Answers to questions for An Introduction to Geographical Economics

Chapter 2 Geography and economic theory

Question 2.1*
Assume a trade model with transportation costs but without increasing returns to scale. In fact, think of this model as a neo-classical trade model with transport costs associated with the trade of goods. Discuss the location of economic activity in such a model.

Answer 2.1*
As has been explained in the discussion of neo-classical trade theory in Chapter 2, trade typically results in inter-industry specialization. In the 2x2x2 Factor Abundance model for instance, assuming that differences in factor endowments are not too large and in the absence of trade costs, both countries will produce both goods and an engage in the export of the good for which they have a comparative advantage. When trade costs are introduced the result will be that the degree of specialization will decrease and for very high trade costs there will be no trade at all. For very high trade costs production will only take place to meet home demand. With respect to the location of economic activity this means that as one moves from zero to very high trade costs countries will become less specialized, the importance of trade will drop, and the spatial distribution of economic activity will get more dispersed. In neo-classical trade theory the market structure is one of perfect competition and very high trade or transportation costs could ultimately mean that, if these trade costs would also concern all within-country trade, every producer ends up producing for its own demand only, a situation referred to as backyard capitalism in the literature.

Question 2.2*
See Box 2.2 about the central place theory in a Dutch polder. Why do you think might it be the case that the predictions of the Dutch authorities about the relative size of cities in this polder have not materialized.

Answer 2.2*
One reason might be that the authorities who planned the Dutch polder underestimated the agglomeration forces that brought the larger than expected growth of the central city. Another reason could be that as time went by agriculture became less important (compared to
manufacturing and services), not only in terms of production but also in terms of the share of income spent on agricultural goods. A third possible reason could be that transportation costs between the polder-cities fell considerably in the post-WWII period (think of the increase in the use of automobiles and the like). Of course, we cannot know for sure why the initial predictions about the city-size distribution in the Dutch polder of Box 2.2 proved to be wrong but the aforementioned reasons sound at least plausible and as will be clear after reading chapter 3, these reasons all spring from the core model of Geographical Economics.

**Question 2.3**
We know from Chapter 1 (see Figures 1.2 and 1.3) that economic activity is clearly not distributed randomly across the world. How would you explain this assuming that you can only use the neo-classical trade or growth theory for your answer?

**Answer 2.3**
The non-randomness of the distribution of economic activity across the world (see for instance Figures 1.2 and 1.2 in Chapter 1) can be explained by neo-classical trade theory by referring to so-called “first nature” determinants of the location of economic activity. These first nature determinants are given, they are not man-made, and they consist of things like the climate, the accessibility to rivers and seas, the existence of mountain ranges, and the availability of natural resources. Cross-country differences in the first nature determinants determine each country’s comparative advantage and the international trade patterns. If, due to its physical geography, a country has a comparative advantage in the production of good X, this will imply that the X-industry will be relatively concentrated (in a locational or geographical sense) in this country. Note that a country’s relative endowments of labor and capital are not necessarily part of the fixed endowments because of the possibility that these factors of production can move between countries. In fact, in the core model of Geographical Economics the factors of production (there only labor) are internationally mobile.

**Question 2.4**
Increasing returns to scale are an important topic in Chapter 2 (see Box 2.1). Below are three examples of a production structure. Explain for each example what kind of returns to scale is relevant.
i) assume a firm \(i\) faces the following cost function (which summarizes its production structure): \(l_i = a + \beta x_i\) where \(l_i\) is the amount of labor necessary to produce output \(x_i\) and where \(a\) and \(\beta\) describe respectively the fixed and marginal labor input requirement.

ii) assume an economy has the following production function (see section 2.4), \(Y = AK\). Additional question: is it to be expected that the same degree of returns to scale hold for the individual firm’s \(i\) production function. If not so, how can these two production functions be reconciled

iii) assume the individual firm has the following production function \(y = ak^{0.3}\) with \(a=K\), where \(K\) is the economy-wide capital stock.

Answer 2.4*

The question refers to 3 examples of a production structure (see also Box 2.1):

(i) \(l_i = a + \beta x_i\); this is an example of internal economies of scale, more output \(x_i\) by firm \(i\) implies that relatively less labor is required by this firm. This is due to the fixed cost parameter \(a\). To see this, rewrite the production structure as \(l_i/x_i = a/x_i + \beta\) and it is clear that relatively less labor is needed when \(x_i\) increases due to the decrease of \(a/x_i\).

(ii) \(Y = AK\); This economy-wide production function displays constant returns to scale (CRS). An increase in \(K\) always yields the same amount of additional \(Y\) irrespective of the initial level of \(K\): \(\partial Y / \partial K = A\).

Additional question: on the firm or micro-economic level it is hard to think why CRS should hold because this would mean that a firm can expand its capital stock indefinitely and no matter how large its \(k_i\) has become it will always result in the same amount of additional output. At some level of \(k_i\) decreasing returns to scale will set in. It is one of the main insights of the new growth theory that decreasing returns to scale at the firm level can go along with, here, CRS at the macro-level. Suppose that an increase in \(k_i\) does not only imply an addition to the total stock of capital but also to \(A\), the economy-wide stock of knowledge. The latter may happen because of a positive externality or spillover associated with the increase in \(k_i\). Apart from the fact that more \(k_i\) implies a larger \(K\) it can also be looked upon as adding to the stock of knowledge, for instance because the learning by doing associated with the installment and use of the new machine also benefits other firms. The individual firm does not take this externality into account (hence it takes the stock of knowledge as given) but for the economy as a whole all these individual additions to the capital stock mean that not only \(K\) but also \(A\)
(with $A$ being a positive function of $k_i$) has increased with the result that, given the right choice of parameters, that we can have CRS on the macro-level.

(iii) $y = a k^{0.3}$ and $a = K$; this is an example of pure external economies of scale. Without the addition that $a = K$, hence we should have had $y = k^{0.3}$ the firm’s production function displays decreasing returns to scale w.r.t. $k$. But once we take $a = K$ into account we see that an increase in the macro-economic stock of capital leads an increase in output at the firm level.

**Question 2.5**

Consider the following two quotations from the *Oxford Handbook of Economic Geography*. Explain in each instance how in your view these quotes relate to the location theories discussed in Chapter 2:

i) “So the tradition of international trade theory has sidestepped geographical questions—most modeling imagines a world without transport costs, let alone cities!—while that of geography has sometimes been based on what trade theorists would consider half-worked out models, and often rejected formalism altogether”

ii) “the analytical machinery of microeconomics [plays a strong role] in Krugman’s geography and his work, despite its originality, can perhaps best be seen a continuation of the tradition of (...) regional science. Better yet, we might call it a ‘new’ regional science”

**Answer 2.5**

Quotation (i) is from the contribution by Paul Krugman to the *Oxford Handbook of Economic Geography* (see p.50), quotation (ii) is from the contribution by the geographer Allen J Scott to this book (see p. 23).

Quotation (i) refers to the absence of transport costs in many trade models which forecloses the analysis of the role of location. This criticism not only applies to a large part of neo-classical trade theory but also to the (early) new trade models like Krugman (1979). As we have explained in Chapter 2 it is precisely the introduction of transport costs that sets Krugman (1980) apart from Krugman (1979). Without some kind of trade or transport costs location is simply irrelevant. Geographers have always been aware of the relevance of transport costs but here the criticism by mainstream economists like Krugman is that the location of economic activity is analysed without a “proper” economic model (think of geometric exercises by von Thünen or Christaller) or without any formal model at all (much of modern economic geography). By a proper model Krugman means a full-fledged neo-
classical model where the economic interactions follow from the underlying behavior of individual agents.

Quotation (ii) by the geographer Allen J.Scott recognizes the ingenuity of the attempt by economists like Krugman to give the analysis of location and economic activity a micro-economic foundation but views this attempt basically as an extension of the so called regional science from the 1950s and 1960s (see section 2.2.2). According to this view, which can also be found in for instance Martin (1999), the work by Krugman is subject to the same limitations as the model of the “old” regional science and it fails to take into account that economic geography has moved on since the 1960s, away from the formal approach advocated by the regional scientists towards a more eclectic, institutional approach.

In chapter 11 we will return to the issues raised by Krugman and Scott.