

Research Statement

Shiyun Xia

My research focuses on understanding how firms make research and development decisions and also on the effects of public policies on innovation. My research develops dynamic general equilibrium models to study how public policies influence the aggregate growth rate of the economy and the implications of the market for ideas on industrial dynamics, including firms' entry, exit, and rate of expansion. I also use a dynamic partial equilibrium model to study how entrepreneurs make financing decisions when adverse selection causes friction in the financial market.

“The Market for Ideas and Economic Growth” (Job Market Paper)

This article studies the effects of intellectual property rights (IPR) and antitrust policies on aggregate innovation. I develop a continuous-time model that examines the roles of incumbent firms and inventors. In this model, incumbent firms choose the extent of research and development (R&D) in which to engage in order to improve the quality of their products. On the flip side of my model, inventors who engage in R&D choose between pursuing a complementary innovation that they could sell to an incumbent firm and pursuing a disruptive innovation that could lead them to develop a superior technology that supersedes that held by an incumbent firm. I argue that public policies need to consider two aspects of the innovation incentives of innovators to facilitate faster economic growth.

First, there may be a trade-off between the incentives of incumbent firms and those of inventors that can hinge on the nature of innovations pursued by inventors. Stronger protection for inventors increases their ability to capture the value of their innovations, thereby raising innovation investment by inventors. But it also reduces the ability of incumbent firms to exploit inventors' innovations. The expectation of lower payoffs from interactions with inventors depresses the equity value of incumbent firms, reducing their investment. The negative effect on the equity value of incumbent firms also feeds back to affect inventors' innovation incentives. As a result, the aggregate innovation rate of inventors increases at a slower rate when their ability to capture the value of their own innovations rises. The decreasing marginal effect of such inventor protection on the aggregate innovation rate of inventors can lead to an inverted-U relationship between the economic growth rate and the ability of inventors to

benefit from their innovations. Stronger protection for inventors pursuing innovations that would supersede an incumbent's technology can reduce aggregate growth rate. In contrast, a stronger IPR policy that protects inventors from incumbent firms on the market for ideas always increases aggregate innovation. This is because incumbent firms always gain from complimentary *R&D* that raises the quality of their products. As a result, strengthening IPR protection has a stronger effect on the incentive of inventors to innovate than it does on the incentive of incumbent firms to do so, raising the aggregate growth rate.

A second aspect that policymakers must consider is the type of innovation pursued by inventors. Complementary innovations are often more cost-efficient because inventors do not need to invest in the complementary assets and technologies that allow them to commercialize those innovations by themselves. Inventors can avoid the costs of duplicating aspects of existing technologies and the costs of entry by pursuing complementary innovations. I show that if inventors' bargaining power on the market for ideas is sufficiently large, they switch from innovating to enter product markets to innovating to sell on the market for ideas, and the resulting improvement in the efficiency of innovation activities leads to faster economic growth.

“The Market for Ideas and Heterogeneous Innovations” (Working Paper)

This paper presents a framework identifying the impacts of the market for ideas on industrial dynamics and economic growth. I develop a continuous-time model in which an incumbent firm can hold multiple product lines. In this model, incumbent firms seek internal innovations to improve their products. Incumbent firms and entrants pursue replacement innovations to obtain product lines they do not currently own. Independent inventors pursue innovations complementary to existing products and sell them to incumbent firms. Entrants successfully become incumbent firms when they obtain a product line, and incumbent firms exit when they lose all product lines. Strengthening the bargaining power of inventors increases complementary innovation by independent inventors. However, because it reduces the value of holding a product line, it reduces incumbent firms' incentive to improve their products, and it also reduces incumbent firms and entrants' incentives to obtain other product lines. Due to a lower replacement innovation rate, the rate at which an incumbent firm loses a product line decreases. Therefore, exit rates fall, and the average number of product lines held by a firm rises. For a large set of parameter values, the positive effect of stronger IPR protection on innovation by inventors dominates the negative effect on innovation by incumbent firms and entrants, resulting in faster economic growth.

“Entrepreneurial Finance and Adverse Selection” (Work in Progress)

In innovative industries, entrepreneurs usually rely on equity investors, such

as venture capitalists and angel investors, for financing. But contract *R&D* with established firms is also a common practice for entrepreneurs. In this paper, I develop a continuous-time direct search model to study how entrepreneurs choose between venture capitalists and established firms. Entrepreneurs have private information regarding the quality of their ideas, which is drawn from a continuous distribution. They can seek financing from venture capitalists, who are uninformed about the quality of their ideas, or contract with established firms to develop new products for them. Entrepreneurs search for venture capitalists on a dynamic, competitive financial market. In the financial market, venture capitalists post contracts to attract entrepreneurs. Entrepreneurs with higher-quality ideas search longer to get a higher valuation. The search time and equity valuation create the sorting property that separates entrepreneurs by the quality of their ideas in equilibrium. Established firms are experts in related technology fields; thus, contracting with them is not subject to adverse selection. However, as discussed in Aghion and Tirole (1994), because the value of entrepreneurs' inventions to a firm is unverifiable, there is an ex-post hold-up problem. I find that established firms generate positive externalities for the venture capital market. If entrepreneurs with medium-quality ideas choose established firms, entrepreneurs with higher-quality ideas then face better trading conditions. This is because separating higher-quality ventures from much worse ventures is easier than separating higher-quality ventures from ventures that are little worse. Thus, if entrepreneurs' expected payoffs from contracting *R&D* increase, more entrepreneurs cooperate with established firms, and the adverse selection problem on the financial market is reduced. I then analyze the effects of various factors, such as product market competition and the cost of innovation, on the financing choices of entrepreneurs.