



# Teaching High School Microeconomics Using the 2020 COVID-19 Pandemic

The COVID-19 (Coronavirus) pandemic offers instructors a real-world event through which to apply principles of microeconomics; basic content taught in the standard course can be used to explain much of what students read about on social media, viewed in the news, and observed through their own experiences. The decrease in economic activity seen during the pandemic can be modeled using demand and supply theory. And the concepts of elasticity of demand, scarcity, market allocation, and shortages are easy to illustrate through examples. Teachers can utilize the examples and suggested extensions to enrich their courses and engage students.

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## 1. Introduction

Teachers of economics often struggle to motivate students who might not appreciate how theory connects to their everyday lives. However, the events surrounding COVID-19 (Coronavirus) offers a powerful real-world example where microeconomic principles can be easily illustrated. Even years after the COVID-19 pandemic is over, references and examples will be useful in the classroom, just as instructors still reference the Great Recession. Students will not soon forget the events that transpired during this unusual period, and they will be able to draw from their own experience.

The goal of this paper is to offer high school economics teachers a way to illustrate to students that much of what has transpired during the COVID-19 pandemic can be explained by the basic microeconomic principles they have learned. The paper starts by discussing examples of demand and supply shifts, complete with graphical presentations. Then topics related to scarcity, shortage, price elasticity of demand, and price gouging are addressed through supporting examples. The idea of non-market allocation is discussed and the theories of externalities and public goods are applied. All content is presented at a level appropriate for high school students in a general economics course and in a manner that will engage them. While it is impossible to cover all microeconomic aspects of the pandemic, the major points are incorporated.

### A. Background on the COVID-19 Pandemic

The COVID-19 pandemic began in Wuhan, China in late 2019. By mid-March of 2020, the outbreak in China began to taper off after 82,000 cases and over 3,000 deaths. By early June of 2020, over 400,000 deaths throughout the world were attributed to the virus, with more than 100,000 of them in the US (“WHO Coronavirus Disease”, 2020). To slow the spread of COVID-19, mandatory quarantines were enacted in most countries and many businesses were forced to adapt or close. Travel was restricted as countries closed their borders to tourists. In the US, large scale gatherings such as concerts, conferences, and festivals were canceled, including the NCAA basketball tournament and most professional and amateur sporting events. All but essential businesses were closed for a period of time and people were encouraged to telecommute where possible. The decrease in business activity resulted in massive furloughs and layoffs, likely impacting the families of most high school students in some manner.

In May and early June of 2020, most states started to reopen their economies. However, the reopening took place in stages to maintain some degree of social distancing. While economic activity began to pick up, the levels in mid-June were still below the pre-pandemic levels. Given these changes in economic activity, the National Bureau of Economic Research (NBER) officially declared that a recession had started in February (NBER, 2020).

### B. Changes in Market Demand

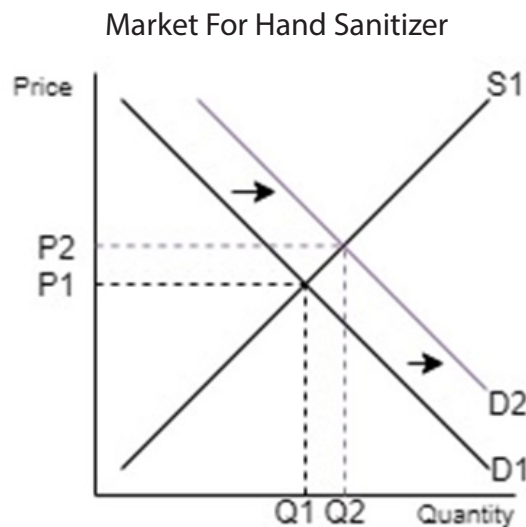
There are numerous examples of real-world events related to the pandemic that can be illustrated with the basic tools of supply and demand. Changes in demand were obvious to the casual observer and affected many sectors of the economy. Such real-world events allow instructors to illustrate many of the demand shifters taught in an introductory economics class. For a few industries, the pandemic led to demand increases, for example, health-related products and delivery services. But many sectors across the economy saw severe and long-lasting decreases in the demand for goods and services.

#### Increases in Market Demand

The COVID-19 pandemic led to dramatic increases in demand for health-related items,

such as disinfectants, hand sanitizers, and face masks. In this case, the demand shifter illustrated is an *increase in the number of demanders*, when people who had never purchased items like face masks purchased them during the COVID-19 crisis. Another demand shifter demonstrated during the pandemic is that of *preference strength*, such as when previous consumers of disinfectant sprays, bleach, and hand sanitizer had stronger preferences for these items than in the past, and therefore, desired to purchase larger quantities. Figure 1 uses hand sanitizer as an example and illustrates that the price of hand sanitizer should increase (from P1 to P2) and the quantity exchanged should increase (from Q1 to Q2) as a result of a demand increase. A similar graph can be generated for face masks, antibiotic soap, and other items in high demand during the pandemic.

Figure 1. Increased Demand for Hand Sanitizer



As theory predicts, consumers did see price increases for health-related items during the pandemic. For example, the media focused on a pair of brothers in Tennessee who reported that their stockpiled hand sanitizer had sold for between \$8 and \$70 at the start of the pandemic (Nicas, 2020). Our own inspection found large bottles (67.6-ounces) of Purell Hand Sanitizer advertised for \$299 on Amazon in March (accessed 3/8/2020), a price far above what the product sold for before the pandemic. Of course, the ability of a supplier to sell items at these unusually high prices depends on consumers' price elasticity of demand, a topic discussed below. The increase in demand for sanitizer and face masks caught suppliers off guard, and in many cases, shelves remained empty, creating shortages (an idea discussed below). In some cases, individuals bought out inventories in an attempt to control supply and obtain high prices (the idea of price gouging is discussed below).

Another interesting development, with clear demand implications, occurred in late February and early March. The FDA and President Trump approved the testing of a substance that had the potential to treat the Coronavirus. Interestingly, the substance was already used in drugs for malaria and arthritis, but it was also an ingredient in a chemical used to fight microscopic organisms in fish tanks. A 25-gram bottle of this fish tank additive went from the normal price of \$10 to over \$400. This increase in demand likely reflected purchases of the fish tank additive for personal use in fighting the COVID-19 virus (Wallace, 2020).

The pandemic also led to *substitution between goods/services*, another demand shifter

taught in a standard supply and demand unit. When hand sanitizer became prohibitively costly (or unavailable), Facebook users offered recipes for making it with aloe vera gel and rubbing alcohol. Thus, the demand for high concentration rubbing alcohol (also a good disinfectant) expanded, resulting in price increases and increased quantity exchanged like that illustrated in Figure 1. A review of listings on Amazon suggests that this was, indeed, the outcome (accessed 3/14/2020).

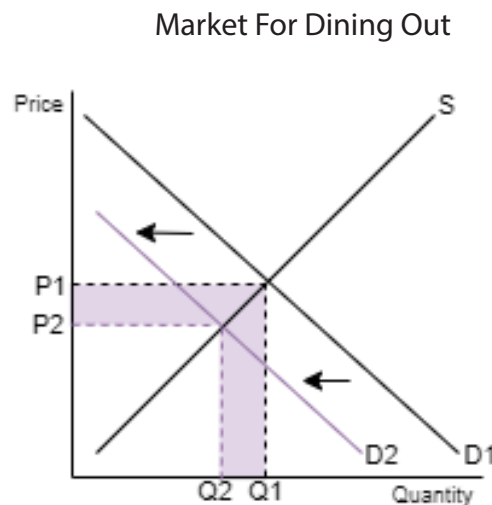
Another example of substitution was related to online shopping and delivery services. Given people's reluctance to visit stores, these activities increased tremendously. Amazon announced the need for an additional 100,000 warehouse workers and offered a \$2 increase in hourly rates for March and April (Kim, 2020). The demand for food delivery services through companies such as Uber Eats and Grubhub also increased (Marcellus, 2020).

### Decreases in Market Demand

While some industries saw increases in demand for goods and services, many markets experienced severe and prolonged decreases in demand as a result of COVID-19. Social distancing led to less time in public—eating out less, avoiding movie theaters and other entertainment venues, canceling vacations, etc. Not surprisingly, these restrictions impacted many industries and businesses including restaurants and bars, hotels and vacation rentals, retail shops, beauty salons, and Uber/Lyft drivers, just to name a few. Also, some states ordered the cancellation of all non-essential medical procedures, including visits to dentists and veterinarians. Students will remember the massive shutdown of businesses in their communities.

Figure 2 uses dining out as an example to illustrate the impact during the pandemic, but the example could easily be vacation rentals or hotel reservations, along with many others. Decreased demand for dining out led to falling prices and a lower quantity exchanged. Price decreases to consumers often came in the form of promotions or coupons by businesses who simply wanted to maintain some level of economic activity. The general conclusion is that the affected industries, which were numerous, saw revenues fall. In Figure 2, revenues change from  $P1 \cdot Q1$  to  $P2 \cdot Q2$ , with the decrease represented by the shaded area.

Figure 2. Decreased Demand for Dining Out



Some restaurants remained open by offering free home delivery or bringing takeout

food to customers' cars in the parking lot, an attempt to protect some portion of their business. Even in June, as states phased in a re-opening of their economy, activity remained limited. For example, many states allowed restaurants to re-open for dine-in services, but only at 50% of inside seating capacity. OpenTable data reported by *The Wall Street Journal* showed that customers started to return to their favorite restaurants during the re-opening in May and June. However, data for June 2020 showed that the number of diners was less than half of what was reported in June 2019 (Scheck and Haddon, 2020).

### Changes in Market Demand Related to Consumer Income

Changes in demand also resulted from *changes in consumer income*, another demand shifter. Unfortunately, during the epidemic, many people found themselves with lower incomes as a result of layoffs, furloughs, decreased hours, or pay cuts. Many business owners found themselves with lower sales revenue, meaning that their compensation fell, as well. The effects were sizable. Tom Douglas, a renowned chef in Seattle, announced the temporary closing of 12 of 13 restaurants due to a 90% decrease in customers. This put most of his employees out of work, forcing them to obtain new jobs (if possible) or wait for the restaurants to re-open (Severson and Moskin, 2020). The Marriot International hotel chain announced in March that they would furlough tens of thousands of workers in their hotels due to the pandemic (Karmin, 2020). The American Hotel and Lodging Association estimated that over 4 million people in the hotel industry (about 50%) could lose their jobs because of decreased travel (Wiley, 2020). By May 2020, at the start of the re-opening, the unemployment rate reported by the Bureau of Labor Statistics was 13.3%, a drop from the April peak of 14.7% ("Economics News Release", 2020).

As instructors explain in their classrooms, changes in income can have significant demand effects. When consumers have less money in their pockets, they decrease their demand for "normal goods," such as vacations, new cars, theater tickets, dining out, and specialty coffee. For example, Starbucks closed more than half of its stores due to the pandemic; only those stores with drive-thru windows were allowed to remain open. Even with all of their customers funneled through the open drive-thru locations, some store sales fell about 25% for the open locations. While travel restrictions and the desire for social distancing affected sales, some of this reduction was because consumers had less room in their budgets for spending on "normal goods" such as specialty coffee (Taylor, 2020). When looking back at results from the spring of 2020, it can be hard to disentangle the effect of a decrease in demand (customers buying fewer "normal goods" as income fell or due to a desire to be socially distant) from the effect of business shutdowns (limiting availability to consumers). Both effects are relevant when determining the effect of the pandemic on businesses.

Conversely, economic theory prescribes that when incomes fall, there is an increase in the demand for "inferior goods." This could mean an increased demand for generic brand food and other household goods, or if the effects were expected to be long term, buying used cars in place of new cars. For example, the demand for rice and dried beans increased by over 50% in the first half of March (Corkery, Yaffe-Bellany, & Nierenberg, 2020). This might reflect the long shelf-life of the products (for those stockpiling food). However, it could also reflect the income effect, as rice and beans are considered to be inferior goods. Compared to the last week of May in 2019, sales of used cars were up 6% and the average selling price rose 5.74% in 2020, as theory related to inferior goods predicts. Likewise, during this same period, the sales of new cars (a normal good) fell by 28% (Carey, 2020).

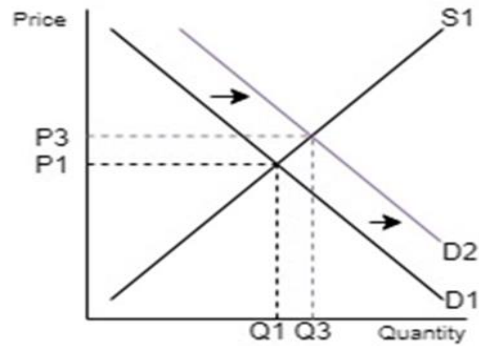
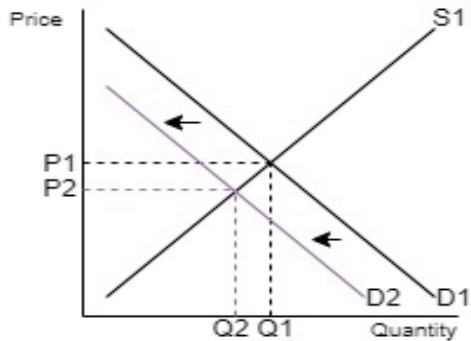
Figure 3 illustrates the effects of falling income on both normal and inferior goods. A drop in income decreases the demand for normal goods (restaurant meals, new cars) and increases the demand for inferior goods (rice & beans, used cars). As a result, the prices and

quantity exchanged of normal goods decreased, whereas the price and quantity exchanged of inferior goods increased. As discussed above, consumers saw price promotions for vacation packages and restaurant to-go meals (normal goods), while prices and sales of used cars (an inferior good) increased.

Figure 3. Decreases in Income and the Demand for Normal and Inferior Goods

Market For Normal Goods  
(EX: Restaurant Meals, New Cars)

Market For Inferior Good  
(EX: Rice & Beans, Used Cars)



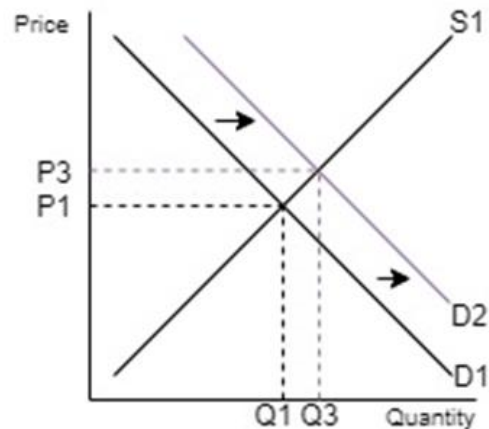
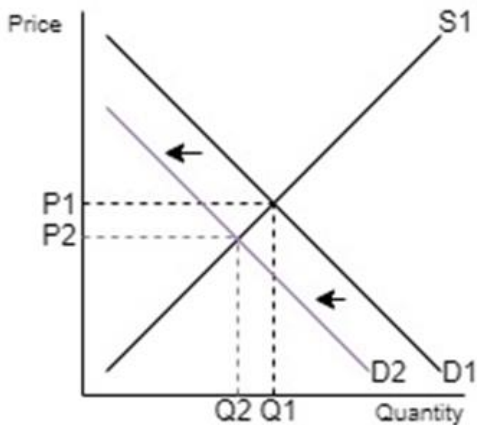
Changes in Market Demand Related to Consumer Expectations

Demand also shifts in response to *changing expectations of future prices*. Theory suggests that when consumers expect prices to decrease in the future, they delay their purchases. This kind of speculation by consumers might have existed concerning travel. For example, suppose the Jones family was planning to attend a family reunion in September 2020 and would normally purchase airline tickets in February 2020. As the pandemic is announced in February, they speculate that airline prices will begin to fall and choose to delay their purchases in hopes of finding a better deal. In this sense, they are decreasing current demand (by not buying tickets in February) and increasing future demand (by waiting until March or April). This strategy is illustrated in Figure 4.

Figure 4. Impact of Expected Increases in Future Prices on Demand for Airline Travel

Current Demand For Tickets

Future Demand For Tickets



Of course, border closings implemented by almost every nation all but eliminated the need for airline travel during the pandemic, something that caused the demand for air travel (at least for international travel) to eventually plummet. However, expectations of future prices impact peoples' willingness to purchase tickets today for future travel.

For Discussion or Extension (MARKET DEMAND):

- Based on observations from your community, what businesses experienced a decrease in demand? Are you aware of any businesses that saw an increase in demand for their good or service during the pandemic?
- Some businesses used innovative methods to increase demand for their goods or services during the pandemic. What examples did you observe?
- In late March, the CARES Act was signed by President Trump. One element of the Act was that checks were sent to most households in the US. How would this impact demand for goods and services? Can you give examples of businesses that might have benefited from families receiving this money?
- Unemployment insurance, which was expanded as part of the CARES Act, provides income to unemployed people. What role does this benefit play in stimulating demand?
- What companies have done well during the pandemic (drug, teleconferencing, cleaning) and what kind of companies have suffered (airlines, hotels, restaurants). Do patterns of stock prices (available at [finance.yahoo.com](http://finance.yahoo.com)) confirm these expectations?
- Lowes and Home Depot (home improvement) reported increased sales and earnings during the pandemic (Cain, 2020). Was this outcome predictable? Why or why not?
- The New York Times Upshot published a study of income and unemployment during the pandemic, "The Rich Cut Their Spending. That Has Hurt All the Workers Who Count on It" (Badger & Parlapiano, 2020). Teachers can divide students into small groups and assign them a particular month and industry discussed in the article. Based on their intuition, students can develop supply and demand graphs to illustrate the anticipated effects of changes in income on their assigned industry.

[https://www.nytimes.com/2020/06/17/upshot/coronavirus-spending-rich-poor.html?campaign\\_id=9&emc=edit\\_nn\\_20200617&instance\\_id=19462&nl=the-morning&regi\\_id=101281165&segment\\_id=311113&te=1&user\\_id=195279e36d3a1902\)2227cb471762df85](https://www.nytimes.com/2020/06/17/upshot/coronavirus-spending-rich-poor.html?campaign_id=9&emc=edit_nn_20200617&instance_id=19462&nl=the-morning&regi_id=101281165&segment_id=311113&te=1&user_id=195279e36d3a1902)2227cb471762df85)

## 2. Changes in Market Supply

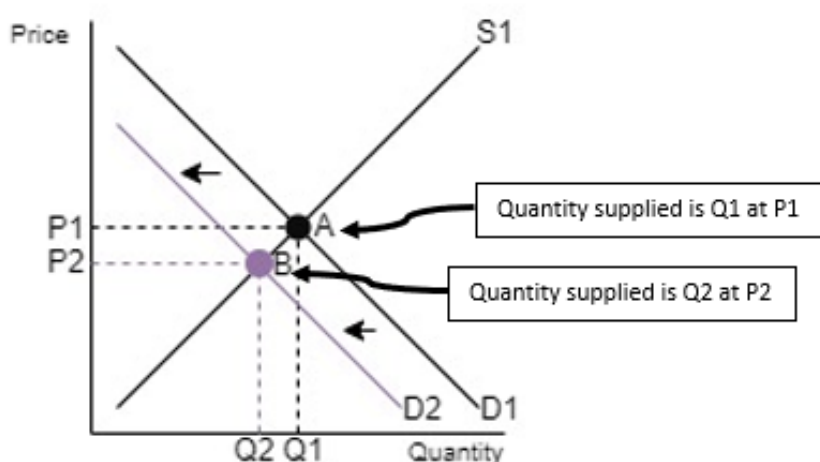
Some of the market effects observed during the COVID-19 epidemic were the result of supply shifts or changes in quantity supplied (resulting from changes in demand). Real-world events during the pandemic provide opportunities to illustrate the supply shifters taught in a general economics course.

### A. Quantity Supplied vs. Supply

Students of economics often have a difficult time understanding the distinction between a *change in supply* (shifting of the supply curve) versus a *change in quantity supplied* (movement along the same supply curve). Changes in supply are a result of the ceteris paribus assumptions. But changes in quantity supplied are generated by changes in price. The phrases are not interchangeable, as they mean two different things. This nuance is often lost on students.

The airline market during the pandemic offers an opportunity to illustrate the difference between a change in supply vs. a change in quantity supplied for students. As borders closed and stay-at-home mandates were imposed, the demand for airline travel fell dramatically. Airlines grounded planes, resulting in fewer flights (a decrease in quantity supplied) for many routes. By early May, German airline Lufthansa had grounded 700 of their 760 planes in response to the decrease in demand (Stefan, 2020). This is illustrated in Figure 5. As seen, the *supply* of airline travel is not changing—there is no shift in the supply curve. The decrease in demand from D1 to D2 causes *quantity supplied* to decrease, as seen in the movement from **point A** (Quantity supplied Q1 at price P1) to **point B** (Quantity supplied Q2 at price P2).

Figure 5. Change in Quantity Supplied of Airline Flights  
Market For Airline Flights



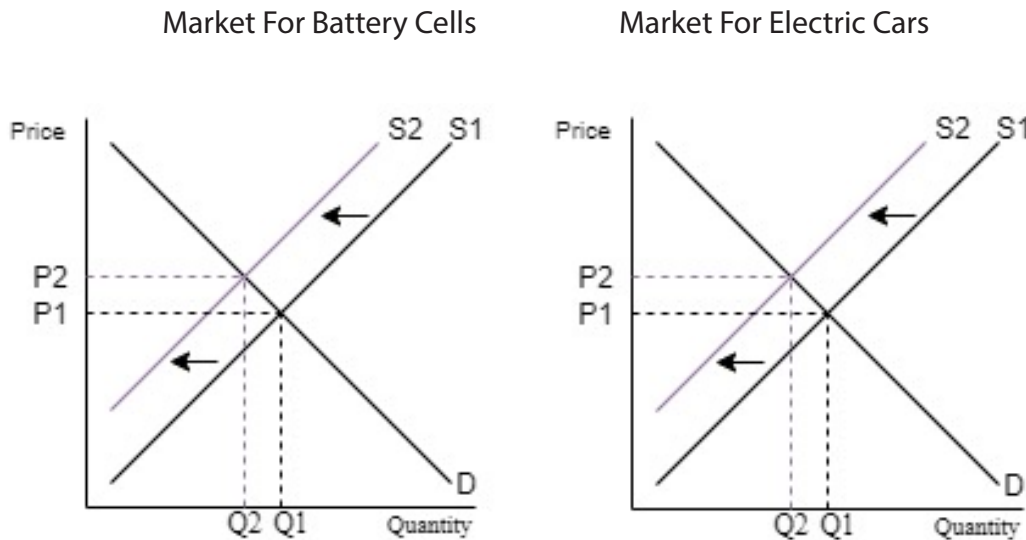
However, Lufthansa communicated that, even when the pandemic ends, the company expects to be 100 planes smaller (“Lufthansa Expects Hundreds”, 2020). Emerging as a smaller carrier, post pandemic, would constitute a *decrease in supply*. Thus, the supply curve would shift to the left (similar to what is seen in another example in Figure 6).

### B. Changes in Prices of Inputs

A supply shifter discussed in microeconomics involves *changes in the price of inputs* to production. The COVID-19 pandemic led to some interruption in imports, especially those from China. Fewer imports from China could lead to price increases. Or, if a manufacturer could not reliably get the needed inputs from China, it might need to utilize a higher-priced substitute. The higher input prices lead to a decrease in supply. For example, China is the leading producer of battery cells, but interruptions in factory operations during the pandemic decreased production by 10%, increasing the price of this item and decreasing quantity exchanged, as illustrated in Figure 6 (left). Manufacturers of electric-based vehicles rely on battery cells and were forced to look elsewhere (Spector, 2020), potentially leading to higher input prices. Higher input prices (left) would decrease the supply of electric vehicles, and increase prices, as seen in Figure 6 (right).



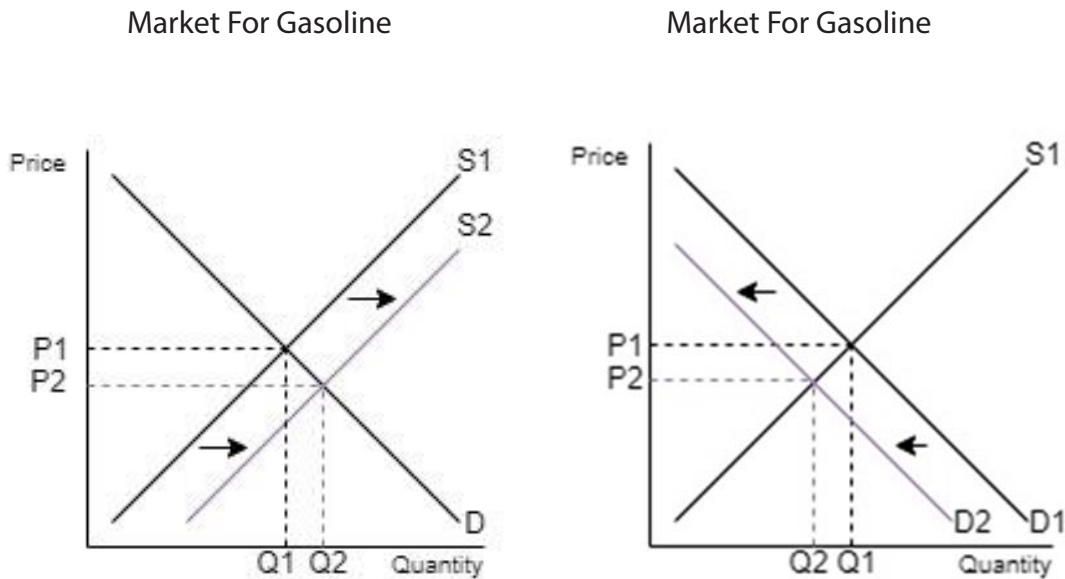
Figure 6. Increased Price of Inputs Resulting in Higher Prices for Related Products



However, the illustration above has been simplified. Instructors should remind students that, likely, the demand for electric cars (a normal good) would be falling at the same time due to the effects of changing income discussed above. The two effects could be combined to show offsetting effects on price, where more expensive inputs drove prices up, but decreased demand for the final good drove prices down. So, the resulting change in prices is uncertain.

Another example of the changing price of inputs took place during the pandemic. Oil prices were heavily influenced by a price war in early March of 2020, stemming from a disagreement between OPEC and Russia on how much to constrain oil supply. The concern was that if supply were reduced too much (to increase prices), it could further open the door to American producers. When the potential agreement imploded, Saudi Arabia increased market supply, which slashed prices (Defterios, 2020). Oil is the primary ingredient in the production of gasoline. Thus, the supply of gas increased as input prices (oil) decreased. But how is that linked to the Coronavirus? The supply shift itself was unrelated to the pandemic. However, at the same time, energy demand was down worldwide—airlines cut back on flights, countries/states mandated cancellation of major events, and businesses reduced hours or shut down. There were fewer cars on the road and people were driving fewer miles, as people were working from home, making fewer trips to the grocery store, and staying at home during the quarantine. As seen in Figure 7, both the supply increase (from cheaper inputs) and the demand decrease (resulting from the pandemic) led to the price of gasoline falling dramatically, since both economic effects drove prices downward.

Figure 7. Increased Supply and Decreased Demand for Gasoline



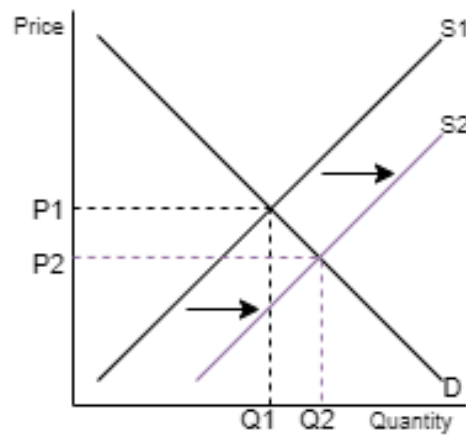
By the end of April 2020, gas prices had fallen to an average of \$1.76 per gallon (“Uptick in Gas”, 2020). As states started to reopen in May and June, the price of gas rose but remained almost a dollar below where it had been during the prior two summers (“Gasoline Demand Steadily”, 2020). Students might recall that people were still social distancing and possibly working from home in June, so the demand for gas was likely still lower than it was prior to the start of the pandemic.

### C. Changes in Number of Suppliers

Students are taught that an *increase in the number of suppliers*, another supply shifter, leads to an increase in supply as more is produced at all prices. For example, if new apartment buildings are constructed in a community, then the supply of apartments has increased. But why would someone choose to build a new apartment complex? It is likely that they see an increasing demand and/or higher than normal prices in a particular market. Typically, the entry of suppliers and the associated increase in supply can take time. Just like it takes time to build apartments, firms in other markets might need to build or convert factories and develop technologies.

Interestingly, the pandemic offered a great example of entry behavior. When consumers had a difficult time obtaining hand sanitizer, firms started to enter this market. Because the production process is reasonably similar, by mid-June, more than 500 craft distilleries around the US had quickly switched from producing spirits to producing hand sanitizer (“Distilleries Producing Hand”, 2020). As seen in Figure 8, when the supply increased, the price of hand sanitizer decreased, and the quantity exchanged increased. Instead of the abnormally high prices for hand sanitizer (if available) seen at the start of the pandemic, hand sanitizer became regularly available with new brands on the market. This move also helped address shortages, a topic discussed below.

Figure 8. Increased Supply of Hand Sanitizer  
Market For Hand Sanitizer

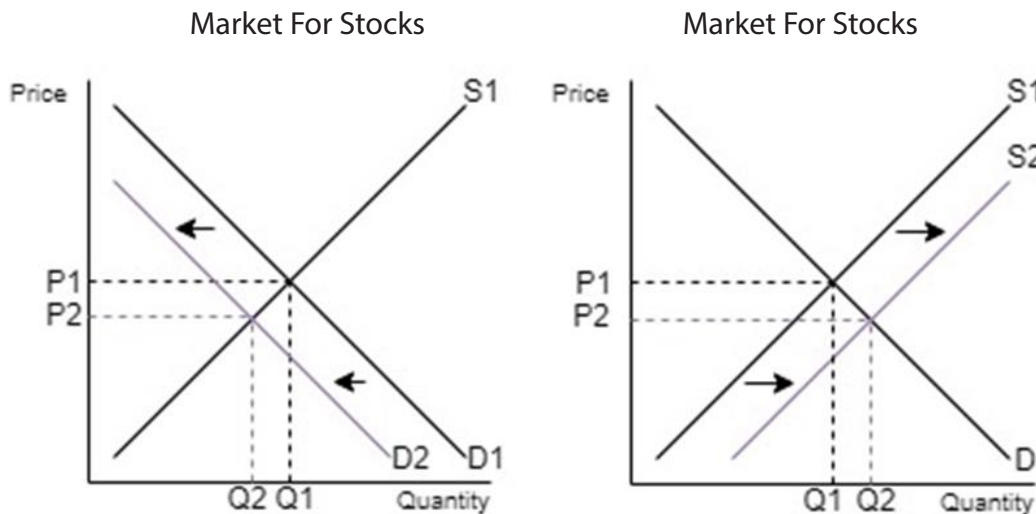


D. Changes in Expectations of Future Prices

The stock market also responded to the COVID-19 pandemic. In the stock market, both demand and supply shifts were seen in relation to *changing expectations of future prices*. Investors generally want to “buy low and sell high.” When someone decides to buy a stock, it is with the expectation that the price will continue to rise (an exception being the short sale). But what happens when people lose confidence that prices of stocks will continue to rise? It is no longer in their rational self-interest to purchase more shares. As a result, investors decreased their demand. At the same time, those holding stocks had similar concerns and sold shares, behavior that increased supply. Interestingly, this behavior was illustrated by two members of Congress, accused of dumping their stocks on the market after receiving insider information about the impact of the COVID-19 virus, knowledge that was gained through a nonpublic meeting (Nelson & Manskar, 2020).

Figure 9 illustrates that both the demand decreases and the supply increases, together, led to the dramatic fall in almost all stock prices (“Dow Jones Industrial”, 2020).

Figure 9. Decreased Demand and Increased Supply in the Stock Market



As theory predicts, the Dow Jones Industrial Average fell 36% between February 20<sup>th</sup> and March 23<sup>rd</sup> (its lowest point during the pandemic). By June, as states re-opened, the stock market had recovered much of its losses, but volatility is likely to remain until the end of the pandemic.

For Discussion or Extension (MARKET SUPPLY):

- Are there examples of businesses that permanently shut down as a result of the pandemic? Would this be a decrease in supply or decrease in quantity supplied?
- Many workers demanded higher pay as “front line” workers during the pandemic (delivery people, grocery store clerks, etc.) and some companies, such as Amazon, did offer higher wages. How would this impact the market for things like groceries, delivery services, etc. given that workers are a key input?
- Regulations imposed costs on businesses such as building partitions, limiting the number of customers who entered a store or dined in, mandated cleaning processes, etc. What examples of added cost did you see in your community?
- How would the activities in the previous question be represented in a supply and demand illustration?
- Dominoes Pizza ran national commercials advertising that they were hiring (Urie, 2020) (<https://www.pennlive.com/life/2020/05/looking-for-work-dominos-pizza-cat-and-others-hiring-amid-coronavirus-pandemic.html>). Why might this company need more workers? And, given the expanded unemployment benefits offered through the CARES Act, why might it have been difficult to find more labor?

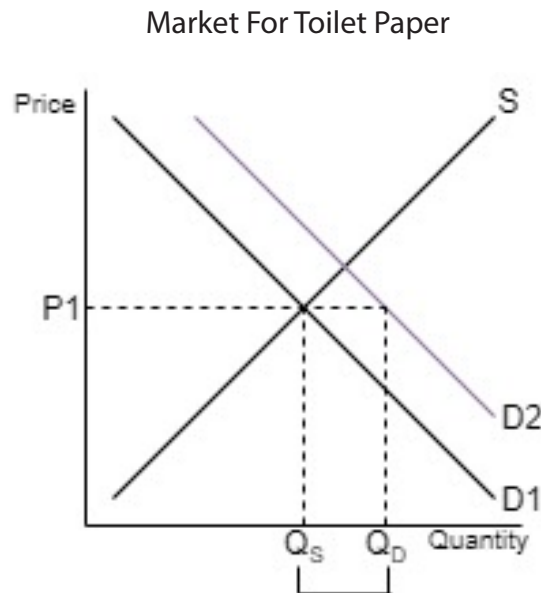
### 3. Scarcity Versus Shortage

Another area of confusion for students is the distinction between scarcity and shortage. Something is *scarce* if people want more than is freely available. In other words, when something is scarce, we cannot all obtain the quantity we wish for when the item is given away for free. For example, if toilet paper were simply handed out (price=\$0), it is very possible that stores would run out and some people would not be able to meet their desires. There are a finite amount of resources in our economy, and this means the amount of toilet paper (and other goods and services) that can be produced is not infinite. We usually do not see toilet paper given away for free—there is a market price established and consumers and producers make decisions on how much to consume and how much to produce with respect to this price. In this sense, the market price serves as a mechanism for allocating items that are scarce. When the market sets a price of \$3 for toilet paper, producers want to produce more units and consumers want to consume fewer units, compared to when the item is handed out at a price of zero (no cost). The market reaches an equilibrium where quantity demanded equals quantity supplied (the demand curve intersects the supply curve). However, the item is *scarce* since it is not unlimited, therefore an allocation mechanism is needed to decide who gets what (usually price).

A situation of scarcity should not be confused with a *shortage*. At the market price of \$3 in the above example, toilet paper is scarce, as it is not unlimited. But there is not a shortage. A shortage is a situation where the amount desired is greater than what is available ( $Q_D > Q_S$ ). Normally, at the going price of toilet paper, consumers are able to get the number of rolls they desire. It should be noted that sometimes goods or services see increased scarcity associated with a decrease in supply. But again, it may not be in shortage. For example, fresh berries in winter are scarcer than in summer, and the reduced supply causes the price to increase. But berries can be found by those who want them—there is no shortage.

However, *shortages* were part of life in some areas during the pandemic. Shortages are characterized by empty shelves in Walmart or products being unavailable on Amazon. Toilet paper was one of the items that were often unavailable for the first part of the pandemic, as people stocked up on this item likely out of sheer panic. Figure 10 illustrates the shortage of toilet paper in the face of increasing demand (and price not changing accordingly). The quantity supplied of toilet paper at price  $P_1$  is  $Q_s$ , but the number of rolls desired is  $Q_D$  (after the demand increase).

Figure 10. Shortages of Toilet Paper



The invisible hand of the marketplace leads to increased prices when shortages occur. But this is often a gradual process. As stores did not change the price of the toilet paper they sold, shelves remained empty for extended periods. To counteract panic buying, many stores limited the amount of toilet paper that could be purchased by customers. The same graph can be applied to many other items during the pandemic, especially during the first several weeks—hand sanitizer, face masks, antibiotic wipes, baby wipes, rubbing alcohol, etc. In some cases, grocery stores ran out of certain food products, for example, yeast and whole wheat flour became difficult to find in our local stores.

Interestingly, the media tried to convince consumers that they should not panic about toilet paper. They explained that, while shelves were often empty, there was not a nationwide shortage of toilet paper. The explanation was that panicked consumers went into a hoarding mode, meaning that supply could not keep up with the unusual surge in demand. From the consumers' perspective, there was, indeed, a shortage at the grocery stores because shelves were often empty and they could not get all that they desired. However, production was not being limited (Gibson, 2020). Nevertheless, the sales of bidets (toilets with a built-in pressurized water sprayer) increased ten-fold for a New-York based supplier since they offered an interesting substitute to toilet paper (Depinto, 2020). Our inspection on Amazon in March (accessed 3/26/2020) showed many models of bidets on backorder for weeks. Shelves of baby wipes and paper towels were often cleaned out in stores.

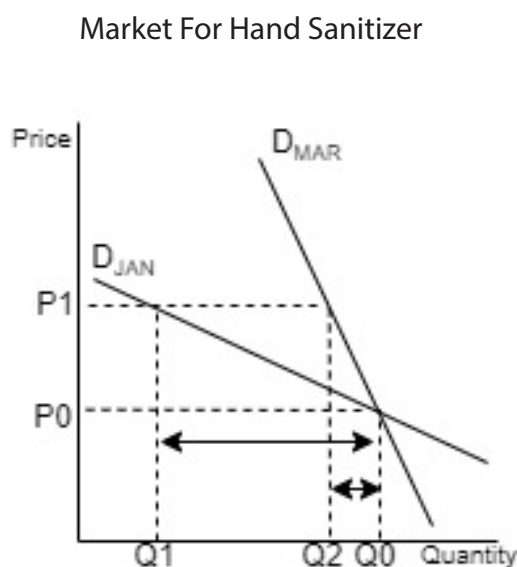
With the growing need for medical services, shortages were seen in many hospitals. There were

shortages of protective masks and gowns for use by medical personnel. In response, people were asked to sew masks in their homes and donate to front-line workers. Joann Fabrics offered free materials to anyone who could help offset this shortage and instructions for making masks were posted online (Puhak, 2020). Clothing producers such as Ralph Lauren and Gap got involved in the production of masks and gowns to reduce the shortage (Harper, 2020). There was also great concern about shortages of hospital beds and specialized equipment such as ventilators (since one symptom of the virus is shortness of breath), not to mention the medical personnel themselves (Villa, 2020). As a result, many countries limited the export of certain medical components. India limited exports of painkillers commonly used to treat symptoms of flu and Germany banned the export of protective gear such as masks, gloves, and suits (Polantz, 2020). Italy waived final qualifying exams for 10,000 medical school graduates so that they could immediately be put to work, a measure that quickly increased the supply of medical personnel (Cole, 2020).

#### 4. Price Elasticity of Demand

During the COVID-19 pandemic, there was an increase in demand for commodities perceived to decrease the risk of infection. But also, consumers became *willing to pay more* for those items. There is evidence that consumers often paid many times the “normal” price for items such as Lysol, Clorox wipes, and hand sanitizer, with Purell supplied by the brothers in Tennessee selling for \$8 to \$70 a bottle on Amazon. During the pandemic, consumers had a more *inelastic* demand, making them less price sensitive. In January, before the spread of the virus to the USA, an \$8 price for Purell would have led to drastically decreased sales and an \$80 price might have entirely eliminated sales. But in March of 2020, at the height of the pandemic, that was not the case. Figure 11 illustrates the changing price elasticity of demand for products like hand sanitizer. In January, the demand curve would have looked more like  $D_{JAN}$ . By March, the demand curve became more inelastic, and therefore more vertical, as in  $D_{MAR}$  (not factoring in the demand shift). As the price increased from  $P_0$  to  $P_1$ , the quantity would have fallen by a much greater amount in January (from  $Q_0$  to  $Q_1$ ) before the pandemic, than it did in March (from  $Q_0$  to  $Q_2$ ).

Figure 11. More Inelastic Demand for Hand Sanitizer



The issue of elasticity of demand became relevant in discussions about medical treatment for COVID-19 and concerns about whether people would pursue testing and treatment. Instructors of economics teach their students that an individual's price elasticity of demand is related to multiple things—if the good or service is a *necessity or luxury*, if there are *available substitutes*, and the *size of the item in their budget*. Testing or treatment for COVID-19 might be a necessity, making demand more inelastic. And there are not substitutes for testing or treatment, also making demand more inelastic. However, estimates suggested that even those with insurance might pay a minimum of \$1,300 if hospitalized for treatment of the virus. The cost for those uninsured would be far higher (Westman, 2020). This would be a sizeable portion of the average American's disposable income, especially for those unemployed or furloughed. As such, this influence would make the demand for testing and treatment more *elastic*. Would people be willing to absorb the cost of testing and treatment? In response to these concerns, some insurance companies waived co-pays for testing (Sullivan, 2020).

For Discussion or Extension (PRICE ELASTICITY OF DEMAND):

- Using the determinants of price elasticity of demand, what might you conclude about the elasticity of demand for COVID-19 testing?
- Demand for a good or service is more elastic over long periods of time because consumers have more time to identify substitutes and change behavior. For example, high gas prices might be tolerated in the short run, but in the long run, people might buy more fuel-efficient cars or relocate closer to their jobs. Is COVID-19 an exception to this idea?
- If government is concerned that people might not get tested due to the high cost of tests and also treatment (if positive), what are ways that testing can be expanded?

## 5. Price Gouging and Retail Arbitrage

Some entrepreneurial individuals attempted to take advantage of the COVID-19 pandemic and the inelastic demand of consumers. One such example involved a British teenager selling individual pumps of hand sanitizer for 50 pence each, the equivalent of just over 60 cents in US dollars (Al-Arshani, 2020). In another case, the public was outraged over two brothers in Tennessee, who, after the first Coronavirus death, stockpiled more than 17,000 bottles of hand sanitizer, along with antibacterial wipes as part of a "retail arbitrage" scheme. This "buy low and sell high" scheme resulted in phenomenal profit levels, as market prices skyrocketed with the rising demand and decrease in consumer price sensitivity. The financial windfalls ended for the brothers when Amazon pulled their listings. In response to retail arbitrage and price gouging that was observed, Amazon, eBay, and Walmart suspended sellers who were taking advantage of the health crisis (Nicas, 2020).

States quickly began to pass price gouging laws to protect consumers (if laws did not already exist). For example, South Carolina passed a law making it illegal to "rent or sell or offer to rent or sell a commodity at an unconscionable price" (Miller, 2020). But what is meant by "unconscionable?" The intent is that normal market functions, such as price changes stemming from shifts in supply or demand, are considered as "conscionable." However, it can be difficult to distinguish between market functions and price gouging. Lumber prices might skyrocket as demand increases during a hurricane, for example. Interestingly, the definition of price gouging differs from state to state. Some states have general language that refers to "unconscionable prices" during a state of emergency but there is no actual definition of what might constitute an unconscionable price. The idea is left open to interpretation and language such as "grossly exceeding" a previously set price is used. Other states quantified the idea of price gouging.

For example, in Alabama, price gouging laws prevent anyone from selling commodities or household essentials at a price more than 10% higher than prices were immediately preceding the declaration of an emergency. Kansas, however, uses a 25% increase benchmark (Price Gouging Laws, 2020). The Tennessee brothers exploiting consumers of hand sanitizer found themselves under investigation by the state Attorney General's office for their price gouging behavior (Pisani, 2020). Fines can be as large as \$20,000 per violation (Price Gouging Laws, 2020).

Airlines also came under attack for what looked like price gouging. After President Trump announced a travel ban, Americans in foreign countries scrambled to return home and avoid the risk of being stranded abroad. This created an immediate spike in the demand for international airline travel resulting in huge price increases. As such, airlines were accused by the public of price gouging. However, the price increases were a natural result of the demand increase. Nevertheless, airlines implemented price caps to avoid negative exposure on social media (Josephs, 2020).

For Discussion or Extension (PRICE GOUGING):

- Generally, what context makes it easier for price gouging to take place? How is price gouging related to consumers' elasticity of demand?
- The New York Times published an article on markets and shortages "The Law of Supply and Demand Isn't Fair" (Thaler, 2020) (<https://www.nytimes.com/2020/05/20/business/supply-and-demand-isnt-fair.html>). Using this article and the examples in this paper, can you debate the pros and cons of "price gouging."
- Put the Tennessee brothers on trial for "price gouging" with some students arguing each side of the case and the bulk of class sitting as a jury.
- It is sometimes difficult to determine if high prices are a result of price gouging or from spikes in demand. If you were faced with a scenario related to a drastic increase in price, how might you determine if price gouging has taken place?
- When publicly accused of price gouging as travel bans were announced, some airlines put caps in place on the price of their tickets, ensuring that price would not increase beyond a certain level. Does this strategy introduce other problems?

## 6. Nonmarket Allocation

In economics, students are taught that prices serve as an allocation mechanism in market economies to address scarcity. Since resources are scarce, there is a limited number of goods and services that can be produced. This requires an economic system to determine "who gets what." In a capitalist economy, the market decides how to allocate goods and services. Markets set prices and those prices dictate who will consume a good or service and who will forgo the consumption. Houses and cars, for example, are allocated to those people who have the *ability to pay* (they have the funds to pay the price) and a *willingness to pay* (they value the house or car at a high enough level). Economists support markets because they ensure that goods and services are allocated to where they are most highly valued, and that is efficient. Market prices also serve as signals to suppliers who might increase or decrease production.

Allocation problems were realized early in the pandemic, when not enough COVID-19 tests were available in hospitals. In this circumstance, how should staff decide who gets tested? Should tests be allocated to those who are willing and able to pay, as per the market mechanism described above? Most would agree that market pricing is not the optimal strategy in this context. So how should decisions be made in the face of scarcity? Non-market approaches are required, for example, first-come-first-served, based on age, or related to medical need.

During the COVID-19 epidemic, many difficult allocation decisions had to be made and



they were not made by the market. Faced with limited hospital beds, physicians/nurses, and medical equipment, Chinese doctors had to make decisions about who would receive treatment. When 1,000 patients needed ventilators and there were only 600 available, a shortage existed (Cha, 2020a). In a pure market setting, a shortage would eventually lead to price increases to address the allocation problem. But that does not happen in a hospital setting. Confronted with similar shortages, Italian physicians had to implement rules to determine who did and did not receive treatments, choosing to allocate resources towards the young and those patients deemed to have the best chances at recovery (Cha, 2020a). US hospital faced with the same staffing and equipment shortages considered how to handle “code blue” emergencies, when a patient stopped breathing or the heart stopped beating. Normally, medical professionals are charged with doing all they can to save lives, yet resource limitations made this impossible. Strategies like “do not resuscitate” had to be considered, even when not consistent with families’ wishes. The medical staff were simply forced to prioritize some patients over others (Cha, 2020b).

For Discussion or Extension (NONMARKET ALLOCATION):

- Many medical providers contracted COVID-19 while caring for patients in hospitals. A non-market mechanism for assigning these jobs would be to have everyone share this work equally. Is this method fair to providers with health risks? Is this method good for the community? Should this type of strategy have been employed?
- In relation to the previous question, what might have been a market mechanism for assigning shifts in hospitals where exposure to COVID-19 was a real concern?
- Teachers face non-market allocation in their classrooms. They want as many students to pass the standardized exam, but they have limited resources. Can teachers use a market mechanism to allocate their time and resources? If not, what non-market mechanisms could teachers use to make decisions? Is the situation in a classroom similar to or different than the one faced by doctors in a COVID ward?

## 7. Externality and Public Goods Implications

Economics courses often introduce the idea of *externalities*, where spillover costs or benefits are imposed on individuals not involved in the market exchange. The standard example is second-hand smoke. Smokers impose costs on others when they light up. Like second-hand smoke, the COVID-19 virus is an example of a negative externality. One person’s vacation to Italy (a high-risk area) or even a trip to the grocery store could result in others being exposed to the virus. Medical professionals were exposed to this negative externality daily, as coughing patients could infect those around them. Limited availability of protective smocks and face masks increased exposure to the negative externalities associated with providing medical care in the face of COVID-19.

The market cannot solve the problem of negative externalities. Markets cannot increase the price of cigarettes because they create a negative externality from second-hand smoke. And in the same manner, the market did not increase the price of a doctor’s visit when the negative externality associated with COVID-19 was present. Instead, negative externalities are usually addressed through government regulation. Governments have banned smoking in public places like malls and restaurants in order to protect people from second-hand smoke. Likewise, to limit the externality, borders were closed, quarantines or “shelter in place” orders were given, and business operations were restricted. Also, some retailers created “senior hours,” where only older shoppers could enter stores, as a measure to limit the externality (Tyko, 2020). Similar measures were taken during the re-opening phase—masks were required, large-scale

gatherings were limited, and businesses could open but had to reduce the number of people entering buildings.

Recent events have illustrated that society's health is what in economics is called a *public good*. Public goods have different characteristics than *private goods*, like hamburgers. Improved social health is "*nonrival*" because everyone can simultaneously benefit from it. There is no "*rivalry*" as there is with a hamburger, where if one person eats the burger another cannot. Consumption of improved social health by one person does not diminish the ability for others to enjoy the improved social health. We can all benefit together. Also, improved social health is "*nonexcludable*," since there is no way to prevent anyone from enjoying it. Thus, even the people who did not socially distance themselves or did not wear masks benefitted from others who did. In this sense, public goods are subject to the "free rider" problem. In the COVID-19 example, some individuals felt sufficiently protected by the activities of others that they shirked on their responsibility to self-quarantine, practice social distancing, or wear masks. For example, the media shared the concerns of residents of Florida when their beaches were packed with spring break vacationers who disregarded the warnings to avoid large gatherings and maintain a safe distance from others (Hargrove, 2020). In another example, a Tennessee man who tested positive for the virus was guarded by police after refusing to quarantine himself (Rahman, 2020). As states re-open, social media posts reference the large number of individuals not wearing masks in public.

For Discussion or Extension (EXTERNALITIES/PUBLIC GOODS):

- As the world deals with the COVID-19 virus in the long-run, testing will be an important strategy for re-opening and reducing the chance of a resurgence of the virus. In what ways is a COVID test a public good? In relation to this, who do you think should pay for testing?
- How does a person choosing not to wear a mask potentially create an externality? After re-opening, did your state require wearing masks in public? Did people comply or act as free riders?
- For states requiring masks in public, what was the role of businesses in enforcing this mandate? How did businesses in your community respond?
- Social media posts revealed a debate about wearing masks, where some were in favor and some were not. What were the arguments on both sides of the debate, and do they tie into the idea of externalities and public goods?
- The labor market did not necessarily respond to the increased risk. Front-line workers were not always given higher wages when having to risk exposure to externalities since market prices (wages) do not incorporate externalities. Should government or businesses have been required to address this market failure? Why or why not?
- Economists are fond of market-based solutions to externalities—making those who create a negative externality pay a tax or fee or subsidizing/rewarding those whose behaviors create positive externalities. Are there strategies that government could take to enact market-based solutions to COVID-19? What about the businesses themselves? Could they employ market-based strategies to encourage the behavior that they want?

## **Conclusion**

Students learn when they can connect to class content in a meaningful way. The COVID-19 epidemic is a real-world event that impacted the lives of both students and teachers, and the events will not be soon forgotten. Instructors can use the examples presented in this paper to show that basic microeconomic principles illustrate much of what transpired during the pandemic. Connections are made to microeconomic topics including supply and demand, elasticity of demand, nonmarket allocation, and externalities. This paper intends to speak at a level understood by the average high school student in a general economics course. While some illustrations are simplified, they offer accurate depictions of events while not adding unnecessary complexity.

## References

- Al-Arshani, S. (2020, March 12). UK teenager sent home from school for selling squirts of hand sanitizer amid coronavirus outbreak. *Business Insider*.
- Badger, E., Parlapiano, A. (2020, June 17). The rich cut their spending. That has hurt all the workers who count on it. *The New York Times*.
- Cain, A. (2020, May 20). Home improvement sales surge during coronavirus pandemic, as Lowe's experiences major jump in in-store and online spending. *Business Insider*.
- Carey, N. (2020, June 5). Bargain-conscious Americans lift used-car sales in the coronavirus economy. *Reuters*.
- Cha, A. E. (2020a, March 15). Spiking U.S. coronavirus cases could force rationing decisions similar to those made in Italy, China. *The Washington Post*.
- Cha, A. E. (2020b, March 26). Hospitals consider universal do-not-resuscitate orders for coronavirus patients. *The Washington Post*.
- Cole, B. (2020, March 18). 10,000 med school graduates in Italy skip final exam, get sent directly into health service to help fight COVID-19. *Newsweek*.
- Corkery, M., Yaffe-Bellany, D., Nierenberg, A. (2020, March 15). 'There Is Plenty of Food in the Country'. *The New York Times*.
- Defterios, J. (2020, March 9). Why oil prices are crashing and what it means. *CNN*.
- DePinto, A. (2020, March 17). Bidet sales skyrocket amid coronavirus toilet paper shortage. *New York Post*.
- Distilleries producing hand sanitizer and disinfectant. (2020, June 16). *American Craft Spirits Association*. Retrieved from <https://americancraftspirits.org/>
- Dow Jones Industrial Average (DJI). (2020, June 16). *Yahoo Finance*. Retrieved from <https://finance.yahoo.com>
- Economics News Release. (2020, June 16). *U.S Bureau of Labor Statistics*. Retrieved from <https://www.bls.gov/home.htm>
- Gasoline demand steadily increasing as pump prices climb. (2020, June 15.) AAA.
- Gibson, K. (2020, March 18). America has plenty of toilet paper, stocking empty store shelves is the hard part. *CBS*.
- Hargrove, A. (2020, March 17). Social distancing not a priority for some Florida spring breakers. *KY3*.
- Harper, J. (2020, March 27). Designer brand Ralph Lauren to make masks and gowns. *BBC*.
- Josephs, L. (2020, March 12). American, Delta and United cap Europe-US fares as Trump travel ban sparks demand surge. *CNBC*.

- Karmin, C. (2020, March 17). WSJ news exclusive | Marriott begins furloughing tens of thousands of employees. *The Wall Street Journal*.
- Kim, E. (2020, March 16). Amazon is hiring 100,000 warehouse workers and raising pay as the coronavirus causes an 'unprecedented' increase in demand for this time of year. *Business Insider*.
- Lufthansa expects hundreds of aircraft to be grounded until 2022. (2020, May 19). *Reuters*.
- Marcellus, S. (2020, March 13). How the coronavirus outbreak is affecting your online food delivery. *Yahoo*.
- Miller, K. (2020, March 16). S.C. price gouging law now in effect amid coronavirus spread. *WIS News*.
- Nelson, S., Manskar, N. (2020, March 24). Senators deny they're corrupt after dumping stocks before coronavirus crash. *New York Post*.
- Nicas, J. (2020, March 14). He has 17,700 bottles of hand sanitizer and nowhere to sell them. *The New York Times*.
- Pisani, J. (2020, March 16). Tennessee brothers who stashed 18,000 bottles of hand sanitizer investigated for price gouging. *KKTV*.
- Polantz, K. (2020, March 15). Health care and consumer industry groups concerned about supply shortages during coronavirus pandemic. *CNN*.
- Price gouging laws by state (2020, March 24). *FindLaw*. Retrieved from <https://consumer.findlaw.com/consumer-transactions/price-gouging-laws-by-state.html#:~:text=In%20most%20states%2C%20price%20gouging,or%20deceptive%20trade%20practices%20law.&text=If%20prices%20are%2010%20or,that%20price%20gouging%20has%20occurred>
- Puhak, J. (2020, March 26). Jo-Ann craft stores are giving away free kits to make face masks. *Fox News*.
- Rahman, K. (2020, March 17). Kentucky man who tested positive for coronavirus guarded at home by police after he refused to quarantine. *Newsweek*.
- Scheck, J., Haddon, H. (2020, June 16). 'Running on fumes': Restaurants trying to reopen face cash crunch. *The Wall Street Journal*.
- Severson, K., Moskin, J. (2020, March 12). Restaurants across the country struggle to respond to coronavirus. *The New York Times*.
- Spector, J. (2020, February 13). Battery market faces supply crunch as coronavirus slows output of China's factories. *Green Tea Media*.
- Stefan, T. (2020, February 5). The fleets of Lufthansa group airlines will remain grounded throughout the summer. *Areonews*.
- Sullivan, P. (2020, March 10). Pence: Major health insurers have agreed to waive copays for coronavirus tests. *The Hill*.

- Taylor, K. (2020, May 5). How Starbucks plans to reopen 85% of stores by the end of this week and what the new normal for its coffee shops will look like. *Business Insider*.
- Thaler, R. (2020, May 20) The law of supply and demand isn't fair. *The New York Times*.
- The National Bureau of Economic Research (2020, June 17). Retrieved from <https://www.nber.org/>
- Tyko, K. (2020, March 18). Stores designate shopping time for seniors vulnerable amid coronavirus: Safeway, Whole Foods, Target and more. *Statesman*.
- Uptick in gas demand leads to first national average increase in 10 weeks. (2020, April 30). AAA.
- Urie, D. (2020, May 14). Looking for work? Domino's Pizza, CAT and others hiring amid coronavirus pandemic. *Penn Live*.
- Villa, L. (2020, March 16). Hospitals worry about shortages as coronavirus spreads. *Time*.
- Wallace, D. (2020, March 19). Drug cleared by Trump, FDA for coronavirus testing also found in fish tanks -- and prices online are soaring. *Fox News*.
- Westman, N. (2020, March 17). People with insurance could pay over \$1,300 for COVID-19 treatment. *The Verge*.
- WHO Coronavirus Disease (COVID-19) Dashboard. (2020, March 17). *World Health Organization*. Retrieved from <https://www.who.int/>
- Wiley, M. (2020). 4 million people who work in the US hotel industry could lose their jobs in the coming weeks due to the coronavirus. *Business Insider*.