

# Supply and demand-driven spillovers and productivity growth

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## Abstract

As information technology and globalization expand the horizons of economic agents' production possibilities and decisions, interconnections between productive entities are likely not only expanding but having increasing impacts on productivity. Such spillovers may derive from various types of linkages, including those associated with time, space, and industry or sector. Productivity studies are however, typically based on economic models that preclude recognition of connections among economic entities, and resulting spillovers affecting economic performance. This paper overviews a conceptual basis for including various types of spillovers in cost and productivity analysis, the potential for building such mechanisms specifically into these analyses, and some evidence indicating the impacts of such interdependencies on exhibited economic performance.

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## 1. Introduction

Production and productivity analysis is based on establishing levels and changes in the outputs or commodities producible from a given amount of inputs or input costs. Most productivity studies are, however, at least implicitly founded on output and input measures, and functional relationships, which preclude consideration of spillovers that could affect production costs. Such spillovers may involve temporal, spatial, industrial, or sectoral linkages. And the importance of these linkages is likely increasing, as information technology and globalization expand the horizons of economic entities' production possibilities and decisions, in turn affecting their economic performance.

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The force of spillover mechanisms is evident in a broad range of industries, from the traditional (the food sector), to the high-tech (computers and E-commerce). Both the anecdotal and academic literatures on productivity/performance drivers for these industries indicate that increasing interdependencies are emerging across production levels—from primary commodity production through distribution channels. These linkages exacerbate the effects of both production rigidities and embodied technological change, through spatial and industrial/sectoral transmission and diffusion. Such adaptations in the technological and economic environment have been experienced in all types of industries, and will ultimately need to be recognized explicitly in productivity analyses to unveil their impacts on industry, sector, and national economic performance and competitiveness, although they are usually ignored.

For example, the literature on economic performance in the US food system highlights the rigidities inherent in agricultural production through its dependence on fixed land, labor, and capital inputs. Differences and linkages among states and regions have also been documented. And high levels of innovation, through R&D and associated changes in inputs (seeds, livestock, pesticides) and production processes in agricultural markets, have been highlighted. These supply-side factors have resulted in greater productivity growth than in virtually any other sector of the economy. Demand-side impacts on food markets and performance, from changes in the diversification, quality, and amount of processing desired by consumers, have also been recognized.

Some studies have stressed the potential transmission of these impacts through supply- and demand-side forces at the sectoral level. That is, innovation at lower levels of the production chain disseminate up to higher levels, and changes in the composition and quality of demanded products affect lower levels of the chain. This wide swath of interconnections clearly has had a great impact on costs, production, and competitiveness in US food markets. These linkages thus clearly need to be understood, or at least recognized and assessed, for appropriate measurement and interpretation of economic performance indicators for this sector.

On the other side of the high-tech “coin”, the (largely non-academic) literature on the computer industry—and in particular E-commerce—has highlighted many types of externalities and spillovers that affect performance in this sector. For example, expansion of consumer/supplier linkages is a critical aspect of the performance contribution of E-commerce, as is well exhibited by analyses of B2B (business-to-business) and B2C (business to consumer) networks. E-commerce facilitates greater transactions speed as well as number of suppliers, and supplier linkages seem to be “impacted more quickly and obviously” than those for demand (Keen and Balance) by these mechanisms.

In addition to these consumer/supplier agglomeration effects, various types of knowledge externalities, changes in transactions costs, inventory procedures, and outsourcing patterns, and an increased focus on information propagation and reputation/good will, have been attributed to the expansion of E-commerce. The role of spatially “thick markets” for computer-oriented firms has been highlighted, and exhibited by the explosion of specifically high-tech areas such as Silicon Valley. And production rigidities, affecting economic performance through the very large and “lumpy” capital and goodwill expenditures (combined with rapid obsolescence) required to thrive in these markets, have been alluded to. The potential of increased production flexibility to enhance performance,

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