The Good Samaritan and Traffic on the Road to Jericho

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A certain man went down from Jerusalem to Jericho and fell among thieves, which stripped him of his raiment and wounded him and departed leaving him half dead. And by chance there came down a certain priest that way: and when he saw him he passed by on the other side. And likewise a Levite, when he was at the place, came and looked on him and passed by on the other side. But a certain Samaritan as he journeyed came where he was and when he saw him he had compassion on him. And went to him and bound up his wounds, pouring in oil and wine, and set him on his own beast and brought him to an inn, and took care of him.
Driving down a lonely road, you see a stalled car and a motorist who appears to be out of gas. You consider stopping to help, but realize this may cost you a good deal of time and some extra driving.
What do you think?

Would your decision be different if the road were more heavily travelled?

If you were to run out of gas, would you prefer that it be on a busy highway, or a lonely road?
Identical Travelers and Stopping Rules on Really Lonely Roads

- Cars pass a stranded motorist at Poisson rate $\lambda$.
- Passers-by are sympathetic but stopping is costly.
- Cost of stopping $c$.
- If expected waiting time is $w$, psychic cost to passer-by of letting him wait is $vw$.
- Travellers would stop if $c < vw$ and would not stop if $c > vw$.
- If everybody would stop, expected waiting time for stranded motorist would be $w = 1/\lambda$. (Implied by Poisson arrival rate.)
- If traffic is so thin that $1/\lambda > c/v$, then everybody would stop and $w = 1/\lambda$ would decrease as $\lambda$ the traffic density decreases.
**Roads with Moderate traffic**

- Suppose that $\lambda > c/v$.
- Then there can’t be a Nash equilibrium where everybody stops. If everybody else is stopping, nobody would want to.
- There can’t be a Nash equilibrium where nobody stops. If nobody else is stopping, everybody would want to.
- Suppose that everybody uses the mixed strategy *Stop with probability $p$.*
- Then arrival rate of passers-by *who will stop* is $\lambda p$. Expected waiting time is $w = 1/\lambda p$.
- Passers-by will be indifferent between stopping and not if $c = vw = v/\lambda p$. 

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Mixed Strategy Nash Equilibrium

- In mixed-strategy Nash equilibrium, \( c = vw = v/(\lambda p) \), and so \( w = 1/\lambda p = c/v \).
- Thus \( w \) is independent of \( \lambda \).
- Over this range of densities, expected waiting time of stranded motorist is independent of traffic rate.
Equilibrium When Costs and Strategies Differ

- Game of incomplete information-played among strangers
- Individuals know their own $c$ and $\nu$, but do not know those of others.
- All believe that the cost ratios $c/\nu$ of other travelers are independent random draws from some continuous distribution $F$.
- There will be a Nash equilibrium in which a traveler will stop if and only if his ratio $c/\nu$ is less than some threshold $\frac{c^*}{\nu}$.
- Then in equilibrium, the probability that a random passer-by will stop is $F\left(\frac{c^*}{\nu}\right)$.
- In equilibrium it must be that someone with cost ratio $\frac{c^*}{\nu}$ would be indifferent between stopping and not. So it would have to be that $\frac{c^*}{\nu} = \frac{1}{\lambda F\left(\frac{c^*}{\nu}\right)}$. 

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**Graphing Equilibrium**

Upward-sloping curve is distribution function of c/w is "supply curve" of help.

Downward-sloping curves are expected wait functions \( w = 1/\lambda p \) for two different \( \lambda \)'s.

With denser traffic, lower thresholds and lower \( p \), but also shorter waiting time.

\[
\begin{align*}
\lambda = 2.5 \\
\lambda = 15
\end{align*}
\]
A mean-preserving spread

Smooth upward-sloping curve is a log-normal distribution function of $c/v$ with mean $1/2$ and variance $1/2$. Thick piecewise linear "curve" is distribution function for identical travelers all with $c/v = 1/2$. 

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![Graph showing log-normal distribution and piecewise linear curve]
Effects of mean-preserving spread

- A simple mean-preserving spread—same mean more dispersed distribution crosses from above.
- Let $\hat{\lambda}$ be the traffic density that passes through the crossing point.
- For roads with density greater than $\hat{\lambda}$, the more dispersed distribution means longer waiting times.
- For roads with density less than $\hat{\lambda}$, the more dispersed distribution means shorter waiting times.
- Elasticity of waiting time with respect to traffic density is between 0 and $-1$. 
Ethical ideals

• Maybe the priest and the Levite who passed by the injured man had important things to do and believed it likely that someone with time on his hands would soon come by and rescue him.

• Suppose that people's costs of stopping vary with circumstances.

• If we could get people to abide by an ethical rule that said *stop if and only if your costs are below some threshold*, what threshold should be chosen?

• In a symmetric model, where all have the same chance of being victim and the same random distribution of stopping costs, we can calculate the ethical ideal threshold cost that would lead to the highest expected utility for everyone if all helped when their costs fell below this threshold.
A Golden Rule

- The ethical guideline, “Act as if the misfortune of others were your own.” would lead you to stop whenever your costs of stopping were less than the expected costs of waiting until the next passerby with costs below this threshold passes by.

- This it turns out is “not generous enough”. The reason is that if you stop, you not only benefit the stranded traveler but you also save a subsequent passer-by the cost of stopping.
Publicly-funded Rescue and Crowding-out

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Hundreds of field experiments in social psychology address the question: “are people in small towns more helpful than those in big cities.”

Typical example: Amato (1981, 1983) staged the following experiment in 55 Australian towns and cities with populations varying from less than 1000 to more than 1,000,000 and in several small Californian cities and San Francisco.

- The experimenter walks along the sidewalk with a noticeable limp. When a pedestrian approaches from the opposite direction, he suddenly drops to the sidewalk with a cry of pain, revealing a heavily bandaged leg smeared with theatrical blood.
- A confederate observes whether the subject offered to help and scored the response of the subject on “social responsiveness”.
Who will help?

“Fallen Man, Paris 1967” photo by Joel Meyerowitz
Results:

- About 50% in small towns offer to help. Only about 15% in large cities.
- Experimenters included several reasonable explanatory variables in regressions, ethnic heterogeneity, crime rates, estimates of tourism.
- They did not include rate of pedestrian traffic.
- Our theory suggests that if people in the city have same preferences as those in the country, we would expect smaller percentages helping in busier places, but the expected waiting time for the “injured” person to get help would be shorter where pedestrian traffic is heavier.
- If it turns out that expected waiting time is not shorter on the more traveled sidewalks of big cities, we might conclude that urban people are more alienated.
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Fables and Games

Ariel Rubenstein asserts:

*Game theory is about a collection of fables. Are fables useful or not? In some sense you can say they are useful because good fables can give you some new insight into the world and allow you to think about a situation differently.*

This paper aspires to add a “good fable” to social scientists’ collection of stories that may help us to understand altruistic behavior.