Journal of Development Economics 101 (2013) 248–255

Contents lists available at SciVerse ScienceDirect

Journal of Development Economics

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

The Dutch disease and the technological gap ☆

Reda Cherif

International Monetary Fund, Washington, DC 20431, USA

ARTICLE INFO

Article history:
Received 17 April 2010
Received in revised form 18 October 2012
Accepted 23 October 2012
Available online 17 November 2012

JEL classification:
F12
O14

Keywords:
Models of trade with imperfect competition and scale economies
Dutch disease

ABSTRACT

I present a theory explaining why less technologically advanced countries could be more vulnerable to the Dutch disease. In a bilateral trade model with monopolistic competition and increasing returns to scale, the extent of the crowding-out in the tradable sector depends positively on an interaction between the amount of revenues from natural resources' exports and the productivity gap vis-à-vis the trade partners. With learning-by-doing, the mechanism is self-reinforcing leading to a productivity divergence pattern. The predictions of the model are consistent with cross-country empirical evidence.

1. Introduction

The Dutch disease phenomenon attracted attention in the 1970s in the Netherlands where the discovery of natural gas fields was followed by rapid de-industrialization. The phenomenon is not peculiar to advanced economies and seems more severe in developing ones. The Netherlands is still an industrial power and in the 19th century, Canada and the U.S. managed to industrialize despite a heavy dependence on commodities exports. Yet, the familiar experience of a developing economy that discovers a tradable natural resource is to become completely dependent on its exports revenues and to fail to build an industrial base. This paper suggests that the extent of the decline in the manufacturing sector depends positively on the technological gap vis-à-vis the trading partner. Moreover, while a country receives windfalls, its technological gap keeps widening. The industrial development of Germany, Japan, and the Asian miracles points to the important role played by the manufacturing sector in their development. It is therefore crucial to understand what determines the extent of the Dutch disease in developing economies.

I present a bilateral trade model with monopolistic competition and increasing returns to scale, in the vein of Krugman (1979). As in most Dutch disease models, the main channel of transmission is the "spending effect" in the terminology of the seminal work of Corden and Neary (1982).[1] In essence it describes how an increase in the exports' revenues from the natural resource sector leads to an appreciation of the real exchange rate and a crowding-out in the other tradable sectors. Because consumers in the recipient country are richer, they will in general want more of all goods and in particular the non-tradable ones assuming that goods are normal and assuming a non-perverse output response. As a result, production factors are reallocated into the non-tradable sector to the detriments of the other tradable sectors while the real exchange rate appreciates.

In the model I present, the natural resource sector does not appear explicitly. Instead, I represent its exports' revenues by pure transfer payments from the foreign to the home country. The discussion is essentially about comparing the extent of the crowding-out in the tradable sector given different technological distances vis-à-vis the trade partner, for example in the Netherlands vs. Nigeria. To make the thought experiment meaningful, I assume that each country receives a certain amount of transfers in terms of the foreign country wages. The next step is to convert the transfer payments into units of home wages. I show in the paper that in the monopolistic competition and increasing returns framework,

☆ I am particularly grateful to Rabah Arezki, Ray Brooks, Francesco Caselli, Thomas Chaney, Gaston Gelos, Fuad Hasanov, Mico Loteran, Robert Lucas, Amine Mati, Alex Mourmouras, Casey Mulligan, Nooman Rebei and anonymous referees for valuable comments. Any remaining errors or omissions are mine. The views expressed herein are those of the authors and should not be attributed to the IMF, its Executive Board, or its management.
E-mail address: acherif@imf.org.

[1] The other effect they define is the "resource movement effect" toward the natural resource sector. A boom in the resource sector would attract factors of production. They indicate that it is usually negligible in comparison to the spending effect. Although the extractive industry can generate massive revenues it is usually a small sector in terms of factors' employment with little links to the rest of the economy. Matsuyama (1992) is a notable exception in the literature where his version of the Dutch disease stems from the "resource movement effect".

0304-3878/$ – see front matter
http://dx.doi.org/10.1016/j.jdeveco.2012.10.010

the wage gap vis-à-vis the trade partner is an increasing function of the productivity gap. If, compared to the Netherlands, Nigeria has a much bigger productivity gap vis-à-vis its trade partners, then its wage gap will also be much greater. The comparative static analysis indicates that if each country receives as transfers an additional unit of foreign wages, then the increase in income in terms of domestic wages and the spending effect associated will be far greater in Nigeria, and so will be the crowding-out effect.

The crowding-out in the tradable sector would be problematic in the presence of externalities. I illustrate this point with a simple dynamic version of the model in the presence of learning-by-doing and cross-country knowledge spillovers. I show that a steady stream of transfers unleashes a vicious cycle of productivity divergence instead of the counterfactual convergence. The crowding-out effect of transfers today leads to a bigger productivity gap tomorrow, which in turn means a bigger marginal effect of transfers in the tradable sector as long as transfers are received.

The standard models of the Dutch disease are based on the neo-classical trade theory. In their seminal paper, Corden and Neary (1982), use the Heckscher–Ohlin type framework to study the effect of a boom in a tradable resource sector on resource allocation and income distribution under different assumptions on sectoral factor intensity. Krugman (1987) uses the comparative advantage model of Dornbusch et al. (1977) to show that temporary transfers can have long term negative effects as some industries disappear irreversibly.[2] As the premise of this paper is that technological distance (i.e. absolute advantage) matters, it seems natural to depart from neo-classical trade models. The factor proportions theory in its standard formulation rules out technological differences while in Ricardian trade it is comparative advantage that matters. Although originally designed to justify trade between perfectly similar economies, I show that in the new trade theory approach (of the Krugman–Helpman type) the effect of technological distance on trade plays an important role and is driven by the relative wage. The latter is in turn a function of relative productivity and structural parameters.

I examine empirically the validity of my theory using cross-country data. I use the dataset of McMillan and Rodrik (2011), which is itself an extension of Timmer and de Vries (2009). It comprises internationally comparable data of sectoral value added and employment for 38 countries. I find that the interaction between the initial labor productivity gap in manufacturing vis-à-vis trade partners (a measure of technological distance which I define in Section 4) and the average share of primary exports in total exports contributes (i) positively to the divergence of the relative labor productivity gap in manufacturing over the period 1990–2000 (ii) and negatively to the change in the employment share in manufacturing. The rest of the paper is organized in the following fashion. Section 2 presents the model. Section 3 extends it into a dynamic version. Section 4 presents cross-country empirical evidence. Section 5 draws conclusions.

2. The model

I present a model of bilateral trade with monopolistic competition and increasing returns to scale in which I introduce a non-tradable good and asymmetry in technologies.

[2] For early contributions, see also Corden (1984) for an extension of Corden and Neary(1982) including immigration dynamics; Van Wijnbergen (1984) for a two period trade model with learning-by-doing and a welfare analysis and policy discussion and Aoki and Edwards (1983) for a small open economy model. Recent contributions focus on the Dutch disease effect in dynamic general equilibrium models. See for example Arellano et al. (2009), Caballero and Lorenzoni (2007) and Lama and Medina (2012) who study the criterion for exchange rate intervention in the presence of financial frictions.

2.1. Preferences

There is a large number of potential tradable goods that enter symmetrically in the utility function of consumers. These goods are assumed to be relatively good substitutes among themselves but poor substitutes for a non-tradable good. Given a number of goods produced at home denoted n, and a number of goods produced abroad denoted n^*, all individuals have the same utility function,

$$U\left(x_0, \left\{\int_0^{n+n^*} x(s)^\rho \, ds\right\}^{\frac{1}{\rho}}\right), \quad 0<\rho<1 \tag{1}$$

where $x(s)$ represents the consumption of tradable good s and x_0 the consumption of the non-tradable good. I will assume that U is Cobb–Douglas and that the number of goods produced is smaller than the number of potential goods.

2.2. Technologies

Labor is the only factor of production in the economy. The two countries differ in the technology they use to produce tradable goods. I define l_1 the labor cost of a domestic producer in terms of quantities produced x_1, and l_2 the labor cost of a foreign producer in terms of quantities produced x_2 as,

$$l_1 = \alpha_1 + \beta_1 x_1 \tag{2}$$

and,

$$l_2 = \alpha_2 + \beta_2 x_2 \tag{3}$$

assuming a fixed labor cost α_1 and a constant marginal labor cost β_1 in the home economy and similarly a fixed labor cost α_2 and a constant marginal labor cost β_2 in the foreign economy. The production of the non-tradable good is of constant marginal cost where I assume for simplicity a unit labor cost per unit produced in both countries.

2.3. Markets clearing and resource constraints

Population size is L and L^* in the home and foreign country respectively. Given the symmetries in the model, each home consumer will consume the same quantity of tradable goods produced domestically, c_1, and quantity of goods produced abroad, c_2. Similarly, each foreign consumer will consume the same quantity of goods produced in the domestic economy c_1^* and the same quantity of tradable goods produced in the foreign economy c_2^*.

The quantity produced of each good should be equal to the sum of individual consumption at home and abroad. For goods produced domestically the constraint is,

$$x_1 = Lc_1 + L^* c_1^* \tag{4}$$

while for goods produced abroad it is,

$$x_2 = Lc_2 + L^* c_2^* \tag{5}$$

Given n the number of goods produced domestically, the labor employed in the tradable sector at home is equal to n multiplied by the labor employed by each producer l_1. The labor employed in the non-tradable sector is simply L times the individual consumption x_0 by construction. Thus, the full employment constraint is written (where I use Eq. (2)),

$$n(\alpha_1 + \beta_1 x_1) + Lx_0 = L \tag{6}$$

and similarly in the foreign country,

$$n^*(\alpha_2 + \beta_2 x_2) + Lx_0^* = L^* \tag{7}$$

There is free entry and exit of firms such that profits are equal to zero in equilibrium.