

# Laffont, Jean-Jacques (1947–2004)

Jean Tirole

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## Abstract

Jean-Jacques Laffont was one of the great economists of the last quarter of the 20th century, with an encyclopedic mind in a time of intense specialization. He won widespread respect and recognition for his breakthroughs in both theory (including public goods, contract theory, and the regulation of natural monopoly) and econometrics. In addition, he was energetically engaged in institution-building not only in Europe but also in Africa, Asia and Latin America.

## Keywords

access prices; adverse selection; asymmetric information; auctions; Bayesian implementation; budget balance; Coase Theorem; collective choice; collusion; contract theory; disequilibrium macroeconomic models; Econometric Society; econometrics; engineering cost models; European Economic Association; industrial organization; instrumental variables; Laffont, J.-J.; less developed countries; nonlinear simultaneous equations; occupational choice; partial equilibrium; productivity; public goods; regulation of natural monopolies; regulatory capture; revealed preferences; risk aversion; theory of entrepreneurs

## JEL classifications

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## Article

Jean-Jacques Laffont was born in 1947 and died in 2004 in Toulouse. He was one of the great economists of the last quarter of the 20th century. He made breakthroughs in many fields within both theory and econometrics, which made him perhaps the last encyclopedic mind in the economics profession at a time when the rapid growth of knowledge pushes most researchers into intense specialization. His creative and prolific contributions brought him widespread respect and recognition, from presidencies of learned societies (Econometric Society, European Economic Association) to numerous prizes (including the Yrö-Jahnsson prize), honorary memberships in foreign learned societies, honorary degrees from several universities and invitations to give numerous prestigious lectures. Besides his academic contributions – the topic of this contribution – Jean-Jacques Laffont will also be long remembered for his selfless contributions to institution building in Europe and in particular Toulouse, where his warmth, devotion and energy allowed him, starting nearly from scratch, to create an enthusiastic and congenial research environment. In Africa, Asia and Latin America also, he encouraged young economists to work with him on frontier economics and helped build research centres.

## Public goods

After completing his Ph.D. at Harvard University in 1974, Jean-Jacques Laffont embarked on a celebrated research agenda on public goods, in collaboration with Jerry Green (culminating in their 1979 book) and later with Eric Maskin. A collective decision-making problem with  $n$  economic agents ( $i = 1, \dots, n$ ) who have quasi-linear preferences of the form:

$$u_i = v_i(a, \theta_i) + t_i$$

consists in selecting a policy  $a$  and transfers  $t_i$  for each configuration of taste parameters  $\theta = (\theta_1, \dots, \theta_n)$ . An efficient policy  $a^*(\theta)$  solves

$$\max_{\{a\}} \sum_{i=1}^n v_i(a, \theta_i).$$

A central issue is how to implement this efficient action through appropriate transfers when agents privately know their own taste parameters. Clarke (1971), Groves (1973) and Vickrey (1961) (CGV) had defined ‘mechanisms’, in which agents announce ‘types’  $\hat{\theta}_i$ , the collective decision is  $a^*(\hat{\theta})$  and agent  $i$  receives a transfer of the form

$$t_i(\hat{\theta}) = \sum_{j \neq i} v_j(a^*(\hat{\theta}), \hat{\theta}_j).$$

They had shown that such schemes would induce each agent to truthfully reveal her preferences  $\hat{\theta}_i = \theta_i$ , as she internalizes the consequences of her choices on the welfare of others. Green and Laffont (1977) showed that these mechanisms were, up to the addition of a function  $t_i^o(\hat{\theta}_{-i})$  which is independent of the announcement of the others, the only schemes in which truthful revelation is a dominant strategy. Laffont and Maskin (1980), pioneering the ‘differentiable approach’ to mechanism design, then showed that the transfers  $t_i^o$  were but constants of integration when the  $v_i$  are differentiable in  $a$  and  $\theta_i$ .

A consequence of Green and Laffont’s characterization was that dominant strategy public good schemes are inconsistent with budget balance ( $\sum_i t_i = 0$ ). This negative result shifted the profession’s attention to the weaker requirement of Bayesian implementation, in which truth telling is an agent’s best response to the other agents’ truth telling. Laffont and Maskin’s (1979) pioneering work showed that inefficiency necessarily resulted from the stricter requirement that the budget be balanced for each configuration of preferences; their paper led the way to the equally pioneering paper of Myerson and Satterthwaite (1983) stating the generic inefficiency of bargaining processes under asymmetric information. These two papers thereby identified one important limitation of the Coase theorem.

## Contract theory

More generally, during the decade following his Ph.D. Laffont was involved in many of the developments of contract theory, from adverse selection to moral hazard, from single-agent partial-equilibrium to general equilibrium settings. Examples of this work include the definitive treatment of adverse selection with Guesnerie (1984), the

first model of occupational choice in which Kihlstrom and Laffont (1979) built a theory of entrepreneurs based on heterogeneity in risk aversion, and the prescient piece with Green (1986) on limited scopes for misreporting (the report  $\hat{\theta}_i$  is restricted to belong to a subset of types that depends on the true  $\theta_i$ ), in which they showed how to amend the revelation principle and derived some implications for the magnitude of distortions brought about by private information.

### *Regulation*

A common application of incentive theory is to the regulation of natural monopolies. The first experiments with price caps in the mid-1980s and later with deregulation raised questions about what could be expected from such reforms and about their potential pitfalls. Starting with the 1986 paper on the power of incentive schemes and up to their 1993 book, Laffont and Tirole focused on these issues, modelling the objective of the regulated firm as (variants of)

$$u = t - C(\theta, e, q) - \psi(e),$$

where  $t$  is the firm's budget,  $C$  its monetary cost,  $\psi(e)$  an increasing and convex non-monetary function of the effort  $e$ ,  $\theta$  a technology parameter unknown to the regulator and  $q$  the vector of outputs. While costs and outputs are observable, the firm can transform naturally low costs into shirking (or private benefits). For any abstract regulatory mechanism  $\{q(\hat{\theta}), t(\hat{\theta})\}$ , expressing, as a function of productivity, the effort needed to reach a given cost level for given outputs and applying the envelope theorem, the regulated firm's rent's sensitivity to the productivity parameter is given by

$$\frac{du}{d\theta} = \psi'(e) \left| \frac{\partial e}{\partial \theta} \right|.$$

where  $\delta e / \delta \theta$  measures the firm's ability to transform productivity gains into private benefits (for example, for a single output  $q$  and  $C(\theta, e, q) = (C_0 - \theta - e)q$ ,  $|\delta e / \delta \theta| = 1$ ). This condition provides the intuition for the incentive-rent extraction trade-off: high-powered incentives schemes – that is, schemes for which the firm bears a high share of its cost (inducing a high effort and therefore a high  $\psi'(e)$ ) – necessarily leave large rents (large  $u(\theta)$  s) on the table (this is the reason why price caps are often subject to political pressure for renegotiation). The 1986 paper provided sufficient conditions for a menu of linear contracts to be optimal.

Subsequent work focused on how the power of the incentive scheme is affected by concerns for quality, auctioning of incentive contracts, dynamics (the ratchet effect), and regulatory capture. Laffont and Tirole argued that a key enabler of political capture of the regulatory process is the asymmetry of information with the political principal (perhaps Congress, and certainly the citizens), and that the regulatory response to the threat of capture was low-powered incentives, as these reduce rents and therefore make the concerted manipulation of information by the firm and its regulator less attractive to them.

Later, Laffont and Tirole derived theoretical principles for the design of access prices, a key ingredient of the liberalization policy, in the case of one-way access to a bottleneck such as a local loop, an electricity grid or a railroad network (1994) and,

in collaboration with Rey (1998a; 1998b), two-way access, that is, access to mutual termination bottlenecks present in telecommunications or the internet.

Jean-Jacques Laffont was adamant about the ability of economic theory to help guide economic development, provided that the theory is properly adapted to reflect the specificities of the developing world. In his posthumous (2005) book, he did just that in the context of regulation. Characterizing less developed countries as countries with easy side transfers within families, ethnic groups and social networks, a lack of a constitutional control of government, a weak rule of law, a high cost of public funds, politically dependent regulators, and weak accounting structures, he systematically drew the implications for the design of regulation, from the power of incentive schemes to universal service obligations and a positive theory of privatization.

### **More contract theory**

Convinced that collusion was a key determinant of economic outcomes and institutions, Jean-Jacques Laffont engaged in a thoughtful and seminal line of research on the methodology and implications of models of collusion, in particular in collaboration with David Martimort. Their 1997 paper developed a general approach for the analysis of collusion among  $n$  agents against a principal; an upper bound on the potential damage of collusive activities is obtained by introducing a fictitious coordinator (or cartel ringmaster in an auction) who (a) privately elicits the  $n$  agents' types  $(\theta_1, \dots, \theta_n)$ , (b) dictates the agents' behaviours in the game designed by the principal, and (c) breaks even. This 'side mechanism' must be incentive compatible as well as individually rational (the agents must be willing to collude).

In their 2000 paper, Laffont and Martimort point at the dual impact of the 'commonness' of information among agents. A fundamental insight due to Maskin (1999) is that information held by multiple agents can often be elicited at very low cost by having economic agents compete, challenge each other's reports, exercise options, and so on. Maskin's insight has wide-ranging consequences for the use of the informational content of financial and labour markets, auctions, options and other commonly used elicitation mechanisms for the design of contracts and organizations. Laffont and Martimort argue that Maskin's insight is most potent when the schemes have integrity, that is, they are not vulnerable to collusion among agents; for it is precisely when agents have the same information that it is easy for them to collude. Put differently, informational asymmetries among agents hinder collusion. Faure-Grimaud, Laffont and Martimort (2003) show that delegation is an optimal response to collusion.

On the more applied aspects of side-contracting, Laffont and Martimort (1999) showed that the separation of regulators may make capture more difficult. Laffont and Meleu (1997) provided one of the first endogenizations of side transfers, and showed that reciprocal supervision provides an undesirable conduit for collusion.

### **Econometrics**

Quite remarkably, Laffont also made key contributions to theoretical and applied econometrics. As a Harvard student, he collaborated with Jorgenson to produce one of the first methods for estimating nonlinear simultaneous equations, in particular extending and studying the efficiency of minimum distance and instrumental variable

estimators, paving the way for Hansen and Hansen and Singleton's 1982 pioneering contributions. Gouriéroux, Laffont and Monfort (1980) is another important illustration of Laffont's contributions to nonlinear econometrics, this time motivated by the identification of simultaneous equation models with latent variables, and in particular disequilibrium macroeconomic models.

Later, Laffont was one of the pioneers of the new empirical industrial economics. He firmly believed in the importance of theory for imposing structural constraints in econometric estimation, and in the continuous back-and-forth interaction between industrial organization theory and empirics. His first research along these lines (with Gasmi and Vuong, 1992) is on the study of tacit collusion in price and advertising in the Coca–Pepsi duopoly. He then found in auctions and their clear extensive form a most favorable ground for structural econometrics in IO. Positing Bayesian equilibrium strategies and adding parametric restrictions allows the researcher to identify the underlying distribution of types and thus the structure of the model. For example, Laffont, Ossard and Vuong (1995) develop a simulated nonlinear least-squares method to estimate auctions with independent private values for a range of first- and second-bid mechanisms and apply it to eggplant auctions in the south-west of France.

Last, Jean-Jacques Laffont's was also interested in the engineering cost models (with Gasmi et al., 2002) as he viewed these as enabling a better regulation of, say, universal service obligations or access prices.

## See Also

- agent-based models
- auctions (empirics)
- cartels
- contract theory
- development economics
- public goods

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