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The (strong) interdependence between intermediate producer services' attributes and manufacturing location ☆

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ABSTRACT

The empirical evidence shows that a high degree of co-location exists between intermediate producer services and manufacturers. This paper develops a theoretical model based on the Footloose Entrepreneur Model of the New Economic Geography in which intermediate producer services play an essential role in characterizing the industrial landscape. Our results show that the concentration of manufacturing is favored when the service sector has high price elasticity for any variety and is a very efficient sector in production and when the mobile-fixed factor, skilled workers, is important in the production of manufacturing. In a nutshell, to promote economic activity, the industrial policy and service sector policy should be coordinated.

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1. Introduction

In modern economies the service sector is essential, not only quantitatively but also qualitatively, and its importance is increasing. In effect, according to data from the World Bank, the service industry contributed 70.1% of the world GDP in 2012, while the figure was scarcely above 50% in the early 1970s. The global importance of the sector is accentuated if we focus on the most developed economies; in 2012 it represented 77.7% in the United States of America and 73.9% in the European Union, reaching 86.1% of the GDP of Luxembourg. Indeed, the relative importance of services in the GDP can be considered an indirect but useful indicator of the degree of a country's development and quality of life. Moreover, the growth in India, China and some other economies in South-East Asia can be attributed to a certain extent to growth in intermediate producer service activities (Bosworth and Collins, 2008; Tseng and Cowen, 2013).

What is so special about services that makes them strategic goods? First, by definition, services have special characteristics that most goods do not share. They are labor intensive; they are, to a certain extent, intangible goods; and, finally, they tend to be luxury goods. Second, intermediate producer services can generate gains in productivity in the manufacturing sector (Amiti and Wei, 2009; Baker, 2007; Greenhalg and Gregory (2001); Hansen, 1990; Kox and Rubalcaba, 2007; Léo and Philippe, 2005). Third, in recent decades manufacturers have gradually changed their organizational strategies from vertically integrated activities to outsourcing. This externalization has especially affected knowledge-intensive business services (KIBSs), which do not include business services such as outsourcing activities located in other countries. The intermediate producers of services may be able to exploit scale economies, supplying these services in a specific and particularized way (differentiated intermediate producer services).

Against this background, we incorporate the service sector into a standard theoretical New Economic Geography (NEG) model, the Footloose Entrepreneur Model of Forslid and Ottaviano (2003, FO hereafter), with special emphasis on its role as an intermediate input for the manufacturing sector. To the FO framework, our model adds an intermediate producer service sector that is differentiated by a monopolistic competition market structure and produces with increasing returns. Moreover, the intermediate producer service sector is non-tradable and acts as a fixed input for manufacturing production, using skilled labor (economists, engineers, lawyers, advertising and marketing experts, actuaries, insurance brokers) as its only production factor. In a nutshell, our model aims to explore and define how the incorporation of intermediate services affects the spatial configuration of the manufacturing equilibria.

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The main links of our model with the previous theoretical literature are the following. A full consideration of the importance of services as intermediate inputs for manufacturing can be found in van Marrewijk et al. (1997), which is constructed mainly from the contributions of Ishikawa (1992) and Markusen (1989). In these papers services inputs are tradable and the emphasis is on the characteristics of the intermediate producer services and final goods trade and not on analyzing issues related to their location. However, Alonso-Villar and Chamorro-Rivas (2001) and de Vaal and van den Berg (1999) introduce intermediate services inputs into a typical economic geography model and, therefore, specifically discuss the problems related to the resulting spatial landscape. Both of these papers are based on the model of Krugman (1991) and thus rely on numerical simulations.

In this context our theoretical model of economic geography may be a step forward in the analysis of the effects that intermediate producer services have on the equilibrium of the industrial landscape in three ways. First, in our approach the intermediate producer services are non-tradable, a feature that, as far as we know, has received little treatment in the literature. Second, the model can be solved analytically, without requiring simulation. Third, it is derived from Forslid and Ottaviano (2003), which, as will be seen below, enables us to obtain very clear results regarding how the different parameters associated with the service sector influence the industrial landscape.

Our main results define when intermediate producer services act as a centripetal force encouraging the concentration of manufacturing. The characteristics of the intermediate producer service sector that tend to favor a more concentrated industrial landscape are a very productive service sector, a less differentiated service sector and a greater requirement of the mobile-fixed factor (skilled workers) in the production of manufactured goods.

The rest of the paper is structured as follows. The second section motivates our theoretical model from a practical and empirical point of view. The third section defines the basic model. The fourth section is the core of the paper and includes a comparative static analysis from which we deduce the three effects summarizing how the service sector affects industrial localization. The fifth section studies the number and stability of the resulting equilibria. Finally, the paper ends with our conclusions.

2. Empirical motivation of our theoretical exercise

Before developing the model, in this section we show the empirical relevance of the research that we carry out, which is related to practical aspects of the real economic world. The main thesis that we want to present is that the location of intermediate producer services exerts an important influence on the location of manufacturing.

First, the theoretical literature, which stretches back as far as Marshall (1890), clearly deduces that buyers and sellers of intermediates will co-locate to minimize their costs. This is the essence of the well-known vertical linkages model of the New Economic Geography (Puga, 1999; Venables, 1996).

Second, the empirical literature also corroborates that intermediate producer services and manufacturing tend to locate near each other. In this context Andersson (2004) deduces that, in Swedish urban areas, the size of the manufacturing sector can be explained by the size of the service sector and vice versa, defining clusters of industrial and knowledge-intensive service firms. His results suggest that the location of manufacturing employment can be explained by its accessibility to intermediate producer services. Holl (2004) analyzes the case of Portuguese manufacturing companies and deduces, among other conclusions, that firms that change their location show a strong preference for areas that are well endowed in intermediate producer services. Taking data from Belgian urban areas between 1982 and 1996, Moyart (2005) confirms that being specialized in services, especially in intermediate producer services, increases the attractiveness of a zone to manufacturing companies. Chen and Chen (2011), using data from 69 cities and regions in the Chinese province of Zhejiang, deduce that services' location has a clear impact on manufacturing's location, although different behaviors appear depending on the size of the city. Panel data from 286 Chinese cities in the period 2003–2008 are used by Ke et al. (2014) to conclude that manufacturing firms tend to locate where intermediate producer services are already located and vice versa, in such a way that a cumulative process of co-agglomeration of the two sectors in specific areas is found.

From the literature reviewed in the previous paragraph, we can conclude that there are strong complementarities between the secondary and the tertiary sector that, without doubt, simultaneously influence the location of both.[1] Therefore, we can refer to the stylized fact that co-location exists between some types of services and manufacturing, at least to a certain extent.[2]

Finally, we carry out a very simple empirical exercise to illustrate, with recent data, that services do matter for industrial concentration. We take information from the US Bureau of Labor Statistics for the year 2014 at the US county level, specifically the location quotients (LQ_{mi}) of the 21 three-digit North American Industry Classification System (NAICS) manufacturing sectors (the codes numbered between 311 and 339)[3] and the location quotients (LQ_{sj}) of a very representative intermediate producer service, management of companies and enterprises (code 551). An OLS regression, $LQ_{sj} = a_0 + a_1 LQ_{mi}$, is estimated for all the possible cases, in which a_1 is the relevant parameter. If positive, it indicates that counties where a manufacturing sector is overrepresented are accompanied by an intermediate producer service sector that is also overrepresented and, therefore, favors the evidence of co-location.

The results of the 21 regressions are as follows. At the 5% level of significance, a_1 is significant and positive in the following cases: printing and related support activities, computer and electronic products, miscellaneous and chemical and electrical equipment and appliances. It is negative and significant for wood products. From this very simple empirical analysis, we can extract two main outcomes. First, the dominant correlation between the LQs of manufacturing and intermediate producer services is positive, which confirms the hypothesis of co-location. Second, depending on which pair of intermediate producer services and manufacturing sector is considered, the relationship is of one of two types. The theoretical model that we propose can help to explain the second outcome. We will see later that, for example, a less efficient production service sector tends to make the concentration of manufacturing more difficult; this might be the case of the intermediate producer services for wood products. The positive relationships between services and manufacturing (estimated a_1 greater than zero and significant at 5%) might be explained by a very efficient service sector.

These explanations would require specific research in any case. We fully agree with Shearmur and Doloreux (2008) that "the causation underlying the correlation between KIBS growth and manufacturing calls for further study." In this paper we try to fill this gap from a theoretical perspective.

[1] There is great variability between manufacturing sectors with respect to the share of business services in their total output (see Table 2 in Guerrieri and Meliciani, 2005). We can also find very intense intercountry variability in these shares (see Figure 1 in Francois and Woerz, 2008).

[2] Interdependence between intermediate producer services and manufacturing is the leitmotiv of our paper. The general interdependence between all the sectors in the economy is empirically highlighted by Arbia et al. (2012) and Saari et al. (2014). Our model is a particular case of these general linkages.

[3] The manufacturing industries are the following: food manufacturing (mnfg), beverage and tobacco products mnfg, textile mills, textile product mills, apparel mnfg, leather and allied product mnfg, wood product mnfg, paper mnfg, printing and related support activities, petroleum and coal product mnfg, chemical mnfg, plastic and rubber product mnfg, nonmetallic mineral product mnfg, primary metal mnfg, fabricated metal product mnfg, machinery mnfg, computer and electronic product mnfg, electrical equipment and appliance mnfg, transportation equipment mnfg, furniture and related product mnfg and miscellaneous mnfg.

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