Internalizing the Externalities of Antibiotic Overconsumption

Antibiotics are beneficial to society as they help to kill bacteria, protect health, and reduce infections in both humans and animals. However, antibiotics can also have adverse affects when not used properly. When misused, bacteria are able to survive exposure to the antibiotic, which creates antibiotic resistance. It has been argued that antibiotic resistance is a key contributor in the increasing future health care costs. This can be attributed to both the positive and negative externalities that stem from the use of antibiotics. Until these externalities are internalized, it will be difficult to combat antibiotic resistance. There is no free-market solution to the crisis of antibiotic resistance. Moreover, it is not possible to rely on a company to regulate its own production of the antibiotic at a necessary and safe level. The government must work to internalize the externalities of antibiotics by influencing the production and distribution of antibiotics; this can be accomplished by extending patent laws and regulating healthcare providers.

This essay is organized into six sections. I will begin by explaining the positive and negative externalities caused by the consumption (and overconsumption) of antibiotics including any incentives to internalize these externalities. The second and third sections explain how both pharmaceutical patents and the ‘tragedy of the commons’ influence and explain these externalities. The fourth section offers potential solutions to internalize the externalities of antibiotic consumption including the role of government regulation for healthcare insurance providers, as well as the extension of patent laws. The fifth section compares my findings to the Coase Theorem and considers the real world limitations of this approach. Finally, I conclude by exploring the potential solutions to internalizing the externalities of antibiotic consumption and the feasibility of their implementations.

Externalities

Externalities are “costs or benefits arising from an economic activity that affect somebody other than the people engaged in the economic activity and are not reflected fully in prices.” (Bishop) It is important to compensate for these externalities since markets affected by externalities suffer from inefficient resource allocations. (Stiglitz, 215) These externalities can be both positive and negative. If benefits are imposed on others, the externality is positive. Inversely, If
others are adversely affected, it is a negative externality. With negative externalities, the marginal social cost will always exceed marginal private costs, which leads the market to overproduce the good. Furthermore, if there is no private incentive for a firm to spend the money to make changes that would benefit the greater good, they will not engage in these changes. A positive externality from antibiotic use is when one patient uses antibiotics, and it reduces the chance of others catching that strain of bacteria from the patient. However, the overuse of antibiotics also yields negative externalities such as helping resistant strains of bacteria to survive when the antibiotic kills all other strains. Any bacteria that can survive antibiotic treatment will have a strong selective advantage over time, further perpetuating the problem. Additionally, Cross-resistance is another negative externality of antibiotic use; the use of one antibiotic can lead to the reduction of effectiveness for another antibiotic. Cross-resistance makes it very difficult to regulate any antibiotic since there are numerous other antibiotics which are also causing, as well as being affected by, this externality. There is also incentive for a healthcare insurance company to internalize the negative externalities of antibiotic consumption because if the resistant bacterial strain gets transferred from one patient to another, its costs go up to cover both patients. At the same time, healthcare providers are inclined to cater to their patients, which often leads to unnecessary prescriptions for antibiotics when the patient has a virus (which cannot be treated through antibiotics) instead of being prescribed only for infections.

**Intellectual Property Rights**

The overconsumption of antibiotics is highly likely due to the current system of antibiotic patents for the intellectual property rights of pharmaceutical companies in the United States. Patents are issued by the government and give “the discoverer of the knowledge exclusive use of the knowledge (including the right to license others to use it) for a limited period of time” (Stiglitz, 349). Since knowledge is considered to be a public good and patents interfere with the efficient diffusion and utilization of knowledge, government support is needed (Stiglitz, 349). John B. Horowitz explains in “How property rights and patents affect antibiotic resistance,” that extended patents reduce antibiotic resistance. This is because patents “give the owners an incentive to protect the value of antibiotics by curtailing their usage” (Horowitz, 578). Patents allow pharmaceutical companies to exclusively produce and distribute their product for a limited time period. Once this time period has expired, other companies are then able to produce and
distribute the same product as they choose. However, due to this finite time for the original company to profit, there is great incentive for the company to overproduce antibiotics in order to capture profits that will not be available once the patent expires. Once the patent has expired, there is little financial incentive to further research efforts on the antibiotic. Accordingly, this furthers the disconnect between creating a successful antibiotic and efficiently producing and using it. With the current patent system, antibiotic resistance is much higher because each company is selling as much as it can in order to maximize its profits; this leads to an overconsumption of antibiotics. The overconsumption of any antibiotic produces a large negative externality because, when a single person uses an antibiotic, there is a greater chance for the spread of resistant bacteria to others. Of the various potential solutions to internalizing this externality, extending the patent system is a strong choice.

‘Tragedy of the Commons’

Garrett Hardin’s theory of ‘the tragedy of the commons’ is a detriment that needs to be addressed when searching for solutions to internalizing the externalities related to antibiotic consumption. The theory pertains to a plot of common-owned land where multiple farmers’ cows graze the land. Putting too many cows upon a pasture will eventually destroy it due to overgrazing. However, when pastures are a shared commons, the benefit of adding a cow goes entirely to the owner, while the costs are left to all owners (Hardin). The rational solution for each farmer is to keep adding cows (to continue consuming antibiotics for the patients own perceived benefit), even though this leads to the deterioration and possible collapse of the pasture (the proliferation of resistant strains of bacteria), at a large cost for all (the health of society as a whole). When related to the consumption of antibiotics, each individual is inclined to consume antibiotics to kill the bacterial infection within himself, which can lead to antibiotic resistance on a larger scale within the society. Here, the patient is able to receive full benefits from the antibiotic – usually at a greatly subsidized cost due to healthcare insurance – so there is little incentive for them to abstain from consuming the drug. This presents a moral dilemma, where in order to inhibit the tragedy of the commons, societal welfare must be placed before the individual (Foster).
Potential Solutions

Horowitz claims that by extending the patent system a greater number of infections will occur in the current time period, but there will be fewer infections in the future time period since there will be fewer restraint bacteria (Horowitz, 578). By giving the companies a larger timeframe to have exclusive rights to their antibiotic, there is less incentive for them to overproduce over a short period of time in order to maximize their profits. Additionally, the ideal timeframe also needs to be taken into consideration to determine if there exists a timeframe where there is little incentive for a company to overproduce. The government faces a trade-off when determining the life of a patent for an antibiotic. If the patent is extended, there is greater incentive for the company to research and develop the drug; however, the knowledge produced is used less efficiently if the patented time period is longer (Stiglitz, 345).

An alternative solution for internalizing the externalities of antibiotics would be to do so through the influence of healthcare insurance providers. Currently the United States has two programs, Medicare and Medicaid, which are significant buyers of our Nation’s healthcare coverage. This gives both programs a great deal of “bargaining power to effect significant changes in the conduct of doctors and hospitals” (Malani, 2011). Therefore, through governmental policy changes, Medicare and Medicaid could offer incentives to the doctors and hospitals for not overprescribing antibiotics; especially for viruses where they are not effective. If doctors become more liable for the amount of antibiotics they prescribe, there is greater incentive for them to critically analyze whether the patient truly needs the drug. By internalizing externalities onto doctors and hospitals, there will be a greater incentive for both to act in the interest of his- or herself, which will be consistent with social welfare. However, since healthcare insurance subsidizes the cost of purchasing antibiotics, the patient is likely to consume more at the reduced price. Either the patient’s co-pay would need to increase for each patient to have less of an incentive to purchase antibiotics (which is something every political leader is currently working against in the U.S.) or healthcare insurance would need to cap the amount of antibiotics one can purchase; which is also unlikely to happen for political reasons.

Having one firm in charge of producing and distributing the antibiotic is another possible solution to internalizing societal costs of antibiotic consumption. Monopolies lead to enhanced economic efficiency (Stiglitz, 218) because it will always be in their own interest to self-regulate for long-term profits and benefits. However, a monopoly only gives a company control over one antibiotic and does not take into consideration cross-resistance, which stems from other
antibiotics being produced. Therefore, to reduce and eliminate cross-resistance, it would be necessary to have one company in charge of producing and distributing all antibiotics on the market (Horowitz 578). This may not be an ideal solution due to the economic and political issues inherent in monopolies.

**Coase Theorem**

Another possible approach to internalizing externalities of antibiotic consumption can be found in the Coase theorem which states, “whenever there are externalities, the parties involved can get together and make some set of arrangements by which the externality is internalized and efficiency is insured” (Stiglitz, 219). The appropriate assignment of property rights is often used to deal with these externalities (Stiglitz, 218). It does not matter who has ownership of the property rights so long as completely free trade of the rights is possible. Accordingly, poorly defined property rights can be a huge detriment in implementing the Coase theorem. Coasion bargaining is dependent on transaction costs being low, property rights being clearly defined, and complete information for both parties. The problem with this theorem is its inability to be applied in economic reality. Coase himself noted that rarely are there situations where real-world transaction costs are low enough for this theorem to work (Coase).

**Conclusion**

The evidence reviewed suggests that externalities from the use of antibiotics must be internalized by the government through extending patent laws and through the regulation of healthcare providers. It is important to internalize these externalities because resistant bacteria strains from one antibiotic can influence resistant strains in other antibiotics; eventually leading to cross-resistance. The most efficient solution to this problem is to have a single firm produce all antibiotics, but that would shift the externalities to bigger political and economical problems. Furthermore, Healthcare insurance is heavily subsidizing the costs of antibiotics, so the patient’s co-pay on antibiotic prescriptions would need to increase or there would need to be a limit on the amount of prescriptions that could be filled each year in order to reduce the amount of antibiotics consumed. However, both actions are politically unpalatable and are therefore unlikely to be implemented. Another strategy to internalize the externalities of antibiotic consumption is to implement the Coase theorem, which is not likely to be successful since the real-world limitations are too great. This leaves the extension of pharmaceutical patents.
Currently, pharmaceutical patents do not last long enough to incentivize firms to further research efforts on the antibiotic or to curtail overproduction of the antibiotic. By extending these patents, firms will have more incentive to research and develop the antibiotic as well as control how much is produced to maximize their long-term profits; ultimately reducing antibiotic resistance in the process.

**Works Cited**


