

## From a Nobel Laureate to Research on Institutions

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This year's (2024) Nobel Prize in Economics is awarded to three professors from MIT and University of Chicago. Although I am not in the field of economics, the name of one of the awardees, Acemoglu, sounds familiar.

After digging around a little, I found at one time I did some research with students on a topic Acemoglu also worked on and we cited his work. The topic is related to the question whether Internet should provide multiple classes of services to maximize the overall need of its users. The Internet, at that time, has already established itself in successfully providing a single class of service for all users - best effort service. Odlyzko, a well-known mathematician who also contributed his thoughts on various topics related to the Internet, proposed a simple way to make Internet provide multiple classes of service by partitioning the network capacity into multiple (most simply just two) non-interfering subnetworks, each offering the same best-effort service. Users can choose which subnetwork to use and pay different prices. This mechanism of offering virtually the same function with different charges is referred to as Paris Metro Pricing (PMP), as conceptually it is very similar to the multi-class service Paris Metro once offered. Because of the different price charged, the number of users using each subnetwork differs, resulting in different quality of service for the subnetworks, hence automatically resulting in providing different services without re-engineering the best-effort service.

A good research question is whether Internet with Paris Metro Pricing would provide better values (in terms of either more total utility for all the users or more profit for operators). This question is practically relevant as well, for example in Hong Kong, the government struggled with how to price three cross-harbour tunnels, and our MTR service probably needs to justify providing a First-Class service. We found several studies discussing this question with similar models but somewhat different conclusions. In view of this, we did our study and published a paper titled "On the Viability of Paris Metro Pricing for Communication and Service Networks" (2010). The analysis basically involves modelling a user's utility (happiness) being served in each subnetwork for a given number of users and charge, hence that user's behaviour of whether to stay in that subnetwork or join another subnetwork with more utility; then the overall social welfare (or operator profit) would be given by the number of users in each subnetwork in equilibrium. The conclusion is that PMP can either be viable or not, depending on users' utility function for given service in equilibrium. While pricing is pretty common in economic/business analysis, PMP is more interesting since it lets users choose, and the choice affects the performance.

We cited a paper Acemoglu co-authored, titled "The Price of Simplicity" (2007). They took a somewhat different approach to study the same research question. Since the single class case is the simplest, they consider that as the benchmark and ask by how much this baseline case is worse off compared to that under PMP. Price of Simplicity (PoS) means how much it would cost you if you want to keep it simple. For this, they use an upper bound of what total utility PMP can achieve instead of an exact solution; if the PoS for the upper bound of PMP is tolerable (close to 1), then they can conclude that it is most likely not worthwhile to go for PMP, as all the additional complexity will cost you more. They indeed managed to show that for various likely situations, the PoS is close to 1 hence PMP is probably not worthwhile.

This research episode makes me reflect on doing (analytical) research on institutions (in Chinese 制度) in general. The outcome of such research questions would usually depend on correctly understanding human desires and human behaviour. Looking back at our approach in studying PMP, it is certainly more “engineering”. We tried to create explicit models that measure people’s “happiness” and how they react to different prices. While these models let us to derive some insightful results, one can always question how reliably those models determine human behaviour. In contrast the PoS work, though also involved sophisticated mathematical models, seems to succeed in posing the question in a way that led to more robust conclusions (that do not depend as much on the accuracy of their model). Besides, they also considered cost, another hard to quantify factor, in a relative way so that it can be addressed robustly.

Looking at Acemoglu’s career, he has ventured to study much more complicated questions about political institutions, such as whether a more inclusive society or extractive society may lead to more economic prosperity. I have not read these works, but I am sure he did an exceptional job that made him famous and led to a Nobel Prize.

But besides the kind of grand social and political institutions that Acemoglu and his collaborators studied, this kind of problem comes up all the time in our everyday life. Let me give some examples from my own experience:

- As a university professor, one question that interests us all is how to measure research and what kind of practice (both personal and institutional) help lead to good research.
- Another problem I came across was how a college (that manages student dormitories) can design an electricity usage charging system to encourage good conservation behaviour.
- A social science colleague challenged us to explain why Hong Kong achieved the longest life expectancy in the world. This question seems simple, and everyone can easily make some speculations, but studying it scientifically based on data evidence is very challenging. Trying to answer this question is a little like trying to explain what institutions lead a country to economic prosperity. Of course, there are lots of differences since the factors are very different.

These problems are practical and meaningful; although they are not that “grand”, we had fun studying them. We managed to publish several papers and I would not go into more details here.

Finally, it is perhaps worth saying a few words about methodology. On the one hand, it is often very elegant to apply mathematical models to these questions, as we did to some extent in the PMP problem, this approach relies heavily on your ability to make good abstraction of the problem into a manageable formulation involving only a few key factors. The advantage of this approach is it gives you very good insights, that may apply to many similar situations. But if you force a mathematical model to the problem without capturing the real issue, that may still allow you to publish some papers, but that would just be “academic”, not practically useful. In social science (and government units) they more often rely on collecting data and making statistical analysis. This is often a big effort for a small academic team, especially if you want to collect sufficient and representative data. But if you manage to amass the data you need, you can more likely arrive at solid conclusions. The

third approach, as we observe these Nobel Prize winners seem to succeed in using, is through “Natural Experiments”. In 2021, one of the winners of Nobel Prize in Economics is David Card, for his study of whether minimal wages would necessarily lead to job losses. He found a way to collect data to compare different policies in the real world to reach some new insights. From what I read about Acemoglu and his collaborators, it seems they also rely on facts collected from historical facts/events that happened at different parts of the world, a form of natural experiments, to reach their conclusions.