



# Encyclopedia of Law & Society: American and Global Perspectives

## Mathematical Modeling

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The use of mathematical modeling in legal scholarship is a relatively recent phenomenon. The law and economics movement brought mathematics to bear on legal analysis in both the positive and normative spheres. Given the increasingly technical nature of modern microeconomics, it is not surprising that law and economics scholars would adopt applied mathematics as their shorthand. In addition to connecting law and economics scholarship with mainstream economics, the use of formal methods allows for increased precision in legal analysis and argumentation and exposes the underlying implicit assumptions of the scholar. Further, modeling allows for the generation of precise testable hypotheses to which one can apply powerful statistical analyses. In that sense, formal analyses of law are a necessary precondition to performing rigorous econometric studies of law.

On the positivist side, formal theory in law and economics primarily involves analyzing the effect of legal rules on the behavior of an individual. Scholars use calculus and linear programming techniques to describe how a rational individual will allocate scarce resources optimally, with legal rules partially determining the costs and benefits of a given action. Given this model of human behavior, scholars can predict how individuals will modify their actions when legal rules change. Such analyses are generally static in nature because the use of dynamic programming techniques and optimal control theory has not yet migrated from the field of economics into the study of law and economics.

From a normative perspective, scholars use the tools of welfare economics to determine the effect of various legal rules on the welfare of an individual and on the aggregate welfare of society. Often, researchers use these tools to measure the divergence between individual welfare maximization and social welfare maximization in the presence of externalities. One can use this welfare analysis to inform the design and implementation of legal rules that are intended to induce individuals to internalize the external costs and benefits generated by their activity. Normative analyses are also limited in their scope to the extent that most scholars do not consider the general equilibrium effects of legal changes, focusing entirely on the direct effects of legal rules.

Some legal scholars, particularly in the public law areas, also employ the tools of social choice theory. Social choice theory uses axiomatic methods to study the properties of rules used to aggregate individual preferences into social preferences or decision rules. One of the most useful applications of social choice theory is the development of possibility theorems, which describe whether it is possible to develop social decision rules that meet certain desirable conditions.

Scholars employ mathematical models in law and economics in both positive and normative inquiries. Although the behavioral law and economics movement is now challenging the rationality assumptions that undergird most of the standard law and economics models, it is doubtful that economists will abandon mathematical modeling because of the precision and transparency it enforces.

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See also

- [Agent-Based Models](#)
- [Behavioral Economics](#)
- [Cost-Benefit Analysis](#)
- [Empirical Research Strategies](#)
- [Functional Law and Economics](#)
- [Multivariate Analysis](#)
- [Normative Economics](#)
- [Social Choice and Judicial Decision Making](#)

### Further Readings

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