Research Policy 44 (2015) 1537–1542

Contents lists available at ScienceDirect

Research Policy

journal homepage: www.elsevier.com/locate/respol

Short communication

Knowledge goods, ordinary goods, and the effects of trade between leading and lagging regions

Amitrajeet A. Batabyal[a,*], Hamid Beladi[b]

[a] Department of Economics, Rochester Institute of Technology, 92 Lomb Memorial Drive, Rochester, NY 14623-5604,USA
[b] Department of Economics, University of Texas at San Antonio, One UTSA Circle, San Antonio, TX 78249-0631, USA

ARTICLE INFO

Article history:
Received 3 November 2014
Received in revised form 14 April 2015
Accepted 20 April 2015
Available online 19 June 2015

JEL classification:
R11
R13
F12

Keywords:
Interregional trade
Lagging region
Leading region
Technology
Welfare

ABSTRACT

We study the effects of trade in knowledge and ordinary goods on the income and welfare gap between a leading and a lagging region. Knowledge goods are invented and produced in the leading region only. In contrast, ordinary goods can be produced in both regions. Our analysis sheds light on four salient questions. First, we determine the equilibrium wage ratio between the leading and the lagging regions. Second, we show that increasing the rate at which the lagging region copies the technology for producing knowledge goods narrows the income and welfare gap between the leading and the lagging regions. Third, we find the steady state level of welfare in the leading region. Finally, we note that an increase in the rate at which the lagging region copies the technology for producing knowledge goods may make the leading region worse off.

1. Introduction

In a developed nation such as the United States, the economic performance of dynamic California is very different from the economic performance of the less dynamic Mississippi. Similarly, in a developing nation such as India, the economic performance of rapidly growing Gujarat is very different from the economic performance of slowly growing Mizoram. Since many more examples of this sort exist, economists and regional scientists now understand that regardless of whether one considers a developed or a developing nation, there are inequalities of various sorts between the regions that comprise the nation under consideration. This understanding has given rise to considerable interest in studying the attributes of so called leading and lagging regions. As noted in Batabyal and Nijkamp (2014a,b), leading regions are generally dynamic, frequently urban, they display relatively rapid rates of economic growth, and they are technologically more advanced. In contrast, lagging regions are typically less dynamic, they are often rural or peripheral, they display slow economic growth rates, and they are technologically stagnant.[1]

The fascinating subject of leading and lagging regions is actually part of a broader literature on spatial disparities.[2] In this regard, the variability in regional economic performance has given rise to much theoretical and empirical research.[3] This research has emphasized the causal mechanisms that are responsible for lingering inequality between regions and on the policy levers for dealing with the concomitant equity-efficiency tradeoffs. Clearly, differential access to technology and productivity differences are key factors in explaining and dealing with regional differences but the existence of such differences calls for a deeper analysis of the various factors such as initial conditions, the availability of public services, the mobility of human capital, and technological spillovers.

* Corresponding author. Tel.: +1 5854752805.
E-mail addresses: aabgsh@rit.edu (A.A. Batabyal), Hamid.Beladi@utsa.edu (H. Beladi).

http://dx.doi.org/10.1016/j.respol.2015.04.008
0048-7333/

[1] In this paper, we are thinking of both leading and lagging regions as geographic entities that are smaller than nations. However, it should be noted that the word "region" has not always been used in the sense just mentioned. The word "region" has been used to refer to nations and, occasionally, to geographic entities—such as the European Union and North America—that are larger than nations.

[2] See Baumol (1986), Lucas (1988), Kochendorfer-Lucius and Pleskovic (2009), Alexiades (2013), and Batabyal and Nijkamp (2014a,b) for more on this literature.

[3] See Armstrong and Taylor (2000), Fujita and Thisse (2002), and Nijkamp (2003) for additional details on this literature.

Researchers now recognize that technology is a major determinant of economic growth within a region. In addition, in the context of trading regions, access to new technology is a key determinant of a region's income and welfare. Given this recognition, in our paper, we pay particular attention to technological interactions and to goods trade in a spatial-economic system characterized by the existence of a leading and a lagging region. However, before we move to the specifics of our paper, let us briefly review the apposite literature.

Ghosh and De (2000, p. 391) concentrate on the metric of income and point out that there are obvious disparities in incomes between the leading and the lagging states in India. Their empirical analysis suggests that these income disparities can be addressed by the government "undertaking large infrastructure projects in lagging regions". Kalirajan (2004) also concentrates on India and notes that if one is to further economic growth and promote growth spillovers from the leading to the lagging states, then it is important to pay attention to the quality of human capital in the various states. Rahman and Hossain (2009) use annual data from 1977–2000 to analyze per capita income convergence across six regions in Bangladesh. Their empirical study shows that if the lagging regions are to advance, then infrastructural, technological, and financial support to the lagging regions will need to be intensified.

Interregional trade between the lagging western and some of the leading regions of China is the focus of He and Duchin (2009). These researchers point out that the planned increase in transport infrastructure in the lagging western region will be cost effective, beneficial to the western region, and conserve overall energy at given levels of demand. Skoufias and Katayama (2011) first note that Brazil's inequalities in welfare and poverty between and within regions can be explained by differences in household attributes and in the returns to these attributes. They then go on to show that the differences in the welfare gains from the above mentioned attributes largely explain the differences between the lagging Northeast region and the leading Southeast region. Finally, in two papers that are similar in orientation to our paper, Batabyal and Nijkamp (2014a,b) have analyzed models of the technology gap between stylized leading and lagging regions. The first paper studies the implications of the lagging region learning the technology of the leading region for economic growth in both the regions under study. Finally, the second paper analyzes the properties of the temporal gap with which the lagging region utilizes the technology available in the leading region.

The various studies discussed thus far in this section have advanced aspects of our understanding of the working of leading and lagging regions in different parts of the world. Specifically, Batabyal and Nijkamp (2014a,b) have pointed to the importance of technology and human capital in enhancing the economic growth prospects of the lagging regions being studied. Even so, as best as we can tell, there are very few studies that have theoretically studied the effects of trade in knowledge and ordinary goods (on which more below in Section 2) on the income and welfare gap between a leading and a lagging region.

The objective of our paper is to use a dynamic model to analyze the income and welfare effects of trade between a stylized leading and a lagging region. The remainder of this paper is organized as follows. Section 2 first delineates our theoretical model of a leading and a lagging region that is adapted from Krugman (1979) and Acemoglu (2009, pp. 674–678). Next, this section focuses on the case in which the number of knowledge and ordinary goods is given. Section 3 first studies the case in which the number of knowledge and ordinary goods is endogenously determined in the model and then determines the equilibrium wage ratio between the leading and the lagging regions. Section 4 shows that increasing the rate at which the lagging region copies the technology for producing knowledge goods narrows the income and welfare gap between the leading and the lagging regions. Section 5 ascertains the steady state level of welfare in the leading region. Section 6 notes that an increase in the rate at which the lagging region copies the technology for producing knowledge goods may make the leading region worse off. Finally, Section 7 concludes and then discusses potential extensions of the research delineated in this paper.

2. The theoretical framework

2.1. Preliminaries

Consider an aggregate economy made up of a leading and a lagging region. We index these two regions with the subscript i where $i = \mathrm{L,F}$. The subscript L denotes the leading region and the subscript F denotes the lagging or following region. There is free trade between these two regions without any trade costs. The relevant households in the two regions have identical constant elasticity of substitution (CES) preferences which display a love for variety that is defined over a consumption index. At any time t, the consumption index for region i, $i = \mathrm{L,F}$ is given by

$$C_i(t) = \left\{ \int_0^{N(t)} c_i(v,t)^{\alpha-1/\alpha} \mathrm{d}y \right\}^{\alpha/\alpha-1}, \tag{1}$$

where $c_i(v,t)$ is the consumption of the yth good in region i at time t, $N(t)$ is the total number of goods in the aggregate economy at time t that are traded freely, and $\alpha > 1$ is the elasticity of substitution between these different goods. There is a representative household in the leading and in the lagging regions with intertemporal preferences defined over the consumption index $C_i(t)$ described in Eq. (1).

The goods that may be traded between the leading and the lagging regions are of two possible types. Knowledge goods are first invented and then produced in the leading region exclusively. In contrast, ordinary goods are those that have been invented in the past and whose production technology has been copied by the lagging region. Therefore, ordinary goods can be produced in the leading and in the lagging regions.

The basic factor of production (input) in each of the two regions at any time t is human capital $H_i(t)$. One human capital unit produces one unit of any good to which this human capital unit's region has access. This means that the various human capital units in the leading region have access to both knowledge and ordinary goods but the human capital units in the lagging region have access only to ordinary goods. Note that from a technological standpoint, the only difference between the two regions is that the human capital units in the leading region have access to a larger set of goods. In other words, the human capital units in the leading region have no productive advantage over human capital units in the lagging region.

The fixed endowments of human capital in the leading and in the lagging regions are denoted by $\bar{H}_\mathrm{L}$ and $\bar{H}_\mathrm{F}$ and this available human capital is supplied inelastically in each of the two regions under study.[4] In this setting, two kinds of equilibria are possible and, to use Acemoglu's (2009, p. 675) terminology, these two are an equalization equilibrium and a specialization equilibrium. In the equalization equilibrium, the leading and the lagging regions both produce some ordinary goods. In particular, in this equilibrium,

[4] Assumptions very similar to those we make in this paper have been made routinely by other researchers analyzing dynamic models of technology and trade. In other words, our assumptions are standard and they are not extremely restrictive. See chapter 19 in Acemoglu (2009)—a standard textbook—for a mode detailed corroboration of this claim. In particular, our assumption that the knowledge good is invented and produced only in the leading region is analogous to similar assumptions made by Krugman (1979) and Saggi (2004).