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Knowledge-intensive business services and economic growth with endogenous market structure

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ABSTRACT

The Knowledge-Intensive Business Services (KIBS) sector has been growing in the US in the recent decades. KIBS are used to overcome the information friction between intermediate inputs and the input users that is generated by technology improvement. We use a Schumpeterian growth model with endogenous market structure to analyze the impacts of KIBS on economic growth and welfare. The model provides the full transition dynamics as well as the balanced growth path, allowing us to engage in welfare analysis. KIBS have a positive effect on the short-run growth of output and consumption, but have no impact on long-run growth because of the endogeneity of market structure. This paper shows analytically and numerically that although KIBS have only a short-run effect, a subsidy to KIBS is welfare improving.

1. Introduction

In OECD countries, the growth of the service sector is largely driven by the growth of producer services.[1] A major group of producer services is Knowledge-Intensive Business Services (KIBS). In the United States, for example, the growth of the producer service sector mainly comes from the growth of various KIBS, including information, professional, scientific, technical and financial services.[2] Public policies towards KIBS are widely discussed in the policy agenda of OECD and the WTO.[3] Those documents state that the service sector, especially KIBS, play a principal role in the economy and is an important engine for overall growth. In addition, they argue that public support is biased towards manufacturing but provides little support for service, and therefore they suggest increasing the subsidy on the service sector especially KIBS.

In the literature, the empirical evidence shows that KIBS in fact do contribute to economic growth, as is indicated in the policy agenda.[4] However, the theoretical work to support the above policy agenda and the empirical results are both relatively weak. The existing theoretical literature usually studies the economic impact of KIBS within a framework based on static

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[1] *Producer services* are defined as intermediate inputs to further production activities that are sold to other firms, although households are also important consumers in some cases. These services typically have a high information content and often reflect a contracting out of support services that could be provided in-house. See STI (2000) and OECD Employment Outlook (2000).
[2] See Berman (2005) Table 2.
[3] See the discussions in STI (Science Technology Industry), business and industry policy forum series entitled "The Service Economy," OECD Employment Outlook (2000) and Benitah (2005).
[4] See Greenfield (1966), Katouzian (1970), Banga and Goldar (2007), Triplett and Bosworth (2004), Inklaar et al. (2007, 2008) and Huang (2013).

analysis which cannot address the effects of KIBS in the long run. See Markusen (1989) and Francois (1990). Therefore, the purpose of this paper is to set up a dynamic general equilibrium framework to discuss how KIBS affect output and productivity in both the short run and long run: a subsidy for KIBS increases short-run growth but does not affect the balanced growth rate of the economy. Furthermore, we show analytically and numerically that a subsidy for KIBS is always welfare improving even though imposing taxes causes a small reduction in current consumption.

KIBS are services that rely heavily on professional knowledge. Miles et al. (1994) divides KIBS into two broad types. One is *traditional KIBS* which include accounting and bookkeeping services, advertising and marketing services and legal services, etc. The other kind is *new technology-based services* which include professional, scientific and technical support services, information services, high-tech traning and consulting services. The main distinction between the two, according to Miles et al. (1994), is their relation to new technology. The former are typically *user* of new technology. The latter usually serve as agents of the *transfer and diffusion* of new technology. In this paper we focus on *new technology-based KIBS.* We highlight the role of KIBS as overcoming an information gap between upstream specialized intermediate input producers and downstream input users due to technology improvement, following the idea in Huang (2013). KIBS transfer and diffuse the new technology from their producers to their users. More specifically, KIBS help disclose to the users the information embodied in a specialized technological input. These services thus reduce the information gap between the two trading partners. For example, when an enterprise purchases a statistical software package from SAS to manage its business, it also needs the following intermediary services provided by SAS, in order to use the software package easily: (1) a consulting service to identify the particular softwares that it needs; (2) a technical support service to assemble different softwares into a package; and (3) a repair and maintenance service to fix the problems with the software package. All those services are KIBS that overcome the information gap between the enterprise and SAS.

This paper embeds KIBS in an R&D-based growth model with an endogenous market structure of the type developed by Peretto (1998), Peretto (2007) and Howitt (1999).[5] Market structure, including the size and number of firms, is endogenously regulated by entry and exit in response to profitability. Growth depends on the *individual firm's market size*, which is consistent with empirical findings. See Cohen and Klepper (1996a), Cohen and Klepper (1996b), Adams and Jaffe (1996). The interaction between KIBS and market structure delivers interesting results in both the short run and the long run.

In order to analyze both market structure and innovation, the model has both horizontal (variety expansion) and vertical (quality improvement) dimensions of technological change. Horizontal innovations occur through the entry of new product lines. Vertical innovation is conducted by existing firms (in-house) and is the only the source of long-run growth rate because firms' fixed operating costs cap the number of firms. See Peretto and Connolly (2007). We treat the new technology-based KIBS as an important supplement to vertical innovation. The process of vertical innovation increases the sophistication of high-tech products, which lead to difficulties in using and maintaining the product. Knowledge-intensive business services help alleviate those problems. As shown in the previous SAS example, the SAS company provides its customers with software packages together with KIBS. From the perspective of SAS, the incentive to provide KIBS is that KIBS reduce the information frictions created by the increasing complexity of the software package due to quality improvement and therefore makes the software easily accessible to its users. Given the level of product quality, increasing the provision of KIBS increases end users' demand for the product.

The model delivers three sets of results. First, KIBS have a positive transition effect on productivity and output growth. Suppose firms increase the use of KIBS due to a government subsidy. In the short run, an increase in the use of KIBS reduces information frictions between intermediate inputs and final good producers. That enlarges the intermediate firms' market size and provides stronger incentives for firms to conduct R&D. Therefore, in the short run, KIBS enhance the speed of technological improvement which leads to a higher rate of economic growth.

Second, KIBS have no long-run effect on productivity and output growth. When facing a government subsidy, firms provide more KIBS and hence have a greater market size, higher profits and higher returns to R&D. The higher profit induces new firms to enter, crowds out the firm market size of incumbents, reduces the returns to R&D and reduces economic growth. In the long-run equilibrium, the two effects cancel out, and KIBS have no long-run impact on productivity or output growth. This result differs from Huang (2013) because here market structure is endogenous, whereas in Huang it is exogenous.

Third, the two foregoing results suggest that a government policy of subsidizing KIBS has only a short-run effect on growth, and not a long-run effect. Imposing a labor income tax to subsidize KIBS[6] reduces the current consumption level which is the negative impact on welfare. However the subsidy increases both the output level and short-run growth rate which is the positive impact on welfare. The numerical analysis shows that a subsidy on KIBS with a labor income tax is always welfare improving. The positive impact on the welfare dominates given that KIBS accounts for only a small share of final output and thus a large subsidy on KIBS requires only a very low tax rate.

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[5] The traditional growth models (variety expansion model and quality ladder model) used by Huang (2013) are not consistent with empirical facts. See Backus et al. (1992), Jones (1995).

[6] To simplify the anlysis, we only impose labor income tax here. Under the model without labor-leisure choice, a labor income tax is equivalent to a lump-sum tax. The reason why we do not directly use a lump-sum tax is because we do not have data to calibrate the lump-sum tax but we can easily find the labor income tax rate.