

# Rethinking (New) Economic Geography Models: Taking Geography and History More Seriously

Harry Garretsen\* and Ron Martin\*\*

\*Department of International Economics and Business, Faculty of Economics and Business, University of Groningen, The Netherlands.

Email: [j.h.garretsen@rug.nl](mailto:j.h.garretsen@rug.nl)

\*\*Department of Geography, University of Cambridge, UK.

Email: [rlm1@cam.ac.uk](mailto:rlm1@cam.ac.uk)

Revised Draft – February 2010

Forthcoming in *Spatial Economic Analysis*

Note: This paper originated in a presentation given at the Conference on ‘Developments in Economic Theory and Policy’, Faculty of Economics and Business, University of the Basque Country, Bilbao. 10-11 July, 2008. We would like to thank Steven Brakman and the editor, Bernard Fingleton, for their comments and suggestions.

## 1. Introduction: The Issue

The fundamental question in economic geography is how to explain the riddle of uneven spatial development. For more than half a century geographers have sought to explicate the role that space and location play in economic development, and how the economic landscape changes over time. To this end, they have used various theoretical and methodological frameworks (see Barnes, 2001, and Scott, 2000, for histories of the post-war intellectual evolution of economic geography). From the mid-1950s to the mid-1970s, geographers drew heavily on Löschian and other Germanic location-theoretic ideas, using a range of statistical models and quantitative methods. From the mid-1970s to the late-1980s, this approach gave way to one heavily influenced by Marxist political economy and related methods of historical materialism. Since then, the subject has undergone several shifts in perspective, with institutional economics, economic sociology, cultural theory and most recently evolutionary economics all contributing to what has been a vast outpouring of literature dealing with different aspects of uneven spatial development (comprehensive surveys of the major theoretical and conceptual contributions that have shaped the field of economic geography since the early-1980s can be found in Martin and Sunley, 2007, and Martin, 2009).

In contrast, for a long time mainstream economists tended not to accord much attention to space and geography. This is not to deny that there have been some important exceptions to this general rule. Over the years, a number of prominent heterodox economists - such as Gunnar Myrdal, Nicholas Kaldor and Jane Jacobs, for example - have argued for the recognition of regions and city-regions as key 'building blocks' of the economy. And urban economics and regional economics have long been active subfields of academic enquiry in their own right. But these various endeavours remained on the margins of, and had negligible impact on, the mainstream economics canon. Over the past two decades, however, this neglect of geography in economics has begun to be remedied. Stimulated by the formative excursions by Krugman (1991a and 1991b) and first synthesized in Fujita, Krugman and Venables (1999), a whole new subfield of economics has developed, now widely referred to as the 'new economic geography' (hereafter NEG) or geographical economics, which is explicitly concerned with understanding uneven spatial economic development, and particularly the phenomenon of spatial agglomeration of economic activity.<sup>1</sup>

---

<sup>1</sup> Although this subfield is now two decades old, it continues to be known as the 'new' economic geography. However, it is difficult to see how the prefix 'new' can be dropped without causing

Since Krugman's initial NEG contributions, the field has expanded apace, with numerous articles and several key texts on the topic (for example, Brakman, Garretsen and Van Marrewijk, 2001, 2009; Fujita and Thisse, 2002; Baldwin, et al, 2003; Combes, Mayer and Thisse, 2008), such that NEG represents what is arguably the most sustained and systematic recognition of the importance of location and geography by mainstream economics to date.<sup>2</sup>

Unfortunately, economic geographers have not on the whole been very impressed by this discovery of geography and space by mainstream economics (for example, Hoare, 1992; Johnston, 1992; Martin and Sunley, 1996; Dymski, 1996; Boddy, 1999; Martin, 1999; Scott, 2004; Martin, 2010). Their criticisms have been directed at what they regard as several shortcomings and limitations of the NEG approach. For one thing, they have questioned whether the formal economic models that are the focus of attention within NEG can adequately capture the full range of factors and forces that help shape the economic landscape, particularly since some of these factors are social, institutional and cultural in nature, and cannot be readily or adequately expressed in mathematical form (a point acknowledged early on by Krugman himself, who argued that such 'messy' factors were the province of sociologists: see Krugman, 1995). For another, they are doubtful whether models based on the highly simplified assumptions that underpin the NEG models, for example relating to economic structure, consumer and firm behaviour, competition, and transport costs, can provide credible representations of the real world they are meant to explain. Upon closer inspection, this line of criticism is not primarily a critique of NEG as such, but of mainstream economics (that is neoclassical and general equilibrium economics) as a whole.

For our present purposes it is important that two further aspects of NEG models are also often singled out for criticism: the treatment of geography – space and place - on the one hand, and of history or, more generally time, on the other. For geographers, the conceptualization of space - and of spatial entities such as regions - is itself problematic and part of the conundrum to be theorised, whereas in NEG models the representation of the economic landscape is typically pre-given, fixed and highly idealized in the form of an abstract geometric space.

---

confusion with the long-standing discipline of economic geography. A better epithet, perhaps, would have been 'geographical economics' (the title preferred by Brakman, Garretsen and Marrewijk, 2001, 2009)

<sup>2</sup> The award of the Nobel Prize in Economics to Paul Krugman on October 13<sup>th</sup> 2008, made in part in recognition of his contributions to the 'analysis of the location of economic activity', will no doubt reinforce the standing of NEG within mainstream economics. For an extensive summary of Krugman's work on trade and geography for which he was awarded the Nobel Prize, see Brakman and Garretsen (2009) in this journal, Fujita and Thisse (2009) or Behrens and Robert-Nicoud (2009).

Similarly, geographers argue that the notion of history or time in NEG is likewise highly circumscribed, that because the focus is on equilibrium outcomes and stable states the models operate with a ‘logical’ concept of time (the movement to equilibrium in a model’s solution space) rather than with real time, or history (Martin, 1999; Boschma and Frenken, 2006)). Even if one believed that real-world regional and urban systems tend towards equilibrium states and configurations, NEG models, geographers argue, tell us nothing about the time taken to achieve such states, nor about the actual adjustment and evolutionary paths which real-world economic landscapes follow. As August Lösch, one of the founding fathers of location theory, wrote seventy years ago: “If everything occurred at the same time, there would be no *development*. If everything existed in the same place, there would be no *particularity*. Only space makes possible the particular, which then unfolds in time” (1939, 1954, p. 508; original emphasis). Geography and history, in other words, are key to understanding the economic process. The charge from economic geographers is that NEG models, by their very nature, embody crude conceptions of geography and history. The same charge could be mounted against other branches of economics used in regional and urban studies, such as neoclassical models of regional convergence, Kaldorian models of regional cumulative causation, and even urban economics. It is not our intention to examine these other fields here, however; our focus is on NEG and its relationship with what we might call ‘proper economic geography’ (or PEG), that is the body of theory and empirics that economic geographers have developed over the past half century (for an overview of this intellectual journey, see Scott, 2000; Martin and Sunley, 2007, Martin, 2009).

For their own part, NEG researchers generally have not been very interested in either the critique mounted by economic geographers or with the more recent work in economic geography to explain uneven regional development and the part played by geography and history in that explanation (Krugman, 1995, 1998; Overman 2004, Scott, 2006). The bulk of economic geography, with its focus on cultural, social and institutional accounts, and its discursive mode of argumentation, is cast aside by NEG theorists precisely because of its *neglect* of formal modelling (and hypothesis testing). At the same time, what could partly be seen to be economic geography’s modelling answer to NEG, the so-called ‘evolutionary economic geography’ (EEG) approach (Boschma and Frenken, 2006, and Boschma and Martin, 2007) is still very much in its infancy. It seems fair to say that whereas economic geographers have reacted strongly to the arrival

of NEG, subsequent developments in economic geography have (so far) not provoked much of a response by (geographical) economists.<sup>3</sup>

While a few scholars have sought to downplay the differences between NEG and what we might call ‘proper’ economic geography, or PEG, (for example, Sjöberg and Sjöholm, 2002; Marchioni, 2004; Duranton and Storper, 2006), in general constructive discussion has by and large been a non-event, with PEG followers typically dismissing NEG as irrelevant, and NEG theorists viewing PEG as non-scientific. Serious discussion of each other’s work has been extremely thin on the ground, and most contributions to the debate read like a case of a ‘dialogue of the deaf’ (Martin, 1999) or of ‘two disciplines ignoring each other’ (Duranton and Rodriguez Pose, 2005).

Certainly there has been little useful exchange around the different conceptions of ‘geography’ and ‘history’ deployed in NEG and PEG. This lack of exchange is rather unfortunate because it is our contention that any useful explanation of the observed real (uneven) economic landscape has to be grounded upon an analysis, however stylized or case-specific, where geography and history are key determinants. Our aim in this paper is to begin to redress this omission by stating what is at stake. In doing so, we take both NEG and PEG seriously. In our view both ‘sides’ stand to gain from an exchange of views, for the treatment of geography and history is problematic not only in NEG but also PEG. Economic geography at large, be it of the NEG, PEG, EEG or whatever EG-flavour, still falls short in taking up the aforementioned challenge put forward by Lösch (1939, 1954). To date, economic geography still lacks a convincing answer to the age-old question how geography and history can account for both the stability of as well as the changes in (uneven) spatial economic outcomes over time. Despite the coming of age of NEG (as exemplified by Krugman’s Nobel Prize in 2008) and the latest round of theoretical developments in PEG, such as the recent emergence of EEG literature, we are still looking for a framework where the role of geography and history is less restricted than it is in prevailing theories of economic geography. Our paper is not a survey of the literature, nor do we present new theoretical results. Instead, we will try to offer some constructive internal and external criticism of the handling of geography (space-place) and history (time and evolution) in economic geography. By internal criticism, we refer to the options available to enlarge the role of geography and history within a particular framework. By external criticism, we step outside such a framework and ask what the requirements of a ‘truly’ dynamic and place-specific analysis would be. As to

---

<sup>3</sup> While it is still early days, one reason that EEG has had little impact on NEG might be the fact that Krugman himself (Krugman, 1996a) contentiously does not see a fundamental difference between evolutionary economics and mainstream economics.

the latter, we look for inspiration outside the realm of existing economic geography theories. From a methodological stance, our paper is a plea for methodological pluralism. Even though we will focus somewhat more on the handling of geography and history in NEG and the corresponding critique by PEG or EEG, we do also point out that the treatment of geography and history is certainly not without its problems in PEG or EEG. The title of our paper reflects this balanced view: by putting the N from NEG between brackets we want to bring out that in the end economic geography at large still struggles with the analysis of geography and history.

The remainder of the paper is organized as follows. We start by identifying precisely how geography and history are treated in the basic or core NEG model (Section 2), and then enquire whether and how far recent developments in NEG have improved on the basic model in this regard, and how the representation of geography and history might be taken further (Section 3). This discussion in turn raises issues as to how PEG addresses these two key determinants of the uneven spatial development. As with NEG, here too we argue that the treatment of geography (Section 4) and history (Section 5) is rather rudimentary and incomplete. Following Sugden (2000), we then continue by sketching possible alternative approaches to tackle the role of geography or history in NEG but also in economic geography at large (Section 6). In concluding our paper (Section 7), we call for a greater role of geography and history in existing location theories. In a nutshell, our paper is a call to arms to all researchers in economic geography, irrespective to whatever f(r)action they belong, to try to take geography and history more seriously

Finally, coming as we do from the two ‘opposing camps’ – Garretsen from NEG and Martin from PEG – and having each contributed to our respective sides of the PEG-NEG debate, (see Martin, 1999, 2010a,b, 2009, Martin and Sunley, 1996; Brakman and Garretsen, 2003, Brakman, Garretsen and Van Marrewijk, 2009), our hope is that our collaboration in this paper (like that of Storper and Venables, 2004, and Duranton and Rodriguez Pose, 2006) illustrates that scope exists for each version of economic geography to at least inform the other (more mutual understanding would be nice but for the time being we would settle for more knowledgeable/better informed disagreement).

## **2. ‘Geography’ and ‘History’ in the Basic NEG Model**

### *2.1 The novelty of the basic NEG model by Krugman (1991)*

A standard critique of the general equilibrium framework that underlies mainstream economics is that it is both aspatial and ahistorical. The neglect of the

role of history (or, more generally, of time) comes to the fore in this framework through its focus on unique equilibria in a world where neither initial conditions nor adjustment paths matter.<sup>4</sup> Further, geography is irrelevant since space is assumed to be frictionless and the behaviour of households and firms to be identical everywhere and anywhere. The economy, in other words, is assumed to exist on the head of the proverbial pin, and to adjust instantaneously towards its unique equilibrium state. This neglect of geography and history (or time) in the general equilibrium setting raises serious questions concerning the relevance and applicability of this framework. For example, the standard general equilibrium model will not work if we want geography or space to matter. As Starrett (1978) showed, the existence of positive transportation or trade costs between locations will result in an equilibrium where no transportation or trade of goods will take place (see also Fujita and Thisse, 2002). Each location will prefer autarky to save on transportation costs and if every economic activity is perfectly (and costlessly) divisible across space, autarky or ‘backyard capitalism’ with self-producing consumers/workers is the only model outcome. This result runs, of course, counter to the most basic empirical facts: the world of the aspatial and ahistorical general equilibrium model bears little resemblance to the real world around us. As Duranton (2008) concludes “if one takes transport costs as an unavoidable fact of life, one must assume either some non-homogeneity of space or some non-convexity of production sets”.

One solution to the neglect of space is that traditionally adopted in international economics. In what is still a workhorse model of international trade theory, the Heckscher-Ohlin model, where international trade is driven by cross-country differences in relative factor endowments, these differences in endowments (climate, natural resources, etc) can be seen as the result of the non-homogeneity of physical geography (‘first nature’ differences). Theorizing in urban and regional economics takes an alternative route by assuming that economic activities are not perfectly and costlessly divisible across space. Some time ago, Koopmans (1957) noted that without some form of indivisibility, actual location patterns can simply not be understood. In modern urban and regional economics it is usually the introduction of some form of increasing returns that performs this role. Fujita and Thisse (2002, Chapter 4) even refer to the relationship between increasing returns and transport costs as the ‘fundamental trade-off for a spatial economy’.<sup>5</sup> With increasing returns but without transport

---

<sup>4</sup> There is a long-standing debate about equilibrium versus history in economic models. Landmark critiques of mainstream economics’ preoccupation with equilibrium include Kaldor (1972) and Robinson (1978). More recent contributions include Setterfield (1997), and Harris (2004).

<sup>5</sup> See also chapter 2 in Combes, Mayer and Thisse (2008) for a very good summary.

costs, firms may find it profitable to produce at a single plant but they do not care where that plant is located. On the other hand, in the absence of increasing returns or, as in standard international trade theory, with non-homogenous space but positive transport costs, we end up in a situation of backyard capitalism.

The novelty of Krugman's (1991a, 1991b) foundational NEG model is that it combined transport costs, increasing returns to scale, and imperfect competition in a general equilibrium framework in which the location of both supply and demand was endogenised. Actually, Krugman's 1991 model is literally just one step removed from the standard model of intra-industry trade, as developed by Krugman (1980) himself (we return to this similarity in Section 3). In his 1980 model, in a setting of monopolistic competition and market sizes that differ across countries, intra-industry trade is the result of the interplay between increasing returns to scale and transport costs. The crucial difference between the new trade model by Krugman (1980) and the NEG model by Krugman (1991a, 1991b) is that in the latter (manufacturing) workers are mobile between regions whereas they are not in the former. This inclusion of inter-regional labour mobility in an otherwise well-established mainstream model of international trade implies that the demand for goods stemming from each region becomes endogenous, since it depends on the location decisions of workers. But the location decisions of workers in turn depend on the location decisions of firms and it is the endogeneity and interdependency of both the location of supply and demand in a general equilibrium framework that sets Krugman (1991a, 1991b) apart from Krugman (1980), and more generally from all other pre-existing theories of location or geography in mainstream economics (Brakman and Garretsen, 2009 and Fujita and Thisse, 2009).<sup>6</sup> This endogeneity of supply *and* demand enabled Krugman (1995) to claim that his model gives an analytical underpinning for a process of cumulative causation in a multi-location setting. The endogenization of the demand for (manufactured) goods or, in other words, of the endogenization of the size of the market, is thus the key difference between the 'new trade model' of Krugman (1980) and the 'new economic geography' of Krugman (1991a,b) (see Brakman and Garretsen, 2009, for an in-depth discussion and comparison of both models).

---

<sup>6</sup> This point can be exaggerated, however, for certain general equilibrium models of the economic landscape can be found in regional science, and even in Lösch who arguably was the first to attempt to present a full general equilibrium system describing in abstract the interrelationship of all locations.

## 2.2 *Geography and history in the basic NEG model*

The well-known basic NEG model has become the foundation for a whole family of NEG models (see for example, Baldwin et al, 2003). How does this model treat geography and history? In terms of its spatial set-up, the basic NEG model assumes a hypothetical two-region economy, where the ‘regions’ can be of any geographical scale: whole countries (global ‘north and south’), regions of a country, cities or even inner and outer divisions of a city. For all intents and purposes, they are just two points at the opposite ends of a straight line.

The main assumptions of the core NEG model are summarised in Table 1. Given these assumptions, how does the equilibrium spatial allocation of economic activity come about, that is, how does *economic geography* come about in the NEG world of Krugman? The answer is that the ‘tug of war’ between a (fixed) set of agglomeration and spreading forces determines whether the outcome is a ‘core-periphery’ pattern (with all mobile workers in one or the other of the two regions) or an evenly spread (symmetric) economic landscape. A few key model parameters (notably, the level of transport costs) determine whether the agglomeration or the spreading forces will get the upper hand. There are two agglomeration forces: the market size effect and the cost of living effect. The market size effect indicates that in the two-region setting, firms find it advantageous to locate in the region with more workers, where they can sell their product at no transport costs to the local customers; whereas the cost of living effect indicates that mobile workers want to locate in the region with more firms because of a lower cost of living there (they do not have to import manufactures for which they have to pay transport costs). The spreading force has to do with a competition effect. In the agglomeration or core region, the presence of more firms means more competition and hence lower prices, which provides an impetus for firms to move to the peripheral region.<sup>7</sup> When transport costs become low enough, the agglomeration forces are stronger than the spreading force, and for low enough transport costs the advantage of relocating to the periphery becomes so small that only full agglomeration turns out to be an equilibrium.

Thus the basic model starts with a very simple idealised, pre-given and fixed, spatial geometry of two regions or locations and generates an equilibrium

---

<sup>7</sup> In some versions of the basic model, congestion costs are also assumed to act as a dispersal force.

spatial distribution of workers between them as a result of the intersection of opposing agglomeration and dispersion forces, and depending on the initial conditions (initial distribution of footloose workers, transports costs, etc) chosen (see Figure 1, the so-called ‘Tomahawk’ figure in NEG). In this two-region model the transport cost parameter is the embodiment of geography. Without transport costs there is no role for geography. In an abstract two-region setting, the distance between the hypothetical regions is normalized to one, and ‘geography’ is therefore only captured by the parameter  $T$  that represents the transport technology (assumed to be of the iceberg type). In Figure 1 the horizontal axis depicts the level of transport costs  $T$ , increasing from left to right along this axis. The vertical axis shows the share of footloose workers in region 1,  $\lambda_1$ , which is the measure of the degree of agglomeration.

**Table 1: Key Assumptions of the Basic NEG Model**

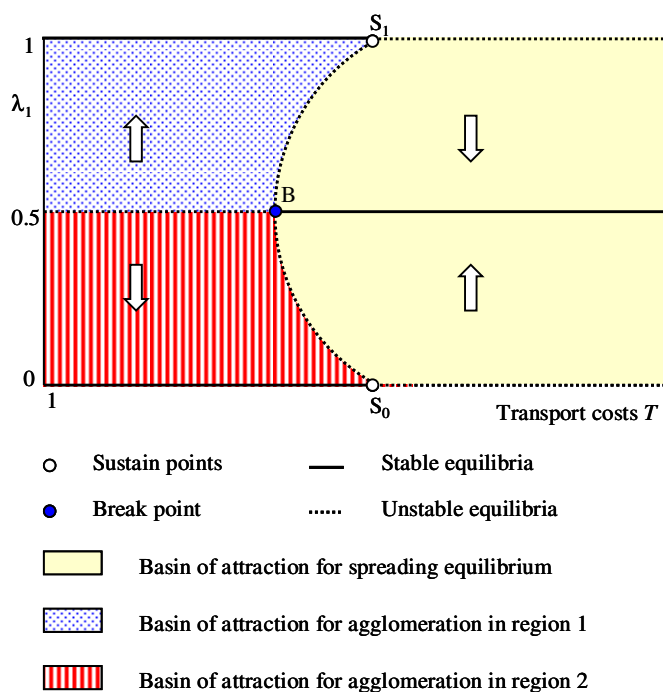
<b>Consumption</b>	Consumers assumed to have preference for variety of goods, and to maximize their utility according to a constant elasticity of substitution (CES) function defined over all such varieties. Consumer preferences assumed identical across space.
<b>Producers</b>	Assumed to be atomistic, single plant profit maximising firms, with each plant producing only one (unique) good, and that production with a single plant is cheaper than with multiple plants. Firms are assumed to move to be near markets (demand).
<b>Workers</b>	Labour markets assumed to clear instantaneously. Workers assumed to move between locations (regions) in response to spatial differences in real wages.
<b>Market structure</b>	Two sector economy: competitive traditional (agricultural) sector, and manufacturing sector characterised by imperfect competition assumed to be of the Dixit-Stiglitz monopolistic type, with economies of scale both internal (fixed costs in production) and external (pecuniary or market size externalities) to manufacturing firms.
<b>Trade (transport) costs</b>	Assumed to be of ‘ice-berg’ type. Indicates a preference for location in regions with large market access.
<b>Geographical Space</b>	Assumes economic space consists of two hypothetical locations or regions, of equal size or extent. These regions can be of any scale – countries, regions of a country, cities, inner and outer areas of a city.

**Source:** Martin (2010a). For extended definitions and discussion of these assumptions see, for example, Fujita, Krugman and Venables (1999), Baldwin et al (2003), and Robert-Nicoud (2005).

In what sense can history be said to enter this framework? For one thing, NEG theorists argue that since the initial conditions shape the equilibrium outcome that is achieved, ‘history matters’ even in this simple model. More precisely, we have multiple (stable) equilibria, and which of these is the outcome depends on the initial conditions in terms of the original spatial allocation of the

footloose workers across the two regions. Note, however, that given the parameter settings chosen, the number and nature of the equilibria are *fixed and pre-determined*. It is further argued that this basic two-region model world also displays ‘path dependence’. For any value of transport costs that lies between the values associated with  $S_0$  or  $B$  in Figure 1, both spreading ( $\lambda_1=0.5$ ) and agglomeration ( $\lambda_1=1$  or  $\lambda_1=0$ ) can be an equilibrium outcome depending on the ‘path’ followed to reach this value of  $T$ . Again, note that only two (stable) equilibria are possible (perfect spreading or full agglomeration) and they are known beforehand. So NEG models claim to incorporate ‘history’ in the sense that the initial conditions matter and that changes in transport costs will set off adjustment paths that depend on where the system started originally.<sup>8</sup>

**Figure 1: ‘Geography’ and ‘History’ in the Core-Periphery NEG Model**



Source: Brakman, Garretsen and van Marrewijk, 2009, ch.4.

<sup>8</sup> The role of history in NEG models refers, of course, to the relevance of the past for the (present) spatial equilibria. In NEG models the relevance of (expected) future events for present spatial equilibria receives less attention, but see Baldwin (1999) or Ottaviano (1999) for important exceptions.

### 3. Reconsidering the Role of Geography and History in NEG

#### 3.1 *The Need to Reconsider Geography and History Within NEG*

The seminal Krugman NEG model, as developed in Krugman (1991a) and summarized by Figure 1 above, was quickly criticized and then extended from within NEG itself. The extensions concern NEG theory as well as empirics. Our main concern is whether these subsequent developments lead to a different view on the role of geography and history in NEG models.

To understand subsequent theoretical developments in NEG take again a look at Figure 1. A first issue is that the model has a bias towards full agglomeration. Once transport costs get low enough, the inevitable outcome will be full agglomeration in either region 1 or 2. NEG theory following Krugman (1991a) can therefore partly be seen as an attempt to come up with a more balanced *menu* of agglomeration and spreading forces. Models that include congestion or non-tradables like housing as additional spreading forces, introduce additional inputs (intermediate goods, capital), or toy with the assumption of interregional labour mobility, are essentially all motivated by the perceived need to move away from the agglomeration bias in the basic NEG model.<sup>9</sup>

A second line of development starts from the observation that the first generation of NEG models relied heavily on rather specific modeling assumptions or tricks (e.g. the Dixit-Stiglitz model of monopolistic competition as well as on numerical simulations, recall Table 1). By allowing for alternative utility and demand functions (Ottaviano, Tabuchi and Thisse 2002) and also by simplifying the production structure (Forslid and Ottaviano, 2003), the second generation of NEG models were analytically easier to handle and became analytically solvable. The third avenue along which NEG theory developed was through the merger of NEG models with growth theory. By incorporating insight from the endogenous growth theory, it turned out to be possible to come up with NEG growth models (see Baldwin and Martin, 2004). A final line of theoretical progress concerns the realization that the ‘one size fits all’ approach of the initial NEG models had to be altered. Spatial scale matters, and hence we saw the development of NEG inspired models that were more specifically aimed at a specific level of geographical aggregation (see Combes et al, 2008 or Brakman et al, 2009 for a discussion of these main theoretical extensions).

The bottom line with respect to these subsequent theoretical developments, however, is that despite qualitatively different and arguably also more realistic results, these more recent NEG models essentially do *not* offer a different or more

---

<sup>9</sup> See chapter 4 of Brakman, Garretsen and van Marrewijk (2009) for a discussion of the various NEG models that build on Krugman (1991a).

substantive analysis when it comes to the role of geography or history. In this respect, Figure 1 also aptly summarizes the depiction of geography and history in these more recent NEG models. It is only when we come to NEG empirics that a different story emerges in the sense that the depiction of geography in terms merely of a transport cost parameter  $T$ , and the depiction of history as initial conditions determining equilibria selection, are found to be too restrictive.

Take first the NEG stance on *geography*. In the two-region model of Krugman (1991a), the transport cost parameter  $T$  stands for the iceberg transport technology according to which goods ‘melt away’ during transport, and  $T$  measures how many goods have to be shipped for one good to arrive in the other region. The distance (in kilometres or otherwise) between the two regions does not play a part in the model and it does not have to in the sense that all transactions between regions 1 and 2 are direct and there is only one way or route in which the two regions can interact (Behrens and Thisse, 2007). The depiction of transport costs via an (exponential) iceberg transport cost function is itself already far from innocent (Fingleton, 2005b, McCann, 2005, Fingleton and McCann, 2007). But our concern here is that the analytical tractability of the NEG models crucially hinges on the fact that they are based on two-region models. With many regions, analytical tractability is no longer possible because the many indirect ways that regions interact imply that the convenient symmetry of transport costs and hence of geography no longer holds. From an empirical point of view this neglect of a more realistic geography is even more problematic (Brakman, Garretsen and Schramm, 2006). For one thing, there is the misguided temptation to apply theoretical insights that apply only to a hypothetical two-region setting (like the derivation and positioning of the break point  $B$  and sustain point  $S$  in the Tomahawk of Figure 1) to a real world setting of many regions: “it is far from being clear that we can extrapolate the predictions and results derived from two-region models to a multi-regional system. Quite the opposite: the answer is probably no, although this is not really recognized by the profession” (Behrens and Thisse, 2007, p. 461, see also Behrens and Robert-Nicoud, 2009).<sup>10</sup> For example, if one applies an NEG model to the EU regions, the depiction of geographical space *inevitably* has to take account of the fact that it cannot be adequately represented in terms of just (iceberg) transport costs, and is more

---

<sup>10</sup> The break point  $B$  in Figure 1 is associated with the level of transport costs where the spreading equilibrium switches from stable to unstable (moving from right to left along the horizontal axis). The sustain points  $S_0$  and  $S_1$  refer to the level of transport costs at which full agglomeration is no longer sustainable (moving from left to right along the horizontal axis).

complex than the simple straight line or ‘race-track’ geometries used in NEG theory to represent geography.<sup>11</sup>

A similar conclusion as to the limited usefulness of the basic NEG models arises with respect to the role of *history*. In Figure 1, ‘history’ is simply a set of *pre-determined* destinies (equilibrium states) where which one is selected is determined by the model’s initial conditions (in Figure 1, a region’s share of mobile manufacturing workers). Not only is the set of possible equilibrium economic landscapes *pre-given* (by the structure and assumptions of the model), so also is the (unique) path that leads that spatial distribution of economic activity from the initial situation to its corresponding (stable) long-run equilibrium configuration. Attention within the NEG literature has focused not on whether this representation of ‘history’ is ontologically meaningful, but rather on empirically testing for the stability of equilibria in response to ‘historic’ shocks. These studies can be roughly grouped into two categories: studies that analyse whether or not the initial (‘equilibrium’) urban or regional distribution of economic activity is stable (that is, whether the system return to its ‘pre-shock’ situation) and those studies that test for the existence of multiple equilibria and hysteresis effects (that is, whether the system moves to a new ‘equilibrium’ spatial configuration following a shock). The kind of shocks that have been used to explore these ideas include the allied bombing of Japan and Germany during WWII, the bubonic plague in medieval Italy, the US bombing of Vietnam, and the post-WWII division and reunification of Germany.

Here, we are not concerned with the precise details of these NEG studies on the impact of historical shocks.<sup>12</sup> The point we want to emphasize with respect to history is that there is an important parallel with the need to take geography more seriously within NEG. In a similar vein as with the case of geography, the ‘shock’ studies take history more seriously than the NEG models do. In Figure 1 history is the reduced to a given number of multiple long-run equilibria and the pre-determined path that will guide any initial allocation of workers to its long-run equilibrium. The change is coming from an exogenous shock, and the stability (equilibria) and the change (shock) are two separate phenomena. The PEG criticism of the treatment of history in NEG centres around these issues (see for example, Dymski, 1998; Martin 1999, and Section 4 below). The empirical NEG

---

<sup>11</sup> For an introduction to multi-region NEG simulations based on real data (and estimations), see Combes et al (2008). For an application to the case of EU regions see Bosker et al (2007a).

<sup>12</sup> See Redding (2009) on the crucial importance of these types of shock or ‘natural experiment’ studies for NEG research, and see Brakman et al (2009, chapter 6) for an introduction. Fowler (2007) provides an interesting modeling example that shows how the core NEG model (as discussed in section 2) may give rise to rather different spatial outcomes once the out of equilibrium behavior is allowed for.

research on the history of shocks already goes some way of addressing these concerns. For one thing, these studies include far more institutional, case-specific and historical details than the basic NEG model as depicted by Figure 1. To take the case of the effect of allied bombing of German cities in World War II on their post-war development (see Brakman et al, 2004, Bosker et al, 2007b), information on the East-West post-war division of the country, on government (rebuilding) policies, the impact of other shocks to city-sizes, and the flow of post-war refugees, all enter the equation. In section 6 we will argue that in dealing with the role of geography and history, one way forward for economic geography at large, including NEG, is to pay more attention to the actual history of economic landscapes.

### *3.2 What's Next? Two Options Within NEG*

One reaction to the statement that the treatment of geography and history is (overly) simplistic in NEG models is to reject any model that argues that the role of geography and history can be usefully summed up by anything resembling Figure 1. As we made clear in the introduction of our paper, this is the standard reaction to NEG by most (proper) economic geographers. We return to this line of argument in Section 4. But since we do not think that there is a single approach (yet) with a convincing and all-encompassing analysis of the role of geography and history, we think that internal criticism is useful as well. Given that the confrontation of the standard NEG models with the real world makes clear that geography and history cannot be modeled merely by a transport cost parameter or a pre-given set of adjustment paths to a fixed set of multiple equilibria respectively, the question becomes whether and how NEG will take up this challenge. Basically, two answers or strategies can be discerned from recent NEG research. The first strategy is to ignore the challenge either by sticking to the well-known 2 region setting of Krugman (1991a) or by even retracting to pre-NEG models like the Krugman (1980) trade model. The second strategy is to try to expand the NEG analysis by incorporating a more substantive role for geography and history.

Since analytical results are basically only available in NEG for the case of 2 or a very few regions, it is tempting to stick to this set-up if one wants to use solvable models to analyse the impact of (policy) induced shocks on the spatial equilibrium allocation of economic activity. It is inter alia for this reason that NEG models that are after the policy implications of NEG prefer the 2 region model (see for instance Baldwin et al, 2003). The downside of this strategy is thus

that one is still basically stuck with the depiction of geography and history as discussed in section 3.1 and summarized by Figure 1.

Even less productive is the strategy to actually further *diminish* the role of geography and history. Many recent NEG studies (implicitly) do so by analysing and testing NEG models for a *given* spatial distribution of economic activity. A key example of this strategy are the numerous market access studies that try to assess whether regions with a good market access, that is regions that are part of or nearby to well-developed markets for final goods or intermediate inputs, pay higher wages or have a higher per capita income. At closer inspection (see for instance Head and Mayer, 2006 or Brakman and Garretsen, 2009), the market access studies are a variation on the well-know *home market effect* of Krugman (1980) according to which regions with a relatively large demand are home to disproportionate share of the production.<sup>13</sup>

As witnessed by the surveys of NEG empirics (see Head and Mayer, 2004 or Redding, 2009) as well as by recent policy applications of NEG, like the *World Development Report 2009* by the World Bank (2008), at present NEG is often almost synonymous with market access. Much like the “old style” market potential studies from economic geography (Harris, 1954), the problem with this is that it typically takes as given what has to be explained: the spatial allocation of the market access. By effectively backtracking to Krugman (1980), this (dominant) line of NEG research throws out whatever notion of history is present in Krugman (1991a,b). By sticking to a given spatial distribution or, in other words, a pre-fixed economic geography, any question as to how initial conditions and hence history determine spatial outcomes has become irrelevant. In terms of Figure 1, in a Krugman (1980) version of NEG the economy is indefinitely stuck at 1 point of the Tomahawk figure for any given value of T. Any notion of multiple equilibria and path-dependence, however abstract or simple, is then completely out of the window.<sup>14</sup>

---

<sup>13</sup> The market access effect where wages fall the further one moves away from economic centers already is effectively incorporated into the Krugman (1980) model when perfectly elastic labour supply is replaced by an imperfectly elastic labour supply is assumed, see Head and Mayer (2006), Brakman and Garretsen (2009). With the latter, a relatively large demand in a region will at last partly show up in higher wages

<sup>14</sup> Instead of retracting to Krugman (1980), a more useful strategy would be to take Krugman (1996b) as an example. Here, Krugman explicitly tries to go beyond his 1991 model when it comes to the role of geography and history, for instance by turning to models of punctuated equilibrium (see also section 6). But also in the punctuated equilibrium story “the basic sources of change are left unexplained- just as the sources of growth are left unexplained in the ‘growth and trade’ literature. In an ugly, but rather useful piece of jargon, we can say that the dynamics are extrinsic rather than intrinsic. What would constitute a case of intrinsic, self-organizing dynamics? For that we need a model in which the economy organizes itself in time rather than (or as well as) in space” (Krugman 1996b, p. 59).

This leaves the question how to expand NEG by incorporating a more substantive role for geography and history which leads us to the second option for the future of NEG. As to the way forward, key words are in our view: *scale specificity*, *multi-regions*, *asymmetric geographies*, *model simulations* and *empirical research*. Invariably, this means moving away from the “one size fits all” approach of the core NEG model. Multi-region NEG models must be developed for the problem at hand and instead of falling back on analytical results in a simple 2 region setting, model simulations have to be used (again). This is essentially a call for multi-region NEG models that are far more flexible than the Krugman (1991) model or its more recent theoretical equivalents discussed in the previous sub-section (Behrens and Thisse, 2007, p. 463). Such a way forward for NEG is also in line with suggestions made by prominent NEG researchers like Fujita and Krugman (2004), p.158, Krugman (1998), p.15, Behrens and Robert-Nicoud (2009), p. 17-18, or Fujita and Mori (2005) and it is useful to quote the latter paper at some length because it adequately sums up what is at stake:

While it will continue to be important to pursue building analytically solvable models regarding the basic mechanism of agglomeration and dispersion, it will become even more important to build numerically computable models. After all, there is great need to finally go beyond the basic two-region-two-industry models and go to asymmetric many-region-many-industry models of trade and geography in order to attain practically useful policy implications. Most models with emphasis on the analytical solvability are solvable only in a very limited low dimensional setup, but they are often not computable numerically (at least not in a reasonable amount of time) once more spatial and industrial structure is incorporated. A most desirable model would be one that has solvability at the low dimensional setup and computability even at the fairly high dimensional setup (Fujita and Mori, 2005, p.396).

The above citation points to a wish list for future NEG research. From an empirical point of view we know that, in NEG jargon, the relevance of agglomeration or spreading forces may work out differently at different *spatial scales* (Fingleton, 2005, 2006). The challenge for NEG theory is therefore to come up with models that are more case or scale specific. As argued above, once one starts to look at the case of *multi-regions* and acknowledges that in the case of many regions the assumption of equidistant regions is no longer harmless as in the 2 region model, the real challenge is to see if any of the NEG predictions surrounding Figure 1 carry over to this more realistic setting. The issue is far from trivial. The aforementioned home market effect, a true cornerstone of NEG, easily ceases to exist in a world of many regions. With no analytical results to fall back on, simulations have to be used in this case (for the NEG attempts see Combes et

al, 2008, chapter 13). Unfortunately, as is also acknowledged by Behrens and Robert-Nicoud (2009, p. 18), NEG has not made much progress since Krugman (1991) in developing or using (new) simulation methods.

A final item on the wish list for future NEG research is the need for (more) theoretically grounded empirical research. In early reviews of NEG, see Krugman (1998a) or Neary (2001), the lack of an empirical validation of the NEG models was seen as a major shortcoming. Nowadays, there is a considerable amount of empirical research that seems to back up the main implications of for instance the model underlying Figure 1 (see Head and Mayer (2004) and Brakman et al (2009, ch. 5) for surveys). The difficulty posed by this research is that competing theories often are very similar, are incomplete explanations without additional covariates, and are non-nested, all of which calls for carefully structured methods of analysis (Fingleton, 2005a, 2006, 2008, Fingleton and Fischer, 2010). Obviously, better use of (micro) data and (spatial) econometric techniques would strengthen the empirical research, but the real challenge is to come up with empirical analyses and testable hypotheses that allow one to separate the different sources of agglomeration and differentiate better between competing explanations, Redding (2009, pp. 9-10). Our main concern here is thus not with the NEG empirics as such, but with the need for better NEG models.

The items on the above wish list for NEG research have as their common denominator that future NEG models should be more informed by the causes and consequences of spatial economic outcomes in the real world. In fact, and following Sugden (2000), we will argue in section 6 that when set against the real world NEG models should focus more on the description of construction of credible counterfactual worlds. Credibility concerns a process of inductive inference whereby the causal processes described in the NEG model are thought to be processes that could go in the real world.

After this brief discussion of the very basics of NEG models in sections 2 and 3, we now turn to a discussion of the role of geography and history in proper economic geography (PEG). As will become clear from sections 4 and 5, the PEG take on geography and history is quite different from that in NEG (and that's an understatement), but just like with NEG here too we will argue that the analysis of geography and history has its own problems and limitations. In that respect, see also section 1.2, the NEG and PEG views on geography and history represent two opposite polar positions. In our view, in both cases taking geography and history more seriously would imply that these polar positions have somehow to be abandoned. In this sense, taking geography and history more seriously is a challenge for economic geography at large.

## **4. Problematizing Space and Regions in NEG: Learning from Proper Economic Geography (PEG)?**

### *4.1 Regions and Space in Economic Geography*

If economic geographers have been critical of the notions of space, location and region deployed in NEG models, what precisely is the basis of that critique, and what can NEG theorists learn from proper economic geography (PEG) in this regard? In their interesting attempt to clarify the space-time premises and outcomes of different types of economic theory, Corpataux and Crevoisier (2007) suggest that the approach taken by Krugman (NEG) type models can be summarized and criticized in terms of four key, inter-related, issues.

First, they suggest, in NEG models both space and time are exogenous. That is to say, space and time act as independent, neutral containers that are external to, and have no influence over, economic activities. In the other direction, economic activities have no influence over spatial forms, since geographical space is itself exogenous. In the models, the point representing a 'region' remains a point even if the region's economy grows. Second, space is pre-given and it does not change. The geometries used in NEG models - the abstract points used to represent regions or cities - are fixed. In other words, economic activity cannot alter space. Third, this spatio-temporal framework - container and content - is purely abstract in form, specifically a Euclidean cadastral geometry of hypothetical points and lines that have no concrete geographical location or history. The spatial distribution of economic activity - the 'economic landscape' - that emerges from NEG models is merely a quantitative allocation (of employment and firms) amongst these abstract points. And, finally, these authors argue, space in NEG models is a purely objective entity, in the sense that it exists outside of the actions of economic agents (and outside the modeler once the particular 'geography' or spatial geometry of regional points or spatial units has been imposed), and is not socially and historically produced or constructed through those actions (see also Martin, 1999). How successful have economic geographers themselves been in avoiding these problems in conceptualizing space and regions in their own work, is another issue. But it is instructive to examine how they themselves think about geographical space.

Conceptualising the nature of space and defining regions have long been regarded as fundamental research issues for geographers - indeed, part of the very *raison d'être* of the discipline, what Lovering (1999) refers to as economic geography's 'supposedly foundational concept'. A recurring central theme in

economic geography is concerned with explaining ‘uneven geographical development’, and this has necessarily entailed discussions of the nature of geographical space and of regions. However, while in recent years geographers have devoted increasing attention to how ‘regions’ should be defined and theorized, no firm or generally accepted consensus has yet emerged (see, for example, Markusen, 1987; Thrift, 1994; Allen, Massey and Cochrane, 1998; *Regional Studies*, 2003, 2007; Entrikin, 2008). The notion of a ‘region’ conjures up an image of a bounded geographical unit that is delineated simultaneously by its own unique internal economic, social and cultural ‘structured coherence’ (Harvey, 1985, p. 146), and by its mutual contrast and distinction from other such spaces. But geographers have struggled to operationalise such a concept. For one thing, it is difficult to discern where the boundaries of a region should be drawn, or where one region ends and another begins. For another, how does one define and measure ‘internal structured coherence’? Regional spaces are rarely if ever internally ‘coherent’ nor contiguous, but characterized instead by various forms of economic, social, cultural – and indeed, spatial - discontinuities. Yet further, regions are not just ‘out there’ as pre-given spaces, but are produced by economic and social forces operating over time. This means that we should preserve analytically the historical potential for regions to appear and to disappear. In short, the ‘region’ is a prime example of what Markusen (1999) would call a ‘fuzzy concept’, or what Harrison (2007) terms an ‘object of mystery’. Economic geographers may be right to criticise the hypothetical and contrived ‘geographies’ and ‘regions’ used in NEG, but NEG theorists might well respond by arguing that PEG hardly provides a superior set of operational concepts that NEG should use instead. In fact, in terms of empirical work both camps often have no option but to work with pre-given administrative regions (such as the various NUTS regions into which the geographical space of the European Union is divided; or the states and counties of the United States), since these are the areas for which official data sets are readily available. Both camps recognize that such regions may have little meaning as functional economic areas, but constructing the latter (for example in terms of travel-to-work areas) is itself not only difficult but also highly demanding from a data point of view.

Part of the problem of defining regions derives, as geographers have stressed, from the fact that three conceptions of space are implicated: absolute space, relative space and relational space. If there is a common theme in the way that geographers have come to view regions, it has involved a playing down of absolute notions of space in favour of relative and relational space. It is of interest, therefore, to examine these different conceptions and what they imply for NEG

models. The distinctions between the three conceptions were set down by David Harvey more than thirty five years ago:

If we regard space as absolute, it becomes a ‘thing in itself’ with an existence independent of matter. It then possesses a structure which we can use to pigeon-hole or individuate phenomena. The view of relative space proposes that it be understood as a relationship between objects which exists only because objects exist and relate to each other. There is another sense in which space can be viewed as relative and I choose to call this relational space – space regarded in the manner of Leibniz, as being contained in objects in the sense that an object can be said to exist only insofar as it contains and represents within itself relationships to other objects (Harvey, 1973, p. 13).

In a recent reaffirmation of this tripartite distinction, Harvey (2006) has elaborated on what each of these categories might entail.

Absolute space is the space of Newton or Descartes. It is usually represented by a pre-existing, immovable and immutable grid amenable to standardized measurement and open to calculation. Geometrically it is the space of Euclid, and thus the space of all manner of cadastral mappings and practices. Absolute space is fixed, and socio-economic agents plan and record events within its frame. It is the space of bounded territorial designations, such as states, administrative units, urban grids and the like. The notion of relative space is akin to that of Einstein and non-Euclidean geometries. According to Harvey, space is relative in a double sense: that there are multiple geometries from which to choose, and that the spatial frame depends critically on what is being relativised (and by whom). The uniqueness of locations defined by bounded territories in absolute space gives way under this conception to a multiplicity of maps of relative locations by differentiating between distances measured in terms of cost, time, modal split, and so on. Such mappings can disrupt spatial continuities by focusing on networks and topological relations, and so on. Transactional spaces – and the spaces of perceptions (and perhaps expectations) – take on different forms (different ‘metrics’) according to the activity and agents in question. Indeed, in some cases - such as electronic financial transactions – absolute space in effect is annihilated altogether by relative space, and propinquity can occur without the need for physical proximity.

According to the relational conception of space, there is no such thing as space - or time - outside the processes that define them. Processes do not occur in some pre-given space, but define their own spatial frame: the concept of space is embedded in or internal to process. As Harvey emphasizes, in both the relative and the relational views of space it is impossible to understand space

independently of time: we should really talk about ‘space-time’ (see also Massey, 1999). The relational notion of space-time implies the idea of internal relations: external influences get internalized in specific processes or things through time. An event at a point in space cannot be understood by appeal only to what exists at that point: it depends on everything else going on around it.

Thus for geographers, space (or space-time) may be absolute, relative or relational: “space is neither absolute, relative or relational in itself, but can become one or all simultaneously depending on the circumstances” (Harvey, 2006, p. 125). So how are we supposed to choose between them? Are there rules for deciding when and where one conception - one spatial frame – is preferable to another? Economic geographers like Harvey and Massey suggest that the choice depends in very large part on the nature of the phenomena under investigation. These same geographers also argue that while an absolute definition of space (or space-time) can be used to delimit ‘regions’, such units may have little meaning in functioning economic terms. If the aim is to understand uneven geographical development, then relative and relational conceptions of space (and space-time) are necessary, and regions become defined by the particular processes under investigation. Further, issues of geographical scale also take on a particular importance, as different processes may operate at different scales in relative and relational space.

#### 4.2 *Rethinking Notions of Space in NEG Models*

So where does all this leave NEG models? It is tempting to argue that NEG models lean heavily on an absolute notion of space. The crude geometries of pre-given, fixed locations or points used in these models are quintessentially Euclidean, independent of the economic processes that are supposed to operate within and between them. But, and keeping Figure 1 in mind, NEG theorists might well contest this point, and argue that the locations in their models, may be albeit fictional and hypothetical, pre-given and fixed, but they are not independent of the economic processes (of agglomeration and dispersal) contained in those models; in this sense they argue that their models endogenise location into the economic process – that is growth in NEG models affects geography (the distribution of economic activity and hence the spatial organisation of the economy) and geography in turn affects growth. The fact remains, however, that *ab initio* the locations – the points or ‘regions’ - are assumed identical (in consumer tastes, technology, openness to trade, and, at least initially, in terms of their factor supplies): in this sense, initially there is *no* geography. The regions have no spatial extent and thus no internal spatial structure. The models may well

generate an agglomeration of economic activity in one location or 'region' rather than another – according to the starting or initial conditions and parameter assumptions used - but that agglomeration takes place at a single point. In reality, of course, spatial agglomerations have an internal geography which plays a key role in shaping the various external economies (and diseconomies, such as congestion effects) that operate within them. Furthermore, and importantly, as agglomeration of economic activity occurs so it extends in spatial coverage in an absolute sense: witness the spatial growth of many of the world's major cities and metropolitan areas. In other words, the process of agglomeration means that the 'regions' in NEG models should change in spatial size accordingly, with the effects this has on the mechanisms the models claim to capture. In contrast, NEG models make no allowance for this, since all activity takes place at individual points that have no spatial extent. There is then, an asymmetry in core NEG models even in the way they utilize an absolute spatial frame: locations ('regions') are pre-given and fixed in an absolute spatial frame, as points on a line or as a crude grid, or some such, but are themselves spaceless entities. In the mathematical models, the regions or locations have no internal geography at all. To be sure, some NEG models do allow for regions to differ in 'size, but this refers to their relative starting shares of labour and capital ('asymmetric sizes' models – see Baldwin et al, 2003), and this asymmetry is purely quantitative, not one of spatiality.

But what of the argument that, despite these features NEG models actually employ relative or even relational notions of geographical space? In as much as a relative view of space has to do with space measured by flows and movements - of commodities, people, information, money and capital – NEG theorists could claim that their models can and do accommodate this notion of geography. It is the flow of people, firms and goods between locations that determines the spatial distribution of economic activity in these models, and the distribution (agglomeration or dispersal) of economic activity between locations in turns shapes these flows. The trade cost function - typically assumed to be of iceberg form – plays a particularly important role in this regard. In one sense it imbues the model with a relative spatial frame, where the geography of the model landscape is represented and measured in cost rather than absolute distance terms. Changes in the cost function changes the trading relationships between the locations – in effect producing a different relative space of interaction between the locations ('regions'), with corresponding consequences for the agglomeration and dispersal forces within the model. Whether these relative spaces are meaningful or credible is another matter, of course, given that the iceberg cost function is itself a highly

simplified representation of trade or transport costs (see Fingleton 2005b, McCann, 2005; Fingleton and McCann, 2007). And while the focus in NEG models is deliberately on trade costs, geographers would point to a whole range of other factors that can influence the flows of trade between regions and cities. Yet, other flows in NEG models such as labour migration and knowledge spillovers, could also be argued to define relative rather than absolute spatial frames. Thus labour migration is assumed to be a function of real wage differences between locations ('regions'), while knowledge flows are represented by a 'spillover parameter' that ranges from perfect knowledge spillovers between regions ('global spillovers') to highly localised spillovers. The one thing in common with all of these flows in NEG models is that they are not defined in terms of any absolute space (standard distance) metric, but in what might be termed 'parameter spaces', each of which defines a relative space in the variable concerned. Some NEG models even combine different notions of relative space: for example by combining different trade cost functions with different knowledge spillover parameters (see Baldwin et al, 2003, Ch. 7)

It is when we come to the idea of relational space that difficulties really loom large. Geographers themselves have hardly begun to make much advance on this front. Harvey admits that "measurement becomes more and more problematic the closer we move to a world of relational space-time" (Harvey, 2006, p. 124). Recall that the idea of relational space is that processes and objects define their own spatial frames. Regions would then be defined by the processes that operate across the economy, and by their relationships with (all) other regions. This implies that the definition of regional spaces depends on what particular processes are being studied, and that different processes and relationships could well map out different 'regionalizations' of geographical space. Interestingly, Harvey cites economic potential surfaces as one example of a material relational space: using a transport cost or transport time denominator to calculate economic or market potential creates a relational spatial frame in which each location is linked to every other. An economic or market potential measure actually figures in standard NEG models in the form of the so-called 'wage equation' (which expresses the wage in a given region as a weighted sum of the market demand in all other regions). In effect, in NEG models each region or location is mutually related to every other region through its wage, which is a function of the weighted sum of the market demand incomes in all other regions and the cost of transporting goods to those regions. A change in the economic potential surface (for example, as a result of a reduction in transport costs) influences, to a greater or lesser degree, the wage and hence the pattern of agglomeration across all

locations, and changes in the pattern of agglomeration in turn reshape the economic potential surface.

Where, then, does this leave the complaint by economic geographers that NEG models deal with abstract, unreal and wholly unrepresentative geographies and regions? In one sense this is true: regions are typically ill-defined in much of NEG theory, beyond being represented by, and reduced to, points and hypothetical, spaceless entities. But PEG itself is not wholly innocent on this front. In much of the conceptual discussion around 'uneven regional development' within PEG, the notion of region is not well defined, and indeed is an abstract, unreal entity. Geographers would no doubt respond by arguing that much of their work also deals with the analysis of 'real' regions and economic spaces, as evidenced in their preference for theoretically-informed empirical case-studies of specific 'actually-existing' regions, city-regions, local industrial clusters and the like. Yet even in this work, the empirical delimitation of the region, city-region or cluster is often either left vague or falls back on to pre-given administrative units; and the internal *spatial* economic structure of the regions studied is also not always evident or specified. In much of PEG as in NEG, there is the problem of translating the conceptual notions of space and regions into empirically operational forms. The economic landscape is simultaneously continuous and discontinuous, according to the particular processes being considered. It is also simultaneously absolute, relative and relational. Neither PEG nor NEG have satisfactory ways of dealing with this complexity, either conceptually or empirically.

However, where PEG does at least provide important pointers for how NEG might improve its interpretation and representation of geographic space – apart from developing a richer array of multi-regional models - is in the implications of relative and relational notions of space. As part of their interest in these notions, economic geographers now put considerable emphasis on the role of flows, linkages and networks as mechanisms shaping the economic landscape, and as ways of representing the multiple spatialities of that landscape. As we have argued, the way in which transport costs and knowledge spillovers are incorporated into NEG models - in terms of parameters which are intended to measure the freeness with which goods and knowledge traverse distance - does imbue them with a sort of relative view of geographic space: each measures a different type of relative geographic proximity. But certainly in NEG theory the forms assumed for these mechanisms are typically simplistic and themselves ignore geography, since the parameters concerned are assumed to be invariant

across locations.<sup>15</sup> In reality, transports costs, the extent of knowledge spillovers and other such forms of interdependency between locations vary from location to location. Two implications follow from this. First, as economic geographers now increasingly emphasise, understanding the economic landscape is essentially about identifying and understanding the various networks of linkages, flows, transactions and (traded and untraded) interdependencies that bind firms, households and a multitude of supporting institutions and organizations together across space. In this context, NEG theorists could usefully explore the emerging interest in networks within economics (see, for example, Goyal, 2009). Second, the networks of flows, linkages, flows, transactions and interdependencies are in their turn reshaped by the processes of spatial economic agglomeration and dispersal to which they give rise and which they underpin. This recursiveness imparts a evolutionary dynamic to the economic landscape which NEG models fail to capture and which itself has become the focus of an emerging evolutionary paradigm within PEG.

## **5. Problematizing History in NEG: Learning from Evolutionary Economic Geography (EEG)?**

### *5.1 Equilibrium Versus Evolution in NEG Models*

The very idea of uneven regional *development* implies a concern with how the economic landscape evolves, or “how it unfolds through time” to use Lösch’s phrase from the introduction of our paper. The pattern of uneven regional development exhibits both continuity and change. Spatial agglomerations of economic activity do not appear overnight, but take decades to develop. Neither do they disappear overnight. In this sense there is a significant degree of continuity - a sort of ‘quasi-fixity’, stability or persistence - in the economic landscape. Yet, the economic structures of regions and spatial agglomerations do change over time, and abrupt shifts in the spatial distribution and organization of the economy can and do occur. Centres of old industry and technology decline and centres of new industry and technology emerge, regions rise and fall, and the regionalization of the economy periodically undergoes major reconfigurations. The economic landscape, in other words, is an *historical* process, and it can only really be understood as such. Theorising and modeling this historical evolution are, however, non-trivial tasks.

---

<sup>15</sup> In NEG empirics, trade costs or knowledge spillovers can (or even have to) vary across locations. This is one reason that it is not all straightforward why the results of essentially “a-geographic” (2 region symmetric) NEG models like the model discussed in section 2 should carry over the real world of many, asymmetric regions, see Bosker et al (2007a).

The treatment of time and history in NEG models is, as we have already noted, rather limited. In this respect NEG reflects its roots in mainstream economics. The latter has long been firmly equilibrist in orientation: the economy is viewed as an *equilibrium* process. That is to say, the economy is assumed to be always tending towards an equilibrium state. Conventionally, the models used to represent and explain the economy are constructed so as to yield a unique equilibrium solution to which the world in the model converges regardless of initial conditions or the adjustment path taken. Time does not figure in mainstream economics, or only a ‘logical’ sense, as the instantaneous movement towards equilibrium or from one equilibrium to another (as in comparative statics). In this way traditional general equilibrium analysis reflects a curious absence for any role for history in the determination of economic outcomes (see Setterfield, 1997; Harris, 2004). In recent years, however, this focus on the determination of a unique general equilibrium state has given way to an interest in multiple equilibria, to the recognition that different initial conditions may produce different long-run equilibrium states. In this respect, mainstream economists have seized upon this idea of multiple equilibria to argue that their models can accommodate the idea that ‘history matters’, since model outcomes will depend on where the system ‘started’.

This is essentially the position adopted in NEG, where the models are explicitly designed to yield a number of alternative equilibrium spatial distributions of economic activity. For example, as we have seen in Section 2, the basic core-periphery (CP) NEG model, as summarized by Figure 1, has three such possible stable distributions of economic activity between the two regions (core and periphery). Which equilibrium distribution is reached depends on the initial conditions used in the model, for example with respect to the ‘freeness of trade’ (or transport technology), the initial distribution of activity between the two regions, and so on. Further, the models are able to show how changes in, and major shocks, to the determinants of agglomeration (such as the ‘freeness of trade’) can lead to a new equilibrium economic landscape. NEG theorists thus claim that their models allow a role for both ‘history’ and ‘path dependence’, since which of the possible equilibrium outcomes is selected depends on both where the system started and on the ‘adjustment path’ followed:

The second famous feature of the CP model is ... that the model has multiple stable equilibria... The importance of this lies in the fact that, in such situations, history matters. If the economy starts out near a CP outcome, it will move to it and stay there. Interestingly, if a temporary shock, say a temporary production subsidy in one region, moved the economy from one stable equilibrium to another, then the removal of

the shock would not lead to a reversal of the effects of the shock. This hysteresis or path dependency feature has important implications for policy analysis (Baldwin et al, 2003, p. 36).

While NEG theorists acknowledge that the ‘history’ in their models is necessarily hypothetical, nevertheless it is interpreted as telling a story about how the spatial economy evolves:

It is crucial in spatial analysis to have some way to narrow down the set of equilibria one considers... Our usual answer will be a ‘hypothetical history’, a story about how the economy evolves over time that allows us to visit only a limited subset of the large, perhaps infinite possibilities (Fujita, Krugman and Venables, 1999, p. 23).

But, as the above quote itself suggests, this appeal to ‘history’ appears to be more a methodological device for ‘narrowing down’ the solution space of the models - for limiting the range of possible multiple equilibrium outcomes – than a genuine attempt to explain how the spatial economy actually evolves.

Indeed, a major issue raised by these models is whether the idea of multiple equilibria tells us any thing at all about history or evolution, even in the hypothetical world of the models. Regardless of how an equilibrium economic landscape is defined, it is a state from which the system will display no endogenously generated tendency to deviate. External shocks, of the sort often invoked in NEG work, may disrupt and destroy that equilibrium, but these are extraneous influences: as Krugman (1996b) himself admits, NEG models only allow ‘extrinsic’ and not ‘intrinsic’ sources of change. What this suggests, then, is that once we are in equilibrium, once an NEG model has produced an equilibrium economic landscape, ‘history’ and change effectively end: the future is predetermined by the state of the system corresponding to the equilibrium that has been achieved. To interpret ‘history’ as the selection process between multiple equilibria seems to imply that ‘history’ (in the form of initial conditions) only matters in the selection and movement towards an equilibrium position, and that once in that equilibrium position the economic landscape is thereafter in stasis, a position of no change. In effect, if we know the various alternative possible starting states, the array of possible final outcomes to which they may conform becomes determined *a priori* – as they are in NEG models - and all that remains to be ascertained is which outcome of the possibles will actually be selected. Characterising spatial economic evolution as a problem of selection from multiple equilibria thus constitutes a limited conception because it overlooks the possibility of spatial economic development *creating* its own set of outcomes in the course of its on-going evolution. The basic distinction here is one of ontology. In NEG

models the environment consists of a *pre-determined* set of possible equilibrium states, from which the model selects. In an evolutionary process, however, the environment is not pre-prescribed, but is instead ‘open’ – it is continuously constructed and reconstructed in the course of the evolution of the system (Setterfield, 1997). Economic geographers would thus argue that the very idea of equilibrium, even of the multiple variety, is difficult to reconcile with what they regard as the defining feature of an economy viewed as an evolving system, namely its capacity to self-transform itself from within, that is its capacity for *endogenously generated change* (Martin, 1999; Boschma and Frenken, 2006; Boschma and Martin, 2007).

### 5.2 *Evolutionary Economic Geography and NEG*

According to Witt (2003, 2006), to be evolutionary in orientation, economic models should satisfy three key criteria: they must be dynamical, they must deal with irreversible processes, and they must cover the generation and impact of novelty. The first criterion rules out any kind of static, or comparative static analysis, whilst the second rules out all ‘dynamical’ theories that describe stationary states or equilibrium outcomes. The third criterion of novelty is crucial to any theory of economic evolution: it is the creative capacity of economic agents (individuals and firms) and the creative functions of markets that drive economic evolution and adaptation. Thus knowledge and innovation assume central importance in evolutionary economics (Metcalf, Foster and Ramlogan, 2006).

The primary concern in evolutionary economics is not with equilibrium outcomes but

with processes of long-term and progressive change. The regularities observable in present reality are interpreted not as a solution to a static problem, but as the result that understandable dynamic processes have produced from known or plausibly conjectured conditions in the past – and also as features of the stage from which a quite different future can emerge by those same dynamic processes (Nelson and Winter, 1982, p. 10).

This focus would clearly seem to set the approach apart from that used in NEG. Indeed, in seeking to establish the theoretical and methodological framework for an evolutionary economic geography (EEG), Boschma and Frenken (2006) argue that whilst EEG does not reject the use of formal models – and in this respect shares some methodological characteristics with NEG – it explicitly takes a critical stance towards the static analysis found in NEG. As Boschma and Frenken (2006) see it, the defining characteristic of an evolutionary economic geography is

... that it explains a current state of affairs from its history... Thus the current state of affairs cannot be derived from current conditions only, since the current state of affairs has emerged from and has been constrained by previous states of affairs. Evolutionary theory deals with *path dependent* processes, in which previous events affect the probability of future events to occur (*ibid*, pp. 280-281, original emphasis).

In contrast to NEG, then, EEG directs attention to how particular spatial configurations of industries and technologies emerge and develop and change over real historical time.

The problem facing evolutionary economic geography (EEG), however, is that there is as yet no commonly agreed or coherent body of evolutionary economics (or evolutionary theory more generally) on which to draw as a basis for constructing evolutionary models of spatial economic agglomeration and uneven regional development. Thus according to Dopfer and Potts (2004), such is now the range of concepts and approaches that “the central problem of evolutionary economics at present is the lack of a clear analytical framework for evaluating, integrating and developing theory” (p. 195). To date, EEG has mainly sought to interpret the evolution of the economic landscape using notions drawn from Generalised Darwinian versions of evolutionary economics, particularly variety (for example of economic structure, technologies and forms of knowledge), novelty (innovation), selection (such as market processes of creative destruction) and adaptation (such as learning). In addition, the literature on path dependence economics has also been especially influential (see Martin and Sunley, 2006). Such ideas have been used to undertake empirical studies of the historical emergence and evolution of industries and technologies across space, the growth and decline of industrial specialisms in specific regions and clusters, and the development and evolution of inter-firm and entrepreneurial networks (for collections of such studies, see Frenken, 2007; Boschma and Martin, 2009).

But while certainly suggestive, these studies do not yet add up to an integrated explanatory or methodological framework. If there is a recurring idea in EEG work it is the emphasis given to the idea of path dependence, as highlighted in the Boschma and Frenken quote above (see also Martin and Sunley, 2006). Outwardly, this notion provides a point of commonality between EEG and NEG, since as we have seen the concept is an important one in NEG models also (recall the quote above from Baldwin et al (2003) on ‘the 2<sup>nd</sup> famous feature of the core NEG model). Early on Krugman acknowledged that in a sense his NEG work was a ‘repetition’ of some of the ideas of Kaldor on increasing returns, cumulative causation and path dependence: “This clear dependence on history is the most convincing evidence available that we live in an economy closer to Kaldor’s vision of a dynamic world driven by cumulative processes than to the standard

constant returns model (Krugman, 1991b, pp. 9-10).<sup>16</sup> This raises an intriguing issue: both NEG and EEG claim path dependence as an important aspect of their respective interpretations of spatial economic development, yet EEG argues it does so as part of its historical approach whilst criticizing NEG for being static and non-historical. It is worth looking in a little more detail, therefore, at the notion of path dependence.

Though intended by one of its prime architects, Paul David, to be a key construct of an historical approach to economics and a key characteristic of economic evolution, the concept of path dependence is not unproblematic (see Martin and Sunley, 2006, 2010; Martin, 2010b). The essence of the concept is that initial historical accidents or random events can have long-run consequences by virtue of triggering off various self-reinforcing increasing returns effects that ‘lock-in’ a particular outcome or trajectory rather than some other. Put another way, a given economic outcome is dependent on early initial events and the adjustment path those events set in motion: ‘history matters’.

However, the difficulty with the concept is that in David’s formulation path dependence becomes the historically conditioned process of selection between multiple equilibria:

The elaboration of theories around the core concept of path dependent dynamics... encourages and enables economists to entertain the possibility that, in place of a unique equilibrium-seeking dynamic, they should envisage a process that is seeking an historically-contingent equilibrium... (David, 2005)

Small events of a random character - especially those occurring early on the path - are likely to figure significantly in ‘selecting’ one or other among the set of stable equilibria, or ‘attractors’... (David, 2007)

Indeed, whilst on the one hand David describes path dependence as a key characteristic of historical or evolutionary processes, on the other he wants to retain the idea of equilibrium (albeit multiple equilibria): in fact he has recently called his approach ‘path dependent equilibrium economics’ (David, 2005). So we are back with the problem of reconciling evolution and equilibrium (Martin and Sunley, 2010; Martin, 2010a,b). The solution in David’s work is to interpret economic evolution as ‘punctuated equilibrium’: an historically contingent event triggers off the path dependent movement towards (selection of) one of a number of possible equilibria, in which, once reached, the system remains ‘locked’, until disrupted by an external shock.

This conception clearly has similarities with NEG uses of the notion of

---

<sup>16</sup> For an interesting assessment of how far and in what ways Kaldor’s work actually anticipated some of the ideas in NEG, see Bhattacharjea (2009).

path dependence. And how NEG theorists use their models to investigate shifts from one economic landscape to another could be equated with the idea of ‘punctuated equilibrium’. However, as Martin (2010b) argues, many real-world examples of regional development do not accord with this version of path dependence and its core concept of ‘lock-in’ to an equilibrium state. Nor is regional development best described by a ‘punctuated equilibrium’ model of economic evolution. In most cases, it is possible to discern a process of more or less continual change in a region’s industrial structures and technologies. Regional economies adapt and mutate over time. These evolutionary processes, though path dependent, may prevent a regional economy from becoming ‘locked-in to a particular stable state or trajectory. This possibility is not considered in NEG models, which may invoke the idea of path dependence but essentially deny it any real historical significance, equating it with the instantaneous, hysteretic movement from one equilibrium state to another following an exogenous shock of some kind. In fact, in NEG, ‘lock-in’ takes the form of a particular distribution of employment between regions. While, locational distributions of industry may get ‘locked in’, that is exhibit stability over time, NEG models have little or nothing to say about the changing sectoral structure of employment within regions or cities.

Another problem with path dependence economics is that it fails to account for how new ‘paths’ of economic and technological development actually emerge (Martin and Sunley, 2006, 2010; Martin, 2010b). Path creation is assumed to be essentially an accidental, random or serendipitous event. In EEG, a not dissimilar assumption is employed, namely that *where* a new industrial or technological path emerges is likewise at least to some extent a random or accidental processes, that what evolutionary economic geographers call the ‘windows of locational opportunity’ are essentially open at this stage, and that pre-existing spatial patterns of industrial and technological development have little or no relevance in determining the locations of new industries or technologies. This is akin to assuming a sort of uniform isolated plain of the kind found in some of the central place variants of NEG models. In reality, however, where new industrial and technological paths emerge, and the nature of those paths, can be shaped in significant ways by the pre-existing landscape of economic activity. New paths can be created out of old ones: in this sense, path creation may itself be a path - and place - dependent process.

All this is not intended to suggest that EEG holds no lessons for how NEG theorists might incorporate a more realistic historical dimension into their models. The emphasis given to variety and novelty, and to innovation and technological change, in EEG, for example, is on how these processes stimulate and shape the ongoing adaptive evolution of the economic landscape, and why this evolution is itself spatially uneven. In NEG the role of innovation and technological change is

restricted to determining the extent of spatial agglomeration of the economy (via productivity, growth, and spillovers), and not on the changing nature of economic activity within regions or spatial agglomerations. The focus is on the implications of spatial agglomeration for growth, but not on structural change. Yet, as Metcalfe, Foster and Ramlogan (2006) argue, growth not only involves structural change but depends on innovation: hence their view that an evolutionary perspective on the economy is fundamentally about *adaptive growth*. The whole focus of an evolutionary perspective on the economic landscape is that the latter is conceived as an historical adaptive process, in which any equilibrium is at best an unintended, happenstance *ex-post* outcome, not an inherent tendency of the system. Economic geographers may criticise NEG for elevating equilibrium over history, or at best interpreting the latter as the influence of initial conditions on what equilibrium is reached. But even some evolutionary economics commits the same error (see for example, Witt, 2003). It is for this reason that Krugman (1996b) is able to claim that evolutionary economics is little different to mainstream economics, and by implication, NEG. The task for both NEG and EEG is to find ways of modeling historical continuity and change, of developing models of the spatial economy that do not depend on any explicit or implicit notions of equilibrium.

## 6. On Theoretical and Natural Models

In reflecting on the various issues and debates surrounding the sort of models used by NEG and, indirectly, by the critics of NEG as well, it is instructive to take a more methodological stance and to consider Sugden's (2000) discussion of the status of theoretical models in economics. According to Sugden (2000), model building in economics has serious intent only if it is ultimately directed at telling us something about the real world. The phrase 'real world' is used here to distinguish the world within a model (the 'model world') from the reality outside it.<sup>17</sup> In broad terms, formal models in economics have two types of use: 'conceptual exploration' and 'empirical theorising' (Hausman, 1992). Conceptual exploration investigates the internal properties and solutions of models, without necessarily considering the relationship between the world of the model and the real world. Many NEG models can be viewed very much as exercises in conceptual exploration, since a key interest centres on determining how changing certain of the model's parameters and assumptions (for example regarding the nature of the model's initial conditions, the degree of 'freeness of trade' or transport costs, the extent of firm or labour mobility, and the like), changes the relative strength of agglomeration and dispersion and the nature and stability of

---

<sup>17</sup> What that 'reality' is, of course, is itself a problematic issue, since different scientific and social philosophies posit different ontologies of the 'real'.

spatial equilibrium generated *internally by the models*. This focus on ‘within-model’ exploration by NEG theorists is vividly illustrated by Baldwin et al (2003), in what is widely held to be one of the main statements in the field. Here, NEG models are developed to help to understand the relevance of NEG for economic policy but throughout the book real world examples of actual policies are few and far between.

But, as Sugden argues, theory becomes just a game when theorists work entirely in the world of conceptual models. A second type of use of models is that of ‘empirical theorising’ or heuristics (Hodgson, 2006), where the aim is to identify some possible causal mechanisms that form part of a much more complex observed real-world system, to which close reference is made as part of the theory-building endeavour. The purpose of heuristics or ‘empirical theorising’ is to establish a plausible or credible segment of a whole causal story, without necessarily giving an adequate or complete explanation of the phenomena to which they relate. NEG models are clearly intended to say something about real world phenomena, but few NEG theorists actually refer to such phenomena in deriving those models. It is interesting here to compare the approach taken by Krugman (1991a,b, 1995) and that by the more recent NEG models. In contrast to the latter, in the former there are many references to real-world examples of regional and urban agglomeration, and regional industrial patterns and histories. Indeed, Krugman has often been quite explicit that his models are intended to help explain actually occurring examples of spatial economic agglomeration, as he states in his first major contribution that launched NEG, namely *Geography and Trade* (1991b):

To introduce the subject of divergent regional development, I turn to economic history to provide a particularly clear-cut example of the forces of economic geography at work. I then offer a simple model [the basic core-periphery model of NEG] that helps makes sense of that example. The example is the case of the US manufacturing belt: a relatively narrow stretch of territory within which the preponderance of US manufacturing was concentrated from the mid-nineteenth century until the 1960s (p. 11)

This approach<sup>18</sup> stands in stark contrast to much of the other theoretical work in NEG, in which there is no little or no discussion of empirical cases or examples that might persuade the reader to acknowledge that the construction of the models is aimed to arrive of a better understanding of these real world examples. Much of

---

<sup>18</sup> In for instance Krugman (1991a,b, 1995) there are many examples ranging from the US manufacturing belt to the clustering of the US carpet industry in Dalton Georgia which in our view are meant to convince the reader that the basic mechanisms from his core 1991 NEG model are similar to the ones observed in these real world examples. This strategy is also apparent in Krugman’s Nobel lecture (Krugman, 2009) and seems to reflect his overall (modeling) research strategy, see Krugman (1998b).

NEG theory is decontextualised, and first and foremost concerned with deriving ‘within-model’ analytical results.

Following Sugden (2000), this difference in invoking real world examples in the process of model building is important because what matters is indeed whether the particular causal factors and relationships isolated by NEG models, and the underlying assumptions that represent the workings of these causal factors, give sufficient grounds to make any plausible or *credible* inferences to the real world. As Sugden notes, we make inferences from one part of reality to another all the time. He uses two famous economic models to make his point, Akerlof’s market for lemons model and Schelling’s checkerboard model of racial segregation. Sugden uses these two model examples because in his view both models succeed in conveying the message that the theoretical models help to understand the real world. The main question is how Akerlof and Schelling succeed in doing so given that the theoretical models are highly abstract and clearly contain some “unrealistic” assumptions. The answer, in a nutshell, is that Akerlof and Schelling succeed in constructing a credible counterfactual model world to the real world (Sugden, 2000, p. 28). This counterfactual model world is credible in the sense that the reader is led to believe that the causal general mechanisms from the theoretical model are the same as those observed in reality for particular phenomena. Thus, to use the Schelling example, if we observe racial segregation in, say, the cities of Chicago, New York, Baltimore, Philadelphia, Detroit, Buffalo and Pittsburgh, then we might make the inference that segregation is a characteristic of large cities of the north-eastern USA, and so form the expectation that there will be segregation in, say, Cleveland. The thought behind this expectation is that the forces at work in the Cleveland housing market, whatever these are, are likely to be broadly similar to those at work in other large cities in this part of the USA. One way of describing this inductive inference is to say that each of the housing markets of Chicago, New York, Baltimore, etc. constitutes a *model* for the forces at work in large north-eastern US cities. Sugden calls these *natural* models, in contrast to theoretical models created in the minds of social scientists. But, Sugden, asks, if we can make inductive inferences from natural models, why not from theoretical ones?

Hence, for a model to have credibility, and thus serve as the basis for plausible empirical inferences, it is not enough that its assumptions and relationships cohere one with another within a deductive structure – ‘within-model consistency’; they must also cohere with what is known about causal processes in the real world. In fact, our *wish list* as to future NEG research in section 3.2 is largely motivated by the fact that the causal processes observed in the real world do not cohere well with the current theoretical models in NEG. In order to remedy this and thus to move forward in NEG research, the future theoretical models need

to be more aligned with the causal processes in the real world to the extent that we are so to say willing to take the inductive step to believe that even though NEG is about an imaginary world of economic geography it actually could be about the economic geography of an existing region or country. To do this, it is not necessary that the assumptions and abstractions of NEG models correspond with any *particular* real world situation. But they must be adequately *representative* of firms, consumers, workers and spatial agglomerations in the real world. Only then can credible inferences be made from the model world to the real world according to Sugden (2000). The world of NEG models is much more uniform, regular and rational than the real world, but clearly NEG theorists want us to believe that the processes represented in their models *could* operate in the real world, and are not just primitives in a formal deductive system, see the abovementioned quotation from Krugman (1991b). But there is a clear credibility gap in our view since within-model consistency does not suffice. NEG should put more effort in arguing that the basic mechanisms from the theoretical model (could) have their counterpart in the real world.

Thus while some NEG theorists, such as Krugman himself, might claim that empirical observation has informed the type of conceptual models they use, in fact those models are not in general abstractions from, or simplifications of actual real world spatial agglomerations, cities and regional economies. In fact, and just like Akerlof's lemons or Schelling checkerboard model, they describe *counterfactual* worlds that the modelers have constructed, representations of what economic landscapes would look like *if* the real processes at work and the nature of geographical space and historical time were like those postulated. Since NEG models are not what Sugden calls 'natural models' – based on the detailed study of actual regions and cities that exist in real geographical space and which develop and evolve over real historical time, NEG models, like all theoretical models, necessarily suffer from a credibility gap. This gap exists because in NEG models "somehow a transition has to be made from a particular hypothesis, which has been shown true in the model world, to a general hypothesis which we can expect to be true in the real world too" (Sugden, 2000, p. 19). One way to make this transition and close the gap is the inductive step that the regularities or processes in the specific model set up will also hold more generally, that is in the real world as well. As Sugden therefore argues, such a gap can be filled by inductive inference, but we can only have confidence in such inference the more credible NEG models are as accounts of what could have been true.

Our focus in this section has been on NEG. But this is not because we think that the other two main analytical approaches to economic geography highlighted in this paper, PEG and EEG, do not face similar challenges when it comes to transition from their analysis to the real world. Proper economic geographers (PEG) would probably argue that their approach is much closer to the

method of ‘empirical theorising’ than it is to ‘conceptual theorising’. They would argue that case-study analysis and sensitivity to context are key aspects of their approach to theory-building, and that they rely much more on ‘natural models’, as Sugden calls them, than on purely conceptual (‘theoretical’) models. Some would no doubt claim that their approach is akin to grounded theory, to constructing general concepts and models on the basis of local inductive case studies. But even grounded theory rarely starts with a ‘clean conceptual sheet’ and relies on certain prior theoretical assumptions and abstractions which guide the empirical case study. So here too, issues of the credibility or plausibility of assumptions and abstractions arise.

Economic geographers might also claim they work with metaphors rather than with abstract theoretical notions (much of evolutionary economic geography, EEG, is based precisely on the application of metaphors, such as selection, fitness, adaptation, etc); but metaphors too must be credible and applicable if they are to provide sufficient grounds for making any plausible explanatory inferences about real economic landscapes. The bottom line is that are lessons from Sugden’s insightful discussion of ‘credible models’ not only for NEG, but also for PEG and EEG.

## **7. Some Conclusions**

Our starting point for this paper has been to respond to two key criticisms leveled at new economic geography (NEG) models by economic geographers, namely that NEG operates with crude and highly simplistic and idealized conceptions of geography and space; and that its conceptualisation of time as logical rather than historical is equally restrictive. Our argument is that NEG does indeed need to take both geography and history more seriously. In examining how it might begin to achieve these tasks, we have looked at economic geography itself (both PEG and EEG) for insight, to see how regions, space, and history are treated there. Following Sugden (2000), we also looked more generally at the kind of model building that would be required for NEG or economic geography at large to be able to come with a more “realistic” treatment of geography or history.

Geographers emphasise the need to think about geography or space in relative and relational as well as absolute terms. We agree. But we also have argued that while NEG models specify unrealistic absolute space regional geometries in order to produce analytical solutions, those same models do in fact incorporate some relative and perhaps even relational notions of space, for example in the way that freeness of trade (or transport technology), knowledge spillovers and market potential are represented. To be sure, these representations are crude in form, and the challenge for NEG is to develop more realistic and compelling ways of handling the relative and relational aspects of economic space. Essentially, these notions of space imply that rather than being exogenous,

geography becomes endogenous and thus a function of the processes being modeled. The spatial agglomeration of economic activity is not something that merely takes place at a point in space, but is a process that itself reshapes and redefines economic space. In addition, proper economic geographers themselves have not yet progressed far in operationalising the notions of relative and relational space – though the growing focus on networks holds some promise on this front.

If finding ways to ‘endogenise’ geography more fully within NEG models is a challenging task, even more so is that of moving to models that take history more seriously. This is arguably a shift-of-paradigm problem for NEG, since the latter regards its major contribution to be precisely the construction of general equilibrium models of the economic landscape. But developing an historical or evolutionary approach, as advocated by some geographers, to the study of regional development is not itself unproblematic. Evolutionary economic geography highlights a number of key aspects of uneven regional development that are ignored by NEG and which would be central to a more history-orientated form of NEG, such as the role of novelty, selection, adaptation, emergence and self-organisation. But these ideas have yet to be integrated into any coherent theoretical or analytical framework by economic geographers themselves. While evolutionary economic geographers may be ahead of NEG theorists in thinking about the economic landscape as an historical process, as yet they do not have a convincing model of that process. Ironically, Krugman himself began to think along more evolutionary lines in his book *The Self-Organising Economy* (1996b), but unfortunately the ideas introduced have not played a major role in the subsequent development of NEG. Perhaps now is the time to revive them.

Geographers, whether PEG or EEG inclined, would respond to all this by arguing that, at bottom, the fundamental impediment to making NEG more geography and history ‘friendly’ is its dependence on formal models, since these are based not on abstracting from concrete reality - from real-world cases in real space and time - but on the basis of idealised assumptions concerning consumer and firm behaviour in highly simplified hypothetical contexts. As we have tried to explain in the previous section, we see this more as a problem of the *plausibility* of the models used rather than as an argument against models per se (see Martin, 2009a). As Sugden (2000) in his excellent paper on the status of theoretical models in economics argues, models can be defined to be of two types: ‘theoretical’ models constructed in the mind of the researcher, based on some hypothetical world, but intended to cast explanatory light on the real world; and ‘natural’ models, based on observation of specific cases or instances in the real world with the aim of being representative of and applicable to the real world more generally. In our view, progress of new, proper or any kind of economic geography as to the analysis of geography (place/space) and history (time)

requires that the plausibility of models becomes the focal point. Whether one opts for theoretical or natural models, and models are here defined in the broadest sense possible from the formal NEG models to appreciative theorizing in PEG, the challenge remains the same: how to come up with a model specific analysis of geography and history that can be convincingly and credibly said to apply more generally, that is to the real world. Since the construction of an all-encompassing theoretical framework that combines the best of NEG, PEG or EEG will clearly not be on the horizon any time soon (if ever), this challenge has first and foremost to be met from within each of these approaches. But in doing so, a recognition of the limitations of each approach and, at least in our view, of the complementary nature of these different approaches by economists and geographers would be most welcome. This paper has tried to show that there may, perhaps, be scope for a fruitful dialogue, but it requires a reassessment on both sides.

## References

- Allen, J., Massey, D. and Cochrane, A. (1998) *Rethinking the Region*, London: Routledge.
- Baldwin, R. (1999) The Core-Periphery model with forward looking expectations, *NBER Working Paper Series*, No. 6921, Cambridge Mass.
- Baldwin, R., R. Forslid, Ph. Martin, G.I.P. Ottaviano, and F. Robert-Nicoud (2003) *Economic Geography and Public Policy*, Princeton University Press, Princeton.
- Baldwin, R. and Ph. Martin (2004) Agglomeration and Regional Growth, in V. Henderson and J-F. Thisse (eds.), *Handbook of Regional and Urban Economics, volume IV*, North Holland, Amsterdam, pp. 2671-2712.
- Barnes, T.J. (2001) Rethorizing economic geography: from the quantitative revolution to the 'cultural turn', *Annals of the Association of American Geographers*, 91(3), pp. 546-565.
- Bhattacharjea, A. (2009) Did Kaldor anticipate the New Economic Geography? Yes, but..., *Cambridge Journal of Economics*, pp. 1-18.  
doi:10.1093/cje/bep069
- Behrens, K. and J.F. Thisse (2007) Regional economics: A new economic geography perspective, *Regional Science and Urban Economics*, 37, pp. 457-465.
- Behrens, K. and F. Robert-Nicoud (2009) Krugman's Papers in Regional Science: The 100 dollar bill on the sidewalk is gone and the 2008 Nobel Prize well-deserved, *Papers in Regional Science*, 88(2), pp. 467-489.

- Boschma, R. and K. Frenken (2006) Why is economic geography not an evolutionary science? Towards an evolutionary economic geography, *Journal of Economic Geography*, 6, pp. 273-302.
- Boschma, R. and R. L. Martin (2007) Constructing an Evolutionary Economic Geography, *Journal of Economic Geography*, 7, pp 537-548
- Boschma, R. and R. L. Martin (2010) *Handbook of Evolutionary Economic Geography*, Cheltenham: Edward Elgar.
- Bosker, M., S. Brakman, H. Garretsen, and M. Schramm (2007) Adding Geography to the New Economic Geography, *CESifo Working Paper*, 2038, CESifo, Munich, forthcoming *Journal of Economic Geography*.
- Bosker, M., S.Brakman, H. Garretsen, and M. Schramm (2007b) Looking for multiple equilibria when geography matters: German city growth and the WWII shock, *Journal of Urban Economics*, 61, pp. 152-169.
- Brakman, S., H. Garretsen, and C. van Marrewijk (2001) *An Introduction to Geographical Economics*, Cambridge UP, Cambridge.
- Brakman, S and H. Garretsen (2003) Rethinking the ‘new’ geographical economics, *Regional Studies*, 37, pp. 637-648.
- Brakman, S, H. Garretsen, and M. Schramm (2004) The strategic bombing of German cities during WWII and its impact on city growth”, *Journal of Economic Geography*, 4(2), pp. 201-218.
- Brakman S., H. Garretsen, and M. Schramm (2006) Putting new economic geography to the test: free-ness of trade and agglomeration in the EU regions, *Regional Science and Urban Economics*, 36(5), pp. 613-636.
- Brakman, S. and H. Garretsen (2009) Trade and Geography: Paul Krugman and the 2008 Nobel Prize for Economics, *Spatial Economic Analysis*, 4(1), pp. 5-24.
- Brakman, S., H. Garretsen, and Ch van Marrewijk (2009) *The New Introduction to Geographical Economics*, Cambridge UP, Cambridge.
- Boddy. M. (1999) Geographical Economics and Urban Competitiveness: A Critique, *Urban Studies*, 36, pp. 811-842.
- Combes, P-P, Th. Mayer, and J-F. Thisse (2008) *Economic Geography*, Princeton University Press.
- Corpataux, J. and Crevoisier, O. (2007) Economic theories and spatial transformations: clarifying the space-time premises and outcomes of economic theories, *Journal of Economic Geography*, 7, pp. 285-310.

- Dopfer, K. and Potts, J. (2004) Evolutionary realism: a new ontology for economics, *Journal of Economic Methodology*, 11, pp. 195-212.
- Dymski, G. (1998) On Paul Krugman's Model of Economic Geography, *Geoforum*, 27, pp. 439-452.
- Durantón, G. and Rodríguez-Pose, A. (2005) When economists and geographers collide, or the tale of the lions and the butterflies, *Environment and Planning A*, 37, 10, pp. 1695-1705.
- Durantón, G. and M. Storper (2006) Agglomeration and growth: a dialogue between economists and geographers, *Journal of Economic Geography*, 6, pp. 1-7.
- Durantón, G. (2008) Spatial Economics, in S. N. Durlauf and L. E. Blume (Eds.) *The New Palgrave Dictionary of Economics, Second Edition*. London: Palgrave Macmillan.
- Entrikin, J.N. (Ed) (2008) *Regions: Critical Essays in Human Geography*, Aldershot: Ashgate.
- Fingleton B (2005a) Beyond neoclassical orthodoxy: a view based on the new economic geography and UK regional wage data, *Papers in Regional Science*, 84 pp. 351-375
- Fingleton B (2005b) Towards applied geographical economics: modelling relative wage rates, incomes and prices for the regions of Great Britain, *Applied Economics*, 37, pp. 2417-2428.
- Fingleton, B. (2006) The new economic geography versus urban economics: an evaluation using local wage rates in Great Britain. *Oxford Economic Papers*, 58, pp. 501-530.
- Fingleton, B. and McCann, P. (2007) Sinking the iceberg? On the treatment of transport costs in New Economic Geography, in Fingleton, B. (Ed) *New Directions in Economic Geography*, pp. 168-203.
- Fingleton B (2008) Competing models of global dynamics : evidence from panel models with spatially correlated error components, *Economic Modelling* 25, pp. 542-558
- Fingleton B and Fischer M (2010) Neoclassical Theory versus New Economic Geography. Competing explanations of cross-regional variation in economic development, *Annals of Regional Science*, forthcoming.
- Forslid, R. and G.I.P. Ottaviano (2003) An analytically solvable core-periphery model, *Journal of Economic Geography*, 3, pp. 229-240.

- Fowler, C.S. (2007) Taking geographical economics out of equilibrium: implication for theory and policy. *Journal of Economic Geography*, 7, pp. 265-284.
- Frenken, K. (Ed) (2007) *Applied Evolutionary Economics and Economic Geography*, Cheltenham: Edward Elgar.
- Fujita, M., P.R. Krugman and A.J. Venables (1999) *The Spatial Economy; Cities, Regions, and International Trade*, MIT Press.
- Fujita, M. and J-F. Thisse (2002) *Economics of Agglomeration: Cities, Regions, and International Trade*, MIT press, Cambridge Mass.
- Fujita, M. and P.R. Krugman (2004) The new economic geography: Past, present and the Future. *Papers in Regional Science*, 83, pp. 39-164.
- Fujita, M. and T. Mori (2005) Frontiers of the new economic geography, *Papers in Regional Science*, 84 (3), pp. 377-407.
- Fujita, M. and J-F Thisse (2009) New Economic Geography: An Appraisal on the Occasion of Paul Krugman's 2008 Nobel Prize in Economics, *Regional Science and Urban Economics*, 39, pp. 109-119.
- Goyal, S. (2009) *Connections: An Introduction to the Economics of Networks*, New Jersey: Princeton University Press.
- Harris, C. (1954) The Market as a Factor in the Localization of Industry in the United States, *Annals of the Association of American Geographers*, 64, pp. 315-348.
- Harris, D.J. (2004) Joan Robinson on 'history versus equilibrium', Paper presented at the Joan Robinson Centennial Conference, Department of Economics, University of Vermont, Burlington, 17-19 October, 2003.  
See <http://www-siepr.stanford.edu/workp/swp04005.html>
- Harrison, J. (2007) From competitive regions to competitive city-regions: a new orthodoxy, but some old mistakes, *Journal of Economic Geography*, 7, pp. 311-332.
- Harvey, D. (1973) *Social Justice and the City*, London: Edward Arnold.
- Harvey, D. (1985) The geopolitics of capitalism, in Gregory, D. and J. Urry (Eds) *Social Relations and Spatial Structures*, London, Macmillan, pp. 128-163.
- Harvey, D. (2006) *Spaces of Global Capitalism: Towards a Theory of Uneven Geographical Development*, London: Verso.

- Head, K and Th. Mayer (2004), The empirics of agglomeration and trade, in V. Henderson and J-F. Thisse (eds.), *Handbook of Regional and Urban Economics, volume IV*, North Holland, Amsterdam, pp. 2609-2665.
- Head, K. and Th. Mayer (2006) Regional wage and employment responses to market potential in the EU. *Regional Science and Urban Economics*, 36(5), pp. 573-594.
- Hoare, A. (1992) Review of Krugman's 'Geography and Trade', *Regional Studies*, 19, p. 679.
- Johnston, R.J. (1992) Review of P. Krugman's *Geography and Trade, Environment and Planning*, 24, p. 1006.
- Kaldor, N. (1972) The irrelevance of equilibrium economics, *Economic Journal*, 82, pp. 1237-1255.
- Koopmans, Tj.C. (1957) *Three Essays on the State of Economic Science*, McGraw-Hill, New York.
- Krugman, P. (1980) Scale Economies, Product Differentiation, and the Pattern of Trade, *American Economic Review* 70, pp. 950-959.
- Krugman, P.R. (1991a) Increasing returns and economic geography, *Journal of Political Economy*, 99, pp. 483-499
- Krugman, P.R. (1991b) *Geography and Trade*, Cambridge, Mass: MIT Press.
- Krugman, P.R. (1995) *Development, Geography and Economic Theory*, Cambridge: MIT Press.
- Krugman, P.R. (1996a) What economists can learn from evolutionary theorists, Paper presented at the European Association for Evolutionary Political Economy, see <http://web.mit.edu/krugman/www/evolute.html>
- Krugman, P.R. (1996b) *The Self-Organizing Economy*, Oxford: Blackwell.
- Krugman, P.R. (1998a) Space: The final frontier, *Journal of Economic Perspectives*, pp. 161-174.
- Krugman P.R. (1998b) Two cheers for formalism, *The Economic Journal*, 108, pp. 1829-1836.
- Krugman, P.R. (2009) The increasing returns revolution in trade and geography, *American Economic Review*, 99, 3, pp. 561-571.

- Lösch, A. (1939, 1954) *The Economics of Location*, (Second edition) New Haven: Yale University Press.
- Lovering, J. (1999) Theory led by policy: the inadequacies of the 'new regionalism', *International Journal of Urban and Regional economics*, 23, pp. 379-395.
- McCann, P. (2005) Transport costs and the New Economic Geography, *Journal of Economic Geography*, 5, pp. 305-318.
- Marchioni, C. (2004) Geographical economics versus Economic Geography: Towards a Clarification of the Dispute, *Environment and Planning, A*, 36, pp. 1737-1753.
- Markusen, A. (1987) *Regions: The Economics and Politics of Territory*, New Jersey: Rowman and Littlefield.
- Markusen, A. (1999) Fuzzy concepts, scanty evidence and policy distance: the case for rigour and policy relevance in critical regional studies, *Regional Studies*, 33, pp. 869-886.
- Martin, R.L. (1999) The new 'geographical turn' in economics: Some critical reflections, *Cambridge Journal of Economics*, 23, pp. 65-91.
- Martin, R.L. (Ed.) (2009) *Economy: Critical Essays in Human Geography*, Aldershot: Ashgate.
- Martin, R.L. (2010a) The New Economic geography: Credible models of the economic landscape? In Lee, R. et al (Eds.) *A Compendium of Economic Geography*, London: Sage.
- Martin, R.L. (2010b) Rethinking regional path dependence: Beyond lock-in to evolution, *Economic Geography*, 86, pp. 1-27.
- Martin, R.L. and P. Sunley (1996) Paul Krugman's geographical economics and its implications for regional development theory: A critical assessment, *Economic Geography*, 72, pp. 259-292.
- Martin, R.L. and P. Sunley (2001) Rethinking the 'economic' in economic geography: Broadening our vision or losing our focus, *Antipode*, 33, 2, pp. 148-161.
- Martin, R.L. and P. Sunley, (2006) Path dependence and regional economic evolution, *Journal of Economic Geography*, 6, pp. 395-437.
- Martin, R.L. and P. Sunley (Eds.) (2007) *Critical Concepts in Economic Geography (Volumes 1-5)*, London: Routledge.

- Massey, D. (1999) Space-time, 'science' and the relationship between physical geography and human geography, *Transactions of the Institute of British Geographers*, NS 24, pp. 261-276.
- Metcalf, J.S., Foster, J. and Ramlogan, R. (2006) Adaptive economic growth, *Cambridge Journal of Economics*, 30, pp. 7-32.
- Neary, J. P. (2001) Of Hype and Hyperbolas: Introducing the New Economic Geography, *Journal of Economic Literature*, XXXIX, pp. 536-561.
- Nelson, R. and S. Winter (1982) *An Evolutionary Theory of Economic Change*, Belknap: Harvard University Press.
- Ottaviano, G.I.P. (1999) Integration, geography and the burden of history, *Regional Science and Urban Economics*, 29, pp. 245-256.
- Ottaviano, G.I.P., T. Tabuchi, and J-F. Thisse (2002) Agglomeration and trade revisited, *International Economic Review*, 43, pp. 409-435.
- Overman, H.G. (2004) Can we learn anything from economic geography proper?, *Journal of Economic Geography*, 4, pp. 501-516.
- Redding, S (2009) The Empirics of New Economic Geography, *Journal of Regional Science*, 50<sup>th</sup> anniversary issue, forthcoming  
see <http://econ.lse.ac.uk/staff/sredding/redpublish.htm>
- Regional Studies (2003) Rethinking the Regions, Special Issue, *Regional Studies*, 37, pp. 535-751.
- Regional Studies (2007) Whither Regional Studies? Special Issue, *Regional Studies*, 41, pp.1143-1269.
- Robert-Nicoud, F. (2005) The structure of simple new economic geography models (or, on identical twins), *Journal of Economic Geography*, 5, pp. 201-234.
- Robinson, J. (1978) History versus Equilibrium, Ch. 12 in *Contributions to Modern Economics*, Oxford: Blackwell
- Scott, A.J. (2000) Economic Geography: the Great Half-Century, in G.L. Clark, M.P. Feldman and M.S. Gertler (eds.), *The Oxford Handbook of Economic Geography*, Oxford University Press, pp. 8-49.
- Scott, A.J. (2004) A perspective of economic geography, *Journal of Economic Geography*, 5, pp. 479-499.

- Scott, A.J. (2006), Review of Handbook of Regional and Urban Economics, vol 4, *Journal of Economic Geography*, 6, pp. 104-107
- Setterfield, M. (1997) Should economics dispense with the notion of equilibrium? *Journal of Post Keynesian Economics*, 20, pp. 47-76.
- Sjöberg, O. and Sjöholm, F. (2002) Common Ground? Prospects for Integrating the Economic Geography of Geographers and Economists, *Environment and Planning, A*, 34, pp. 467-486.
- Starrett, D. (1978) Market allocations of location choice in a model with free mobility, *Journal of Economic Theory*, 17, pp. 21-37.
- Storper, M. and Venables, A. (2004) Buzz: Face-to-Face Contact and the Urban Economy, *Journal of Economic Geography*, 4, pp. 351-370.
- Sugden, R. (2000) Credible Worlds: the Status of Theoretical Models in Economics, *Journal of Economic Methodology*, 7(1), pp. 1-31.
- Thrift, N. (1994) Taking aim at the heart of the region, in Gregory, D., Martin, R.L. and Smith, G. (Eds) *Human Geography: Society, Space and Social Science*, London: Macmillan, pp. 200-231.
- Witt, U. (2003) *The Evolving Economy: Essays on the Evolutionary Approach to Economics*, Cheltenham: Edward Elgar.
- Witt, U. (2006) Evolutionary economics, *Papers on Economics and Evolution*, No. 0605, Max Planck Institute of Economics, Jena.
- World Bank (2008) *World Development Report 2009*, World Bank, Washington.