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Infra-technology and economic performance: evidence from the United Kingdom measurement infrastructure

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Abstract

This paper investigates the impact on the United Kingdom of the measurement activity that provides the basic underpinning technology, or infra-technology, for a diverse set of economic activities. Using data on R&D, patents and input–output relationships we track the nature and extent of spillover effects from measurement technology into the wider economy. The results show that measurement R&D has a significant impact, equivalent to around 2% of GDP. This benefit is economy wide but is particularly important for certain high technology and other industries. The presence of a measurement infrastructure is also important in supporting investment and export activity.

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1. Introduction

Economists now almost universally accept the importance of technology in understanding the economics of industrial evolution and economic growth. As a result there is an extremely large literature in this area. However a somewhat neglected aspect of the story is the importance of *underpinning technologies* or *infratechnologies*, which are often quite sophisticated pre-requisites to technologi-

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cal innovation. A useful working definition of infratechnologies is provided by Tassej (1992, Chapter 8) as follows:

Infratechnologies are a varied set of ‘technical tools’ that include measurement and test methods, artefacts such as standard reference materials that allow these methods to be used efficiently, scientific and engineering databases, process models and the technical basis for both physical and functional interfaces between components of systems technologies such as factory automation and communications.

In this paper we focus on measurement infratechnologies in the United Kingdom to investigate whether they provide a coherent set of economic processes with a quantifiable contribution to economic activity both in aggregate and from a sectoral perspective.

Economies and society as a whole depend upon accurate measurements at every stage of the production process from R&D through to design, production and marketing and even after a product’s ‘death’, when for example the environmental consequences of disposal need to be assessed. The efficiency of market activity requires that quantities and qualities be properly measured so that consumers and suppliers are confident about exchanges. Further, the feasibility of mass production requires accurate measurement of components to ensure compatibility and to allow exploitation of scale economies. Indeed the introduction and development of new techniques requires the availability of accurate measurement instruments and techniques in the first place.

The accuracy and universal acceptance of measurement standards are absolutely essential to all of these processes but particularly in supporting and facilitating technological innovation. However, while technological change is viewed as one of the principal sources of economic growth it is also understood to be prone to extensive market failure often due to the public good characteristics of technological knowledge. This poses a considerable challenge to advanced economies, not least in the design of policies to efficiently ameliorate such failures. In contrast to other areas of economic policy it is notable that national economies have developed quite different technology strategies, especially for the provision of technology infrastructures, which therefore provide a rich vein for policy research.

Three broad literatures have begun to shape thinking in the area of technology and technology policy (see for example Stern et al., 2000). All of them emphasise the powerful role played by technological spillover effects. First there is the endogenous growth literature. An element of this has demonstrated the importance for economic growth of the generation of new varieties, especially among intermediate inputs. Second, the literature on industrial clusters has emphasised the extent to which technology and spillovers have a geographically bounded character with business competitiveness being conceived in terms of technological interdependence across sectors. Third, there is the literature on National Innovation

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