his Latin homework, the teacher asked and received the parents' permission to teach her Latin too. This was a unique opportunity for a girl at that era, although she later wrote that she was only allowed to read "Christian texts and envied the boys who read all the classical authors."[2] Her coronation poem to Queen Ulrika Eleonora of Sweden in 1719 justifies her title of "the first Swedish spokeswoman for female rights":

> Our body is nothing but the clothes of our soul
> which makes the only difference between he and she,
> as for the soul concerned, it is just as good,
> yes, just as great, in many woman's body.[3]

Demand Two factors formed the demand, a reading public among women. First factor has been the rise of women's literacy, particularly reading ability. Our best measure of literacy for this period,

[1] De Beauvoir (1956) p129. There are very few examples of professional writers before Behn, e.g. the aforementioned Christine de Pizan. Behn had an adventurous life also before her writing career: she worked as a spy for Charles II.

[2] Quotation from Göransson (2006), p.26 and 27.

[3] Brenner (1713)

the ability to sign, indicates a robust rise during the 16th and 17th centuries.[1] Reading ability estimates – based on indirect evidence like numbers of books dedicated or explicitly addressed to women – point that an even higher share of women able to read.[2] The second force accompanying the increase in literacy is the rise of upper-class women's purchasing power. The surplus income, income over subsistence, rose, and we witness increasing women's participation in markets.[3]

Supply The women writers and poets were not educated at universities like other women of this era (Section 2.3), but by informal "household academies." Humanist principles had led some fathers to educate their daughters at home, sometimes even employing university scholars to tutor them.

Two informal public spheres were open to these highly educated women and enabled them to flourish and inspire the next generations. First was the salons, "the vast engine of power, an organ of public opinion," where highly educated women were central figures. Salons spread across Europe, from Paris to Berlin, London, and Vienna, also later into Poland, Russia, and Sweden, where the concept lasted for more than two centuries.[4] Salons should be compared to academies that were formal gatherings of men interested in science and philosophy (Harth (1992)). In our sample, salonnière are the majority of French writers of this period, including Marie-Catherine d'Aulnoy (1651-1705).

The second emerging public sphere was the Republic of Letters, where women participated both by writing and traveling, creating the "Republic of Women." The "celebrated exchange of letters" between the above-mentioned van Schurman and other humanists is a chief example.[5]

An increasing return to women's education supported both the growth of literacy - the demand - and the rise of highly educated women - the supply. The increasing return occurred in both labor and marriage markets. New opportunities arose in the labor market, where "governess emerged as a career possibility of learned women," pioneered by Bathsua Makin (c.1600-c.1675).[6] In the marriage market, the premium for education rose as educated mothers were able to "educate their children for the first eight or ten years," according to English philosopher and physician, John Locke (1632-1704). However, English writer and philosopher, Mary Astell (1666-1731), saw a return to education in the marriage market since education made better wives. In retrospect, and supporting Astell's view, historians observe that reading and other cultural activities of the middle-class couples became the foundation of their new companionate marriage of this era.[7]

[1] Sometimes called "Reading revolution," e.g., in England in 1686, 20% of women (>40% of men) were able to sign in the late 17th century; this share was zero for English women around 1500 (Hauser (1951), Gross (2011), Reis (2005)).

[2] Reading and writing were separate skills and were taught independently (Ferguson (2007)). There is a lag between the timing of events and our birth-cohort-based results (Figure 4).

[3] O'Rourke and Williamson (2002). A more general contemporaneous phenomenon of the Industrious and Consumer Revolutions discussed in De Vries (2008) and Ogilvie (2010), and references therein. What distinguishes the book market is the matching of women's demand and supply.

[4] Schwinges (1992),Kale (2002), Ross (2010). Quotation from Amelia Mason cited from Landes (1988) p23.

[5] Norbrook (2004),Campbell and Larsen (2009),Goodman (1996) and Pal (2012). The first quotation from the last title, and the second quotation from the first, p.227.

[6] Ross (2010)p241.

[7] Gross (2011), Stone et al. (1979) p. 345.

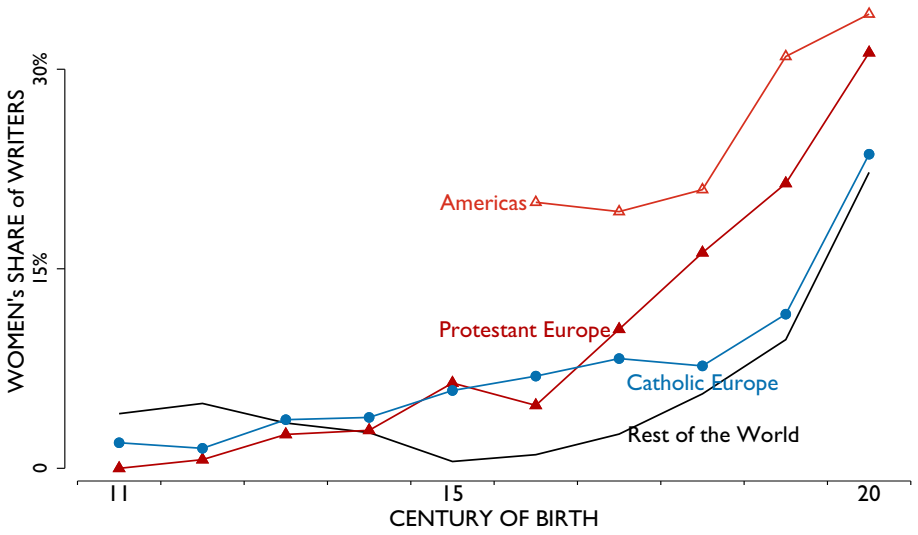


Figure 7: **Women's Share of Writers** The women's share of all self-mades writers in HBR is reported against their century of birth. "Americas" include the entire American continent. Catholic and Protestant Europe refer to the countries where a majority of population belongs to those religions in 1880 when the first such estimate is available (see Appendix), with the exception that Spain and Portugal under the Muslim rule in the 11th and 12th centuries are excluded. Orthodox Europe is included in "Rest of the World", given its similar patterns.

The New Market for "Female Literature" Most women writers addressed women and in vernacular instead of Latin. The emergence of "female literature" is visible in the number of books published by women. It happened in various genres, old and new: poetry, drama, and fiction, memoirs, letters, pamphlets, broadsides, prophecies, and 'skill books' on housewifery, medicine, and midwifery.[1] Leading examples of new genres include fairy tales by the above-mentioned salonnière d'Aulnoy and letters by de Sévigné(1626-1696).[2]

Women wrote in these new genres, not science and history, and in the new language vernacular, not Latin, given their skill set shaped by their education restrictions. But there have been vital signs of the change to come. In 1703, "The Ladies' diary", the first annual almanac with specialty in problems of geometry and algebra was published. Its editors, according to Brown (2009), "had the foresight to encourage the participation of women in the advance of mathematics."

> "By 1770 the feminine reading market was now so large that there appeared the first successful women's periodical, The Ladies' Magazine ... while the sales and circulation of novels, written mostly for and often by women, continued to soar. 'All our ladies read now, which is a great extension,' commented Dr Johnson in 1778."[3]

[1] Hobby (1989) and Hackel and Kelly (2011). For quantity see Bell (2002), Crawford (2005) and for genre see Suzuki (2011).

[2] Crawford (2005), Merriman (2009), Ross (2010). In England of the 17th century, women also wrote petitions that were published and circulated (Stone et al. (1979),Crawford (2005),Suzuki (2011)).

[3] Stone et al. (1979) p. 355. "successful" alludes to the short life of the first periodical for women published in 1693.

Why was the first wave among literary women? We have no definitive answer to this question, but a few hypotheses. The nature of book production with little required investment and the book market structure with many small buyers and a lower guild presence created a rare opportunity for women to realize the fruits of their creativity and education. This opportunity has to be judged in its historical setting. As British scholar Margaret Cavendish (1623-73) pointed out in 1656:

> "... since all heroick Actions, publick Imployments, powerfull Governments, and eloquent Pleadings are denyed our Sex in this age, or at least would be condemned for want of custome, is the cause I write so much."[1]

On the latter point, it is important to reemphasize the hostile forces these early women faced. In addition to the restrictive legal position of women, discussed before, social norms implied that women "risked their reputations" by writing; publishing it was even worse - a public act against their modesty.[2] This may explain why the first occupations where women took the scene were the least power-intense ones - writing and poetry. However, as we will argue in the next section, this early literary rise built the foundation of the women's takeoff that started a century and a half later.

3.3 Between Waves: Persistence and Mechanisms

We now investigate the connection between the waves of self-made women that the previous section documents. Figure 8 provides the main piece of evidence. It shows a stronger takeoff resulting in a higher 19th- or 20th-century women's share of self-mades in countries with a higher women's share of writers *before* the takeoff began in the 17th and 18th centuries.

To understand the correlation of Figure 8, we start with a parsimonious framework whereby two complementary determinants drive the women's share: the level of opportunities for women, and the degree to which society allows women to take such opportunities.

The first determinant – the level of opportunities for women – is mainly a function of economic development and physical conflicts. Adam Smith saw a "historic opportunity" for women created by economic development where higher productivity means high option-value of time and thus fewer wars. A decline in the importance of physical strength implies more gender-neutral wealth accumulation (Smith (1763)). Another way to think of the second determinant, whether women have *access* to opportunities, is to what extent there is a public sphere for women: salons and the Republic of Letters provided a "literary public sphere" for women, before the 19th-century women benefited from "its political equivalent" (Norbrook (2004)).

Using this conceptual framework, two scenarios can explain the correlation between the pre-1800 women's share of writers and the post-1800 takeoff (Figure 8). Under the first scenario, the pre-1800 literary women *caused* the post-1800 broad takeoff by changing culture to be more

[1] Cited in Cerasano and Wynne-Davies (2002), p.41.
[2] Prior (2005) p.162.

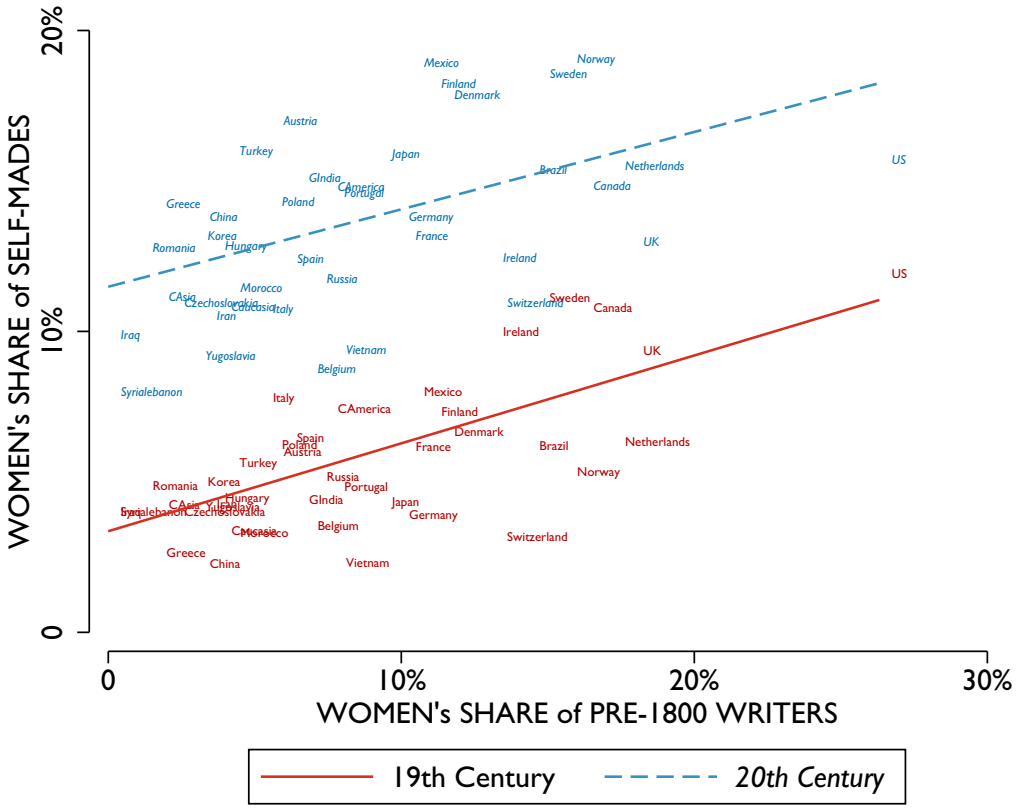


Figure 8: **Women's Share of Pre-1800 Writers vs. Self-mades of 19th & 20th Centuries** Women's share of writers for each country is defined among self-made writers born between 1600 and 1800, independently of their rank. 39 countries are included. The top one percentmille is defined as the group of top 1 over 100 thousands of each country population. If missing, due to an insufficient number of observations in HBR, top one over a million is used. All countries with fewer than 20 observations are omitted.

favorable for women.[1] The second scenario entails that in societies already more favorable for women, women emerged among writers – the only opportunity in the pre-1800 period– before a broader takeoff later as opportunities spread into other occupations. Conditioning on proxies for the preexisting culture or institutions favorable for women should matter for the second scenario, but not the first. In the same way, given that these preexisting circumstances are likely to manifest themselves in the pre-1800 overall women's share and in other phenomena (e.g., women's access to education or feminist movements), conditioning on such variables should help us to distinguish the two scenarios (Table 1).

To start with, the variation among the pre-1800 women's share of writers among neighboring countries remains correlated with the post-1800 takeoff (Column 3). The same is true after controlling for another important pre-1800 factor, the "Protestant Europe" indicator (Figure 7), and

[1] For example, by improving the public perception about women's potentials or inspiring future women (Beaman et al. (2009) and Beaman et al. (2012)).

controlling for the persistence in the women's share (Column 4).[1][2] We construct two additional proxies for other relevant pre-1800 developments: one for the presence of an active debate on the status of women and another for women's access to higher education.[3] Furthermore, we also control for an indicator of having a woman as head of state based on Dube and Harish (2020). Controlling for these other pre-1800 factors confirms both the statistical and the economic significance of the early literary movements (Column 5).

If the driver for women's takeoff was, as in our second scenario, a preexisting culture favorable for women, such a culture should have also manifested itself in other 19th-century factors. Controlling for such factors should thus change the women's share of writers coefficient under the second scenario. To that end, we construct proxies for two important 19th-century factors. First, an indicator for the existence of feminist organizations to proxy for feminist movements. Second, an indicator for whether women have access to university in the 19th century using HBR, similar to the 18th-century one. As an alternative measure for the latter, we use Lee and Lee (2016). Columns 6-7 show that, conditioning on these factors, the correlation between the 19th-century takeoff and the pre-1800 literary women's share remains unchanged.

The first determinant of women's share - the level of opportunities for women - is a critical variable that we need to control for. Column 8 conditions on the main drivers of women's opportunities: economic development and conflicts. Although it provides evidence of the association of both factors with contemporaneous women's share, the significance of the previous results is unchanged. A complementary approach to keep constant the level of women's opportunities is to control for the composition of the top group (Column 9). This is indicative evidence for our first scenario, literary women in the pre-1800 lead to a later takeoff by shaping culture favorably.

The continuation of the takeoff in the 20th century is investigated in Table 2. Columns 1 and 2 show the persistence in the women's share, similar to Table 1, suggesting a cross-country divergence. Columns 3 and 4 document that having a feminist organization or access to universities in the 19th century is associated with a higher women's share in the 20th century, conditional on the 19th-century share. Columns 5-8 show that controlling for various developments during the 20th century – university access, economic development, and conflicts –

[1] To interpret the magnitude of coefficients in column 4, we should bear in mind that the variation in women's share among writers is higher than among self-mades, as the early rise of writers depicted in Figure 6 suggests. The median women's share of writers is 8.3%, and the 90th percentile is 16%, whereas corresponding numbers for the women's share of self-mades are 4.5% and 6%.

[2] The persistence in women's share is documented in Columns 1 and 2: we observe a higher prevalence of self-made women in countries with a higher share in the previous century.

[3] The former is an indicator for the publication of a major book as a part of the "*Querelle de Femmes*" using WorldCat (a union catalog of libraries). The latter is an indicator for women having access to universities constructed using the entire population of HBR. For more details about the construction of these proxies, see the Appendix.

Table 1: **Self-made Women's Takeoff in the 19th Century**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
18th cent. Women's Share of Self-mades	0.306***	0.276***		0.133***	0.119***	0.108***	0.107**	0.138***	0.129***
	(0.047)	(0.061)		(0.040)	(0.040)	(0.041)	(0.043)	(0.046)	(0.046)
Pre-1800 Women's Share of Writers			0.220***	0.270***	0.244***	0.204***	0.208***	0.188***	0.178***
			(0.038)	(0.057)	(0.060)	(0.062)	(0.062)	(0.066)	(0.065)
Protestant Europe				-0.007	-0.004	-0.007	-0.002	-0.009	-0.003
				(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Pre-1800 Debate on Women					-0.007	-0.005	-0.005	-0.008	-0.006
					(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Pre-1800 Queens					0.011**	0.010*	0.008	0.004	-0.003
					(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Pre-1800 Uni. Access					0.004	-0.005	0.005	-0.004	-0.001
					(0.005)	(0.006)	(0.006)	(0.006)	(0.006)
Uni. Access						0.022***			
						(0.004)			
Uni. Access, LL							0.014***	0.019***	0.022***
							(0.004)	(0.004)	(0.004)
19th cent. Feminist org.						0.005	0.010**	0.010**	0.012**
						(0.005)	(0.005)	(0.005)	(0.005)
19th cent. Conflict								0.021***	0.015**
								(0.007)	(0.007)
Population Growth								0.018***	0.012*
								(0.007)	(0.007)
Region FE		✓	✓	✓	✓	✓	✓	✓	✓
Occ FE									✓
Num. Obs.	49,409	49,409	49,250	46,777	46,777	46,777	46,777	46,777	46,769
R2	.0042	.0053	.0063	.0068	.0072	.0088	.0077	.0085	.037

Note: The dependent variable is an indicator of being a woman in the sample of the 19th-century defined at country level: 51 countries' top one percentmille self-made group. Mean dependent variable is .060 in columns 1 and 2, .057 in the rest. All observations from a country-century cell with less than 20 observations omitted.
Covariates: "18th cent. Women's Share of Self-mades": the Women's share of the top one percentmille self-made group of each country in the 18th century. "Women writers 17-18th cent." measures the share of women among writers born between 1600 and 1800 in each country, with mean (standard error) of .083 (.058). "Pre-1800 Debate on Women": an indicator for countries where a major book was published contributing to this debate in pre-1800. "Queens" indicates the presence of a woman as head of state pre-1800. "Pre-1800 Access to Uni." is an indicator for whether women had access to universities in pre-1800. "Uni. Access" indicates for each observation the university access in her country and for her generation, constructed using HBR. "Uni. Access, LL" is an alternative measure constructed from (Lee and Lee (2016)). "19th cent. Feminist org." is an indicator for countries that have a feminist organization in the 19th century. "19th cent. Conflict" is the number of years a country was involved in a war in the 19th century. "Population growth" measured between the 18th and 19th centuries. Region FE indicates six regions: Asia, Middle east, North Africa, Eastern Europe, Western Europe, and Americas. The OCC fixed effects include ten occupations: nobility and rulers, elected and appointed politicians, military, spirituals, artists, writers, scholars, sport and business people. See the Appendix for the construction and sources used.

Table 2: **Self-made Women's Takeoff in the 20th Century**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
19th cent. Women's Share of Self-mades	0.390***	0.363***	0.306***	0.266***	0.194***	0.216***	0.168***	0.172***	0.141**
	(0.050)	(0.050)	(0.050)	(0.050)	(0.051)	(0.053)	(0.059)	(0.060)	(0.059)
19th cent. Feminist org.			0.026***	0.012***	0.014***	0.011**	0.016***	0.011*	0.005
			(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.006)	(0.006)
19th cent. Conflict				0.002	-0.005	-0.002	0.003	0.003	-0.003
				(0.005)	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)
19th cent. Uni. Access				0.033***	0.012**	0.029***	0.032***	0.030***	0.018***
				(0.005)	(0.006)	(0.005)	(0.006)	(0.006)	(0.006)
Uni. Access					0.060***				
					(0.007)				
Uni. Access, LL						0.037***	0.034***	0.036***	0.033***
						(0.007)	(0.007)	(0.008)	(0.008)
20th cent. Conflict							-0.033**	-0.027*	-0.022
							(0.014)	(0.014)	(0.014)
Population Growth							0.011***	0.008*	0.011**
							(0.004)	(0.005)	(0.005)
20th cent. GDP								0.005	0.007*
								(0.004)	(0.004)
Region FE		✓	✓	✓	✓	✓	✓	✓	✓
Occ FE									✓
Num. Obs.	149,737	149,737	149,737	149,737	149,737	149,737	149,737	133,787	133,776
R2	.0021	.0034	.004	.0051	.0079	.006	.0063	.0066	.051

Note: The dependent variable is an indicator of being a woman in the sample of the 20th-century defined at country level: 84 countries' top one percentmille self-made group. Mean dependent variable is 0.128, and 0.129 in the last two columns, where the sample is smaller since GDP measure is not available for several countries. All observations from a country-century cell with less than 20 observations omitted. Each observation is weighted with the inverse of the size of country-century cell.
Covariates: "19th cent. Women's Share of Self-mades": the Women's share of the top one percentmille self-made group of each country in the 19th century. "Feminist org." is an indicator for countries which have feminist organization. "19th cent. Access to Uni." is an indicator for whether women had access to universities in the 19th century. "Uni. Access" indicates for each observation the university access in her country and for her generation, constructed using HBR. "Uni. Access, LL" is an alternative measure constructed from (Lee and Lee (2016)). "Conflict" is the number of years a country was involved in a war in that century. Region FE indicates six regions: Asia, Middle east, North Africa, Eastern Europe, Western Europe, and Americas. The OCC fixed effects include ten occupations: nobility and rulers, elected and appointed politicians, military, spirituals, artists, writers, scholars, sport and business people. See the Appendix for the construction and sources used.

does not change the coefficients of 19th-century university access or feminist organizations.[1] Their link to the rise of self-made women a century later can also not be explained by the top group's occupational composition (Column 9).

Our proxies for aspects of women's history used in this quantitative exercise are not perfect. In particular, our proxy for education captures only access to higher education. There is an indisputable improvement in this dimension during the 19th century that this proxy captures.[2] There have also been significant developments in educational opportunities at higher levels. Starting from the late 19th century, women were allowed to attend doctoral programs and medical schools in several European countries and the U.S.[3] This resulted in "the breakthrough of women as scientists and subsequently as professors ... at the turn of the century."[4] In the mid-20th century, the last prestigious universities appointed women to regular faculty positions.[5] Finally, national academies of science were the last to admit women, some as late as 1980.[6] The British scientist, Hertha Ayrton(1854-1923), who was the first woman allowed to present her own work in 1904 at the Royal Society, needed still to argue in 1919 that "I do not agree with sex being brought into science at all. The idea of woman and science is completely irrelevant. Either a woman is a good scientist, or she is not."[7]

While it is impossible to judge with certainty, the most likely interpretation of the evidence from Tables 1 and 2 is that the pre-1800 rise of literary women caused a stronger takeoff, perhaps by improving the public perception about women's potential or inspiring new generations of women. The alternative interpretation seems unlikely since it would require that a preexisting culture favorable for women produced both the literary wave and the broad takeoff but did not correlate with any other developments, e.g. improving women's university access or feminist movements.

[1] In contrast to the Adam Smith's view, several arguments for wars improving women's status include: Women thrive due to a vacuum of power at home (French (2008)), women's wealth increases due to bounty or deaths of their male relatives (Evans (1991), Van den Bergh (2000)), and emancipation due to their direct participation in wars (Loraux (1985)). For review, see Stuard (1998) and Boxer (2008). Dube and Harish (2020) suggest a reverse causality whereby a queen causes more wars.

[2] See Figure 5 and the related discussions.

[3] The women's share of doctoral students increased from zero to 15% between 1870 and 1920 in the U.S. (Graham (1978), DeRidder-Symoens (2004b), also Goldin and Katz (2011), Thelin (2011)). The first medical degrees awarded to women in several European countries and the U.S. between 1821-1875, except for Germany in 1742 (or 1754) (Schiebinger (1989) and DeRidder-Symoens (2004a)); for comparison, the equivalent date for Turkey is 1900 and 1940 for Iran. The rise of women's share in other professional programs occurred later, e.g. from 1970 onward in the U.S. (Goldin (1990), Goldin and Katz (2002), Goldin (2006)).

[4] The first women ascended to a professorship in Stockholm of 1884, in Bologna of 1889, in Paris of 1909 (DeRidder-Symoens (2004b), quotation p.133).

[5] Graham (1978). E.g. In 1948, the first women became professors at Oxford and Harvard universities (Figure 4).

[6] The Royal Swedish Academy of Sciences admitted the first female full-member in 1748, but other Academy of Sciences followed only in the 20th century, e.g. 1936 in Bavaria, 1945 in London, 1964 in Berlin, in 1979 in France, and in 1980 in Italy (Schiebinger (1989), Frize (2013)).

[7] Fara (2006), p.283.

4 Conclusion

This paper connects two scholarly worlds: the studies of women's status in current society and those analyzing women's role in a historical context. The former is today a ubiquitous topic both in public and academic debates, and the latter is flourishing field in women's history.[1] We contribute to these debates by collating information on women's status across recorded history into one single database, the Human Biographical Record (HBR). For over two millennia, documenting the existence of "exemplary" women has been a way of alluding to their suppressed potential.[2] The "*Querelle des femmes*", starting in the 14th century and still ongoing, has its root in such exercises.

HBR allows us to measure the women's share among the most prominent individuals in recorded history and take a broader and comparative view of cross-section and time-series. We explain the current status as a result of historical trends. The main caveat to our approach is that recorded history is not real history.

We document the absence of a long-run trend in women's share in recorded history, but the rise of a new type of woman– self-made women –as opposed to those women who dominated history for a long time whose power was based on family connections. Self-made women took off in separate waves, gaining momentum from 1800. What is remarkable about their rise is that it became a ubiquitous phenomenon in the 20th century, visible across countries, continents, and occupations. This unprecedented rise represents a relatively long-run trend. Its speed, given the initial low level, is far from satisfactory: at the current pace, if we use a linear extrapolation, we should expect to reach gender equality at the top by the year 3000. Whether the takeoff documented here is a linear phenomenon remains unanswered, but what is clear is that self-made women are on the rise.

References

Alesina, A., P. Giuliano, and N. Nunn (2013). On the origins of gender roles: Women and the plough. The Quarterly Journal of Economics 128*(2), 469–530. 5*

Allen, R. C. (2009). The British industrial revolution in global perspective. *Cambridge University Press. 15*

Atkinson, A. B., T. Piketty, and E. Saez (2011). Top incomes in the long run of history. Journal of economic literature 49*(1), 3–71. 2, 7*

Beaman, L., R. Chattopadhyay, E. Duflo, R. Pande, and P. Topalova (2009). Powerful women: does exposure reduce bias? The Quarterly journal of economics 124*(4), 1497–1540. 2, 24*

Beaman, L., E. Duflo, R. Pande, and P. Topalova (2012). Female leadership raises aspirations and educational attainment for girls: A policy experiment in india. science 335*(6068), 582–586. 2, 24*

Beard, M. (2015). SPQR: a history of Ancient Rome. *Liveright. 7*

[1] Already 30 years ago, historian Raymond Grew wrote: "of all the topics and methods that in the last twenty years have given life to historical studies, none has been more exciting or fundamental than the history of women" p. viii Herlihy (1990).

[2] The earliest examples, all from around two thousand years ago, include: "Biographies of Exemplary Women" by Liu Xiang Sievers (1999) and Mann (2005), "Warrior Women" by an anonymous author (Gera), "On the Bravery of Women" by Plutarch (Plutarch), and "On Famous Courtesans" by Suetonius (the Lydian).

Bell, M. (2002). *Women writing and women written.* *In* the Cambridge History of the Book in Britain, *Volume 4, pp. 1557–1695.* 22

Bennett, J. M. (1997). *Confronting continuity.* Journal of Women's History 9*(3), 73–94.* 3, 8

Bennett, J. M. (2006). History matters: patriarchy and the challenge of feminism. *University of Pennsylvania Press.* 7

Bertrand, M. (2018). *Coase lecture–the glass ceiling.* Economica 85*(338), 205–231.* 2, 9

Bitel, L. M. (1998). Becoming Visible, Women in European History, *Chapter Women in early medieval northern Europe. Boston: Houghton Mifflin.* 7

Bohmbach, K. G. (2000). Women in Scripture: A Dictionary of Named and Unnamed Women in the Hebrew Bible, the Apocryphal/Deuterocanonical Books and New Testament, *Chapter Names and naming in the biblical world. Houghton Mifflin Harcourt.* 9

Boxer, M. J. (2008). The Oxford Encyclopedia of Women in World History, *Chapter Capitalism. Oxford University Press.* 28

Brenner, S. (1713). Poetiske dikter. *Tryckt hos Julius Georg MatthiÃŠ.* 20

Bridenthal, B., S. M. Stuard, and M. E. Wiesner (Eds.) (1998). Becoming Visible: Women in European Histo-ry. 9

Brin, S. and L. Page (1998). *The anatomy of a large-scale hypertextual web search engine.* Computer networks and ISDN systems 30*(1-7), 107–117.* 6

Brown, A. (2009). *A valuable monument of mathematical genius.* Historia mathematica 36*(1), 10–47.* 22

Campbell, J. D. and A. R. Larsen (2009). Early Modern Women and Transnational Communities of Letters. *Ashgate Publishing, Ltd.* 21

Cerasano, S. P. and M. Wynne-Davies (2002). Readings in renaissance women's drama: criticism, history, and performance 1594-1998. *Routledge.* 23

Chen, T. and C. Guestrin (2016). *Xgboost: A scalable tree boosting system.* *In* Proceedings of the 22nd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, *KDD '16, New York, NY, USA, pp. 785â794. Association for Computing Machinery.* 6

Chmielewski, W. E., J. Norgren, and K. Gwinn-Becker (2013). *Digital history, digital sources, digital display: The her hat was in the ring project on us women who ran for political office before 1920.* 17

Chojnacka, M. (2001). Working women of early modern Venice, *Volume 113. JHU Press.* 7

Crawford, P. (2005). *Women's published writings 1600–1700.* *In* Women in English Society, 1500-1800, *pp. 185–236. Routledge.* 22

Crouch, D. (2005). The birth of nobility: constructing aristocracy in England and France, 900-1300. *Routledge.* 7

De Beauvoir, S. (1956). The second sex. *Cape.* 20

De Vries, J. (2008). The industrious revolution. *Cambridge.* 21

DeRidder-Symoens (Ed.) (2004a). A history of the university in Europe: Universities in early modern Europe (1500-1800), *Volume 2. University Press.* 15, 28

DeRidder-Symoens (Ed.) (2004b). A history of the university in Europe: Universities in the nineteenth and early twentieth centuries:(1800-1945), *Volume 3. University Press.* 28

Dialeti, A. (2018). *Patriarchy as a category of historical analysis and the dynamics of power: the example of early modern italy.* Gender & History 30*(2), 331–342.* 4

Drell, J. (2013). The Oxford Handbook of Women and Gender in Medieval Europe, *Chapter Aristocratic Economies: Women and Family. Oxford University Press.* 7

Dube, O. and S. Harish (2020). *Queens.* Journal of Political Economy 128*(7), 2579–2652.* 25, 28

Ermakoff, I. (1997). *Prelates and princes: aristocratic marriages, canon law prohibitions, and shifts in norms and patterns of domination in the central middle ages.* American Sociological Review, *405–422.* 15

Evans, J. K. (1991). War, Women and Children in Ancient Rome (Routledge Revivals). *Routledge.* 28

Fara, P. (2006). *Women or just good scientists?* Nature 444*(7119), 548.* 28

Ferdowsi, A. (2016). Shahnameh: The Persian book of kings. *Penguin.* 9

Ferguson, M. W. (2007). Dido's Daughters: Literacy, Gender, and Empire in Early Modern England and France. *University of Chicago Press.* 21

Fourier, C. (1808). The Theory of the Four Movements (Théorie des quatre mouvements et des destinées générales: prospectus et annonce de la découverte). *Paris.* 2

French, M. (2008). From Eve to Dawn, A History of Women in the World, *Volume 1-4. The Feminist Press at CUNY.* 15, 28

Friedman, J. H. (2001, 10). *Greedy function approximation: A gradient boosting machine.* Ann. Statist. 29*(5), 1189–1232.* 6

Frize, M. (2013). Laura Bassi and Science in 18th Century Europe: The Extraordinary Life and Role of Italy's Pioneering Female Professor. *Springer Science & Business Media.* 14, 15, 28

Gardner, J. F. (1986). Women in Roman law and society. *Croom Helm.* 15
Gera, D. L. (Ed.). Warrior women: the anonymous Tractatus de mulieribus [English 1997]. *Brill.* 29
Goldin, C. (1990). Understanding the gender gap: An economic history of American women. *Oxford University Press.* 28
Goldin, C. (2006). The quiet revolution that transformed women's employment, education, and family. American economic review 96*(2), 1–21.* 28
Goldin, C. and L. F. Katz (2002). The power of the pill: Oral contraceptives and women's career and marriage decisions. Journal of political Economy 110*(4), 730–770.* 28
Goldin, C. and L. F. Katz (2011). Putting the "co" in education: timing, reasons, and consequences of college coeducation from 1835 to the present. Journal of Human Capital 5*(4), 377–417.* 28
Goodman, D. (1996). The republic of letters: A cultural history of the French enlightenment. *Cornell University Press.* 21
Goodman, D. (1998). Women and the enlightenment. In B. Bridenthal, S. M. Stuard, and M. E. Wiesner (Eds.), Becoming Visible, Women in European History. *Boston: Houghton Mifflin.* 14
Göransson, E. (2006). Letters of a learned lady: Sophia Elisabeth Brenner's correspondence, with an edition of her letters to and from Otto Sperling the Younger. *Almqvist & Wiksell International.* 20
Graham, P. A. (1978). Expansion and exclusion: A history of women in american higher education. Signs: Journal of Women in Culture and Society 3*(4), 759–773.* 28
Gross, R. A. (2011). Reading outside the frame. In Hackel and Kelly (Eds.), Reading Women: Literacy, Authorship, and Culture in the Atlantic World, 1500-1800, *Chapter reading outside the frame. University of Pennsylvania Press.* 21
Hackel, H. B. and C. E. Kelly (2011). Reading Women: Literacy, Authorship, and Culture in the Atlantic World, 1500-1800. *University of Pennsylvania Press.* 22
Harth, E. (1992). Cartesian women: Versions and subversions of rational discourse in the old regime. *Cornell University Press.* 21
Harvard University, Academia Sinica, and Peking University (2019, April). China biographical database (CBDB). 5
Hauser, A. (1951). The social history of art. *London Routledge & Kegan Paul.* 21
Herlihy, D. (1990). Opera muliebria: women and work in medieval Europe. *Temple University Press.* 29
Hobby, E. (1989). Virtue of necessity: English women's writing, 1649-88. *Univ of Michigan Pr.* 22
Hughes, S. S. and B. Hughes (2001). Women in ancient civilizations. A. Michael, Agricultural and pastoral Societies in Ancient and Classical History, *116–150.* 7, 9
Hughes-Warrington, M. (2012). Genders. In J. H. Bentley (Ed.), The Oxford Handbook of World History. *Oxford University Press.* 14
ICW (1899). The International congress of women of 1899. *London, T. F. Unwin.* 15
James, L. (2008). The Oxford Encyclopedia of Women in World History, *Chapter Europe: Medieval Period. Oxford University Press.* 7
Johnson, J. H. (2002). Women's legal rights in ancient egypt. Fathom Archive. 9
Kale, S. D. (2002). Women, the public sphere, and the persistence of salons. French Historical Studies 25*(1), 115–148.* 21
Karant-Nunn, S. C. (1998). Becoming Visible, Women in European History, *Chapter The reformation of women. Boston: Houghton Mifflin.* 4, 13
Kelley, D. R. (2008). The Oxford Encyclopedia of Women in World History, *Chapter Property Rights. Oxford University Press.* 15
Kelly, J. (1982). Early feminist theory and the" querelle des femmes", 1400-1789. Signs: Journal of Women in Culture and Society 8*(1), 4–28.* 4, 13
Kelly-Gadol, J. (1977). Becoming Visible, Women in European History, *Chapter Did womenhave a Renaissance? Boston: Houghton Mifflin.* 4, 19
Landes, J. B. (1988). Women and the Public Sphere in the Age of the French Revolution. *Cornell University Press.* 21
Lee, J.-W. and H. Lee (2016). Human capital in the long run. Journal of Development Economics 122*, 147–169.* 25, 26, 27
Lesko, B. S. (1998). Becoming Visible, Women in European History, *Chapter Women of Ancient Egypt and Western Asia. Boston: Houghton Mifflin.* 9
Levin, C. (1998). Becoming Visible, Women in European History, *Chapter Women in the Renaissance. Boston: Houghton Mifflin.* 7
Loraux, N. (1985). La cité, l'historien, les femmes. Pallas*, 7–39.* 28
Lucas Jr, R. E. (2018). What was the industrial revolution? Journal of Human Capital 12*(2), 182–203.* 15
Mann, S. (2005). Women in east asia: China, japan, and korea. In B. G. Smith (Ed.), Women's history in global perspective, *Volume 2. University of Illinois Press.* 29

Marx, K. and F. Engels (1845). The holy family, English: 1956. *Foreign Language Publshing House. 2*
Maschietto, F. L. (1978). Elena Lucrezia Cornaro Piscopia (1646-1684) (Elena Lucrezia Cornaro Piscopia, 1646-1684, Prima donna laureata nel mondo). *St Josephs University Press, 2007. 15*
McEvedy, C., R. Jones, et al. (1978). Atlas of world population history. *Penguin Books Ltd, Harmondsworth, Middlesex, England. 7*
Merriman, J. (2009). A history of modern Europe: from the Renaissance to the present, *Volume 1. WW Norton & Company. 22*
Mill, J. S. (1870). The subjection of women. *Longmans, Green, Reader, and Dyer. 2, 7, 15*
Monter, W. (2011). Gendered sovereignty: Numismatics and female monarchs in europe, 1300–1800. Journal of Interdisciplinary History 41*(4), 533–564. 15*
Monter, W. (2012). The rise of Female Kings in europe, 1300-1800. *Yale University Press. 4, 15, 17*
Mossman, M. J. (2006). The first women lawyers: A comparative study of gender, law and the legal professions. *Bloomsbury Publishing. 19*
Murphy, K. M., A. Shleifer, and R. W. Vishny (1991). The allocation of talent: Implications for growth. The quarterly journal of economics 106*(2), 503–530. 17*
Nekoei, A. and F. Sinn (2020a). Human biographical record (hbr). 5
Nekoei, A. and F. Sinn (2020b). Open elite, competition, and the rise of professions. 13
Nobel (31 Jan 2019). All nobel prizes. 9
Norbrook, D. (2004). Women, the republic of letters, and the public sphere in the mid-seventeenth century. Criticism 46*(2), 223–240. 21, 23*
Offen, K. (1998). Contextualizing the theory and practice of feminism in nineteenth-century europe (1789-1914). In B. Bridenthal, S. M. Stuard, and M. E. Wiesner (Eds.), Becoming Visible, Women in European History. *Boston: Houghton Mifflin. 2, 15*
Ogilvie, S. (2010). Consumption, social capital, and the industrious revolution in early modern germany. The Journal of Economic History 70*(2), 287–325. 21*
O'Rourke, K. H. and J. G. Williamson (2002). After columbus: explaining europe's overseas trade boom, 1500–1800. The Journal of Economic History 62*(2), 417–456. 21*
Pal, C. (2012). Republic of women: rethinking the republic of letters in the seventeenth century, *Volume 99. Cambridge University Press. 21*
Pande, R. and D. Ford (2012). Gender quotas and female leadership. 2
Persson, T. and G. Tabellini (2020). Culture, institutions and policy. 5
Piketty, T. (2020). Capital and ideology. *Harvard University Press. 16*
Piketty, T., E. Saez, and G. Zucman (2018). Distributional national accounts: methods and estimates for the united states. The Quarterly Journal of Economics 133*(2), 553–609. 2*
Plutarch. De Mulierum Virtutibus [English translation, 1931], *Volume III. the Loeb Classical Library edition. 29*
Prior, M. (2005). Women in English society, 1500-1800. *Routledge. 23*
Rawson, B. (Ed.) (1986). The Family in Ancient Rome: New Perspectives. *Croom Helm. 7*
Reis, J. (2005). Economic growth, human capital formation and consumption in western europe before 1800. Living standards in the past: New perspectives on well-being in Asia and Europe, *195–225. 21*
Rieu, D. C. H. (2003). The Iliad. *Penguin UK. 9*
Ross, S. G. (2010). The Birth of Feminism: woman as intellect in Renaissance Italy and England. *Harvard University Press. 21, 22*
Schiebinger, L. (1989). The mind has no sex?: Women in the origins of modern science. *Harvard University Press. 15, 28*
Schwinges, R. C. (1992). Student education, student life. In W. Rüegg (Ed.), A history of the university of Europe, *Volume 1, pp. 195–243. Cambridge Univ Press. 21*
Sewall, M. W. (1894). The World's Congress of Representative Women : a historical rÃ©sumÃ© for popular circulation of the World's Congress of Representative Women. *Chicago : Rond, McNally. 15*
Sewall, M. W. (1899). The international council of women. Fortnightly 66*(391), 151–159. 15*
Sherby, L. S. and W. Odelberg (2002). The who's who of Nobel Prize winners, 1901-2000. *Oryx Pr. 9*
Sievers, S. (1999). Women in Asia: Restoring Women to History, *Chapter Women in China, Japan, and Korea, pp. 157–241. Indiana University Press Bloomington. 29*
Smith, A. (1763). Lectures on Jurisprudence. *Oxford University 1978. 23*
Smith, J. M. (2005). Europe after Rome: a new cultural history 500-1000. *Oxford University Press. 7*
Staves, S. (1990). Married Women's Separate Property in England, 1660-1833. *Harvard University Press. 7*
Stone, L. et al. (1979). The family, sex and marriage in England 1500-1800, *Volume 43. Citeseer. 21, 22*
Stuard, S. M. (1998). Becoming Visible, Women in European History, *Chapter The dominion of gender : women's*

fortunes in the High Middle Ages. Boston: Houghton Mifflin. 7, 28
Suzuki, M. (2011). The History of British Women's Writing, 1610-1690: Volume Three. *Springer.* 22
the Lydian, J. On the magistracies of the Roman constitution [English traslation by Thomas F. Carney in 1965]. *Sydney: Wenthworth Press.* 29
Thelin, J. R. (2011). A history of American higher education. *JHU Press.* 28
Thrupp, J. (1862). The Anglo-Saxon Home: A History of the Domestic Institutions and Customs of England, from the Fifth to the Eleventh Century. *Longman, Green, Longman, & Roberts.* 15
UBS and Wealth-X (2017). Gender distribution of billionaires around the world in 2017. 9
Union, I.-P. and U. Women (2017). Women in politics 2017 map. 9
Van den Bergh, R. (2000). The role of education in the social and legal position of women in roman society. Revue internationale des droits de l'antiquité *(47), 351–364.* 28
Wickham, C. (2009). The inheritance of Rome: A history of Europe from 400 to 1000, *Volume 2. Penguin UK.* 15
Wickham, C. (2016). Medieval Europe. *Yale University Press.* 7, 12
Wiesner, M. E. (1993). Women and gender in early modern Europe. *Cambridge University Press.* 19
Wiesner, M. E. (1998). Becoming Visible, Women in European History, *Chapter Spinning out capital : women's work in preindustrial Europe, 1350-1750. Boston: Houghton Mifflin.* 15
Wiesner-Hanks, M. E. (2008). The Oxford Encyclopedia of Women in World History, *Chapter Europe: Renaissance and Early Modern Period. Oxford University Press.* 4, 13, 15
Wikipedia (2020). Wikipedia:Vital articles — Wikipedia, the free encyclopedia. http://en.wikipedia.org/w/index.php?title=Wikipedia%3AVital%20articles&oldid=994143610. *[Online; accessed 14-December-2020].* 6
Wilkin, R. (2019). The Querelle des femmes, *pp. 190–197. Cambridge University Press.* 4
Williams, D. (2004). Condorcet and modernity. *Cambridge University Press.* 14
Wolf, A. (1986). Reigning queens in medieval europe: When, where, and why. In Medieval Queenship, *pp. 169–188. Springer.* 15
Woolf, V. (1929). A room of one's own and three guineas. *OUP Oxford 2015.* 20
Yu, A. Z., S. Ronen, K. Hu, T. Lu, and C. A. Hidalgo (2016). Pantheon 1.0, a manually verified dataset of globally famous biographies. Scientific data 3, *150075.* 6