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A general equilibrium analysis of the evolution of Canadian service productivity

Pierre Mohnen ^{a,*}, Thijs ten Raa ^b

^a *Departement des Sciences Economiques, Université du Québec à Montréal and CIRANO, C.P. 8888, Succ. Centre-Ville, Montreal, Quebec, Canada H3C 3P8*

^b *Tilburg University, Tilburg, The Netherlands*

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Abstract

Can the slowdown in total factor productivity (TFP) that we have experienced since the mid-seventies be ascribed to the increasing importance of services, or do we instead observe an improvement of productivity in the service sectors by way of learning-by-doing or specialization? We feel that such questions are best answered within a general equilibrium analysis of the whole economy, i.e. a structural view of the whole economy. We maximize the level of domestic consumption subject to commodity balances and endowment constraints. The Lagrange multipliers associated with the endowment constraints measure the marginal productivities of labor and capital. We declare these shadow prices to be the factor productivities. The main empirical contribution of this paper is a reexamination of the services paradox. In Canada, the sluggish productivity in services is limited to finance, insurance and real estate, and to business and personal services. Any attempt to resolve the services paradox may focus on these two sectors. Transportation, trade, and to a lesser extent communication are progressive sectors. © 2000 Elsevier Science B.V. All rights reserved.

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1. Introduction

Services have long ago relegated manufacturing to second rank in the importance of an economy's total activity. It is often argued that services suffer from the Baumol disease. More and more resources are devoted to services, where productiv-

* Corresponding author. Tel.: +1-514-9873000 ext. 3503; fax: +1-514-9878494.
E-mail address: mohnen.pierre@uqam.ca (P. Mohnen).

ity gains are limited. The whole economy thus drifts to a lower productivity performance, unless the growth of services is offset by input savings in manufacturing. Oulton (1997) shows how resource shifts to service sectors with sluggish productivity may increase aggregate productivity if it concerns intermediate (business) rather than final (personal) services. Can the slowdown in total factor productivity (TFP) that we have experienced since the mid-seventies be ascribed to the increasing importance of services, or has this drag been offset by big savings of other inputs in manufacturing? Have services suffered from the Baumol disease at all, or do we instead observe an improvement of productivity in the services sectors by way of learning-by-doing or specialization? We feel that such questions are best answered within a general equilibrium analysis of the whole economy, i.e. a structural view of the whole economy. Our approach does not belong to the class of general equilibrium models, which model supply and demand functions and aim at finding prices, which sustain observed data as equilibrium outcomes. Our position is to start from the fundamentals of the economy to establish the production frontier and its shift over time, and to compute competitive prices, which sustain that frontier. We do not capture the variations of the economy about its frontier in this paper. The full theory of fundamentals based productivity measurement is presented in ten Raa and Mohnen (2000). Also, in this paper we focus on the service sectors and assume that capital is sector specific and not differentiated by type.

The fundamentals are the usual ones — endowments, technology, and preferences. Endowments are represented by a labor force and stocks of capital. Technology is given by the combined inputs and outputs of the sectors of the economy. Preferences are reflected by the pattern of domestic final demand. All the information can be extracted from input and output tables in real terms, that is constant prices. The productivities are determined as follows. We maximize the level of domestic consumption subject to commodity balances and endowment constraints. Now, as is known from the theory of mathematical programming, the Lagrange multipliers associated with the endowment constraints measure the marginal productivities of labor and capital — the consumption increments per units of additional labor or capital. In economics, these Lagrange multipliers are shadow prices that would reign under idealized conditions of perfect competition. We declare these shadow prices to be the factor productivities.

The paper is organized as follows. Factor productivities and TFP are defined by means of a linear program in the next section. In Section 3 we present the data of the Canadian economy from 1962 to 1991. In Section 4 we present our results. The last section concludes.

2. Productivities

We find the economy's frontier by maximization of the level of domestic final demand, which excludes trade by definition. Exports and imports are endogenous, controlled by the balance of payments. We make no distinction between competi-

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