

# *Hidden Tax*

## *—Analysis of Premium Level for Sanitary Napkins and Adult Diapers*

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**Abstract:** As the social attention on women's dilemma, some unfair regulations have raised a heated discussion, and the 'pink tax' which is a hidden tax levied on homogeneous products consumed by women, and most of those products have the same quality and raw material, but higher prices when it is marketed as female-targeted goods. In this paper, unlike the previous researches focusing on pink tax in united industry, it shows the price disparities also exist on conventional women commodity, and mainly investigate the similarity and difference of sanitary napkins and adult diapers. By analyzing the costs of raw material, comprehensive applications and market prices of both kinds of products, calculating and comparing the net profit margins of the two industries, the results confirm the existence of price disparity on these two goods under similar costs, but because of the lack of database and specific cases, further researches are necessary for verification. This work may widen people's horizon on pink tax, which is not limited on the comparison of opposite genders' products, but the price bias on feminine goods, and it can promote Economics gender equality.

**Keywords:** pink tax, sanitary napkins and adult diapers, gender equality of economics

## 1. Introduction

According to extensive previous research, gaps are existing in income levels, wage payments, and working opportunities because of gender basis. By the research from Zhilian Website [1], in China, the average monthly income for females is 8138yuan and that for males is 9328yuan. As the interview shows, 59.1% of female interviewers expressed that they are in a more dilemma under the situation of COVID-19, which is much more than the proportion of males.

While these wage and salary discrepancies have been well-documented, other, more subtle ways in which women are financially burdened remain less understood. One such practice is known as the "pink tax", which broadly refers to the additional sum of money paid by female consumers for products and services that are essentially identical but are marketed specifically to women, hence with unique features that justify the increased price when compared to their male-targeted counterparts [2].

Based on the profit-maximizing theory, as rational agents, a lot of retailers and producers tend to confer and increase the price of female-targeted goods for higher revenue, and this situation is very

common in almost all necessities, like children's toys, homogeneous clothing, identical toiletries and so forth. As the research in <The Pink Tax How Gender-Based Pricing Hurts Women's Buying Power> by Ranking Democrat Carolyn B. Maloney showed, the two identical Microsoft Wireless Mobile Mouse 1850 in pink and blue each, with the price of \$21.89 and \$15.79 respectively. All these products targeted opposite genders that provide equal merit or even less use and are produced with the same materials, have disparities in prices, and most of them targeted female consumers will adhere extra decorations or packaging with feminine features to attract females' attention, leading to differences with the ones consumed by males, but the costs and genuine materials have no changes [3].

Additionally, some products with the same price and raw materials for different genders, contain different volumes or amounts in gender-differed packages. Steaks and popcorns are the main instances, in which ones consumed by women consumers are much less or smaller than by males. As a result, women have to burden living standards more than males in daily life, especially for buying such higher-price or less-volume goods.

According to the extensive discoveries and collection of the database, we found that besides the price disparities of unified industry, in the conventional women commodity, there also exists pink tax. Those commodities and industries only targeting females have problems of excessive appreciation, relative to homogeneous products. This means these female products will be charged higher than the defined price level according to some useless marketing strategies, like feminine color, branding popularization, and spokesperson strategy, causing the increase in selling price. For instance, sanitary napkins and the adult diapers can be example for further study and analysis.

According to the Chinese online shopping website, the most common sanitary napkin and adult diaper have almost 4.1RMB difference per piece, and the raw material for adult diaper is even more expensive, which is macromolecular PE leak proof membrane. In comparison, the introduction of sanitary napkin is its novel packing of the product and its new smell, which is not useful for covering bloody smells. This specific example of sanitary napkin and adult diaper may not have universality and common rules, so this essay will dive more justified and authoritative database in the second part of literature review.

This kind of price difference is very tricky and has huge invisibility. Although both sanitary napkin and adult diaper belong to the kind of personal care products, focus on absorption and sanitation, the special physiological differences of women cause the gaps in social conception of female-only products and other substitutes, and people can approve the existence of price disparity in these two kinds of close substitutes.

This adds to women's living burdens and decreases their living standards, especially for the ones from poor families whose family income is much lower than the average income level, and the monthly payments for sanitary napkin will be a heavy burden for individuals and families. As a result, to save the living costs, girls tend to reduce the frequency of changing sanitary napkin, or consuming those overdue or without product certifications, and some healthcare problems will arise, then leading to some negative externalities.

However, the present and actual data for this aspect are limited and scarce, causing difficulty in collecting and organizing data. So, in the next parts of the paper, it will propose some designs for study and use some specific methods to estimate the rationality and authenticity of price disparities in sanitary napkin and adult diaper.

It is hopeful that this paper can expand the research domain of pink tax, enlarging from normal unified industries to all products including conditional female industry, and redefine the concept of pink tax. Finally, promote the steps and frequency of gender equity in society.

## 2. Literature Review

### 2.1. Research Summary on Pink Tax

#### 2.1.1. History of Feminine Pink

The history of pink as feminine color is from World War II, that women in blue meant they were ready to support the war effort and replace vacant jobs left behind by men in the service. Subsequently, when the war ended, the propaganda took a turn and then showcased women returning to the role of supportive housewife. Afterward, pink in women means they can rely on their husbands and families.

Because of the basic history, pink is defined as a girly color, with some meaning of gender basis and discrimination. Although according to the research done regarding color preference among genders by Yazıcıoğlu [4], women are naturally attracted by the color reddish-purple, and Anya C. Hurlbert and Yazhu Ling [5], also found that men are naturally attracted to colors within the range of blue and green. But the society's central ideas on exclusive relative choice for women and feminine features, like pink color and flower decoration, secretly enforce women consuming those female-targeted products. As Mackenzi Lafferty said, through the flourish of trumpets by social media and conventions, women are programmed to believe that their natural appearance will not be good enough and the only way to be accepted is to purchase these pink products branded to them [6].

#### 2.1.2. Luxury Tax and Tampon Tax

Mackenzi Lafferty in Monmouth College also raised the definition of luxury tax [6]. The luxury tax is not directly associated with the pink tax. The tax is in place as tampons and other feminine hygiene products are as viewed as luxury goods. In Australia, female consumers have to pay 10% GST for sanitary napkin, as this kind of product has not been counted in life necessities. In counterpart, males' health care products, like Viagra, are often included in healthcare planning. In Australia, most medicines are in the region of life necessities without paying GST.

Moreover, the pink tax is also referred to as 'the tampon tax', which means there are always extra taxes added on feminine hygiene products, like tampons, sanitary napkin and so on [7]. This tax directly represents discrimination against women, whose basic living standards and rights are treated on a basis, that they have to pay more taxes on such a common and normal issue.

### 2.2. Research Summary on Domestic Market of Adult Diapers

In adult incontinence product market, there are basically three main types of diapers. The first one which is hold the greatest market share for over 50% is waist diaper. It is designed for disabled old people and bedridden patients. The second one is paper diaper. It is more likely to be alternatives of sanitary napkins. It has lowest price and simple technics among these. The third one is pants diaper which can deal with moderate incontinence. It is the most expensive among these.

The structure of adult diapers is basically includes:

- Surface non-woven fabric
- Diversion non-woven fabric
- Fluff pulp and SAP
- Tissue
- Bottom layer

Surface and diversion non-woven fabric diffuse urine to fluff pulp and SAP and tissue which keep urine in it. The bottom layer is made by waterproof material. Table 1 shows the raw material and cost split for adult diapers.

Table 1: Cost split of raw material [8].

Unit prices of raw materials	2017	2018	2019
Non-woven fabric (yuan/kilo)	14.67	15.16	15.09
High polymer rubber (yuan/kilo)	9.73	10.52	9.39
Wood tissue (yuan/kilo)	4.58	5.57	5.05
Covers (yuan/piece)	0.28	0.30	0.30
Melt adhesive (yuan/kilo)	18.92	18.66	18.50

Figure 1 shows the change in average market unit price of adults' incontinence products from 2012 to 2018. From 2012 to 2017, average unit price of adults incontinence products decrease from 1.83 yuan to 1.40 yuan. It increases to 1.59 in 2018.



Figure 1: The market unit price of adult incontinence products in China [8].

### 2.3. Research Summary on Domestic Market of Sanitary Napkins

The market penetration of sanitary pads has increased a lot with the education level of women. With the improvement of economic strength and social status, product penetration has reached a high level, and price increase has become the main growth engine. As shown in figure 2, since 2006, the market size of feminine hygiene products in China has been growing from 30 billion yuan to nearly 90 billion yuan. Until 2017, the market penetration rate rose to 100. (See Figure 3)

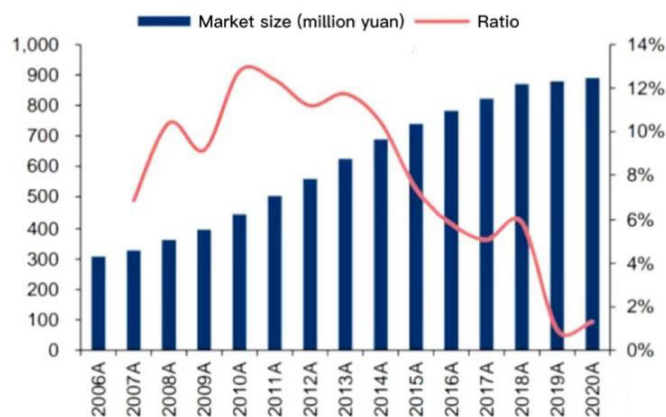


Figure 2: Market size of in China [9].

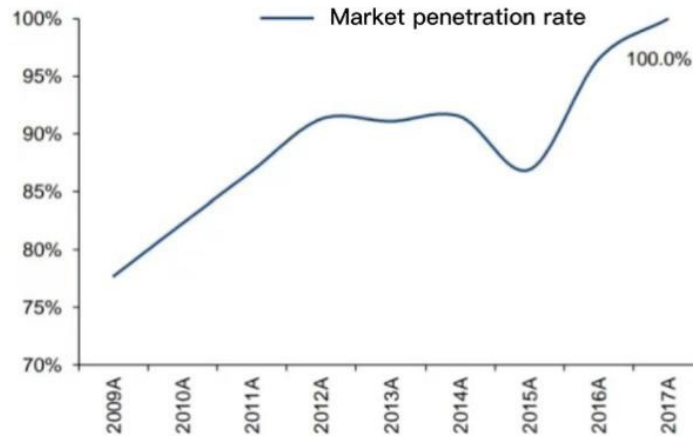


Figure 3: Sanitary napkin market penetration rate in China [9].

As sanitary pads gradually become an indispensable part of women's lives, many enterprises have begun to focus on exploiting the business opportunities. To avoid brand influence on the price of these products, there is a intuitive data. Taking Baiya as an example. Its ex-factory price is 0.38 yuan/piece, the primary distribution price is 0.51 yuan/piece, and the average terminal selling price is about 1.25 yuan/piece, which is 3.3 times the ex-factory price.

It is more expensive for pants-type sanitary napkins that differ from pad-type sanitary napkins. Table 2 shows the unit prices of panty sanitary napkins of common brands in the Chinese market. All the prices were over \$3 per piece and the highest was almost \$10 per piece.

Table 2: Prices of panty sanitary napkins [8].

Brand	Price (yuan/piece)
freemore	4.58
whisper	9.98
Kotex	6.48
Sofy	3.96
Space	3.32

The industry can be identified as a high gross margin industry. From table 3, one of the brands have gross margin as high as 72.2%. The gross margin of other brands are also above 40%.

Table 3: Gross margin of five brands [8].

Company	Hengan	Jingxing	Baiya	Unicharm	P&G
Brand	Space7	ABC	Freemore	Sofy	Whisper
Brand gross margin	72.2%	43.4%	55.4%	-	-
Company gross profit margin	46.9%	41.7%	45.9%	38.7%	50.0%

After 2018, the gross margin of feminine hygiene products continued to be higher than that of adult incontinence products as shown in the table 4.

Table 4: Gross profit margin of feminine hygiene product and adult incontinence product [8].

	2017	2018	2019	2020
Feminine hygiene product	30.4%	29.9%	35.8%	42.9%
Adult incontinence product	30.9%	27.5%	30.6%	38.2%

## 2.4. Commentary

Under such a high gross profit margin, the structure and material of sanitary napkins are actually not very complicated. In the production of sanitary napkin, the absorbent cost accounts for the largest proportion of raw materials, about 50% (including part of non-woven fabrics, macromolecular tree fat, dust-free paper, fluff pulp, etc.). Raw materials account for about 80% of operating costs. However, the structure of adult diapers is almost the same as the structure of sanitary napkins, which mainly includes four parts:

- (1) The main surface (the main material is breathable non-woven fabric)
- (2) The diversion layer which is located between the surface layer and the absorption core layer, its function is to transfer the liquid received by the surface layer to the absorption layer, (the main material is the punched non-woven fabric)
- (3) The absorbing core layer which can quickly absorb and disperse the liquid absorbing core layer (the main materials are Super Absorbent Polymer and villous slurry)
- (4) The bottom which can prevent leakage (the main material is non-woven fabric or polyethylene film)

It can be seen that there is no difference between the main material and cost of sanitary napkins and adult diapers. Their functions are almost identical, especially for the pants-type. There is a strong fungibility between the two of them.

## 3. Methodology

The previous analysis of sanitary napkins and adult diapers shows their substitutability. But comparing the market price and size of two products is not enough to show whether there is a pink tax, because different companies may use different materials and costs in their production. In order to get a clearer result, gross margin should be calculate. The Gross Profit Margin shows the income a company has left over after paying off all direct expenses related to manufacturing a product or providing a service. This can better see whether there is discrimination between the two products when targeting different consumers, so as to obtain higher profits.

$$\text{Gross Margin} = \frac{\text{Total Revenue} - \text{Cost of Goods Sold}}{\text{Total Revenue}} \times 10 \quad (1)$$

## 4. Result

Next, we will show 3 different ways for calculating and comparing the net profit margins of the two industries

1. Finding the average gross margins of the two industries and compare them. If the average gross margin in the sanitary napkin industry is substantially higher than in the adult nappy industry, we can assume that there is gender-based price discrimination in the absorbent products industry, which is so-called pink tax.

2. When comparing the gross profit margin of different enterprises in the two industries, ANOVA can be used. It provides a statistical test of whether their mean gross profit margins are equal in the sanitary napkin industry and the adult diaper industry by examining the total sum of squares, between the sum of squares, within the sum of squares, and finally the ratio of between means sum of squares

and within means sum of squares, which is also used as F-value to test the statistical significance. If there is a statistical significance in F-value, then we can conclude that premium levels exist and might be attributed to pink tax, as we have excluded the influence of compulsory cost of sales, and consumed these leading businesses are of equal size. (See Table 5)

Table 5: comparing the gross margin of different enterprises in the two industries.  
 ANOVA [Owner-draw].

	Company1	Company2	.....
Sanitary napkin	$Y_{11}$	$Y_{12}$	$Y_{1n}$
Adult diaper	$Y_{21}$	$Y_{22}$	$Y_{2n}$

$$TSS: \sum_i \sum_j (Y_{ij} - \bar{Y}_{total})^2 \quad (2)$$

$$WSS: \sum_i \sum_j (Y_{ij} - \bar{Y}_i)^2 \quad (3)$$

$$BSS: \sum_i n_i (Y_j - \bar{Y}_{total})^2 \quad (4)$$

$$F - Value: \frac{BMSS}{WMSS} \quad (5)$$

3. As there is not enough data available, we will use hypothesis testing. Experiments are conducted to test the gross margin of each of sanitary napkin and adult diaper industry. A random sample of  $n_x$  companies of sanitary napkin industry and a random sample of  $n_y$  companies of adult diaper industry are selected. ( $n > 30$ ) The measured in gross margin of sanitary napkin and adult diaper industry, with appropriate units, are recorded as X and Y.

The test, at the  $\alpha\%$  significance level, of the null hypothesis that the differences between the population means of X and Y is 0 against the alternative hypothesis that it is larger than 0 is carried out.

$$H_0: \mu_A - \mu_B = 0 \quad H_1: \mu_A - \mu_B > 0$$

According to central limit theorem, when n is bigger than 30, it can be seen as normal distribution.

$$S_X^2 = \frac{\sum X^2 - n_x \bar{X}^2}{n_x - 1} \quad S_Y^2 = \frac{\sum Y^2 - n_y \bar{Y}^2}{n_y - 1} \quad (6)$$

$$z = \frac{(\bar{X} - \bar{Y}) - (\mu_X - \mu_Y)}{\sqrt{\frac{(S_X)^2}{n_X} + \frac{(S_Y)^2}{n_Y}}} \quad (7)$$

Using the  $\alpha\%$  significance level finds out the critical region of null hypothesis. If z is in the critical region, it means that  $H_1$  is accepted. The differences between the population means of sanitary napkin and adult diaper industry is larger than 0. It may show that there is pink tax in the feminine hygiene industry market.

## 5. Discussion

Admittedly, although adult nappies can be defined as the substitute of sanitary napkin in some extents, which may still have some arguments exist, and the average unit price of adult diaper is more economical than sanitary napkin; while, most females prefer to consume normal sanitary napkin for their menstrual period, instead of adult diapers. Thus, I will list a number causes that why most women will have this choice. Firstly, information failure can be the non-negligible reason. As the effects of

advertisement and propaganda of well-known brands, most women prefer to consume those brands of menstrual pad instead of searching for others. In China, the top seven brands--Space 7, Sufi, Safeguard, ABC and so forth, have taken 37% of the whole sanitary napkin market. This oligopoly can be another reason for the high-price of sanitary napkin in China. Collaboration between them not only influence the market order and ruin some market rules, like equilibrium price and allocative efficiency, but also reduce the natural competitions in free market, and prevent other firms' advertising. Furthermore, people's understanding to adult nappies still stay at where the adult nappies are used by the elderly who cannot control their digestive and excretory systems, and the adult nappies are used to take fecal matter.

Secondly, the psychological features are also significant. For women aged between 10 to 49 who are the major target consumers of sanitary napkin, because of feudal rites and social rules, they had to pay attention to everything, even including their privacy. For example, there is a perfume for privates for women, which is advertised by attracting males. Thus, under these limitations, women have to spend more energy, time and money on their appearance. Due to this reason, females are easy attracted by those fancy packages and decorations of sanitary napkins, and also, the slogan that covering odors. In comparison, adult nappies seem as clumpy and heavy, which are produced for the elderly and represents over-control. As a result, more women would rather pay more on sanitary napkins monthly, than wearing tough adult nappies.

Thirdly, the price elasticity of demand for sanitary napkin is relatively inelastic. As a necessity, sanitary napkin is indispensable for women's daily life; and the oligopoly and advertisement also make female's choices fewer and fewer. Afterwards, although firms decide to raise prices of sanitary napkin, consumers will not reduce their consumption for a wider range; and as a profit-maximizing entrepreneur, it will increase the price for purchasing more revenue. Under this situation, 'menstrual poverty' has become a serious problem. In the cities of India, 43% to 48% girls use reusable cloth as menstrual pad. In England, over 137 thousand girls drop out because they cannot afford sanitary napkins every year. It is essential an urgent to ensure the elimination of 'menstrual poverty'.

Lastly, in reality, although there are no obvious differences between these two products, adult napkin is still not able to substitute menstrual pad in use. Most adult napkins in the market are panty-style, which are too heavy and inconvenient when changing the new ones. Meanwhile, to prevent escaping, most adult napkins will increase the amount used of raw materials, thus the breathability can be another problem. In conclusion, those internal and external causes are all the hinder to use lower-cost adult nappies to substitute sanitary napkin. However, it can be consensus for the society that it is significantly important to decrease the price of sanitary napkin.

## 6. Policy Implication

The food news is that many countries have realized the existence of pink tax and the following inequality and discrimination taken to women, and may relative laws and regulations have been enacted against the pink tax. In America, it is unlawful for the producer to sell two consumer products or services that are substantially similar if these two products are priced differently based on gender of individuals, and the Federal Trade Commission need to enforce this section by guidance and monitoring [10]. To be specific, New York City, Miami-Dade county in Florida, and the entire state of California has promulgated laws to prohibit gender-based pricing services, like haircut or dry cleaning

However, the implementation of those laws may be difficult, as it is hard to define the reasons for different prices, whether based on price bias, or the variety of costs. And the guidance from the related department, since most people will not pay too much attention on differentiating the price gap between two gender-based products, and reporting to the department.



## 7. Limitation

Because of the difficulty of collecting data and the lack of relevant data available, we chose to describe the method needed for the study. The results of the sample survey are likely to be based. The customer base, marketing effectiveness and price elasticity of demand of different brands may affect the study. In addition, because adult diapers are usually aimed at the disabled and the elderly, while sanitary napkins are aimed at most women, their needs and preferences for some special properties of the product may be different. Therefore the influences of other external factors are hard to rule out.

## 8. Conclusion

According to the awakening of feminist consciousness, the whole society has followed with interest question is which aspect exists unfair issues based on gender diversity, and under this circumference, pin tax has been come to awareness and attract popular attention. During the study of pink tax, in surprise, we discovered the trading section affected by gender-based price disparity is not only limited on unified industry, like child toy, electronic mouse or clothing, but also appears in the conventional feminine products, and in this paper, we mainly talk about the sanitary napkin, in comparison with homogeneous adult nappies. While, regretfully, because of the lack of data and specific cases, the current research and analysis still have defect and imperfection. But it still inspired us to seek for more markets and varieties of feminine products, and investigate the presence of both explicit and implicit pink tax. We sincerely look forward to eliminate the price disparities based on genders and strive for females' well-earned rights, to devote ourselves into the career for gender equality.

## Acknowledgement

Xinyi Wang and Yining Wang contributed equally to this work and should be considered co-first authors.

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