Plant Productivity Dynamics and Private and Public R&D Spillovers: Technological, Geographic and Relational Proximity

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Paper Abstract: We examine the effects of R&D spillovers on total factor productivity in a large panel of Japanese manufacturing plants matched with R&D survey data (1987-2007). We simultaneously examine the role of public (university and research institutions) and private (firm) R&D spillovers, and examine the differential effects due to technological, geographic and relational (buyer-supplier) proximity. Estimating dynamic long difference models and allowing for gradual convergence in TFP and geographic decay in spillover effects, we find positive effects of technologically proximate private R&D stocks, which decay in distance and become negligible at around 500 kilometres. In addition to knowledge spillovers from technologically proximate R&D stocks, ‘relational’ spillovers from buyer and supplier R&D stocks exert positive effects on TFP growth that are similar in magnitude. The elasticity of TFP is highest for public R&D (corrected for industrial relevance), in particular for plants operated by R&D conducting firms. We do not find evidence of geographic decay in the impact of public and relational spillovers. Over time, declining R&D spillovers appear to be responsible for a substantial part of the decline in the rate of TFP growth. The exit of proximate plants operated by R&D intensive firms plays a notable role in this process and is an important phenomenon in major industrial agglomerations such as Tokyo, Osaka, and Kanagawa.