

The new economic geography: Past, present and the future*

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Abstract. This article presents a summary of our conversation on the past, present and future of the new economic geography, which took place with the help of an interlocutor in San Juan, Puerto Rico in November 2002. Following the introduction, we explain what the new economic geography is, and we describe some basic models. The discussion of its various critical aspects is presented subsequently, and the article concludes with the discussion of future issues and challenges facing the field.

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1 Introduction

The internet engages people in the exchange of information and movement around the world to such a large extent that rarely do they have opportunities to sit together and enjoy conversation. Thanks to the North American Meetings of the Regional Science Association in San Juan, Puerto Rico in November 2002, the two of us had the rare chance to relax and discuss the past and future of the new economic geography for the special issue of *Papers in Regional Science* celebrating the fiftieth anniversary of the Regional Science Association International. We were together with one of our friends, who kindly volunteered (but preferred to remain anonymous) to serve as the coordinator, or interlocutor, of our discussion.

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largely for analytical tractability. The systematic investigation of efficiency, equity and optimal agglomeration is another important subject for further research. I: Thus far, we have set forth our subject matter in detail, outlining its early stages, growth and development as well as some issues and challenges. All this in short, paves the way for the final phase of our discussion today.

5 The future of the new economic geography

I: You guys have suggested three important directions for future work: enlarging the theoretical menu, buttressing the approach with empirical work, and addressing the welfare and policy implications of the whole approach.

K: Let me add one more. In connecting these three lines of work, *quantified models* can play an important role. By quantified model we do not exactly mean a model fitted to actual data; rather, we mean a theoretically consistent model whose parameters are based on some mix of data and assumptions, so that realistic simulation exercises can be carried out. In certain fields of economics, notably public finance and international trade, such models have been playing an important role as analytical tools.

We should be able to carry out a similar exercise for economic geography – to develop, if you like, *computable geographical equilibrium models*. Due to the highly nonlinear nature of geographical phenomena, such modelling is not easy. Probably it will be necessary to introduce some new technical tricks to make the models consistent with the data. The payoff to such modelling would, however, be a major step toward making theoretical economic geography an actual predictive discipline, able to evaluate the impact of hypothetical shocks – including policy changes – on the economy's spatial structure.

F: Speaking of quantified models, according to Paul Samuelson, von Thünen "not only created *marginalism* and *managerial economics*, but also elaborated one of the first models of *general equilibrium* and did so in terms of realistic *economic parameters*" (Samuelson 1983, p. 1468; emphasis by the original author). In fact, von Thünen was satisfied with his abstract model of the Isolated State only after taking laborious investigations of costs and returns on his Tellow estate over ten years, and then confirming that the collected data fitted well into his model. No wonder Joseph Schumpeter (1954, p. 466) called von Thünen "one of the patron saints of econometrics". So we may consider von Thünen also the pioneer of a computable geographical equilibrium model.

I: Masa, you sound like a big fan of von Thünen.

F: Indeed, in September 2000, I flew all the way from Japan to Tellow (a small village in the north of Berlin, where von Thünen wrote *The Isolated State* while engaging in ceaseless agricultural improvement on his land), and together with his great-granddaughter and her daughter, offered a wreath at von Thünen's grave in commemoration of the 150th anniversary of his death.

I: That's a great story! Now I would like for you to both talk freely on your ideas/suggestions elaborating on one of the four directions for future work, keeping in mind the interested young readers who might work in this field in the future.

The setting could not have been better. During the late morning of a beautiful day in the Caribbean, the three of us relaxed on reclining chairs beside a placid pool, facing a seamless horizon, where the vast blue skies met the deep azure Atlantic Ocean – the very same waters Christopher Columbus sailed 600 years ago in search of “the new world.” The conversations reproduced here have been conducted in an informal tone, which may help illuminate what new economic geography is all about. We provide a general overview of its origins, development, as well as the current debates, which will be particularly helpful to students and the uninitiated in this burgeoning field of research. In general, the discussion summarised below is intended to convey a vivid sense of what is happening, the major issues and challenges facing new economic geography.

Interlocutor: Do you guys often meet like this?

Fujita: Well, we met for a few days in Tokyo about a month ago. But we were so busy that there was no time to sit together like this.

Krugman: Indeed, attending this conference is a real treat for me.

I: Incidentally, congratulations on jointly receiving the first Alonso Pritz for your contributions to the development of the new economic geography.

K: Thanks, but it was a big surprise for me when I was notified about it a couple of months ago.

F: This is a great honour for me. In fact, I only wish that Anthony (J. Venables) were also here with us. Anyway, we share the prize with all our friends and colleagues who have worked towards developing the so-called new economic geography.

I: Today, I would like to let you both talk freely about the past, present, and future of the new economic geography.

2 What the new economic geography is

I: For our readers, it would be nice to review first what the new economic geography is. Perhaps, you might start with its goals.

2.1 Goals of the new economic geography

F: The defining issue of the new economic geography is how to explain the formation of a large variety of economic agglomeration (or concentration) in geographical space. Agglomeration or the clustering of economic activity occurs at many geographical levels, having a variety of compositions. For example, one type of agglomeration arises when small shops and restaurants are clustered in a neighbourhood. Other types of agglomeration can be found in the formation of cities, all having different sizes, ranging from New York to Little Rock; in the emergence of a variety of industrial districts; or in the existence of strong regional disparities within the same country.

At the other extreme of the spectrum lies the core-periphery structure of the global economy corresponding to the North-South dualism. It is also important to

notice that all these different types of agglomeration at different levels are embedded in a larger economy, altogether forming a complex system.

K: Take New York, for example. At one level everyone understands the economics of metropolitan New York reasonably well. As many historians, for example, Albion (1939), explain, the city owes its front-rank status to the initial advantages conveyed by the Erie Canal and the innovations (such as regularly scheduled Atlantic crossings) introduced by its merchants in the early nineteenth century. Its importance is now sustained by the advantages conveyed by an existing agglomeration to certain industries, notably finance and communication. Even now it is difficult to obtain a better account of how these advantages work than is given by Hoover and Vernon (1959). And one can understand much of the *internal* structure of the metropolis by thinking in terms of land-use models along the lines pioneered by Alonso (1964).

F: In fact, when I was a Ph.D. student in the Department of Regional Science at Penn in the late 1960s, Hoover and Vernon (1959) and Alonso (1964) were the main textbooks in the location theory course, together with Weber (1909), Christaller (1933), Lösch (1940) and Isard (1956).

K: And yet from the point of view of someone accustomed to the crystalline clarity of international trade theory, this level of understanding is quite unsatisfactory. You want the discussion of the city's economy to be integrated with an account of the workings of the national (or world) economy as a whole. As an economist would say, you want a *general-equilibrium* story, in which it is clear where the money comes from and where it goes. This story should explain both concentration and dispersion: why so many people work in Manhattan and also why so many other people do not. The long tradition of analysis descending from von Thünen (1826) does an excellent job of explaining the pattern of land use around a city or central business district, but it simply assumes the existence of that central focus. And as far as possible the story should explain the forces of concentration in terms of more fundamental motivations; it should not leave us open to jibes like that of the physicist who said, "So economists believe that companies agglomerate because of agglomeration economies".

I: That sounds rather sarcastic. But it is similar to the attitude of a famous mathematician who once asked Paul A. Samuelson, "Name me one proposition in all of social sciences which is both true and non-trivial."

F: The larger point is that by modelling the sources of increasing returns to spatial concentration, we can learn something about how and when these returns may change, and then explore how the economy's behaviour changes with them.

K: The goal of the new economic geography, then, is to devise a modelling approach, a story-telling machine that lets one discuss things like the economics of New York in the context of the whole economy. That is, in general equilibrium, it should allow us to talk simultaneously about the *centripetal forces* that pull economic activity together and the *centrifugal forces* that push it apart. Indeed, it should allow us to tell stories about how the geographical structure of an economy is shaped by the tension between these forces. And it should explain these forces in terms of more fundamental micro decisions.

I: That sounds perfectly reasonable. But why is it such a difficult order that has to be kept waiting for its fulfillment until now?

K: Indeed, it may not sound like such a tall order. But it turns out that for annoyingly technical reasons it is not an easy order to fill. The sorts of stories that might explain agglomeration in terms of micro decisions depend on increasing returns, or at least indivisibilities, at the level of the individual producer. This, in turn, means that one cannot assume perfect competition, and imperfect competition is notoriously hard to embed in a general-equilibrium story. Transportation costs are also clearly crucial; yet if one wants to have an integrated picture of the economy, this means that the resources used and income generated by the transportation industry must also be part of the picture.

F: Let me emphasise some key terms here. The first is the *general-equilibrium modelling* of an entire spatial economy, which sets apart our approach from that of the traditional location theory and economic geography. The second is *increasing returns or indivisibilities* at the level of the individual producer or plant, which is essential for the economy not to degenerate into "backyard capitalism" (in which each household or small group produces most items for itself). Increasing returns, in turn, lead to the market structure characterised by *imperfect competition*. The third is, of course, *transport costs* (broadly defined), which makes location matter. Finally, the *locational movement* of productive factors and consumers is a prerequisite for agglomeration.

K: Put one thing on top of another, and it all starts to look too complicated to convey any insights. But provided one is willing to make some silly-but-convenient assumptions, assumptions that have also played a role in the new trade theory and the new growth theory that emerged in the second half of the 1980s, things need not be so bad. And that is the strategy employed in the new economic geography.

2.2 Modelling strategies

I: I have a reasonably clear idea about the goals of the new economic geography. But in practice, what kind of "silly assumptions" or modelling strategies do people use?

F: Let Paul, the master player, explain the games played by modellers in the new economic geography.

K: In our book *The Spatial Economy* (1999), Masa, Tony and I offer a slogan only an economist could love: "Dixit-Stiglitz, icebergs, evolution and the computer". Yet the slogan captures the essence of the intellectual tricks that we and other new economic geography theorists have used in order to cope with the technical difficulties involved in trying to deal with the subject. Everyone recognises that these are strategic simplifications, which is to say, intellectual cheap tricks; but they do allow us to get past the technical issues and tell stories about the real economics.

"Dixit-Stiglitz" refers to an ingenious analytical model introduced by Avinash Dixit and Joseph Stiglitz more than twenty years ago (Dixit and Stiglitz 1977). What

they did was take an old idea, that of "monopolistic competition", and give it a much sharper-edged formulation. Monopolistic competition, in turn, may be described as an attempt to recognise the existence of monopoly power – and the increasing returns that give rise to that power – while sacrificing as little as possible the simplicity of good old-fashioned supply and demand. Thus firms have market power and use it; but they are assumed to act in a purely unilateral fashion, never trying to organise cartels or even tacitly collude on prices. Every firm has a monopoly on its own distinctive product, but other firms can introduce products that are (imperfect) substitutes for that product. Telling this story in an uncomplicated fashion requires some funny assumptions both about consumer behaviour and about the technology of production; but it has the virtue of producing in the end a picture of an economy in which there are increasing returns, in which one need not get into the fascinating but messy issues posed by realistic oligopoly.

"Icebergs" refers to a clever model of transportation introduced by Paul Samuelson (1952) in one of the relatively few papers in traditional trade theory that does put transport costs into the story. Instead of describing an industry that produces transportation services, using capital and labour to get stuff from here to there, Samuelson proposed imagining that goods can be shipped freely but that part of the shipment "melts" in transit. Silly, yes, but it sidesteps the need to analyse transportation itself as another industry, and it also turns out to simplify the description of how monopolistic firms set their prices (specially, it removes the incentive to absorb transport costs, charging a lower f.o.b. price for exports than for domestic sales).

"Evolution" refers to how one thinks about how the economy "selects" one of several (or many) possible geographical structures. It is typically true of new economic geography models that they have multiple equilibria: to put a realistic gloss on it, if somehow Philadelphia rather than New York had become established as the centre of the financial industry in 1860, that leadership would be just as self-sustaining today as the one we actually see. It may seem obvious that this means that history determined which of many possible structures actually emerges. But in fact it is not so obvious: what happens if individuals themselves try to forecast the future, and base their decisions on those forecasts? Then one faces the possibility of self-fulfilling prophecies: if most financial firms believed that most other financial firms were about to move to Philadelphia, their belief would be vindicated, but so would a corresponding belief that they would all go to New York or, for that matter, Boston. The slogan of evolution in the new economic geography essentially refers to the decision not to let the hypothetical players be that forward-looking, to assume that decisions about where to locate are based on current conditions, and therefore to rule out self-fulfilling prophecies. The geography of an economy therefore evolves in a way that reflects history and accident, but not expectations of the future.

Finally, the "computer" refers to the tendency of new geography theorists to use high-technology numerical examples, the sort of thing that would have been a major undertaking a generation ago, but can now be carried out almost casually on any desktop computer as an intuition pump, a way to gain a sense of the possibilities implied by the underlying models. It is still possible to learn a great deal from paper-

and-pencil analysis, and often the results both of that analysis and of simulation can be given clear intuitive explanations; but both the analysis and the intuition in general are attained on ground first explored with the computer.

F: Talking about the computer reminds me of Paul's visit to the University of Pennsylvania in 1992. Just after the appearance of Paul's now classic two works, *Increasing Returns and Economic Geography* (1991a) and *Geography and Trade* (1991b), I invited Paul to come to Penn to give a speech, which was realised on April 16, 1992 (incidentally, the same date when a Democratic presidential candidate, Mr. Clinton, came to Philadelphia for a big campaign). In the taxi cab on the way to Penn's campus from the airport, he excitedly opened his laptop and started simulating his "racket economy" model, the programme he had just completed in the Boston airport while waiting for the plane. (The initial version of his "racket economy" had twelve regions around the circumference of a circle, like a clock, and goods must be transported along the circumference.) Starting with any initial distribution of economic activity nearly uniform across space, the simulation always ended with all manufacturing equally agglomerated into just two regions, which located exactly in the opposite side, thus leading to the self-organisation of a central-place system. This surprising result was later proven analytically (in a more general setting with a continuum of locations) in Krugman (1996), *The Self-Organizing Economy*, using Turing's (1952) approach for morphogenesis in biology. Such a combination of computer simulation and paper-and-pencil analysis is typical in the process of theory development in the new economic geography.

I: Turing the famous mathematician?

K: Yes, Alan Turing who introduced the concept of the Turing machine, a mathematical model of the computer. He is also a pioneer of mathematical models of pattern formation in biology.

I: Perhaps, you may now provide representative examples of how such a characteristic method works.

3 Basic models

F: In *The Spatial Economy* we have three classes of models: regional models, urban system models and international models. At first sight, they seem to be dealing with separate issues in disparate fields. But the three classes of models actually represent minor variations of the same basic *modelling architecture*, indicating that these fields are not that disparate after all. Indeed, be it urban economics, location theory or international trade, it's all about where economic activity takes place and why.

I: Let us briefly describe, in turn, the typical approach taken in each class of models.

3.1 Core and periphery

K: The core-periphery model, introduced in Krugman (1991a), is like the $2 \times 2 \times 2$ models of textbook trade theory, providing a basic introductory framework for the

new economic geography – a framework that illustrates how the interactions among increasing returns at the level of the firm, transport costs and factor mobility can cause spatial economic structure to emerge and change.

There are two regions, two production sectors (agriculture and manufacturing), and two types of labour (farmers and workers). The manufacturing sector produces a continuum of varieties of a horizontally differentiated product; each variety is produced by a separate firm with scale economies, using workers as the only input. The agriculture sector produces a homogeneous good under constant returns, using farmers as the only input. Workers are freely mobile between regions; whereas farmers are immobile, distributed equally between the two regions. Finally, the agricultural good is costlessly traded between regions, whereas the interregional trade of manufactures involves a positive transport cost (in an iceberg form).

In this model, the immobility of farmers is a centrifugal force because they consume both types of goods. The centripetal force is more complex, involving a *circular causation*. First, if a larger number of firms locate in a region, a greater number of varieties are produced there. Then, workers (who are consumers) in that region have a better access to a greater number of varieties in comparison with workers in the other region. Thus, (other things being equal) workers in that region get a higher real income, inducing more workers to migrate towards this region. Secondly, the resultant increase in the number of workers (= consumers) creates a larger market than the other region, which in turn yields the *home market effect* familiar in international trade (Krugman 1980). That is because of scale economies, there is an incentive to concentrate the production of each variety in only one region; because of the transport cost (other things being equal) it is more profitable to produce in the region offering a larger market, and ship to the other. This implies the availability of even more varieties of differentiated goods in the region in question. In short, the centripetal force is generated through a circular causation of *forward linkages* (the incentive of workers to be close to the producers of consumer goods) and *backward linkages* (the incentive for producers to concentrate where the market is larger).

If forward and backward linkages are strong enough to overcome the centrifugal force generated by immobile farmers, the economy will end up with a *core-periphery pattern* in which all manufacturing is concentrated in one region. The core-periphery pattern is likely to occur (i) when the transport cost of the manufactures is low enough, (ii) when varieties are sufficiently differentiated, or (iii) when the expenditure on manufactures is large enough.

Agglomeration need not occur, of course. However, a small change in critical parameters can “tip” the economy, from one in which two regions are symmetric and equal to one in which *initial advantages cumulate, turning one region into an industrial core and the other into a de-industrialised periphery*. That is, the dynamics of the model economy are subject to *catastrophic bifurcations*: points at which their qualitative character suddenly changes.

Finally, there turns out to be a subtle but important distinction between the conditions under which a core-periphery geography *can* arise and under which it *must* arise. Basically, there is some range of conditions under which an established concentration of industry in one region would be self-sustaining, but under which an

equal division of industry will also be stable. At one level this is a technical issue – it means that when doing the algebra of the model, the economist must make separate calculations of the conditions for *symmetry breaking* and for *sustainability*. But it also suggests that the possible evolution of geographical structure in the real world has more complexity to it than one might have supposed. Consider, for example, the future financial geography of Europe. One might notice that the US has one dominant financial centre, and might suppose that with growing integration and the introduction of a common currency the same must eventually be true for Europe; but core-periphery theory tells us that sometimes both a polycentric and a monocentric geography are stable – that while Europe would surely sustain a New-York-style financial capital had one been established, it need not necessarily evolve one starting from its current position.

3.2 *Evolving an urban system*

F: Two-location stories are helpful builders of intuition; yet empirical economic geography must cope with a world in which activities are spread across continuous space. Is the new economic geography, like much of traditional trade theory, stuck with “two-ness” and all the imitations that it implies?

The answer is: not necessarily – though there is still quite a difference between what can be formally modelled, or even simulated on a computer, and what one can see on a map.

Perhaps the most appealing, albeit least realistic, approach to the evolution of spatial structure involves applying Turing’s approach for morphogenesis in biology, which I mentioned previously in connection with Paul’s “race-track economy”. The Turing approach offers as nice an example as one might wish for about how trendy concepts like self-organisation might apply in economics, and it has a certain charm for those so-minded in the way that it makes use of unusual tools for economists, notably Fourier transforms. It even suggests some possibly more general insights. But, of course, the real world is neither initially flat nor circular, so the approach is, in a way, no closer to realism than a two-location model.

An alternative, perhaps more directly realistic approach has been followed in a series of my papers with Paul and my students (notably Fujita and Krugman 1995; Fujita and Mori 1997; Fujita et al. 1999). We now change slightly the basic 2×2 model of core-periphery. Instead of two regions, the location space is now described by the real line along which land is distributed uniformly. All workers in the economy are now assumed to be identical and free to choose their location and occupation. The agricultural good is produced now using both land and labour. Finally, transport costs are assumed positive for both the agricultural and industrial goods. In this model, only the agricultural land is the immobile factor, which is the source of the centrifugal force.

The approach starts with a von Thünen “isolated state”: a city, defined as a concentration of manufacturing, surrounded by an agricultural hinterland. (Using the tricks of the new geography trade, it is possible to make this a fully defined equilibrium, in which the existence of the central city is derived from the effects

of forward and backward linkages, rather than simply assumed.) Then one gradually increases the population of the economy as a whole. The outer reaches of the hinterland eventually become sufficiently far from the centre that it becomes worthwhile for some manufacturing to "defect", giving rise to a new city. Further population growth gives rise to still more cities, and so on.

Key to this approach is the recognition that the attractiveness of any given location for manufacturing can be represented by an index of "market potential" derived from the underlying economics (Krugman 1993; but the idea of market potential goes back to Harris 1954, and this new work can be regarded as a justification of that approach). The process of change in the economy can then be regarded as involving a sort of co-evolution in which market potential determines where economic activity locates, and the shifting location of that activity in turn redraws the map of market potential.

Like the Turing approach, this city-evolution approach ends up suggesting that despite the existence of many possible equilibria, there should be some predictable regularities in spatial structure. Once the number of cities has become sufficiently large, the size of and distance between cities tend to settle down at a roughly constant level determined by the relative strength of centripetal and centrifugal forces, providing some justification for the central place theory of Losch (1954). If there are multiple industries that differ in terms of scale economies and/or transport costs, the economy tends to evolve a hierarchical structure reminiscent of Christaller (1933). So this line of work provides a link back to some of the older traditions in location theory and economic geography.

And there is one other payoff to such an evolutionary modelling: it offers an interesting viewpoint on the role of *natural* geography in determining economic geography. Anyone who examines even casually the real geography of economic activity is struck by the important degree of arbitrariness or, at best, historicity involved: New York is New York because of a canal that has not been economically important for 150 years. Silicon Valley, as we know it, exists because of the vision of one Stanford official two generations ago. Yet rivers and ports surely do matter. In new geography models in which a system of cities evolves, these observations are in effect reconciled. Favourable aspects of a location, such as availability of a good harbour, typically have a "catalytic" role: they make it likely that, when a new centre emerges, it will be there rather than some other location in the general vicinity. But once a new centre has become established, it grows through a process of self-reinforcement, and may thus attain a scale at which the initial advantages of the location become unimportant compared with the self-sustaining advantages of the agglomeration itself. In an odd way, natural geography can matter so much precisely because of the self-organising character of the spatial economy.

3.3 Industrial concentration and trade

K: In the previous two types of models, namely, core-periphery and urban system, factor mobility has been a key element in creating agglomeration. But in practice the concentration of production is greater than that of resources, in the sense that not every agglomeration is an important producer in every industry. There are many

cities specialised in a narrow range of industries such as Detroit and Hollywood. Can new economic geography-type models shed light on such industrial concentration, or must one appeal to other forces not present in the basic approach?

The answer is that while more diffuse, hard-to-model forces like informal diffusion of information surely play an important role in creating and sustaining real-world industrial concentrations, it is also possible with a small modification of the core-periphery approach to shift the focus from agglomeration of resources to geographical concentration of particular industries. Such a shift of focus is essential especially in the analysis of international specialisation and trade, defined in our case as models in which labour is immobile among locations.

The key is to allow for a vertical structure of production in which one or more upstream sectors produce inputs for one or more downstream sectors, while both upstream and downstream producers are subject to increasing returns and transport costs. As Venables (1996) showed, this immediately means that there are backward and forward linkages that tend to concentrate the upstream and downstream producers in a single location. That is, producers of intermediate goods have an incentive to locate where they have the largest market, which is where the downstream industry is; and producers of final goods have an incentive to locate where their suppliers are, which is where the upstream industry is located.

One can either elaborate or simplify this basic insight. To simplify, one makes the slightly odd assumption that the upstream and downstream industries are really the same – that is, that the same goods are consumed and used as inputs to production of other goods. As shown in Krugman and Venables (1995), this leads to a formal model of industry concentration that is algebraically isomorphic to the core-periphery model, with only a slight reinterpretation of the meanings of the symbols. Thus this simplification highlights the essential similarity between the reasons why population concentrations within which to be concentrated themselves.

Alternatively, one can imagine a more realistic input-output structure in which each upstream industry provides inputs to several downstream sectors, and conversely. In that case it becomes possible to discuss which characteristics of the input-output matrix cause industrial clusters to form, and also about the sequence in which regions will industrialise as world markets expand (Puga and Venables 1996).

A shift in focus from agglomeration to industry concentration has the incidental effect of bringing the new economic geography to bear on a traditional issue of international trade theory: the role of external economies in trade. A long tradition, going back to Graham (1923), has considered the possibility that increasing returns at the level of the industry (as opposed to the level of the individual plant) can cause otherwise similar countries to specialise in the production of different goods – and also that this process can work to the advantage of some countries at the expense of others (Krugman 1987). Many observers have noticed that the motivating examples for such stories, like the Italian advantage in the production of the British dominance of financial services, tend to involve not just national external economies but specific localisations within countries – a point stressed in modern times by Porter (1990). New economic geography models allow us to revisit this idea with

an additional level of insight, because now the external economies are derived rather than assumed and can therefore be seen to vary in a predictable way as more fundamental parameters of the economy change.

A slightly tongue-in-cheek example is Krugman and Venables (1995), which the authors themselves refer to as "History of the World, Part I". It shows how a gradual process of growing world trade due to falling transport costs can first cause the world to divide spontaneously and arbitrarily into a high-wage, industrialised "North" and a low-wage, primary-producing "South"; then, at a later date, cause the South to rise again at the North's expense. The point is not necessarily that this is a very good story about the actual history of the world economic system; but since stories more or less along these lines have enjoyed considerable popularity over the years, this approach shows how they can be justified by *stratification*, date we say neoclassical, economic models – and also highlights the reasons why the story might *not* work as well as sometimes supposed.

4 Looking at the new economic geography in perspective

I: Thus far, you guys have explained the new economic geography for its own sake. I would now like to introduce several critical issues surrounding the new economic geography and hear your reactions to them. This is not only to satisfy my own curiosity, but also to prepare the ground for our next discussion on the future of the new economic geography.

F: I know there are plenty of critical opinions, from emotional ones to fundamental issues. Which should we start with?

K: Let us begin with philosophical ones, to which we really don't have good enough answers anyway.

4.1 "It's obvious, it's wrong, and anyway they said it years ago"?

I: As you may know, many economic geographers roll their eyes at the mention of "new economic geography":

K: I am aware that this name can annoy hard-working traditional economic geographers, who feel not only that many of the things the "new" geographers say are old hat, but also that the new economic geography ignores almost as much of the reality they study as old trade theory.

I: Not only traditional economic geographers but also some regional scientists and urban economists seem to have been annoyed. In your earlier period of working on the new economic geography, Paul once mentioned, "I am having a terrible time with my work on economic geography. Referees tell me, 'It's obvious, it's wrong, and anyway they said it years ago' (Gans and Shepherd 1994, p. 178)."

K: Perhaps such negative reactions may be partly due to my insufficient attention to previously published work.

¹ The title of this subsection comes from the title of the paper by Isserman (1996).

F: In my opinion, such an apparent rejection by some traditional geographers arose not simply from an insufficient review of previous literature. Rather, it was based on emotional grounds. Whether something is new or not depends in part on the point of view. If one says, for example, "I found a new world", then the native people would be greatly offended. In the present case, the possible offence from the combination of "new" and "economic geography". If one called the same thing "the new geographical economics" or "the new spatial economics", then it might have been less annoying for traditional geographers. In retrospect, however, I guess that the original naming has been constructive because it attracted the attention of many geographers, and we learned how differently economists and traditional geographers treat/understand geographic space.

I: How about the negative reactions of some regional scientists and urban economists?

F: Well, it was a case of "paradise invaded". For regional scientists and urban economists, the field of economic geography/spatial economics has been a paradise where they exclusively enjoyed the mathematical modelling of spatial economic behaviour since the late 1950s. For a long time the paradise was protected naturally from mainstream economists, who deemed spatial economics inherently unprofitable for, as Paul mentioned in Krugman (1995), they did not know how to deal with the problem of market structure in space in the face of increasing returns. Eventually, however, a prominent mainstream economist, Paul Krugman, arrived at the paradise in the early 1990s, carrying with him the new economic geography. It was a kind of invasion. However, the advent of the new economic geography caused a much less emotional snag for regional scientists and urban economists, for they themselves were newcomers (regional science in the late 1950s, and urban economics in the late 1960s) to the original paradise of economic geography. They were rather quick to embrace the new economic geography as a welcome addition to the field of spatial economics.

K: Indeed, we view our work to an important degree as a continuation, perhaps even a validation, of Isard's dream of returning space to the core of economic science.

I: Apart from these emotional reactions, some of the criticism of the new economic geography models and the ways they've been presented, seem valid in their own right. Which criticism did you find the hardest to encounter or deal with? Which criticism is highest on your agenda for future incorporation?

K: I think you are referring to criticism of the intellectual tricks summarised in our slogan "Dixit-Stiglitz, icebergs, evolution and the computer".

I: Yes, I am.

K: We do admit that they represent intellectual cheap tricks, or strategic simplifications, which only an economist could love. But you must also understand that, about a decade ago, we faced a formidable task of developing a new general-equilibrium machinery to enable us to tell stories about how the geographical structure of an economy is shaped by the tension between centripetal forces and centrifugal forces. The question then was simply: "Can we do it, or shall we give it up?" We naturally chose the simplest possible framework for our purposes. This does not mean,

of course, that the new economic geography is forever bound with such an initial choice of strategic simplifications.

F: Replacing "stilly assumptions" with more realistic/general ones would not be easy. I believe, however, it can be done step by step, as I will explain in greater detail when we discuss the future of the new economic geography a bit later.

I: Speaking of Isard's dream, it may be a good time to try to provide a historical account of the development of the new economic geography in connection with its precursors. First, Paul, how did you reach the basic framework of the new economic geography?

4.2 Historical account of the new economic geography

K: Well, in my case, I started thinking in the late 1980s what would be the likely consequences of increased European integration. As I explained in Krugman (1991b), I initially thought that some interesting things about the increasing factor mobility might be said from my own perspective on international trade. As I worked on the subject, however, I found that my analysis was drifting further and further away from international economics as I knew it. In international economics, we take as our base case a world in which resources are completely immobile but in which goods can be costlessly traded. What I found myself gravitating towards was a style of model in which factors of production were perfectly mobile but in which there were costs to transporting goods. In other words, I found myself doing something closer to classical location theory than to international trade theory.

F: Speaking of classical location theory, it is interesting to observe that Paul's experience is quite similar to that of von Thünen, the "founding God" (Samuelson 1983, p. 1468) of economic geography and location theory. Almost two centuries ago, von Thünen's model of *The Isolated State* (1824) was developed by simulating deviating from the then mainstream trade theory. That is, in characterising von Thünen's model, Paul Samuelson states in "Thünen at Two hundred" (1983, p. 1482) as follows:

Ricardian trade theory traditionally assumes zero factor mobility and 100% commodity mobility between countries or regions. Thünen's model works out the opposite case. Within a region, labour moves freely (on immobile land); goods move only at a cost. Where labour will locate was not a question that trade theory considered, but Thünen did.

K: That's an interesting story I was not aware of.

F: Furthermore, there is a close similarity between Paul's core-periphery model and von Thünen's model of a monocentric economy. That is, aside from the treatment of space (a continuous two-dimensional space by von Thünen and a discrete two-region space by Krugman), the core-periphery structure is essentially the same as the monocentric spatial structure of von Thünen in which manufactures are exclusively produced in the city and exported to the surrounding agricultural hinterland.

I: What is the difference then?

F: There is, of course, an essential difference. In von Thünen's model, manufacturing was supposed a priori to take place exclusively in the city of which unique existence

was also assumed a priori. Von Thünen's main concern was how the agricultural activity distributed itself in the hinterland of the city, which was formalised using a perfectly competitive equilibrium model under constant returns. In contrast, in the core-periphery model, manufacturing can possibly occur in either region. However, under certain conditions, all manufacturing agglomerates into a single region due to the centripetal force generated through a circular causation of forward-and-backward linkages as explained previously. For this to happen, of course, there must exist scale economies at firm-level; thus an imperfect competition model is required.

I: Masa, in your case, how did you approach the new economic geography?

F: Well, my case is more directly related with von Thünen's classic work. Before I started working together with Paul on the so-called new economic geography in the early 1990s, I was mainly concerned with the morphology of cities. As is well known, the land use model of monocentric city originated by Alonso (1964) is dual to the land use model of monocentric economy by von Thünen (1824), in which the city is replaced with the CBD, whereas agricultural land is replaced with residential land. When I first learned the Alonso-model in a location theory course at Penn in the late 1960s, I immediately felt something strange about it. That is, when our objective is to explain the spatial structure of a city, the city is a priori assumed to be monocentric (namely, all production activity of the city is supposed to take place at the given centre, or CBD, which is to be surrounded by the residential area of workers who commute to the city).

It was, however, only in the late 1970s when I became seriously concerned with this fundamental limitation of monocentric urban models after Alonso, and started together with my then student, Hideaki Ogawa, to develop the so-called *non-monocentric urban models*. In such a model, all firms and households (= consumers) are assumed to be free to choose their locations within the city, and each worker supplies labour to a firm of his/her choice from his/her residence through commuting. The entire spatial structure of the city (including the number and locations of business centres) is then to be determined endogenously as an outcome of interactions between firms and households through competitive land and labour markets.

I: In non-monocentric urban models, which are the centripetal forces that keep the location of firms and households together in a city?

F: In our earlier models such as Ogawa and Fujita (1980) and Fujita and Ogawa (1982), the centripetal force of the city arises from communication externalities among business workers. Later in Fujita (1988, 1990) I also developed monopolistic competition models of the non-monocentric city, in which stores or firms sell a continuum of differentiated varieties of consumption goods or business services. In the latter class of models, the centripetal force arises from the pecuniary externalities from the transactions of differentiated products between suppliers and buyers, as in the models in the new economic geography. Thus, non-monocentric urban models can be considered as a precursor of the new economic geography.

K: In fact, soon after publishing my first model of the new economic geography in Krugman (1991a), I noticed the existence of such models of urban morphology.

J: Are there precursors of the new economic geography earlier than non-monocentric urban models?

F: Well, historically speaking, both the new economic geography and non-monocentric urban models represent a renewed interest in the "general theory of location and space economy", using the terminology of Isard (1956), or in short, the *general location theory*, which is supposed to embrace "the total spatial array of economic activities" in an economy. Actually, Isard's pioneering thinking on general location theory reflects an earlier idea of Ohlin (1933), who proposed the development of a "general location theory" by integrating trade and location theories. Unfortunately, however, the general equilibrium theory at that time (based on perfect competition) was not ready for advancing such a general location theory.

K: In this sense, as I noted previously, the new economic geography can be viewed as a continuation of Isard's dream of a general location theory.

I: What is the earliest work most closely related with the new economic geography? K: That is a difficult question. However, Alfred Marshall was certainly one of the first, who suggested over a century ago a threefold classification of the reasons for industrial localisation (1890, 1920, Chapter X). In modern terminology, he argued that industrial districts arise because of (i) knowledge spillovers ("the mysteries of the trade become no mysteries; but are as it were, in the air"), (ii) the advantages of thick markets for specialised skills, and (iii) the backward and forward linkages associated with large local markets. The new economic geography in effect considers only the third, one that is arguably less important in practice – but easier to formalise – than the others.

F: Traditionally speaking, Paul is certainly right. When we discuss the reasons for the concentration of an industry at a specific location, or more generally, the agglomeration of people and industries in a city, it has been customary to go back as far as Marshall (1890), and then to Weber (1909) and Hoover (1936), and to the central place theory of Christaller (1933) and Lösch (1940). Recently, however, I had the chance to carefully read the English translation of von Thünen's work by Wartenberg (1966), and found that von Thünen himself provided a very systematic account of most factors explaining economic agglomeration.

I: Really? I never heard such a thing.

K: It is also news for me. *The Isolated State* then is another classic to which everybody refers but few have actually read.

F: This is a good chance to remedy the history of location theory. Economic geographers and location theorists always refer to von Thünen, but (to the best of my knowledge) never in the context of agglomeration economies or city formation. However, one will be surprised to read Sect. 2.6 of Part II of von Thünen (1826, 1966), which contains the extracts of posthumous papers on location theory written between 1826 and 1842, and edited by Hermann Schumacher in 1863. Investigating whether industrial firms are better off located in major cities (especially in the capital), von Thünen first asks for the reasons against the location of industries in the capital, or the centrifugal forces (using the terminology of the new economic geography). Although I cannot go into detail here at the moment, von Thünen's

treatise is surprisingly comprehensive, including the impact of high land rents and high food prices on monetary wages in large cities. Von Thünen (1966, pp. 287–290) next investigates in depth the centripetal forces of industrial agglomeration:

The following factors, on the one hand, favour the location of industries in large towns: (1) Only in large-scale industrial plants is it profitable to install labour-saving machinery and equipment, which economise on manual labour and make for cheaper and more efficient production. (2) The scale of an industrial plant depends on the demand for its products. . . . For all these reasons, large-scale plants are viable only in the capital in many branches of industry. But the division of labour (and Adam Smith has shown the immense influence this has on the size of the labour product and on economies of production), is closely connected with the scale of an industrial plant. This explains why, quite regardless of economies of machine-production, the labour product per head is far higher in large than in small factories. . . . (7) Since it takes machines to produce machines, and these are themselves the product of many different factories and workshops, machinery is produced efficiently only in a place where factories and workshops are close enough together to help each other work in unison, i.e., in large towns. Economic theory has failed to adequately appreciate this factor. Yet it is this which explains why factories are generally found communally, why, even when in all other respects conditions appear suitable, those set up by themselves, in isolated places, so often come to grief. Technical innovations are continually increasing the complexity of machinery, and the more complicated the machines, the more the factor of association will enter into operation.

Although von Thünen wrote his book at the very beginning of the Industrial Revolution in Germany, it would be hard to imagine a more explicit description of the forces shaping the industrial landscape. In particular, observe that the combination of von Thünen's agglomeration factors 1, 2 and 4 closely resembles the "basic story" in Krugman (1991b) on the emergence of a core-periphery structure. Furthermore, if we combine these factors with the last one (7), which is about interindustry linkages and technological spillovers, we receive another fundamental explanation for the emergence of industrial agglomeration.

I: This is a big surprise. I should read von Thünen's book myself. Does this mean that if von Thünen's original theory of monocentric spatial economy were unified with his equally pioneering thinking about industrial agglomeration above, then it would become a typical model of the new economic geography?

F: You are perfectly correct. In fact, what we did in Fujita and Krugman (1995) "When is the economy monocentric: von Thünen and Chamberlin unified", is exactly the unification of von Thünen's two ideas in the original framework of the isolated State in continuous space (albeit without previous knowledge of von Thünen's work on agglomeration economies).

I: Then why did von Thünen not develop such a unified model himself? Or, why did it take so long to take such a (seemingly) small step?

F: To prepare my answer, let me use my favorite metaphor. That is, since the beginning of mankind, almost every person had an eager dream of flying. The basic mechanics of flying has also been understood a fairly long time ago. For example, if you see the drawings of "flying machines" by Leonardo da Vinci in the late fifteenth century, it is clear that he understood well the basic mechanics of flying in the air. But it was not until 1903 that the Wright brothers actually succeeded in

flying more than 200 meters above the ground. Why did it take so long? Because, human power alone was not sufficient for flying in the air, and hence we had to wait for the invention of powerful combustion engines.

Likewise, if we read the following sentences by von Thünen (p. 295) about the impact of the development of transport development on the distribution of towns in the Isolated State, then we can see that von Thünen had actually a good unified-model in mind:

It is worth noting that railway construction will rob of all their force the arguments against the development of the capital, and will strengthen those in favour of such growth. Thus we may say with certainty that railways will make an important contribution to the development of the large towns, and that, but for the fact that railways will promote also the prosperity of the rural districts surrounding the provincial towns, the latter would decay in consequence.

In fact, von Thünen's statement above coincides with one of the most important theoretical findings of the new economic geography: that is, (contrary to the intuitive belief of most people) the development of transport technology (at least in its initial phase) will strengthen the agglomeration of economic activities (operating under increasing returns) in the core region or in large cities.

At the same time, as explained previously, von Thünen understood clearly that the scale economies at individual firm-level are essential for industrial agglomeration. But, as is well-known in modern economic theory, scale economies are inconsistent with perfect competition on which von Thünen's model of agricultural land use was based. Hence in order to develop a truly unified model of the Isolated State, von Thünen needed a *non-competitive general equilibrium model* of the Isolated State. If von Thünen had invented such a model by himself, of course, he could have developed a truly unified theory of the Isolated State. But this is like asking Leonard da Vinci to invent a combustion engine five hundred years ago. In fact, the first operational non-competitive general equilibrium model, called the monopolistic competition model, was invented by Dixit and Stiglitz only in 1977. This monopolistic competition model provided general location theory with a combustion engine, and the new economic geography represents the first prototype to actually succeed in "flying in the air".

4.3 Is the new economic geography too narrowly focused?

I: Let me turn to another subject. As Paul mentioned previously, traditional economic geographers feel that the new economic geography ignores as much of the reality as old trade theory. Do you guys agree with that opinion?

K: I understand their concern. It is true that in all models presented in *The Spatial Economy*, centripetal forces arise solely from pecuniary externalities through linkage effects among consumers and industries, neglecting all other possible sources of agglomeration economies. But it was a deliberate choice. That is, such a narrow focus of the book was designed in order to establish a firm micro-foundation of geographical economics based on modern tools of economic theory. It does not mean that the new economic geography is limited to such a narrow range of models

Table 1. Forces affecting geographical concentration and dispersion

| | |
|--|--|
| Central forces | Central forces |
| Thick markets | Immobile factors |
| Knowledge spillovers and other pure external economies | Land rent / commuting |
| | Congestion and other pure diseconomies |

and issues. On the contrary, its framework is widely open to further development. To elaborate, let us see the following table (which is from *The Spatial Economy*).

On the left, we show the Marshallian trinity of external economies, already described previously. On the right, we show a somewhat comparable trinity of forces opposing agglomeration. There can be little doubt not only that all of these forces operate in the real world, but that all have at least some bearing on almost any real-world issue in economic geography one might discuss. Yet that is, of course, not the way we have approached the subject. In economic modelling it is natural and generally appropriate for the theorist to simplify matters, to focus on only some of the possibilities. So in our modelling we have generally allowed only for linkages as a force for concentration, factor immobility as a force against.

There are, of course, other possible choices. And some of them have recently been explored sporadically. Still, we believe that it would be useful to carry out a more systematic exploration of the implications of our means, to inquire into the behaviour of models in which multiple central and centrifugal forces are operating, to ask how the predictions of those models depend on the relative importance of these forces. Only by carrying out such an exploration will we be in a position to interpret the results of the obvious next step: empirical research.

I: Speaking of empirical research, Paul's comment above somewhat explains the reason for the lack of this in *The Spatial Economy*. Why then did you not include policy analysis in the book?

K: Indeed, so far we have made little effort to draw policy conclusions from the new economic geography literature. The main goal thus far has been to explain why. In principle, the sort of economy envisaged by the models in the new economic geography should be a prime target for government intervention. There is no presumption here that the market will get it right. Moreover, the models suggest that under some circumstances, small policy interventions can have large and perhaps lasting effects. Finally, because cumulative processes of concentration tend to produce winners and losers, perhaps at the level of nations, there is an obvious incentive for policy makers to try to ensure that their nation emerges as one of the winners. Nonetheless, those of us working on these models have been extremely cautious about drawing policy implications. Mainly this reflects a strong sense of how difficult it is to go from suggestive small models to empirically based models that can be used to evaluate specific policies. The long debate over the applicability of the theory of strategic trade policy, which eventually led mainly to an appreciation of just how hard it is to map reality into even sophisticated models of imperfect markets, is fresh in the minds of many of the relevant theorists. And new geogra-

phy models, in which the crucial effects are general equilibrium rather than merely partial equilibrium, are likely to be even harder to make operational. There also is, to be honest, concern (at least on my part) that some of the less pleasant aspects of the history of strategic trade policy will be repeated: the frantic efforts of interested parties to recruit reputable economists to endorse questionable interventionist policies. Admittedly, that temptation was admirably resisted by all the major players in the new trade theory, but it was not an experience one wants to encourage.

But there also is a special consideration that makes policy conclusions difficult in the geographic literature. Consider Table 1 again, bearing in mind that in most cases all the entries will be relevant. What is immediately striking is that there are external effects on both sides. So there is a market failure case to be made both that any given agglomeration is too big (look at the congestion and pollution) and too small (think of the linkages and spillovers that would come with more activity). One may have opinions – I am quite sure in my gut, and even more so in my lungs, that Mexico City is too big – but gut feelings are not a sound basis for policy. One recommendation is safe, however. Because geography is such a crucial factor in development, and there are undoubtedly strong policy implications of some sort, it is an important subject for further research.

F: Closely related – but not identical – to “policy implications” is the issue of optimality. One could argue that the consideration of efficiency and optimality conditions of a model, and the confrontation with equilibrium conditions, has the benefit of improving our understanding of the model’s properties, even disregarding questions of whether and how the findings should affect policy making in reality. It is difficult to imagine that, over the years, you have consistently resisted the temptation to explore optimality issues in the numerical – and analytical – models you have developed, if only for the reason I just mentioned. If I am right, can you indicate in broad terms what sort of tentative, qualitative conclusions you have reached in such exercises? What do they tell us about the properties of the new economic geography models?

F: Indeed, we have always been concerned with optimality issues in that sense. Recall that in the case of the von Thünen model of agricultural land use, for example, the competitive equilibrium (which consists of a concentric ring pattern) is efficient, and is indeed the same as the optimal plan. The same result, however, cannot be expected from monopolistic competition models in the new economic geography, in which several distortions and pecuniary externalities are at work. First, any market equilibrium cannot be the first-best because of non-marginal-cost pricing by monopolistic firms. Second, there is a question of the optimality of the number of monopolistic firms in the whole economy. Third, the optimality of the geographical distribution of firms and workers is in question. For the last two questions, unfortunately, the answers depend largely on the specifics of models. For specific results on optimality issues, see Ottaviano and Thissse (2002) and Baldwin et al. (2003, Chapter 11) with core-periphery models, and Fujita and Thissse (2002, Chapter 10) with urban models. It is, however, too early to derive general conclusions on optimality issues from such specific models which are designed

We may start by discussing Table 1 dealing with the possible theoretical menu to be pursued.

5.1 Theoretical menu

F: Even before considering other possible sources of centripetal forces, an obvious immediate necessity is to develop a more general theory of monopolistic competition based on *linkages* through production and transactions of goods and services. So far, we have worked with specific functional forms on utility and production functions, transport technology and so on. The next step is to work with an alternative set of functional forms and technological assumptions, and investigate the robustness of the results. This is, in fact, being vigorously pursued in studies such as Ottaviano, Tabuchi and Thisse (2003), which deals with a "linear model" of core-periphery. We are then able to develop more complete characterisations of monopolistic competition models. Eventually, further advances in the new economic geography depend largely on the ability of the economics profession to develop a more general class of general equilibrium models involving imperfectly competitive markets in space.

J: Concerning the second type of centripetal forces, namely *thick markets* Paul, you presented in Krugman (1991b, Appendix C) a simple model of labour market pooling. Empirical work such as Dumais, Ellison and Glaeser (1997) also suggests the importance of such a type of agglomeration forces. Can you suggest any further possible work on this line of research?

F: Actually, the model of labour pooling in Krugman (1991b) has recently been extended by Stahl and Walz (2001) and Gerlach, Rønde and Stahl (2001). The former introduces sector-specific shocks as well as firm-specific shocks, together with moving costs of workers across sectors. The latter work introduces endogenous shocks resulting from risky investments by firms to increase their productivity. In these models of labour pooling, labour is assumed to be homogeneous. In contrast, heterogeneity of workers plays the central role in *matching models*, another class of thick labour-markets. When workers are heterogeneous in the type of work they are best-suited for whereas firms can differentiate their technologies in the skill-space, increasing the thickness of the labour distribution within the skill-space yields agglomeration economies through matching externalities. Such a model of labour matching was first highlighted by Helsley and Strange (1990), and extended later by Hamilton, Thisse and Zenou (2000).

All these models of labour pooling and labour matching, however, are essentially spatial, more in the tradition of urban economics. Embedding such models of thick markets into the present framework of the new economic geography would provide an interesting direction for future research.

I: Turning to the third, *knowledge spillovers and other pure external economies*, this type of agglomeration forces has been most widely discussed by geographers, regional scientists, urban economists, and even by management scholars such as Porter (1998). Paul, why have you been rather shy on this topic?

K: I admit that I have been rather asetic on this topic. I could have talked a lot and presented fuzzy models of knowledge/information spillovers, but I chose to be quiet. This is not because I do not agree with the potential importance of such agglomeration forces, but because I could not find any solid micro-model of knowledge spillovers or communications. I chose instead to develop microeconomic foundations of the new economic geography based on linkage factors. I agree, however, that developing solid models of knowledge spillovers is of urgent necessity.

F: I perfectly understand Paul's attitude. There are many models of urban and industrial agglomeration based on (pure or "Marshallian") *external economies*, which are external to individual firms but internal to the industry (Fujita and Thisse 2002). The concept of *external economies* provides a convenient framework, for increasing returns at the industrial level are compatible with competitive equilibrium. Furthermore, Abdel-Rahman and Fujita (1990) show that for descriptive analyses of urban aggregates (such as the equilibrium city size and the wage rate), external economy models often yield the same results as (appropriately designed) monopolistic competition models à la Dixit and Stiglitz.

However, such models have a number of disadvantages. In particular, the sources of external economies are vague, at best. When normative or policy questions are addressed, we need to know more precisely the nature of external economies. Furthermore, since the underlying mechanisms of external economies are not clear, their spatial extent can be specified only exogenously in an ad hoc manner. Even when the spatial process of external economies is well-specified, the essential details regarding the information/knowledge externalities are often missing. For example, in communication externality models of urban morphology (Fujita and Thisse 2002, Chapter 6), although the communication process is well specified, it is not clear what information is exchanged and how it is utilised by firms.

Furthermore, the nature of information/knowledge externalities is essentially dynamic, and hence their full-fledged treatment requires a dynamic framework. Clearly, advancing the micro-foundations of knowledge diffusion and information externalities is a future research direction of major importance.

J: Turning to the column of centrifugal forces in Table 1, do either of you have any additional comments? I do not see much conceptual difficulty in incorporating these centrifugal factors in the present framework of the new economic geography.

F: Let me note just one point. There exist several models of the new economic geography which incorporate the land rent for urban housing (and possibly commuting), such as Helpman (1998) and Tabuchi (1998). These two-region models show that when the transport costs of manufactures become sufficiently low, the industry disperses again to the periphery in order to avoid the high land rent in the core. However, given the discrete nature of space, it is difficult to distinguish whether such an industrial dispersion really represents an interregional dispersion or merely a suburbanisation within a metropolitan area. In order to investigate this question satisfactorily, we need to unify the new geography models and traditional urban models, and study both the development of cities (having spatial extent) and industrial agglomeration in the same continuous space.

5.2 Unifying urban economics and the new economic geography

I: Although urban economics and the new economic geography are largely treated today as two distinct fields, they deal with essentially the same spatial phenomena. Don't you think that finding ways to intertwine the two fields more closely would be beneficial?

K: Certainly. Urban economics consider cities as "floating islands" while assigning big roles to developers and city governments. In contrast, new economic geography has been concerned with self-organisation in space while neglecting developers and governments. It seems the time is ripe for cross-fertilising the two fields.

F: Indeed, some efforts have been undertaken along this line in recent years. For example, the introduction of Tiebout-type inter-jurisdictional competition (in taxation and the provision of local public goods) into core-periphery models has been achieved recently by several people such as Baldwin and Krugman (2000), Kind et al. (2000), and Anderson and Forsid (2003) (Baldwin et al. 2003, Chapters 15–16). The next step would be to graft various urban features (such as land and housing markets, commuting, transportation networks, and other urban infrastructure) onto geographical models with local governments. In modelling the competition among cities, however, we should note that most city-governments/developers have, in practice, very limited powers and foresight in choosing their policies. Instead of fully-fledged Nash games, it may be more appropriate to use a certain kind of evolutionary game combined with an appropriate political process such as voting. Eventually, we must squarely face the concept of cities as a seedbed for the generation, diffusion and accumulation of knowledge, which is central for the phenomena of innovation and economic growth.

I: Now seems to be the right time to discuss more generally about future research on interactions between agglomeration and knowledge externalities.

5.3 Agglomeration, knowledge externalities and growth

I: Masa, you mentioned just previously that a fully-fledged treatment of knowledge externalities requires a dynamic framework. Could you further elaborate on this?

F: Think, for example, about the three of us meeting like this today. By chatting for over two hours, we have certainly learned a lot from each other, and generated (hopefully) many potential ideas for further development of the new economic geography. Suppose, however, we continue this discussion, say, over three days. Not long before the third day, we would have had almost nothing further to talk about on this topic.

The upshot is that, in the short-run, the proximity of people is certainly helpful in the diffusion and generation of knowledge (in particular, through face-to-face communications). In the long-run however, agglomeration of the same group of people in proximity would make their knowledge converge, and hence diminish externalities.

As emphasised by many scholars such as Marshall (1890), Jacobs (1969) and Lucas (1988), agglomeration of a large number of heterogeneous people (essentially, professional workers with heterogeneous skills/knowledge) in a city or in-

dustrial district can naturally be expected to contribute to the diffusion, generalization/innovation, and accumulation of knowledge, and hence to economic growth. This would certainly be true in the short-run. But this is not assured in the long-run unless there is a sufficient infusion of new blood.

Hence, a fully-fledged treatment of knowledge externalities in cities/industrial districts would require a dynamic framework in which the movement/migration of people, in both the short and long-run, among different places, characterized by different *knowledge-fields*, plays an essential role. This also implies that the development of such a dynamic framework will greatly contribute to the further development of a new growth theory in space, in which heterogeneous knowledge fields in different cities/regions are endogenously generated and maintained through cyclical migration of knowledge workers. Therefore, as mentioned previously, advancing the micro-foundations of knowledge externalities is critical for further development of the new economic geography.

K: I definitely agree with Masahisa. There recently appeared several multiregional growth models such as Martin and Ottaviano (1999), Baldwin et al. (2001) and Fujita and Thisse (2002, Chapter 11) in which a core-periphery model is grafted onto a Grossman-Helpman-Komerc-type model of endogenous growth. Although the concept of knowledge externalities play a crucial role in such models, its micro-foundations are rather weak, leaving plenty of room for further development.

I: Speaking of the endogenous formation of knowledge fields, such a concept is closely related with those of social norms and culture. All these concepts are recently very fashionable in geography, regional science as well as in economics. For example, Paul, in your article, "For Richer", in *The New York Times Magazine* (October 20, 2002), you repeatedly mentioned about changing social norms and culture in connection with the growing income divergence in the US. Unfortunately, however, I am unaware of any formal model that can explain the formation and evolution of different social norms and culture in different places. Don't you think it would be important to develop such formal models in the spatial context?

K: Of course, I agree with you. But, ...

I: Hey Paul! Why are standing up? Where are you going?

K: Talking under the Caribbean sun for over two hours has literally fuelled my now burning desire to jump into that ocean.

F: Yeah, all I can think of now is to savour this Caribbean moment with a quick dip and a large beer under the cool shade.

K and F (in unison): *Hasta la vista!*

Sounds of two big splashes

I: Well, I guess it's futile to get the final word on this particular aspect from these two guys. Suffice it to say that the role of social norms and culture is fertile ground for future research. Under less alluring circumstances, I would have had greater success in persuading them to give their pennies worth on the topic, but at the moment, I simply don't have a chance against the beckoning Caribbean sea.

Hey, Paul, Masahisa! Wait for me!

Another big splash is heard, followed by hearty laughter

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