ECONOMIC GEOGRAPHY AND CLUSTER POLICY, WITH SPECIAL REFERENCE TO KAZAKHSTAN

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ABSTRACT

After the collapse of the Soviet Union, the Central Asian Economies became independent and autonomous countries. Like most of the transition economies, they have experienced considerable difficulties in their economic development in moving from a centrally planned system to a market economy. Over the first ten years of transition there was a significant economic dislocation, with very low or even negative growth rates. However, at the beginning of the 2000s, their fortunes changed as they started experiencing a rapid growth path. Kazakhstan is an excellent example of this. Consequently, a major issue is to understand what are the best economic policies to ensure that these rapid rates of growth are maintained. This paper considers the implications of economic geography, especially the role of space, distance, and density, and of cluster policies for the development path of these countries, with special reference to Kazakhstan. It discusses whether or not it is optimal to implement a resource-based cluster development strategy for these countries and concludes considering other possible development strategies.

Key words: central Asian economies, cluster policies, development strategies, economic geography, transition economies.

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"*The development of well-functioning clusters is one of the essential steps in moving to an advanced country" (Porter, 1998, p. 234).*

1. Introduction

The CAREC[2] countries have now been independent from the former Soviet Union for nearly two decades. Yet they still face considerable problems in their economic development, notwithstanding their rapid growth over the last seven or so years. Like many other transition economies, the initial move towards a market economy was accompanied by a significant economic dislocation, with low or negative growth rates. Moreover, the prognosis at the end of the 1990s was not good because of the lack of political and economic cooperation between the countries and their vast distances from the major world markets (Olcott *et al.,* 1999). Since about 2000, however, there has been a remarkable transformation in their fortunes with rapid growth rates averaging between 5 and 9 per cent per annum. There has also been a more positive move towards a market economy, increased efficiency, and regional cooperation. (Olcott, 2005). (See Pomfret (2006) for a good discussion of the post-1991 performance of the Central Asian Economies.[3]) With the exception of Kazakhstan, their exposure to 2007/10 financial crisis was limited, and it reduced the average growth rate of the CAREC counties by only about one percentage point.[4] Kazakhstan is the most developed of the Central Asian countries and is now classed as a "middle income" country by the World Bank. It already sees itself as having the potential to join the BRIC countries (Brazil, Russia, India and China) but, nevertheless, it still has a long way to go (Olcott, 2008). Consequently, a central question facing not only Kazakhstan, but all the CAREC countries is what are the best economic policies to ensure that the rapid rates of growth since 2000 are maintained?

This chapter considers the implications of economic geography, especially space and distance, for the development of the CAREC countries, and in particular the Central Asian Economies. One of the major set of impediments to rapid growth is the landlocked nature

[2] The CAREC countries are Azerbaijan, Kazakhstan, the Kyrgyz Republic, Tajikistan, Uzbekistan, Afghanistan, Northern China and Mongolia.
[3] The Central Asian Economies are Azerbaijan, Kazakhstan, the Kyrgyz Republic, Tajikistan, Uzbekistan. Although very diverse in their institutions and resource bases, they form a natural grouping in terms of their development problems.
[4] Kazakhstan has the most developed financial sector of the CAREC countries which is integrated into the world financial markets. Hence, it was the most severely affected by the sub-prime crisis.

of these countries, their poor transport infrastructure and high transport costs (Asian Development Bank, 2006, Raballand *et al.,* 2005). But the importance of space and distance goes beyond these considerations, important though they are.

More generally, in recent years, there has been increasing evidence amongst mainstream economists that space and density, factors long neglected in neoclassical growth models, including both the Solow and endogenous specifications, are important in explaining both the level and productivity growth of a region or country (World Bank, 2008)[5]. This has important implications for any national economic development strategy, including those of the CAREC countries. A corollary is that it is now appreciated that increasing returns, especially city agglomeration economies, an essential part of the story. In many advanced, developing and transition countries, there has been a marked change from trying to promote economic growth solely by policies at the national level to a more 'bottom-up' approach based on identifying and encouraging spatial groupings or 'clusters' of firms and enhancing the competitiveness of cities. This is especially true of Kazakhstan and the other CAREC countries are likely to follow Kazakhstan's lead.

As we shall see, there is evidence that suggests that firms that are in close spatial proximity to each other benefit from a number of positive externalities, ranging from technological spillovers to the advantages of pooling labour and the specialisation of firms producing intermediate goods. Thus, increasing returns, the density of production and spatial clusters of firms are all interrelated and form a central part of any explanation of both international and regional productivity disparities. Any attempt to achieve balanced spatial development is likely to drastically reduce the overall rate of growth, but development will bring with it convergence in per capita incomes (see World Bank, 2008, chapter 1).

In the policy field, undoubtedly one of the most influential concepts is the concept of the 'cluster'. While the cluster is not a precisely defined term, it generally refers to the spatial concentration of firms and its importance stems from the fact that these firms benefit from increasing returns broadly defined to include, especially, agglomeration economies as noted above.

[5] Regional economists and economic geographers have long appreciated this.

The cluster has become largely associated in policy circles with the approach taken by Michael Porter (1990, 1993, 1998, 2000, 2003). Indeed, it is fair to say that the term cluster is now almost exclusively associated with Porter, notwithstanding the larger number of studies on related concepts by economic geographers and regional scientists. (For an interesting, although now somewhat dated analysis of studies on clusters, see van der Linde, 2002). Porter has advised numerous countries on clusters, including Kazakhstan (Porter 2005), and largely through his work, cluster analysis and development has blossomed in the policy area, with the World Bank, the OECD (Roeland and den Hertog, 1999, OECD 2005), the UN, and national governments all taking an active role. While most studies were initially undertaken for the advanced countries, cluster policies are also now being widely implemented in the developing countries. See, for example, Yusuf *et al.,* (2008), for a recent example of Asian clusters and USAID has advocated cluster policy for African countries (USAID, 2008).

The transition economies have also embraced the cluster approach. A recent OECD (2005) report on the transition countries contained cluster case studies for the Czech Republic, Hungary, Poland, Slovenia, and Slovakia. Furthermore, cluster policy has also been undertaken by Russia (Romanova and Lavrikova, 2008) and Romania (Popa, *et al.,* 2007). Cluster initiatives have been enthusiastically adopted by the OECD Local Economic and Employment Development (LEED) Programme (OECD, 2005). In conjunction with Central European Initiative/European Bank for Reconstruction and Development, the LEED has undertaken analytical studies on clusters in the transition economies and forms a network for disseminating information about clusters and the best-practice techniques.

However, until recently, the CAREC countries have largely avoided adopting a cluster policy. The exception is Kazakhstan which has now based its development strategy, in principle if not yet in practice, largely on the cluster concept. This is indicated by the 2004 programme, *Diversification of Kazakhstan's Economy through Cluster Development in the Non-extraction Sectors of the Economy*. Kazakhstan is particularly concerned to diversify its economy away from its heavy dependence on oil production and has developed its cluster policy following the advice of Porter and the American consultants J.E. Austin Associates. [6]

[6] See Zabortseva (2009).

Kyrgyzstan is also moving in the direction of adopting a cluster-led development policy. As Musabaeva (2007) has noted, President Bakiev stated in 2007 that "Kyrgyzstan needs to orient itself to entering regional and world clusters, for the processing and realization of agricultural produce, rare minerals, communications, and tourist services". Musabaeva comments that "from the names of the Departments in the approved [in 2006] structure of the Centre for Economic Strategies under the Cabinet of the Kyrgyz Republic, it is clear that the development of economic clusters is offered as one of the key guiding lines of economic policy in the immediate future".[7] In Uzbekistan, the Ministry of Economy is developing a legal framework to promote industrial clusters.

After some general comments on the importance of economic geography, we first discuss Porter's interpretation of the cluster. The concept of the cluster is usually considered in relation to manufacturing industry, but it has also been extended to cover services and, more narrowly, to technological clusters (Porter, 2003). One of its strengths, and also one of its weaknesses, is that the concept tends to be all encompassing. The spatial extent of a cluster can vary from very small clusters at the local economy level with employment measured in tens to those that cross national boundaries employing millions. As such, a cluster can take on many forms. As a recent OECD (2007, p.24) report notes, there is now a certain amount of "cluster fatigue" amongst some policy makers and academics. Nevertheless, work done by the OECD "demonstrates at both the national and regional level that the key concepts that underlie the cluster approach continue to be at the centre of policy formulation", even if the term cluster is not explicitly used (OECD, 2007, p. 24).

However, the role of the cluster in economic policy, and indeed, the very concept itself is a contentious issue (Martin and Sunley, 2003). This is notwithstanding the increasing importance that is being given to the role of space, distance, and density in economic growth. This chapter considers the role of these factors in economic growth, focusing especially on the cluster. The assessment of the usefulness of this approach is confined primarily to Kazakhstan, since, as noted above, this is the CAREC country which has developed this approach in the greatest detail. It is, however, likely that some of the other CAREC countries will follow Kazakhstan's lead, an in addition to Kyrgyzstan, the Ministry

[7] In this approach Kyrgyzstan was following the lead of Russia and Kazakhstan. Musabaeva notes, however, Porter's advice to Kazakhstan drew criticism from among Kazakh economists who "considered certain suggestions of [Porter] simply inapplicable to Kazakhstan".

of Economy in Uzbekistan is developing a legal framework to promote industrial clusters and, as has been noted above, clusters have become a widely accepted method of promoting economic growth in many of the other transition economies including Russia, Hungary, Slovenia, Slovakia, Poland Hungary and the Czech Republic.

In contradistinction to the other transition economies, there are at present very few readily available published studies of clusters in the CAREC countries, either setting out the rationale for them within the local context or detailing the exact government proposals. Consequently, this report concentrates on Kazakhstan for the simple reason, as noted above, that it has gone furthest down this road. It cannot be taken as axiomatic that cluster policy as practiced by many governments is necessarily either coherent or has a firm analytical basis and this chapter will also consider these issues.

The chapter next briefly considers the theory underlying clusters, including the different types of agglomeration economies and the insights from, for example, the economic geographers, regional science and the neoclassical 'New Economic Geography'. The cluster is an essentially static concept, but we also consider it in a dynamic, or growth, context. It transpires that Porter has at the back of his mind some form of export-base theory and we show that there are indeed strong links between cluster theory and the Kaldorian regional growth model of cumulative causation.[8] This includes at its core the Verdoorn law (the statistical relationship between labour productivity growth – or total factor productivity growth - and output growth that provides evidence of substantial increasing returns). The empirical evidence for the importance of increasing returns and the effect of density in explaining productivity differences is reviewed, but for reasons of space only briefly.

Four of the CAREC countries are heavily dependent on the production of energy (especially oil and gas) and natural resources such as cotton. These countries are Azerbaijan, Kazakhstan, Tajikistan and Uzbekistan (henceforth designated the AKTU countries). The question arises as to whether or not it is optimal to implement a resource-based cluster development strategy for these countries, especially in the light of the so-called "natural resource" curse. The chapter documents cases where this strategy has been successful in other, now developed, countries and examines the implications for the AKTU

[8] The concept of "circular and cumulative causation" was first developed by Myrdal (1957).

countries.

As we have noted, cluster policy is only being discussed being implemented on a wide scale in one of CAREC countries, namely Kazakhstan. It is too early to form an assessment as to whether or not Kazakhstan cluster policy is likely to be a success and there is, at present, little readily available evidence as to the exact form of the policy. The chapter considers three areas where studies have been made, namely the energy cluster policy, innovation clusters and the agro-food cluster.

While cluster policy is widely adopted it is not without its critics. For example, one the one hand, it is shown that the use of cluster theory is far more problematic than many policymakers believe and may, in certain cases, be just a smokescreen for a "picking winners" industry policy. Indeed, one critic has gone so far as to comment that "cluster policies can even turn ugly when implemented by less than perfectly benevolent governments" (Duranton, 2008, p.1). On the other hand, there is no doubt of the importance of the spatial element in explaining economic growth. There is also a qualitative difference in the role of policy with respect to clusters between the developed countries and the transition (and developing) countries which must be taken into consideration.

The chapter ends by casting doubt on the use of cluster policy, *per se,* and briefly considers other possible development strategies.

2. Geography and Economic Development

Space is all around us and it matters for growth. Growth theory has come a long way since merely trying to account differences in the growth of productivity in terms of the rate of capital accumulation, human capital formation and technological change (or "ideas"). These are the proximate rates of growth and the question arises as to why these vary between countries producing such wide differences in productivity levels and growth rates. Three broad types of explanations are now considered that place *geography*, *institutions* and *integration* at the centre stage.

Geography includes the role of natural resources; especially the substantial reserves of oil and natural gas found in Azerbaijan, Kazakhstan, Tajikistan, Uzbekistan which, while

bringing the benefits of substantial economic rents, also raise the spectre of the "resources curse" and the "Dutch disease". This is reflected in the empirical evidence that many of the resource-rich developing and transition economies, *ceteris paribus*, perform worse in many development indicators than those with fewer natural advantages. Geography also has a direct impact through the location of the CAREC countries, especially their landlocked position and poor communications with the rest of the world. This has detrimental implications for their volume of trade, which is exacerbated by economic barriers to trade consisting of both tariffs and other administrative impediments (Asian Development Bank, 2006). Their historical ties with the Former Soviet Union have not helped as it distorted the direction of trade. This has led to the integration approach which emphasises the role of market integration and increased trade in promoting growth (see van der Ploeg, this volume). Again geography plays a role in the "problem of the commons" which has caused the Aral Sea to shrink to such an extent that it has altered the climate and seriously affected the local economies of the lands of the various countries bordering the sea (Markandya and Auty, 2006).[9]

When we move to a more explicitly spatial scale, we find that there are wide variations in the geographical *spread* and *density* of production. Of course, it has long been realized that this is true for the world as a whole – the top twenty nations with only 15% of the population produce over half of the world's output. As a corollary, the poorest half of the world's population account for only 14% of its production (Easterly and Levine, 2002).

But this is also reflected within any country at any level of development. If the area west of the Mississippi River in the US is considered, it is found that about half of the nation's GDP is produced on just 4 percent of the land area (Easterly and Levine, 2002).

[9] There has been a largely fruitless debate between those who argue that geography is paramount in explaining the large per capita income disparities between countries and those who emphasise the role of institutions. The latter stress the importance of property rights, the transparency, and impartiality of the legal system etc., following the influential work on North (1999). (See Frankel and Romer, 1999; Acemogu *et al*., 2001; Rodrick, *et al.* 2002). The approach is to regress income per capita measured in terms of PPP on proxies for institutions, geography (*viz*., distance from the equator) and economic integration (such as the ratio of trade to GDP). We call it fruitless, because undoubtedly all are important and it does not seem meaningful even to attempt to quantify the percentage contribution of say, geography, in accounting for the disparities in per capita income (see Kenny and Williams (2001) for a detailed methodological critique of such Barro-type regressions.) The approach does, nevertheless, provide some insights that are of relevance to the CAREC countries. The weak institutions; geography (natural resources); landlocked nature of the countries and the lack of integration leading to relatively small home markets missing the benefits of agglomeration economies all affect their potential for growth.

Furthermore, rather like a fractal, this pattern of concentration repeats itself at smaller spatial scales. The state of New York is the most economically dense state in the US which is due to the extreme concentration of employment in New York City. Indeed, the city contains the densest county in the United States (New York County) as well as three of the next ten densest counties (Ciccone and Hall, 1996). Moreover, not only is the spatial distribution of economic activity within a country spatially concentrated, but it is also persistent. New York has been the largest US city for over a century (Kim and Margo 2004, p. 2994), the US manufacturing belt dominated industrial production within the country from the middle of the 19th century until recently (Krugman, 1991), and no new urban agglomeration has emerged in France since 1911 and no city that was (relatively) large has died (Eaton and Eckstein 1997, pp. 447-448). Once established, a dense agglomeration of economic activity tends to persist for a long period of time, so that a country's economic geography exhibits considerable inertia.

Within the Central Asian Economies, like in all countries, population and economic activity is spatially concentrated. Uzbekistan has a population of 27 million and is dominated by the capital city, Tashkent. The city has a population of just over 2 million and is over five times as large as the next largest city, Namangan. Kazakhstan, the second largest country in the region in terms of population (with about 25.5 million inhabitants) likewise has a highly skewed spatial distribution of population. Almaty, the former capital has a population of 1.3 million, over twice that of the second largest city, Astana, and is five times the size of the tenth largest city, Oral. [10]

The cause of this concentration of population, and, by implication, economic activity is due to the importance of increasing returns to scale, broadly defined, in manufacturing and many other sectors. If all activities were subject to constant returns to scale, there would be what Krugman terms "backyard capitalism". With transport costs, production would be distributed more or less uniformly across space. While, apart from a few regional and other economists (notably Kaldor, 1972), the implications of increasing returns to scale has until recently been ignored by mainstream economists. However, this has changed since the mid-

[10] In many countries, there is a well-defined relationship between the cities' sizes known as the rank size rule. This states that the population of a city is approximately equal to the size of the largest city divided by the rank of the city under consideration.

1980s,[11] leading one commentator to write of the "increasing returns to scale revolution" in economic theory (Warsh, 2006).

There has been a growing realization that space and distance matter, and theoretical models have long shown that cities and the densities of population and production (the latter being defined as output per unit area) will vary even on an isotropic plain (Christaller, 1933, Lösch, 1946). The fundamental reason is the prevalence of increasing returns in the production process. Increasing returns are broadly defined to include the traditional static and dynamic internal returns to scale, but perhaps of equal importance are the *agglomeration* economies that arise from spatial juxtaposition of firms. These are often categorised as arising from *localisation* economies, the external economies arising from the spatial concentration of firms in the same industry and *urbanisation* economies resulting from the clustering of different firms.

The importance of space for economic policy is emphasized in the 2009 World Development Report (2008), *Reshaping Economic Geography.* The first attribute of development is "geographical unevenness" and this implies that governments generally cannot maximise growth if they try to spread growth uniformly across the country. With increasing returns to scale, a second attribute is growth takes the form of a process of "circular and cumulative causation", to use Mrydal's (1957) term. As a region grows, increasing returns, broadly defined to include induced technical progress, mean that productivity growth increases, producing a positive feedback – "success breeds success". As growth increases, increasing returns lead to a faster growth of productivity. The benefits of this can either be passed on to the consumer in the form of lower relative prices, or the resulting increased profits can be used either for investment or R&D expenditure, or both. Likewise, a slowly growing region can be caught in a vicious circle of low output and productivity growth. This may initially lead to increasing spatial disparities "but market forces of agglomeration, migration, and specialisation can, if combined with progressive policies, yield both a concentration of economic production and convergence of living standards" (World Bank, 2008, p.2). Moreover, increasing diseconomies of density such as congestion costs and rising land rents may eventually lead to a diminution of the benefits of agglomeration.

[11] This can be dated from the publication of Romer (1986).

Finally, there are *"neighbourhood effects"* or economic spillovers. The principle of cumulative causation and the resulting virtuous and vicious circles of growth can make it difficult for the lagging regions to catch up. But, a policy that promotes economic integration can "harness the immediate benefits from concentration to achieve the long-term benefits of convergence" (World Bank, 2008, p.?) This is particularly germane to the CAREC countries, given the recent emphasis on the possibility of regional cooperation between these countries which is discussed later in this report.

The World Development Report (2008, p. 37) has epitomised this importance of space by the triumvirate of *density, distance,* and *division.*

- ***Density*** is the value of economic output per square kilometre and is highest in the largest cities. This (and the absolute size of output) reflects the importance of agglomeration economies.
- ***Distance*** measures the ease of reaching markets and areas far from economically dense centres are more likely to lag behind in their development.
- ***Division*** is most important in an international context and reflects the barriers to economic interaction caused by differences in currencies, politics, customs and language and is most important in an international context.

3. The Increasing Returns Revolution in Economic Theory

In fact, it is probably fair to say that there has been a major revolution in economic theory. For much of the last two hundred years, the emphasis with respect to the degree of returns to scale has been on constant returns to scale and the modelling of competitive general equilibrium. There have been exceptions, and indeed the opening sentences of Adam Smith's *Wealth of Nations* (1776) stressed the importance of increasing returns. Book I begins with the famous dictum, "The greatest improvement in the productive powers of labour, and the greater part of the skill, dexterity, and judgment with which it is anywhere directed, or applied, seem to have been the effects of the division of labour." Smith continued with the observation that the division of labour was limited by the "extent of the market". The greater the volume of production, the greater is the scope for the division of labour. But the "extent of the market" also has a spatial dimension – the same volume of production concentrated in a few square kilometers provides the opportunity for a greater

division of labour than if the same output produced is spread over several hundred square kilometers.

Yet ever since Ricardo's *Principles*, until recently. the assumption of constant returns to scale held sway.[12] Marshall was well aware of the possibility of downward sloping supply curves and multiple equilibria. The problem was that these were incompatible with perfect competition and would inevitably lead to monopoly. Consequently, as the economy was not dominated by monopolies, the discussion of this was banished to an appendix (Appendix H). Only external economies of scale that would not pose a threat to perfect competition were considered. It is somewhat ironical that these Marshallian economies of scale should later come to assume such importance in the cluster literature. The 1920s saw the celebrated "cost controversies" and Sraffa's (1926) paper which led to Robinson's (1933) *Economics of Imperfect Competition.*[13] This showed how equilibrium on the downward sloping part of the average cost curve could occur without monopoly profits being made. Nevertheless this did not have much theoretical impact at the time.

Arrow (2000, p. 171) presented another reason for the persistence of the non-convexity assumption, arguing that the "history of competitive equilibrium is essentially *cumulative*" (emphasis in original). In other words, "each step depends in a fairly clear cut way on the work of predecessors." The development of equilibrium theory occurred in a linear fashion from Adam Smith (at least from Chapter IV, Book One, of the *Wealth of Nations*), through Ricardo, Menger, Jevons, Walras to Hicks, Koopmans, Arrow and Debreu. "Other aspects of perfectly competitive theory, such as the theory of demand, optimality theorems, and the relation between competitive equilibrium and bargaining outcomes, also have well-structured histories in which earlier work influenced the later work which subsumed it" (Arrow, 2000, p.172). The perfectively competitive equilibrium paradigm was logically self consistent and, at the theoretical level, was replete with Kuhnian "puzzles" to solve.

In terms of macroeconomics and growth theory, in particular, constant returns, together with the marginal productivity theory, was a crucial assumption of the seminal Solow

[12] There were, of course, exceptions. Hamilton, the first US Secretary to the Treasury, used the concept of increasing returns to justify protectionist policies in 1794 that were unsuccessful. Frederick List (1841) was influenced by Hamilton and made a similar argument in favour of protectionism in the early stages of industrialization.

[13] Edward Chamberlain's (1993) *Monopolistic Competition* which covered much the same area was published in the same year.

model (Solow, 1956, 1957, 2000). From the late 1950s until 1986 this approach was extended to, for example, two-sector, vintage capital, and optimal growth models. The growth accounting approach attempted to whittle down the Solow residual (loosely interpreted as technical change, which Solow found accounted for about 80 percent of the US growth over the first half of the 20th Century). This used the aggregate production function and again the assumption of constant returns to scale (Jorgenson and Griliches, 1967).[14] 1986 saw the development of the first growth model which endogenised technical change and introduced substantial increasing returns into growth theory (Romer, 1986).[15] However, it should be said that some still find the assumption of constant returns to scale in the Solow model, augmented by human capital to be convincing (Mankiw, *et al.* 1992, and Mankiw 1995.)

In other areas, especially international trade and the new economic geography, it was not until an economic theory was developed that could handle increasing returns within an equilibrium framework that the assumption was widely adopted. Of particular importance was the Dixit-Stiglitz (1997) model, essentially a mathematical formalisation of the Robinson (1933) and Chamberlin (1933) imperfect competition model. It was this, rather than any new empirical evidence that increasing returns were important, that led to the intellectual revolution in trade theory and the New Economic Geography.

Indeed, the prevalence of increasing returns had for a very long time been seen to be self-evident in regional economics (Hoover *et al.* (1948). See van Oort and McCann (2009) for a good discussion.) The early work by Weber (1909) on location theory showed how firms located, given an exogenously determined source of raw materials, a fixed market and transport costs. This also included a discussion of agglomeration economies. Lösch (1946) showed how, even on a featureless plain, increasing returns and transport costs could give rise to a concentration of firms (cities). Christaller (1933) used economies of scale in retailing and distribution to give a model that could also generate an urban hierarchy of city sizes. This was later shown to follow the frequently observed rank size rule (Beckmann, 1958). Work on cities as generating new ideas was undertaken by Vernon (1960) and Chinitz (1961).

[14] Denison (1967) was another pioneer in this field, but pragmatically he allowed for the contribution of increasing returns to scale at the expense of theoretical purity.
[15] There had been previous attempts but except under implausible assumptions, only a Cobb Douglas production function was compatible with steady state growth (Conlisk, 1968).

It was the seminal work of Krugman (1991a, 1991b) that brought space and location back into mainstream (neoclassical) economics by developing formal optimising general equilibrium models to study agglomeration economies, the location of firms and the formation of cities. Since the publication of these papers there has been an explosion of theoretical and empirical work within this framework of what has come to be known as the "New Economic Geography".[16] For good introductory surveys of the New Economic Geography, see Krugman (1998, 2000) and Simonis (2002). Neary (2001) presents a more critical survey.

The key aspects of this approach are the presence of increasing returns and transport costs. For simplicity, the early models took increasing returns to be internal to the firm. The larger the market size, as partly determined by backward and forward linkages, the greater the scope for reaping the benefits of increasing returns to scale (the "home market" effect). In order to minimize transport costs, a firm will locate where the local demand is greatest. If, for historical reasons firms concentrate at a specific location, other firms will also be attracted there because of the existing demand and so there will be a positive feedback effect, leading to a process of circular and cumulative causation. Once a city is established for whatever reason, there are powerful forces that will prevent it declining.[17] In this sense, history matters.

Suppose we have two regions. With high transport costs it will pay firms to have plants in both locations. But if transport costs are low, it will be optimal for firms to locate in one location to reap the benefits of increasing returns and to ship their products from there to satisfy the demand in the other region. Krugman (2009) has presented the simplest model possible ("a sort of model of the model") to explain these processes. Suppose that there are two regions and a single producer has fixed sales of S_1 and S_2 in each of the two markets, where $S_1 > S_2$. Transport costs per unit output are t. The producer can have either one plant in region 1 or two plants, one in each region. If a second plant is opened in region 2, it saves on the transport costs (i.e., tS_2) but, by assumption, incurs a fixed cost F. (This is

[16] The pace of development has been so fast that the leading textbook on the subject is now into its second edition (Brakman *et al.,* 2009).
[17] It is, of courser, recognised that a geographical concentration will be limited by the centrifugal forces of factor immobility, rising land rents, increasing congestion costs etc. (see Krugman, 1998b).

where the increasing returns come from.) It will only open the second plant if $F < tS_2$. If $F > tS_2$, it will pay the producer to concentrate all the firm's operations in region 1.

Suppose now that there are two symmetric regions and there are a number of manufacturing firms (which are footloose, as are their factors of production) which produce a share μ of total sales, *S*. There is an agricultural sector which is regionally fixed, as are its factors of production. If the manufacturing firms all locate in one region, the smaller region will demand $S(1-\mu)/2$. Thus, if $F > tS(1-\mu)/2$, production will be concentrated in one region. It can be seen that production will be concentrated in one location, the higher are transport costs, the greater is the share in output of footloose industries, and the greater are the economies of scale. Which of the two regions the footloose industries locate in may be purely a matter of historical accident.

As has been noted, the crucial breakthrough in modelling increasing returns to scale within an equilibrium framework was the Dixit-Stiglitz (1977) model which introduced a utility function where the arguments were a variety of separate goods. Many years ago, Robinson (1933) and Chamberlin (1933) had shown how it was possible to incorporate increasing returns into an equilibrium model by assuming a variety of goods that were close, but not perfect substitutes, i.e., by introducing product differentiation. With a single firm making one particular variety, and with free entry, equilibrium with no abnormal profits would occur where the downward sloping demand curve for the good was tangential to the downward sloping long-run average cost curve. The Dixit-Stiglitz approach allowed this to be formally modelled and so market structure, the elasticity of demand, etc., could be included in the approach and applied to economic geography.

For our purposes here, the importance of the New Economic Geography is that it explains why firms 'cluster', namely because of the importance of increasing returns to scale.[18]

[18] The new economic geography has not been without its critics. Martin (1999) sees it merely a continuation of the old regional science models, which economic geographers had long ago discarded as an inadequate paradigm. The formal mathematical nature of the new economic geography means that it has to ignore those socioeconomic and institutional factors that economic geographers now consider to be important in explaining the performance and diversity of cities and regions. Brakman *et al.,* (2003) are more sanguine.

3.1 Sources of Increasing Returns to Scale

Two major sources of increasing returns have been identified in the literature and in a spatial context may be traced back to the early work of Hoover and Giarranti (1948). (See Table 1). The first arises from *internal economies of scale*. These are either static or dynamic in nature. The former are increasing returns that occur as the size or scale of the firm or plant increases. The most common source is indivisibilities or fixed costs of some description and as production increases, so these costs are spread over a larger number of units of output. Dynamic returns to scale are those such as learning-by-doing, where costs fall as a function of cumulative output. The classic example is the production of airframes during the war (Wright, 1953), where productivity rose steadily, even though no new technology had been introduced. This was simply as a result of the experience gained in the methods of assembly. The gains are also a decreasing function of the rate of production, since it also takes time to acquire experience.

The other major source is due to *agglomeration economies* and their distinctive feature is that they are external to the individual firms. They arise as the density of production (defined as output per unit area) and the size of the urban area increases. Note that these are not the same. It is possible to have a very high density of production but where the total output is low and a low density of production but a high volume of total production as it occurs in a large sprawling urban area.[19] These external economies of scale are subdivided into *localization economies,* which arise from the concentration of firms in the same or similar industry, and *urbanisation economies* which occur when disparate firms are in close spatial proximity.

It was Marshall (1922) who provided the seminal discussion of external economies of scale in his well-known chapter concerning the "the concentration of specialised industries in particular localities". He advanced three causes, although he did not explicitly make the distinction between localization and urbanisation economies of scale. First, there are knowledge spillovers where the close proximity of firms would lead to a rapid inter-firm diffusion of innovations. As Marshall put it: "The mysteries of the trade become no mysteries; but are as it were in the air. … If one man starts a new idea, it is taken up by others and combined with suggestions of their own; and thus becomes the source of further

[19] These are sometimes treated as synonymous (e.g., World Bank, 2008).

Table 1 A Taxonomy of Increasing Returns to Scale

Type of economy of scale				**Example**
Internal	1. Pecuniary			Being able to purchase intermediate inputs at volume discounts
	Technological		2. Static technological	Falling average costs due to fixed costs of operating a plant
			3. Dynamic technological	Learning to operate a plant more efficiently over time
External, or Agglomeration	***Localization***	Static	4. "Shopping"	Shoppers are attracted to places where there are many sellers
			5. "Adam Smith" or Allwyn Young (EJ, 1928) specialisation	Outsourcing allows both the upstream input suppliers and downstream firms to profit from productivity gains due to specialisation
			6. "Marshall" labour pooling	Workers with industry-specific skills are attracted to a location where there is a greater concentration of the relevant industry. A worker is more likely to be able to find a new job in the same industry if their employer experiences a downturn of fortunes. An individual firm also benefits by being better able to hire labour when experiencing an upturn in fortunes, especially if it coincides with a downturn for other firms.
		Dynamic	7. "Marshall-Arrow-Romer" learning by doing	Reductions in costs that arise from repeated and continuous production activity over time and which spillover between firms in close proximity
	Urbanisation	Static	8. "Jane Jacobs" innovation	The greater is the diversity of the local economy, the more opportunities there are for observing and adapting ideas from others
			9. "Marshall" labour pooling	Workers in an industry bring innovations to firms in other industries; similar to no. 6, but the benefit arises from the diversity of industries in one location.
			10. "Adam Smith" division of labour	Similar to no. 5 above, the main difference being that the division of labour upstream is made possible by the existence of many different downstream buying industries in the same place
		Dynamic	11. "Romer" endogenous growth	The larger the market, the higher the profit, the more attractive the location to firms, the more jobs there are, the more labour pools there are, the larger the market—and so on
	12. "Pure" agglomeration			Spreading fixed costs of infrastructure over more taxpayers; diseconomies arise from congestion and pollution

Source: World Bank (2008, p. 128) Adapted from Maureen Kilkenny (2006).

new ideas." Same industry or localization spillovers are sometimes known as Marshall-Arrow-Romer (MAR) externalities. The last two are a reference to Arrow's (1962) learning-by-doing model and Romer's (1986) "linear-in-K" model. Productivity gains from the induced technical change described in these models can spillover to similar firms in the neighbourhood, but the impact decreases with increasing distance from the source.

Second, there are the gains in productivity from the concentration and specialisation of suppliers. Suppliers would be able to specialize to a greater extent than if there were only a few firms in the locality and smaller output. These producers of intermediate goods would thereby benefit from the gains of the division of labour. Third, there are the benefits of labour market pooling whereby firms can benefit from a large labour force with the special skills they require.

As may be seen from Table 1 these external increasing returns may give rise to both localization and urbanisation economies. Chinitz (1961) was one of the first to emphasise the importance of the diversity of production, rather than specialisation. He considered that Pittsburgh had suffered because of its monolithic production structure. However, it is Jane Jacobs (1961, 1969) with whom the concept of urbanisation economies are most associated. She emphasised the role of the diversity of activity in a city in promoting innovation and growth. Urbanisation economies, consequently, are sometimes known as Jacobs's externalities. Benefits of labour market pooling can also arise from a wide variety of different industries in a single city since the extent to which the fluctuations in demand for their output are uncorrelated, this will lead to a more stable level of aggregate demand for labour.

3.2 Increasing Returns: The Empirical Evidence

It is a paradox that many early estimates of aggregate production functions using cross-country data found either very small or constant returns to scale. In the 1930s Paul Douglas and his colleagues in numerous regression studies estimated the Cobb-Douglas production function using cross-industry and cross-regional data and found a very close correspondence between the estimated output elasticities and the factor shares (See Douglas, 1976, for a summary. Douglas took this as not refuting the hypothesis of competitive markets and disproving the Marxian notion of labour exploitation.) Moreover,

this was subsequently confirmed by detailed work by Hildebrand and Liu (1957), and Moroney (1972), at the industry level using cross-regional data and Griliches and Ringstad (1971) likewise using cross-industry data. Consequently, it may be for this reason that the assumption of constant returns to scale lasted so long in aggregate growth models.

Nevertheless, McCombie and Roberts (2007) prove that this result can be attributed to spatial aggregation bias. They do this is the context of the Verdoorn law which is discussed below, but the results follow through for conventional production functions. Essentially, their argument is to suppose that the economic spatial unit of measurement is what might be termed the *functional economic area* (which may be a function of journey to work areas) and which is smaller than the smallest spatial unit of observation for which the data is available, e.g., the state or region. If the data of the functional economic areas are summed arithmetically to give the "state" data, this will impart a substantial basis towards constant returns to scale.

Prima facie evidence of the importance of clusters is the fact that US industries are not located randomly across the country, but tend to be spatially concentrated. Krugman (1991) calculated an index of regional specialisation and found that it was not just the high–tech industries that were concentrated, but also the more traditional industries. Ellison and Glaeser (1997) adopt a more formal approach and compare the distribution of industries against a benchmark of a distribution arising if the industries had been distributed at random, i.e., if their location had been determined by throwing darts at a dartboard. They find that 446 out of 459 four-digit SIC industries display excess concentration, but "while there are a number of industries that look like Silicon Valley or the auto industry, it is much more common for industries to be only very slightly concentrated." (Ellison and Glaeser, 1997, p.891).

In a follow-up paper, they attempt to determine how much of the concentration is due to 'natural advantage', such as the wine industry will naturally be affected by climatic conditions. They come to the conclusion that about 20 percent of the observed geographic concentration can be explained by a small set of natural advantages and, more realistically, the figure is likely to be nearer one-half. Nevertheless, "there remain a large number of highly concentrated industries where it seems that agglomeration must be explained by localized intraindustry spillovers. Simple cost differences cannot explain why the fur industry, the most agglomerated industry in our sample, is centred in New York," (Ellison and Glaeser, 1999, p.316.) In fact, this evidence will underestimate the importance of

clustering as it merely looks at the concentration of firms within one narrowly defined (4-digit SIC) industry and this will capture only localization economies. But as Porter has shown, clusters also consist of firms that are from a variety of industries that may be in someway linked in the production process and benefit from urbanisation economies.

It is interesting to note that Krugman, (2008) in his Nobel Prize acceptance speech paradoxically notes that the world might be becoming more classical in that regional specialisation in manufacturing in the US has been steadily decreasing since the 1930s (Kim, 1998). Nevertheless, Brulhart and Sbergami (2008) find evidence that urbanisation provides an impetus for growth until per capita income level of countries such as Brazil or Bulgaria are reached. So the extent to which clusters are associated with urbanisation, the former are especially important for the developing and transition economies.

Rosenthal and Strange (2009) give a detailed overview of the methods that have been used to estimate the size of agglomeration economies and survey the various key studies up to 2003. It must be born in mind that much of the evidence comes from the developed countries. Glaeser (2003) provides an introduction to urban and regional growth which touches on agglomeration economies and the use of the aggregate production function to measure them. Chapter 4 of the World Bank (2008) presents a more discursive overview of the now substantial empirical evidence for scale and agglomeration economies. All three studies suggest that there is wide variety of methods of estimating agglomeration economies (including estimating separately the degree of urbanization and localization economies). It will come as no surprise that the exact results are dependent on the exact method used. But, generally speaking, the evidence suggests that these external economies are important, even though the estimates differ between studies.

Turning first to *internal economies of scale*, a survey of the literature suggests that these are insubstantial in light industries, whereas they are large in the heavy and high-tech manufacturing industries (see World Bank, Table 4.2, p. 130). There is also evidence that internal increasing returns to scale are found in services, including electric power and banking and finance.

Localization economies, as has been noted, result from the spatial clustering of firms linked by the technology they use, the markets they serve, the products and services they provide and the skills they require. These are the type of economies that Porter emphasizes and also result from increased competitive pressures. The evidence put forward by the World Bank is the case study of the U.S. hosiery industry which moved south after the Second World War from New York. "The localization of the yarn and hosiery industry in North Carolina is a powerful manifestation of intra-industry external economies" (World Bank, 2008, p. 131). There is also substantial evidence that doubling city size will, through urbanization economies. increase productivity by about 3-8 per cent, although some earlier studies found much larger increases (Rosenthal and Strange, 2003, p. 12). "In the Republic of Korea, a plant in a city with 1,000 workers could, without altering its input mix, increase output by 20-25 percent simply by relocating to a city that has 15,000 workers in the same industry" (World Bank, 2008, p.135.) Furthermore, productivity tends to fall with distance from the centre of a dense metropolitan city, with evidence suggesting a doubling of the distance will reduce productivity by some 15 percent (World Bank, 2008, p.135).

Generally speaking the evidence seems to be more favourable to the importance of localization economies rather than urbanization economies, but the evidence is not conclusive. But all the surveys leave little doubt for the importance of agglomeration economies, *per se*.

4. Clusters and Regional Development

The notion of the cluster, especially in the policy arena, is often almost synonymous with the worker of Porter. Porter developed the notion of a cluster from his work on *The Competitive Advantage of Nations* (1990).[20] From detailed case studies around the world, he found that firms from one or two nations with surprising regularity come to dominate a world industry. This led him to develop his theory of industry clusters, and from here it was a short step to give this a spatial dimension. Porter defines a cluster as follows.

> "Clusters are geographic concentrations of interconnected companies, specialist suppliers and service providers, firms in related industries, and associated associations (e.g. universities, standards agencies and

[20] Porter, somewhat confusingly, equates competitiveness with productivity. However, countries with relatively low productivity, such as China, can be highly competitive in world markets if the relatively low productivity is more than offset by relatively low wages (and other costs).

> trade associations) in particular fields that compete but also cooperate." (Porter, 2000, p. 253)

The key words are "geographic" and "cooperate". While all firms have upstream and downstream linkages, the emphasis of Porter is on the spatial dimension and the benefits that geographical proximity brings. Also, while competition generally increases efficiency, in a global economy, cooperation between firms within a cluster can be as equally important in giving a cluster a competitive advantage.

Not only then does the literature on agglomeration economies discussed above, give both empirical and theoretical support to the notion of clusters, but they are ubiquitous:

> Some clusters centre on research universities, while others draw little on the resources of formal technological institutions. Clusters occur both in high tech and traditional industries, in manufacturing as well as service industries. Indeed, clusters often mix high tech, low technique, manufacturing and services. Some regions contain a single dominant cluster, while others contain several. Clusters appear in both developing and advanced economies, although the lack of depth of clusters in developing nations is a characteristic constraint to development.

In a similar definition to the one above, he adds the rider "linked by externalities of various types" (Porter 2003, p. 562.) Firms benefit by being in close spatial proximity and these advantages result from external economies of scale and spillovers – "The presence of clusters suggests that much of competitive advantage lies outside a given company or even outside its industry, residing instead in the locations of its business units" (Porter 2000, p.254).

The geographic size of a cluster can vary "from a single city or state to a country or even a group of countries." (Porter, 2000, p.254). But there is no consensus over what exactly a cluster is and indeed Porter has a very broad definition.[21] It can include a core industry,

[21] In an influential article, Markusen (1996) posed the question as to why, with high regional capital mobility, some regions attracted proportionally more investment than others. She found that the role of the government at the national and regional level was important as well as that of the multinational corporations. She devised a classification consisting of the Hub and Spoke District, the Satellite Industrial Platform and the State-centred District. In Hub and Spoke District production is located around a number of large corporations, either in one or in several industries. In the Satellite Industrial Platform, there are spin-off firms from multinational corporations often with public subsidies. In the State Centred District, regional production is linked to government investment broadly defined (OECD, 2005, p.23).

together with the downstream industries (industries which process the output to give an end product), upstream industries (industries which supply inputs and services). But the list does not stop there. It includes "firms in related industries", financial institutions, specialized infrastructure providers, institutions, such as those providing education, information, technical support and even "standard-setting agencies (although these would seem to have national rather than a local influence). Even government institutions that influence the performance of a cluster and organizations such as trade associations can be considered members of a cluster.

When account is taken of other studies on spatial agglomeration, it is not surprising that there is certain vagueness as to what is precisely a cluster. Martin and Sunley (2003, Table 1, p.13), for example, in a highly critical article on the notion of clusters, enumerate ten different definitions, although there is a high degree of overlap between them. Moreover, they argue that Porter's concept is just a 'branding' of detailed empirical and theoretical work carried out by economic geographers in the broad area of industrial districts, agglomeration economies, etc. with little value added. This is not, of course, to say that the location of firms and industry in close proximity is not of great importance in understanding the determinants of productivity. It is just the confusion the term engenders. Moreover, at times, a cluster is simply taken to be synonymous with an industry, regardless of its location.[22]As Gordon and McCann note (2000, p. 515) point out, "there has been a tendency to use terms such as 'agglomeration', 'clusters', 'new industrial areas', 'embeddedness', 'milieux' more or less interchangeably, with little concern for questions of operationalisation, which are actually far from straightforward, and should be different for each."

Pioneering early studies include what is often taken to be the exemplars of Silicon Valley, (Scott, 1993, Saxenian, 1994) and the clothing industry in northern Italy (Poire and Sable, 1984). Porter's emphasis on the relationships between firms in a cluster is mainly on the economic derived benefits. However, there is also a large interest in the sociology literature in clusters, broadly defined, and the individual and the embedded social networks. Much of the literature is again focused on the advanced countries and the way diffusion of

[22] For example, Zeng (2008) contains a number of studies of African clusters, but some such as the textile and clothing sector in Mauritius or the wine cluster in South Africa have no explicit geographical basis save that they are located in a particular country.

innovations is enhanced by clustering. This is often discussed within the framework of what has been called "national innovation systems."

One of the key questions that we shall address later is how important a policy priority should the notion of clustering be in the transition economies, in the light of the many other urgent development problems that they have. While there may be benefits, should it be central to their development strategy? Is just cluster policy simply a disguise for an industrial policy for "picking winners". To the extent that clusters develop naturally through the actions of the market participants, can government policy actually improve on this? Indeed, the problems of the lagging regions in developed countries and their relationship with their more advanced regions are likely to be very different to the problems in the CAREC where all the regions are struggling.

As we noted above, there have been many other definitions of the cluster, often differing depending upon whether they are seen as an analytical or policy tool. All definitions emphasise the notion that proximity to other firms brings both cost and productivity advantages that would not otherwise have existed. Some, like Porter's definition, emphasises geographical distance but others stress technological distance, skill distances, or social distances. Nevertheless, the fact that industries cluster in cities has meant that the definition of spatial clustering is the one most commonly used.[23]

The cluster encompasses a large typology, from broad industries at the state or metropolitan area (e.g. the wine industry in California or the apparel industry in North Carolina) through to very much more narrowly defined industry concentrated in a neighbourhood (such as the garment industry in New York City). Just as the industrial composition of a cluster can vary, so can its spatial extent. "The geographic scope of a cluster can range from a single city or state to a country *or even a group neighbouring countries"* (Porter, 2000, emphasis added).

[23] Gordon and McCann (2000) go further and argue that there are three types of clusters, two which have developed from the neoclassical economics concepts of *pure agglomeration* and the *industrial-complex model*. The third, the *social-network* or club definition, was developed predominantly within the sociology tradition. "Social networks of certain strong interpersonal relationships can transcend firm boundaries, with the result that many interfirm social interactions may be stronger than their intrafirm counterparts" (Gordon and McCann, 2000, p.520). Porter's definition of a cluster encompasses all these.

4.1 Clusters and Spatial Growth

The theory of clusters is essentially a static theory, explaining the relationship between the spatial concentration, density of output and the level of productivity. To the extent that clusters enhance the rate of innovation, they can temporarily increase productivity growth in the less technically advanced clusters.[24] They cannot, of course, explain the rate of technical advance in the technologically leading clusters. The Schumpeterian endogenous growth models provide such an explanation (Jones, 2002). In this section, we shall show how Porter's notion of the cluster can be seen as providing the micro foundations for the Myrdal/Kaldor (Myrdal, 1957, Kaldor 1970) cumulative causation model of regional economic growth.

It is worth initially noting that Porter also has a somewhat simple 'stages' theory of economic development.[25] In the early stages, a region is a 'factor-driven economy', where low input costs are the key.[26] As development occurs, this progresses to an 'investment-driven economy', where productivity increases occur through heavy investment. The last stage is the 'innovation-driven economy', where the cluster creates high quality and unique products and services.

Porter (2003) provides the foundations for a cluster-based regional growth theory. He identifies three types of industries. The first type is the *local,* or predominantly service, industries (Porter, 2003, p. 559). The distribution of employment in these industries (which includes, for example, retailing and wholesaling) is roughly proportional to the population of a region. The second type of industry, which in the advanced countries is declining in importance, is that which is *resource* dependent, such as oil or logging. These serve global markets and are spatially distributed according to the location of the natural resources. (We shall see, however, that they are particularly important for Azerbaijan, Kazakhstan, Tajikistan, and Uzbekistan – the AKTU countries.) Finally, there are the key industries of growth which are the *traded* industries that are footloose. These serve both the home market and, more importantly, markets in other regions and overseas and have strong

[24] This will also depend upon the ability of the cluster to use the new technology which will be a function of the social capability (Abramovitz, 1986) of the cluster which many factors including the level of skills.
[25] This is somewhat reminiscent of Rostow's (1960) *Stages of Economic Growth.*
[26] The CAREC countries fall into this category.

cluster effects. As we shall see, it is the performance of the export sector that determines the overall growth of the region.

In order to determine empirically what constitutes a cluster, the method of "cluster mapping" is used by Porter (see, for example, Porter 2001).[27] First, a region's traded and local industries are determined using the traditional location quotient approach, together with the use of an employment Gini coefficient. In the US, the vast majority of the goods industries were classified as traded. Overall, 32% of employment was in the traded industries and 67% in local industries. Industries dependent upon natural resources consisted of less than one percent of the total. At the regional level, the traded goods industries are seen as the drivers of regional growth because wages in the local sector were only 66 per cent of those in the traded sector. Moreover, traded industries have higher growth of wages, higher productivity, and higher levels of patenting than the service industries and there is a statistically significant relationship between the wages in the traded and non-traded industries.

Having established the empirical importance of the traded goods sector,[28] Porter then establishes the extent of clustering. In the US, with its availability of regional and city statistics, Porter used the locational correlation of employment to determine clusters. For example, if computer hardware employment is always associated geographically with software employment, this provides a strong indication of locational linkages" (Porter 2003, p.563).

Porter identified about 41 traded clusters in the US with an average of about 29 industries in each cluster, with each industry being on average a member of two clusters. Further sub-clusters were identified within each cluster and clusters include both manufacturing and service industries. "Clusters, then, represent a different way of dividing the economy than is embodied in conventional industrial classification systems that are based primarily on product type and similarities in production" (2003, p. 563). Average wages, productivity

[27] Cortright (2006, p.28) terms this quantitative approach the "top-down" approach to identifying clusters. The "bottom-up approach" relies is more qualitative, relying on case studies, interviews and primary data. However, as Cortright (p.29) points out, these alternative methods can worryingly lead to very different classification results for the same cluster, as evidenced by Porter's 1998 and 2003 studies of the California wine cluster, which give "dramatically different" results.

[28] It should be noted that the size of the traded goods sector is scale dependent; the world exports nothing and the individual nearly everything. (See the interchange between North, 19555, 1956 and Tiebout, 1956).

and patenting per worker are all higher in the traded than non-traded (service) industries, and the former are more concentrated than the latter. Although much of the literature on clusters in the advanced countries concerns the high-tech industries, they form less than 3 percent of total private employment in the US. Patenting rates vary considerably across industries and, hence, across clusters.[29]

Perhaps most importantly, differences in a region's level of wages and productivity are not due to it having a higher proportion of clusters with higher productivity. Rather the cause is that *all* the clusters in the region tend to have higher productivity. "This finding carries important implications of economic development. Many regional economic development initiatives focus heavily on shifting the mix to more 'desirable' clusters. An equally if not more important policy focus is to upgrade the productivity of *all* clusters in which the region has a meaningful position" (Porter, 2003, p.568, emphasis in the original). Theoretical support for this proposition is provided by Rodríguez-Clare (2005) who uses a Ricardian model to show that import substitution policies to develop clusters in new advanced sectors are inappropriate. Rather clusters should be promoted in those sectors which have the strongest comparative advantage, which are most likely to be the existing clusters. The tenet of Porter's Cluster theory is that first, productivity does not depend on what industries a region competes in, but the efficiency with which it competes. Secondly, the impact of initial endowments or natural resources is diminishing, at least in the advanced countries.[30] Consequently, "the most important sources of prosperity are *created* not inherited" (Porter, 2001. p. x). A cluster initiative is not, Porter claims, a case of a disguised form of an industry strategy or of "picking winners". In other words, "there are no low-tech industries, only low-tech firms" (Porter, 2001, p.7). We shall return to this important policy consideration below. [31]

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[29] However, there is convincing evidence that patents are a poor indicator of inventive activity and there is no evidence that those industries with the largest number of patents also have the greatest rate of profit. (See Boooz Allen Hamilton's annual study of the world's 10000 largest corporate R&D, for example, "Smart Spenders: The Global Innovation 1000", *Strategy and Business*, vol. 45, 2006.) The familiar argument that patents are better than nothing as a measure of invention is not convincing.

[30] For example, the Hecksher-Ohlin model which predicts that capital-rich regions should export goods which use capital-intensive methods of production is not particularly helpful in devising a development strategy.

[31] For example, Porter argued that the South Carolina's economic strategy "emphasizing its abundant and flexible workforce, good physical infrastructure and responsive government in order to attract manufacturing" was misguided. What was required was a new approach emphasising innovation and cluster development (Woodward, 2004, p.2). However, Woodward argues that Porter's specific advice has, in fact, not avoided simply being a form of industrial targeting. "Most policy makers in

4.2 Clusters and the Cumulative Causation Model of Growth

Although the theoretical model underlying this analysis is not spelt out by Porter, it is reminiscent of the export-base model where the level of total employment (or output) is determined by the level of exports, through the export-base multiplier.[32] The model may be expressed in terms of growth rates to explain growth rate disparities and has been extended in a more sophisticated Keynesian model to take account of the regional balance-of-payments constraint (Thirlwall, 1980). Thus, the crucial determinant of growth is the traded-goods sector and the clusters that affect its competitiveness.

In the cumulative causation model of regional growth, a key relationship is the Verdoorn law. In its simplest for this is a relationship between the growth of industrial productivity (p) and output (q) and takes the form $p = a + bq$, where b is the 'Verdoorn coefficient' and generally takes a value of around one-half. Thus, a one percentage point increase in output growth is assumed to *cause* an increase in productivity growth by one half because of increasing returns, broadly defined to include induced technical change, through, for example, learning by doing (Arrow, 1962). Kaldor (1966), following Young (1928), argued that these returns to scale were also due to increased division of labour and thus occurred at the industry rather than the firm level. In turn, Young draws heavily on Adam Smith's dictum that the degree of the division of labour is limited by the extent of the market. This has obvious similarities to cluster externalities, especially if we interpret the extent of the market in terms of its spatial extent. Thus, the law will be picking up the impact of agglomeration economies. The Verdoorn law is a deceptively simple relationship and there is now a considerable literature on, for example, the econometric problems (endogeneity and associate simultaneous equation bias), specification errors (the omission of the capital stock and the effect of the diffusion of innovations). These will not be

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South Carolina, for example, believed that Porter's analysis was designed to identify clusters to target for development. 'All clusters matter' does not appear to be a strategy" (Woodward, 2004, p.11). First, Porter argues that *traded* clusters are more important for development than *non-traded* clusters. Secondly, Porter makes use of a standard four-quadrant diagram in his analysis of a region's cluster where the north-east quadrant identifies those clusters which have both the largest share of national cluster employment in a given year and the largest percentage change of share over a specific period. (See, for example, Porter (2001, p.21 Exhibit 13). These are used to determine a region's competitive strengths.

[32] See North (1955) for an early version of this model and Tiebout (1956) for a critique and North (1956) for a rejoinder. The export-base model is explained in more detail in, for example, Armstrong and Taylor (2000).

discussed here,[33] but it is sufficient to say that the main result of the importance of substantial increasing returns have been confirmed by many studies.

Angeriz *et al.*, (2008) tested the law for the EU regions over the period 1986-2001, within a spatial econometric framework. The Verdoorn law was augmented to take into account that growth of the capital stock by regressing the growth of total factor productivity (rather than labour productivity growth) on output growth.[34] Additional explanatory variables that were included were the initial level of total factor productivity (to capture the diffusion of innovations), and the density of production to capture dynamic agglomeration economies (Baldwin and Martin, 2004). The results are instructive. A Verdoorn coefficient of 0.673 gives an estimate of "encompassing" returns to scale, including induced technical change, of just over 3. There was no statistically significant growth of exogenous total factor productivity (which may be roughly regarded as the rate of technical change).

There is a statistically significant diffusion of innovations, given by the negative coefficient on the logarithm of the initial total factor productivity (a proxy for the level of technology in the region) and the density of production also has a pronounced effect on TFP growth.

One of the problems with cluster analysis is the lack of empirical data on the importance of externalities, which "is understandable since knowledge [and other] spillovers are difficult if not impossible to measure directly" (Porter, 2003, p.562). The spatial econometric approach sheds some interesting light on this. The model includes as regressors, the growth of the surrounding regions' output as well as the level of their density. These both proved to be statistically significant, suggesting that spillover effects are important. Consequently, these results provide econometric support that space and proximity are important for the understanding of growth, although the exact mechanism of the spillover effect is uncertain.[35, 36] It is here that the cluster literature is instructive.

[33] See McCombie *et al.,* (2002) for a comprehensive discussion.
[34] The absence of this from the original Verdoorn law is a shortcoming, as productivity growth could also be due to a growth in the capital-labour ratio. The original Verdoorn law implicitly takes this into account by assuming the stylized fact that there is no growth in the capital-output ratio.
[35] It should be noted that spatial correlation could arise from the use of administrative rather than economic regions.
[36] Unfortunately, at present data limitations preclude the estimation of the augmented Verdoorn law for the CAREC countries.

Once an allowance is made for increasing returns to scale, a positive feedback is introduced into the growth process, which gives rise to the circular and cumulative causation nature of growth. A faster rate of growth, through increasing the rate of productivity gives a region a relative advantage over slower growing regions. The faster growth of productivity can be passed on in the form of a relative improvement of the region's prices (assuming all the benefits are not fully passed on in the form of higher wages) or the resulting increased profits can be ploughed back into R&D and product improvement, again increasing the demand for the region's output. The canonical formalisation of this model is by Dixon and Thirlwall (1975). It is essentially a demand-oriented model, on the assumption that in a regional context a fast growing region will induce either labour or capital or both and so as a first approximation there is no supply constraint. (In less developed and transition economies, there may be substantial disguised unemployment in the region.) The model consists of four equations.

(*i*) There is a demand function for the region's (or cluster's) exports. The growth of demand is determined by the rate of change of the region's relative prices vis-à-vis the other regions (including other countries) with which it is competing. The region is also affected by the growth of its export markets and the impact on its growth rate is determined by the world income elasticity of demand for its exports. The value of this elasticity, which proves to be crucial in determining the region's growth rate, is a function of the region's structure of production (whether it specialises in goods and services for which world demand is rapidly growing) and all aspects of non-price competitiveness (the quality of the goods, etc.).

(*ii*) The growth of the region's output is determined by the growth of its exports, through the Hicks super-multiplier or the Harrod foreign trade multiplier.

(*iii*) The growth of prices is determined, through a mark-up pricing policy, by the growth of money wages minus the growth of productivity. (The mark up is generally assumed not to change.)

(*iv*) The growth of productivity is determined by the growth of output through the Verdoorn law. A faster growth of productivity feeds back into improved regional competitiveness and hence either increases or sustains a fast growth rate.

The cumulative causation model can be illustrated in the following simplified form in Box 1.

Box 1. A Cumulative Causation Model of Economic Growth

…… growth of output ⇒ growth of productivity (Verdoorn law) ⇒ rate of change of price and non-price competitiveness ⇒ growth of exports (via improved price and non-price competitiveness ⇒ growth of output (Hicks supermultiplier) ⇒ growth of output ……

Thus growth can take the form of vicious and virtuous circles. Whether growth is explosive or converges to equilibrium depends upon the parameters of the model, most notably the size of the Verdoorn coefficient and the price elasticities. Dixon and Thirlwall (1975) are of the opinion that growth will converge to equilibrium, with the differences in regional growth rates being determined by their income elasticities of demand for their exports. Kaldor differs, but while these economic forces may lead to divergent growth, supply side factors such as labour shortages bidding up money wages or greater congestion increasing costs may serve to reduce, or even offset, the effect (Roberts, 2002). The outcome is a core-periphery situation with high and low productivity regions, although the income disparities are often greatly reduced by interregional fiscal transfers. In many ways, the Kaldorian model anticipated many of the results of the New Economic Geography (Krugman, 1998, 2003).

The conditions under which the formal model two-sector leads to convergent or divergent growth have been examined by Guccione and Gillen (1978) and Dixon and Thirlwall (1978). The cumulative causation model outlined above could lead to the situation of one region experiencing a permanently growing current account deficit and the other a growing surplus. Even though there is a common currency, this is likely to be unstable and the regional balance of payments will operate as a constraint to prevent this from occurring. This is examined in Thirlwall (1985).

5 Criticisms of the Theory of Clusters

Clusters have not been without their critics. In particular, Martin and Sunley (2003) present what can only be called a scathing assessment of specifically Porter's work on clusters. The cluster, they argue, is a vague ill-defined concept, lacking clear indicators for the boundaries, either geographical or industrial. (See Martin and Sunley, 2003, Table 1, p.12 for some of the different definitions that have been advanced.) As such it has become a way of thinking rather than a theory. Moreover, a multitude of methodologies for identifying clusters have been used, ranging from "cluster measurement" based on the use of location quotients together with co-location to relying simply on the judgement of local participants. It is little wonder that the different methodologies used often come up with wide disparities in the number of clusters for the same country.[37] We have also noted above the huge variation in the sizes of clusters in terms of employment – indeed, a case could be made for any spatial concentration of firms or industries, together with their suppliers to be termed a cluster.

Martin and Sunley (1993) also note that most of the careful detailed work by economic geographers on analogous concepts such as "industrial districts", "new industrial spaces", territorial production complexes", "neo-Marshallian nodes", "regional innovation milieux, "network regions" and "learning regions" is simply ignored. Indeed, Martin and Sunley go so far as to simply dismiss Porter's notion of the cluster as merely a "rebranding" exercise that has made it intuitive and attractive to policymakers and consultants.

The supposed benefits of a cluster of industries are the various externalities that spatial proximity brings, but there is very little *direct* evidence of the importance of these. Indeed, they are very difficult to measure. The problem is that spatial concentration does not necessarily arise because of agglomeration economies. Martin and Sunley (2003, p. 22) note that

[37] Cortright (2006, p.29) discussing Porter's (2003) statistical classification of clusters notes that in his 1988 study, the wine cluster (often taken by Porter to be the exemplar of a cluster) "includes a wide range of different industries, including fertilizers and pesticides, grape-harvesting and winemaking machinery, packaging, glass, public relations, food and restaurants, and educational organizations. In contrast, in his 2003 study, wine and brandy appear as a subcluster in agriculture and none of the other industries is included in the cluster".

> much of the evidence used in support of the superior performance argument is anecdotal and is based on success stories about particular locations (Malmberg, 1996), and there are few extensive studies which document how common and important clustering is within particular industries (Malmberg and Maskell, 1997) or studies that carefully compare similar firms inside and outside of clusters.

While the studies cited by Martin and Sunley are now somewhat dated, their arguments still hold.

One of the key aspects stressed by Porter is the importance of the "depth" of a cluster. "Deep clusters have extensive collaborative local networks between firms and supporting agencies that help to develop and maintain competitive edge for firms in the cluster by sharing information, knowledge and assets" (McDonald *et al.,* 2007, p. 40). McDonald *et al.,* used data for the UK to test this proposition. Using Department of Trade and Industry statistics that had placed clusters into five categories (stage of development, cluster depth, employment dynamics, industry sector, and significance), they found that cluster depth was statistically insignificant as an explanatory variable for employment growth and international significance. The most important explanatory category was industrial sector (whether the cluster was manufacturing, services, or media, computer-related and biotechnology industries). "The results indicate that the links between performance, and depth, stage of development and industrial sector are not clearly in accord with Porter-type views on clusters. In particular, the significance of industrial sector for both employment growth and international competitiveness contradicts the view that industrial sector does not affect clusters performance (Porter 2003)" (McDonald *et al.,* 2007 p.45).

What is the role for policy, as the consensus is that clusters are unlikely to be created successfully *ab initio*? This is particularly crucial for attempts to foster clusters in the lagging regions of developed countries and in the transition and developing countries. However, given the vagueness of the term, it is presumably possible to identify a cluster in every part of the country. In fact, this could be one of its attractions to consultants and policy makers keen to identify clusters and there is a tendency for political reasons to identify clusters in virtually all regions.

Porter further argues, as we have seen, that the aim should be to improve the performance of all clusters, not just specific ones. [1] However, matters are not as straightforward as this. First, as we have seen above, Porter argues that *traded* clusters are more important for development than *non-traded* clusters given that he subscribes to a form of export-base or export-led growth theory of cluster development. Secondly, Porter repeatedly makes use of a four-quadrant diagram in his analysis of a region's cluster. The vertical axis is the cluster share of national cluster employment and the horizontal axis is the percentage change of the share. The north-east quadrant identifies those clusters which are seen to be the most successful and presumably ones on which policy should focus. (See, for example, Porter (2001, p.21 Exhibit 13).

Duranton (2008) also presents a formidable critique of cluster policy. The difficulty with the proponents of cluster initiatives is that at best they only have an informal model in mind. It is this, not the fuzziness of the concept, that Duranton finds weakens the case for intervention to promote clusters. The "competitive diamond" of Porter (see Porter 2000, p.20) sets out diagrammatically the "sources of vocational competitive advantage". The model has as its central component the "local context" which is then linked to "firm rivalry", "supporting industries", "demand conditions", and "input conditions" by two-way arrows. Thus improving any one will improve the "competitive advantage" of the cluster. But as Duranton points out, there are no negative effects, in particular rising costs, because of the increased density of production or size of the cluster.

Duranton specifies a very simple model where productivity rises with population because of increasing returns, but so do marginal costs because of the fixity of land. These gives the potential net returns curve a bell shape, as increasing returns initially increases the net returns, but this is eventually offset by rising land costs. Assuming that the supply curve of labour is perfectly horizontal (this is relaxed latter in his paper), the equilibrium outcome is that the cluster is too large, being where the net returns curve cuts (equals) the labour supply curve; not where the distance between them is the greatest. (This is reminiscent of the optimum city size argument, see Richardson, 1978, pp. 73-77.) The problem is one of "coordination failure", where all the clusters may be too big, but no firm wishes to start a new cluster because it would be a very small and unproductive. There are also other inefficiencies that occur when there are increasing returns derived from the fact that external benefits will lead to market failure.

From the Tinbergen dictum we need two policy instruments, one to reduce the size of the cluster and the second to correct the inefficiencies in production, although the latter is likely to need more than just one policy. Porter's prescriptions are seemingly only confined to the productivity curve. Duranton then relaxes the conditions of a horizontal supply curve, allowing it to slope upwards (greater labour needs a higher wage to attract it) and allowing the net returns curve to also shift upwards. This merely reinforces the earlier argument. Correcting negative externalities such as congestion, he argues, could be more effective than any of the policies that cluster advocates suggest for raising productivity growth.

His second criticism relies on the standard argument that consultants and the public bodies charged with implementing the policies may have less information than the industrial entrepreneurs. Thus using public money to enhance clusters could be wasteful and there could also be collusion between the local public bodies and consultants to extract extra resources from the national government.

Duranton also considers that the results of the empirical estimation of the productivity gains by firms being in a cluster. The evidence suggests that on balance the gains, while positive, are small. "Doubling the specialization in a typical activity and area is associated with an increase in productivity of around 4%" and even then he considers these estimates to be an overestimate (Duranton, 2008, p.31.) The overall conclusion of Duranton is that "larger gains can be achieved locally by improving the policies associated with the cost curve, such as land-use planning, urban transport, provision of local public goods, etc. These policies, which have been for the longest time the "staple" policies of local governments, may not be as "sexy" as setting up a bio-tech cluster or the next Silicon valley" (p.37).

A further critique of the cluster concept is as follows. Firms have to locate in space somewhere. To minimise costs, in the past it is likely that manufacturing suppliers located near to their purchasing firms. With uncertainty about all forms of location costs, similar firms will locate near existing firms. (See, for example, Webber, 1972.) In other words, the close juxtaposition of firms may have nothing to do with positive externalities. Yet the theory of clusters relies on the existence of positive externalities, but in most cases there is little convincing micro (case study) evidence of pervasive externalities. There is no compelling evidence that the present clustering of, for example, law firms or financial

services has anything to do with the ease of face-to-face communication. Generally, the spread of the major innovations does not occur costlessly through diffusion and is not greatly enhanced by the spatial proximity of firms – it occurs through the embodiment of capital goods and purchase of intermediate goods; e.g. the I.T. revolution has occurred through the spread of, for example, personal computers. Distance is to all intents and purposes for this irrelevant. The whole rationale of in-house R&D and the patent system is to *prevent* the diffusion of invention. The importance of specific skills (e.g. textile workers) has long since disappeared. Modern society depends upon general skills or skills that can be quickly acquired in on the job training. Manufacturing in the advanced countries is now less than 16% of output. Its location is subject to sunk costs and there is a path dependence effect; investment is of a 'putty-clay' nature. Incremental investment makes a firm's location "sticky" and it is this that leads to the persistence of concentrations of particular firms (Arthur, 1994). It has nothing to do with prevalence of agglomeration economies.

If this is correct, the question then arises as to why do cities exist if there are not pervasive agglomeration economies? The answer is that cities greatly reduce the costs of the movement of people Glaeser (1998, p.140). They also enable the efficient distribution of retail goods (Central Place Theory), and there are different preferences of people for living in different city sizes. Moreover, the existence of cities of different sizes does not necessarily imply the existence of increasing returns to scale. The fixed costs (provision of infrastructure) limits number of potential city sites and the stochastic "law of proportionate effect" can give rise to the (quasi) rank size rule. A stochastic phenomenon such as the law of proportionate effect, by definition, is *not* due to specific economic forces.

Does this mean cluster policy is misplaced? Not necessarily, but simply because in developing countries, scare resources means that a degree of spatial concentration of investment is optimal, especially social overhead capital. Space is important and this is true of the CAREC countries.

6 Resource-based Industrialization and Clusters

Energy is the most significant natural resource of several of the CAREC countries and is an important element in the development equation. Azerbaijan and Kazakhstan have substantial reserves of coal and oil. Turkmenistan and Uzbekistan are large gas producers,

while Kazakhstan also has significant gas deposits. The Chinese province of Xinjiang is self sufficient in gas production. Coal is the major source of domestically used energy for all these countries. The Kyrgyz Republic is a significant producer of hydroelectric power. Consequently, these resources should provide the basis for rapid growth in these countries and indeed, as we shall see, Porter (2005) has suggested the importance of generating clusters in Kazakhstan that are based on the country's energy industry. The energy cluster involves the development of linkages between firms that produce capital equipment for the industry. It also includes firms that produce products that use coal and petroleum, etc., as a raw materials (such as the petrochemical industry), and not just as an energy source. Cluster policy goes beyond improving the extraction of the natural resource, but involves a diversification and movement up the value chain.

A priori, it would be thought that the resource-rich (especially in terms of minerals and energy resources) developing or transition countries would be in an excellent position for rapid sustained growth. The substantial revenues from the economic rents[38] of these natural resources could be devoted to physical and human capital formation and also to the diversification of the economy into the production of relatively more high-tech industries. The exports of energy should be able to generate foreign exchange earnings that could finance the purchase of the required advanced capital equipment from abroad. From this point of view, the resource rich countries of Azerbaijan, Kazakhstan, Tajikistan and Uzbekistan the (AKTU countries) should have been well placed.

However, there is now a substantial literature that suggests that in many cases natural resources may actually be a "curse", in that the presence of significant reserves of natural resources may actually hinder economic development (Sachs and Warner, 1995, Lal and Myint, 1966 Auty, 2001). The argument is that in a non-democratic country, the rents from these natural resources may be expropriated by the government to pay its supporters and maintain itself in power. Thus, there is less incentive for such governments to introduce beneficial economic and social reforms, which indeed may weaken its hold on power.

Dalmazzo and Blasio (2000) present a formal economic model along these lines. Auty (2006) presents a more qualitative, but somewhat richer framework. In his *staple trap and*

[38] Economic or resource rents are the pure profits that remain after transport costs have been deducted and all the factors of production have been remunerated at their opportunity costs.

exogenous democratization (STEX) model, the analysis is very similar to that of Dalmazzo and Blasio. The resource abundance encourages "predatory political states" to focus on rent extraction rather than reforms, and consequently the return to investment falls over time. In Auty's alternative *competitive industrialization and endogenous democratization* (CIEN) model where the natural resources are much smaller, the absence of substantial economic rents encourages the governments to introduce wealth-creating policies, and to promote early industrialization. Furthermore, the manufacturing sector is forced to be competitive because it is the main source of foreign exchange. "The resulting low-rent development trajectory triggers virtuous economic and social circles that sustain rapid [per capita GDP] growth" (Auty, 2006, p.22).

The econometric evidence for developing countries as a whole is somewhat mixed and the term resources covers such diverse products as oil as agriculture. Important for our purposes is the study of Collier and Goderis (2007), which used co-integration methods that allowed them to distinguish between short- and long-run effects. For agriculture, both the short and long-run effects of greater production are advantageous for exporters, reflecting improvements in the terms of trade and resulting in an improvement in growth. But for oil, and non-agricultural natural resource exports, there is strong evidence of a significant resource curse.

One of the major differences between agriculture and minerals (together with energy) is that the rents from agriculture tend to be more spatially spread and this sector has substantial linkages with the surrounding economy. Minerals and oil and gas production tend to be much more locally concentrated. Moreover, given the more capital-intensive nature of mineral and, consequently, energy extraction, very little, if any, of the skilled labour or intermediate inputs come from the immediate surrounding areas. There are consequently very small spatial (regional) multiplier effects.

A second reason for the possible deleterious effect of resource abundance is the so-called "Dutch Disease". The substantial foreign exchange earnings from the exports of the resources can increase the exchange rate, which reduces the prices of other, notably, manufactured exports and imports, when both are measured in the domestic currency. This may have long-run adverse effects on industrialization if it curtails the development of the manufacturing sector and manufacturing export growth. Manufacturing is often seen as the

engine of growth and generates large positive externalities (Kaldor, 1966). Moreover, given the relatively low level of employment that the energy sector generates, the lack of manufacturing employment growth can leave the country remaining as a labour-surplus economy with substantial disguised unemployment.

The Dutch disease can occur through the *resource movement effect*. The rise in oil production and/or its price encourages both domestic and foreign investment in the sector, at the expense of the manufacturing sector. This can also lead to the attraction of skilled labour from the other sectors. Moreover, the *spending effect* where the relative price increase of the nontradable sector rises can also cause deindustrialization. This occurs because of the movement of labour which is drawn from the nontradable to the oil sector, which causes excess demand. To the extent that increases in wages across all sectors arise from the high wages in the oil sector and the fact that the nontradable sector normally has lower productivity than the other two sectors, this can cause the relative price on nontradables *vis-à-vis* the rest of the economy to range. Finally, the tax revenues from the oil production may be more than proportionally spent on nontradables (Corden and Neary, 1982). Finally there is the *real exchange rate effect*. The greater cost of manufactured exports in foreign prices will cause loss of competitiveness on world markets and hence a fall in non-oil exports. The Dutch Disease can be offset to the extent that the foreign exchange revenues are "sterilized" in a special sovereign fund, such as that created by Norway and emulated by Kazakhstan, which can then be used when there is a collapse in demand and/or prices of the resource. It also provides a revenue stream when the natural resource becomes depleted.

The volatility of energy prices can also pose problems, both for private investment in the energy sector and for the level of government revenues. As far as the latter is concerned, increased government expenditure when resource revenues are booming may be very difficult to curtail when the boom collapses.

6.1 Successful Resource-Based Clusters

As the ECA [the United Nations Economic Commission for Africa] (2004) and Singh (2001) point out, there are, in fact, a number of examples of the successful development of resource-based clusters. The benefits do not necessarily come entirely from the natural

resources, *per se,* but from the value chains and linkages from the industries that develop around them. These clusters can even thrive long after the original resources on which they were initially built have been exhausted. Thus, the resource curse is not inevitable.

Examples of successful resource-based clusters include Finland, Sweden and the Sudbury cluster in Canada (ECA, 2004). In Finland, the key natural resource was forestry and the successful telecommunications firm Nokia began life as a paper and pulp producer. It then diversified into rubber and cables, electrical goods and finally into telecommunications. Sweden was a major producer of iron ore, but the opening up of cheap ore deposits in Brazil and Australia forced it to diversify. This led to a deliberate diversification into sophisticated, but related, industries, such as "specialty steels, and fine paper, roller bearings, rock drills and fabricated steel products" (Walker and Jourdan, 2003, p. 33). This diversification was accompanied by a development of a capital goods industry to provide the machinery for the primary industries. Sudbury in Canada was a major producer of nickel, but in the 1970s the price of this raw material contracted and forced rationalization. New enterprises were established and Sudbury established itself as a centre for innovation in the hard rock mining industry (Ritter, 2000).

These countries' successful cluster strategy "was based not so much on the continued exploitation of a rich natural resource base as increasing the domestic value added associated with such natural resources by prompting the development of those activities which naturally tend to 'cluster' around resource–based processing and extraction industries. These included supplying critical 'side stream' inputs (such as capital equipment, consulting services, and consumables), and activities engaged in further processing or utilization of outputs ('downstream' activities). Clustering not only enhanced the productivity of the workforce, but also resulted in increased income distribution in the local population and rapid economic growth" (ECA, p.13). Thus, an appropriate cluster policy may obviate the resource curse.

However, it should be noted that all these examples are from mature countries with a transparent and democratic government, an impartial and well-developed legal system and well-defined property rights. Without these it will be difficult, if not impossible, to develop competitive clusters and this is the major challenge facing the AKTU countries.

6.2 The Spatial Implications of Energy and Mineral Clusters

The energy resources have two distinctive characteristics; they are spatially concentrated and do not easily lend themselves to the development of forward and backward production linkages. Moreover, the rents can, through taxation, provide fiscal revenues, but whether or not these funds are used productively and the degree to which public expenditure is local (rather than being siphoned off to the capital city) depends upon the quality of the institutions. Oil and gas can be shipped large distances for further processing and the specialised and technological advanced capital equipment can be imported. In other words, the energy industries pose the serious risk of remaining enclave economies, with little multiplier effects on the local economy. Infrastructure may be geared solely towards to the export of the energy resource and there may be little resulting development in the surrounding area. The labour input, although skilled, is likely to be small in numbers and high-income consumer goods will largely be imported from abroad. The growth of the regional economy becomes highly dependent on the price of the natural resource and hence subject to possibly large exogenous shocks. Moreover, being a relatively homogeneous product, there is little scope for improving non-price competitiveness of energy resources and thereby increasing the income elasticity of demand of a natural resource and stabilising its market through product differentiation.

The most natural formation of a mineral cluster is through the refining of the minerals and the production of, say, steel from neighbouring iron ore deposits. But as we shall see in Kazakhstan, this can still lead to highly-specialised company towns which are highly dependent upon the natural resource. A region only becomes mature when its dependence on a single commodity, or resource, ceases.

What are the implications to be drawn from the New Economic Geography (NEG) models? These point to the importance of agglomeration economies and show, for example, how as transport costs fall below a critical level, one of two *ex ante* identical regions can come to dominate manufacturing. The NEG suggests several possibilities. “For example, one might tell an ‘extreme Dutch Disease’ story, in which rather than simply ‘squeezing’ manufacturing, a resource boom totally inhibits all manufacturing agglomeration. Conversely the opposite may occur, where a resource boom increases the size of the domestic market size, encouraging manufacturing agglomeration. Whether we have the

former or the latter would likely to be driven by, *inter alia*, the linkages fostered by the resource sector with the domestic economy, through, for example, its factor use" (Nelson and Behar, 2008, p.10). This leads to the promotion of agglomeration economies through a cluster policy. As we shall see, in Kazakhstan there was the development of large company towns under the Soviet system, but the industries were, and still are, very inefficient, with none of the dynamic private initiatives emphasised by Porter. To make them competitive is likely to need a substantial role for government. As Porter has stressed, the key to rapid growth is the diversification into first, labour-intensive manufacturing and then into more high-tech production around the core industry. This also has the benefits of spatially concentrating the scarce resources available for infrastructure rather than spreading them geographically too thin.

However, as Nelson and Behar (2008, p.16) emphasise the implications for development depend upon the underlying theory thought to be most plausible. It is worth quoting them in detail on this.

> More concretely, a basic Hecksher-Ohlin type trade model would suggest it may be a mistake for some African countries to pursue labour intensive manufacturing based industrialisation along the lines of the East Asian 'Tigers', as their comparative advantage in land and resources looks more like the 18th and 19th century US (on this see Wood, 2002). By contrast, if one had a 'new economic geography' type model in mind, featuring increasing returns and the potential for agglomeration, the policy conclusions may be quite different. Here, the development of particular regions, characterised by the agglomeration of manufacturing activity, is the flip-side of underdevelopment in others. Moreover, such forces of agglomeration set the scene for international income inequality and regional divergence (see e.g. Redding and Venables (2004)). Such models could be taken to suggest that governments in developing countries should expressly aim to *encourage* the development of manufacturing activity. Thus the potential cleavage in the theoretical literature brings with it a potentially contradictory set of policy prescriptions. (Emphasis in the original)

The cluster-based approach, as we have seen, has much in common with the 'new economic geography'.

6.3 Energy Resources in the AKTU Countries

The CAREC countries can be divided into the resource-rich countries, namely, Azerbaijan, Kazakhstan, Turkmenistan and Uzbekistan (the AKTU countries) and the rest. While

resources in this context include both agriculture and minerals, it is the energy production that is particularly important as it generates the largest economic rents. The remainder of the CAREC countries, the Kyrgyz Republic, Afghanistan, Northern China and Mongolia are resource poor. As we shall see, the oil and gas reserves of the resource rich countries are substantial and the economic rents provided form a significant part of their GDP. (For detailed discussions of the role of oil in these countries, see the papers in Akiner (2004) and Najman *et al*., (2008).

As may be seen from Table 1 the oil reserves and production of Kazakhstan and Azerbaijan are substantial relative to their size. Moreover, the importance of energy to the AKTU economies can be best seen from the large share of energy rents as a percentage of GDP in these countries. (Table 2).

Table 1 Oil Reserves and Oil Production 2008

Country	Oil Reserves			Oil Production		
	Thousand million tonnes	Share of total[a] (%)	Rank[b]	Million tonnes	Share of total[a] (%)	Rank[b]
Kazakhstan	5.3	3.2	9	72.0	5.1	18
Azerbaijan	1.0	0.6	19	44.7	1.1	22
Turkmenistan	0.1	0.0	46	10.2	0.3	37
Uzbekistan	0.1	0.0	47	4.8	0.1	47

Note: [a] Share of world total; [b] world rank

Table 2 Energy Rents as a percentage of GDP in AKTU and Russia, 2000

Country	Gas Rents	Oil Rents	Total Rents
Azerbaijan	5.7	50.5	56.2
Kazakhstan	1.2	27.2	28.4
Turkmenistan	31.6	31.6	63.2
Uzbekistan	17.8	15.6	33.4
Russia	16.5	16.2	32.7

Source: Esanov, Raiser and Buiter (2006)

Nevertheless, in spite of these substantial reserves, the oil resources of Kazakhstan, Turkmenistan and Uzbekistan were relatively underdeveloped in the Soviet era, compared with Azerbaijan and the Siberian areas. This was probably because of the technical

difficulties in exploiting the reserves in the Caspian basin. Natural gas reserves have long been exploited in Uzbekistan where they were becoming exhausted, and the Soviet Union had begun to invest heavily in Turkmenistan's natural gas industry (Pomfret, 2006, p.153).

Much of the problem in the Soviet era was that its oil industry was outdated in its production technology and well behind the technological frontier. In the 1980s, with the progressive liberalization of the Soviet economy, Chevron entered into discussions about developing the large Tengiz field that had been discovered in 1979. After 1991, the US companies continued to maintain an interest in the other substantial oil fields that had been discovered in the Caspian basin, including Karachaganak. There was also growing foreign participation in Azerbaijan with a number of Production Sharing Agreements signed. Turkmenistan initially attracted less attention due to its more limited oil resources and its more inaccessible location, but in the 1990s foreign companies explored the substantial gas reserves of the country.

The optimistic assessment of the reserves in the 1990s ("Turkmenistan alone was often spoken of as a 'second Kuwait' (Akiner, 2004, p.10)) were soon tempered by the realisation of the technical problems of extraction, including geological difficulties, the remoteness of some of the fields and the poor infrastructure. Moreover, legal disputes arouse over the ownership of the reserves in the Caspian Sea. The joint use that the Soviet Union had agreed with Iran over the mineral rights were not agreeable to the new independent states or to the oil companies (for a detailed discussion, see Granmayeh, 2004).

Foreign investors were also concerned about the fact that as a result of a legacy from the Soviet Union, most of the major oil and gas pipelines from the AKTU countries were to the FSU and still under Russian control. Indeed, this is still of major concern. It was only in 2009 that the EU and Turkey came to an agreement over what seemed for a time to be the ill-fated $US 9bn Nabucco pipeline that was designed to transport natural gas from the Central Asian Countries to Europe, thereby breaking Russia's and Gazprom's monopoly. The pipeline stretched for more than 2000 miles from Turkey's eastern border to the EU gas hub outside of Vienna and the success of the project was in doubt until Turkey relinquished is demands for a tax on the pumped gas. The pipeline will initially take gas from Azerbaijan's Shah Deniz-2 field but the aim is to transport gas from the vast Turkmenistan deposits.

Yet, certainly in the 1990s, the energy resources did not seem to have conferred any beneficial effect on the growth of the AKTU countries and they seemed to be subject to a resource curse.[39] As Esanov *et al.*, (2006, p.30) put it: "The main argument is that far from being a blessing that would have allowed energy-rich countries to cushion the impact of reforms and thus make faster progress, resource rents have often been wasted or appropriated by the ruling elites." In Auty's (2006) STEX model, high resource rents generate a vicious circle where the government concentrates on taxation and other measures to appropriate the economic rents. "Consequently, it amplifies the probabilities of predatory behaviour, of policy failure and of economic distortion due to maladroit rent deployment" (Auty, 2006, p.28). On the other hand, the resource-poor countries have, of necessity, had to undertake economic reforms and the conditionality requirements of the internal financial institutions have had more effect.

The rents in the AKTU countries were not spent on social services (notably health and education) to ease the path of transition. The resource-poor countries spent about the same as a percentage of their GDP as the resource rich countries. Using the European Bank for Reconstruction and Development transition indicators for the degree of reform for 5 and 10 years after independence, Esanov *et al.,* (2006) find that the degree reform (as measured by the transition indicators) in the AKTU countries did not exceed the remaining CIS countries to any significant degree. "This is a remarkable result, if we remember the size of the rents available to these countries to cushion adjustment costs and thus the potentially much weaker feasibility constraint on implementing reform" (Esanov, *et al.,* 2006, p.46). But this result was largely driven by Turkmenistan and Uzbekistan, where the rents came from the state-owned farms and were easily appropriated at the beginning of independence. Consequently, these countries had little incentive to undertake any reforms. In Azerbaijan and Kazakhstan, the energy resources had to be developed first, largely through foreign investment, so there were initial reforms, including aggressive privatization in Kazakhstan. But once the energy rents came on stream, the reforms declined sharply before resuming in the mid-2000s.

[39] Two types of resource curse may be identified. The "strong" resource curse occurs when the pace of economic development is below the rate that would have occurred in the absence of these natural resources. The "weak" form is when the natural resources confer some extra benefit to the growth process, but not as much as would have occurred in a fully democratic country.

Under the FSU, the resources were sold to the Soviet Union at grossly underpriced rates. This was compensated for by a complicated series of direct and indirect transfers. In the AKTU countries where the parliament was totally dominated by the ex-communists, there were pressures to maintain what were in effect, economic subsidies, and economic rents from the energy resources were used for this purpose. The resource–poor countries were under greater pressure to undertake reforms by the international financial institutions.

7 Industrial Development in Kazakhstan

In this section, attention is confined to cluster policy in Kazakhstan, which has gone furthest down this road than any of the other CAREC countries.

The Kazakhstan government has indicated that it recognises the importance of entrepreneurs and market forces in the growth process, but it has developed a government-led diversification strategy. In order to avoid the putative "resource curse" discussed above, the government has seen it as essential that the economy diversifies away from the extraction of oil (Zabortseva, 2009). While the country enjoyed a rapid growth of GDP of 9 per cent per annum from 2000 to 2007 (until the global financial crisis reduced the growth rate to 3% in 2008), there was an over-dependence on oil production. Hydrocarbons increased from 11 per cent of GDP in 1990 to 16 percent in 2007. Mining consisted of 67% of total industry in 2007 (current prices) and mineral products accounted for 70% of total export revenues (and 47% of the value of exports to the CIS countries and 74% of those to the rest of the world).[40]

Under the present policy, it is the government that determines the sectors that are to be encouraged and supported by government funding and investment. In this, it is following the strategy of Singapore, South Korea and Malaysia where government planning has played a major role in industrial development. In particular, Kazakhstan sees Malaysia as the example to follow, because of the latter's initial heavy reliance on natural resources. The first development strategy, *Kazakhstan 2030,* emphasised the need for an open market economy and substantial foreign FDI,[41] but also stressed the need for government policy at

[40] Agency of Statistics of the Republic of Kazakhstan, Statistical Yearbook, "Kazakhstan in 2007", Asatana.

[41] It has been remarkably successful in this. Over 80% of all FDI to the Central Asian Economies has gone to Kazakhstan (Zabortseva, 2009)

the microeconomic level. The major initiative occurred in 2003 with the publication of the *Innovative Industrial Strategy for the Republic of Kazakhstan 2003-2015*. This identified the industries that were to be given priority for development and in 2004 it was announced that this was to be achieved by the policy of cluster development. The target is to turn Kazakhstan into one of the top 50 most competitive countries in the world and to increase its GDP by three-and-a-half times by 2015, compared with 2002.

The proposed increase in Kazakhstan's competitiveness might not be as ambitious as it seems at first sight, as it depends upon how competitiveness is measured. According to the World Economic Forum's *Global Competitiveness Index* (GCI), *2008-2009,* Kazakhstan is ranked 66th in terms of overall competitiveness out of 134 countries, just above Greece. The Russian Federation is ranked 51st. The index is based on a ranking of institutions and other factors that determine the level of productivity. Following the Porter classification, countries are classified as either *(i)* factor-driven, *(ii)* efficiency-driven or *(iii)* innovation-driven economies. There are three aggregate sub-indices (based, in turn, on 12 groupings or pillars) on which the overall index is based. These are given different weightings, depending upon the level of development. For example, the innovation index is given a 30% weighting in the index for an innovation-driven economy, but only 5% for a factor-driven economy.

Kazakhstan is classified as being in the transition stage from a factor- to efficiency-driven economy.[42] (Of the other Central Asian Countries for which data are available in the GCI, Azerbaijan (ranked 69th) is also categorized as in transition while the Kyrgyz Republic (116th) and Tajikistan (122nd) are both factor-driven.) This explains how Kazakhstan can be ranked higher than Greece, although Greece has a much higher level of productivity. Greece does not perform well in the innovation index, which, given its level of development, is one of the key drivers of its competitiveness. [43,44]

[42] In the sub-indices, Kazakhstan ranks 74th in basic requirements, 64th in efficiency enhancers and 77th in innovation factors.

[43] There are also some anomalies in the rankings in the individual indices. Kazakhstan is recorded as having a "competitive advantage" in its railroad system, which clearly does not reflect the difficulty in transporting goods to its export markets. It is also 4th in its hiring and firing practices, but to the extent that this reflects the absence of any employment protection or trade union representation and hence reduces the work effort and worker satisfaction, it is not necessarily an advantage.

[44] The report stated that "more will have to be done in Kazakhstan to improve the institutional environment. Particular attention should be focused on addressing weaknesses related to the quality of the institutions, notably judicial independence, the protection of property rights, government inefficiency, public trust of politicians and security. A focus on improving the health of the

7.1 The Historical Legacy and the Spatial Structure of Industry in Kazakhstan[45]

It has been shown that the spatial, in addition to the economic, structure of production is an important factor in economic development. Consequently, in order to fully appreciate the present spatial structure of industry within Kazakhstan, it is necessary to consider the historical development of its industrial economy.

Kazakhstan's prosperity in the past has almost entirely depended upon the production of basic commodities, and this is still very much the case today. These commodities include agricultural products such as wheat and livestock and mineral deposits of copper, alumina, lead, zinc, iron ore and especially, oil, gas and coal. In 2007, basic commodities accounted for 22% of GDP compared with only 12% for manufacturing.

The pattern of development under the Soviet system throughout the 1920s and 1930s was the construction of large enterprises and company towns, a legacy which persists to the present day.

> After World War II, investments continued to concentrate on developing the resource sectors even though the costs of development in remote areas were increasingly burdensome, and Kazakhstan's economy remained dependent on the extraction and preliminary processing of its many resources. The economy of no other Soviet republic was so concentrated in these sectors, and it is hard to name an economy anywhere in the world with such a substantial proportion of its industrial structure in resource-based enterprises. (Peck, 2004, p.235)

The problem with this strategy is that few ancillary industries were developed in the company towns and so the benefits of the MAR externalities were forgone.[46] This legacy has important implications for the development of clusters today, as we shall see. The spatial distribution of industry, with the high transport costs, followed Weberian (1909/1929) lines with its location tied especially to those of its raw materials. The eastern region of Kazakhstan became an important centre of nonferrous mining based on local ore

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workforce and the quality of the educational system, and placing a greater focus on technological adoption, will also be important in the country's efforts to improve its competitiveness" (GCI, 2008, p.290) .

[45] This draws heavily on Peck (2004).

[46] The company towns included schools, hospitals and cultural centres.

deposits. The central region became important for its production of coal and copper and a major iron and steel complex developed in Karaganda,[47] again based on local deposits of iron ore. In the west, oil and natural gas production dominated the economy. The south remained largely agricultural.

The northern two-thirds of the Kazakhstan where most of the mineral deposits are to be found developed significantly faster than the southern one-third. The former region received the lion's share of investment. Moreover, the ethic composition of the two regions varied. Russians dominated the northern two-thirds and Kazakhs were predominant in the south. "And, although regional equity was a frequently reiterated goal of Soviet industrial policy, Kazakhstan never reached economic equity with other industrial republics in the former Soviet Union. Even within the country, equity among regions remained an illusive goal" (Peck, 2004, p.44).

After the Second World War until the collapse of the Soviet Union in 1991, the development of Kazakhstan's mineral reserves was given top priority by the Soviet planners. In the early 1970s, Kazakhstan's investment was 20-30% above the average of Soviet Union but the rate of return on capital was lower than in the rest of the Soviet Union, suggesting a serious misallocation of capital accumulation. As the discovery of new mineral deposits declined, so did the region's share of investment. But even by the 1960s, the return to capital in Kazakhstan was just 50 percent of the overall average rate of return in the Soviet Union and, by 1990, the large firms were more obsolete than many commentators realised. The prospects for the economy in the 1990s were consequently viewed over-optimistically. (Peck, 2004, p. 49, cites Pomfret, 1995, and the World Bank, 1993, as examples.)[48]

The Soviet planners had thought that with the large mineral deposit and hydroelectric power, these, together with the aid of heavy initial investment, would have propelled Kazakhstan into rapid sustained growth. But this never occurred. With the abolition of forced labour, higher wages were needed to maintain the labour force in the inhospitable country and, even so, the industries in the East were subject to high labour turnover. Kazakhstan was less productive than areas of the Former Soviet Union to the west of the

[47] In 1989, the huge complex at Karaganda accounted for about 5% of total GDP and was in the top 25 largest firms in Russia.
[48] Nevertheless, growth in the subsequent decade has fulfilled their expectations.

Urals, yet the Soviet planners persisted with high investment in Kazakhstan for strategic reasons. With the collapse in growth in the Soviet Union, so the rate of investment declined sharply and the rate of return actually improved a little. Nevertheless, over the period 1940-1990, the growth of industrial output in Kazakhstan was above that of the whole country, although its path closely paralleled that of the latter, so that by the late 1980s it was only 3% per annum.

Because of the location of the mineral deposits, during the twentieth century Kazakhstan developed into a spatially dual economy. Most of the industrial development occurred in the northern two-thirds of the country, approximately north of a line through Lake Balkhash. While some valuable deposits were later discovered in the south, most of this region was agricultural with investment largely concentrated in such projects as irrigation. Even by the 1970s, the spatial economy could scarcely be called integrated.

The development of Kazakhstan under the Soviet system led to the oblasts (regions) often having stronger links with the rest of the Soviet Union than with each other. "In 1960, for example, 61 per cent of all rail shipments (by weight) from cities in the northern two-thirds of the country were destined for locations outside of Kazakhstan. Of the remaining 39 per cent of rail shipments, 26 percent were to other locations in the northern region and only 13 per cent were to locations in the southern third of the country" (Peck, 2004 p.53). These external links were largely to Russia. Even *within* the northern region, where there were four distinct sub-regions, very little trade occurred between these areas. Less than 15 percent of rail shipments originating in these regions went to another region in Kazakhstan. During this time there was "not a development plan which fostered the creation of an integrated national industry where growth in one region might have supported development in another or become the impetus for 'rapid self-sustaining' growth" (Peck, 2004, p.54).[49]

Consequently, the spatial structure of production arising from the command economy of the Soviet years have important implications for Kazakhstan's future growth. In particular, the development of a spatially integrated transport network with links to external markets other than the Former Soviet Union countries is essential for the development of Kazakhstan.

[49] Nevertheless, in terms of social provision and indicators (physicians per capita, levels of education, life expectancy, etc), Kazakhstan faired much better than the other Central Asian Economies

8 Kazakhstan's Cluster Policy

Given the importance of space and distance in economic development, as has been noted, Kazakhstan, since the early 2000s, has enthusiastically embraced the concept of cluster development, partly through the advice of Porter.[50] The strategy is twofold. First, given the large energy resources and agricultural production, there is an attempt to develop these two as clusters as well as several other industries. Secondly, it is recognised that there has to be diversification of the economy (World Bank, 2005, Rakhmatulina, 2006, Zashev and Vahtra, 2006).

As the name suggests, *Diversification of Kazakhstan's Economy through Cluster Development in Non-extraction Sectors of the Economy*[51] is an attempt to diversify the economy away from, particularly, the extractive industries. In the first stage of the programme 55,000 enterprises in 46 branches in 12 regions were studied by government appointed committees, together with advice from a US consulting company.

Seven sectors have already been identified as being suitable for developing as a cluster. They are oil-and-gas machine building, tourism, transport logistics, construction materials, food processing, textiles, and metallurgy. Later additions to be added to the list are cotton, wine and fish clusters. Thus, cluster development is one of the major policy instruments for generating economic development and growth. The government considers it important that to build an innovation system and to this end a national innovation fund has been developed to lower the risk of private capital in dealing with projects that involve technological transfer and to finance R&D.

The general problem with a cluster strategy, that was identified earlier, is that, first, by definition all enterprises have input-output links with upstream and downstream firms and unless the spatial dimension is explicitly incorporated, the concept of a cluster could become nothing more than a tautology. Secondly, it could be merely a cloak for a widespread "picking winners" government industrial policy that some commentators consider has been long discredited as a development strategy.

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[50] See, for example, M.E. Porter (2005).
[51] "Diversification of Kazakhstan's Economy through Cluster Development in Non-extraction Sectors of the Economy", (http://www.kazakhemb.org.il/?CategoryID=185&ArticleID=252)

In the transition economies with only a short experience of a quasi-market economy and with lack of entrepreneurial experience, it is inevitable that the government will need to on take a leading role. Romanova and Lavrikova (2008), in their study of regional clusters in Russia distinguish between two types of cluster policy. The *continental or "top down" policy of cluster development* involves active central government participation in the selection of the clusters, their financing and various targets such as creating the necessary infrastructure and encouraging R&D. This, they argue, has been the approach in Japan, France, Singapore and Sweden. The *Anglo-Saxon* or *" bottom up" policy* relies heavily on private enterprise to determine the clusters and it is the largely role of the regional authorities is to facilitate this by advice. These two are not mutually exclusive and their empirical study shows that the "Titanium Valley" cluster in Russia is essentially a top-down cluster while the Ural Automobile cluster is essentially a bottom-up cluster.

Any assessment of Kazakhstan's cluster programme faces two problems. The first is that the policy is in its very early stages and, as Porter has stressed, it may take years or decades for the full effects of a cluster to come to fruition. The second is that, to date, there are relatively few studies that have been undertaken of clusters in Kazakhstan, even of those that have developed without government intervention. (Zashev and Vahtra's (2006) study of Kazakhstan's industrial clusters has no explicit consideration of its spatial aspects or implications.) The next sections concentrate on the energy cluster, innovation clusters and the technoparks (although strictly speaking these are not government designated clusters) and the agro-industry cluster.

8.1 Kazakhstan's Energy Cluster

As was noted above, Oil production is a major component of Kazakhstan's output. In 2008 the country was ranked 18th in the world in terms of its production, producing 72 million tonnes and accounting for 1.8% or world production, immediately ahead of the UK. In terms of proven reserves Kazakhstan ranked 9th in the world with 5.3 billion tonnes which was 3.2 percent of the world total. The reliance on mining (of which 85% is the extraction of oil) is reflected in the fact that it accounts for one and a half times the value of total manufacturing and over 60 percent of total exports. It also accounts for about 40 percent of the fixed gross capital formation.

Both oil production and proven reserves are expected to increase substantially over the next few years, with most of the extra output coming from the offshore fields in the far west North Caspian region, especially from the Kashagan field in the Atyrau oblast. With the Tengiz oil field, the oblast of Atyrau is the main oil region. While there have been a number of smaller developments, oil is produced in very few regions (21 of the 158 rayons, excluding the cities). Although the oil fields are not completely isolated from urban developments, they are far from the large urban areas of Almaty and Astana. Lohmus and Ter-Martirosyan (2008) estimate that the oil revenues are likely to allow a sustainable non-oil fiscal deficit of 6 per cent of GDP in the short term, without reducing the value of the oil wealth, although this estimated is hedged with uncertainties about the price of oil and the infrastructure constraints etc., on future production.

The way the oil revenues should be spent in order to diversify the economy and promote overall growth have been the subject of a number of detailed studies (see, for example, World Bank, 2005, Rakhmatulina, 2006) and will not be examined in any great detail here. An issue though that has implications for any development of Kazakhstan is whether or not the country suffers from the "Dutch disease". In other words, do the foreign exchange earnings from Kazakhstan's oil production have a detrimental effect on the manufacturing sector. The evidence for Kazakhstan is mixed. Kutan and Wyzan (2005) employing a version of the Balassa-Samuelson model using data from 1996-2003 find that changes in oil prices have had a significant effect on changes in the real exchange rate, which indicates Dutch disease effects.[52] Different results are found by Egert and Leonard (2008) who use the monetary approach to the balance of payments for the period 1996-2005. They find that the real exchange rate of the non-oil open sector is *not* linked to the real price of oil.

8.1.1 The Spatial Impact of the Oil Revenues

This has been analysed in detail by Najman *et al.,* (2008) who find that the oil production has virtually no spatial spillover effects. There has not been any sustained employment growth in the regions where the oil production centres are located and inequality and poverty remain worse in these areas. The oil production centres are, in fact, enclave economies. They employ less than one percent of the total active labour force and the

[52] The model they estimate is: Real Exchange Rate = *f* (Productivity, Inflation, Oil prices).

immediate employment effects of related construction (such as the CPC pipeline) is positive but short lived. There are thus very limited regional multiplier effects and most of the oil revenues benefit the metropolitan areas in other regions increasing the inequality between the rich and the poor. Many of the poorest people live in the regions that produce the oil. Part of the oil revenues goes straight into the National Oil Fund which was established in 2000 to reduce the impact of the volatility of world oil prices.[53] It also acts to distribute the oil wealth over the generations. However, a substantial proportion goes to the central government, but as a *quid pro quo*, the regional governors have considerable power to extract revenues from the oil companies in their jurisdiction (see Raballand and Gente 2008, p. 20, figure 2.5). The poorer regions benefit most from the official transfers from the central government, but the northern oblasts, although equally poor compared with the other regions, receive proportionally less. Higher real wages in the oil producing regions have little effect on poverty, due to the small numbers employed in the oil industry, but "unofficial or informal earnings" are more important in these regions.

8.1.2 Energy value chains or clusters?

The importance of the energy sector in Kazakhstan's development has long been recognized, although the earlier studies analysed it in terms of "value chains" rather than clusters (see, for example Gereffi, *et al.,* 2003, World Bank, 2005). "The purpose of a global value chain analysis is to identify: who the lead firms are in global industries; how international supply chains are organized; where different types of high and low-value goods and services are located; and how countries can improve or maintain their positions within these industries. … The goods and services in any supply chain involve a combination of high and low value-added activities, and value chain analysis uses these to help determine how a country is inserted into the global economy, and the conditions under which a country might be able to improve or "upgrade" its position" (Gereffi *et al*., 2003, p. 7). The relationship between the aspatial value chain and the spatial cluster analysis is readily apparent.

[53] The fund utilizes the foreign exchange earnings purchasing them with the domestic economy and investing them in foreign securities. The fund currently (March 2009) stands at US$ 22 million having fallen from US$ 22 billion at the beginning of 2009. This was due to the fund being drawn one to counter the global economic crisis. However, as recently as January 2007 the fund stood only at just under US$ 15 billion.

Gereffi *et al.*, (2003) identify the important opportunities for economic diversification that there are in the oil and gas sector. All the leading international companies in the oil and gas value chain are in Kazakhstan. There is a need for collaboration with these companies and the government should not merely seek to extract the maximum revenue from them in the form of tax revenues. In particular, there is the need to train a Kazakhstani cadre of specialists, which will facilitate technological transfer. The World Bank (2005, pp. 37- 43) elaborates in greater detail the necessary policies to foster the development of oil and gas sector.

What is interesting, however, is the very limited discussion of the spatial implications of the necessary policy measures. Rakhmatulina (2005) notes that the construction of an integrated petroleum complex using gas from the fields in Tengiz, Kashagan, and North Caspian was mooted for West Kazakhstan and there are also plans for benzol production at the Atyrau refinery. One of the country's six special economic zones, the National Petrochemical Industrial Technopark has been established in the Atyrau region. "The aim is to attract investments in the construction and complex development of petrochemical plants for enhanced processing of hydrocarbon feedstock in Kazakhstan based on innovation technologies" (Kaktmatulina, 2005, p 10). In fact, the special economic zone is ambitiously seen as a possible Silicon Valley. Zabortseva (2009), while mentioning clusters, provides virtually no further details or analysis. Zashev and Vahtra (2006) treat "industrial clusters", including the energy industry in an aspatial sectoral manner.

8.2 Innovation Clusters and Technoparks in Kazakhstan

8.2.1 The Science Base of Kazakhstan

It has been argued above that it is important for Kazakhstan to diversify away from its dependence on the extraction of oil and gas and the exports of those products. This view is set out by the Kazakhstan's Ministry of Industry and Trade (2003) and supported by a recent World Bank (2005) study. In particular, it needs to move into the production of relatively knowledge-intensive technically sophisticated goods with a high income elasticity of demand. Although the per capita income of Kazakhstan is relatively low, at $6140 per capita measured at PPP[54] (World Development Indicators database 2008), it is

[54] This gave it a ranking of 91 on a world scale.

important to remember that it is a transition and not a developing country, and has a well-developed science sector.

Under the Soviet regime, Kazakhstan developed a sophisticated research capability, largely based on the defence (including nuclear and biological weapons research) and space industry. Since 1991, the emphasis has shifted away from military R&D and many of the Soviet scientists have returned to Russia. The 50 large Soviet enterprises that supported most of the R&D in Kazakhstan prior to 1991 have all but disappeared. There is still a dependency on Russia for spare parts for capital equipment, but with the introduction of new foreign technology, this is declining.

Consequently, there is an extensive foundation of technology capability on which Kazakhstan is attempting to build. The Soviet legacy includes a population with a 99% literacy rate. Nevertheless, in spite of the government's focus on science and technology (S&T), education provision in this area has deteriorated significantly over the last decade. Many educators have left the university system for the private sector, given the relatively low pay in the former. Working in the S&T sector has steadily declined in prestige, as has an interest in the engineering and the physical sciences (National Research Council, 2007). There is now a severe lack of well-trained students entering the S&T profession. This is not only due to the low salaries, but also to the marked decline in the standard of equipment and other facilities since the Soviet era.

Moreover, the structure of S&T research is segmented and there is little collaboration between the universities and the 25 independent researches institutes. Many of the research centres operate in isolation even from each other and there are few links with industry, either domestic of foreign. The institutes are also excessively hierarchical in structure, a legacy from the Soviet era, which stifles the research incentives of the younger members of staff.

It is inevitable that, for the foreseeable future, Kazakhstan will have to rely on foreign technology and technological transfer as it attempts to diversify its production. Indeed, few domestic companies show much interest in local R&D. The problem that this poses is that there are no market indications to guide the direction of S&T research, especially in the public sector research programmes.

The National Research Council (2007) has emphasised that upgrading established technologies are likely to have greater payoffs than trying to establish and compete in "breakthrough" technologies, attractive though the latter are to the government in terms of prestige. This upgrading includes providing technical support for the provision of health care, education, agriculture, transport and communication industries and the improvement of water and sanitation services. Agriculture is particularly important given that a substantial proportion of the population depends upon the sector for its livelihood, and it accounts for a substantial proportion of the country's exports.

A major problem is that many domestic companies are still uncommitted to R&D, preferring to concentrate on ways of minimising costs using outmoded technology rather than developing and using new technology. The government proposal that the private sector should provide 50% of total national R&D by 2012, rising eventually to two-thirds looks very over-optimistic. At present, of all new technology about 5% is provided by foreign companies operating in the country, 3.7% from Kazakhstan's private sector and 0.6% from the state-owned companies. The remainder comes from abroad.[55]

It should also be remembered that in the advanced countries, innovative activity results in a myriad of small improvements with only occasional substantial and revolutionary scientific breakthroughs. But few large domestic companies have R&D departments. Part of the reason is the lack of taxation incentives. Moreover, while most of the research is done in the research institutes and universities, there is little interest in their output due to poor marketing and technical transfer capabilities.[56] It is for this reason that the establishment of technoparks have been advocated.

8.2.2 The Innovation Clusters and the Technoparks

In the advanced countries, ever since the success of Silicon Valley, a great deal of attention has been focussed on the role of science parks, or technoparks as they are sometimes called,

[55] National Research Council (2007, p.21).
[56] The National Research Council (2007) provides detailed recommendations for improving Kazakhstan's science and technology both with regard to S&T institutions and the various sectors. These will not be discussed here.

in fostering both invention and innovation. In this section, the experience of Kazakhstan in this area is discussed.

Silicon Valley is the exemplar of a cluster of high-tech firms that have developed with the close collaboration of a leading university (Stanford).[57] As such, the firms in Silicon Valley have not only benefitted from all the MAR and Jacobs external benefits that spatial proximity brings, but have been crucial in the commercialising and developing new ideas from the university sector. The Boston cluster and the Cambridge (UK) science park are also seen as examples, par excellence, of this phenomenon. In particular, technoparks containing the biotech/life sciences have become increasingly fashionable, including one being developed at Astana, Kazakhstan with an investment of US$50 million. Most of these parks are funded by public funds.

It has been taken as almost axiomatic that the encouragement of the diffusion of leading-edge, or best-practice techniques, is of crucial importance in increasing the competitiveness of an advanced country. But it should be remembered that this is unlikely to be the optimal strategy for a transition economy, where, as was noted above, improvements to existing out-of-date technology will likely have a higher rate of return. Consequently, many science parks, or technoparks, were set up in the advanced countries in the 1970s and the 1980s, and the pattern was replicated in the transition economies in the 1990s. Given that R&D was exclusively undertaken by the state in these countries until the break-up of the Soviet Union, the establishment of technoparks would seem to be an important strategy in improving the rate of innovation.

Nevertheless, the success of technoparks, especially as they are seen as an integral part of the linear innovation model,[58] has been greatly over-estimated by policy makers. Even in the advanced countries the ability of local universities to generate new technology that can successfully be transformed by the small high-tech firms in the neighbouring technoparks has been greatly exaggerated. Very often, the research outputs from the universities are too abstract or fundamental for easy and immediate application by firms. Moreover, where this

[57] See, for example, Kenney (2008).
[58] The linear innovation model sees inventions in the university sector being the generator of new ideas, which are then taken up and commercially developed by the small high-tech firms on the technoparks which then forward them to the big commercial companies. Thus, the technoparks are seen as the incubators of new knowledge.

is not the case, universities are often funded by the large companies on a long-term basis, especially in the pharmaceutical, chemical and engineering industries. These firms also have large in-house research departments that develop the new knowledge from the universities for commercial application. Spatial proximity in this case, and more generally, plays a very minor, if any role, in technology transfer which is, after all, the rational for the technopark.

In the case of the Cambridge science park, many firms set up there mainly because of the provision of new infrastructure and the prestige of the address, even if they have no direct links with the university. This is not to say that the technoparks do not convey some benefits. Firms tend to grow faster on the technoparks in terms of jobs and sales, even if this is not true in terms of profitability. But fast growth may equally be due to the small base from which the growth occurs and the firms are likely to be in sectors of high growth, *per se.*

Some technoparks undoubtedly have been a success, North Carolina's Research Triangle which was established in 1959 and is now one of the world's largest technoparks comes to mind. Similarly, Singapore's Biopolis and Taiwan's Hsinchu Science Park are also seen as a success (Rinaldi, 2006). But equally, there are many that have failed and the successes seem to be more the exception than the rule (Wallsten, 2004a).

The position is summarised by Radosevic and Myrzakhmet's (2006) study of technoparks in Kazakhstan. They state that "science parks generally do not constitute a significant stimulus for technology transfer from universities to industry (Koenraad, 1991) and have generated only a modest direct contribution to employment (Storey and Tether, 1998)". Not surprisingly, the experience of technoparks in the transition economies has been disappointing.

> Practice shows that Polish technology parks are too weak to encourage the reindustrialisation of depressed areas, and their economic weight is insignificant (EU, 2003). The creation of technoparks was implemented in Russia during the 1990s to commercialise its vast S&T (science and technology) potential. However, the high expectations have not materialised, primarily because of weak demand from large firms for the products and services of new technology–based firms (Kihlgren, 2003).
> (Radosevic and Myrzakhmet, 2006, p.5)

In the light of this, it is perhaps not surprising that the study by Radosevic and Myrzakhmet (2006) also came to rather negative conclusions about the success of Kazakhstan's technoparks. One of the reasons may, of course, be that the technoparks have only recently been established and it may be too early to come to any definitive conclusions. (The data for the study were collected in 2004.) Nevertheless, their results are instructive. There were at that time seven technoparks that had been set up by the local authorities. The study considered five of them, together with a sample of similar firms not on technoparks that served to act as a control. The first point to note is the relative small size of the technoparks. The parks employed only about 200-300 people each and the average employment per enterprise was only 12, compared with 61 for the firms in the control sample. Thus, they are not likely to have any major quantitative effect on Kazakhstan's economic development.

The study found that there were some systemic problems of the technopark strategy. In most other countries, the technoparks are designed to encourage the development of new high-tech firms and to encourage the commercialisation and development of new inventions. However, as was noted above, much of R&D in Kazakhstan is still produced almost entirely by the government sector. (See Table 3.) Consequently, there has been little movement from a state driven R&D sector to a private R&D sector. Moreover there is little evidence that innovation policy has moved from technical institutions that undertake R&D on behalf of the firms to one that successfully encourages in-house R&D expenditure.

Table 3. Percentage Shares of R&D Expenditure in Kazakhstan, North America and the EU by Sector

Proportion of R&D Expenditure by	Kazakhstan 2002	North America 1995	EU 1995
Business sector	18.6	59.3	52.5
Higher Education Sector	22.2	15.6	20.8
Government Sector	57.2	10.2	16.2

Source: Radosevic and Myrzakhmet (2006)

The major reason for the limited success to date of the technoparks is that the firms that have located there are nearly all low-tech businesses engaged in the production of, for example, furniture, souvenirs and services such as catering. Out of 110 firms studied, only four were in the IT industry and 11 in pharmaceutical industry. It seems that the main attraction of the technoparks was the lower rents. The firms had no strong links with other local firms on the park or with universities or research institutes and neither were they in any way export orientated. The firms on the technopark were no greater innovators than firms located elsewhere. Radosevic and Myrzakmet (2006) conclude that the innovation policy of Kazakhstan was, at that time, a failure. Most of the money for the parks went into basic infrastructure and there was little emphasis on innovation or creating links between firms, industries and research industries. In short, the technoparks were failures as innovative clusters.

Nevertheless, the government is pressing ahead with its policy of creating technoparks. The Center of Engineering and Transfer of Technology of MIT is aiming to set up 12 incubators, 7 regional technoparks and 6 national technoparks. The incubators are to be established in a university and for three years will provide marketing, financial, legal and other services to new firms. The regional technoparks will provide infrastructure and services to any companies while the national parks will concentrate on specific areas such as IT. The new Alatau Information Technology Park has attracted overseas companies such as Microsoft, Hewlett Packard, Siemens, Cisco Systems and the domestic firm, Kazkhtelecom. But the take-up by domestic firms has been disappointing. "The resident companies apparently are using the park for warehouse storage space, thereby taking advantage of the economic incentives, while contributing little to the economic development of the country" (National Research Council, 2007, p.81).

The conclusion is that the technoparks to date have been of virtually no help in developing technical transfer or increasing the rate of innovation in Kazakhstan. While this could change in the coming years, the major problems of S&T that need to be addressed are at the national level. They include developing a strategy that moves the S&T away from "technology push" (i.e., determined by agendas set by the research institutes) to one determined by "market pull". Moreover, there should be a greater focus on small incremental improvements to existing technology rather than attempts spectacular prestigious scientific breakthroughs. As Radosevic and Myrzakhmet (2006, p.19) conclude,

it is necessary to introduce policies to ensure that companies can "articulate their demand for R&D. Without this step, focusing on technoparks as a mechanism to improve competitiveness and diversify the economy may be far too expensive and uncertain a policy at this stage of economic development".

8.3 The Agro-Food Cluster in Kazakhstan[59]

Agriculture is still a major source of employment in Kazakhstan accounting for about 32% of the total. However, because of its very relatively low productivity it only produces about 6% of the country's output. Because of the large numbers employment and the large proportion of the population living in rural areas (44%), the government has been active in promoting the development of this industry. Moreover, agriculture represents an important source of foreign earnings, mainly from exports to Russia. (Agricultural exports represent 4.2% of the total foreign earnings, but these are dwarfed by "mineral products' that account for nearly 70 %. Wheat accounts for over half the value of agricultural exports.)

Given its importance, it is not surprising that agriculture forms part of the Kazakhstan's government's cluster policy, with a number of potential regional clusters being designated. However, as we shall see, the question arises as to whether or not the establishment of clusters are likely to make much difference, given the overall level of inefficiency in the sector. This is both in terms of the low yields (half those found in the US), an inefficient transport system, inadequate food processing and outdated machinery. There is also the suggestion that government assistance has not been distributed to where the highest returns are and has gone proportionally more to the large corporate farms. All this would suggest that widespread aspatial economic reforms are the first priority and, without these, the cluster policy is likely to have only a marginal impact. The second problem, discussed below, is that the cluster policy seems designed to replicate the structure of the existing large agroholdings found in the north of the country and it is doubtful whether this is the best organisational structure for agriculture as a whole (Wandel, 2008).

Like the rest of the economy, the agricultural sector went through a crisis in the 1990s following the break up of the Soviet Union. Production collapsed and the sector was short of funds. The price of inputs used in agriculture such as fertilizers increased rapidly while

[59] This discussion draws on J. Wandel (2008)

the price of output remained strictly controlled by the government. This was reversed in 1999 due to a rapid rise in world prices and the recovery of Kazakhstan's major trading partners. There was a dramatic increase in the numbers employed in agriculture from 1.3 million in 1999 to 2.4 million in 2001, although part of this may be due to classificatory errors (Pomfret, 2006, p. 55). Nevertheless, in 2006, 39 percent of all corporate farms were still unprofitable, although this was an improvement on the figure of 78.5% in 1998 (Wendal, 2008, p.10).

Farm privatization and restructuring began in 1993 and, following a new Land Code in 2003, 90 percent of agricultural land is now private, with full property rights. There was a deliberate attempt to preserve the large integrated agroholdings in the northern grain areas.

Wheat is a major crop of Kazakhstan and the country is the 6th largest grain producer in the world. The major wheat growing areas are the northern oblasts of Akmola, Kostana and North Kazakhstan and wheat is mainly produced by large-scale corporate enterprises or 'agroholdings'. By way of contrast, individual family farms which produce most of the output dominate in the south. In the past, the CIS countries had been the main importers of Kazakhstan's grain, but now other countries are being targeted and Kazakhstan exports to Austria, the UK, Turkey, Switzerland, Saudi Arabia, China, North Korea and Mongolia. (Zashev and Vahtra, 2006, p.19.)

Kazakhstan's agricultural policy in the past was one of import substitution with food security as a priority. This has now changed to a more export-orientated policy, but it is still one based on subsidies and tariffs, with all the possible adverse resource allocations this implies. However, when world prices led to an export boom in grains, the government in May 2008 introduced export licences to retain more of the crop for domestic consumption for fear of social unrest. However, with 22 million tons of wheat produced in 2007, and domestic demand of only 3.5 million, the fact that this was necessary points to the substantial inefficiency in the distribution and marketing system. Thus, agriculture is, for domestic reasons, a politically sensitive sector.

There is a 40% subsidy for farm inputs and low tax rates for farmers. Agricultural machinery can be leased at subsidized rates (Wandel, 2008, p.11). There has also been a bias towards greater support for the larger corporate farms. The government has also

supported the food processing industry, which is the weakest link in the value chain. In 2007, nearly 80% of Kazakhstan food products were unprocessed. (Wandel, 2008, p.10) and the majority of processed goods have to be imported (including nearly all the country's butter and meat requirements).

All sectors of agriculture are plagued by old and inefficient machinery. "Almost 85% of the machinery currently being used in Kazakhstan is at least 12 years old and needs to be replaced, requiring up to $320 million of investments for renovation. The lack modern agricultural machines is considered one of the major constraints preventing the sector's effective development" (Zashev and Vahtra, 2006, p.20). While there are plants in Kazakhstan producing agricultural machinery, this is not true of the food processing industry and nearly all the capital equipment for this sector has to be imported. This has led to the policy of "industrialization of agricultural production" which involves re-equipping agriculture with modern machinery. According to the government this can most effectively be done by the development of clusters. This is particularly true as there is a need to develop transport infrastructure and a whole host of ancillary support industries, including "a network of veterinarian and phyto-veterinarian services, procurement organizations, wholesale markets, information and marketing services as well as financial and insurance institutions" (Wandel, 2008, p.13).

The initiatives out forward to develop clusters in the agro-food industry include the following:

- Grain processing in the Akmola, Kostonay and North Kazakhstan
- Dairy production in Akmola, Kostonay, North Kazakhstan, Almaty, and East Kazakhstan,
- Fruit and vegetable production in Almaty, Zhambyl, and South Kazakhstan
- Meat processing in Kostanay, Pavlodar and North Kazakhstan
- Fish production in Atyrau, East Kazakhstan and Karanganda
- Cotton production in South Kazakhstan

Coordination councils were set up to bring the participants together and various tax relief and subsidies are proposed. The clusters are still in their infancy and the various individual developments have been discussed in detail by Wandel (2008). However, he is particularly

critical of the whole initiative as he sees it essentially government driven with no reliance on, or guidance from, market forces. As such, it is based on the old Soviet mindset of the efficacy of state planning (partly in order to achieve food security) and the putative advantages of large vertically integrated enterprises that the government considers should be encouraged. In fact, as has been noted above, these have developed in the 1990s when large corporations, which comprised of vertically integrated production process, were often created by firms outside the agricultural industry. In a way, these could be seen as a blueprint for the cluster policy.

This was a pattern that first occurred in Russia in the 1980s and is generically termed "agroholdings". These had their origins in the centrally planned large vertically integrated agricultural organisations. These covered the whole production structure from the supply of inputs to marketing, and even included banks and enterprises from other industries such as the energy sector. The advantage of the agroholdings is that they can internalise many of the inter-firm and spatial spillover effects and hence may be an appropriate way for institutions to develop in transition economies. However, the work of Hockmann *et al.,* (2004) suggests that in Russia the agroholdings are often less efficient than other types of agricultural organisation. The reason was that this organizational structure leads to highly centralised decision making which is only suitable for a few specialised agricultural value chains.

In Kazakhstan, similar agroholdings are found especially in the grain growing areas of the north. It has been estimated that there are about 40 holding companies in the grain sector accounting for about two-thirds of total grain sales (both domestic and for export). The largest agroholding company outside the grain industry is the diary company *AO Food Master* which accounts for 30% of the market, but it is not engaged in primary production (Wandel, 2008, p.15). These agroholdings have a number of advantages that has resulted of the development of, especially, the grain sector. They have access to bank lending often based on their non-agricultural collateral; they benefit from economies of scale and specialist staff. They also can guarantee their sources of supply, and they can spread risk through their diversification of production and finally they have political influence. There are often close influential connections between the directors of the agroholdings and the regional administrators. Nevertheless, it should be remembered that the agroholdings only

developed in the large grain areas of the north and some large holdings are now leaving agriculture.

A close parallel drawn by Wandel (2008) is that of the late 19th and early 20th Century corporate wheat farming in the US which developed under similar conditions as are founds in Kazakhstan today. These included rising demand and prices for wheat, favourable weather conditions, technical change that favoured economies of scale, and cheap land. But they foundered, giving rise to smaller agricultural farms and the corporations instead concentrated on processing and marketing. The same seems to be happening in Kazakhstan simply because of delegation and agency problems and the difficulty of finding good quality managers (Wandel, 2008, p. 22). Moreover, some find it more profitable to move into other sectors, such as oil and real estate development.

The similarities between the agroholdings with the proposed agro-food cluster policy are readily apparent, and therein lies the problem. The cluster policy is based primarily on vertical integration. The agroholdings only developed in the wheat growing areas in the north and not in the south. One size does not fit all, and there are reasons for doubting whether or not agroholdings, *per se*, are the most efficient form of agricultural organisation.

Kazakhstan cluster policy is driven by government rather than being driven by market forces. The Ministry of Agriculture through a number of working groups identified the possible clusters. There is a reliance on protectionism, picking winners and "strategic trade policy" which compares unfavourably with the successful development of clusters that are based on competition and openness. But there is also a question of how far these policy intentions will actually be carried out in practice.

9. Conclusions

There is no doubt that the consideration of space matters for economic development. There is substantial evidence that the observed punctiform nature of production is due to internal increasing returns and agglomeration economies. It has been shown how these can give rise to a process of cumulative causation and increasing disparities both within and between countries. Within a country, there will, however, be limits to the rate of growth of a city as

congestion costs and rent increases begin to offset the cost advantages of economies of scale.

As a national economy becomes more integrated of the course of development, so there are like to be greater centripetal forces leading to a convergence of regional productivity levels. But, as the World Development Report (2008) notes, attempts to accelerate these spread effects are likely to be at the cost of aggregate productivity growth. There is thus a trade-off between efficiency and spatial equity. As we have seen, the concept of clusters, especially of the form advocated by Porter, have become an almost ubiquitous tool for considering how to increase productivity and competitiveness, and thereby accelerate development. But there are serious questions about whether or not this concept has the necessary theoretical foundations or empirical importance upon which to base the main thrust of a transition country's development strategy. Nevertheless, this is the path Kazakhstan has taken, at least in principle, drawing heavily on the advice of Porter.

A number serious reservation about the concept is that it is rather nebulous (Martin and Sunley, 2003). One of the problems is that the notion of the cluster is so broad that has been applied at a wide variety of geographical levels, ranging from small artisan clusters in rural villages in developing countries (see the symposium in *World Development*, Schmitz and Nadvi, 1999) to the large high-tech clusters such as Silicon Valley. Indeed, it is possible to identify clusters at virtually any spatial scale.

Furthermore, there are, almost by definition, likely to be a number of linkages between firms and their suppliers and their customers. Generally, they are all likely to be in reasonably close spatial juxtaposition, especially if the industry developed when transport costs were high and there is a large degree of inertia, or path dependency, because of sunk costs. Moreover, given firms in the same industry face the same locational constraints and, with bounded search and uncertainty, it is perhaps not surprising that they cluster, even when agglomeration economies are weak, or even absent. As van der Linde (2003, p.146) points out in his extensive survey of clusters, the presence of raw materials, cheap labour and special growing conditions (in the case of the agriculture and fishery sector) are often initially more important than a skilled labour force, a specialized labour force, or a near-by university.

Cluster studies have almost obligatory flow diagrams that show the connections between the supporting and related industries, industrial associations, academia (including research institutes) etc. Such relationships are not, *per se,* evidence, of market failure due to agglomeration economies and they are not necessarily evidence of the need for government intervention to correct these failures. The development problems facing the transition economies go beyond mere considerations of the improving the coordination of existing industries and institutions.

Moreover in spite of the widespread use of the cluster as a policy tool, Porter's policy prescriptions are somewhat anaemic, essentially because of a conflict between what is seen as the primacy of market forces, but also the need for government policy. Porter argues that it is not the government's job to initiate new clusters or to encourage the development of a particular industry, but merely to raise the productivity of *all* existing clusters. This is largely to be done through the setting up of, for example, appropriate co-ordinating agencies. But, perhaps not surprisingly, this is not how the implications of cluster policy have been interpreted. As Woodward (2005) has cogently argued, it has often been taken as a recipe, to a greater or lesser extent, for industrial targeting and an industrial strategy.

For a developing or a transition country, following Porter's advice would mean rigidly following the country's static comparative advantage whereas much of the evidence from the rapid development of Japan in the 1950s and the 1960s and the newly industrialising countries points to the opposite conclusion. The aim should be to develop industries which have the greatest growth potential, even if this is not where the short-term comparative advantage lies. In this sense, a distinction should be made between the static comparative advantage and dynamic comparative advantage or the "competitive strengths" (McCombie and Richardson, 1987) of a country. This is not to say that widespread import substitution policies, especially without sunset clauses, are a *sine qua non* of development. Clearly the experience of some Latin American economies points to the opposite conclusion. But as Rodrik (2004, p.2) has persuasively argued, while market forces and private entrepreneurship have to be harnessed, governments need to perform a "strategic and coordinating role in the productive sphere beyond simply ensuring property rights, contract enforcement, and macroeconomic stability." There is a clear and important role for government in the development process (Wade, 2003)

There are certainly a number of general issues that Kazakhstan needs to address, but have nothing to do with clusters, indeed as Porter (2005) notes. Like many former communist countries, prior to 1991, property rights were vested in the state and private property rights may still be unclear. There is need for a clear and transparent judicial process. Because the national economy was integrated into the FSU, there was an over-dependence of heavy machinery which is still producing inefficiency. There is still the problem of excessive red tape and lack of regard for the entrepreneurial spirit. "The notion of owning one's own business and profit making is still seen as something negative by large parts of society. Entrepreneurs are often hesitant to cooperate both with authorities and with business owners, preferring instead to go it alone. One reason for this could be lack of social capital in post socialist societies with social networks in short supply". (OECD, 2005, p. 28. See Chapter 2 for a discussion of the importance of social capital in post-communist societies.) These are all issues that the transition economies, including Kazakhstan need to tackle, especially if much needed foreign direct investment is to be encouraged. Moreover, a crucial issue for all the CAREC countries is to improve transport communications with the rest of the world.

This is not to say that cluster analysis is not without its uses, especially given the need for government resources to be spatially concentrated for the greatest return. While Kazakhstan has made the development of industrial clusters a major component of its economic strategy, it is noticeable how recent studies concerning the country have barely mentioned clusters (Zabortseva, 2009, Rakhmatulina, 2006, Libman, 2006, and World Bank 2006. Even Zashev and Vahtra, 2006, treat clusters as, in effect, industrial categories.) This may be partly a result of the lack of published data and information on clusters. It is interesting, however, to note that although the structure of the cluster initiative was discussed at www.cluster.kz (Libman, 2006, p.24), "services for this domain have been discontinued" (as of 21st February, 2010). There is evidence that the emphasis of clusters in Kazakhstan's development policies is waning and cluster policy is no longer being actively discussed, notwithstanding its earlier prominence.[60]

[60] Meruert Makhmutova, Director, Public Policy Research Center, Kazakhstan, personal communication, October 2009.

Nevertheless, Porter does stress the importance of the competitiveness of traded sector for generating growth. The approach of Hausmann *et al.,* (2005) in determining those industries where countries have the greatest potential for competing in world markets is especially instructive. Once this is has been done, there is a limited role for cluster analysis to determine how this may best be implemented.

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