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The Household Equipment Revolution

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# The Household Equipment Revolution

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*Abstract:* A brief historical overview of the household equipment revolution and the women who transformed the home in Germany and the United States.

*Keywords:* appliances, housework, leisure, Christine Frederick, Hildegard Margis, Arne Meyer, vintage advertisements

*JEL Numbers:* B31, D13, J22, N32, N34

## Opening

Imagine one day that you wake up and discover all of your household appliances have disappeared!<sup>i</sup> What would you do? How would you prepare meals, wash the dishes, clean the floor, and do the laundry?

Nowadays, in most countries a standard home is typically equipped with an oven, a microwave, a dishwasher, a vacuum cleaner, a washing machine, etc. People take for granted the existence of these household appliances and do not realize the enormous amount of time that household equipment saves in daily life.

## Housework at the Turn of the 20<sup>th</sup> Century

Back in 1900, without household appliances, the average US household spent 58 hours per week on meal preparation, laundry, and cleaning.<sup>ii</sup> Christine Fredrick (1883-1970) communicated the laborious nature of housework around 1910.<sup>iii</sup> “In our country home on Long Island, it required almost an hour for me to daily clean and fill seven portable oil lamps. I operated a hand pump to secure water from the cistern, placed my soup in a box fireless cooker, washed the children’s rompers in an unwieldy ‘dolly’ type washer by plunging its lever up and down, and smoothed these garments with a coal-heated ‘sad-iron.’ I used a broom and an oil mop on the floors” (Frederick, 1929, p. 167).<sup>iv</sup>

In 1900, around 98% of households relied on a 12-cent scrub board for laundering clothes. The process involved transporting water to the stove where it was heated using wood or coal. Clothes were then cleaned using either a washboard or a mechanical washing machine. Subsequent rinsing was necessary. To remove excess water, clothes were either wrung out manually or through a mechanical wringer. Then, they were hung on a clothesline for drying. The final step involved the laborious task of ironing, utilizing weighty flatirons that required constant heating on the stove.

A similar picture was depicted for Germany during the 1920s by Erna Meyer (1890-1975) -- see Figure 1.



Figure 1. A woman doing laundry in Germany during the 1920s.<sup>v</sup>

# The Decline in Hours of Housework

The time spent on household chores has declined sharply over the 20th century, reaching just 18 hours per week by 1975 (see Figure 2). This process was gradual and stabilized after the 1990s.

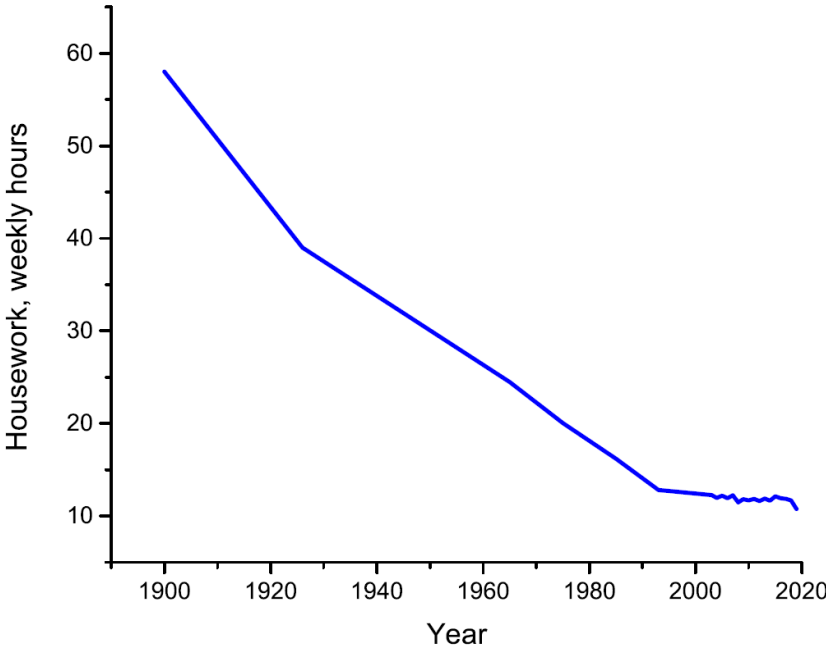


Figure 2. The decline in weekly hours spent on housework in the United States.<sup>vi</sup>

Nowadays, there are still differences across countries in the average weekly hours spent on housework. Households in poorer countries tend to spend more time on cleaning and cooking as the adoption of modern home appliances and technological innovations is slower than in richer countries. For example, in 2005 only 36% and 64% of households in Brazil and Mexico, respectively, owned a washing machine as opposed to 82% in the United States.<sup>vii</sup>

## Engines of Liberation

The drop in time spent on household chores took place in a period during which household appliances emerged and became widely adopted. Figure 3, upper panel, illustrates the diffusion over time of common electrical appliances for American households. The widespread adoption of these appliances was driven by a significant decline in their time prices (Figure 3, lower panel). The time price is an index measuring the amount of time an average person would need to work to afford the appliance. Miele launched Europe's first mass-produced washing machine in 1901 and the first dishwasher in 1929 (See Figure 4).

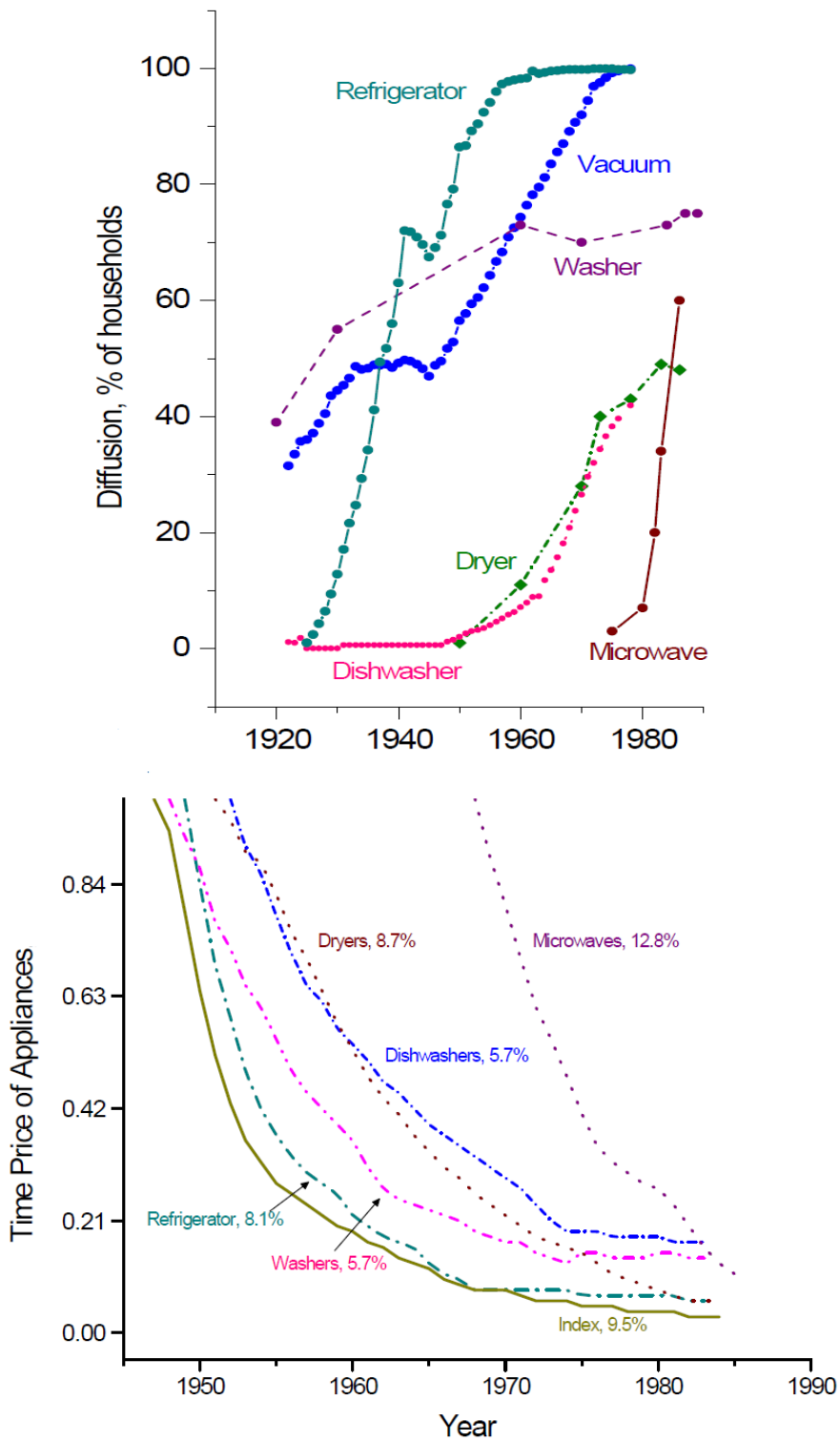


Figure 3. The diffusion (upper panel) and the time price (lower panel) of electrical appliances through the U.S. economy.<sup>viii</sup>

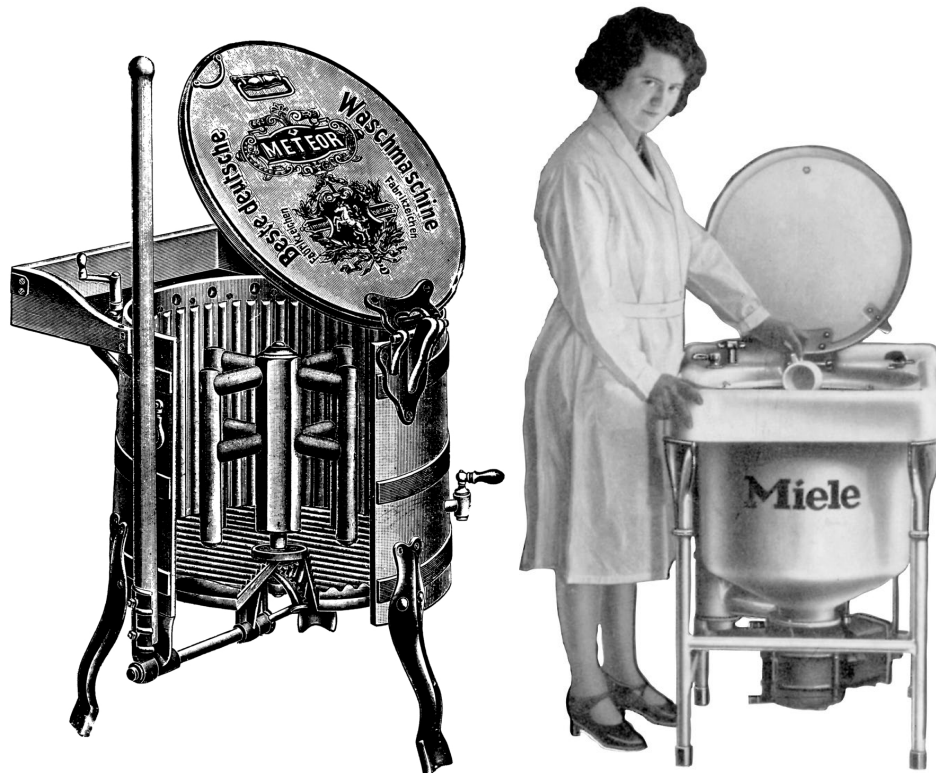


Figure 4. Miele's first washing machine (right panel) and first dishwasher (left panel).

In 1945-46, the Rural Electrification Authority conducted a study, focusing on 12 farm wives in the United States to assess the impact of electrification on laundry activities. The comparison involved evaluating the time spent handwashing versus utilizing electrical equipment. Each participant was equipped with a pedometer. One of them was Mrs. Verett. Before electrification, she employed a gas-powered washing machine (as opposed to a scrub board) for laundry tasks. Post-electrification, she adopted electrical appliances such as a washer, dryer, and iron, along with the installation of a water system featuring a water heater. The study estimated that, before being equipped with electric appliances, handwashing a 38 lb. load took approximately 4 hours, with an additional 4.5 hours for ironing, using traditional irons. In contrast, utilizing electrical appliances reduced laundry time to 41 minutes, with ironing taking 1.75 hours. The distance Mrs. Verett walked for handwashing decreased from 3,181 feet to 332 feet with electrical equipment. Similarly, the distance covered during ironing fell from 3,122 feet to 333 feet with the adoption of electrical appliances.

Meyer (1926) compares three different types of sewing machines, namely manual, treadle, and motorized, in terms of speed and the effort that a woman had to exert on each of them (see Figure 5). The introduction of the treadle sewing machine led to a significant reduction in the required effort but without any improvement in speed. Then, the motorized sewing machine increased sewing speed considerably.



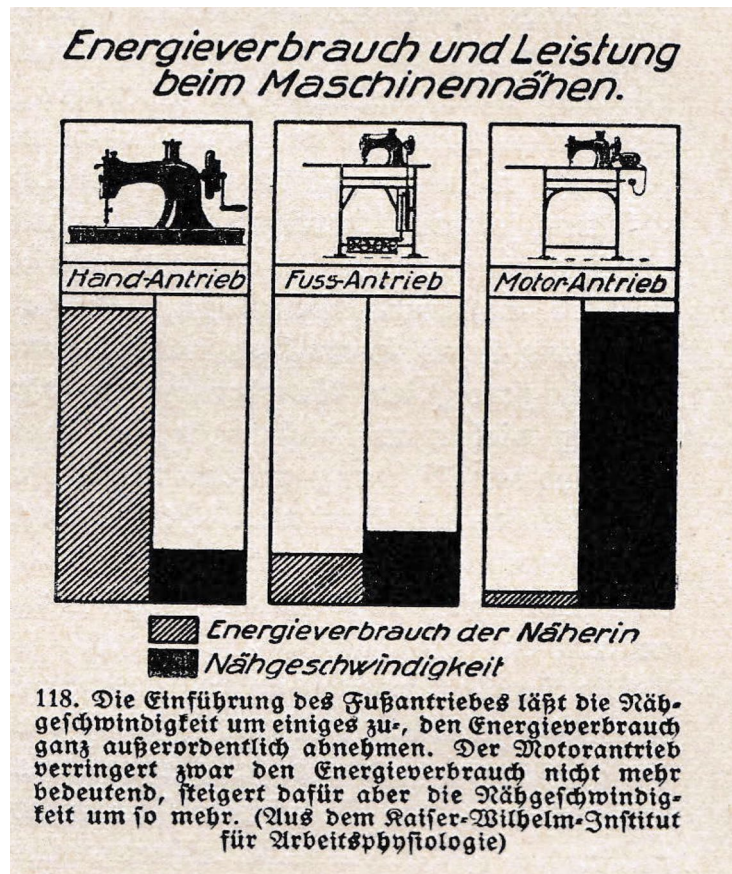


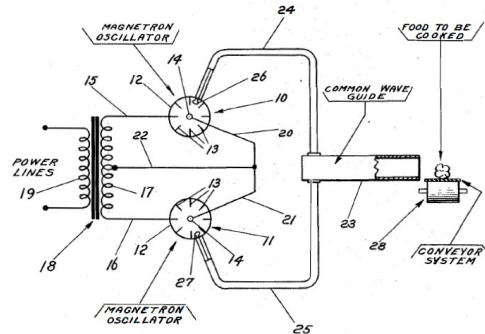
Figure 5. Comparison of sewing machines' energy consumption and efficiency. The thatched blocks show effort and the solid ones speed.<sup>ix</sup>

During the onset of the Second Industrial Revolution, women's magazines brimmed with articles praising the benefits of household appliances in assisting women with domestic tasks. For example, a 1920 piece in the *Ladies' Home Journal* titled "Making Housekeeping Automatic" asserted that household appliances could save a four-person family 18.5 hours of weekly housework (of which 8.5 was for meal preparation and 7.75 for cleaning, dishwashing, washing, and ironing).

A similar movement took place also in Germany. For example, Margis Hildegard (1887-1944) and Mechthilde Raetsch (unk.-unk.) mention in their book:

"Considering that there is hardly any need for constant supervision during electric cooking, and the homemaker can attend to other tasks during the cooking process, it is safe to say that electric cooking is a significant relief for the homemaker". "The housewife is no longer tied to monitoring the cooking process as before, freeing her up to engage in other household tasks during cooking. It is a considerable relief for her, especially since she is no longer confined to 'the kitchen' even during cooking." (Hildegard and Raetsch, 1933, p.13 and p.18)<sup>x xi</sup>

The microwave oven is another time-saving device. It was invented in 1945 by Perry Spencer (1894-1970). While working with a magnetron, a high-power vacuum tube used in radars, he noticed that a chocolate bar in his pocket melted. Investigating, he then placed an egg in a tea kettle by the magnetron. It exploded with hot yolk. He then built a metal box and saw that food could be cooked by microwaves. This was the genesis of the microwave oven. The company he worked for, Raytheon, filed a patent application in 1945-see Figure 6 (top panel).



INVENTOR.  
 PERCY L. SPENCER,  
 BY *Clara J. [Signature]*  
 ATTORNEY.



Figure 6: Upper Panel, Perry Spencer's 1945 patent application for a microwave oven.<sup>xii</sup> Lower panel, A Miele vintage 1977 microwave oven.

The first use of microwave ovens was in commercial restaurants. The food industry used them for various things such as drying potato chips and roasting coffee. These commercial microwaves were expensive and huge, \$2,000 to \$3,000 (or about \$22,000 to \$33,000 in today's terms) and 6 feet high. The microwave oven entered the home in the 1970's—see Figure 6 bottom panel. It diffused rapidly among households, propelled by a rapid (quality-adjusted) price drop of 60% by 1980.



What would a microwave oven be without frozen foods? Frozen foods were introduced by Clarence Birdseye (1886-1956) in the early 1920s. When ice fishing in Canada, he learned that when fish were frozen rapidly, they were still fresh when thawed. He sold his patents and company for \$22 million (about \$325 million in today's dollars) to what became General Foods Corporation. Marjorie Merriweather Post (1887-1973), who inherited the company from her father in 1914, headed this company. It is known for a variety of products such as Birds Eye frozen foods, Hostess Food Products, Kraft Foods Inc, Post Cereals, etc.

## Taylorism in the Home

In 1909 Fredrick Winslow Taylor (1856-1915) published a book titled *The Principles of Scientific Management*. A mechanical engineer by training, he was interested in increasing industrial efficiency by rationalizing the industrial workplace. It wasn't long before pathbreaking women, such as Christine Frederick and Arne Meyer, strived for efficiency at the home.

In parallel to the advancement of new home appliances, the organization of household tasks also underwent rationalization. In 1912, Christine Frederick set up the Applecroft Experiment Station—see Figure 7. The station's goal was to promote efficiency in housework. To this end, she conducted time and motion studies on housework, tested various new household appliances, and studied kitchen design.



Figure 7: Christine Frederick in her Applecroft testing kitchen.<sup>xiii</sup>

Frederick initially applied her innovative approach to dishwashing, later extending its application to various tasks. She meticulously dissected dishwashing into three distinct

phases: scraping and stacking, washing, and drying, as well as putting away dishes and utensils. Frederick's calculations led her to determine the optimal sink height, and she discovered that efficiency in dishwashing could be significantly improved by incorporating drainboards on the left, utilizing deeper sinks, and connecting a rinsing hose to the hot water outlet—yielding a time-saving benefit of approximately 15 minutes per dinner. In 1913, she reflected on the unnecessary physical strain experienced by countless women who stooped over kitchen tables, sinks, and ironing boards, drawing parallels to the strain endured by bricklayers.<sup>xiv</sup>

Frederick, along with others in the home economics movement, exerted a substantial influence on the design of appliances and homes. The evolution of the kitchen serves as a notable example. In the 1800s, kitchens were characterized by large tables and isolated dressers. However, by the 1930s, an organized kitchen with continuous working surfaces and built-in cabinets began to emerge. The integration of kitchens with dining rooms and other living areas in the 1940s marked the end of the housewife's isolation.

Figure 8 displays two diagrams by Christine Frederick, illustrating a poorly organized kitchen on the left and an efficiently organized one on the right. In the efficiently organized kitchen, equipment for food preparation (A) and clearing (B) are strategically arranged in proximity, contrasting with the more haphazard arrangement in the poorly planned kitchen.

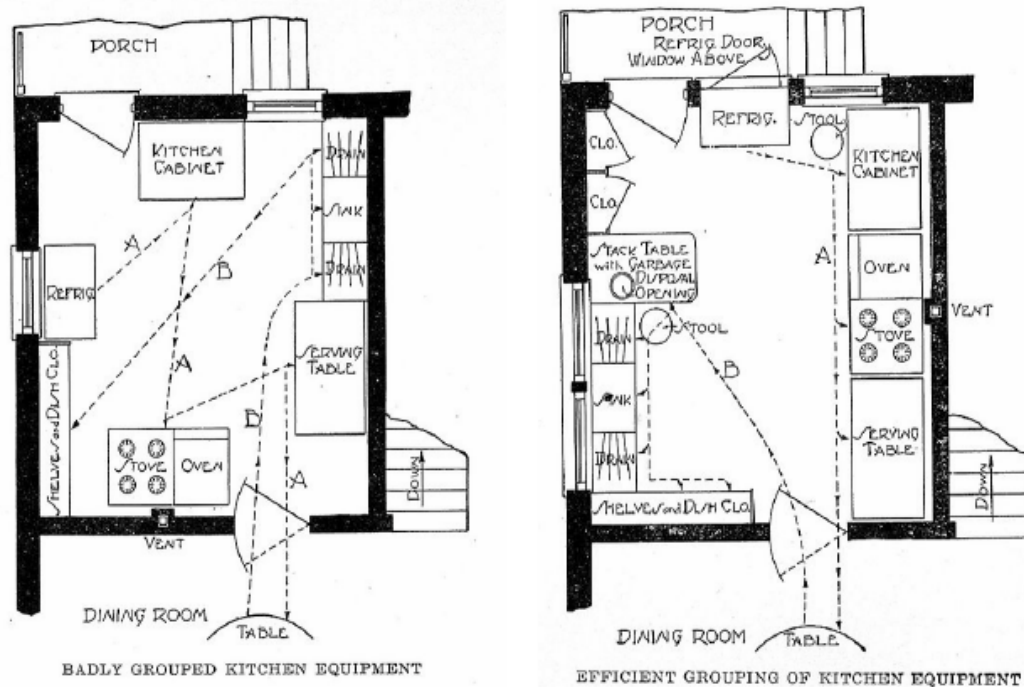
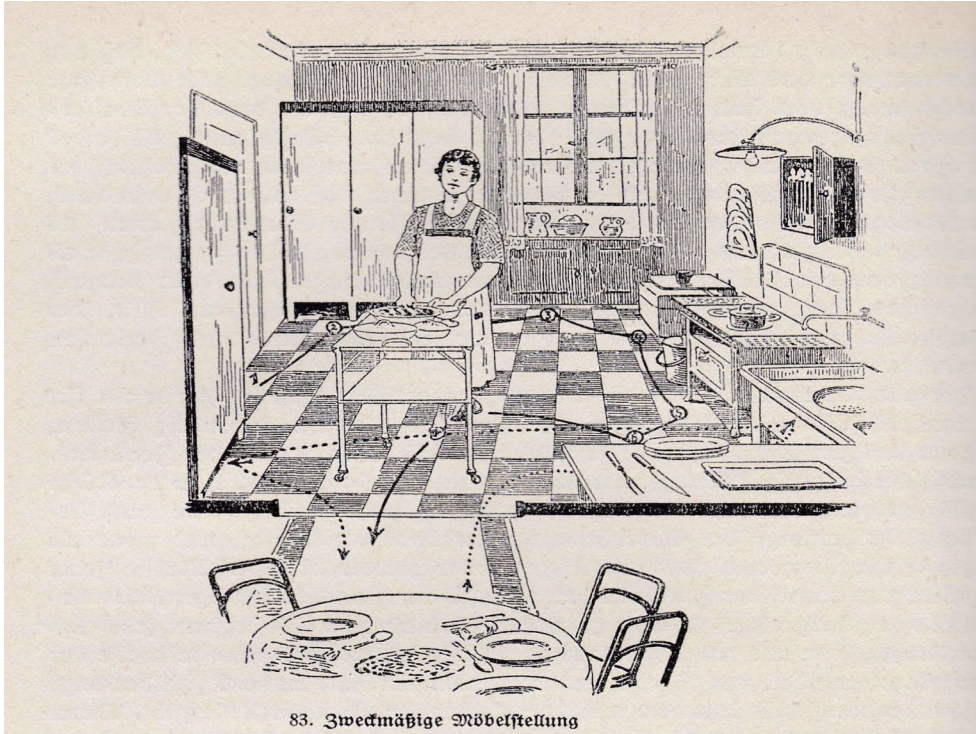


Figure 8. A badly organized kitchen (left panel) and an efficiently organized kitchen (right panel). "A" shows the preparing route, while "B" denotes the clearing one.<sup>xv</sup>

A few years later, Arne Meyer emphasized efficient kitchen organization in her 1926 book "Der neue Haushalt" (The New Household in English). She proposed an efficient kitchen floor plan, which could be implemented in both the simplest and most luxurious kitchens (see Figure 9).



83. Zweckmäßige Möbelstellung  
*Figure 9. The right kitchen furniture organization.<sup>xvi</sup>*

The quest for attaining the most ergonomic work posture gives rise to another crucial requirement, already extensively addressed by industrial workers due to its long-acknowledged significance: ensuring the proper working height. All items need to be adjusted at a certain height, referred to as the working height. According to Meyer, this height is deemed correct (“Richtig” in German, see Figure 10) when it minimizes tension, even in muscle groups not directly engaged in the task, and when there is no discomfort or pain in the feet, legs, chest, back, or neck, even during prolonged periods of work.



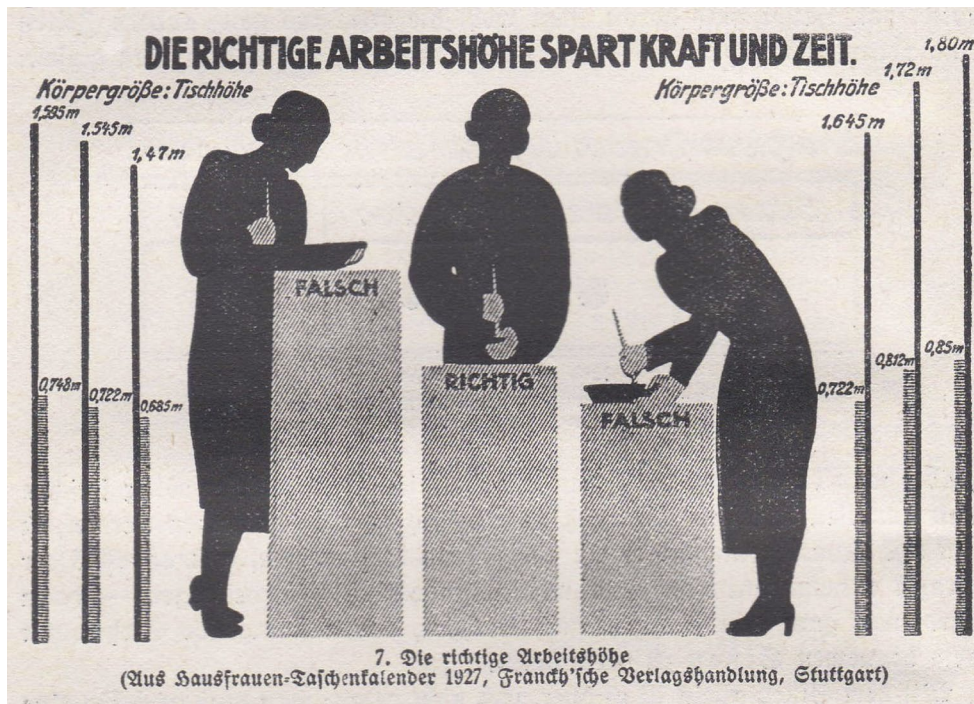


Figure 10. The right working height. (From housewife Taschenkalender 1927).<sup>xvii</sup>

## Selling Mrs. Consumer<sup>xviii</sup>

When marketing was in its infancy, Christine Frederick wrote a book titled *Selling Mrs. Consumer*. The first chapter was titled “The Growing Recognition of the Need for Consumer Study.” She wrote that “consumer market research is the bridge that covers the great gap by which most business firms are separated from the consumers,” (Frederick, 1929, p. 89) further writing “knowledge of the consumer is gained by analytical study, research, test, consultation and experimental contact” (Frederick, 1929, p. 99). She was particularly interested in marketing new household appliances to women.

In her book she presented many facts about the American consumer. She showed a pie chart displaying the percentage shares of 5 broad categories of spending to total consumer spending in 1913 and the growth of each category from 1913 to 1923: viz., food, clothing, housing, fuel-light, furniture-furnishing, and miscellaneous. She subsequently provided a detailed breakdown of per-capita spending within each category. She also examined three aggregated consumption categories by 10 income levels. As income levels fell families spent proportionately more on necessities, less on advancement, and had smaller surpluses.<sup>xix</sup> Spending was also broken down across men and women.

An example of marketing in the 1930s in Ireland and from the 1950s in Germany is displayed in Figure 11. Note the stress on the gain in leisure from new electric appliances. The Irish advertisement states “The Mistress of the Home free from unnecessary toil, free from health-destroying fatigue, free to rest and read”. In the same vein, the German advertisement states “The housewife had a long, tiring day at work. Any relief is very welcome.” Christine Frederick (1929, p. 170) advised “the seller must always keep in mind when offering household equipment: does this tool, device, or appliance give Mrs. Consumer more leisure?”



To enjoy the full benefits of electricity the home should be wired not merely for lighting, but also for the use of electrical appliances. This is the really essential factor which is usually forgotten. When your home is being wired, insist on it being adequately fitted. In that way only can you have perfect electrical service.

THE house fragrantly clean. The laundered things crisp and snowy. The food easily and perfectly cooked. The Mistress of the Home free from unnecessary toil—free from health-destroying fatigue—free to rest and read and recapture that sense of buoyant joy in life which comes from congenial work and compensating ease.

**ELECTRICITY**

LIGHTS COOKS WASHES  
HEATS CLEANS IRONS

with the highest degree of comfort and efficiency for the lowest expenditure of energy, time and money.

**ELECTRICITY SUPPLY BOARD**  
Showrooms : 25 St. Stephen's Green, Dublin



**Miele macht's der Hausfrau leichter**

Die Hausfrau hat einen langen, anstrengenden Arbeitstag. Jede Erleichterung ist da hochwillkommen. Die ganze Familie profitiert davon. Besonders aber den Kindern kommt es zugute, wenn Mutti es leichter hat und mehr Zeit für die Kinder findet (siehe Foto).



Zu den größten Erleichterungen im Haushalt gehört die Waschmaschine—eine Miele-Waschmaschine. Eine Miele-Waschmaschine erledigt die kleine und große Wäsche mühelos und spielend-leicht. Dabei wäscht Miele schonend-fein und pfleglich-sanft. Ja, Miele ist eine Wohltat für die Hausfrau und die Wäsche.



Für jeden Haushalt, für jede Waschleistung und für jede Beheizungsart bietet Miele die richtige Waschmaschine. Diese einzigartige Vielseitigkeit ist das Ergebnis einer mehr als 50-jährigen Erfahrung in der Herstellung von Waschmaschinen.



- 1. Miele-Automatik, wunderbar in Form und Leistung
- 2. Miele 155, spritzt und bewahrt
- 3. Miele 307, besonders große Waschleistung
- 4. Miele 75 S, ideal für die Hausfrau
- 5. Miele Haushalt-Wäscheschleuder



... weil die Auswahl so groß ist

Bitte fordern Sie Prospekte an Mielewerke A.G., Göttingen/W.

Figure 11. The upper panel shows a 1930s ad for a Dublin appliance store.<sup>xx</sup> The lower panel shows a 1950s ad for a Miele washing machine.



# Changing Households

The household equipment revolution changed the way of life for households around the world during the 20<sup>th</sup> century—see Figure 12. With the reduction in the needs for household labor, driven by the introduction of new home appliances and the rationalization of the home, there was a notable increase in female labor-force participation worldwide—see Figure 13.<sup>xxi</sup> The household equipment revolution is significant even when judged alongside the new technologies in industry brought about by the Second Industrial Revolution at the turn of the last century. The decline in household labor also reduced the benefits of the traditional division of labor, with a breadwinner husband and housekeeper wife, lessening the incentives to get married—see Figure 14.<sup>xxii</sup> The household equipment revolution was an engine of liberation.



Figure 12: A 1958 ad for a Miele washing machine with the slogan “In many countries, in many languages there is nothing like a Miele, Miele makes things easier for housewives.”

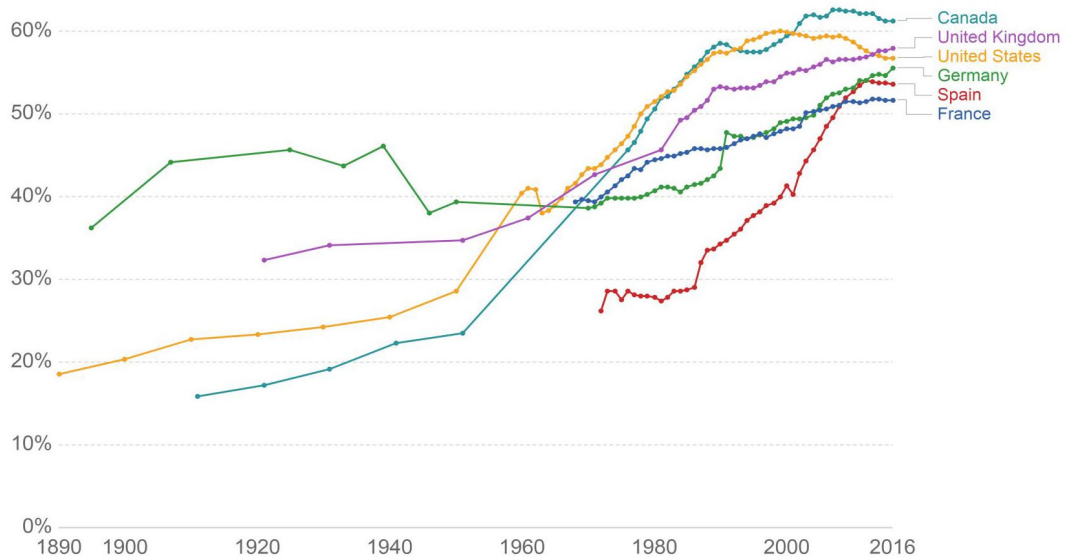


Figure 13. Evolution of Female Labor-Force Participation rates in a set of countries.

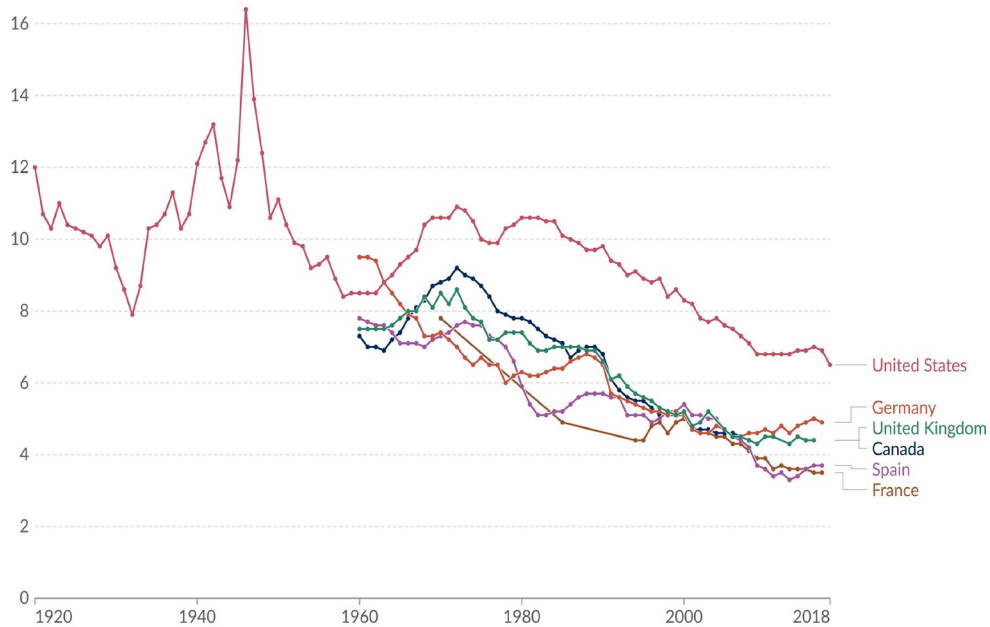


Figure 14. Evolution of Marriage rates in a set of countries.

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<sup>i</sup> Some of the materials used in this chapter are based on Greenwood (2019) and Greenwood, Guner, and Marto (2023). We thank Jiangting Wang for excellent research assistance.

<sup>ii</sup> Source: Greenwood (2019).

<sup>iii</sup> A biography of Christine Frederick is provided in Rutherford (2003).

<sup>iv</sup> The fireless cooker was an insulated metal box used to store food initially heated by coal or wood and further cooked by preheated soapstone disks placed at the bottom of the contraption.

<sup>v</sup> Source: Meyer (1926).

<sup>vi</sup> Source: Greenwood, Guner, and Marto (2023).

<sup>vii</sup> Source: Cubas (2016).

<sup>viii</sup> Source: Greenwood, Seshadri, and Yorukoglu (2005).

<sup>ix</sup> Source: Meyer (1926).

<sup>x</sup> The original quotes in German read as follows: "Wenn man bedenkt, dass beim elektrischen Kochen kaum ein Zwang zur Beaufsichtigung besteht, also die Hausfrau während des Kochprozesses andere Arbeiten erledigen kann, darf man ruhig behaupten, dass das elektrische Kochen eine große Entlastung für die Hausfrau ist".

"Die Hausfrau ist nicht mehr wie früher an die Überwachung des Kochguts gebunden. Sie wird von der lästigen Herdarbeit befreit und kann während des Kochens anderen Hausarbeiten nachgehen. Das ist eine erhebliche Entlastung, insbesondere weil sie während des Kochvorgangs nicht mehr ausschließlich an "die Küche" gebunden ist".

<sup>xi</sup> Hildegard Margis was a devotee of household technologies and of rationalizing the home. As well as writing articles and books devoted to household matters, she started Heibaudi, a service for home economics purchasing, consulting, and information. She also set up a publishing house in 1928 with Deutsche Verlags-Anstalt devoted to household issues. She subsequently joined forces with Ullstein Verlag in 1930, disseminating information on women's matters. Margis spoke on the radio about household rationalization. She died at age 57 after being tortured by the Gestapo. She was Jewish. More details about her life can be found in von Braun (2007).

<sup>xii</sup> Source: United States Patent and Trademark Office.

<sup>xiii</sup> Source: Schlesinger Library, Radcliffe Institute, Harvard University.

<sup>xiv</sup> Frank Bunker Gilbreth (1886-1924) was an early proponent of scientific management. He dramatically increased efficiency in bricklaying. One of his innovations was an adjustable shelf that allowed bricklayers to pick up bricks without having to stoop down. In 1909 he wrote a book titled *Bricklaying Systems*.

<sup>xv</sup> Source: Frederick (1919, pp. 22-23).

<sup>xvi</sup> Source: Meyer (1926).

<sup>xvii</sup> Source: Meyer (1926).

<sup>xviii</sup> The title of Christine Frederick's 1929 book.

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<sup>xix</sup> It's unclear what exactly she meant by advancement and surplus, but an educated guess is that advancement was spending on things such as education, personal care, recreation, and travel, while the surplus referred to savings.

<sup>xx</sup> Source: Wikimedia Commons.

<sup>xxi</sup> Proportion of the female population ages 15 and over that is economically active. Source: Our World in Data based on OECD and Long (1958).

<sup>xxii</sup> Ratio of the number of marriages during the year to the average population in that year, expressed per 1,000 inhabitants. Source: Our World in Data based on UN, OECD, and Eurostat.