

Original Research Article

Analysis of the Mask Price Change from the Perspective of Economics

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Abstract: Since the outbreak of the new type of outbreak, the demand for masks has increased in a straight line and there is a situation of oversupply, mask prices once hit a record high, many businesses began to switch to masks. But since late May, the new crown outbreak has been largely under control and mask prices have fallen. Now analyze the trend and internal laws of mask prices during the epidemic from an economic perspective.

Keywords: Mask Price; Outbreak Economy; Model Analysis

1. Background

At the beginning of the new year, since people were returning from all over the world to be re-united, the new coronavirus swept across the country. On New Year's Eve, when the traffic was high, it created a rapidly expanding soil. And because of the new crown virus is mainly transmitted through contact and droplets, and the mask can effectively isolate the new crown virus, so the mask has become the most sought-after goods in the New Year.

In the case of the new crown virus looting, the price of ordinary medical disposable masks rose from 0.5 yuan / one to 5 yuan / even 10 yuan, 15 yuan / one, Kn95 masks also rose from 3 yuan / to 30 yuan / each, each pharmacy was snapped up and continued to be out of stock. The price of fused spray cloth, the main raw material of the mask, also rose from 50,000 yuan/ton to 120,000 yuan/ton, while the cost of the molten spray in each mask rose from 5 to 12 cents, compared with the price of the mask changed even more.

Masks are extremely scarce after the outbreak, prices are soaring since mask merchants want to profit more. Institutions illegally intercept masks. Masks have also become the hottest topic of the day. Rich people can't buy masks, and people who can't afford masks raise a series of social problems. The question of whether the increase in the price of masks is reasonable and how masks are distributed has gradually become the focus of society. And the market mechanism cannot adjust its internal contradictions on its own, it requires the government's tangible hand to intervene. To intervene in this problem, it is necessary to understand the factors related to the change in the price of the mask.

2. Data analysis

There has been a significant change in the price of masks and their raw materials from January to May 2020, as shown in Figure 1. From January 2020, the price of masks began to soar rapidly, peaking at the peak of disposable medical masks (original price of 0.5 yuan / each) market average price as high as 13.34 yuan, that's a 26-fold increase from the original. Kn95 masks (original price of 3 yuan / each) market average price reached 36.35 yuan, that's a 12-fold increase from the original. The price of dissolved spray cloth also began to rise on a large scale. In addition, the mask and its raw material prices have increased significantly in March and April, the price of masks and their raw mate-

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-rials in the first half of the month began to fall sharply, May-November mask prices gradually fell, lower than the original market price after a certain range to maintain balance.

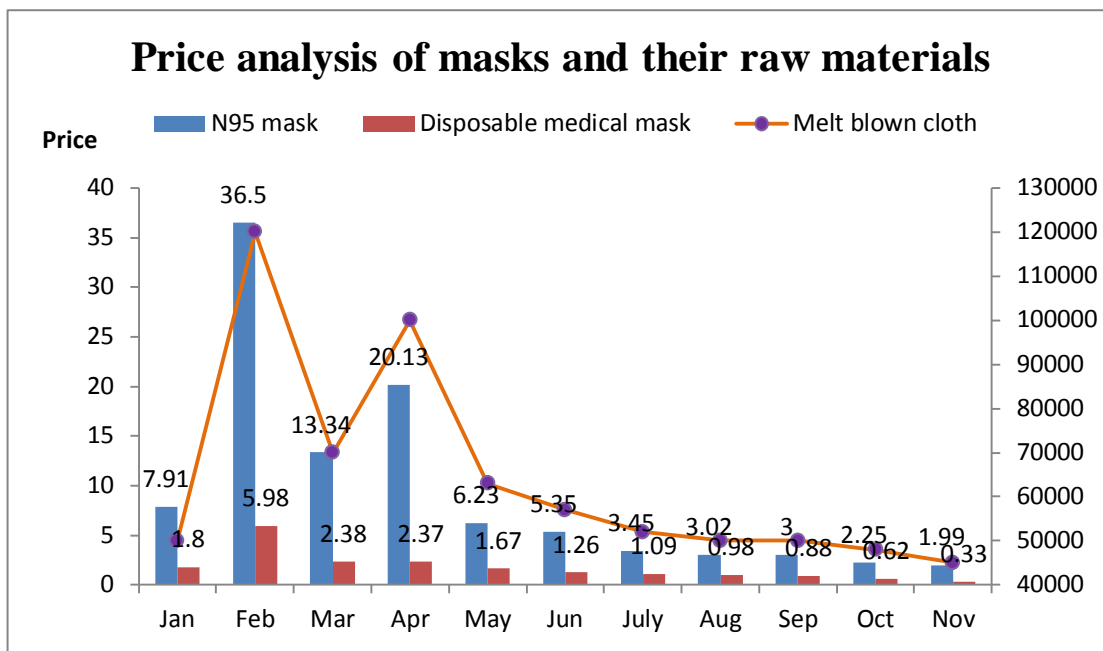


Figure 1. Changes in the price of masks and their raw materials

The most inexplicable thing is that since February, the price of masks has been on a downward trend overall. However, there was an abnormal rise in April, and this needs to be analysed in the context of the large behind the outbreak. January-February coincides with the Spring Festival travel period, with factory shutdown since the outbreak of the epidemic, masks are in short supply, so prices rose sharply. The pricer decline in March-April is due to the resumption of work across the country, people’s demand for masks are increased several times, the number of masks in short supply, prices began to fluctuate upward. Mask prices are on a downward trend and are stable within a certain range and close to the original price.

Comparing Figure 2, the price changes of export covers are greatly affected by the epidemic situation. When the new crown outbreak is serious, the number of masks in short supply, the price increased accordingly. From late March, due to the initial control of the epidemic, people’s demand for masks is relatively reduced. Therefore, the degree of control of the new crown outbreak directly caused people’s demand for masks, the overall trend of the epidemic situation and mask demand in the same direction.

In addition, non-direct outbreak factors should also be taken into account. Although the outbreak has been initially controlled since April, the outbreak will rebound at any time, the outbreak in July there was a small rebound. Looking at the current situation of the entire international epidemic, is not optimistic, and China is like a siege, to guard against foreign importers, raw food carrying the virus, local cases and other unpredictable factors. In order to prevent the inevitable situation, people’s demand for masks in the future for a longer period of time will remain at a relatively stable level.

On the other hand, the outbreak is widespread, especially in countries such as the United States, India and Brazil, where confirmed cases account for half of the world’s share, while developed countries such as the United States lag behind in light industry. Even though India’s light industry is more developed, the serious domestic outbreak, the production and export of masks also have been seriously affected. At present, nearly 70% of the world’s masks are exported by China. It can be seen that China to stabilize the domestic epidemic, foreign demand for masks and other light industrial goods mainly provided by the Chinese market, masks abroad business opportunities are still huge.

Although there is relatively stable demand for masks at home, the potential of foreign markets is also very optimistic. But we should be clear, after the mask produced such a huge dividend, a large number of manufacturers into the industry, seize market share, market competition is bound to become more intense as well as in the supply at the same time because demand is certain, mask prices fell. In the short term, manufacturers can bear the losses caused by their own low-cost sales decisions, but if the company has been in a loss-making state for a long time, manufacturers are at risk of bankruptcy. As a result, a large number of mask manufacturers went bankrupt, only a small number of enterprises remained. After this round throughout the industry's large-scale screening, the remaining enterprises are mostly large-scale, high-quality, sufficient capital chain of old mask manufacturers, industry barriers are also raised accordingly. This is due to economies of scale and the impact of high-tech management technology, screening out of the manufacturers produced masks will be very low long-term average cost, which also increases the competitiveness of these manufacturers in the market. It will be difficult for new industries to enter into the industry. On the basis of rational assumptions, people in other industries are not expected to enter the mask industry after the expected market share, but face the risk of sustained losses and closure, it is clear that the mask market has reached a point of preservation, and then into the mask industry has no meaning, they will choose to give up. As a result, the number of mask manufacturers will stabilize, and the price of masks will change much less as a result of supply. In a sense, the mask market has reached a new relatively stable equilibrium point after ups and downs.

From the perspective of the whole international epidemic situation and economic mechanism and national policy, the possibility of a large-scale rebound of the future outbreak in China is very small, but there are many masks for daily protection. Foreign countries in the short term cannot completely control the outbreak, the demand for masks mainly depends on imports, and the number of domestic mask manufacturers is basically stable. Due to the relative stability of domestic and foreign demand, the numbers of existing mask manufacturers to produce masks in the coming period will not be significantly reduced, mask prices will also fluctuate within the current market price range.

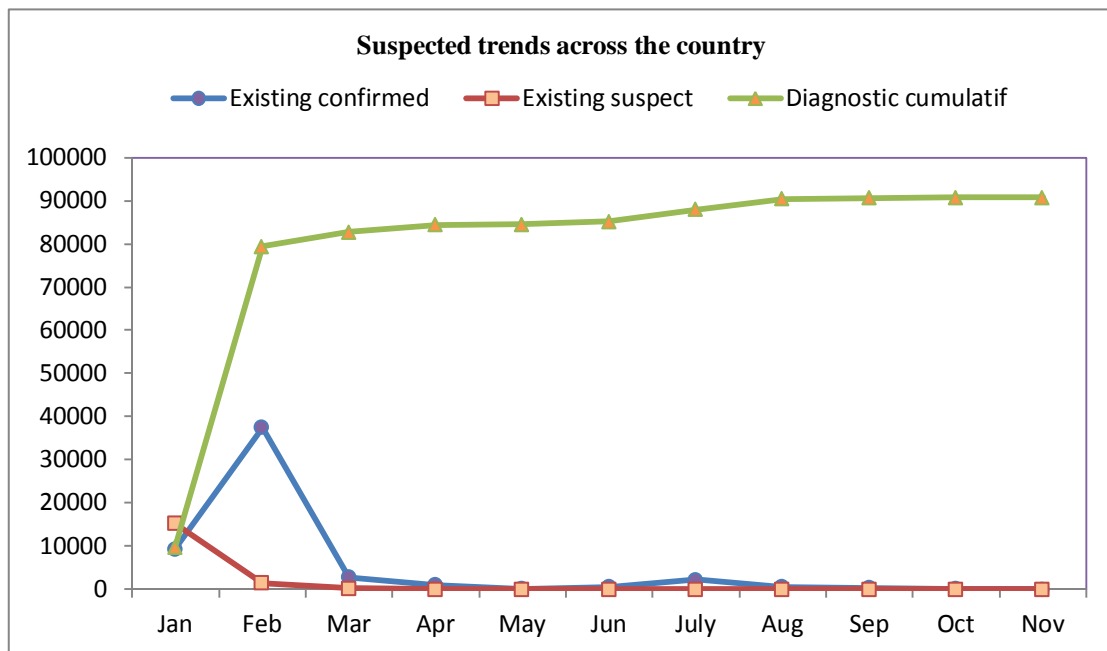


Figure 2. Suspected trends have been confirmed throughout the country

3. Case study

3.1 Supply and demand models

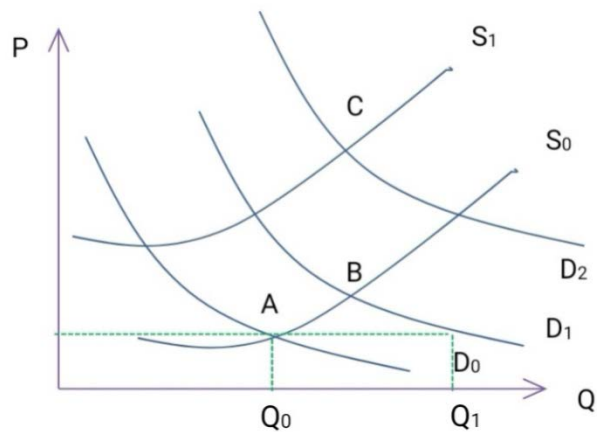


Figure 3. Changes in supply and demand for masks

As shown in **Figure 3**, in the right-angle coordinate system, the horizontal axis represents the supplier's supply of masks, the vertical axis indicates the price at which the consumer is willing and able to purchase the mask, and for the consumer, the demand and price of the mask are negatively related. Under normal circumstances, the demand curve of the mask is D_0 , the supply curve is S_0 , their intersection is point A, the ordinate of point a indicates the price P_0 of the mask when supply and demand are balanced, and its horizontal coordinates represent the quantity Q_0 when supply and demand are balanced.

"The change in the price of the mask itself will cause consumers and suppliers to make changes in the amount of their demand and supply, which is premised on the rational assumption, and the non-price factor, i.e. factors other than price, will cause changes in demand and supply, which will cause the position of the demand curve and supply curve to move." The main factors affecting the demand for masks are: mask price P_x , consumer income M , consumer preference for mask h , related commodity prices (such as molten spray cloth, etc.) P_i , consumer expectations of mask price P_e . Influences can be represented by functions such as:

$$\text{Demand function: } Q_d = f(P_x, M, h, P_i, P_e)$$

$$\text{Supply function: } Q_s = f(P, C, P_r, X, P_e, N)$$

At the beginning of the outbreak, only a few people realized the severity of the new coronavirus, a small number of people began to stock up^[1], consumer preference for masks increased, demand increased from Q_0 to Q_1 , so the demand curve D_0 to the right level moved to D_1 , in the case of the supply curve unchanged, the demand curve to the right will move point A to point B, the price of masks increased.

In the middle of the outbreak, people's preference for masks was heavier, and the price of masks was expected to rise in the future, thus increasing the demand for masks, with the demand curve shifting from D_1 to the right to D_2 . This period coincides with the Spring Festival period, the number of workers decreased, mask inventory gradually consumed, the reduction of raw materials led to the increase in the price of mask-related goods. Production costs increased, merchants expect mask prices will continue to rise, low the current supply of masks, supply curve S_0 to the left to move to S_1 . At this time the demand curve of masks D_2 and supply curve S_1 intersection C, mask prices further climbed.

Similarly, after the outbreak, the new crown outbreak is effectively controlled, people's preference for masks is reduced, the demand for masks will be reduced, the demand curve from D_2 back to D_0 . At the same time, with the government's intervention and regulation, the price of raw materials such as molten spray cloth has been effectively controlled, the number of manufacturers of masks increased substantially, a large number of workers into the mask production line, manufacturers' supply increased substantially, so the supply curve S_1 back to S_0 .

It can be seen that the government's intervention and the implementation of related policies to adjust the imbalance between supply and demand mask price stability plays an important role. If the market is left to its own allocation of resources, without any regulation and intervention, the market cannot function properly, also cannot adjust the balance between supply and demand, reasonable allocation of resources. Manufacturers in the mask market will default to

an agreement to secretly compress the supply of masks, maliciously raising the price of masks, that is, to carry out monopoly price increases. Consumers in this particular period of the epidemic, masks upgraded to necessities of life, for their own health and safety, they had to be forced to accept monopoly high prices, consumers have become mask manufacturers for personal gain the greatest victims. Therefore, when the mask market supply and demand changes in large-scale fluctuations, the market mechanism failure and may lead to monopoly and other negative effects, the government's macroeconomic control and policy guidance is particularly important.

3.2 Supply price elasticity analysis

Supply price elasticity refers to the ratio of the rate of change of a commodity supply to the rate of change of its price, which reflects the degree to which a commodity supply reacts to price changes. The elasticity of the supply price is calculated as follows:

$$E_s = (dQ/dP) * (P/Q)$$

In the early stage of the epidemic, mask supply price elastic $E_s < 1$, which indicates that the mask supply response to its price factors is low, that is, inelastic, because of the epidemic prevention and control measures and the Spring Festival workers return to work during the resistance, the production of masks also need specialized machines and professional practitioners, mask production cycle is longer, mask supply in the short term cannot have a significant growth trend. Due to the oversupply, consumer demand for masks is rigid, and the suppression of demand by rising prices is not obvious^[2]. But in the long run, the supply price elasticity of masks $E_s > 1$, that is, the price of masks will stimulate a substantial increase in supply. The rise in the price of masks reflects the urgency of consumer demand for masks, from a microeconomic point of view, the high price of masks promotes the effective allocation of resources and maximizes the utility of society as a whole, but from a moral and ethical point of view, the high price of masks does not represent the great value of masks during the outbreak, the intrinsic value of masks is that it blocks the spread of the virus, to protect people's health and safety, which is impossible to show the currency price. From this level, it can be seen that the maximum utility of the resource allocation of the mask does not simply represent the maximization of the utility of people's welfare. Therefore, the simple sum of the utility of producers and consumers does not result in a relatively simple total utility^[2]. At the same time, the government 'tangible hand' macro-control mask market price is also needed to ensure maximum social utility.

3.3 Externality analysis

Externality is divided into positive externality and negative externality, which refers to the influence of economic subject's behavior on others that is not included in cost or benefit. In layman's terms, it's about doing bad things without compensation, doing good things without reward. External effects are widespread in daily life, and people's use of masks will have corresponding external effects. The use of masks can block the spread of new coronavirus, reducing the likelihood that others will be infected with the virus, while others do not have to pay for it, a phenomenon that manifests itself as positive externality. But when the price of a mask exceeds the consumer's tolerance, some people may give up wearing a mask, in public places will affect the health and safety of other people's lives, but they do not have to bear the corresponding responsibility for the consequences of their actions, a phenomenon known as externality.

The external effects of masks during the epidemic have made it more difficult to implement the epidemic prevention and control, which increased the pressure of state financial expenditure, and brought potential hidden dangers to the safety of other people's lives, which will inevitably lead to society's departure from the production situation of maximum output and reduce the level of people's welfare. Therefore, it is necessary for the government to eliminate the negative externality of the mask and ensure the maximum welfare of the people. The reason is to control the price of masks. Government must ensure the stability of the price of masks, so that ordinary people can use the mask, thereby reducing the externality caused by masks exceeding the maximum price that people can afford not to wear masks. In addition, the government's quality testing of products produced by mask manufacturers and the regulation that citizens must wear masks in public places are important measures to eliminate the externality of masks.

4. Conclusion

The new crown epidemic led to a substantial increase in the price of masks. This paper attempts to explain the market price mechanism of masks through economic perspective, through macro-data analysis, supply and demand models, supply price elasticity and external effects. To analyze the market in the allocation of resources and price change system, the government took a series of measures to intervene in the market mechanism (such as the crackdown on drugstores to raise mask prices), basically solving the phenomenon of market failure. The price of a mask is influenced by many factors, among which supply and demand are the decisive factors that determine the price of mask. The price of a mask in turn affects the supply and demand of a mask and produces externality. Because the supply price elasticity of masks is low in the short term, it leads to an increase in the price of masks. At the same time, the increase in supply is not obvious, while in the long term the supply is more sensitive to price changes and the price decreases accordingly.

In addition, since a large number of manufacturers joining the market during the mid-epidemic time, mask are in overproduction, as a result, a large number of manufacturers have no return, but also accelerate the survival of mask manufacturers, mask industry barriers to entry also be increased. With the mask market *already* saturated and the epidemic improving, re-entering the mask industry will only lead to a decline in the balanced price of masks. However, as far as the status quo of the international epidemic is concerned, in the longer term, especially in the light industry underdeveloped countries, such as the United States, Canada and other countries, the potential of the mask market is still considerable, and China's epidemic prevention and control into the normal stage, personal protective consumption of masks enough to support the development and growth of mask brand manufacturers.

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