

A Shining Externality on a Hill: Do the competitive advantages of industry clusters attract investment in new plant and equipment from outside the region?

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Abstract

The importance of industrial clusters to boost regional economic development has widely gained scholars’ attention. Several researchers – Michael Porter and Christian Ketels, among others – have developed the study of cluster-based economic development and touted the employment and competitive benefits of cluster-based development strategies (Porter, 2003; Porter, 2008; Ketels, 2013; Ketels and Memedovic, 2009). The benefits revolve around employment growth, productivity and competitiveness. Although much of the empirical work focuses on the benefits of clusters on industrial employment, innovation and productivity, less systematic empirical attention has paid to identifying strong regional clusters and the regional characteristics that attend cluster formation and growth.

Clusters form due to the benefits of agglomeration externalities in a region, or, said differently, industries that develop in clusters tend to have a competitive advantage (Porter, 1998). It has sometimes been said that clusters form “because there is something in the air.” More practically, what is in the air may be that firms in the same or related industries in a cluster benefit from being in close proximity, often called “localization externalities.” Long established firms grow and new firms, start-ups, can also take advantage of a well-developed regional labor force and supply chain. One might say that these firms grow based on the region’s economic metabolism, that is, they expand using the resources, labor and know-how in the region, as well as technology from outside the region – combined with increasing demand for the cluster’s goods and services from outside the region. In this way, regional clusters grow metabolically.

On the other hand, there may be significant benefits to close geographic proximity for incumbent firms, either young or mature, from outside the region to move into the region to take advantage of these agglomerative externalities. In other words, clusters can also grow “magnetically,” that is, a region can attract firms to take advantage of that region’s competitive advantage in

resources, supply networks and human talent. An example of magnetic growth is foreign direct greenfield investment (FDI).

The empirical question is then: do strong, established, growing clusters tend to attract incoming firms in the form of “foreign” direct investment? (Foreign is in quotes because any investment from outside the region – international or domestic – can take advantage of a region’s competitive advantages to colocation.)

Strength is viewed as the relative concentration of a cluster, without regard to the balance or concentration of industries within that cluster, in the same way that industry strength, or specialization, is viewed as the relative concentration of an industry as measured by a location quotient. In other words, how concentrated is the cluster relative to other clusters in the region? This aligns with the notion of related variety discussed by Frenken, Van Oort, and Verburg (2007), who categorized industries based on their technological and material requirements. In a similar way, Delgado and colleagues (2016) used industry input-output relationships to categorize industries into clusters. The agglomerative benefits of such related variety are often called “localization economies” (Frenken et al., 2007) and were first conceptualized by Marshall over a century ago (1890/1966) and since refined by Arrow (1962) and Romer (1986). The agglomeration byproduct of related variety is often referred to as MAR externalities. MAR externalities are within industries, usually broadly defined, but in this case MAR externalities would be in evidence within a cluster.

The forces of agglomeration as expressed in the formation of regional clusters is partially based on the diversification of industries, as a result, it may be helpful to contrast the Jacobian urbanization diversity benefits (Jacobs, 1969) of the unrelated variety of economic sectors, with how cluster diversification will be operationalized here. The findings of Delgado et al. (2014) point to cluster variety – multiple clusters in a region that are related – as having a positive effect on innovation as measured by patenting rates. Frenken and colleagues (2007) hypothesize that Jacobian, or unrelated variety, externalities are positively related to employment, but they also discuss an additional dimension to unrelated variety, namely resilience. In our case, a diversity of industries within a cluster is akin to the diversification of stocks in a portfolio. Cluster diversity used here is not a measure of how, and in what ways, unrelated clusters are different from each other, rather diversity is more synonymous with balance within a cluster. Following Frenken, and colleagues (2007), we use an entropy index to measure cluster industry diversity/balance.

This empirical study investigates the role of magnetic cluster growth in U.S. regions, in the form of greenfield and expansionary investment flows, i.e., FDI. Expanding upon the work of Delgado et al. (2014), we explore the degree to which the agglomeration externalities motivate decisions to move into a region. In the spirit of their work, we examine whether a high concentration of related industries, or strong clusters, tend to attract additional investment inflows and thus additional employment within that cluster. In addition, we are particularly interested in whether a more diversified, or balanced, set of industries within a strong, or highly concentrated cluster, tends to attract new greenfield investment or additional expansionary investment for firms already operating in the region.

Somewhat in the spirit of Ellison and Glaeser (1997), we are investigating whether the location patterns of new investment, and the concomitant employment, in plant and equipment follow a random, throw-a-dart approach or reflect decisions that may be motivated by seeking the competitive benefits of industrial colocation and concentration. For this reason, we can identify investment moving into a region and assess whether a region has relative strength in the cluster associated with the investment. In addition, we can also assess whether the receiving regional cluster has a diverse set of industries or simply dominated by one or two industries within that cluster.

We use industry cluster definitions from the U.S. Cluster Mapping Project (CMP) and employment by industry data from QCEW-complete employment estimates. The proprietary dataset, [fDiMarkets](#), is the source for greenfield employment and investment announcements. We use a concordance developed by fDiMarkets to map their industry definitions to NAICS-based industries and, following that, assigning FDI to the cluster aggregations from the CMP. Only in a handful of cases did the need arise to aggregate two or three CMP clusters in order to correspond to fDiMarkets industry aggregations. All of these data are available at the county level. However, we assess differences in geographic boundaries, population concentration and degree of rurality by modeling MSA, micro-politan statistical areas and the rural balance of state counties separately.

The time span of study for FDI announcement data series is from 2007 to 2015. Our empirical strategy is to construct a three-period pseudo panel of regions, by dividing the time series of data into three time phrases (2007–2009, 2010–2012 and 2013–2015) and denoting each the first, second and third period respectively. (The reason for doing this – instead of using the time series as it is – is that the FDI data tends to be sparse on a yearly basis.) We then study the dynamics between cluster strength and anticipated FDI flows over time.

A potential weakness of the FDI announcement data is that: 1) the jobs realized once the plant and equipment are in place may be different than the number of jobs reported in the press releases; 2) there is no way to know how many new, incoming magnetic jobs, were created because of the disclosure constraints associated with record-level QCEW establishment data; and 3) there is no fixed time between an FDI press release and realized jobs. The latter can vary greatly depending on the industry, the scale of investment, market demand conditions for the firms, etc. That said, firms can spend several years and millions of dollars in site selection and negotiating with local and state officials before making an announcement; thus, we consider the FDI announcements as an appropriate signal for a region's relative attractiveness in terms of agglomeration externalities.

To examine region-cluster employment growth, we draw on studies of regional economic growth as a function of the level of economic activity and attributes of the region (Combes, 2000; Delgado et al., 2014). The econometric model regresses announced investment on plant and equipment (and employment), both binary and level, on a number of factors that characterize cluster strength, such as employment location quotients (LQ), a measure frequently used to quantify the concentration of a particular population in a region as compared to the relative concentration of the nation (or some other geographic peer). We also use an entropy index, such

as the Herfindahl or Shannon, to assess cluster diversity. In addition, we will also explore the development of an additional measure of industry balance that provides an indication for a region's balance relative to the balance of the nation (or some other geographic peer) rather than an industry's salience or the balance of the industries within a cluster. Two regions can share the same Herfindahl score of 1 (or a Shannon score of zero) showing one salient industry and no presence of other industries within the cluster, but little else can be gleaned from the measure.

The advantage of the panel structure in this study is that it overcomes the endogeneity problem that often occurs in the aggregated-level analysis, such as with regional analysis. One can argue either way that industrial clusters magnetically attract firms from outside the region or that inflow of investment in plant and equipment facilitates the formation of a cluster. However, this issue can be easily resolved if we use previous cluster strength as the control covariates. It also allows us to see the differences across time (vertically) and among regions (horizontally).

The first period for FDI (2007–2009) coincides with the last recession – there is a noticeable difference between the first and later periods in the volume of announced FDI. We hypothesize, therefore, that a region's competitive advantages due to robust clusters may make the industries, and the aligned industries in that robust cluster, more resilient to economic shocks. Moreover, these regions may also stand out in terms of being among the first to garner new plant and investment as the economy rebounds. Thus, regions with strong clusters may have an advantage post-recovery.

The FDI data reveals several dimensions that may be of interest. For example, a quick overview shows that many jobs supported by incoming investment are in sectors that are growing due to population growth, or the growth of certain demographic groups, such as seniors. These investments may be more motivated by being close to market, rather than the presence of either MAR or Jacobian externalities. The data also notes the source of the investment, either country or, if sourced from within the U.S., the state. Here one can potentially ascribe regional wage rate differences to location decisions within country. One can also hypothesize about the level of the associated technological sophistication for the new employment. The investment in non-high-technology clusters (such as hospitality and tourism and real estate development) is well in evidence after the Great Recession, for example. Other investments in local or non-traded industries may show an appetite for international businesses to invest in a safe and growing developed country, in contrast to those developed countries that continued to experience economic doldrums.

Initial analysis also shows that the clusters in the top ten list in terms of the number of incoming jobs tend to be more diversified – that is, having either lower (higher) average Herfindahl (Shannon) index scores. Based on an initial examination of scatter plots of FDI and cluster strength for the top ten employment receiving clusters show that more diversified clusters tend to garner a greater volume of FDI-related employment, thus potentially signaling the importance of a well-developed labor force as well as supply chains and material linkages among co-located firms. Finally, we analyze how different geographic definitions may affect the results to see agglomerative benefits decline with distance and population density.

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