

# Inframarginal analysis of division of labor A survey

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## Abstract

This paper provides an updated survey of the rapidly growing literature on inframarginal analysis of division of labor, tracing the development of this literature since its emergence in the 1970s and exploring the linkages between this literature and classical ideas on division of labor and contemporary work from other research programs. The paper also outlines the basic inframarginal economics and illustrates its wide applications by reviewing recent work in a wide range of research fields including international trade, e-business, theory of the firm, contract and property rights, public economics, economics of the state, economics of urbanization, and macroeconomics.

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## 1. Introduction

This paper provides an updated survey of the rapidly growing literature on inframarginal analysis of division of labor, tracing the development of this literature since its emergence in the 1970s and to explore the linkages between this literature and classical ideas on division of labor and contemporary work from other research programs. The paper also outlines the basic inframarginal analytical framework and illustrates its wide applications by reviewing recent work in a wide range of research fields including international trade, e-business, theory of the firm, contract and property rights, public economics, economics of the state, economics of urbanization, and macroeconomics.

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## 2. What is inframarginal economics?

### 2.1. Marginal and inframarginal decisions

We categorize business decisions into two classes: marginal decisions of resource allocation and inframarginal decisions of economic organization. Marginal decisions involve the extent to which resources are allocated to a pre-determined set of activities. Inframarginal decisions are about what activities to engage in (or whether or not to engage in an activity).

To illustrate, before a student enrolls in a university, he needs to choose his major (field of study). If he chose economics as his major, then typically he would take microeconomics and macroeconomics classes rather than chemistry or physics classes. His choice of major and the associated choices of courses to take are inframarginal decisions since they involve deciding *what* activities to engage in (which is a series of yes-no decisions or corner decisions). Once he has chosen his major and classes, he then decides how to allocate his time to the chosen courses. These allocation decisions are marginal decisions since they involve deciding the *quantity* of resources devoted to each activity given the activities that have been chosen.

In the context of social division of labor, inframarginal decisions are perhaps more important than marginal decisions. If each individual chose to be self-sufficient (which is an inframarginal decision that says yes to production of all essential consumption goods and no to all trade activities), there would be no trade connection between individuals and no social division of labor. If each individual chose to specialize in producing a single good and to buy all other goods that he consumed (which is an inframarginal decision), then the network of division of labor would be very large. There are many intermediate network sizes of division of labor between the two extremes. As an individual becomes more specialized, he must have more trade connections with other specialists to obtain goods that he needs but does not produce. Thus, an individual's (inframarginal) specialization decision determines his trade connections with others, and all individuals' specialization decisions jointly determine the network size and pattern of social division of labor. For this reason, we refer to individuals' (inframarginal) specialization decisions as inframarginal network decisions.

### 2.2. Inframarginal analysis and Smithian framework

Inframarginal analysis is concerned with optimal inframarginal network decisions and the outcome of these decisions. The optimization of inframarginal network decisions involves both total cost benefit analysis across different network patterns of specialization and trade connections as well as marginal analysis of resource allocation for a given network pattern.

In mathematical terms, inframarginal analysis includes all non-classical mathematical programming (linear and non-linear programming, mixed integer programming, dynamic programming, and control theory) that allows corner solutions. Inframarginal analysis was developed by mathematicians in the 1950s and has been applied to economics by Koopman, Arrow, and other economists in the 1950s and 1960s.<sup>1</sup> Inframarginal economics is a combination of inframarginal analysis and a Smithian framework of consumer–producers.

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<sup>1</sup> Coase (1946, p. 173) noted “a consumer does not only have to decide whether to consume additional units of a product; he has also to decide whether it is worth his while to consume the product at all rather than spend his money in some other direction”. He applies this inframarginal analysis to criticize the marginal cost pricing rule

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