

Models of firm innovation

The way firm innovate and the nature of their contributions to innovation varies and depends critically on firm characteristics and the conditions they face to engage in innovation. The “technology push” and “market pull” models provide two perspectives on firm innovation. Innovation output may differ along the several dimensions, including the type of innovation and the impact of innovation.

Actors of innovation

A wide range of actors are involved in firms’ innovation processes (see [Key actors for innovation in firms](#) [1]). The conditions for innovation faced by large multinational enterprises differ substantially from that of SMEs and start-ups. Various additional firm characteristics (e.g. the question whether firms operate on international markets or not or their ownership status) will have impacts on the types of innovation activities.

Inputs to firm innovation

Key inputs for innovation include:

- Finance (see [Financing Innovation](#) [2]). Access to finance is a key driver of the creation, survival and growth of innovative businesses.
- Skilled labour (see [Firms’ access to labour for innovation](#) [3] and 96. Skills for Innovation). Skilled labour plays a key role in innovation by generating new knowledge, adopting and adapting existing ideas to develop incremental innovations, and identifying relevant new business opportunities.
- Knowledge (see [Firms’ access to knowledge for innovation](#) [4]). Access to knowledge helps businesses recognize the value of new knowledge, assimilate it and apply it to commercial ends.

Innovation process

Models of innovation processes

There are two main models of innovation processes:

- The “technology push” model describes innovation processes as technological developments in firms, manufacturing, and then their commercialisation and diffusion in the marketplace.
- The “market pull” model describes innovation processes as starting with a market opportunity or demand followed by development, manufacturing and commercialisation.

Both models simplify the nature of innovation processes, which are non-linear. Loops typically occur between the different phases of the process in order to overcome shortcomings.

Variations in innovation process

The “technology push” model is particularly relevant for some industries, such as pharmaceuticals and chemicals. In these industries, the supply of novel or radical innovations is crucial. These science-based industries (Pavitt, 1984) typically run large in-house R&D programmes, or sponsor R&D activities in universities and public or private research institutes or firms (Malerba, 2005). For other industries, particularly platform or standards-based industries, such as computer operating systems, automobiles, machine tools or telecommunications, responding to changing demand through incremental innovations is more frequent. For this group of industries, incremental innovation around dominant designs and locked-in systems, with a greater focus on integrating new innovations into existing products and services, is more important than producing revolutionary innovations to replace the existing standards along which competition and innovation have evolved (Utterback and Suarez, 1993; Malerba, 2005) (see [Industrial specialization](#) [5]).

Overall, the process of innovation may take multiple forms: firms may rely solely on internal assets and capacities, acquire external knowledge (e.g. through licensing and purchasing), externalize R&D (e.g. through contract R&D). Firms may also choose to collaborate with partners. Confronted with increasing global competition, rising costs, the growing integration of different technologies, shorter life cycle, and an increased pace of innovation, many companies collaborate with external partners, whether suppliers, customers or universities. These collaborations help them stay abreast of developments, expand their market reach, tap into a larger base of ideas and technology, find complementary expertise, access specific skills and competences, and get new products or services to market before their competitors (see [Innovation Networks and Clusters](#) [6]). These collaborations can be based on formal types of arrangements (e.g. joint ventures, strategic alliances, and sponsored research agreements) or on

informal arrangements (e.g. collaborations of regionally close firms). Collaborations can also differ in terms of scope: they may concern the whole innovation process (e.g. co-development of an entire product) or only a part of it (e.g. co-development of a particular component). Evidence shows that large firms tend to collaborate more on innovation than small- and medium-sized enterprises (SMEs) (OECD, 2011a).

The process of innovation depends on multiple factors related to innovation characteristics, such as the type of innovation (e.g. product, process, organizational or marketing innovation) and the source of innovation (technological versus non-technological innovation); as well as firm characteristics (e.g. firm size, age, innovation strategy, organization, and culture), and framework conditions (e.g. regulatory framework, access to finance, access to external knowledge). For instance, small and medium enterprises (SMEs) tend to collaborate less on innovation activities than large firms.

Innovation output

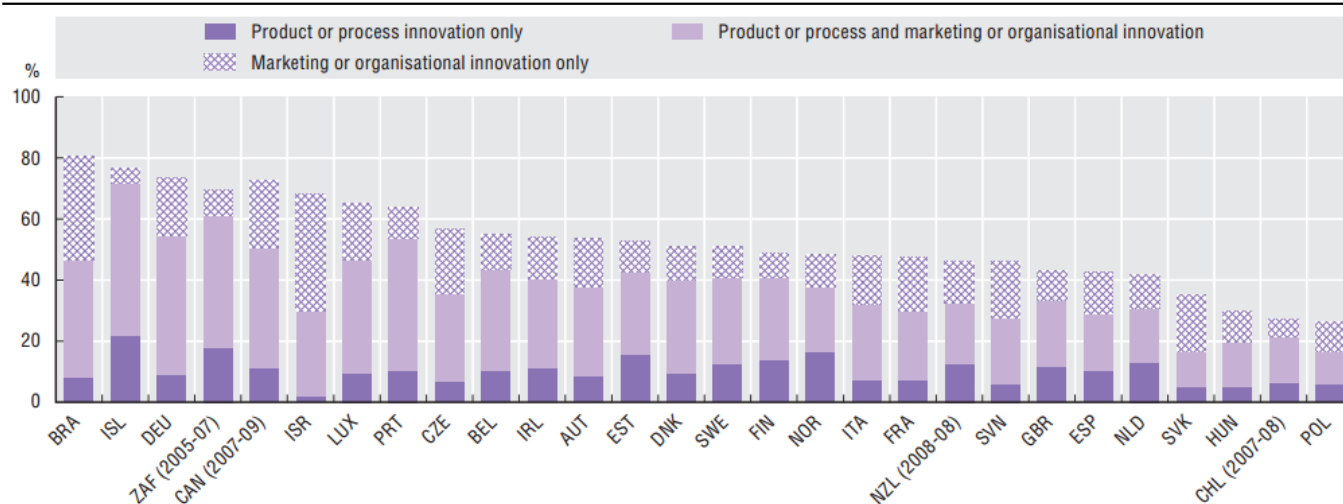
Innovation output may differ along the several dimensions (see [What is innovation](#) [7]), including the following:

- **The type of innovation** (see [Product and process innovation](#) [8]). The innovations (OECD, 2009) are organized into product, process, and organizational innovations. However, many firm innovations may have characteristics that span more than one type of innovation.
- **The Amplitude of innovation** (see [Radical and incremental innovation](#) [9]). The amplitude of innovation is measured by the degree to which an innovation changes an existing product, service, process, organization or external knowledge. Innovations in which performance has been significantly enhanced or upgraded.

Evidence from firm innovation surveys suggests that the share of innovative firms by type of innovation varies significantly across countries and depends on firm size and economic sector (Figures 1,2 and 3) (OECD, 2011b).

Figure 5. Types of innovation in the services sector, 2006–08

(% of all services firms)



OECD (2011), "Mixed modes of innovation", in OECD Science, Technology and Industry Scoreboard 2011, OECD Publishing.

Source: OECD, based on Eurostat (CIS-2008) and national data sources, June 2011. See chapter notes.
StatLink: <http://dx.doi.org/10.1787/888932487096> [10]

Figure1. Product and/or process innovative firms, % of total firms

Figure 2. Organisational innovative firms, % of total firms

Figure 3. Marketing innovative firms, % of total firms

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