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# Regional Policy in the Global Economy: Insights from New Economic Geography

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OTTAVIANO G. I. P. (2003) Regional policy in the global economy: insights from new economic geography, *Reg. Studies* 37, 665–673. So far the contribution of new economic geography (NEG) has been mainly positive. Normative analysis and policy implications have lagged behind. The reason is the fear of the consequences of taking too literally the neat structure of the models. In this respect the somewhat incautious aim of this paper is precisely to take NEG models literally and ask what their exact policy implications are. This is viewed as a necessary though preliminary step towards bringing NEG insights to the policy domain.

Economic integration      Increasing returns to scale      Market power      Pecuniary externalities      Regional policy  
Spatial economics

OTTAVIANO G. I. P. (2003) La politique régionale au sein de la mondialisation économique: des aperçus de la Nouvelle Géographie Economique, *Reg. Studies* 37, 665–673. Jusqu'ici, la contribution de la Nouvelle Géographie Economique (NGE) s'est avérée essentiellement positive. L'analyse normative et les retombées pour la politique ont du retard. Cela s'explique par la peur des conséquences de prendre au pied de la lettre la structure bien ordonnée des modèles. Avec cette idée en tête, le but quelque peu irréflecti de cet article c'est précisément de prendre au pied de la lettre les modèles de la NGE et de remettre en question leurs retombées pour ce qui est de la politique. On le considère comme une démarche à la fois nécessaire et préalable à l'introduction des aperçus de la NGE dans le domaine de la politique.

Intégration économique      Economies d'échelle croissantes  
Pouvoir de marché      Effets externes péculniaires  
Politique régionale      Economie géographique

OTTAVIANO G. I. P. (2003) Regionalpolitik in der globalen Wirtschaft: Einsichten vom Standpunkt der Neuen Wirtschaftsgeographie, *Reg. Studies* 37, 665–673. Bisher ist der Beitrag der Neuen Wirtschaftsgeographie (New Economic Geography = NEG) vorwiegend positiv ausgefallen. Normative Analyse und Implikationen der Bestrebungen sind zurückgeblieben. Der Grund dafür ist die Befürchtung der Folgen, die eine zu wörtliche Auffassung der tadellosen Struktur des Modells nach sich ziehen könnte. In dieser Hinsicht ist das etwas unvorsichtige Ziel dieses Aufsatzes genau dies: NEG Modelle wörtlich zu nehmen, und die Frage aufzuwerfen, was die exakten Implikationen der Bestrebungen sind. Dies wird als notwendiger, obschon vorläufiger Schritt in Richtung Einführung von NEG Einsichten in den Bereich der Grundsätze angesehen.

Wirtschaftliche Integration  
Dem Maßstab entsprechende steigende Aufwandserträge  
Macht des Marktes      Finanzielle Externalitäten  
Regionalpolitik      Raumwirtschaft

## INTRODUCTION

After more than a decade since the seminal contribution by KRUGMAN, 1991a, the new wave of general equilibrium models in spatial economics, sometimes dubbed 'new economic geography' (henceforth, simply NEG), has now reached its first theoretical consolidation. This has been achieved by the appearance of two books that retrospectively systematize what NEG has attained so far. On the one hand, FUJITA *et al.*, 1999, expose the techniques of NEG models and survey the

positive insights they provide when applied to urban, regional and international issues. On the other hand, FUJITA and THISE, 2002, assess the relative merits of NEG insights within the rich tradition of regional and urban economics.

At this stage the natural question is the one raised by NEARY, 2001: what next? Neary points to two directions for future research: empirics and policy. This paper focuses on the latter. Specifically, its purpose is to provide a streamlined discussion of the key policy implications of NEG. Indeed, as argued by Neary,

'[t]he field's potential to throw light on policy is undoubtedly part of its appeal'. This is clearly exemplified by the few applications of NEG insights to the debate on European regional policies such as MARTIN P., 1999, and PUGA, 2002.

More than scarcity, however, the main problem with existing work on the policy implications of NEG models is the lack of a coherent organizational framework. In other words, there seems to be a disconnect between positive and normative analysis. For example, FUJITA *et al.*, 1999, admittedly restrain from discussing policy. This is praised by NEARY, 2001, who would postpone the meeting between NEG and policy to some undetermined future date for fear of the consequences of taking too literally the neat structure of the models. The point of this paper is rather the opposite: what is needed at this stage is precisely to take the models literally and ask what their exact policy implications are. This is a necessary preliminary step to provide a model-grounded benchmark for more realistic extensions of NEG insights to the policy domain. In other words, if the final aim is to seriously consider NEG contributions to policy, one cannot avoid a deep understanding of what NEG models literally mean in terms of welfare and policy implications. This is the approach recently adopted by BALDWIN *et al.*, 2003, whose results directly inspire the current paper.

The paper is organized as follows. The next section briefly summarizes the basic intuition behind NEG models. In the wake of OTTAVIANO and THISSE, 2001, 2003, it also points out NEG's comparative advantage in terms of policy analysis with respect to alternative modelling strategies. The third section presents a parsimonious list of NEG models' key features along the lines drawn by BALDWIN *et al.*, 2003. The fourth section does the same in terms of implications for regional policies. Though a bit terse, the presentation by lists is chosen for its immediate clarity. A final section concludes with a critical assessment of the limits of NEG models and a prospective view on future research.

### NEG MODELS: BASIC INTUITION

A firm's location decision gives rise to an economic problem when two things are true. First, the shipment of goods and factors across space is costly. Second, production fragmentation is also costly, i.e. there are increasing returns to scale at the plant level. The former gives physical substance to the concept of space. Together with the latter, it generates an economic trade-off between market proximity and production concentration that makes location choices non-trivial. SCOTCHMER and THISSE, 1992, call this the 'folk theorem of spatial economics'.

However, while fundamental, these two ingredients

are incompatible with the perfectly competitive paradigm that still dominates much of mainstream economics. This theoretical impasse is highlighted by STARRETT, 1978, in his 'spatial impossibility theorem': if space is homogenous, there does not exist any competitive equilibrium with shipments between distant locations. Thus, any analysis trying to explain how economic interactions *per se* shape the economic landscape has to leave the assumption of perfect markets and the associated efficiency property of the market equilibrium.

The crucial implication of Starrett's theorem is that any explanation of what we observe in reality is necessarily based on some kind of market imperfection and thus necessarily implies that the market mechanism is not able to deliver an optimal economic landscape. OTTAVIANO and THISSE, 2001, call this the 'spatial question': any positive model of economic geography necessarily raises normative issues.

There are many ways out of the spatial impossibility impasse. Indeed, while there is only one way to be perfect, there are many ways to be imperfect. Most obviously, a first solution is to acknowledge that space is not homogenous. Places differ in terms of their relative abundance of natural resources, proximity to natural means of communication and climatic conditions. This is the way out investigated by international trade theory. However, it seems an inadequate explanation of the dramatic differences in economic development that one observes even between areas that are not very different in terms of those exogenous properties. In other words, there must be something more going on that is inherent to the functioning of economic interactions. This point was raised quite forcefully by MARSHALL, 1890, who stressed the role of both localized technological and pecuniary externalities. Both concepts stem from the standard textbook situation in which market prices incompletely reflect the cost and utility values of the interactions between economic agents. However, while the problem with technological externalities is that some effects of the interactions are not priced at all, with pecuniary externalities the problem lies in the price distortion due to the presence of market power. Accordingly, while the former can be transmitted by sheer proximity, the transmission of the latter requires market transactions.

Localized pecuniary externalities are at the core of NEG. Eventually, their comparative advantage lies in the possibility of relating their emergence to a set of well-defined microeconomic parameters. So far, this has proved to be quite difficult in models based on the concept of technological externalities as these still remain mostly 'black boxes' (OTTAVIANO and THISSE, 2001). In particular, NEG shows how pecuniary externalities arise in sectors characterized by relevant trade costs (due to transportation as well as to administrative and cultural barriers), increasing returns to scale and monopolistic competition. In those sectors,

when a new firm starts producing in a certain location, it increases local demand for upstream activities ('market expansion effect') and local supply for downstream ones ('market crowding effect'). It generates a pecuniary externality in so far as its entry decision is based on its own profit and this, due to imperfect competition, does not perfectly reflect all the changes in the payoffs of upstream and downstream activities.

Agglomeration takes place when the final impact of the market expansion effect dominates the impact of the market crowding effect. Consider, for instance, the situation depicted by VENABLES, 1996, where there are three vertically linked activities: intermediate production; final production; and consumption. For simplicity, assume that final production uses only intermediate inputs, intermediate production employs only labour and workers are the only source of final demand. If, for any reason, a new firm starts producing intermediates, it will increase labour demand and intermediate supply. Due to excess demand and supply respectively, wages will go up while intermediate prices will fall. This is bad news for the other intermediate producers ('market crowding effect'). However, it is good news for final suppliers, who experience falling production costs and higher demand by richer workers. As new final producers are lured to enter the market, the expansion of final production will feed back into stronger intermediate demand so that also intermediate suppliers will benefit ('market expansion effect'). When the latter effect dominates the former, both final and intermediate firms will end up being agglomerated in the same place.

This mechanism is not new. For example, it is carefully described by both MARSHALL, 1890, and OHLIN, 1933. The crucial contribution of NEG is that it is translated into a general equilibrium model with solid microeconomic foundations (see, for example, MARTIN R., 1999, for a critical assessment as well as FUJITA and THISSE, 2002, for a detailed reply). Accordingly, the evolution of the spatial landscape is related to microeconomic parameters: agglomeration is more likely to take place in sectors where increasing returns are intense, market power is strong, customers and suppliers are easily mobile, and trade costs are low. The reason is that more intense returns to scale and stronger market power weaken the market crowding effect, while more mobile customers and suppliers amplify the market expansion effect. On the other hand, lower trade costs reduce both market expansion and market crowding effects, but the latter more than the former.

The impact of trade liberalization is probably the central insight of NEG models. At first sight, it does not sound that new as it is reminiscent of KALDOR, 1970, who predicts the loss of its industrial base by a less developed region facing trade liberalization with respect to a more developed one. The purpose of adding NEG models is to provide a more detailed

understanding of how the economic landscape evolves as trade impediments are gradually eliminated. In particular, this is shown to affect the balance between market expansion and market crowding effects in a very non-linear way. The next section provides evidence for this statement.

## NEG MODELS: KEY FEATURES

The relation between the level of trade costs and the spatial distribution of economic activities in NEG models can be conveniently summarized by Fig. 1. Indeed, as pointed out by BALDWIN *et al.*, 2003, the scenario depicted by Fig. 1 is broadly consistent with most NEG models, both static (e.g. KRUGMAN, 1991a; KRUGMAN and VENABLES, 1995; VENABLES, 1996; PUGA, 1999; OTTAVIANO *et al.*, 2002) and dynamic ones (e.g. BALDWIN, 1999; MARTIN and OTTAVIANO, 1999, 2001; BALDWIN *et al.*, 2001).

Fig. 1 portrays the possible long-run spatial configurations of a simple economy consisting of two regions with no inner spatial dimensions. There are two productive sectors. The first sector is perfectly competitive, operates under constant returns to scale, and its output is freely traded between regions. The second sector is monopolistically competitive, operates under increasing returns to scale, and interregional shipments of its output are costly because of trade impediments. The focus is on the location of firms belonging to the latter sector.

In the figure the extent of trade freeness,  $\phi$ , is represented on the horizontal axis while the share of firms located in one of the regions appears on the vertical one. Trade freeness is an inverse measure of trade costs:  $\phi = 0$  means autarky;  $\phi = 1$  means free trade. Heavy solid lines indicate long-run outcomes. These are geographical distributions of firms towards which the economic system evolves as pointed out by the vertical arrows. Fig. 1 then shows that for low

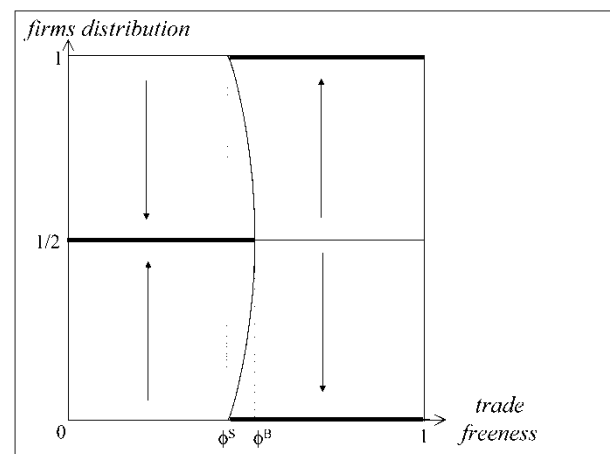


Fig. 1. The basic NEG model

trade freeness (i.e.  $(\phi < \phi^S)$ ) a dispersed geographical distribution of firms is the only long-run outcome. For high trade freeness (i.e.  $\phi > \phi^B$ ) agglomeration in either region is the only long-run outcome. For intermediate values of trade freeness (i.e.  $\phi^S < \phi < \phi^B$ ) both dispersion and agglomeration can emerge in the long run. FUJITA *et al.*, 1999, call the values  $\phi^B$  and  $\phi^S$  'break point' and 'sustain point' respectively: as freeness crosses  $\phi^S$  from below agglomeration becomes 'sustainable' as a long-run outcome; as freeness crosses  $\phi^B$  from below symmetric dispersion is 'broken'.

Fig. 1 can be used to discuss all the key features of NEG models as recently classified by BALDWIN *et al.*, 2003. These are seven: home-market magnification; circular causality; hump-shaped agglomeration rents; endogenous asymmetry; catastrophic agglomeration; locational hysteresis; and self-fulfilling expectations.

#### Home market magnification

The first key feature of NEG models is the 'home market effect' (HELPMAN and KRUGMAN, 1985). This is the net effect of market expansion and market crowding and reflects the fact that an exogenous change in the location of upstream demand leads to a more than proportional change of downstream supply in the same direction.

Crucially, the strength of the home market effect depends on the level of trade freeness, a property called 'home market magnification' by BALDWIN, 2000. Specifically, since freer trade weakens the market crowding effect more than the market expansion effect, lower trade costs magnify the change of downstream supply that comes from a given shift in upstream demand. Thus, if we consider an initial situation in which firms are dispersed between regions, increasing trade freeness tends to make firms more footloose, not less as one might expect.

#### Circular causality

The second key feature of NEG models is the fact that agglomeration forces are self-enforcing. This feature is sometimes called 'circular causality' to stress the feedback relation between economic activities: upstream expansion can lead to downstream expansion and vice versa.

Unlike home market magnification, circular causality is not typical of NEG models only. Indeed, any model with localized external economies, whether pecuniary or technological, would exhibit circular causality. What is typical instead of NEG models is that the strength of circular causality depends on the level of trade barriers.

#### Hump-shaped agglomeration rents

The relation between the strength of circular causality and trade freeness shows up in the third key feature of

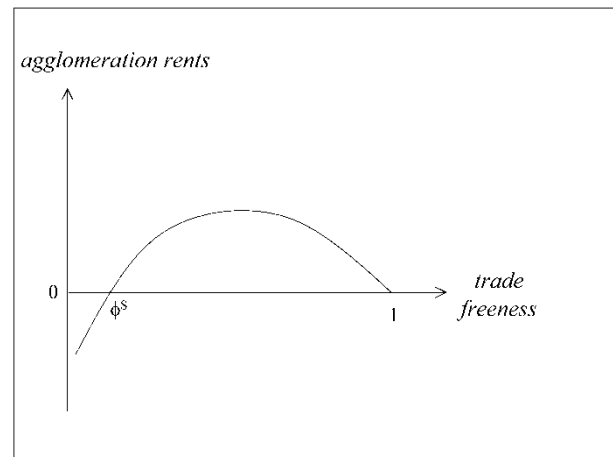


Fig. 2. Hump-shaped agglomeration rents

NEG models, namely 'hump-shaped agglomeration rents'. Considering a long-run outcome where all firms are located in one region only, agglomeration rents are defined as the loss that a firm would incur by relocating to the other region. Then, the hump shape refers to the fact that agglomeration rents are a concave function of trade freeness.

The dependence of agglomeration rents on trade freeness is depicted in Fig. 2, which has freeness on the horizontal axis and rents on the vertical one. The figure shows that agglomeration rents equal zero at  $\phi = \phi^S$  and  $\phi = 1$ , while they are positive in between and reach a maximum for some intermediate value of trade freeness. Accordingly, starting at  $\phi = \phi^S$ , as trade gets freer (i.e.,  $\phi$  rises towards 1), the agglomeration rents first rise and then fall ('hump shape').

In Fig. 2 the horizontal intercepts of agglomeration rents are readily explained. Rents equal zero at  $\phi = 1$  as in this case trade is free so that a firm's location is immaterial. They also equal zero at  $\phi = \phi^S$  because, when freeness falls below the sustain point  $\phi^S$ , firms are better off if they do not cluster. This implies that the rents from agglomeration are negative.

#### Endogenous asymmetry

Circular causality accounts for the fourth key feature of NEG models: 'endogenous asymmetry'. This relates to the fact that, as Fig. 1 shows, starting with two symmetric regions and very high trade barriers, a gradual increase in trade freeness eventually produces regional asymmetries. The reason is that, as freeness crosses the break point  $\phi^B$ , symmetric dispersion ceases to be a long-run outcome and firms start clustering in one region. This feature is important because it allows for the emergence of spatial imbalances independently of any nature-given regional unevenness.

As in the case of circular causality, endogenous asymmetry would arise also in models based on localized technological externalities. However, in those

models the level of trade impediments would play no role in determining whether agglomeration emerges or not. This is not true in NEG models as trade costs have to be low enough for agglomeration to be a long-run outcome.

#### *Catastrophic agglomeration*

The importance of the extent of trade freeness in causing agglomeration is somewhat dramatically stressed by the fifth key feature of NEG models, namely 'catastrophic agglomeration'. The name is motivated by the fact that the way in which endogenous asymmetry emerges is highly discontinuous.

As discussed above, Fig. 1 points out that, starting at a symmetric outcome and very low trade freeness, a gradual decrease in trade barriers does not affect the geographical distribution of firms until the break point  $\phi^B$  is reached. However, once that point has been reached, even a small increase in freeness triggers catastrophic agglomeration in that all of a sudden the only long-run outcome is agglomeration.

#### *Locational hysteresis*

'Locational hysteresis' is the sixth key feature of NEG models and it arises when the level of trade freeness is such that there are multiple long-run outcomes (i.e. for  $\phi > \phi^S$ ). In this case, history matters.

Consider, for example, an initial situation in which almost all firms are located in the same region and  $\phi > \phi^B > \phi^S$ . Then, the arrows in Fig. 1 tell us that all firms will eventually cluster in that region. However, if a large enough shock moved a majority of firms to the other region, all firms would eventually cluster there. What is crucial is that even a temporary shock would do the job. Indeed, the removal of the initial shock would not lead to a reversal of its effects. This is 'hysteresis' or 'path-dependency': transitory shocks have permanent effects.

Models with localized technological externalities also typically produce multiple long-run outcomes. Once more, the difference lies in the fact that multiplicity arises regardless of the level of trade impediments.

#### *The overlap and self-fulfilling expectations*

The seventh and last key feature of NEG models appears when dispersion and agglomeration are both long-run outcomes. As Fig. 1 shows, this is the case when  $\phi$  falls in the range between  $\phi^S$  and  $\phi^B$ . BALDWIN *et al.*, 2003, call this range the 'overlap'. When the main concern of firms is the future and the market expansion effect is very strong, the existence of that range implies that a jump between the dispersed and agglomerated outcomes can be triggered by a shock to expectations.

This follows from circular causation. Since agglomeration rents are self-enforcing, firms may end up being

clustered in one region simply because all expect it to happen. In other words, in the presence of circular causality, the shared belief that all firms will cluster in a certain region is self-rewarding and thus self-fulfilling.

Expectations can be self-fulfilling also in models with technological externalities and indeed it is in one of such models that the point was originally raised by KRUGMAN, 1991b. Again, the difference of NEG models is to be found in their microeconomic foundations. The possibility of self-fulfilling prophecies arises when the agglomeration rents are large enough. As argued above, in NEG models this happens when trade freeness is high enough but not too high (OTTAVIANO *et al.*, 2002).

### NEG MODELS: KEY POLICY IMPLICATIONS

Let us now turn to policy analysis by taking NEG models literally. That is, let us distil the essence of their policy implications from the seven key features described in the previous section. This yields six key implications: regional side effects; trade interaction effects; threshold effects; lock-in effects; selection effects; and coordination effects.

#### *Regional side-effects*

The spatial distribution of economic activities is the central concern of regional policy. The reason is that such distribution has relevant welfare implications. From an efficiency point of view, the way activities are organized across sites affects the overall wealth an area can generate. From an equity point of view, the spatial organization of activities also affects the geographical distribution of overall wealth.

The first key policy implication of NEG models is that all sorts of non-regional policies can have 'regional side-effects', that is, a potentially large impact on the location of economic activities and thus on the geographical distribution of wealth. In particular, this is true for all the policies that influence the balance between market expansion and market crowding effects.

As pointed out by BALDWIN *et al.*, 2003, policy analysts tend to be rather focused, with tax experts looking at tax policies, competition experts looking at competition policies, trade experts looking at trade policies and so on. In the wake of NEG models, such mono-minded approaches are likely to be incomplete at best. Indeed, because the geographical distribution of economic activities is endogenous to most policy interventions, an evaluation of their impacts without taking into account the mobility of economic agents would run the risk of being wide of the mark. In some sense, this argument is reminiscent of Lucas's critique to macroeconomic models lacking microeconomic foundations.

Consider, for instance, the implementation of an anti-trust law that reduces the market power of firms. According to NEG models, such policy would strengthen the market crowding effect, thus leading to a more balanced distribution of firms. This is the regional side-effect of the chosen competition policy. Alternatively, consider the enforcement of a protectionist law that reduces the degree of trade freeness. According to NEG models, this policy would strengthen the market crowding effect more than the market expansion one, thus leading again to a more balanced distribution of economic activities. This is the regional side-effect of the chosen trade policy.

#### *Trade interaction effects*

A second key policy implication of NEG models is that the impact of regional policies depends on the extent of trade integration. In particular, home-market magnification means that firms are more footloose when trade barriers are lower. Accordingly, the very same intervention – whether through taxes, subsidies, infrastructure, antitrust or R&D policies – will have a much stronger impact on firms' location.

As an example, consider the scenario studied by OTTAVIANO, 2001, in the context of investment subsidies. The institutional framework is the EU imposition of state-aid caps, which limits the share of public money in the initial investments made to start private enterprises. Since caps vary on a regional basis, they indirectly determine a matrix of maximum bilateral subsidy differentials. In this set-up the home-market effect generates an overall tendency of imperfectly competitive sectors to inefficiently cluster in regions that offer market access advantages. The location inefficiency can be corrected by an optimal subsidy differential in favour of peripheral regions.

More crucially, home-market magnification implies that the inefficiency becomes more severe the lower trade costs are. Nonetheless, as trade costs fall, the optimal subsidy differential shrinks. Thus, even though trade integration increases the welfare loss due to inefficient location, the policy asymmetry needed to restore efficiency falls. The explanation is precisely that, as trade costs fall, firms become increasingly footloose. On the one side, this fosters their inefficient concentration in the regions with better market access, on the other it makes firms more responsive to any given differential in subsidies.

These cooperative results are confronted with a non-cooperative tax-competition scenario by OTTAVIANO and VAN YPERSELE, 2002. They show that, when regions differ in terms of market access, tax competition for mobile firms is efficiency-enhancing with respect to the free market outcome. The reason is that tax competition generates subsidy differentials that favour peripheral regions; as firms are attracted towards central regions because of agglomeration rents, these regions

can offer lower subsidies without losing all their attractiveness. Nonetheless, the tax-competitive subsidy differentials are too pronounced, which leads too many firms to locate in peripheral regions. This provides theoretical ground for limiting tax competition through state-aid caps conditional on trade costs.

#### *Threshold effects*

The third key policy implication of NEG models is 'threshold effects'. To see this, consider an initial situation in which trade barriers are high ( $\phi < \phi^B$ ) and firms are evenly distributed across regions. As long as freeness is below the break point, firms remain dispersed since this is the only long-run outcome. However, as trade is gradually liberalized and freeness crosses the break point, Fig. 1 shows the sudden appearance of what FUJITA and THISSE, 1996, call 'putty clay geography'; there is *a priori* great flexibility on where particular activities locate, but once spatial differences take shape they become quite rigid. The reason is circular causality: agglomeration is self-enforcing as it produces rents that tend to hold firms and factors in place.

Putty clay geography implies that policy interventions of somewhat limited size may have no impact whatsoever on the location of firms. Indeed, only when the magnitude of intervention rises above some threshold level do the economic landscapes start to change. When this happens, the forces that sustained the *status quo* unwind quite rapidly giving rise to sudden geographical shifts.

This threshold property of effective policy intervention casts doubts on regional fine tuning. Marginal policy changes are completely ineffective until the cumulated change remains below a certain threshold. After the threshold is crossed, the impact is catastrophic. BALDWIN *et al.*, 2003, stress the analogy with the way plate-tectonics shape the earth's physical geography. Even if the underlying force is steady, its effects appear as long periods of quiescence punctuated by earthquakes and volcanic eruptions that suddenly and dramatically alter the landscape.

As an example of threshold effects, consider the case analysed by KIND *et al.*, 2000, as well as BALDWIN and KRUGMAN, 2000. These authors depict an initial situation in which firms are agglomerated in some region. They show that, if another region wants to attract firms, it has to offer a subsidy that is larger than the agglomeration rents firms enjoy in their current location. Any differential that falls short of this threshold has no impact on firms' location. Moreover, as agglomeration rents are hump-shaped, the threshold subsidy varies with the level of trade freeness. In particular, as suggested by Fig. 2, it reaches a maximum for intermediate trade impediments; as trade costs fall further, it becomes increasingly easier to 'steal' the agglomeration.

*Lock-in effects*

The fourth key policy implication of NEG models is 'lock-in effects'. These stem from locational hysteresis, which implies that temporary policy changes can have permanent location effects.

To see this, consider Fig. 1 again and the following thought experiment. The initial configuration has all firms clustered in one region. Trade freeness is above both the sustain point  $\phi^S$  and the break point  $\phi^B$  so that the initial configuration is a long-run outcome. In addition, there exists only another potential long-run outcome in which all firms are clustered in the other region.

Now suppose the deserted region offers a subsidy to firms that is large enough to convince them all to relocate. How long should the subsidy remain in place to sustain the shifted agglomeration? The answer is no time at all. Indeed, once firms have moved, there is no need for any subsidy to exist, because the new agglomeration is self-enforcing. Thus, even temporary policy shocks can have permanent effects on the economic landscape. Moreover, reversing the effects of a certain policy may be difficult and require policy reforms that are much larger than the change that led to the initial effects.

*Selection effects*

The fifth key policy implication of NEG models is 'selection effects', which materialize when there is a multiplicity of long-run outcomes. As Fig. 1 shows, that is the case when trade freeness is large enough (precisely,  $\phi > \phi^S$ ). In this situation of indeterminacy of the final outcome, policy intervention can play an important role in selecting which distribution of firms will be reached in the long run.

As a simple example, consider an initial situation in which firms are evenly dispersed across regions and trade freeness is low enough to make such distribution sustainable as a long-run outcome (i.e.  $\phi < \phi^B$ ). Now increase trade freeness above the break point  $\phi^B$ . This will destabilize the dispersed configuration so that firms will eventually agglomerate in one of the regions. However, since regions are identical in terms of all their exogenous attributes, which region will attract the cluster is undetermined.

In such a flexible situation, even minor policy changes can break the tie and thus have major effects on the final distribution of firms. For instance, even a small subsidy that lures only very few firms can be enough to attract the entire cluster. The reason is again self-enforcing agglomeration: once some firms move, agglomeration rents start growing so that all other firms have an incentive to follow. Thus, in the presence of a multiplicity of potential long-run outcomes, policy intervention can act as a selective device.

*Coordination effects*

The sixth and last key policy implication of NEG models is 'coordination effects'. These arise when the complexities of forward-looking behaviour become relevant.

As argued above, this may happen in the overlap ( $\phi^S < \phi < \phi^B$ ). In this interval dispersion as well as agglomeration are potential long-run outcomes and expectations rather than history determine which spatial configuration will eventually emerge. The reason is that expectations become self-fulfilling: a firm's rational choice is to locate where it believes other firms will locate. Thus, shocks to expectations can have a strong impact on the economic landscape even without any actual change in environmental parameters.

Self-fulfilling expectations add a new dimension to the selection effects of policy interventions. Specifically, public authorities can shape the economic landscape by coordinating the expectations of firms. In principle, this can happen even in the absence of any policy implementation.

As an example, consider again the case of the tie-breaking subsidy discussed above. When history mattered, even a small transitory subsidy had large permanent effects on the location of firms. Now that expectations matter, no subsidy is actually required. All that a region needs to attract all firms is the credible announcement of the subsidy. This will be enough to generate an optimistic view on the future of the region. Firms will move accordingly and the lock-in effect of self-enforcing agglomeration will make the cluster self-rewarding even if the subsidy is not actually delivered. Thus, credible announcements are sufficient to make policies reach their stated aims without ever being implemented. Vice versa, perfectly plausible policies might have no or even perverse effects because of lack of communication or credibility.

**CONCLUDING REMARKS**

A shared view on the current state of NEG stresses two main directions of future research: empirical tests and policy applications. As to the latter, it has been argued, for example by NEARY, 2001, that NEG models are too stylized to be taken literally and therefore policy speculation should be deferred until more realistic models appear.

The present paper, mainly based on the thorough investigations of BALDWIN *et al.*, 2003, has taken a rather different position and argued that, for policy analysis to proceed, the first step is precisely to take the models literally. As NEG's potential to throw light on policy is undoubtedly part of its appeal, it is worthwhile asking what its exact policy implications are.

The next step will be to acknowledge the limits of NEG models, which boils down to assessing the theoretical robustness and the empirical relevance of



their key features and implications. First of all, to some critics some results are simply too stark. One such result is catastrophic agglomeration. This is probably the least robust feature of NEG models. For example, PUGA, 1999, shows that the existence of some congestion in the agglomerating region can smooth the transition from dispersion to agglomeration. TABUCHI and THISSE, 2002, as well as MURATA, 2003, point out that the same would happen if some heterogeneity were introduced across firms, which is usually neglected in NEG models.

Another disturbing result is that static NEG models depict the location process as a win–lose situation. Specifically, for a region it is always better to attract firms and this happens to the detriment of other regions. Such a clear welfare ranking runs the risk of fostering what NEARY, 2001, calls ‘strategic location policy’ through the exploitation of the selection effects of policy interventions. It should be noted, however, that the win–lose scenario is typical of static models but it is not the rule in dynamic models as shown, for instance, by MARTIN and OTTAVIANO, 1999. In these models, policies that foster agglomeration in a region may nonetheless make also other regions better off by promoting growth.

More generally, as pointed out by OTTAVIANO and

THISSE, 2002, efficiency and equity considerations should not be confused. This highlights another important limitation of NEG models: welfare analysis is still at an infant stage and this hampers their policy applications. On the one side, some central questions of regional planning are still left unanswered – among them, those on the optimal size and number of regional clusters. On the other hand, the study of the consequences of a few distortions that are relevant to policy makers is still underdeveloped – among them, unemployment and strategic interactions between firms.

Finally, as to the empirical relevance, the biggest effort should go into two main directions. On the one side, one should find ways to test the non-linear non-monotonic relations predicted by NEG models. On the other, one should try to disentangle pecuniary and technological externalities by solving the riddle of their *prima facie* observational equivalence.

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