



# Sectoral differentiation, allocation of talent, and financial development<sup>☆</sup>

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## ABSTRACT

I present a theory of development in which heterogeneously talented entrepreneurs require credit to start new projects and open new sectors. During development the variety of sectors expands, which allows better sorting of entrepreneurial talent. The paper shows that, in addition to increasing the average productivity of matches between agents and sectors, this process also mitigates informational frictions in the financial markets. Furthermore, the impact of sectoral variety on the operation of financial markets gives rise to an interesting feedback between financial development and R&D effort, which may lead to different types of dynamics. A successful economy exhibits a progressive increase in the variety of sectors, which in turn enhances the operation of financial markets. However, a poverty trap may also arise. This situation is characterised by a rudimentary productive structure with poor matching of skills to activities and severely inefficient credit to talented entrepreneurs.

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## 1. Introduction

Over the course of development, the variety of productive activities in the economy tends to increase in conjunction with the aggregate stock of capital and output. This observation implies that economic development manifests itself partly as a process of sectoral diversification and increasing specialisation within the economy, an idea that dates back to Adam Smith (1776) in his discussion of the division of labour and its relation with the size of the market (*The Wealth of Nations*, chapter 3). Such a dynamic pattern is also described by Allyn Young (1928, p. 537), who writes that “industrial differentiation has been and remains the type of change characteristically associated with the growth of production.” Similarly, Landes (1969, p. 5) argues that the most evident effects brought about by the Industrial Revolution were the gains in productivity and the increase in the variety of products and occupations.

I propose a theory in which this process of sectoral diversification helps to mitigate informational frictions affecting the operation of financial markets. Furthermore, the degree of sectoral variety is itself

endogenous to the theory, and it is positively influenced by financial markets. As a result, sectoral differentiation and the operation of financial markets appear interrelated in the model, and this positive interaction becomes a key feature that shapes the patterns of development followed by different economies.

The paper studies the evolution of an economy populated by heterogeneously talented individuals. In particular, individuals are characterised by distinct intrinsic skills concerning different types of entrepreneurial activities. A key assumption is that these skills are private information. In such a context, when agents need credit to start up their projects, asymmetric information gives rise to an adverse selection problem linked to the allocation of skills and prevents the provision of efficient credit contracts to talented entrepreneurs.

The modelled economy is constituted by different productive sectors. Each of these sectors represents a particular industry or activity, and requires the application of some specific types of entrepreneurial skills. The appearance of new sectors is assumed to be the result of R&D effort and innovations. This assumption reflects the idea that carrying out new productive activities requires first an increase in the stock of knowledge in the society.

The central point in this paper rests on the hypothesis that sectoral variety allows improvements in the self-selection of talents to sectors. This fact reduces the severity of the adverse selection problem in the credit market, enabling the provision of more satisfactory credit contracts to talented agents, which fosters their entrepreneurial investment. The impact of sectoral variety on the operation of credit

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market, in turn, gives rise to a positive feedback between financial development and innovation activities. Entrepreneurs are the agents who put innovations into practice in the economy. This means that the return to entrepreneurial investment is what ultimately determines the size of the market for innovations and the returns to R&D effort. As a result, when talented entrepreneurs receive better credit contracts this also raises the incentives to undertake R&D, while higher investment in R&D contributes to financial development (by expanding the variety of sectors and enabling better sorting).

Based on this setup, I present two main findings. First, there is a static efficiency result related to the degree of sectoral diversification: a larger variety of sectors helps to lessen the informational frictions in the credit market affecting talented entrepreneurs. In particular, given the heterogeneity of skills, sectoral variety allows better matching of agents to activities, which in turn raises the quality of the pool of credit applicants. In that regard, adverse selection here stems from an underlying problem of relative scarcity of sectors, because this hinders the efficient sorting of (unobservable) talents. When the variety of sectors is limited, a large number of agents have no other choice but to specialise in activities for which they might not be exceptionally talented. Asymmetric information concerning skills, in turn, spreads the negative consequences of low-productivity matches to other sectors in the economy, since it prevents the (ex-ante) screening of heterogeneous agents in the credit market. In other words, those agents who are not able to exploit their advantage inflict a negative externality (through the adverse selection problem) on those who, in principle, could exercise fully their intrinsic skills.

Second, from a dynamic perspective, the paper shows that some economies might follow successful development paths, while others might get trapped in an underdevelopment equilibrium. In the former case, development is characterised by a continuous process of sectoral differentiation. In addition, alongside development and expanding diversification, the allocation of talent improves and, concomitantly, the adverse selection problem preventing talented entrepreneurs from receiving efficient credit contracts is progressively mitigated. On the other hand, in the poverty trap, economies exhibit a rudimentary productive structure, with few active industries, and highly inefficient financial institutions. In that sense, the poverty trap is the result of a general organisational failure in the economy, leading to the collapse of several markets.

The idea that the efficiency of the credit market may be influenced and by agents' payoffs in other markets of the economy is already present in Ghatak et al. (2007). In particular, their model exploits an interesting general equilibrium feedback between the credit market and the labour market: when the economy is able to provide high wages, low-quality entrepreneurs find themselves better off selling their labour in the market. As a result, as a side effect, high wages help to "clean" the pool of credit applicants, reducing informational frictions and enabling better operation of the credit market which in turn helps in sustaining high wages.<sup>1</sup>

Like Ghatak et al., I study the sorting of talents in a context of informational asymmetries. A new aspect of my model is that it integrates the ensuing credit market imperfection within a multi-sectoral endogenous growth model. Innovation and the expansion of the set of activities in the economy become thus key features of the model, since they allow an improved sorting of skills to sectors. Two new findings result from my model compared to Ghatak et al. First, it shows that innovation improves the assignment of skills, which in turn feeds back on innovation by increasing the returns to R&D. Second, it highlights a new role for the innovation process, very different from the one traditionally stressed in the growth literature. Innovations are not only desirable because they directly augment the

productivity of inputs, but also because they may help to mitigate frictions in financial markets. From that perspective, this paper is also contributing to the literature on sectoral variety and growth by proposing an additional channel whereby increased variety promotes development.<sup>2</sup>

Sectoral diversification as a factor leading to financial development is also studied by Acemoglu and Zilibotti (1997). They propose a growth model with technological indivisibilities where the degree of market incompleteness tends to disappear with capital accumulation, allowing better risk sharing of idiosyncratic shocks and, thus, further enhancing capital accumulation by risk-averse entrepreneurs. In my model, although financial development is aided by the level of sectoral diversification too, this is the result of a different mechanism: the alleviation of agency costs faced by talented entrepreneurs as the sorting of skills to activities improves when the variety of sectors expands. In a related contribution, Acemoglu and Zilibotti (1999) study the evolution of informational asymmetries and agents' performances over the development path. However, they focus on how a society manages to provide correct incentives to agents, and how incentives may become more effective as an economy grows. My paper instead studies how the assignment of heterogeneous skills evolves during development in a context of endogenous variety expansion.

Finally, the present paper is also closely related to the literature on financial market imperfections and poverty – e.g., Banerjee and Newman (1993), Galor and Zeira (1993), Piketty (1997), Aghion and Bolton (1997), Lloyd-Ellis and Bernhardt (2000), Mookherjee and Ray (2002), and Ghatak and Jiang (2002). These articles stress the influence of wealth distribution on the dynamic behaviour of the economy when agency costs lead to credit rationing. My paper contributes to this literature mainly through two different channels. It first provides an alternative micro-founded explanation (involving multiple sectors and multi-market interactions) of why agency costs in the credit market may arise in a developing economy. Secondly, it is able to generate dynamics whereby these agency costs are alleviated as an economy develops and sectoral diversification takes place.

Section 2 describes the basic setup of the model. Section 3 studies the static equilibrium of the economy; in particular it analyses the entrepreneurs' optimal choice in the presence of adverse selection. Section 4 introduces the innovation activities into the model, which endogenises the variety of sectors in the economy. Section 5 proceeds to the dynamic analysis of this economy. Section 6 discusses an important extension to the basic model. Section 7 presents and discusses some stylised facts consistent with the main predictions of the model. Section 8 concludes. Omitted proofs are provided in the Appendix.

## 2. Environment

The paper considers a small economy enjoying full access to international financial markets. Life evolves over a discrete-time infinite horizon,  $t = \{0, 1, \dots, \infty\}$ . In each period  $t$  a single-period lived continuum of agents with mass normalised to 1 is alive.

There exists in the economy a continuum of sectors indexed by the letter  $i \in [0, 1]$ . Each sector  $i$  represents a particular industry where a final good may be produced. The set of sectors  $[0, 1]$  is constant over time; however, not all sectors are necessarily active at any moment in

<sup>2</sup> Sectoral differentiation has traditionally been considered to raise aggregate productivity by two distinct channels: 1) permitting the exploitation of economies of scale through increasing specialisation (e.g., Smith, 1776; Young, 1928; Romer, 1990; Yang and Borland, 1991; Jones, 2008); 2) enabling heterogeneously skilled agents to obtain a better match (e.g., Rosen, 1978; Miller, 1984; Kim, 1989). The contribution of this paper to that literature is then to show that sectoral differentiation brings about an additional positive effect on growth via improved sorting, because an increasing variety of activities helps to lessen the negative consequences of adverse selection linked to the allocation of skills.

<sup>1</sup> See also De Meza and Webb (2000) for another model where agents' outside options influence the efficiency of the credit market. Unlike Ghatak et al. (2007), though, in their paper the value of agents' outside options are exogenously set.

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