DOI: 10.24425/academiaPAS.2023.147464

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Between the Market and the State

Mathematical models offer certain solutions to social problems, but implementing them in practice may spark certain controversies – says **Prof. Piotr Dworczak** from Northwestern University.

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Greater awareness of inequalities seems to be something of a new trend in economics nowadays – is that right?

PIOTR DWORCZAK: We are certainly seeing a surge of interest in this topic. Until recently, inequalities – especially in my field, which is microeconomic theory – remained on the fringes of scientific consideration. Today, more and more scientific fields are paying attention to this important issue.

The question we address in our ERC-funded research is this: How should markets be organized and how should valuable social resources be distributed, given the systematic inequalities between market participants? Classical economic theory, of course, deals with the problem of resource allocation, but it often implicitly assumes utilitarianism – the idea that we should be striving to maximize the sum of the utility of all members of society. Therefore, it does not distinguish any particular group that we are most concerned about: everyone carries the same social weight. It does not consider who is important from the perspective of a particular social goal. In practice, however, the point of many social policies is specifically to reach out to marginalized individuals, those most in need of assistance. If we take the goal of improving their material situation seriously, the conclusions reached by classical economics must be modified. One of them, for example, is the conclusion that a free market is the best way to allocate resources. We show that this is not always the case – that under certain conditions, the way the market operates can be designed to better serve those who are marginalized.

And what methods do you use?

We use mathematical modeling in our research. We try to formalize these considerations with mathematics, essentially focusing on solving an optimization problem. We examine how resource allocation should be optimized, under the assumption that we care more about the welfare of the poor than that of the rich. A good example of a problem where such mathematical modeling is applicable is the current steep rise in energy prices in Europe. After Russia's invasion of Ukraine, electricity prices soared and it became apparent that the poorest households might find themselves unable to pay their bills. In response, most European countries introduced various types of interventions based on artificial price reductions. This runs against classical economic theory, where natural market processes should not be tampered with. However, in our theory, the primary focus is on the social goal of protecting the poorest people. This makes it possible for different types of political solutions and tools (such as price controls or subsidies) to be better differentiated and understood, and we can also test out which ones are most effective.

As for subsidizing energy prices, it turns out that lowering energy prices without properly considering consumption levels is a bad idea. A much better solution is to offer price discounts up to a certain level of energy consumption (which can be determined in a mathematical model) and apply price increases after that level is exceeded. If the levels are correctly calibrated, poorer individuals have the option to slightly reduce their consumption and pay lower bills. On the other hand, wealthier individuals, who might not even pay attention to how high their bills are, will pay more, effectively financing discounts for poorer individuals. With such an approach, it becomes possible to genuinely help the poorest individuals while not excessively disrupting the market system.

Where else does the problem of resource allocation appear?

Another example is the distribution of vaccines during COVID-19. Facing the pandemic, the world's governments completely abandoned market mechanisms.

Most countries decided to distribute vaccines for free – but distributed them to people in an order that raised certain questions. The paradox was that the allocation of vaccines *between* countries was still determined by a classic "wild" market, which resulted in poor countries getting them very late or not at all. The criteria adopted in Poland, for instance, to determine who would receive vaccines first were very coarse. A few priority groups were identified, but within those groups, the order of access to vaccinations was more or less random, based on who happened to show up at a particular time, who happened to know where vaccines are available without queueing, etc. This was neither fair nor socially useful.

The first example we have discussed, involving energy prices, is an example of gentle interference with the market system. The second, involving vaccines, is the complete circumventing of markets. But these are not the only possible approaches. It is possible to find a compromise between these two approaches, which may make the most sense. Continuing with the COVID-19 example, we might all have agreed that doctors need to be vaccinated right away, because they are crucial and at the same time the most vulnerable. For the rest of the population, on the other hand, some sort of not-too-high price could have been set, which would have gradually declined over time. Then people who really wanted to get vaccinated for various reasons could have been the first to do so, while those who cared less would wait until prices come down.

Are these socially sensitive issues?

Yes, because everyone has their own idea of what is fair or unfair in the allocation of valuable resources. We propose to approach this question scientifically, prioritizing the pursuit of specific social goals. In other words, we first determine which group is crucial, which group is the most vulnerable, and which group is marginalized and may not manage to get by without help. This way, the social objective function can be expressed mathematically and the allocation system can be optimized.

In the case of COVID-19 vaccines, there are also issues related to individual freedom. We suggest how, in such a situation, vaccine distribution can be approached in the most socially optimized way. Our theory introduces a more rational order. We may, for example, conclude that people with the highest level of risk aversion should have access to vaccines before those who were not so afraid of contagion. It is precisely via pricing that such an outcome can be achieved.

In one of our articles, we also pose the question of whether millionaires should be able to get vaccinated before others if they pay more. At first glance this sounds controversial and perhaps unfair, but upon further consideration the idea turns out not to be completely absurd. It will be better, after all, for the wealthy to have to pay for the vaccine than to receive it for free. Moreover, they often get vaccinated first anyway, due to personal connections. The money obtained from selling vaccines to wealthy individuals at high prices can then be used to buy more vaccines for the less affluent or to finance new hospitals for the sick. Although such a solution stirs social emotions and might sound like a grave injustice, it could actually be justified by the overall good.

How can the difference between a poor person and a rich person be captured in a mathematical model?

Let's say we have $100 and want to evaluate how much it is worth if we give this amount to a particular per-

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A makeshift camp of homeless individuals, illustrating the scale of the problem faced by the authorities of Los Angeles

son. Its value will vary depending on who receives the money. To a poor person, receiving $100 might be life-saving, while a millionaire will not even notice it. Mathematically, we can assign a value to each person in society – representing, so to speak, the "social value" of $100 for that particular person. This value will probably be higher for a poor person than for a millionaire, but it may also reflect moral aspects, the consequences of social justice or the effects of needs at a given time. The utility of any other good, such as electricity or vaccines, can be translated into a price. This is how economists measure value: we ask how much a person is willing to pay for something. So, knowing what the value of a resource is to a person expressed in money, we can then compare these values between individuals using social values. In other words, in our approach, we do not automatically assume that if someone is able to pay more for something, it is necessarily more valuable to them. We also have to take into account the value of money to that particular person – that is to say, its social value.

Of course, assigning social values to individuals is controversial in the sense that it strives to factor in people's views, moral intentions, and political convictions. As scientists, we do not take a stance on these issues. Instead, our theory shows how to optimally allocate resources under a given set of assumptions about social values. That is, we do not say, "We should care more about the poor," but rather: "If we want to care more about the poor, then here is the most effective way we can do so."

Does this approach involve a move away from rational choice theory? Are the old economic paradigms losing currency?

This is happening, but it is not a dominant trend. Of course, we are well aware that no one is fully rational, but it is quite challenging to pin down exactly how and to what extent we are irrational. In any model, we have to assume some kind of human behavior. Sticking with the theory of rational choice, which is what I opted for in my approach, is often the lesser evil.

When one makes specific assumptions about irrationality of human behavior, the optimal mechanism typically turns out to strongly exploit that irrationality, which often leads to absurd conclusions. People are not so irrational when it comes to topics that are important to them and when the consequences of their choices are clear. It is not easy to say, for example, that in general people are short-sighted in their planning. It all depends on what's at stake. Someone may not think about what consequences certain actions today will have tomorrow, but at the same time be putting aside money for a house they will not buy until many years from now. Some model has to be decided upon. In ours, people are still assumed to be rational, but we are more concerned with the social goal than in classical economics. If we also changed the assumption of rationality, it would be difficult to assess what affects the results more: the goal or rationality. That is why we only change one assumption at a time, as otherwise it will not be clear which assumption is relevant to our conclusions.

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What is it like having an ERC grant?

I split my time between the United States, where I work at Northwestern University, and Poland, where I have my ERC grant project. I am currently putting together the research team for the project, which is quite difficult. I want it to be an international-caliber team, and it is much easier to find good post-doc economists in the United States and Europe. I try to recruit from among people who are finishing their PhDs at the world's best universities, but such people are hard to attract to Poland because of low salaries. Therefore, there are two approaches I can use. I try to invite Polish scholars who have done their doctorates abroad, but for family reasons would like to spend time in Poland. I also attract scholars who have no personal connection to Poland, but may be willing to spend some portion of the year here.

My dream is to create a top-notch economics research center in Poland. I would like talented young Poles to be able to learn something closer to home, before they move further out into the world – or maybe they will not have to go abroad after all? Economics graduates in Poland currently get off to a difficult start in the international arena. I hope this can be changed over time.

Interviewed by **Justyna Orłowska, PhD**

Further reading:

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