Industrial Cluster Formation As A Strategy To Diversify A Sub-National Economy: Illustrations From South Africa's North West Province

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ABSTRACT

Economic modelling techniques can assist policy makers to understand the effects of policy or external shocks and to make informed decisions about economic development programmes. Economic diversification is a priority of resource-dependent regions such as South Africa's North West Province (NWP) in the wake of the 2014 platinum strike. The economy of the NWP is highly specialised and dependent on a few sectors - in particular, mining and quarrying. Both the NWP and the South African economies were adversely affected by a prolonged strike in the platinum sector.This paper sets out to illustrate the effects of industrial cluster formation as a strategy to enhance competitiveness in the NWP and diversify its economy using SAM multiplier analysis. The supported activity of eight of the ten industrial clusters was shown to be greater than the actual activity, indicating that industrial cluster formation will enhance economic activity in the NWP. Of the ten identified clusters for the NWP, four were found to be moderately integrated and to have high upstream effects. Finally, structural change in the NWP economy through industrial cluster formation was observed using economic landscaping. A key finding was that the identified industrial clusters are significant contributors to the structural change of the NWP economic landscape with the promotion of cluster-specific exports. It is recommended that the North West provincial government adopt this strategy with a view to enhancing competitiveness and economic diversification.

Keywords: Industrial Clusters; Economic Diversification; Competitiveness; Multipliers

1. INTRODUCTION

The need for policy makers to understand the sectoral, regional, temporal and social effects of policy or external shocks has been a key driver in the advances made in economic modelling to address this challenge. Economists have come up with a number of methods that can assist national and regional governments to make informed decisions about economic development programmes (Honkatukia, 2013). In this regard, social accounting matrices (SAMs) can be useful in calibrating a broad class of models to demonstrate the social and economic effects of different policies.

The economy of the North West province (NWP) of South Africa is highly specialised and dependent on a few sectors (Pisa, 2014). This dependency manifests in particular in the following four sectors: mining and quarrying (25.5%), financial services (16.7%), government services (13.9%), and trade and accommodation (11.4%). Together these contributed 67.5% of the NWP's output in 2011 (Quantec Easy Data, 2014). Its heavy reliance on resources (i.e. mining and quarrying) makes the province vulnerable to external shocks and currency fluctuations. Furthermore, resource dependency makes the provincial economy prone to macroeconomic instability and crowds out domestic industry, including manufacturing (Eitzen, 2012). Manufacturing is crucial for sustainable

economic development, yet specialisation in resources results in manufacturing losing ground when it comes to development (Kingstone, 2012). In 2014 the NWP and South African economies were adversely affected by a prolonged strike in the platinum mining sector. The strike adversely affected global supply of minerals and mineral products, South Africa's economic growth, mining companies' revenues and workers' remuneration (Singh, 2014; Solomons; 2014; Alers, 2014). Economic activity and economic growth in South Africa contracted in the first quarter of 2014 with real gross domestic product (GDP) declining to -0.6%, in the first quarter of 2014 compared to 3.8% in the last quarter of 2013 (SARB, 2014). Mining production decreased by 6.5% year-on-year in May 2014 (SARB, 2014). In terms of platinum supply, 440 000 ounces of platinum production was lost. The three major companies in the sector; Impala Platinum, Amplats and Lonmin suffered a total revenue loss of about R24.1billion during the strike while the workers incurred a further loss of R10.6 billion in wages (Platinum Wage Negotiations, 2015).

In the wake of the 2014 platinum sector strike it is crucial for the NWP to implement strategies to diversify its economy and to minimise the adverse effects of dependence on mineral resources. To address this problem, this paper proposes an industrial cluster formation strategy and illustrates how it can help to enhance competitiveness and diversify the economy of the NWP. To achieve this, the Structural Path Analysis (SPA) and Power-of-Pull (PoP) methods were applied to a 2006 provincial Social Accounting Matrix (SAM) for the NWP in order to identify industrial clusters (Pisa, 2014). This paper shows industrial cluster formation's contributions to the NWP economy using detailed analysis to illustrate how the clusters interact with other sectors and to trace their impact throughout the economy. An important aspect of this study is to estimate the economic contributions of industrial clusters to the NWP economy. Specifically, the paper focuses on the use of the NWP SAM to develop simple economy-wide multipliers and economic landscaping. These two methods respectively, illustrate the effects of industrial cluster formation on the NWP's economy by demonstrating the additional output, employment, employment income and GDP that each cluster can generate as well as the change in the structure of the economy of the NWP.

The rest of this paper is structured as follows: section 2 (below) provides a background on multiplier analysis as a tool to measure the strength of interactions among sectors. Section 3 discusses the methods used and section 4 presents the results, which comprise: the graphical presentation of the clusters' backward and forward linkages, the supported activity generated by the ten identified clusters, and the economic landscapes of the NWP economy pre- and post-industrial cluster formation. Section 5 concludes the paper with some final observations.

2. THE USE OF MULTIPLIER ANALYSIS TO MEASURE
THE STRENGTH OF INTERACTIONS AMONG SECTORS

The level of activity directly associated with a sector differs from the level of activity that the sector supports. According to Learmonth, Munrow & Swales (2003), the supported activity of clusters is expected to be higher than the direct activity due to the enhanced competitiveness of clusters. Porter's view on the genesis and evolution of industrial clusters supports this notion. According to Porter (2002), the establishment of firms and subsequently clusters in response to the availability of factors of competitiveness in a region leads to the creation of a competitive industry. The success of an industry makes it a sophisticated buyer of products and services (Porter, 2002). Both domestic and foreign suppliers will be attracted to establish operations in close proximity to this competitive industry in order to provide goods and services, which in turn increases the cluster's supported output.

The SAM provides a basis for measuring the strength of interaction among sectors (Czamanski, 1974). This is achieved by analysing multipliers. Multipliers measure the forward and backward, as well as the direct and the indirect, linkages that exist between the cluster sectors themselves and between cluster and non-cluster sectors (Learmonth *et al.,* 2003). SAM multiplier analysis can be traced back to the 1970s, with studies such as those of Pyatt and Thorbecke (1976), Pyatt and Round (1979), Hayden and Round (1982), and Defourny and Thorbecke (1984). These studies mainly analysed the effects of government policy to reduce poverty and inequality by observing household and income multipliers. A SAM shows the circular flow of income in an economy in a square matrix format (Ciaschini & Socci, 2007). The underlying structure of a SAM includes structural and/or behavioural specifications for the various groups of transactions (Round, 2003). In particular, the SAM specifies the structural changes of relative prices. SAM multipliers account not only for the direct and indirect effects but also for the induced effects on factor and household incomes and activity outputs due to the (Keynesian) income-expenditure

multipliers (Robinson, 1989; Adelman & Robinson, 1989). SAM multiplier analysis gives some indication of the possible resultant effects of an exogenous shock on the functional (factoral) and institutional distributions of income as well as on the structure of output.

Traditional multiplier analysis or "first cut ex-ante analysis" in a SAM captures the generation of income by activities by producing commodities. It maps the income payments to the different factors of production, the distribution of factor and non-factor income payments to households, and the subsequent spending of income by households on commodities (Round, 2003; Breisinger, Thomas & Thurlow, 2010). These patterns of payments are manifested in the structural features and interdependencies of the SAM. The patterns of payments are modelled analogously to the input structure of the activities in a SAM model, based only on inter-industry transactions for that particular economy (Round, 2003). Traditional multiplier analysis gives some indication of the contributions of each sector to various indicators, such as production, value added, capital and labour, relative to the structure of the economy. Traditional SAM multipliers measure the effects of production linkages only.

There are 4 types of multipliers that can be computed. Type I multipliers constitute direct and indirect output changes to the initial direct change in final demand (Learmonth *et al.,* 2003). Miller and Blair (1985) define Type II multipliers as the ratio of the direct, indirect and (income) induced changes associated with a direct change in a given sector. This means that Type II multipliers account for induced impacts based on the purchases made by employees in addition to the direct and indirect impacts (Bess & Ambargis, 2011). Lee (1986) states that Type III multipliers involve the inclusion of another final demand component, such as state and local government expenditure, as an endogenous account. Type IV multipliers (income and employment multipliers) can be obtained by pre-multiplying the matrix of output multipliers by a row vector of wage-to-output ratios in the case of income, and employment-to-output ratio in the case of employment (Ciaschini & Socci, 2007; Polenske & Jordan, 1988).

3. METHODS

3.1 Identifying Industrial Clusters Using the SPA and PoP Methods

Structural path analysis (SPA) was applied to a social accounting matrix for the NWP. The SPA was conducted using the program, SimSIP SAM, which is a Microsoft Excel tool developed by the World Bank that utilises MATLAB to analyse I-O and SAM tables (Parra & Wodon, 2009). Fixed origin analysis was conducted in SimSIP SAM. SPA decomposes SAM multipliers into direct and indirect components and reveals the network through which transmission occurs (Defourny & Thorbecke*,* 1984; Rasmussen, 1956; Hirschman, 1958). The backward linkages or diffusion effects are calculated as follows:

$$\text{BL}_j = \frac{B_j}{\frac{1}{n}v}, \; j = 1 \dots n \tag{1}$$

The forward linkages or the absorption effects are calculated as follows:

$$\text{FL}_i = \frac{B_i}{\frac{1}{n}v}, \; i = 1 \dots n \tag{2}$$

Where *B* represents the sectorial interdependences in an economy or the Multiplier Product Matrix (MPM). The sub-indexes i, j make reference respectively to the rows and columns of the corresponding matrices. *n* is the number of endogenous variables in the SAM that is, the productive sectors, the production factors and the consumers. *v* is a global intensity factor that corresponds with the sum of all the elements of the associate inverse matrix. If the backward linkages are greater than 1, it implies that a unit change in the final demand of sector *j* will generate an increase above the average in the global activity of the economy (Lima, Cardenete & Vallés Ferrer, 2005). If the forward linkages are greater than 1, it implies that a unit change in all the sectors of the final demand will generate an increment above the average in sector *i*. A key sector is the one with both indexes greater than 1 (Lima *et al.,* 2005).

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The SPA method, however, does not determine the optimal number of clusters. It shows different clusters and how they are interconnected with the rest of the economy, but it does not show the most important cluster with the greatest economy-wide effects. In light of this, the power-of-pull (PoP) method was used to prioritise the number of clusters. This is essential for the effective promotion of industrial clusters because governments have limited resources (Martin & Sunley, 2003). Following Dietzenbacher (1992), we assume $\mathbf{r}_i$ to be a vector of power indicators of the sectors, and the indicator vector r_{i+1} is updated as the sum of backward linkages (columns of the A matrix) weighed by the normalised r_i from the previous iteration. The inputs from a sector with high pulling power receive a larger weight than the inputs from a sector with lower pulling power. The power scores, which are also used as the weighting factors, are normalised to have an average of 1. The power scores take the following form:

$$r_{i+1} = n\grave{r}_i A / \grave{r}_i Ae \qquad (3)$$

Where n is the total number of sectors, and e is the column summation vector ($e_i = 1$ for all i). Estimates of a sector's power indicator improve through iterations to infinitum $(i \rightarrow \infty)$. Furthermore, according to Dietzenbacher (1992), "the indicator converges to the normalised left hand eigenvector corresponding to the dominant eigenvalue (i.e. the Perron vector) of the input coefficient matrix A". The indicator vector can be calculated as nq'/(q'e) with:

$$\acute{q} = \lambda \acute{q} \qquad (4)$$

Where q' is the dominant eigenvalue of the A matrix. The elements of nq'/(q'e) indicate how powerfully the activities of sectors may pull the activities (thus outputs) of the overall economic network (including themselves), i.e. the power-of-pull. For more details on this method, including its derivation, see Dietzenbacher (1992).

3.2 Illustrating the Effects of Industrial Cluster Formation on the NWP Economy

3.2.1 Graphical Representation of Multiplier Analysis

Following Learmonth *et al*. (2003) the linkages a cluster has with the rest of the economy are identified using an accounting procedure that quantifies the intermediate purchases made by that sector (both direct and indirect). This proposed method has been discussed in detail by Learmonth *et al*. (2003) and can be illustrated using an example. The production of the agriculture cluster sector output (commodities) as an example requires intermediate production inputs. The intermediate inputs, in turn, require intermediate inputs ad infinitum, thereby generating a multiplier process. With cluster formation agriculture output will increase, but in order for these increases to occur the agriculture cluster sector's demand for intermediate production inputs will increase. The intermediate inputs' demand for intermediate inputs will in turn increase ad infinitum resulting in the increase in economic activity of other sectors in the economy and the diversification of economic activity from mining. Therefore it is essential to understand how well the identified industrial clusters are interlinked with the different sectors in the NWP. With the identification of the clusters' inter-industry strengths to the different economic sectors, the economic sectors related to the clusters can be better informed of the opportunities that cluster formation presents.

The SAM provides a basis for measuring the strength of interaction among sectors (Czamanski, 1974). This is achieved by analysing multipliers. Multipliers measure the forward and backward as well as the direct and the indirect linkages that exist between the cluster sectors themselves and between cluster and non-cluster sectors (Learmonth, Munrow & Swales, 2003). Porter (2002) highlighted that downstream industries are drawn to the cluster location to enhance the transmission of information to suppliers about their needs. Type I multipliers are calculated in each case to capture the downstream effects. Type I multipliers incorporate the indirect impacts associated with intermediate purchases (Ciaschini & Socci, 2007). In order to capture the upstream effects, Type II multipliers are calculated. In addition to capturing the indirect impacts associated with intermediate purchases, Type II multipliers include induced consumption effects on gross output, employment, wage income or value added (Ciaschini & Socci, 2007).

The summary multiplier values for the ten identified potential clusters for the NWP are graphically presented. Data from the NWP SAM (particularly the intermediate demand) are used. The full direct and indirect linkages associated with the production of any of the cluster sectors and their associated sectors' outputs are calculated from information embedded in the SAM table (Miller & Blair, 1985). The main advantage of presenting the linkages between the cluster sectors and the non-cluster sectors in this way is that no information is lost. The graphical presentation provided of the results depicts all the linkages a particular cluster has with the rest of the NWP economy.

3.2.2   Measuring Supported Activity Induced by Industrial Cluster Formation in the NWP

Following Learmonth *et al*. (2003), we applied multiplier analysis together with SAM data to determine each cluster's supported activity, that is additional output, employment, employment income and GDP generated by clusters and to show the impact of each cluster on the economy. The output, employment income and GDP data used were obtained from the 2006 NWP SAM (Conningarth Economists, 2009). The employment numbers used were obtained from Quantec Easy Data (2013). Additionally, employment numbers were measured as full-time equivalents, while the monetary values were measured in 2006 prices. The supported activity was derived using the relevant Type II SAM multipliers applied to the sector's final demand. Supported output is the direct final demand for cluster output. This includes indirect expenditure on intermediate goods directly or indirectly needed to meet final demands. Additionally, supported output includes exports, sales to the government and investment. Type I and Type II multiplier analysis were conducted. Type I multipliers are calculated in each case to capture the downstream effects. Type I multipliers incorporate the indirect impacts associated with intermediate purchases (Ciaschini *et al*., 2007). This means that under Type I analysis, consumption demand is treated as a final demand in its own right. Contrary to this, in Type II analysis, consumption demand is treated as induced expenditure on consumer goods and services purchased from the wages generated ultimately by the sales to other final demand. Type II multipliers are calculated in order to capture the upstream effects. In addition to capturing the indirect impacts associated with intermediate purchases, Type II multipliers also include induced consumption effects on gross output, employment, wage income or value added (Ciaschini *et al*., 2007). Resultantly, the sum of supported activity for all sectors in the economy gives sum to the total activity in the economy as a whole.

The level of activity directly associated with a sector differs from the level of activity it supports. According to Learmonth *et al*. (2003), the supported activity of clusters is expected to be higher than the direct activity owing to the enhanced competitiveness of clusters. Porter's view on the genesis and evolution of industrial clusters supports this notion. According to Porter (2002), the establishment of firms and subsequently clusters in response to the availability of factors of competitiveness in a region leads to the establishment of a competitive industry. The success of an industry makes it a sophisticated buyer of products and services (Porter, 2002). Both domestic and foreign suppliers will be attracted to establish in close proximity to this competitive industry to provide goods and services thereby increasing the cluster's supported output.

3.2.3 Illustrating the Structural Change of the NWP Economy Induced by Industrial Cluster Formation

Economic landscaping is used in this study to demonstrate the changes in the structure of the NWP that will be induced by industrial cluster formation. Economic landscaping is derived from the methods of linkage analysis (Sonis, Hewings & Guo, 2000). This method is based on the multiplier product matrix (MPM) of the SAM. The MPM ranks sectors according to the strength of their linkages with other sectors. This means that the MPM quantifies and ranks the inter-industry linkages between sectors (Parré, Alves & Sordi, 2002).

The MPM shows an industry's linkages. That is, the MPM reflects the impacts of an industry on other industries or the relationship of an industry to all other industries. These linkages represent the inter-industry exchange of an industry with other industries, both as a producer of output and a consumer of inputs (Guo & Planting, 2000). An industry's linkages can be compared with those of other industries or with itself at different points in time.

The results of economic landscaping can be illustrated in matrix. The economic landscape shows the hierarchy of backward and forward linkages as well as the structure of an economy (Parra & Wodon, 2008). In this

regard, the economic landscape matrix shows the economic sectors' ranking based on the size of their hierarchies of the backward and forward linkages (Bonet, 2005; Khanal, 2011). This reveals the changes in the structure of the economy. The economic landscape matrix enables one to visualise the economic structure in the two different scenarios.

The structural change in the economy of the NWP was depicted using SimSIP SAM. In this paper SimSIP SAM was used to model the economic landscape of the NWP before industrial cluster formation (as it was in 2006; hereafter referred to as pre-cluster economic landscape). In order to model the effects of industrial cluster formation in the SAM (hereafter referred to as post-cluster economic landscape), exports of the ten identified clusters were increased by 10%. The data for the two scenarios were entered into the SimSIP SAM software to generate the results. The economic landscapes of the NWP generated pre- and post- industrial cluster formation are depicted as heat maps. Since the NWP SAM comprises 37 sectors, heat maps of the MPMs allow a better visualisation of the increases and decreases in backward and forward linkages associated with the promotion of cluster-specific exports.

4. RESULTS

Ten industrial clusters were identified and prioritised for the NWP. These ten clusters are:

(i)   Communication
(ii)   Real estate
(iii)   Grain mill, bakery and animal feed products
(iv)   Building and other construction
(v)   Basic metal products
(vi)   Other food products
(vii)   Agriculture
(viii) Non-metallic mineral products
(ix)   Trade
(x)   Dairy products (Pisa, 2014).

The clusters are ranked according to PoP scores. A cluster's or sector's PoP is its power to pull (influence) all sectors through direct and indirect linkages in the network (Newman, 2008). As a result, the ranking of clusters by PoP reflects each cluster's strength (power to pull other sectors). The subsequent section illustrates inter-linkages of the identified industrial clusters with the different sectors in the NWP. This is helps to illustrate the impact that the identified clusters will have on the NWP economy through inter-linkages with other sectors.

4.1 Illustrating the Levels of Integration and the Supported Activity of the NWP's Clusters

To add further insight into the benefits of each identified cluster, the following subsections also provide a graphical illustration of the multiplier effect of each cluster. The figures represent three variables for each of the sectors in each cluster, namely upstream effects, downstream effects and scale. The sum of the upstream linkages of a particular cluster sector represents its utilisation of the value added of all other sectors' outputs as intermediate inputs. Additionally, in monetary terms, this represents "the proportionate reduction in costs in an individual cluster sector caused by the lowering of intermediate input prices if the value added of all cluster sectors could be produced at zero cost" (Learmonth *et al*., 2003:579). A high upstream effect score means that the sector utilises a large amount of intermediate inputs from other sectors in the NWP economy.

The downstream effects represent the proportion of a sector's gross output that is utilised directly or indirectly as an intermediate input (final demand) by other sectors in the economy. In monetary terms, the downstream effect measures "the proportionate reduction in the output of a particular cluster caused as a result of reduced intermediate demand if the final demands for the output of all cluster sectors fell to zero" (Learmonth *et al*., 2003:579). A high downstream effect score means that a sector has high intermediate sales to other sectors. Downstream and upstream effects are measured on a scale of 0 and 100 percent, respectively. The upstream effects for individual sectors are shown on the x-axis, and the downstream effects on the y-axis.

Scale is measured as the size of the sector's value-added in the NWP SAM. The scale is shown by the size (area) of the bubble in the figures. There is no direct association between the scale and the upstream and downstream effects, respectively. Sectors towards the top right corner of the diagram are ones that have the highest relative backward and forward linkages. A strong cluster may be represented by an image with many sectors in the top right corner of the bubble chart, indicating an integrated set of sectors that are reliant on each other's value added and final demands. The graphical presentation of the multiplier analysis illustrates the strength of existing linkages in each of the ten clusters. This highlights the level of integration (dependency of sectors) that exists between the sectors in each of the clusters. A strong cluster may be represented by an image with many sectors in the top right corner of the bubble chart, indicating an integrated set of sectors that are reliant on each other's value added and final demands.

While the graphical presentation of the multiplier analysis illustrates the strength of existing linkages in each of the ten clusters, which highlights the level of integration (dependency of sectors) that exists between the sectors in each of the clusters, we also present the results of applying multiplier analysis for the ten identified potential clusters. The aim is to show the impact of each cluster on the NWP economy, in particular on output, employment, employment income and GDP. The monetary values are measured in 2006 prices. The supported activity is derived using the relevant Type II SAM multipliers applied to the sector's final demand.

4.1.1 Communication Cluster

In the communication cluster (see Figure 1), the electricity sector has high upstream linkages, although the sector is relatively small (i.e. as seen by the relative size of the bubble). The trade sector is the largest sector in the cluster and has high downstream linkages. The real estate, and building and other construction ('building etc.') sectors also have high downstream effects, though much lower than the trade sector. Similarly, the communication and transport sectors have high upstream effects relative to the electricity sector. The linkages between the other sectors are relatively weak. Figure 1 illustrates that most sectors are located in the bottom left section of the charts, indicating that the cluster has relatively low upstream and downstream linkages.

Figure 1. Upstream and downstream linkage effects of the NWP communication cluster and related sectors
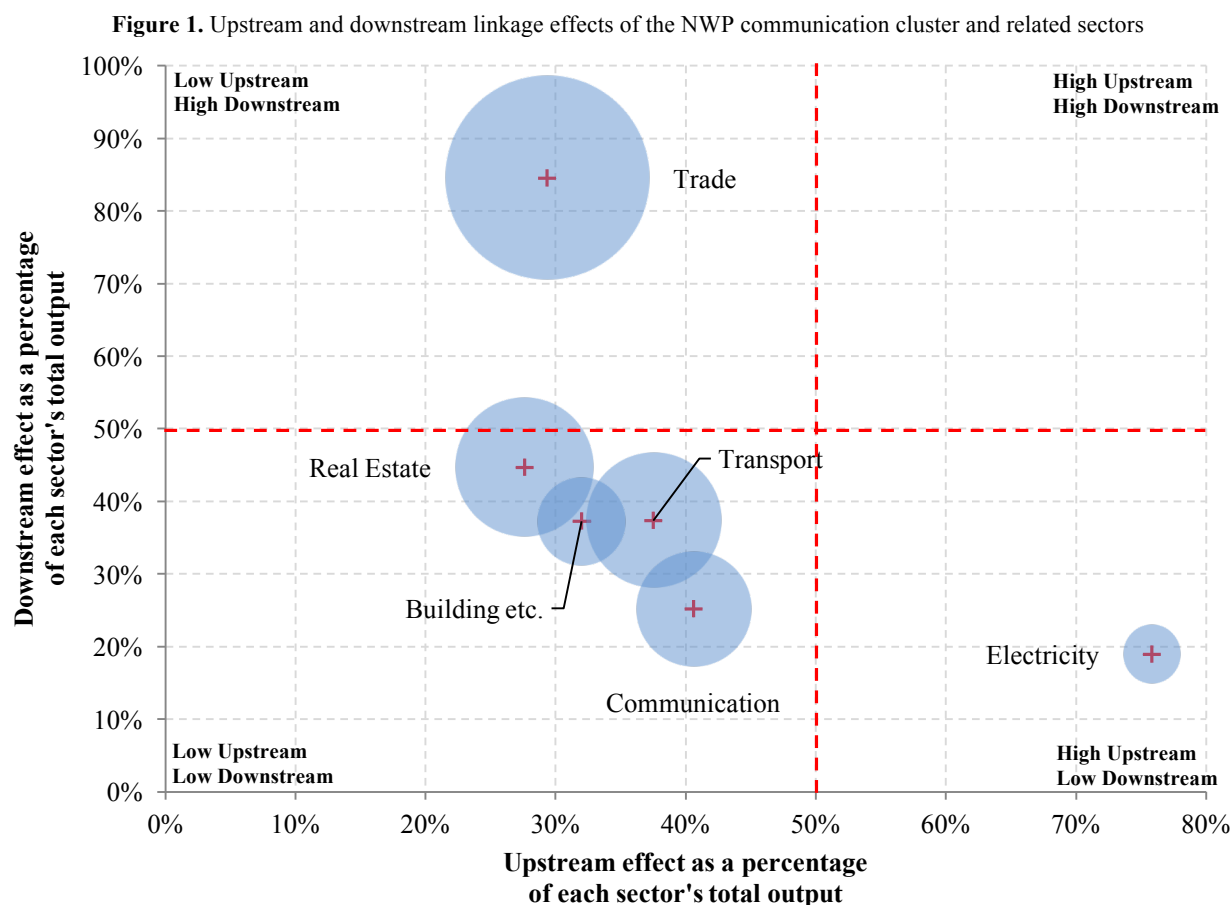
Source: Compiled by authors from Conningarth Economists SAM, 2009

Table 1 shows the NWP's output, employment, income and GDP supported by the communication services industry cluster. The supported activity by the communication cluster is much higher than the actual activity. For example, the communication services cluster will stimulate additional output of 18% and increase employment by 44%. Employment income in the communication cluster will increase by a significant 172% as a result of cluster formation. GDP will increase by 26% from ZAR3.4 billion to ZAR4.3 billion.

Table 1. NWP output, employment, income and GDP supported by the communication services industry cluster

	Output (ZAR millions)	Employment (Number)	Employment income (ZAR millions)	GDP (ZAR millions)
Actual	8.456	13161	1.305	3.410
Supported	9.954	23 455	3.549	4.295

Source: Conningarth Economists, 2009 and Quantec Easy Data, 2014

4.1.2 Real Estate Cluster

Figure 2 shows the upstream and downstream linkage effects of the NWP real estate cluster and related sectors. The business services sector and the community, social and personal services ('CSPS') sector have the highest upstream effects, respectively. Additionally, the trade sector has high downstream effects. Similar to the communication cluster, the real estate cluster is not highly integrated and the sectors in this cluster are not reliant on each other's value added and final demands. This is shown by the low levels of upstream and downstream effects of the sectors in this cluster (most sectors are located in the lower left corner of Figure 2).

Figure 2. Upstream and downstream linkage effects of the NWP real estate cluster and related sectors
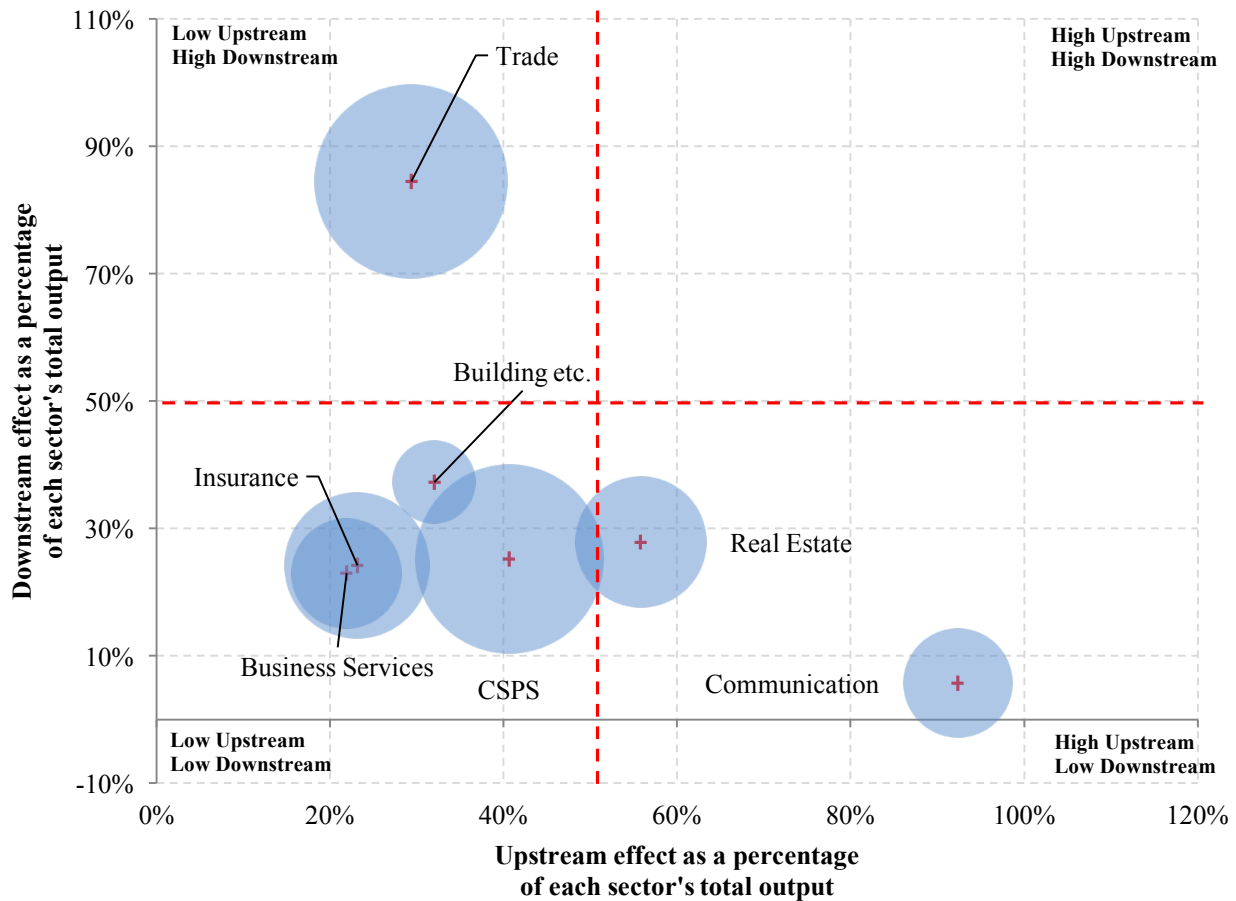
Source: Compiled by authors from Conningarth Economists SAM, 2009

The supported output, employment, income and GDP for the real estate cluster are shown in Table 2. The supported output and GDP for the real estate cluster are much lower than the actual figures. The number of people employed in the cluster will increase from 12 657 to 40 251. In addition, employment income is expected to more than treble (240%) with cluster formation.

Table 2. NWP output, employment, income and GDP supported by the real estate services industry cluster

	Output (ZAR millions)	Employment (Number)	Employment income (ZAR millions)	GDP (ZAR millions)
Actual	16.360	12 657	1.673	10.022
Supported	12315	40 251	5.735	5.523

Source: Conningarth Economists, 2009 and Quantec Easy Data, 2014

4.1.3 Grain Mill, Bakery and Animal Feed Products Cluster

The grain mill, bakery and animal feed products ('grain mill etc.') cluster comprises several sectors with high upstream and downstream effects. Trade, community, social and personal services ('CSPS') and agriculture, respectively, are the three largest sectors in the grain mill etc. cluster (see Figure 3). The business services sector, chemicals and chemical products sector ('chemicals etc.') have the highest upstream effects in this cluster. The trade and grain mill etc. sectors have the highest downstream effects. This cluster includes the dairy products sector. Although this sector is small, it has high upstream and downstream effects (above 50%; see Figure 3). Similarly, the community, social and personal services ('CSPS') and agriculture sectors have relatively high upstream and

downstream effects (close to 50%). This shows that this cluster is more integrated and has potential to integrate more with cluster formation.

Figure 3. Upstream and downstream linkage effects
of the NWP grain mill, bakery and animal feed products cluster and related sectors
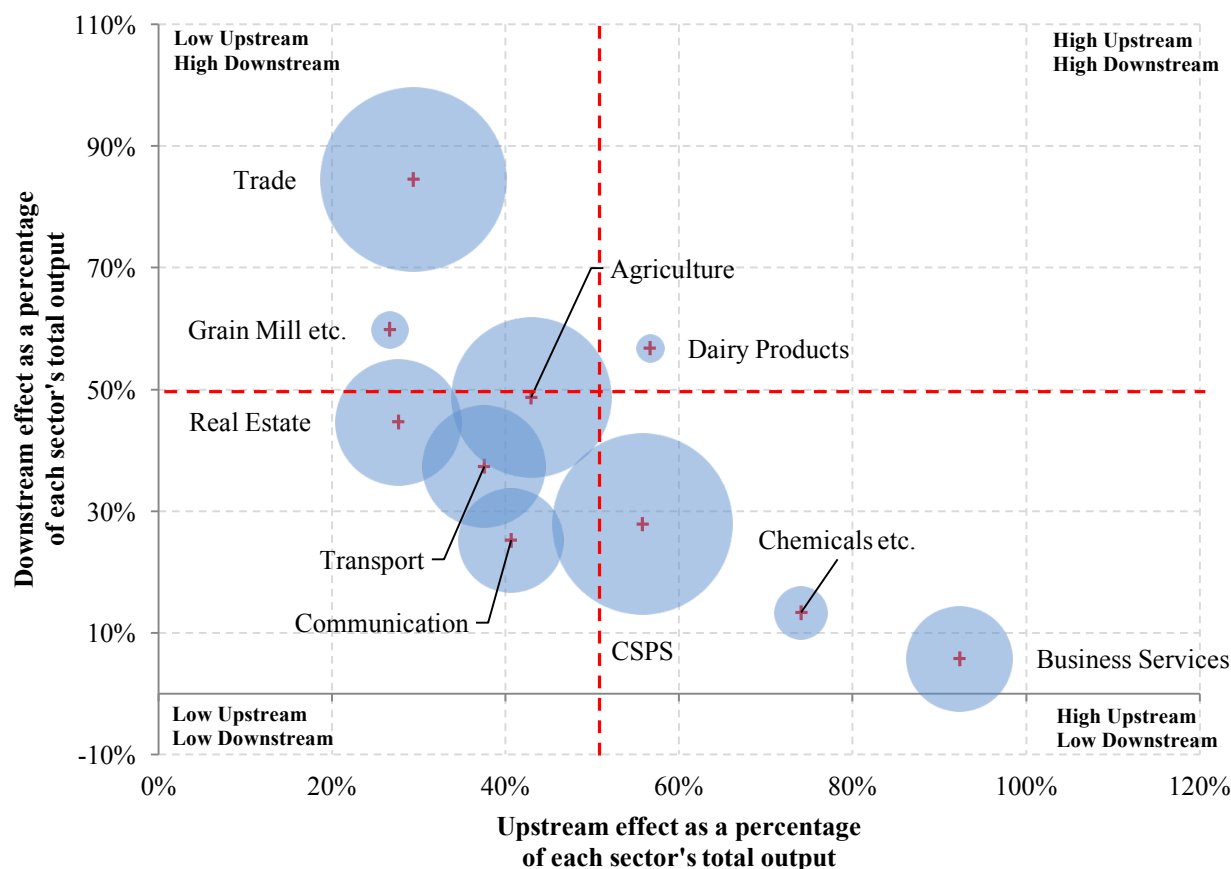
Source: Compiled by authors from Conningarth Economists SAM, 2009

Industrial cluster formation in the grain mill, bakery and animal feed products sector will generate higher levels of economic activity in the NWP. As shown in Table 3, output, employment, employment income and GDP will all increase in response to cluster formation.

Table 3. NWP output, employment, income and GDP supported
by the grain mill, bakery and animal feed products industry cluster

	Output (ZAR millions)	Employment (Number)	Employment income (ZAR millions)	GDP (ZAR millions)
Actual	2.947	2 916	181.44	594
Supported	3.796	34 032	993.66	1.650

Source: Conningarth Economists, 2009 and Quantec Easy Data, 2014

The rest of the figures and tables for the proceeding clusters will be presented in Appendices 1 and 2 respectively.

4.1.4 Building and Other Construction Cluster

The following sectors have high upstream effects in the building and other construction ('building etc.') cluster: non-metallic mineral products ('non-metallic'), community, social and personal services ('CSPS'), electrical

632   *The Clute Institute*

machinery ('electrical mach') and structural metals products ('structural etc.') (as shown in Figure 4 in Appendix 1). Only the trade sector has high downstream effects. Efforts to promote industrial cluster formation can enhance the downstream effects in the non-metallic mineral products ('non-metallic'), community, social and personal services ('CSPS'), and electrical machinery ('electrical mach') sectors as they already have high existing upstream effects. This would make the cluster more integrated and would enhance the effects (power-of-pull) of the building and other construction cluster in the NWP economy. All the variables are expected to increase more than the actual values with cluster formation in the building and other construction cluster (see Table 7 in Appendix 2). This highlights that cluster formation will enhance the competitiveness of the building and other construction cluster, resulting in supported activity being greater than the actual activity.

4.1.5 Basic Metal Products Cluster

An analysis of the upstream and downstream linkage effects of the NWP basic metal products cluster and related sectors reveals that the other mining sector has low downstream and upstream linkages relative to the other sectors in the cluster (see Figure 5 in Appendix 1). The low downstream effects imply that this sector does not use up a lot of intermediate inputs from other sectors in its production (downstream linkages; 9%). Similarly, other mining output is not utilised by many sectors in the NWP as final demand (upstream linkages; 23%). The following sectors in the basic metal products cluster have high downstream linkages: business services, chemicals and chemical products ('chemicals etc.'), basic metals products ('basic metals etc.') and community, social and personal services ('CSPS'). Output, employment income and GDP in the cluster will increase to support enhanced demand generated by the cluster. The supported employment (number), employment income and GDP in the basic metal products cluster are greater than actual activity (more than 10% increases; see Table 8).

4.1.6 Other Food Products Cluster

The other food products and dairy products sectors are the smallest in this cluster (see Figure 6). However, these two sectors have the highest linkages (both upstream and downstream) with other sectors the NWP economy. Similar to the five clusters discussed thus far, the trade sector is large and has high downstream linkages. Figure 6, however, reveals that most sectors are located in the bottom left section of the charts and as such have relatively low upstream and downstream linkages. Table 9 shows the output, employment income and GDP supported by the other food products industry cluster for the NWP. The other foods cluster will generate higher supported output, employment (number), employment income and GDP for the NWP.

4.1.7 Agriculture Cluster

In the agriculture cluster, the chemical and chemical products ('chemicals etc.') sector has high downstream linkages although the sector is relatively small. The trade sector is the largest sector in the cluster (see Figure 7) and has high downstream linkages. The grain mill, bakery and animal feeds ('grain mill etc.') and real estate sectors also have high downstream effects although much lower than the trade sector. Similarly, the community, social and personal services ('CSPS') and dairy products sectors have high upstream effects relative to the electricity sector. The dairy products sector has high upstream and downstream linkages. The machinery and equipment sector has low upstream and downstream linkages. The linkages between the other sectors are relatively weak, as shown by the clustering of the sectors in the lower centre of Figure 7. With cluster formation, output, employment and GDP in the agriculture cluster will decline by 27%, 66% and 40%, respectively (see Table 10). This may be attributed to outsourcing. With cluster formation, firms specialise in activities that they are more efficient in and outsource the rest in order to maintain and enhance cluster competitiveness. Employment income, however, will increase by 70%.

4.1.8 Non-metallic Mineral Products Cluster

The non-metallic mineral products cluster in the NWP comprises several sectors that contribute a large portion of the province's value added (see Figure 8). This is shown by the diameter of the bubbles for the different sectors. In terms of upstream linkages, the business services, community, social and personal services ('CSPS') and non-metallic mineral products ('non-metallic') sectors, respectively, have the highest upstream linkages (50% and

above). The trade sector has the highest downstream effects in the cluster. However, most of the sectors in the cluster are located in the lower left hand corner of Figure 8. This indicates that the cluster is not highly integrated and that the upstream and downstream linkages between the sectors in the cluster are weak. The non-metallic mineral products cluster will generate more output, employment income and GDP, as shown by the supported activity being larger than the actual activity (see Table 8). The number of people employed in the cluster will decline from 16 328 to 15 971.

4.1.9 Trade Cluster

The trade cluster comprises the highest number of sectors relative to the nine other clusters identified for the NWP. It comprises mostly small sectors. The trade sector itself is the largest in the cluster, while the real estate, transport and communication sectors are relatively large (see Figure 9). Six sectors in the trade cluster have high upstream effects (above 50%). These are: other fabricated metals ('other fabricated etc.'), rubber products, chemicals and chemical products (including plastics) ('chemicals etc.'), structural metal products ('structural etc.'), electrical machinery ('electrical mach') and basic metal products ('basic metals'), respectively. Only the trade sector has high downstream effects. Efforts to enhance the effectiveness and competitiveness of the trade cluster should be directed towards enhancing the downstream effects. The trade cluster's supported output, employment (number), employment income and GDP are lower than actual figures, as shown in Table 9. This may be as a result of sectors in the cluster using up more domestic inputs. This will result in the cluster requiring fewer imports of intermediate goods as the cluster evolves to become more competitive and self-reliant.

4.1.10 Dairy Products Cluster

Although the dairy products cluster is small, it has high upstream (57%) and downstream (54%) linkages in the NWP economy (see Figure 10). The business services, chemicals and chemical products (including plastics) ('chemicals etc.') and community, social and personal services ('CSPS') sectors, respectively, have high upstream and low downstream effects. The trade sector has high downstream effects and moderate upstream effects. Most of the sectors in the dairy products cluster are located in the central lower part of Figure 10. This shows that the upstream effects of this cluster are relatively high. It also indicates that the downstream effects of this cluster are low and efforts should be directed towards enhancing these downstream effects in order to improve the cluster's effectiveness. With cluster formation, the dairy products sector will contribute more to the NWP economy. Table 10 in Appendix 2 shows that supported output, employment, employment income and GDP are greater than the actual figures.

The subsequent section illustrates the importance of the identified industrial clusters in terms of their economic impact on transformation of the structure of the NWP economy using an economic landscape matrix.

4.2 The Economic Landscape of the NWP

The economic landscape matrix Figure 11, discussed in this section is presented in Appendix 3. The first two matrices illustrated in Figure 11 (Appendix 3) show the pre- and post-cluster economic landscape of the NWP, while the third matrix shows the change (or difference) between pre- and post-economic structures. Note that the header numbers 1 through 37 represent the economic sectors of the NWP economy, as captured in the NWP SAM. Table 4 shows the descriptions associated with the numbers for the different economic sectors. The economic landscape also shows the hierarchy of forward and backward linkages of the economy (Khanal, 2011), ranking the 37 sectors in the NWP SAM according to the size of forward and backward linkages.

Figure 11 reveals 3 heat maps of the multiplier product matrix (MPM) for the pre-cluster, post-cluster and net change matrices associated with the promotion of cluster-specific exports. The rows represent the forward linkages (output produced by industries) while the columns represent the backward linkages (inputs required by industries). Forward linkages arise when there is an increase in final demand of a particular industry's products. That is, an increase in final demand of a particular industry's products results in additional production of inputs by other industries in order to meet the final demand. Backward linkages arise from the increase in demand for inputs from other industries. Industries with high backward linkages relative to other industries are important for an economy

because it induces production in other industries. An industry with high forward linkages relative to other industries is sensitive to changes in other industries' output. In the first two matrices, the colour grading represents the relative size of the multiplier of each sector, ranging from dark grey for those sectors with relatively higher multiplier values and medium grey for those in between, tolight grey for the sectors with relatively lower multiplier values. In the third matrix, the dark grey shading represents increases in inter-industry linkages, while the light grey represents a reduction. The colour intensity in the charts represents the value of the inter-industry linkages. That is light grey represents a large reduction and light red represents relatively small losses, while dark green represents a large increase and light green represents moderate increases.

Table 4. Economic sectors in the NWP SAM

Sectors		Sectors continued...	
1	Agriculture	20	Other fabricated metal products
2	Platinum mining	21	Machinery and equipment
3	Gold mining	22	Electrical machinery and apparatus
4	Other mining	23	Communication, medical and other electronic equipment
5	Meat, fish, fruit, vegetables, oils and fat products	24	Manufacturing of transport equipment
6	Dairy products	25	Other manufacturing and recycling
7	Grain mill, bakery and animal feed products	26	Electricity
8	Other food products	27	Water
9	Beverages and tobacco products	28	Building and other construction
10	Textiles, clothing, leather products and footwear	29	Trade
11	Wood and wood products	30	Accommodation
12	Furniture	31	Transport
13	Paper and paper products	32	Communication
14	Publishing and printing	33	Insurance
15	Chemicals and chemical products (incl. plastic products)	34	Real estate
16	Rubber products	35	Business services
17	Non-metallic mineral products	36	General government services
18	Basic metal products	37	Community, social and personal services
19	Structural metal products		

Source: Conningarth Economists, 2009

In the first matrix in Figure 11 - that is, the pre-industrial cluster formation - the top 5 key sectors in terms of backward linkages were: (1) dairy products, (2) grain mill, bakery and animal feed products, (3) meat, fish, fruit, vegetables, oils and fat products, (4) building and other construction, and (5) other food products. These economic sectors achieved higher hierarchies than the average of all sectors' hierarchies in the NWP. Sectors possessing average backward linkages were: accommodation; non-metallic mineral products; wood and wood products; electricity; and other mining. The following sectors were considered the least important sectors in the NWP based on the hierarchy of backward linkages before industrial cluster formation: business services; furniture; communication, medical and other electronic equipment; manufacturing of transport equipment; and general government services.

In terms of greater hierarchy of forward linkages, trade (ranked 1st), real estate (ranked 2nd), agriculture (ranked 3rd), community, social and personal services (ranked 4th) and basic metal products (ranked 5th) were the key sectors in the NWP prior to industrial cluster formation. Average performing sectors based on the greater hierarchy of forward linkages were: electrical machinery and apparatus; other food products; furniture; electricity; and beverages and tobacco products. Low performing sectors based on the hierarchy of forward linkages prior to industrial cluster formation were: wood and wood products; other manufacturing and recycling; publishing and printing; communication, medical and other electronic equipment; and general government services, as shown in Figure 11.

The second matrix in Figure 11 shows the structure of the economic landscape of the NWP economy post-cluster formation. The results reveal that the top 5 key sectors in terms of backward linkages remained: (1) dairy products, (2) grain mill, bakery and animal feed products, (3) meat, fish, fruit, vegetables, oils and fat products, (4) building and other construction, and (5) other food products. The average performing sectors were: wood and wood products; accommodation; transport; non-metallic mineral products; and electricity. The sectors that were

considered the least important in terms of backward linkages were: publishing and printing; business services; manufacturing of transport equipment; communication, medical and other electronic equipment; and general government services. In terms of forward linkages, the key performing sectors were: trade; real estate; agriculture; community, social and personal services; and other mining. The average performing sectors were: building and other construction; non-metallic mineral products; grain mill, bakery and animal feed products; electrical machinery and apparatus; and furniture. The sectors with the weakest forward linkages after industrial cluster formation in the NWP economy were: wood and wood products; other manufacturing and recycling; publishing and printing; communication, medical and other electronic equipment; and general government services.

From the three matrices in Figure 11, and especially the third matrix, one can clearly identify the sectors where changes occurred due to the promotion of cluster-specific exports. Significant shifts can be observed in the forward linkages or changes in output. Significant reductions are observed in other mining, and machinery and equipment output. In contrast, increases in output can be observed in the following sectors: other food products; chemicals and chemical products (including plastic products); meat, fish, fruit, vegetables, oils and fat products; dairy products; electricity; and trade. With regards to the backward linkages or the demand of inputs from other industries, significant increases occurred in the following sectors: communication, medical and other electronic equipment; and communication sectors. It is important to note that the identified industrial clusters are significant contributors to the structural change of the economic landscape of the NWP economy. That is, other food products, dairy products and trade achieved a significant gain in terms of forward linkages with the promotion of cluster-specific exports, while the backward linkages associated with the communication sector increased significantly with the promotion of cluster-specific exports.

Tables 5 and 6 show the changes in the economic structure of the NWP pre- and post-cluster formation. The tables show that the composition of the key sectors changes with industrial cluster formation. Similar differences are observed in the forward linkages for the key average and weak performing sectors. This indicates that industrial cluster formation will result in structural change in the NWP economy (see Tables 5 and 6).

636   *The Clute Institute*

Table 5. Rankings of backward linkages in the NWP economy

Sectors	Pre-cluster		Post-cluster
Key			
6	Dairy products	6	Dairy products
7	Grain mill, bakery and animal feed products	7	Grain mill, bakery and animal feed products
5	Meat, fish, fruit, vegetables, oils and fat products	5	Meat, fish, fruit, vegetables, oils and fat products
28	Building and other construction	28	Building and other construction
8	Other food products	8	Other food products
34	Real estate	34	Real estate
19	Structural metal products	19	Structural metal products
32	Communication	9	Beverages and tobacco products
9	Beverages and tobacco products	18	Basic metal products
18	Basic metal products	29	Trade
22	Electrical machinery and apparatus	20	Other fabricated metal products
29	Trade	22	Electrical machinery and apparatus
Average			
20	Other fabricated metal products	11	Wood and wood products
21	Machinery and equipment	30	Accommodation
31	Transport	31	Transport
30	Accommodation	17	Non-metallic mineral products
17	Non-metallic mineral products	26	Electricity
11	Wood and wood products	4	Other mining
26	Electricity	21	Machinery and equipment
4	Other mining	2	Platinum mining
13	Paper and paper products	25	Other manufacturing and recycling
1	Agriculture	13	Paper and paper products
2	Platinum mining	32	Communication
27	Water	**27**	Water
Weak			
25	Other manufacturing and recycling	3	Gold mining
3	Gold mining	1	Agriculture
15	Chemicals and chemical products (incl plastic products)	15	Chemicals and chemical products (incl plastic products)
33	Insurance	33	Insurance
10	Textiles, clothing, leather products and footwear	10	Textiles, clothing, leather products and footwear
37	Community, social and personal services	37	Community, social and personal services
16	Rubber products	16	Rubber products
14	Publishing and printing	12	Furniture
35	Business services	14	Publishing and printing
12	Furniture	35	Business services
23	Communication, medical and other electronic equipment	24	Manufacturing of transport equipment
24	Manufacturing of transport equipment	23	Communication, medical and other electronic equipment
36	General government services	36	General government services

Table 6. Rankings of forward linkages in the NWP economy

Sectors	Pre-cluster		Post-cluster
Key			
29	Trade	29	Trade
2	Platinum mining	34	Real estate
34	Real estate	1	Agriculture
33	Insurance	37	Community, social and personal services
4	Other mining	4	Other mining
3	Gold mining	18	Basic metal products
31	Transport	32	Communication
37	Community, social and personal services	31	Transport
32	Communication	33	Insurance
28	Building and other construction	15	Chemicals and chemical products (incl plastic products)
35	Business services	6	Dairy products
17	Non-metallic mineral products	35	Business services
Average			
7	Grain mill, bakery and animal feed products	28	Building and other construction
6	Dairy products	17	Non-metallic mineral products
1	Agriculture	7	Grain mill, bakery and animal feed products
26	Electricity	22	Electrical machinery and apparatus
9	Beverages and tobacco products	12	Furniture
18	Basic metal products	21	Machinery and equipment
5	Meat, fish, fruit, vegetables, oils and fat products	3	Gold mining
19	Structural metal products	9	Beverages and tobacco products
25	Other manufacturing and recycling	2	Platinum mining
8	Other food products	26	Electricity
20	Other fabricated metal products	16	Rubber products
22	Electrical machinery and apparatus	30	Accommodation
Weak			
30	Accommodation	8	Other food products
15	Chemicals and chemical products (incl plastic products)	27	Water
11	Wood and wood products	5	Meat, fish, fruit, vegetables, oils and fat products
14	Publishing and printing	10	Textiles, clothing, leather products and footwear
21	Machinery and equipment	19	Structural metal products
16	Rubber products	13	Paper and paper products
13	Paper and paper products	20	Other fabricated metal products
27	Water	24	Manufacturing of transport equipment
10	Textiles, clothing, leather products and footwear	11	Wood and wood products
23	Communication, medical and other electronic equipment	25	Other manufacturing and recycling
12	Furniture	14	Publishing and printing
24	Manufacturing of transport equipment	23	Communication, medical and other electronic equipment
36	General government services	36	General government services

5. CONCLUSION

In the wake of the 2014 platinum sector strike it is crucial for the NWP to implement strategies to diversify its economy and to minimise the adverse effects of dependence on mineral resources. In this paper, the impact of industrial cluster formation as strategy to diversify the NWP economy was explored using SAM multiplier analysis. Solid evidence was provided to show that industrial cluster formation will enhance economic activity in the NWP based on the existing economic structure as captured in the SAM. This paper further illustrated the strength of the existing inter-industry linkages by quantifying and graphically presenting the backward and forward linkages

between the clusters and their related sectors. In this way, the level of integration of the industries' inter-industry transactions was highlighted. The literature suggests that a cluster that is highly integrated, where the sectors in that cluster are highly dependent on each other's output, is shown by high upstream and downstream linkages. It is essential to understand how well the identified industrial clusters are interlinked with the different sectors in the NWP. With the identification of the clusters' inter-industry strengths to the different economic sectors, the economic sectors related to the clusters can be better informed of the opportunities that cluster formation presents. Of the ten identified clusters for the NWP, the following were found to be moderately integrated: (i) trade (ii) basic metal products (iii) grain mill, bakery and animal feed products, and (iv) building and other construction. These clusters have high upstream effects. Efforts to promote industrial cluster formation should aim to enhance the inter-industry linkages, particularly the downstream effects in these clusters, as they already have moderately high existing upstream effects. This would make the clusters more integrated and would enhance the effects (power-of-pull) of the clusters. For the rest of the clusters, namely communication, real estate, other food products, agriculture and non-metallic mineral products, the levels of cluster integration were found to be weak. Therefore, efforts to promote industrial cluster formation should aim to enhance both the upstream and downstream effects.

SAM-based multiplier analysis was used to demonstrate the output, employment, employment income and GDP supported by cluster formation for the NWP. This was demonstrated by comparing the actual activity (output, employment, employment income and GDP, given in the SAM) with the supported activity (computed using SAM data and the multipliers) for each cluster. The literature suggests that the supported activity of clusters is expected to be higher than the direct activity owing to the enhanced competitiveness of clusters. Contrary to the literature, though, the supported activity for the agriculture and trade clusters was less than the actual activity. As supported by the literature, the following clusters' supported activity was greater than the actual activity: communication; real estate; grain mill, bakery and animal feed products; building and other construction; basic metal products; other food products; non-metallic mineral products; and dairy products.

Finally, this paper demonstrated, using economic landscaping, that industrial cluster formation will result in a structural change to the NWP economy. This was shown by the changes in the hierarchies of backward and forward linkages of the different sectors in the province. It is important to note that the identified industrial clusters are significant contributors to the structural change of the economic landscape of the NWP economy. That is, other food products, dairy products and trade gained significantly in terms of forward linkages with the promotion of cluster-specific exports, while the backward linkages associated with the communication sector increased significantly with the promotion of cluster-specific exports. In conclusion, this paper provided evidence that industrial cluster formation enhances competitiveness and economic diversification.

The authors recommend that the NWP government promote industrial cluster formation as a strategy to enhance competitiveness and economic diversification. The provincial government should assume a catalytic role and initiate the industrial cluster formation process by bringing vested interests together to encourage collaboration. This will help to reveal the extent of cooperation between firms in the clusters and stimulate interest in the potential benefits of cluster formation, and is an important step because the quantitative analysis conducted in the study offers no insight into the cluster characteristics, such as active networks, learning and innovation, or the sharing of information or equipment. Once the cluster formation process is initiated, the provincial government should formulate a cluster development strategy outlining the various stakeholders involved and the objectives of the exercise, and decide on the optimal means by which the objectives should be achieved. Furthermore, the cluster development strategy should outline the steps involved in implementation, monitoring and evaluation.

The provincial government could take the catalytic role a step further by providing infrastructure, education or training. Alternatively, the government's role could be directive, which would entail implementing policies to improve the local business environment, such as reviewing tax rules, reducing costs of services, and providing market or competitor information. These are important considerations as the ten clusters identified in this study include several related sectors which together account for a large proportion of the economic sectors in question.

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**APPENDIX 1: FIGURES FOR NWP OUTPUT, EMPLOYMENT,
INCOME AND GDP SUPPORTED BY INDUSTRIAL CLUSTER FORMATION**

Figure 4. Upstream and downstream linkage effects of the NWP building and other construction cluster and related sectors
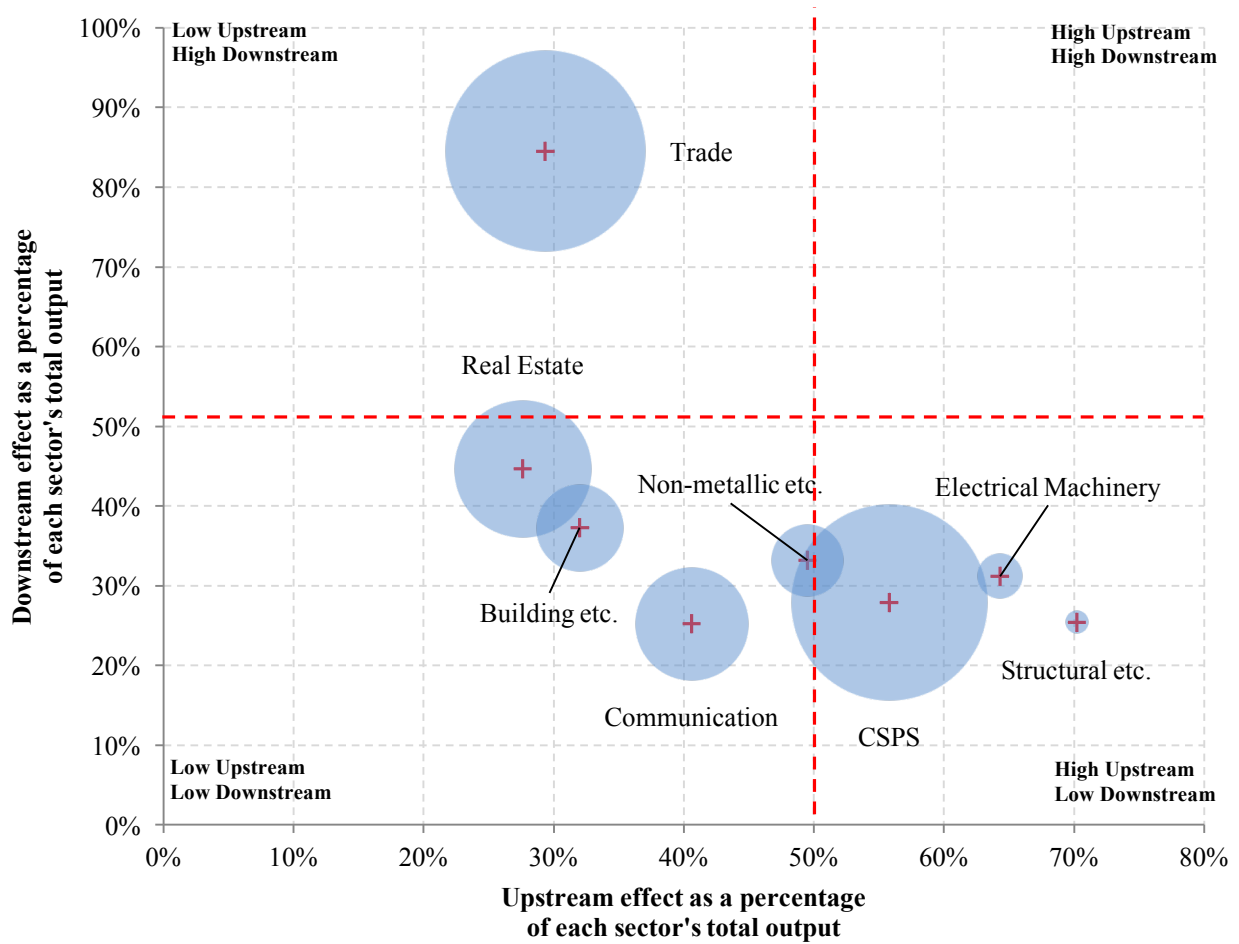
Source: Compiled by authors from Conningarth Economists SAM, 2009

Figure 5. Upstream and downstream linkage effects of the NWP basic metal products cluster and related sectors
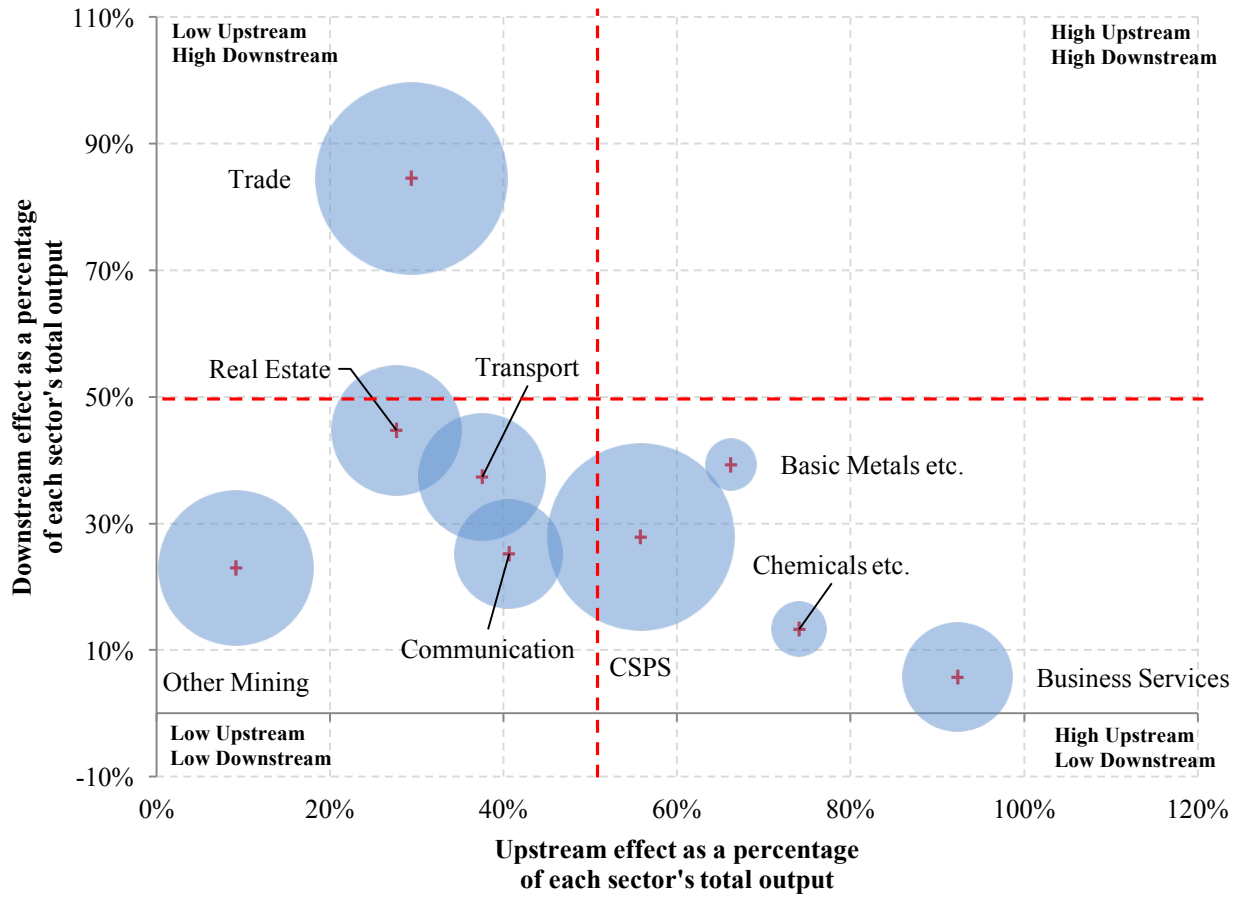
Source: Compiled by authors from Conningarth Economists SAM, 2009

Figure 6. Upstream and downstream linkage effects of the NWP other food products cluster and related sectors
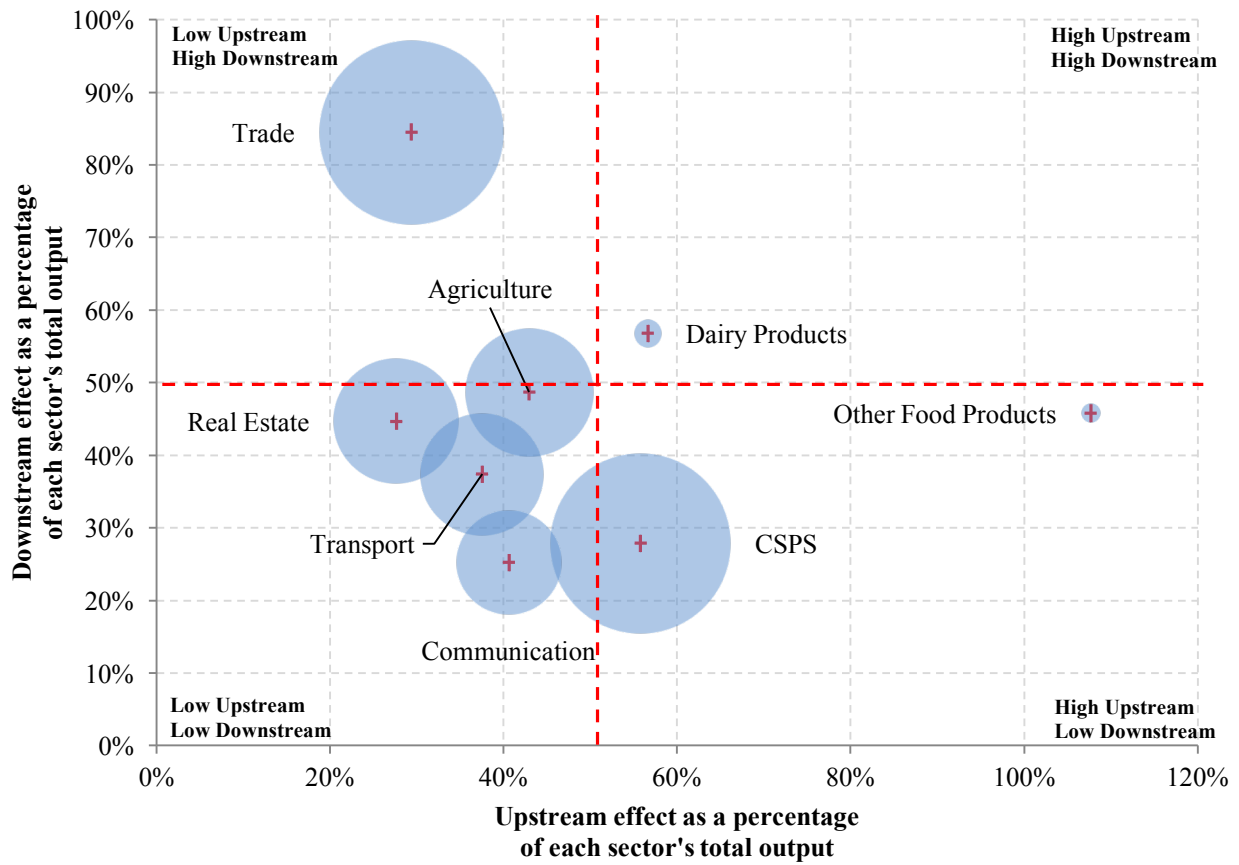
Source: Compiled by authors from Conningarth Economists SAM, 2009

Figure 7. Upstream and downstream linkage effects of the NWP agriculture cluster and related sectors
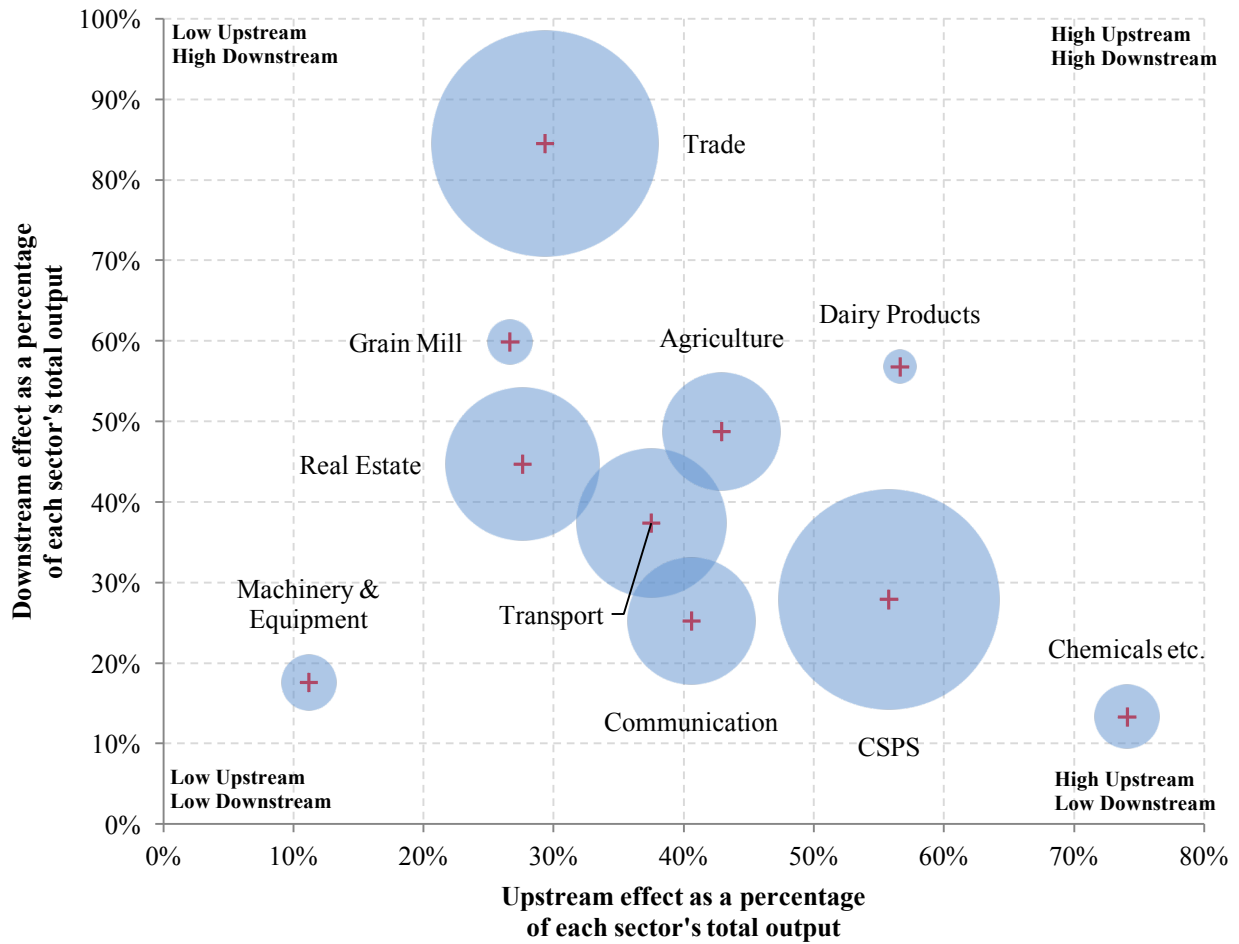
Figure 8. Upstream and downstream linkage effects of the NWP non-metallic mineral products cluster and related sectors
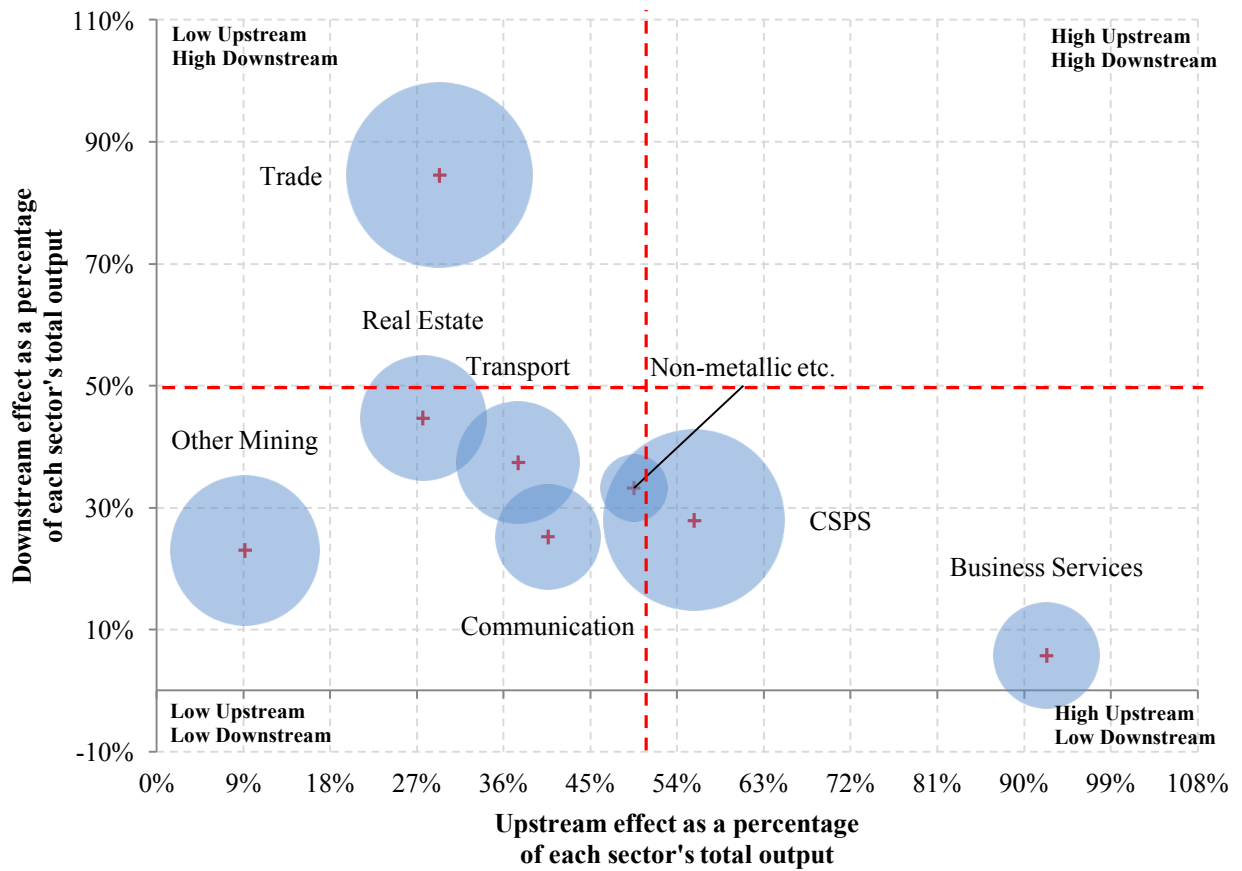
Source: Compiled by authors from Conningarth Economists SAM, 2009

Figure 9. Upstream and downstream linkage effects of the NWP trade cluster and related sectors
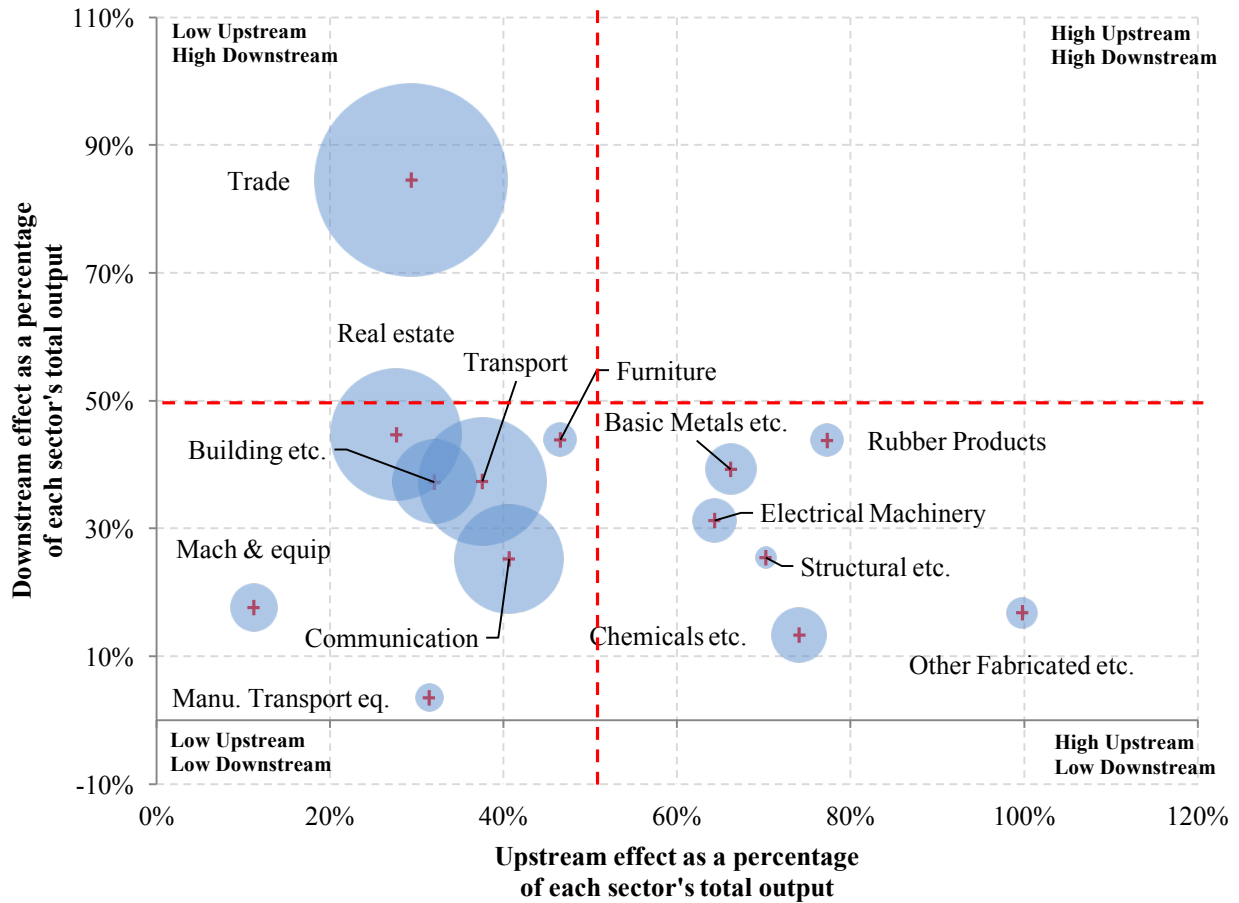
Source: Compiled by authors from Conningarth Economists SAM, 2009

Figure 10. Upstream and downstream linkage effects of the NWP dairy products cluster and related sectors
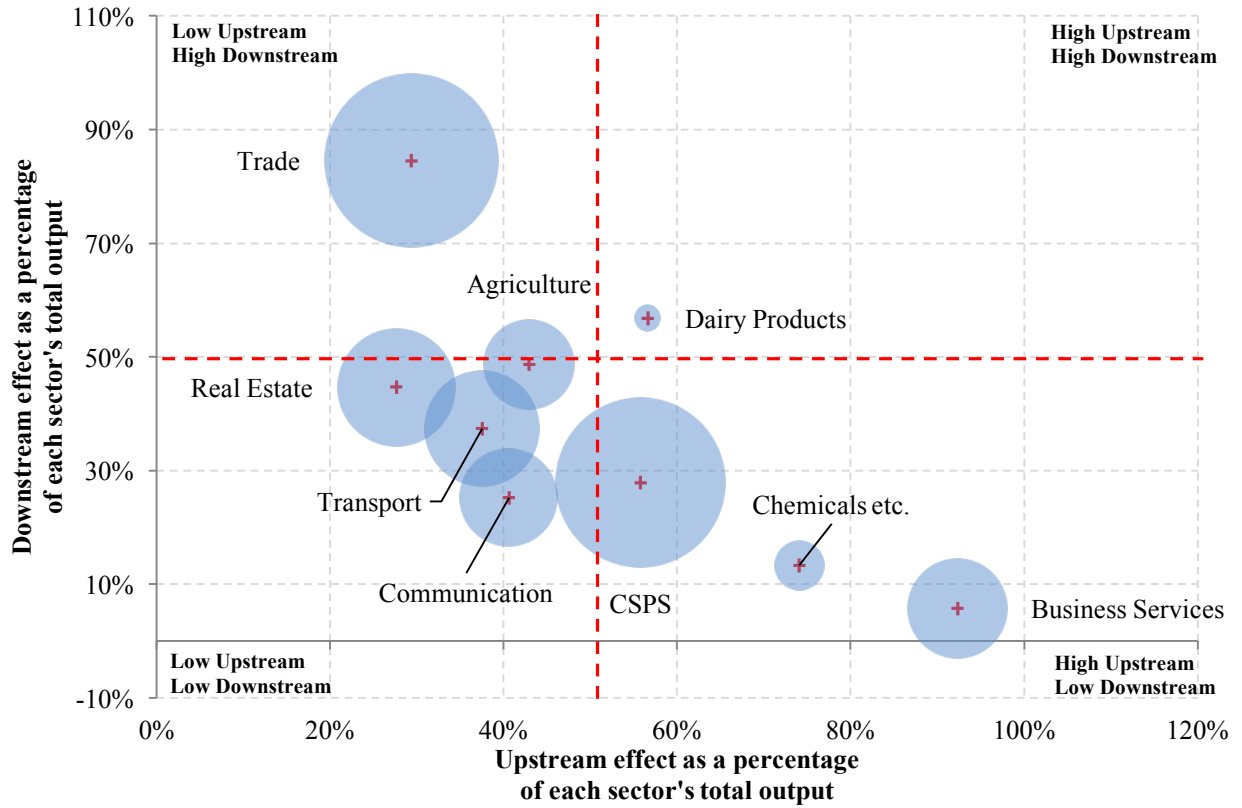
Source: Compiled by authors from Conningarth Economists SAM, 2009

APPENDIX 2: TABLES FOR NWP OUTPUT, EMPLOYMENT, INCOME AND GDP SUPPORTED BY INDUSTRIAL CLUSTER FORMATION

Table 7. NWP output, employment, income and GDP supported by the building and other construction industry cluster

	Output (ZAR millions)	Employment (Number)	Employment income (ZAR millions)	GDP (ZAR millions)
Actual	9.271	35 333	1.133	2.206
Supported	14.260	56 577	4.248	5.495

Source: Conningarth Economists, 2009 and Quantec Easy Data, 2014

Table 8. NWP output, employment, income and GDP supported by the basic metal products industry cluster

	Output (ZAR millions)	Employment (Number)	Employment income (ZAR millions)	GDP (ZAR millions)
Actual	4.174	7 198	343	894
Supported	7.108	20 602	1.836	2.993

Source: Conningarth Economists, 2009 and Quantec Easy Data, 2014

Table 9. NWP output, employment, income and GDP supported by the other food products industry cluster

	Output (ZAR millions)	Employment (Number)	Employment income (ZAR millions)	GDP (ZAR millions)
Actual	352	2 931	49	106
Supported	519	3 292	162	215

Source: Conningarth Economists, 2009 and Quantec Easy Data, 2014

Table 10. NWP output, employment, income and GDP supported by the agriculture industry cluster

	Output (ZAR millions)	Employment (Number)	Employment income (ZAR millions)	GDP (ZAR millions)
Actual	8.286	81.088	882	4.188
Supported	6.050	27.633	2.913	2.529

Source: Conningarth Economists, 2009 and Quantec Easy Data, 2014

Table 11. NWP output, employment, income and GDP supported by the non-metallic mineral products industry cluster

	Output (ZAR millions)	Employment (Number)	Employment income (ZAR millions)	GDP (ZAR millions)
Actual	3.2745	16 328	639	1.046
Supported	4.822	15 971	1.442	2.075

Source: Conningarth Economists, 2009 and Quantec Easy Data, 2014

Table 12. NWP output, employment, income and GDP supported by the trade industry cluster

	Output (ZAR millions)	Employment (Number)	Employment income (ZAR millions)	GDP (ZAR millions)
Actual	21.685	89 816	5.332	10.786
Supported	10.532	30 595	5.212	4.868

Source: Conningarth Economists, 2009 and Quantec Easy Data, 2014

Table 13. NWP output, employment, income and GDP supported by the dairy products industry cluster

	Output (ZAR millions)	Employment (Number)	Employment income (ZAR millions)	GDP (ZAR millions)
Actual	1.868	2 430	108	427
Supported	4.486	16 790	700	982

Source: Conningarth Economists, 2009 and Quantec Easy Data, 2014

APPENDIX 3: ECONOMIC LANDSCAPES OFTHE NWP PRE- AND POST-INDUSTRIAL CLUSTER FORMATION

Figure 11. Total multiplier landscapes for the NWP

Pre-cluster economic landscape for the NWP

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
1	0.2868	0.2925	0.2874	0.2941	0.3512	0.3637	0.3523	0.3265	0.3113	0.2819	0.2996	0.2673	0.2905	0.2654	0.2848	0.2757	0.2982	0.3093	0.3181	0.3058	0.2936	0.3046	0.2136	0.2495	0.2909	0.2958	0.2886	0.3360	0.3078	0.2994	0.2990	0.2899	0.2822	0.3253	0.2627	0.0686	0.2770
2	0.0735	0.0750	0.0737	0.0754	0.0901	0.0933	0.0903	0.0837	0.0798	0.0723	0.0768	0.0685	0.0745	0.0680	0.0730	0.0707	0.0765	0.0793	0.0816	0.0784	0.0753	0.0781	0.0548	0.0640	0.0746	0.0759	0.0740	0.0862	0.0789	0.0768	0.0767	0.0743	0.0723	0.0834	0.0674	0.0176	0.0710
3	0.0744	0.0758	0.0745	0.0763	0.0910	0.0943	0.0913	0.0847	0.0807	0.0731	0.0777	0.0693	0.0753	0.0688	0.0738	0.0715	0.0773	0.0802	0.0825	0.0793	0.0761	0.0790	0.0554	0.0647	0.0754	0.0767	0.0748	0.0871	0.0798	0.0776	0.0775	0.0751	0.0731	0.0843	0.0681	0.0178	0.0718
4	0.1922	0.1960	0.1926	0.1971	0.2354	0.2438	0.2361	0.2189	0.2086	0.1890	0.2008	0.1792	0.1947	0.1779	0.1909	0.1848	0.1999	0.2073	0.2132	0.2049	0.1968	0.2042	0.1432	0.1672	0.1950	0.1983	0.1934	0.2252	0.2063	0.2006	0.2004	0.1943	0.1891	0.2180	0.1761	0.0460	0.1857
5	0.0673	0.0686	0.0674	0.0690	0.0824	0.0853	0.0826	0.0766	0.0730	0.0661	0.0703	0.0627	0.0681	0.0622	0.0668	0.0647	0.0699	0.0725	0.0746	0.0717	0.0688	0.0714	0.0501	0.0585	0.0682	0.0694	0.0677	0.0788	0.0722	0.0702	0.0701	0.0680	0.0662	0.0763	0.0616	0.0161	0.0650
6	0.1410	0.1437	0.1412	0.1446	0.1726	0.1788	0.1731	0.1605	0.1530	0.1386	0.1472	0.1314	0.1428	0.1304	0.1400	0.1355	0.1466	0.1520	0.1564	0.1503	0.1443	0.1497	0.1050	0.1226	0.1430	0.1454	0.1418	0.1651	0.1513	0.1471	0.1470	0.1425	0.1387	0.1599	0.1291	0.0337	0.1362
7	0.1061	0.1081	0.1063	0.1088	0.1299	0.1345	0.1303	0.1207	0.1151	0.1042	0.1108	0.0989	0.1074	0.0981	0.1053	0.1019	0.1103	0.1144	0.1176	0.1131	0.1085	0.1126	0.0790	0.0922	0.1076	0.1094	0.1067	0.1242	0.1138	0.1107	0.1106	0.1072	0.1043	0.1203	0.0971	0.0254	0.1024
8	0.0707	0.0721	0.0708	0.0725	0.0866	0.0897	0.0869	0.0805	0.0767	0.0695	0.0739	0.0659	0.0716	0.0654	0.0702	0.0680	0.0735	0.0763	0.0784	0.0754	0.0724	0.0751	0.0527	0.0615	0.0717	0.0729	0.0711	0.0828	0.0759	0.0738	0.0737	0.0715	0.0696	0.0802	0.0648	0.0169	0.0683
9	0.0742	0.0756	0.0743	0.0760	0.0908	0.0940	0.0911	0.0844	0.0805	0.0729	0.0775	0.0691	0.0751	0.0686	0.0736	0.0713	0.0771	0.0800	0.0823	0.0791	0.0759	0.0788	0.0552	0.0645	0.0752	0.0765	0.0746	0.0869	0.0796	0.0774	0.0773	0.0749	0.0729	0.0841	0.0679	0.0177	0.0716
10	0.0671	0.0684	0.0672	0.0688	0.0821	0.0850	0.0824	0.0766	0.0728	0.0659	0.0701	0.0625	0.0679	0.0620	0.0666	0.0645	0.0697	0.0723	0.0744	0.0715	0.0686	0.0712	0.0499	0.0583	0.0680	0.0692	0.0675	0.0786	0.0720	0.0700	0.0700	0.0678	0.0660	0.0761	0.0614	0.0160	0.0648
11	0.0469	0.0479	0.0470	0.0481	0.0575	0.0595	0.0576	0.0534	0.0509	0.0461	0.0490	0.0437	0.0475	0.0434	0.0466	0.0451	0.0488	0.0506	0.0521	0.0500	0.0480	0.0498	0.0350	0.0408	0.0476	0.0484	0.0472	0.0550	0.0504	0.0490	0.0489	0.0474	0.0462	0.0532	0.0430	0.0112	0.0453
12	0.0823	0.0839	0.0824	0.0844	0.1007	0.1043	0.1011	0.0937	0.0893	0.0809	0.0859	0.0767	0.0833	0.0761	0.0817	0.0791	0.0855	0.0887	0.0913	0.0877	0.0842	0.0874	0.0613	0.0716	0.0834	0.0849	0.0828	0.0964	0.0883	0.0859	0.0858	0.0831	0.0809	0.0933	0.0753	0.0197	0.0795
13	0.0598	0.0610	0.0599	0.0613	0.0732	0.0758	0.0734	0.0681	0.0649	0.0588	0.0625	0.0557	0.0606	0.0553	0.0594	0.0575	0.0622	0.0645	0.0663	0.0637	0.0612	0.0635	0.0445	0.0520	0.0606	0.0617	0.0602	0.0700	0.0642	0.0624	0.0623	0.0604	0.0588	0.0678	0.0548	0.0143	0.0578
14	0.0425	0.0433	0.0425	0.0435	0.0520	0.0538	0.0521	0.0483	0.0461	0.0417	0.0443	0.0396	0.0430	0.0393	0.0422	0.0408	0.0441	0.0458	0.0471	0.0453	0.0435	0.0451	0.0316	0.0369	0.0431	0.0438	0.0427	0.0497	0.0456	0.0443	0.0443	0.0429	0.0418	0.0481	0.0389	0.0102	0.0410
15	0.1411	0.1438	0.1413	0.1447	0.1727	0.1789	0.1733	0.1606	0.1531	0.1387	0.1473	0.1315	0.1428	0.1305	0.1401	0.1356	0.1466	0.1521	0.1565	0.1504	0.1444	0.1498	0.1051	0.1227	0.1431	0.1455	0.1419	0.1652	0.1514	0.1472	0.1470	0.1426	0.1388	0.1600	0.1292	0.0337	0.1362
16	0.0731	0.0745	0.0732	0.0749	0.0895	0.0927	0.0897	0.0832	0.0793	0.0718	0.0763	0.0681	0.0740	0.0676	0.0726	0.0702	0.0760	0.0788	0.0810	0.0779	0.0748	0.0776	0.0544	0.0636	0.0741	0.0754	0.0735	0.0856	0.0784	0.0763	0.0762	0.0738	0.0719	0.0829	0.0669	0.0175	0.0706
17	0.1104	0.1125	0.1106	0.1132	0.1352	0.1400	0.1356	0.1257	0.1198	0.1085	0.1153	0.1029	0.1118	0.1021	0.1096	0.1061	0.1147	0.1190	0.1224	0.1177	0.1130	0.1172	0.0822	0.0960	0.1119	0.1138	0.1110	0.1293	0.1184	0.1152	0.1151	0.1115	0.1086	0.1252	0.1011	0.0264	0.1066
18	0.1754	0.1789	0.1758	0.1799	0.2148	0.2225	0.2155	0.1997	0.1904	0.1724	0.1832	0.1635	0.1777	0.1623	0.1742	0.1686	0.1824	0.1892	0.1946	0.1870	0.1796	0.1863	0.1307	0.1526	0.1779	0.1810	0.1765	0.2055	0.1883	0.1831	0.1829	0.1773	0.1726	0.1990	0.1607	0.0420	0.1694
19	0.0615	0.0627	0.0616	0.0630	0.0753	0.0780	0.0755	0.0700	0.0667	0.0604	0.0642	0.0573	0.0623	0.0569	0.0610	0.0591	0.0639	0.0663	0.0682	0.0655	0.0629	0.0653	0.0458	0.0535	0.0624	0.0634	0.0618	0.0720	0.0660	0.0642	0.0641	0.0621	0.0605	0.0697	0.0563	0.0147	0.0594
20	0.0562	0.0573	0.0563	0.0576	0.0688	0.0713	0.0690	0.0640	0.0610	0.0552	0.0587	0.0524	0.0569	0.0520	0.0558	0.0540	0.0584	0.0606	0.0623	0.0599	0.0575	0.0597	0.0419	0.0489	0.0570	0.0580	0.0565	0.0658	0.0603	0.0587	0.0586	0.0568	0.0553	0.0637	0.0515	0.0134	0.0543
21	0.0820	0.0836	0.0822	0.0841	0.1005	0.1040	0.1008	0.0934	0.0890	0.0806	0.0857	0.0765	0.0831	0.0759	0.0815	0.0789	0.0853	0.0885	0.0910	0.0874	0.0840	0.0871	0.0611	0.0714	0.0832	0.0846	0.0825	0.0961	0.0880	0.0856	0.0855	0.0829	0.0807	0.0930	0.0751	0.0196	0.0792
22	0.0840	0.0857	0.0842	0.0862	0.1029	0.1066	0.1032	0.0957	0.0912	0.0826	0.0878	0.0783	0.0851	0.0777	0.0834	0.0808	0.0874	0.0906	0.0932	0.0896	0.0860	0.0892	0.0626	0.0731	0.0852	0.0867	0.0845	0.0984	0.0902	0.0877	0.0876	0.0849	0.0827	0.0953	0.0770	0.0201	0.0812
23	0.0400	0.0408	0.0401	0.0411	0.0490	0.0508	0.0492	0.0456	0.0435	0.0394	0.0418	0.0373	0.0405	0.0370	0.0398	0.0385	0.0416	0.0432	0.0444	0.0427	0.0410	0.0425	0.0298	0.0348	0.0406	0.0413	0.0403	0.0469	0.0430	0.0418	0.0417	0.0405	0.0394	0.0454	0.0367	0.0096	0.0387
24	0.0555	0.0565	0.0556	0.0569	0.0679	0.0703	0.0681	0.0631	0.0602	0.0545	0.0579	0.0517	0.0562	0.0513	0.0551	0.0533	0.0576	0.0598	0.0615	0.0591	0.0568	0.0589	0.0413	0.0482	0.0562	0.0572	0.0558	0.0650	0.0595	0.0579	0.0578	0.0560	0.0545	0.0629	0.0508	0.0133	0.0536
25	0.0443	0.0452	0.0444	0.0455	0.0543	0.0562	0.0545	0.0505	0.0481	0.0436	0.0463	0.0413	0.0449	0.0410	0.0440	0.0426	0.0461	0.0478	0.0492	0.0473	0.0454	0.0471	0.0330	0.0386	0.0450	0.0457	0.0446	0.0519	0.0476	0.0463	0.0462	0.0448	0.0436	0.0503	0.0406	0.0106	0.0428
26	0.0733	0.0748	0.0735	0.0752	0.0898	0.0930	0.0901	0.0835	0.0796	0.0721	0.0766	0.0684	0.0743	0.0678	0.0728	0.0705	0.0762	0.0791	0.0813	0.0782	0.0751	0.0779	0.0546	0.0638	0.0744	0.0756	0.0738	0.0859	0.0787	0.0765	0.0765	0.0741	0.0721	0.0832	0.0672	0.0175	0.0708
27	0.0677	0.0690	0.0678	0.0694	0.0828	0.0858	0.0831	0.0770	0.0734	0.0665	0.0707	0.0631	0.0685	0.0626	0.0672	0.0650	0.0703	0.0730	0.0750	0.0721	0.0692	0.0719	0.0504	0.0588	0.0686	0.0698	0.0681	0.0793	0.0726	0.0706	0.0705	0.0684	0.0666	0.0767	0.0620	0.0162	0.0653
28	0.1264	0.1289	0.1267	0.1296	0.1548	0.1603	0.1553	0.1439	0.1372	0.1243	0.1320	0.1178	0.1280	0.1170	0.1255	0.1215	0.1314	0.1363	0.1402	0.1348	0.1294	0.1343	0.0942	0.1100	0.1282	0.1304	0.1272	0.1481	0.1357	0.1319	0.1318	0.1278	0.1244	0.1434	0.1158	0.0302	0.1221
29	0.3303	0.3368	0.3309	0.3387	0.4044	0.4188	0.4057	0.3760	0.3584	0.3247	0.3450	0.3078	0.3345	0.3056	0.3280	0.3175	0.3434	0.3562	0.3663	0.3521	0.3380	0.3508	0.2460	0.2873	0.3350	0.3407	0.3323	0.3869	0.3544	0.3447	0.3443	0.3338	0.3249	0.3746	0.3025	0.0790	0.3190
30	0.0728	0.0742	0.0729	0.0747	0.0891	0.0923	0.0894	0.0829	0.0790	0.0716	0.0760	0.0679	0.0737	0.0674	0.0723	0.0700	0.0757	0.0785	0.0807	0.0776	0.0745	0.0773	0.0542	0.0633	0.0738	0.0751	0.0732	0.0853	0.0781	0.0760	0.0759	0.0736	0.0716	0.0826	0.0667	0.0174	0.0703
31	0.1705	0.1739	0.1709	0.1749	0.2088	0.2162	0.2095	0.1941	0.1851	0.1676	0.1781	0.1589	0.1727	0.1578	0.1693	0.1639	0.1773	0.1839	0.1891	0.1818	0.1745	0.1811	0.1270	0.1483	0.1730	0.1759	0.1716	0.1998	0.1830	0.1780	0.1778	0.1723	0.1677	0.1934	0.1562	0.0408	0.1647
32	0.1752	0.1786	0.1755	0.1797	0.2145	0.2222	0.2152	0.1995	0.1901	0.1722	0.1830	0.1633	0.1774	0.1621	0.1740	0.1684	0.1822	0.1890	0.1943	0.1868	0.1793	0.1861	0.1305	0.1524	0.1777	0.1807	0.1763	0.2052	0.1880	0.1829	0.1827	0.1771	0.1723	0.1987	0.1605	0.0419	0.1692
33	0.1678	0.1711	0.1681	0.1721	0.2055	0.2128	0.2061	0.1910	0.1821	0.1649	0.1753	0.1564	0.1699	0.1552	0.1666	0.1613	0.1744	0.1810	0.1861	0.1789	0.1717	0.1782	0.1250	0.1459	0.1702	0.1731	0.1688	0.1966	0.1801	0.1751	0.1749	0.1696	0.1651	0.1903	0.1537	0.0401	0.1621
34	0.3037	0.3097	0.3043	0.3115	0.3719	0.3852	0.3731	0.3458	0.3296	0.2986	0.3172	0.2831	0.3076	0.2810	0.3016	0.2920	0.3158	0.3276	0.3369	0.3238	0.3109	0.3226	0.2262	0.2642	0.3081	0.3133	0.3056	0.3558	0.3259	0.3170	0.3166	0.3070	0.2988	0.3444	0.2782	0.0727	0.2934
35	0.1349	0.1376	0.1352	0.1383	0.1652	0.1711	0.1657	0.1536	0.1464	0.1326	0.1409	0.1257	0.1366	0.1248	0.1340	0.1297	0.1403	0.1455	0.1496	0.1438	0.1381	0.1433	0.1005	0.1173	0.1368	0.1391	0.1357	0.1580	0.1448	0.1408	0.1406	0.1363	0.1327	0.1530	0.1236	0.0323	0.1303
36	0.0375	0.0382	0.0376	0.0385	0.0459	0.0476	0.0461	0.0427	0.0407	0.0369	0.0392	0.0350	0.0380	0.0347	0.0372	0.0360	0.0390	0.0404	0.0416	0.0400	0.0384	0.0398	0.0279	0.0326	0.0380	0.0387	0.0377	0.0439	0.0402	0.0391	0.0391	0.0379	0.0369	0.0425	0.0343	0.0090	0.0362
37	0.2122	0.2164	0.2127	0.2177	0.2599	0.2691	0.2607	0.2416	0.2303	0.2086	0.2217	0.1978	0.2149	0.1964	0.2108	0.2040	0.2207	0.2289	0.2354	0.2263	0.2172	0.2254	0.1581	0.1846	0.2153	0.2189	0.2135	0.2486	0.2278	0.2215	0.2213	0.2145	0.2088	0.2407	0.1944	0.0508	0.2050

                                                   The Clute Institute

Post-cluster economic landscape for the NWP

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
1	0.2916	0.2913	0.2866	0.2943	0.3539	0.3690	0.3555	0.3295	0.3135	0.2821	0.2983	0.2598	0.2924	0.2670	0.2845	0.2759	0.2989	0.3133	0.3201	0.3075	0.3024	0.3122	0.2528	0.2409	0.2889	0.2966	0.2893	0.3383	0.3109	0.3003	0.3009	0.3160	0.2842	0.3269	0.2636	0.0693	0.2775
2	0.0743	0.0742	0.0730	0.0750	0.0902	0.0940	0.0906	0.0839	0.0799	0.0719	0.0760	0.0662	0.0745	0.0680	0.0725	0.0703	0.0761	0.0798	0.0815	0.0783	0.0770	0.0795	0.0644	0.0614	0.0736	0.0755	0.0737	0.0862	0.0792	0.0765	0.0767	0.0805	0.0724	0.0833	0.0671	0.0176	0.0707
3	0.0751	0.0751	0.0739	0.0758	0.0912	0.0951	0.0916	0.0849	0.0808	0.0727	0.0769	0.0670	0.0753	0.0688	0.0733	0.0711	0.0770	0.0807	0.0825	0.0792	0.0779	0.0805	0.0652	0.0621	0.0745	0.0764	0.0745	0.0872	0.0801	0.0774	0.0775	0.0814	0.0732	0.0842	0.0679	0.0179	0.0715
4	0.1106	0.1105	0.1087	0.1116	0.1342	0.1399	0.1348	0.1250	0.1189	0.1070	0.1131	0.0985	0.1109	0.1013	0.1079	0.1046	0.1134	0.1188	0.1214	0.1166	0.1147	0.1184	0.0959	0.0914	0.1096	0.1125	0.1097	0.1283	0.1179	0.1139	0.1141	0.1198	0.1078	0.1240	0.1000	0.0263	0.1052
5	0.0744	0.0743	0.0731	0.0751	0.0903	0.0941	0.0907	0.0841	0.0800	0.0720	0.0761	0.0663	0.0746	0.0681	0.0726	0.0704	0.0762	0.0799	0.0816	0.0784	0.0771	0.0796	0.0645	0.0615	0.0737	0.0756	0.0738	0.0863	0.0793	0.0766	0.0768	0.0806	0.0725	0.0834	0.0672	0.0177	0.0708
6	0.1506	0.1504	0.1480	0.1519	0.1827	0.1905	0.1835	0.1701	0.1618	0.1456	0.1540	0.1341	0.1510	0.1379	0.1469	0.1424	0.1543	0.1618	0.1653	0.1587	0.1561	0.1612	0.1305	0.1244	0.1492	0.1531	0.1493	0.1747	0.1605	0.1550	0.1554	0.1631	0.1467	0.1688	0.1361	0.0358	0.1433
7	0.1081	0.1080	0.1063	0.1091	0.1312	0.1368	0.1318	0.1222	0.1162	0.1046	0.1106	0.0963	0.1084	0.0990	0.1054	0.1023	0.1108	0.1161	0.1186	0.1140	0.1121	0.1157	0.0937	0.0893	0.1071	0.1099	0.1072	0.1254	0.1153	0.1113	0.1115	0.1171	0.1053	0.1212	0.0977	0.0257	0.1029
8	0.0854	0.0853	0.0839	0.0862	0.1036	0.1080	0.1041	0.0965	0.0918	0.0826	0.0873	0.0761	0.0856	0.0782	0.0833	0.0808	0.0875	0.0917	0.0937	0.0900	0.0886	0.0914	0.0740	0.0705	0.0846	0.0868	0.0847	0.0991	0.0910	0.0879	0.0881	0.0925	0.0832	0.0957	0.0772	0.0203	0.0812
9	0.0771	0.0770	0.0758	0.0778	0.0936	0.0976	0.0940	0.0871	0.0829	0.0746	0.0789	0.0687	0.0773	0.0706	0.0752	0.0729	0.0790	0.0829	0.0846	0.0813	0.0800	0.0826	0.0669	0.0637	0.0764	0.0784	0.0765	0.0895	0.0822	0.0794	0.0796	0.0836	0.0751	0.0864	0.0697	0.0183	0.0734
10	0.0688	0.0688	0.0677	0.0695	0.0835	0.0871	0.0839	0.0778	0.0740	0.0666	0.0704	0.0613	0.0690	0.0630	0.0671	0.0651	0.0706	0.0740	0.0756	0.0726	0.0714	0.0737	0.0597	0.0569	0.0682	0.0700	0.0683	0.0799	0.0734	0.0709	0.0710	0.0746	0.0671	0.0772	0.0622	0.0164	0.0655
11	0.0487	0.0487	0.0479	0.0492	0.0591	0.0617	0.0594	0.0551	0.0524	0.0471	0.0498	0.0434	0.0489	0.0446	0.0475	0.0461	0.0499	0.0524	0.0535	0.0514	0.0505	0.0522	0.0423	0.0403	0.0483	0.0496	0.0483	0.0565	0.0520	0.0502	0.0503	0.0528	0.0475	0.0546	0.0440	0.0116	0.0464
12	0.0788	0.0787	0.0774	0.0795	0.0956	0.0997	0.0960	0.0890	0.0847	0.0762	0.0806	0.0702	0.0790	0.0721	0.0768	0.0745	0.0808	0.0846	0.0865	0.0831	0.0817	0.0843	0.0683	0.0651	0.0780	0.0801	0.0781	0.0914	0.0840	0.0811	0.0813	0.0854	0.0768	0.0883	0.0712	0.0187	0.0750
13	0.0625	0.0624	0.0614	0.0630	0.0758	0.0790	0.0761	0.0706	0.0671	0.0604	0.0639	0.0557	0.0626	0.0572	0.0609	0.0591	0.0640	0.0671	0.0686	0.0659	0.0648	0.0669	0.0542	0.0516	0.0619	0.0635	0.0620	0.0725	0.0666	0.0643	0.0645	0.0677	0.0609	0.0700	0.0565	0.0148	0.0594
14	0.0434	0.0433	0.0427	0.0438	0.0527	0.0549	0.0529	0.0490	0.0466	0.0420	0.0444	0.0387	0.0435	0.0397	0.0423	0.0411	0.0445	0.0466	0.0476	0.0458	0.0450	0.0465	0.0376	0.0359	0.0430	0.0441	0.0430	0.0503	0.0463	0.0447	0.0448	0.0470	0.0423	0.0486	0.0392	0.0103	0.0413
15	0.1562	0.1560	0.1535	0.1576	0.1896	0.1976	0.1904	0.1765	0.1679	0.1511	0.1597	0.1392	0.1566	0.1430	0.1524	0.1478	0.1601	0.1678	0.1714	0.1647	0.1620	0.1672	0.1354	0.1291	0.1547	0.1589	0.1549	0.1812	0.1665	0.1609	0.1612	0.1692	0.1522	0.1751	0.1412	0.0371	0.1486
16	0.0736	0.0735	0.0723	0.0742	0.0893	0.0931	0.0897	0.0831	0.0791	0.0712	0.0752	0.0655	0.0738	0.0674	0.0718	0.0696	0.0754	0.0791	0.0808	0.0776	0.0763	0.0788	0.0638	0.0608	0.0729	0.0748	0.0730	0.0854	0.0784	0.0758	0.0759	0.0797	0.0717	0.0825	0.0665	0.0175	0.0700
17	0.1123	0.1122	0.1104	0.1133	0.1363	0.1421	0.1369	0.1269	0.1207	0.1086	0.1148	0.1000	0.1126	0.1028	0.1095	0.1062	0.1151	0.1207	0.1233	0.1184	0.1165	0.1202	0.0974	0.0928	0.1113	0.1142	0.1114	0.1303	0.1197	0.1156	0.1159	0.1217	0.1094	0.1259	0.1015	0.0267	0.1069
18	0.1820	0.1818	0.1789	0.1837	0.2209	0.2303	0.2219	0.2057	0.1957	0.1761	0.1862	0.1622	0.1825	0.1667	0.1776	0.1722	0.1866	0.1956	0.1998	0.1919	0.1888	0.1949	0.1578	0.1504	0.1803	0.1851	0.1806	0.2112	0.1941	0.1875	0.1878	0.1972	0.1774	0.2040	0.1645	0.0432	0.1732
19	0.0621	0.0620	0.0611	0.0627	0.0754	0.0786	0.0757	0.0702	0.0668	0.0601	0.0635	0.0553	0.0623	0.0569	0.0606	0.0588	0.0637	0.0667	0.0682	0.0655	0.0644	0.0665	0.0539	0.0513	0.0615	0.0632	0.0616	0.0721	0.0662	0.0640	0.0641	0.0673	0.0605	0.0696	0.0561	0.0148	0.0591
20	0.0583	0.0582	0.0573	0.0588	0.0708	0.0738	0.0711	0.0659	0.0627	0.0564	0.0596	0.0520	0.0585	0.0534	0.0569	0.0552	0.0598	0.0627	0.0640	0.0615	0.0605	0.0624	0.0506	0.0482	0.0578	0.0593	0.0578	0.0677	0.0622	0.0601	0.0602	0.0632	0.0568	0.0654	0.0527	0.0139	0.0555
21	0.0663	0.0662	0.0651	0.0669	0.0804	0.0838	0.0808	0.0749	0.0712	0.0641	0.0678	0.0590	0.0664	0.0607	0.0646	0.0627	0.0679	0.0712	0.0727	0.0699	0.0687	0.0709	0.0574	0.0547	0.0656	0.0674	0.0657	0.0769	0.0706	0.0682	0.0684	0.0718	0.0646	0.0743	0.0599	0.0157	0.0630
22	0.0865	0.0864	0.0850	0.0873	0.1050	0.1094	0.1054	0.0977	0.0930	0.0837	0.0885	0.0771	0.0867	0.0792	0.0844	0.0818	0.0887	0.0929	0.0949	0.0912	0.0897	0.0926	0.0750	0.0715	0.0857	0.0880	0.0858	0.1004	0.0922	0.0891	0.0893	0.0937	0.0843	0.0970	0.0782	0.0205	0.0823
23	0.0394	0.0393	0.0387	0.0397	0.0478	0.0498	0.0480	0.0445	0.0423	0.0381	0.0403	0.0351	0.0395	0.0360	0.0384	0.0372	0.0403	0.0423	0.0432	0.0415	0.0408	0.0421	0.0341	0.0325	0.0390	0.0400	0.0390	0.0457	0.0420	0.0405	0.0406	0.0427	0.0384	0.0441	0.0356	0.0094	0.0375
24	0.0565	0.0565	0.0556	0.0570	0.0686	0.0715	0.0689	0.0639	0.0608	0.0547	0.0578	0.0504	0.0567	0.0518	0.0551	0.0535	0.0579	0.0607	0.0620	0.0596	0.0586	0.0605	0.0490	0.0467	0.0560	0.0575	0.0561	0.0656	0.0603	0.0582	0.0583	0.0612	0.0551	0.0634	0.0511	0.0134	0.0538
25	0.0450	0.0449	0.0442	0.0454	0.0546	0.0569	0.0548	0.0508	0.0483	0.0435	0.0460	0.0401	0.0451	0.0412	0.0439	0.0425	0.0461	0.0483	0.0494	0.0474	0.0466	0.0482	0.0390	0.0372	0.0446	0.0457	0.0446	0.0522	0.0480	0.0463	0.0464	0.0487	0.0438	0.0504	0.0407	0.0107	0.0428
26	0.0787	0.0786	0.0774	0.0794	0.0956	0.0996	0.0960	0.0890	0.0846	0.0762	0.0805	0.0701	0.0789	0.0721	0.0768	0.0745	0.0807	0.0846	0.0864	0.0830	0.0816	0.0843	0.0683	0.0650	0.0780	0.0801	0.0781	0.0913	0.0839	0.0811	0.0812	0.0853	0.0767	0.0882	0.0712	0.0187	0.0749
27	0.0711	0.0711	0.0699	0.0718	0.0863	0.0900	0.0867	0.0804	0.0765	0.0688	0.0728	0.0634	0.0713	0.0651	0.0694	0.0673	0.0729	0.0764	0.0781	0.0750	0.0738	0.0762	0.0617	0.0588	0.0705	0.0723	0.0706	0.0825	0.0758	0.0733	0.0734	0.0771	0.0693	0.0797	0.0643	0.0169	0.0677
28	0.1265	0.1263	0.1243	0.1276	0.1535	0.1600	0.1542	0.1429	0.1359	0.1223	0.1293	0.1127	0.1268	0.1158	0.1234	0.1196	0.1296	0.1359	0.1388	0.1333	0.1312	0.1354	0.1097	0.1045	0.1253	0.1286	0.1254	0.1467	0.1348	0.1302	0.1305	0.1370	0.1232	0.1418	0.1143	0.0300	0.1203
29	0.3369	0.3365	0.3311	0.3399	0.4089	0.4262	0.4107	0.3807	0.3621	0.3259	0.3445	0.3001	0.3378	0.3085	0.3286	0.3187	0.3453	0.3620	0.3698	0.3552	0.3494	0.3607	0.2921	0.2783	0.3338	0.3426	0.3341	0.3908	0.3592	0.3469	0.3476	0.3650	0.3283	0.3776	0.3045	0.0800	0.3206
30	0.0704	0.0703	0.0692	0.0710	0.0854	0.0890	0.0858	0.0795	0.0756	0.0681	0.0720	0.0627	0.0705	0.0644	0.0686	0.0666	0.0721	0.0756	0.0772	0.0742	0.0730	0.0753	0.0610	0.0581	0.0697	0.0716	0.0698	0.0816	0.0750	0.0725	0.0726	0.0762	0.0686	0.0789	0.0636	0.0167	0.0669
31	0.1677	0.1675	0.1648	0.1692	0.2035	0.2122	0.2044	0.1895	0.1803	0.1622	0.1715	0.1494	0.1681	0.1536	0.1636	0.1586	0.1719	0.1802	0.1841	0.1768	0.1739	0.1795	0.1454	0.1385	0.1661	0.1705	0.1663	0.1945	0.1788	0.1727	0.1730	0.1817	0.1634	0.1880	0.1516	0.0398	0.1596
32	0.1783	0.1781	0.1753	0.1800	0.2164	0.2257	0.2174	0.2015	0.1917	0.1725	0.1824	0.1589	0.1788	0.1633	0.1740	0.1687	0.1828	0.1916	0.1958	0.1880	0.1850	0.1909	0.1546	0.1474	0.1767	0.1814	0.1769	0.2069	0.1902	0.1837	0.1840	0.1932	0.1738	0.1999	0.1612	0.0424	0.1697
33	0.1709	0.1707	0.1680	0.1725	0.2074	0.2163	0.2084	0.1931	0.1837	0.1653	0.1748	0.1523	0.1714	0.1565	0.1667	0.1617	0.1752	0.1836	0.1876	0.1802	0.1773	0.1830	0.1482	0.1412	0.1693	0.1738	0.1695	0.1983	0.1822	0.1760	0.1764	0.1852	0.1665	0.1916	0.1545	0.0406	0.1626
34	0.3170	0.3166	0.3116	0.3198	0.3847	0.4011	0.3864	0.3582	0.3407	0.3067	0.3242	0.2824	0.3178	0.2903	0.3092	0.2999	0.3249	0.3406	0.3479	0.3342	0.3287	0.3394	0.2748	0.2619	0.3140	0.3224	0.3144	0.3678	0.3380	0.3264	0.3271	0.3435	0.3089	0.3553	0.2865	0.0753	0.3016
35	0.1493	0.1491	0.1467	0.1506	0.1812	0.1889	0.1820	0.1687	0.1605	0.1444	0.1527	0.1330	0.1497	0.1367	0.1456	0.1412	0.1530	0.1604	0.1639	0.1574	0.1548	0.1598	0.1294	0.1233	0.1479	0.1518	0.1481	0.1732	0.1592	0.1537	0.1540	0.1618	0.1455	0.1673	0.1349	0.0355	0.1420
36	0.0379	0.0378	0.0372	0.0382	0.0460	0.0479	0.0462	0.0428	0.0407	0.0366	0.0387	0.0337	0.0380	0.0347	0.0369	0.0358	0.0388	0.0407	0.0416	0.0399	0.0393	0.0406	0.0328	0.0313	0.0375	0.0385	0.0376	0.0439	0.0404	0.0390	0.0391	0.0410	0.0369	0.0425	0.0342	0.0090	0.0360
37	0.2172	0.2170	0.2135	0.2192	0.2636	0.2748	0.2648	0.2454	0.2335	0.2101	0.2221	0.1935	0.2178	0.1989	0.2119	0.2055	0.2226	0.2334	0.2384	0.2290	0.2252	0.2325	0.1883	0.1795	0.2152	0.2209	0.2154	0.2520	0.2316	0.2237	0.2241	0.2353	0.2116	0.2435	0.1963	0.0516	0.2067

Change from pre- to post-cluster economic landscape

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
1	0.0048	-0.0012	-0.0007	0.0001	0.0027	0.0053	0.0032	0.0030	0.0022	0.0002	-0.0013	-0.0075	0.0019	0.0017	-0.0004	0.0002	0.0007	0.0040	0.0019	0.0017	0.0089	0.0076	0.0392	-0.0085	-0.0020	0.0007	0.0007	0.0023	0.0031	0.0010	0.0019	0.0261	0.0020	0.0016	0.0009	0.0007	0.0004
2	0.0007	-0.0008	-0.0007	-0.0005	0.0001	0.0007	0.0002	0.0002	0.0000	-0.0004	-0.0008	-0.0024	0.0000	0.0000	-0.0006	-0.0004	-0.0003	0.0005	0.0000	-0.0001	0.0018	0.0014	0.0096	-0.0026	-0.0010	-0.0003	-0.0003	0.0000	0.0003	-0.0003	0.0000	0.0062	0.0000	-0.0001	-0.0002	0.0001	-0.0004
3	0.0008	-0.0007	-0.0006	-0.0004	0.0002	0.0008	0.0003	0.0003	0.0001	-0.0004	-0.0008	-0.0023	0.0001	0.0000	-0.0005	-0.0004	-0.0003	0.0006	0.0000	0.0000	0.0018	0.0015	0.0098	-0.0026	-0.0010	-0.0003	-0.0003	0.0001	0.0003	-0.0002	0.0000	0.0063	0.0001	-0.0001	-0.0002	0.0001	-0.0003
4	-0.0817	-0.0855	-0.0839	-0.0856	-0.1012	-0.1039	-0.1013	-0.0939	-0.0898	-0.0820	-0.0877	-0.0807	-0.0838	-0.0766	-0.0830	-0.0802	-0.0865	-0.0885	-0.0918	-0.0883	-0.0821	-0.0858	-0.0473	-0.0758	-0.0854	-0.0858	-0.0837	-0.0969	-0.0884	-0.0867	-0.0863	-0.0745	-0.0813	-0.0941	-0.0761	-0.0197	-0.0805
5	0.0071	0.0057	0.0057	0.0061	0.0079	0.0088	0.0081	0.0075	0.0070	0.0058	0.0058	0.0036	0.0065	0.0059	0.0058	0.0057	0.0063	0.0074	0.0070	0.0067	0.0083	0.0082	0.0144	0.0029	0.0055	0.0063	0.0061	0.0075	0.0071	0.0064	0.0066	0.0126	0.0063	0.0071	0.0056	0.0016	0.0058
6	0.0096	0.0067	0.0067	0.0074	0.0101	0.0117	0.0104	0.0096	0.0089	0.0071	0.0067	0.0027	0.0082	0.0074	0.0069	0.0069	0.0078	0.0097	0.0089	0.0085	0.0119	0.0115	0.0255	0.0018	0.0062	0.0077	0.0075	0.0095	0.0093	0.0079	0.0084	0.0207	0.0080	0.0089	0.0070	0.0020	0.0071
7	0.0020	-0.0002	0.0000	0.0003	0.0013	0.0023	0.0015	0.0014	0.0011	0.0003	-0.0002	-0.0025	0.0010	0.0009	0.0001	0.0003	0.0005	0.0018	0.0010	0.0009	0.0036	0.0031	0.0147	-0.0029	-0.0005	0.0005	0.0005	0.0012	0.0014	0.0006	0.0010	0.0099	0.0010	0.0009	0.0006	0.0003	0.0004
8	0.0147	0.0132	0.0131	0.0136	0.0170	0.0184	0.0172	0.0160	0.0150	0.0131	0.0135	0.0102	0.0140	0.0128	0.0131	0.0128	0.0140	0.0155	0.0153	0.0146	0.0162	0.0163	0.0214	0.0090	0.0129	0.0139	0.0136	0.0162	0.0152	0.0141	0.0144	0.0211	0.0136	0.0155	0.0124	0.0034	0.0130
9	0.0030	0.0014	0.0015	0.0018	0.0028	0.0035	0.0029	0.0027	0.0024	0.0017	0.0014	-0.0004	0.0022	0.0020	0.0016	0.0017	0.0019	0.0029	0.0024	0.0022	0.0041	0.0038	0.0116	-0.0008	0.0012	0.0019	0.0019	0.0026	0.0026	0.0020	0.0023	0.0086	0.0022	0.0023	0.0018	0.0006	0.0017
10	0.0018	0.0004	0.0005	0.0007	0.0014	0.0020	0.0015	0.0014	0.0012	0.0007	0.0004	-0.0012	0.0011	0.0010	0.0005	0.0007	0.0008	0.0016	0.0012	0.0011	0.0027	0.0025	0.0097	-0.0015	0.0002	0.0008	0.0008	0.0013	0.0014	0.0009	0.0011	0.0068	0.0011	0.0011	0.0008	0.0003	0.0007
11	0.0018	0.0008	0.0009	0.0010	0.0017	0.0021	0.0018	0.0016	0.0014	0.0010	0.0008	-0.0003	0.0013	0.0012	0.0009	0.0010	0.0012	0.0017	0.0014	0.0013	0.0025	0.0023	0.0073	-0.0006	0.0007	0.0012	0.0011	0.0016	0.0016	0.0012	0.0014	0.0054	0.0013	0.0014	0.0011	0.0004	0.0010
12	-0.0035	-0.0052	-0.0050	-0.0049	-0.0051	-0.0046	-0.0050	-0.0046	-0.0046	-0.0047	-0.0054	-0.0065	-0.0043	-0.0040	-0.0048	-0.0046	-0.0048	-0.0041	-0.0048	-0.0046	-0.0025	-0.0030	0.0070	-0.0065	-0.0054	-0.0047	-0.0046	-0.0050	-0.0043	-0.0047	-0.0045	0.0022	-0.0042	-0.0050	-0.0041	-0.0010	-0.0045
13	0.0027	0.0014	0.0015	0.0017	0.0026	0.0032	0.0027	0.0025	0.0023	0.0017	0.0014	-0.0001	0.0021	0.0019	0.0016	0.0016	0.0019	0.0026	0.0022	0.0021	0.0036	0.0034	0.0096	-0.0004	0.0012	0.0019	0.0018	0.0024	0.0024	0.0019	0.0021	0.0073	0.0020	0.0022	0.0017	0.0005	0.0017
14	0.0009	0.0001	0.0001	0.0002	0.0007	0.0011	0.0008	0.0007	0.0006	0.0003	0.0000	-0.0009	0.0005	0.0005	0.0002	0.0002	0.0003	0.0008	0.0005	0.0005	0.0016	0.0014	0.0060	-0.0011	-0.0001	0.0003	0.0003	0.0006	0.0007	0.0004	0.0005	0.0041	0.0005	0.0005	0.0003	0.0002	0.0003
15	0.0151	0.0122	0.0122	0.0130	0.0168	0.0188	0.0172	0.0159	0.0148	0.0125	0.0124	0.0077	0.0138	0.0125	0.0123	0.0122	0.0135	0.0157	0.0150	0.0143	0.0176	0.0174	0.0304	0.0064	0.0117	0.0134	0.0130	0.0160	0.0152	0.0136	0.0141	0.0267	0.0134	0.0151	0.0120	0.0034	0.0124
16	0.0005	-0.0010	-0.0009	-0.0007	-0.0002	0.0004	-0.0001	0.0000	-0.0002	-0.0006	-0.0011	-0.0026	-0.0002	-0.0002	-0.0008	-0.0006	-0.0005	0.0003	-0.0003	-0.0003	0.0015	0.0012	0.0094	-0.0028	-0.0012	-0.0005	-0.0005	-0.0002	0.0000	-0.0005	-0.0003	0.0059	-0.0002	-0.0004	-0.0004	-0.0002	-0.0006
17	0.0019	-0.0004	-0.0002	0.0001	0.0011	0.0021	0.0013	0.0012	0.0009	0.0001	-0.0004	-0.0028	0.0008	0.0007	-0.0001	0.0001	0.0004	0.0016	0.0008	0.0007	0.0035	0.0030	0.0152	-0.0032	-0.0007	0.0004	0.0003	0.0010	0.0013	0.0005	0.0008	0.0101	0.0009	0.0007	0.0004	0.0003	0.0002
18	0.0066	0.0030	0.0031	0.0038	0.0061	0.0079	0.0064	0.0060	0.0053	0.0037	0.0029	-0.0013	0.0049	0.0044	0.0034	0.0036	0.0042	0.0064	0.0052	0.0049	0.0092	0.0086	0.0272	-0.0022	0.0024	0.0042	0.0041	0.0057	0.0058	0.0044	0.0050	0.0199	0.0048	0.0051	0.0039	0.0013	0.0038
19	0.0006	-0.0006	-0.0005	-0.0004	0.0001	0.0006	0.0002	0.0002	0.0001	-0.0003	-0.0007	-0.0020	0.0000	0.0000	-0.0005	-0.0003	-0.0002	0.0004	0.0000	-0.0001	0.0015	0.0012	0.0081	-0.0022	-0.0008	-0.0002	-0.0002	0.0000	0.0003	-0.0002	0.0000	0.0052	0.0001	-0.0001	-0.0002	0.0001	-0.0003
20	0.0021	0.0009	0.0010	0.0012	0.0019	0.0025	0.0021	0.0019	0.0017	0.0012	0.0009	-0.0004	0.0015	0.0014	0.0011	0.0011	0.0013	0.0020	0.0017	0.0016	0.0030	0.0027	0.0087	-0.0007	0.0008	0.0013	0.0013	0.0018	0.0019	0.0014	0.0016	0.0064	0.0015	0.0016	0.0012	0.0004	0.0012
21	-0.0158	-0.0175	-0.0171	-0.0173	-0.0200	-0.0202	-0.0200	-0.0185	-0.0178	-0.0165	-0.0179	-0.0174	-0.0166	-0.0152	-0.0168	-0.0162	-0.0174	-0.0173	-0.0183	-0.0176	-0.0152	-0.0162	-0.0037	-0.0166	-0.0176	-0.0172	-0.0168	-0.0192	-0.0174	-0.0174	-0.0171	-0.0111	-0.0161	-0.0188	-0.0152	-0.0039	-0.0162
22	0.0025	0.0007	0.0008	0.0011	0.0021	0.0029	0.0022	0.0021	0.0018	0.0011	0.0007	-0.0013	0.0016	0.0015	0.0009	0.0011	0.0013	0.0023	0.0017	0.0016	0.0037	0.0034	0.0124	-0.0016	0.0005	0.0013	0.0013	0.0019	0.0021	0.0014	0.0017	0.0088	0.0016	0.0017	0.0012	0.0004	0.0011
23	-0.0007	-0.0015	-0.0014	-0.0013	-0.0013	-0.0010	-0.0012	-0.0011	-0.0011	-0.0013	-0.0016	-0.0022	-0.0011	-0.0010	-0.0014	-0.0012	-0.0013	-0.0009	-0.0012	-0.0012	-0.0002	-0.0004	0.0043	-0.0023	-0.0016	-0.0013	-0.0012	-0.0012	-0.0010	-0.0012	-0.0011	0.0022	-0.0010	-0.0013	-0.0011	-0.0002	-0.0012
24	0.0011	-0.0001	0.0000	0.0002	0.0007	0.0012	0.0008	0.0007	0.0006	0.0002	-0.0001	-0.0013	0.0005	0.0005	0.0001	0.0002	0.0003	0.0009	0.0005	0.0005	0.0019	0.0016	0.0077	-0.0015	-0.0002	0.0003	0.0003	0.0006	0.0008	0.0003	0.0005	0.0052	0.0005	0.0005	0.0003	0.0002	0.0002
25	0.0006	-0.0003	-0.0002	-0.0001	0.0003	0.0007	0.0004	0.0003	0.0002	-0.0001	-0.0003	-0.0013	0.0002	0.0002	-0.0002	-0.0001	0.0000	0.0005	0.0002	0.0002	0.0013	0.0011	0.0060	-0.0014	-0.0004	0.0000	0.0000	0.0002	0.0004	0.0000	0.0002	0.0039	0.0002	0.0001	0.0000	0.0001	0.0000
26	0.0054	0.0039	0.0039	0.0042	0.0057	0.0066	0.0059	0.0055	0.0050	0.0041	0.0039	0.0018	0.0047	0.0042	0.0040	0.0040	0.0045	0.0055	0.0051	0.0048	0.0066	0.0064	0.0136	0.0013	0.0036	0.0044	0.0043	0.0054	0.0052	0.0045	0.0048	0.0112	0.0046	0.0051	0.0040	0.0012	0.0041
27	0.0035	0.0021	0.0021	0.0024	0.0035	0.0042	0.0036	0.0034	0.0030	0.0023	0.0021	0.0003	0.0028	0.0025	0.0022	0.0023	0.0026	0.0035	0.0030	0.0029	0.0045	0.0043	0.0113	-0.0001	0.0019	0.0026	0.0025	0.0033	0.0032	0.0026	0.0029	0.0087	0.0028	0.0030	0.0023	0.0007	0.0023
28	0.0001	-0.0026	-0.0023	-0.0020	-0.0013	-0.0003	-0.0011	-0.0010	-0.0012	-0.0019	-0.0027	-0.0051	-0.0012	-0.0011	-0.0022	-0.0019	-0.0018	-0.0004	-0.0014	-0.0014	0.0018	0.0012	0.0155	-0.0055	-0.0029	-0.0018	-0.0017	-0.0014	-0.0008	-0.0017	-0.0013	0.0093	-0.0011	-0.0016	-0.0015	-0.0002	-0.0018
29	0.0066	-0.0003	0.0002	0.0012	0.0044	0.0074	0.0050	0.0047	0.0037	0.0012	-0.0004	-0.0077	0.0033	0.0029	0.0006	0.0012	0.0019	0.0058	0.0034	0.0031	0.0113	0.0099	0.0461	-0.0089	-0.0012	0.0020	0.0019	0.0039	0.0048	0.0022	0.0033	0.0312	0.0034	0.0031	0.0020	0.0010	0.0015
30	-0.0024	-0.0040	-0.0038	-0.0037	-0.0038	-0.0033	-0.0037	-0.0034	-0.0034	-0.0035	-0.0041	-0.0052	-0.0032	-0.0029	-0.0037	-0.0034	-0.0036	-0.0029	-0.0035	-0.0034	-0.0015	-0.0020	0.0068	-0.0052	-0.0041	-0.0035	-0.0035	-0.0037	-0.0031	-0.0035	-0.0033	0.0027	-0.0031	-0.0037	-0.0031	-0.0007	-0.0034
31	-0.0028	-0.0064	-0.0060	-0.0057	-0.0053	-0.0041	-0.0050	-0.0047	-0.0048	-0.0054	-0.0066	-0.0095	-0.0046	-0.0042	-0.0058	-0.0053	-0.0054	-0.0037	-0.0051	-0.0050	-0.0006	-0.0016	0.0184	-0.0098	-0.0068	-0.0053	-0.0052	-0.0052	-0.0042	-0.0053	-0.0047	0.0094	-0.0044	-0.0054	-0.0046	-0.0010	-0.0052
32	0.0031	-0.0005	-0.0003	0.0003	0.0019	0.0035	0.0022	0.0021	0.0016	0.0003	-0.0006	-0.0044	0.0014	0.0012	0.0000	0.0003	0.0007	0.0027	0.0014	0.0013	0.0056	0.0049	0.0241	-0.0050	-0.0010	0.0007	0.0006	0.0017	0.0021	0.0008	0.0014	0.0162	0.0014	0.0012	0.0007	0.0005	0.0005
33	0.0031	-0.0004	-0.0001	0.0004	0.0020	0.0035	0.0023	0.0021	0.0016	0.0004	-0.0005	-0.0041	0.0014	0.0013	0.0001	0.0004	0.0008	0.0027	0.0015	0.0013	0.0055	0.0048	0.0232	-0.0047	-0.0009	0.0008	0.0007	0.0017	0.0022	0.0009	0.0014	0.0156	0.0015	0.0013	0.0008	0.0005	0.0006
34	0.0133	0.0069	0.0072	0.0084	0.0128	0.0159	0.0133	0.0124	0.0111	0.0081	0.0069	-0.0007	0.0102	0.0093	0.0076	0.0079	0.0091	0.0130	0.0110	0.0104	0.0179	0.0168	0.0486	-0.0023	0.0060	0.0091	0.0089	0.0120	0.0120	0.0094	0.0105	0.0365	0.0101	0.0109	0.0083	0.0027	0.0083
35	0.0144	0.0116	0.0116	0.0123	0.0160	0.0178	0.0163	0.0151	0.0141	0.0118	0.0118	0.0073	0.0131	0.0119	0.0117	0.0115	0.0128	0.0149	0.0142	0.0136	0.0167	0.0166	0.0289	0.0060	0.0111	0.0127	0.0123	0.0152	0.0144	0.0129	0.0134	0.0254	0.0128	0.0143	0.0114	0.0032	0.0117
36	0.0004	-0.0004	-0.0003	-0.0002	0.0000	0.0006	0.0001	0.0001	0.0000	-0.0002	-0.0004	-0.0012	0.0000	0.0000	-0.0003	-0.0002	-0.0002	0.0003	0.0000	0.0000	0.0009	0.0007	0.0049	-0.0013	-0.0005	-0.0002	-0.0002	0.0000	0.0001	-0.0001	0.0000	0.0031	0.0000	-0.0001	-0.0001	0.0000	-0.0002
37	0.0049	0.0005	0.0008	0.0015	0.0037	0.0057	0.0041	0.0038	0.0031	0.0015	0.0004	-0.0043	0.0028	0.0025	0.0011	0.0014	0.0020	0.0045	0.0030	0.0027	0.0080	0.0071	0.0302	-0.0052	-0.0001	0.0020	0.0019	0.0034	0.0038	0.0022	0.0029	0.0208	0.0029	0.0028	0.0019	0.0008	0.0017

Source: Authors'   own   calculations   based   on   Conningarth   Economists,   2009

NOTES