

Constructal Theory: a new approach to spatial economics and finance

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Abstract: This paper illustrates an application of Constructal Theory to spatial economics and finance. Constructal theory is about the generation of architecture in flow systems in general. Simply stated, the constructal law proclaims a tendency to maximize flow access in time, i.e., for a finite-size flow system to persist in time (to live), it must evolve in such a way that it provides easier access to the currents that flow through it.

Constructal optimization in spatial economics is possible since the business world is moved by some fundamental goals, namely the maximization of profits, the minimization of costs, the minimization of time spent in some assignment, the maximization of returns (constructal purpose) and faces a background of constraints that can be quantitatively defined. The similarities between the spatial structures of physical and economic flows spring out of the same deterministic principle [Bejan et al. (2000); Reis (2006)].

1 Introduction

Constructal theory is about the generation of architecture in flow systems in general. Simply stated, the Constructal law proclaims a tendency to maximize flow access in time, i.e. for a finite-size flow system to persist in time (to live), it must evolve in such a way that it provides easier access to the currents that flow through it. The Constructal law is not about what flows (fluid, energy, momentum, goods, or people) but about how the flow system generates its architecture. Constructal theory is revolutionizing the way we think about self-organization and self-optimization in nature [Poirier (2003)]. It places on a scientific foundation the generation of shape and structure in everything that moves, and tears down the walls between physics, biology, engineering and spatial economics. Flows of goods and flows of people can also be understood in the light of the Constructal law. Here, flow tree architectures also emerge as the result of optimization in time. For example, a space-filling tree architecture can be deduced from the Constructal law for a flow between one point (source, or sink) and an infinity of points (curve, area, or volume).

A basic outcome of Constructal theory is that system shape and internal flow architecture do not develop by chance, but result from the permanent struggle for better performance and therefore must evolve in time. Constructal the-