We need to know our supply chains

Editorial Stefan Thurner

Antibiotics, painkillers, and even fever syrup for children – for months now, media outlets have been reporting time and again about unavailable medications. But that was by far not the only sector affected. Among many other products, chips for car manufacturing or bicycles, for example, were in short supply. However, especially in times of crisis – such as during a pandemic – it is of enormous importance that people have safe access to medicine, food, housing, energy, and other vital goods. And governments must be able to ensure this.

Although supply shortages occurred in the past, the Covid-19 pandemic has exacerbated the situation. Massive uncertainties in energy supplies triggered by a war on European territory, the collapse of an entire sea route due to a single ship blocking the Suez Canal, and the non-availability of baby food in the US, as well as basic drugs in EU countries, made many aware of how intertwined production networks really are. How fragile and how dependent we are!

Knowing supply chains precisely – on the company level at which the economy operates – and understanding the strategic dependencies will therefore be of central importance if we want to proactively design efficient and resilient production networks. For this very reason, we, the CSH, founded the Supply Chain Intelligence Institute Austria (ASCII) together with three partner organizations (WIFO, FH OÖ, and VNL).

The strength of the institute will be its interdisciplinarity, bridging complexity science and economics and being linked to industry needs. CSH will contribute novel, policy-relevant analytical tools, algorithms, and simulators that help monitor and secure supply chains to better ensure security of supply. It is a great pleasure to announce that CSH faculty member Peter Klimek will be the founding CEO. In our first joint study we revealed the reasons for antibiotic shortages and provided guidance on how to avoid them in the future. We are convinced that together with this new baby daughter institution we can accomplish creative and hitherto unthought-of ways to benefit society.

Suddenly fighting for antibiotics – but why?

Soon after the Complexity Science Hub, together with the other founding members, unveiled the Supply Chain Intelligence Institute Austria (ASCII) in March, its first study shows the causes, interconnections, and effects of the antibiotic shortage. ASCII director Peter Klimek in an interview:

What is the reason for the global shortage of antibiotics?
First of all, it is important to know that we have also had bottlenecks in the past. However, these could be countered with substitutes, which was not the case this time. According to our data, this is due to the fact that early production phases in particular, e.g., for ingredients, are increasingly concentrated in two countries: India and China. If bottlenecks occur there, substitutes can also no longer be produced.

Is there evidence for other causes?
Yes, during the pandemic non-pharmaceutical measures to contain the spread of SARS-CoV-2 reduced the spread of other pathogens, too. Therefore, significantly fewer antibiotics were needed. According to our analysis, it is reasonable to conclude that the industry underestimated the demand for fall and winter 2022.

Would it help to move the production facilities to Europe?
So far, the shortage could not be remedied in this way. After all, manufacturers have to meet their contractual obligations and cannot just redistribute their products at will to their host countries. This is shown by the case study of Austria, where one of the few European production facilities for antibiotics is located in Kundl, Tirol, and yet shortages of antibiotics occurred.

What measures can prevent bottlenecks like these in the future?
There are a few opportunities here. One of the most important will be to invest in building a solid data, planning, and forecasting infrastructure to measure, know, and predict antibiotic needs. We should additionally place greater emphasis on security of supply and take appropriate action, because a well-designed market should internalize the risk of disruption. But the inappropriate use and lack of development of antibiotics also entail a huge risk, namely the emergence of antimicrobial resistance. Policies need to tackle both of these issues.

Find more information here:
https://vis.csh.ac.at/antibiotics-shortage/

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Recent highlights at the CSH

Three award winners

We have had a lot to celebrate recently: Fariba Karimi received the "Young Scientist Award" of the German Physical Society for her outstanding scientific contribution to a better understanding of minorities and inequality.
Liuhuaying Yang, who is a master at translating data into visual information in a way that anyone can understand, was awarded first place in the 2023 World Dataviz Prize competition in the interactive category.
For their study "Disentangling Decentralized Financial (DeFi) Compositions," Stefan Kitzler, Pietro Saggese, and Bernhard Haslhofer won the 2023 SUERF/UniCredit Foundation Research Prize.

Tweets can prevent suicide

Hannah Metzler and her colleagues analyzed more than 7 million tweets about suicide and suicide prevention. They found that the suicide rate can drop in times when prevention information is increasingly disseminated, and coping stories are shared.

Tackling cybercrime

The number of cases of cyber fraud and child sexual abuse on the Internet is exploding. Bernhard Haslhofer and his team therefore developed new methods that enable investigative authorities to proceed more efficiently and track financial flows on the dark web, for example. In collaboration with the Bavarian Cybercrime Center (ZCB), these methods have already produced promising initial results.

Are you interested in this topic? Then come to our panel discussion on May 9, 2023. Register here: **https://www.csh.ac.at/calendar/category/event/**

How Africa's future megacities are saving energy

By measuring the coordinates and surface of 183 million buildings in nearly 6,000 African cities, Rafael Prieto-Curiel shows that if a city's population doubles, the energy demand associated with commuting triples. This makes it all the more important to plan cities sustainably.

This gives you just a brief overview of our accomplishments. Find more news here: https://www.csh.ac.at/news-events/

How relevant are individual countries for the production of antibiotics?

Antibiotics have become a scarce commodity in recent times. The main problem is the concentration of the market. A new study shows that 76 % of the production facilities for intermediates and 59 % of the active pharmaceutical ingredients (API) producers are located in China and India. Explore global connections for yourself here: https://vis.csh.ac.at/antibiotics-shortage/


Different stages of antibiotic production:
Ingredients
Unpackaged Products
Packaged Products
Importance
lowest
highest
Higher importance shows that global supply is more susceptible to disruptions from the considered country.