

Principles of Microeconomics

Group Project Semester 1, 2020

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Class: _____ **Class 2, Microeconomics**

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1. Introduction

Explain the rationale for selecting the theme (product or service).

Briefly state the Microeconomics concepts that you will be discussing in this report.

Our group select PPE, MD such as masks and protective suits as our studying object of research. The COVID-19 pandemic has made great impacts on human society and world economy, therefore, it's important and meaningful to study the shock that this event put on the PPE market. This market is about the normal good that people actually haven't paid much attention to before the outbreak of the pandemic, and it contains the concepts that we study and discuss in the Microeconomics class. Therefore, we select five different reports that are focused on this issue, and we do some analysis from different perspectives: demand, supply, cost, and monopolistic competition in the market. Hope that our research can find the clear clue of the development of the market that is changed by the pandemic.

2. Discussion

Newspaper Article #1

Article Title: N95 masks are still in hot demand. 3M is trying to answer the call

Article URL: <https://edition.cnn.com/2020/09/16/success/3m-ceo-n95-masks-boss-files/index.html>

Student Name: 吕昕宰

Microeconomics concept discussed: Demand

(Write your analysis here, accompanied with suitable Microeconomics graphs, tables, computations etc)

Less than a year ago 3M, a major American multinational in St. Paul, Minnesota, was churning out a bunch of everyday problem-solving products, like Post-its, Scotch tape and ACE elastic bandages. Then the pandemic hit and consumers got to know 3M for another product that, in just a matter of weeks, had become critical in the fight against the coronavirus: the N95 respirator mask. 3M (MMM) is the world's largest maker of N95 masks. The gold standard of respirator masks, it is seen as one of the best lines of defense for frontline workers -- doctors, nurses, home healthcare, public transportation and grocery store employees -- whose jobs have been deemed essential throughout the pandemic.

As demand surged early on in the pandemic, N95 masks were in short supply around the globe. 3M felt the pressure -- and the backlash, including from president Donald Trump, who requested that 3M cease exporting made-in-the-USA respirators to Canada and Latin America. But 3M refused the Trump administration's request, noting that there would be "significant humanitarian implications" if it ceased shipping respirator supplies to healthcare workers in other countries.

"We knew we would have to step up in delivering additional N95s to ramp up our capacity. It's something we learned back with SARS more than a decade ago that we were going to be looked to for leadership," 3M CEO Mike Roman told CNN's Poppy Harlow in a recent Boss Files interview. "And so, we invested in capacity to have it ready for the next emergency, the next pandemic. And so, that was already part of our playbook." said Roman. What also incited 3M to start revving up N95

production early on in January was an urgent call to action from an epidemiologist at the University of Minnesota, who warned that Covid-19 had the potential to quickly become a global pandemic. "I think it was a very serious moment for us, a big responsibility, but something that we were ready for," said Roman.

By March, as coronavirus cases surged, 3M had doubled N95 mask production. It then doubled it again. Today, the company is on track to produce 95 million masks a month and a billion in total by the end of the year. "That was a stepping up of where we started the year," said Roman. Still, it may not be enough, he acknowledged. "Even today, the demand for N95s is greater than not only our production capacity, but the entire industry," As 3M continues to ease the capacity crunch for masks, Roman said the company is forging ahead to explore and produce other kinds of solutions. One is a rapid diagnostic test for Covid-19 that 3M is developing in partnership with Massachusetts Institute of Technology that can deliver results in a matter of minutes. "It's one of those areas that came out of attacking the pandemic from every angle," said Roman, adding that it still could be a while before consumers are able to reap the benefit of a rapid test. "We're right in the middle of really developing the accurate test. We need to take a couple more steps before we can put a timeline out there," he said. As 3M races against the clock, Roman said the pandemic has surfaced challenges, some of which he wasn't expecting.

The overwhelming demand for N95 masks, for example, resulted in counterfeits leaking into the supply chain. The Centers for Disease Control and Prevention (CDC) warned in April that fake or substandard masks could compromise the safety of anyone who uses them, including healthcare providers.

3M over the past few months has investigated as many as 6,300 cases of mask fraud and has been working with large online sellers and federal and state authorities to identify and remove counterfeiters.

"We had to step in and help fight that. It wasn't something we had envisioned at that scale," Roman told Harlow.

As 3M rushes to address the demand for its products that has resulted from the coronavirus, the company has borne witness to a scourge of a different kind in its own backyard.

"The killing of George Floyd hit us all hard," said Roman. "It hit 3M'ers, it hit our African-American community especially hard. For me, it was a call to action and I really do believe companies and company leaders can and need to make a difference."

Newspaper Article #2

Article Title: Nation's daily mask output exceeds 110 million

Article URL: <https://mp.weixin.qq.com/s/cQJ5RPoFh0x3lqkEYmaGEw>

Student Name: 黄萍希

Microeconomics concept discussed: Supply

(Write your analysis here, accompanied with suitable Microeconomics graphs, tables, computations etc)

During the pandemic, the supply of masks rapidly increases because of many factors.

First, the spread of the novel coronavirus and the policy to wear masks induce people to wear masks, leading to the great shortage and price rise. So, the law of supply makes the sellers produce more masks to satisfy the needs. (*graph 1 and 2*)

Second, the technology improvement like the fully automatic mask machine mentioned in the passage makes it more efficient and increases the daily output. (*graph 3*)

Third, the price of inputs has largely decreased by the measures such as offering loans with discounted rates of interest and reducing business-related charges for power and natural gas, and this helps mask manufacturers resume work and production.

Forth, the number of suppliers increases as the NDRC has encouraged some companies to revamp their plants to produce masks. "As of the end of February, three groups of enterprises have revamped their plants to step up the production of masks." More suppliers produce more goods. (*graph 3*)

Now, China's daily output of masks was well over 110 million units and it lows down the price of masks. People could buy masks they just need.

graph 1

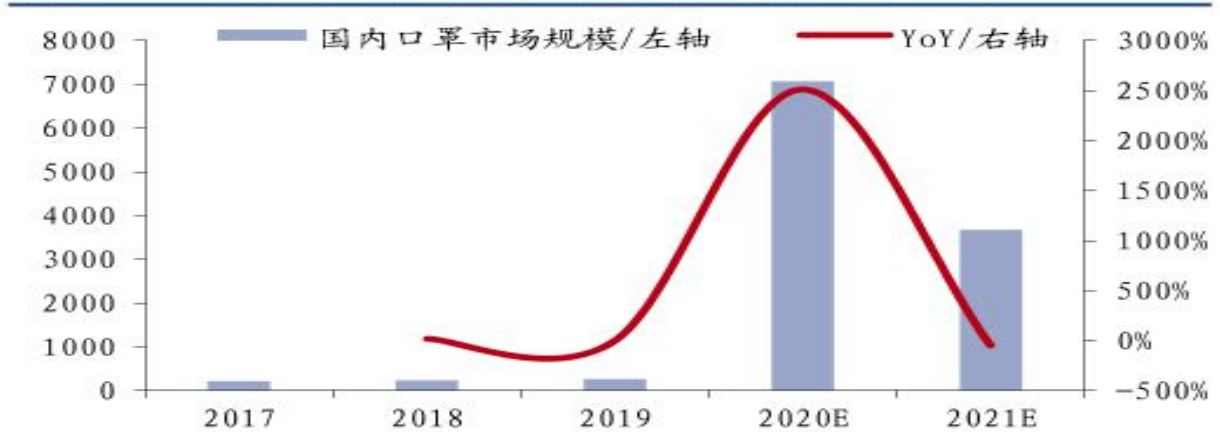
表 3：2020 年全球口罩、防护服市场规模预测

口罩市场规模（亿美元）	数据来源	预测时间
1664	Grand View Research	2020 年 4 月
913	kbvresearch	2020 年 6 月
319	Absolute Markets Insights	2020 年 5 月
200	Arizton	2020 年 7 月
130	QY Research	2020 年 9 月
71	Industry Research	2020 年 7 月
防护服市场规模（亿美元）	数据来源	预测时间
> 130	Allied Market Research	2020 年 6 月
118	Fortune Business Insights	2020 年 7 月
78	The Business Research Company	2020 年 7 月

资料来源：Allied Market Research, kbvresearch, QY Research 等，中信证券研究部

graph 2

图表 36 国内口罩市场规模预测（亿元，%）



资料来源：艾媒网《艾媒报告|2020-2021 年中国口罩行业市场状况

Graph 3

表 9: 涉足口罩机生产业务的上市公司

公司名称	口罩机相关业务内容
机器人	研发出了平面型及 N95 型口罩生产线，订单充盈
埃斯顿	全自动一拖二平面口罩机，全自动 N95 折叠口罩机
拓斯达	广东拓斯达长沙重工事业部研发出全自动一拖二平面口罩机，大量供应给比亚迪、富士康等企业
智云股份	全资子公司鑫三力签订口罩机大额订单，交货顺利
赢合科技	疫情发生后开始医疗平面医用口罩的全自动一体机的生产
南兴股份	与汇通自动化形成战略合作，利用公司在通用设备的技术研发、管理及生产优势，快速提升汇通自动化的口罩生产加工设备的产能
劲胜智能	口罩机订单陆续实现交付
慈星股份	由公司旗下的中天自动化进行口罩机的生产

资料来源：网络资料整理，东兴证券研究所

Newspaper Article #3

Article Title: why global value chains remain essential for COVID-19 supplies

Article URL: The research paper of this part is packed with this file

Student Name: 庄婉琳

Microeconomics concept discussed: supply and demand; strategies for firms in the long-run and short-run; government

(Write your analysis here, accompanied with suitable Microeconomics graphs, tables, computations etc)

(blue words: extracted from the article; black words: my analysis)

Background:

The rapid escalation of the COVID-19 pandemic has put the global health-care supply chain in the Spotlight. Suggestions of nationalizing parts of supply chains, or whole supply chains, however, run counter to empirical evidence on how the industry works.

Reason1:

Booming global demand has driven the globalization of medical supplies and devices in recent decades; traditional exporters have seen their exports surge over this period, but non-traditional exporters have grown even more.

As we know, market equilibrium is affected by the forces of both supply and demand. Factors that affect demand include population of buyers, the price of related goods, income, tastes and expectation. During the COVID-19 pandemic, the rapidly increasing number of buyers and the high expected price of the PPE and MD for fear of its shortage contributed to the increasing quantity demanded. In the short run, the supply of PPE and MD was inelastic in any single nation, leading to the price to go up. However, if nations work together and take advantage of the impeded flow of capital, technology and resources in the medical field thanks to globalization and the expansion of medical market in recent years, the supply can become more elastic to deal with the surge of quantity demanded. Due to the accelerating exports and imports process and certain adjustment made by the governments, the global market, as a whole, has achieved a new equilibrium.

Reason #2:

While global production has increased, outsourcing in the industry has been slow and leading firms from developed countries dominate global supply.

Since certain numbers of firms dominate global supply and the products are not quite differentiated, the market is an oligopoly market. With advanced technology, up-to-date information in the frontier and control over abundant resources, these oligopolists are able to choose locations and other manufacturing conditions to their advantage.

Governments can affect market outcomes. The life-and-death consequences relating to MDs require a high level of supervision on the supply process, which may lead to slow outsourcing. This

kind of interference is necessary considering the specific attributes of this industry, although it hinders some kind of cooperation and fails to allocate resources efficiently.

Interdependence, namely one economic actor's benefit depends on every actor's decisions. It is an important characteristic in oligopoly. Globalization has boosted interdependence. Many leading firms still rely on others' raw materials while others may rely on their technologies, which illustrates that this kind of interconnection is hard to wipe away. This pandemic reveals two major kinds of interdependence products, PPE and MD.

Reason #3:

Since COVID-19 erupted, global supply chains have helped smoothen severe shortages experienced by the most severely infected countries.

As we know, factors that affect supply include the number of suppliers, prices of factors of production, technology and expected future price. For one thing, increasing suppliers from developing countries have filled the vacancy in the supply market to a certain degree. For another thing, some firms produce alternatives at a relatively low cost to buyers. The resource substitution availability is greater in the long run, as a result of which the price elasticity of supply is greater.

Reason # 4:

The massive scale-up of supply during the COVID-19 crisis is challenging from a pure production and processing perspective. Leveraging inter-firm relations to disseminate know-how and ensure international coordination on regulations can speed up responsiveness.

It is all known that trade can make everyone better off because it connects markets from different countries and balance the production and consumption levels by inducing the flow of goods and services, thus increasing the total surplus.

Short-run average total cost curves lie on or above long-run average total cost curves. In the long run, firms can choose which short-run average total cost curve to use by adjusting its size and other factors with the intension of lowering the costs. However, firms can hardly benefit from the expansion of its size when specialization has been achieved and coordination problems become severer. The firms in the medical industry, most of which have achieved economies of scale, can lower costs by both taking better advantage of assembly line production and seeking better solutions of regulation, such as synergies and international coordination to respond better to the growing demand in this specific period since quarantine has affected normal production.

The importance of specialization is stressed by the authors. PPE is mainly produced by less developed countries while MD is mainly produced by developed countries. Specialization makes labor become better at specific tasks, thus leading to economies of scale and a prosperous modern society. Although specialization has been achieved by more and more firms and it may not serve as the major focus for further development nowadays, it still plays an important role on the global scale.

Moreover, as government can sometimes improve market outcome, its influence in enforcing certain rules to prevent chaos is non-negligible. For one thing, government can encourage innovations and creative activities by patents, increasing incentives for firms in the medical industry to search for effective approaches. For another thing, as the authors have mentioned in the article, governments can improve labor mobility and ease regulation on international trade to help smoothly the flow of resources. In this way, the environment is more competitive for oligopolists and more efficient allocation of resources can be achieved.

At last, the authors emphasize the importance of globalization and the adverse effect of nationalizing any part of the supply chain, which proofs the benefit of trade one more time. Some strategies such as mandatory re-shoring and tariff drive the domestic market equilibrium closer to the situation without trade and protect domestic suppliers, but are not effective in bringing maximum benefit to most people during this specific period.

Newspaper Article #4

Article Title:

The Global Respiratory Masks Market Is Projected to Grow 22.9% by 2023

Article URL:

Market Research.com <https://blog.marketresearch.com/the-global-respiratory-masks-market-projected-to-grow-22.9>

Microeconomics concept discussed:

Monopolistic Competition & Oligopoly in Masks Market. The market competition in this context is mainly represented by several industry giants, such as 3M and Honeywell.

(Write your analysis here, accompanied with suitable Microeconomics graphs, tables, computations etc.)

The Analysis of the Monopolistic competition and Oligopoly in Global Mask Market

2019201234 陈科睿

Background: N95 respirators and the COVID-19 pandemic:

The N95 respirator mask was first invented by 3M and approved in 1972. Being able to filter viral particulates, its use was recommended during the COVID-19 pandemic but supply soon became short. Much of the company's supply had already been sold prior to the outbreak. The shortage leads to the US government asking 3M to stop exporting US-made N95 respirator masks to Canada and to Latin American countries, and President Donald Trump invoked the Defense Production Act to require 3M to prioritize orders from the federal government. The dispute was resolved when 3M agreed to import more respirators, mostly from its factories in China. 3M later struck a \$70M CAD deal with the federal government of Canada and the Ontario provincial government to produce N95 masks at their plant in Brockville, Ontario.

Analysis:

1. The mask producing market before

COVID-19 pandemic has brought great pressure on the medical health system of almost every country around the world; It also changes the competitive situation in the market of mask producers. Delving into the research of global masks market, this article tries to study the competition among the mask companies. In this article, the most fascinating part for me is the policies provided by 3M and Honeywell, which are two of the most powerful and wealth companies in the world. Since the demand of masks has been surged after the outbreak of the pandemic, the prices of all types' masks increased to a range between INR 0.68 to INR 3 (\$0.009 – \$0.04) apiece, and by March had reached INR 6 to INR 18 (\$0.08 – \$0.24) apiece. The change stimulates the big enterprises in the mask production market to adjust their production strategies.

The respiratory masks (N95 respirators, surgical masks, and others) market is fragmented, with a large number of small players. The top ten competitors in the market made up to 35% of the total share in 2019. This is mainly due to the presence of a large number of local manufacturers who produce common surgical masks and dust masks. The top five players in the market include

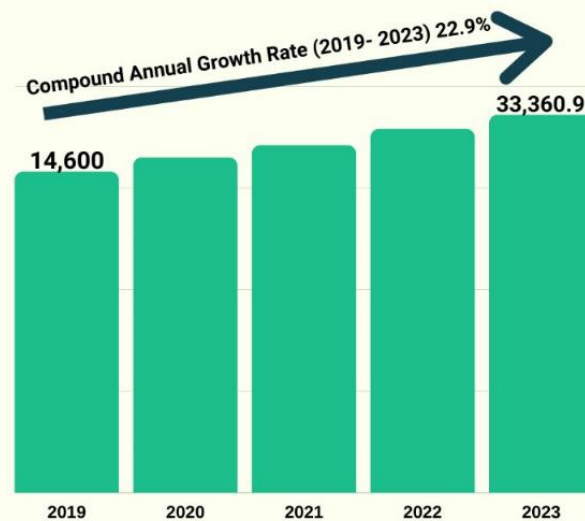
Honeywell International Inc., The 3M Company, Kimberly-Clark Corporation, Ansell Limited, and Owens & Minor, Inc. Therefore, the mask market has the characteristics of monopolistic competition, and the top two (3M and Honeywell) also have the relationships partly like oligopoly.

Global Respiratory Masks (N95 Respirators, Surgical Masks, And Others) Market, Key Competitor Estimated Market Shares, 2019, Percentage (%)



The Business Research Company

Global Respiratory Masks (N95 Respirators, Surgical Masks, And Others) Market, Forecast, 2019 – 2023, Million Units

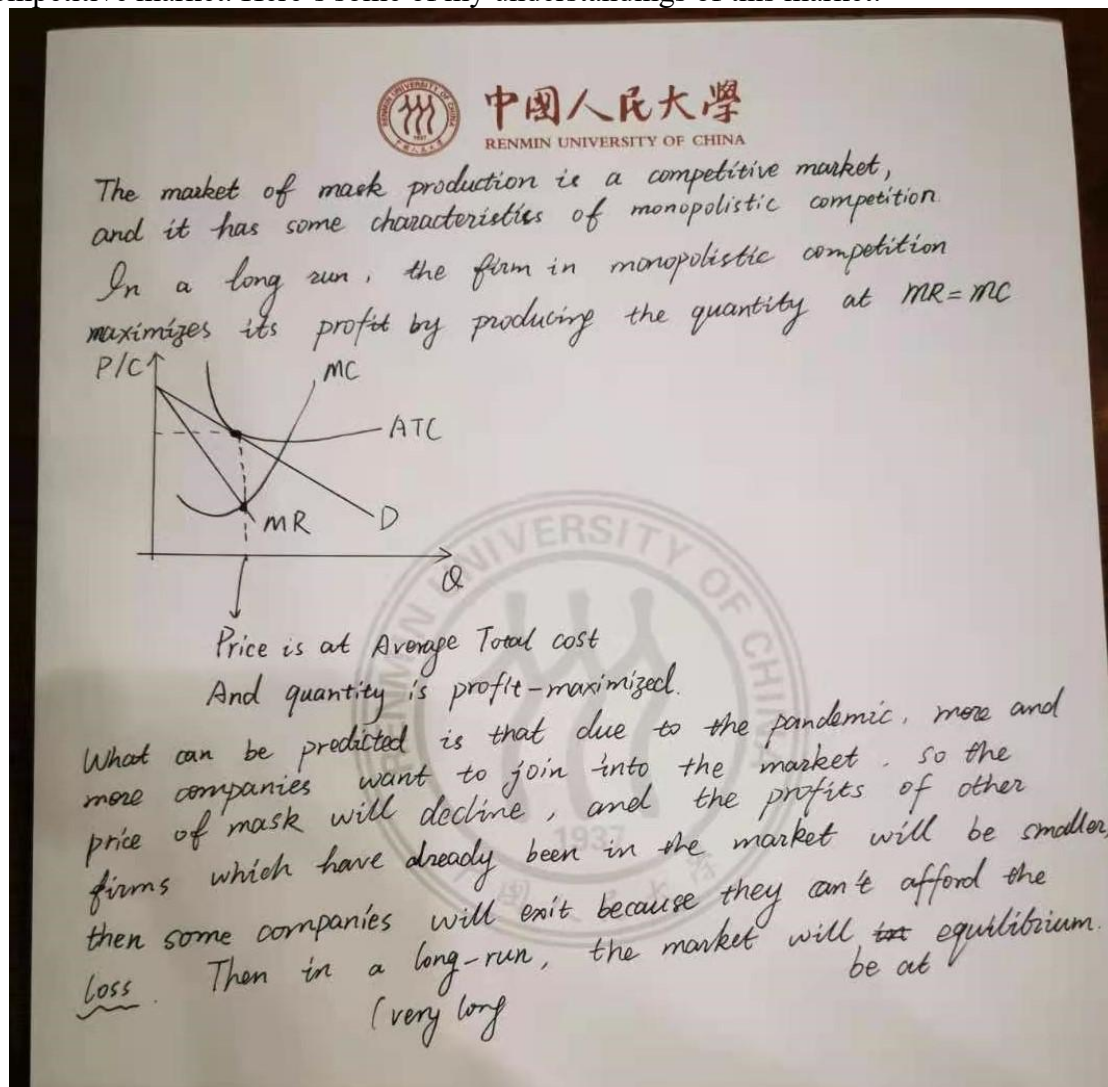


The Business Research Company

2. The future market:

In the wake of the pandemic outbreak, countries began to consider providing financial support to bankrupt medical supplies manufacturers. Every country has introduced supporting policies according to the situation, with two main directions: on the one hand, to alleviate the tax pressure of enterprises and provide various financial support; On the other hand, the government guarantees business. Some countries are setting up special funds to use the money to buy up damaged lifeline companies and keep them from going bankrupt. Still, we need to wait for the next move from the multinational oligopoly. The multinational group led by 3M and Honeywell pushed the profit target in reverse to make up for the loss, because at the beginning of the epidemic, all the masks in its

stock had been sold out. At that time, masks had become an extremely scarce commodity. Stimulated by the huge demand at home and abroad, a large number of companies rushed into the production chain of masks. It can be predicted that although the market cake has been enlarged, the industry competition will become fiercer and the market will gradually transfer into the form of competitive market. Here's some of my understandings of this market:



Since 3M and Honeywell consist of nearly 20 percent profit and supply in the world mask market, they have the potential to become the oligopoly firms; but due to the Anti-Trust Laws, the collusion and cooperation between these two giant companies are difficult to achieve in real world. What can be confirmed is that because of the pandemic, the mask market will have a considerable shift in the future, and the competition of those companies will surely move to a new leap.

Appendix

1. 3M

The 3M Company is an American multinational conglomerate corporation operating in the fields of industry, worker safety, US health care, and consumer goods. The company produces over 60,000 products under several brands, including adhesives, abrasives, laminates, passive fire protection, personal protective equipment, window films, paint protection films, dental and orthodontic products, electrical and electronic connecting and insulating materials, medical products, car-care products, electronic circuits, healthcare software and optical films. It is based in Maplewood, a suburb of Saint Paul, Minnesota.

3M made \$32.8 billion in total sales in 2018, and ranked number 95 in the Fortune 500 list of the largest United States corporations by total revenue. As of 2018, the company had approximately 93,500 employees, and had operations in more than 70 countries.



2. Honeywell International Inc.

Honeywell International Inc. is an American publicly traded, multinational conglomerate headquartered in Charlotte, North Carolina. It primarily operates in four areas of business: aerospace, building technologies, performance materials and technologies (PMT), and safety and productivity solutions (SPS).

Honeywell is a Fortune 100 company, and was ranked 92nd in 2019. The company has a global workforce of approximately 110,000 workers, with approximately 44,000 employed in the United States.



Newspaper Article #5

Article Title: Melt blown cloth: a 15 times price increase survey of mask raw materials, Wang Yang, China Small & medium enterprises, e-mail of editorial department, issue 04, 2020

Article URL:

<https://kns.cnki.net/kcms/detail/detail.aspx?dbcode=CJFD&dbname=CJFDLAST2020&filename=ZXQ202004066&v=0suhN2VBFyn0%25mmd2BR4tnjoz3UbdWUaiRbd0IO1ivrVm%25mmd2FxTjMkchZY0PWEs9NHq6Lugu>

Student Name: 何乐轩

Microeconomics concept discussed: Cost

(Write your analysis here, accompanied with suitable Microeconomics graphs, tables, computations etc)

Background: the COVID-19 pandemic and the raw material:

The COVID-19 pandemic has caused a dramatic shortage in the medical supplies needed to treat the virus due to a massive surge in demand as the disease circled the globe during the first half of 2020.

Firstly, during the COVID-19 epidemic period, the mask is an important protective equipment, which has become a necessary product for front-line medical care, the production of enterprises and people's traveling, and the market demand has increased sharply.

Second, the cost of meltblown cloth increased a lot. Melt blown cloth is the key material to filter virus for masks. With the rapid increase of mask production capacity in the world, the supply of core raw material meltblown cloth was in short supply, which led to price rise.

Analysis:

1.1 The variable cost of mask producing market during pandemic

1.1.1 The variable cost rose during pandemic period due to the price rise of raw materials and workers' wages. Variable cost refers to the cost paid to various variable factors of production, such as the purchase of raw materials and workers' wages.

1.1.2 Melt blown cloth is the key material to filter virus for masks.

Melt blown cloth is the key material to filter virus for masks, which can be called the "heart" of medical surgical masks and N95 masks. Medical surgical masks generally adopt multi-layer structure, referred to as SMS structure: inside and outside is a single spunbond layer (s), the middle is a single or multi-layer meltblown layer (m), meltblown cloth is the best material for meltblown layer.

Compared with the mask production line, the production technical threshold of meltblown cloth is high. The quality of meltblown cloth directly determines the mask quality. The investment of cloth factory production line is tens of millions of yuan, and the equipment manufacturing and installation

are much more complex than the mask production device. The requirements for the workshop are relatively high, and the staff need to be specially trained. Therefore, during the epidemic period, in the face of the rapidly rising demand for masks, there was a serious shortage of meltblown cloth, the supply exceeded the demand, and the price rose.

1.1.3 The wages of workers were higher than usual.

During the epidemic period, due to the requirements of national policies, many enterprises could not produce normally. Because working during pandemic was at risk of infection, many workers were less willing to work. Enterprises that continued to produce needed to pay workers higher wages than usual.

2.1 The future market:

2.1.1 In the future, the prices of raw materials and workers' wages will return to normal levels.

The supply of raw materials will return to normal. First, due to the high profit and large demand of raw materials, new manufacturers are attracted to join. After new manufacturers join, the output of raw materials will increase, the supply of raw materials in the market will increase, and the price of raw materials will decrease. Second, after the improvement of the epidemic situation, workers no longer face a high risk of infection, and their wages return to the normal level.

2.2 In the future, many measures will be taken by the government to solve the shortage of raw materials and ensure stable supply and price of the raw material.

2.2.1 First, the government will promote similar enterprises to switch production and supply mask materials. According to the statistics of China Nonwovens Industry Association, there're many similar enterprises that are capable to produce meltblown cloth in their production line. It is understood that BYD, Changan Automobile and other automobile manufacturers have been making use of the advantages of the industrial chain to produce materials for masks.

2.2.2 Second, Chinese government takes the state-owned enterprises as the leader to speed up the process. The state-owned enterprises not only invest money to produce raw material, but also set an example for other enterprises.

Because the raw material of meltblown cloth is taken from petroleum. Petrochemical enterprises have advantages in producing meltblown cloth. Sinopec has invested about 200 million yuan to build production lines.

2.2.3 Third, under the leadership of state-owned enterprises, many new manufacturers will join. Also, due to the high profit and large demand of raw materials, new manufacturers are attracted to join. After new manufacturers join, the output of raw materials will increase, the supply of raw materials in the market will increase, and the price of raw materials will decrease.

2.3 Second, after the improvement of the epidemic situation, workers no longer face a high risk of infection, and their wages return to the normal level.

Conclusion

Summarise the main findings of the above discussion.

The goal of your conclusion is not to introduce any new ideas, but to sum up what you have discussed earlier.

Through our group research of the PPE products, especially their changes during the COVID-19 pandemic, we have some more logical and convincing evidence that can analyze and prove the impressive shift in this market. The demand and supply of masks both surge to a new level, and its cost also make a change due to the government's policies. We also research the competitive market of masks and study the production of 3M and Honeywell to know that how much impact this pandemic has made to the giant companies in this industry. To sum up, the mask production is an indispensable part in the economy influenced by COVID-19, and many economic factors has changed because of it; and the future is still unpredictable, so there are many possibilities that will happen in this market.

---- END OF REPORT ----