

MOC Asia-Pacific Summer Conference
Ulaanbaatar, Mongolia
July 1, 2025

Mongolia Regional Cluster Mapping

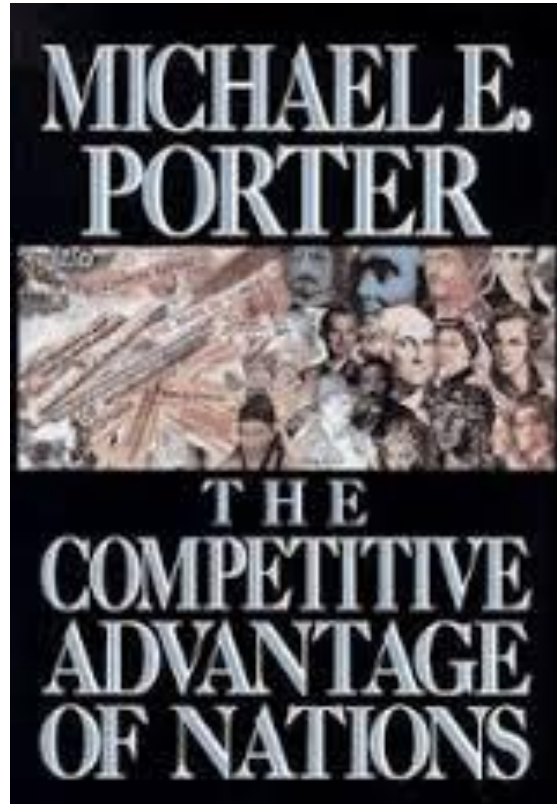
Richard Bryden
Strategy and 
Competitiveness
Associates

Agenda

1. Cluster Case Studies
 - Where we started and still important
2. The Research Foundation of Cluster Mapping
3. Cluster Mapping: Data from Mongolian Regions
4. From Cluster Mapping to Cluster-Based Policies
 - Roles for the Government and for the Private-Sector

Cluster Case Studies

A Research Effort that Started Four Decades Ago



(1990)

- What drives **differences in economic performance across locations**?
 - Role of **location** in competition
- Why do leading companies in specific industries **concentrate in a small number of places**?
 - How do clusters **matter**?
- How can nations, states, and regions achieve **sustainable improvements in economic performance**?

What is a Cluster?

A geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities (external economies)

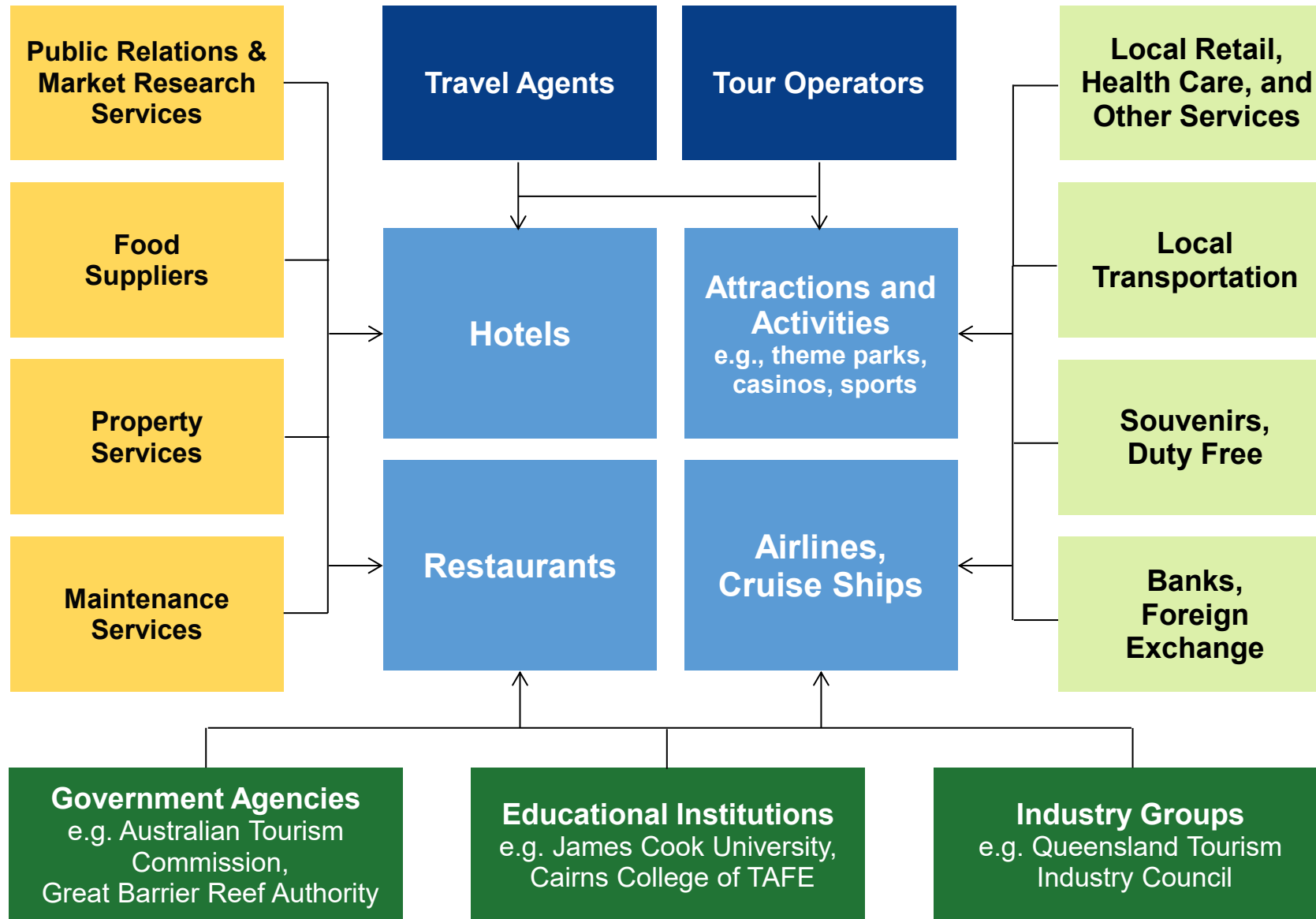
- End product industry or industries
- Downstream or channel industries
- Specialized suppliers
- Related service providers
- Related industries: those with important shared activities, skills, technologies, common channels, or common customers
- Supporting Institutions: financial, training and standard setting organizations, research institutions, and trade associations



- Clusters vs. industries
- Clusters vs. sectors

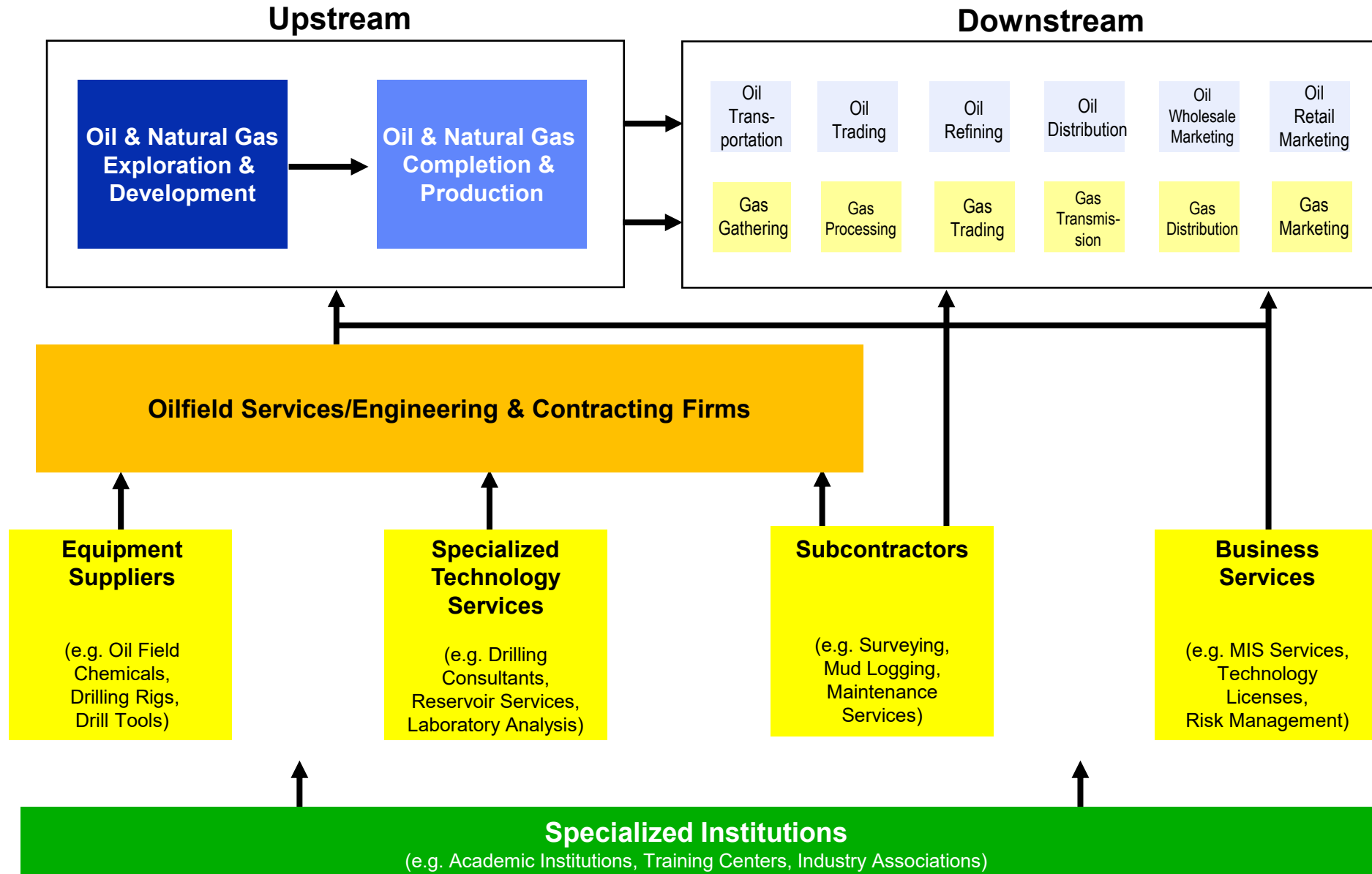
What is a Cluster?

Tourism Cluster in Cairns, Australia

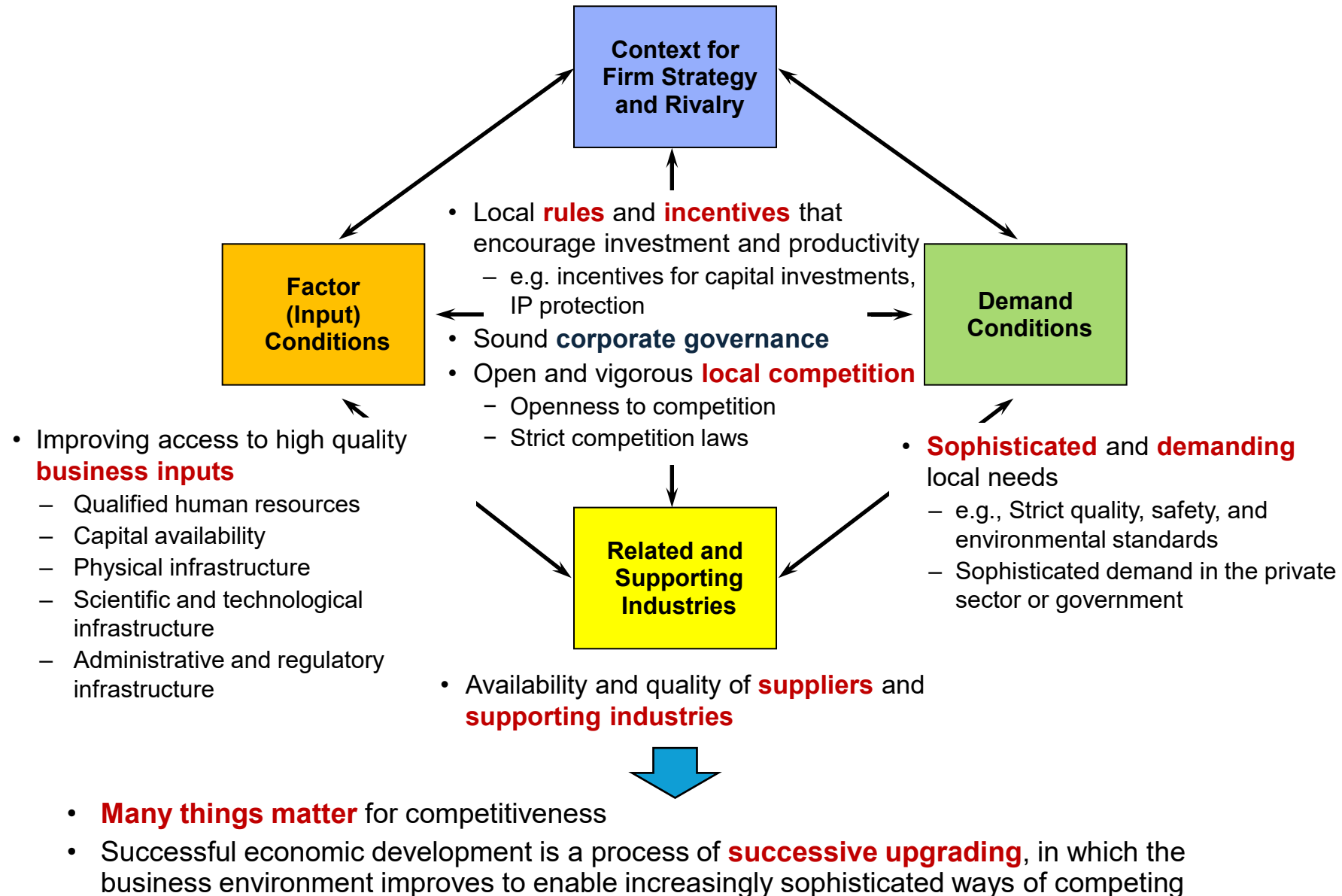


Mapping a Cluster

The Houston Oil and Gas Cluster

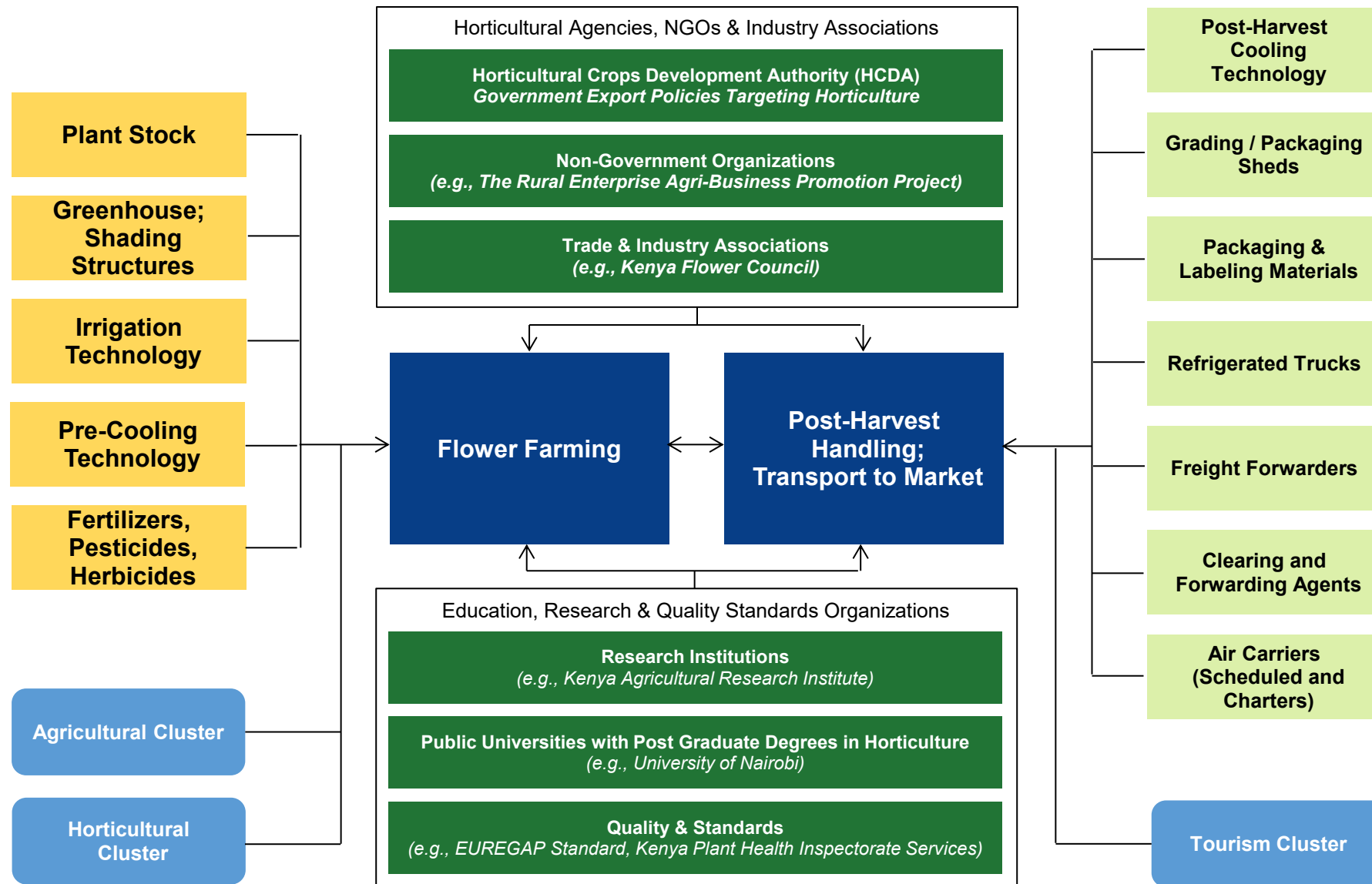


Assessing the Quality of the Business Environment



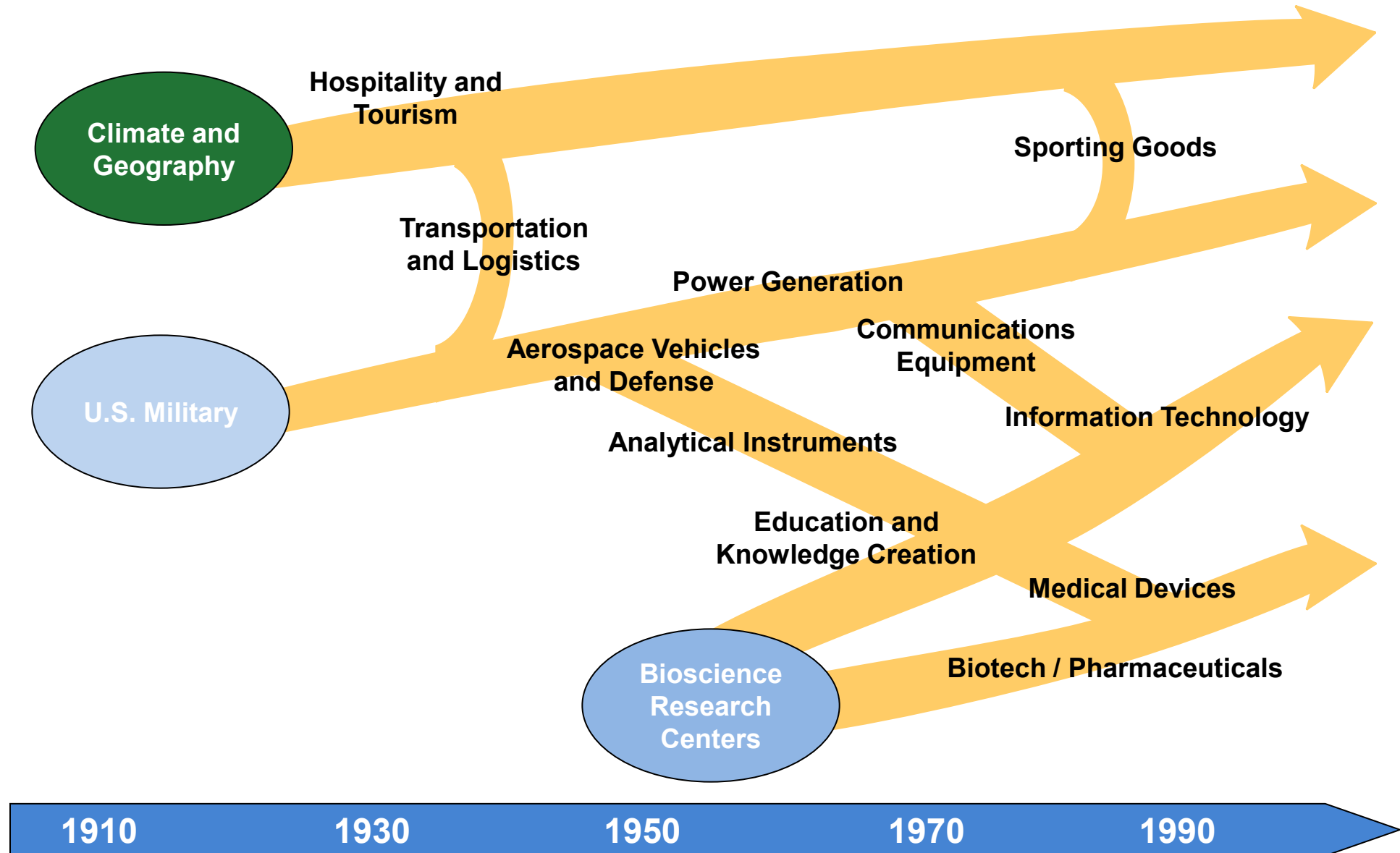
Clusters in Developing Countries

Cut Flower Cluster in Kenya

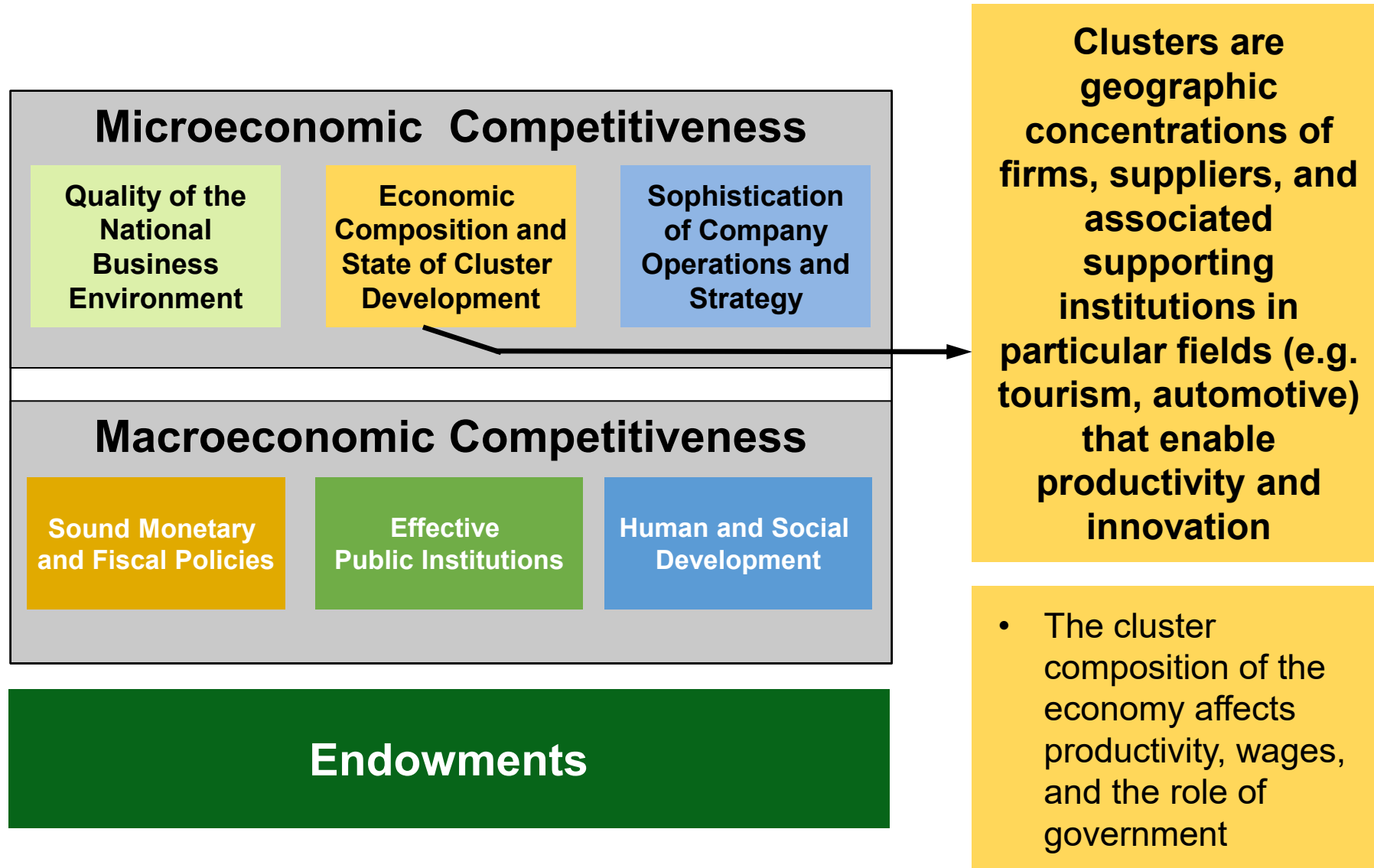


The Evolution of Regional Economies

San Diego



What Determines Competitiveness?



Why Clusters Matter?

- Clusters **increase productivity, operational efficiency, and regional economic performance**
 - Clusters stimulate and enable **innovations**
 - Clusters facilitate **commercialization, new business formation, and resilience**
- 
- Clusters reflect the fundamental importance of **linkages and spill-overs** across firms and institutions within a geographic area
 - Clusters have a powerful impact on the range of **strategic options** that are available to firms in a given location

Research About Clusters

Case Studies

- Show nature of clusters
- Establish types of linkages that exist within clusters
- Identify patterns of cluster dynamics and their drivers
- Develop hypotheses on the impact of clusters on firms and regions

Cross-sectoral quantitative Studies

- Systematic comparison of clusters across sectors and locations
- Measurement of the overall importance of clusters
- Tracking of cluster evolution
- Empirical tests of the impact of cluster presence on regional and firm-level economic performance

“Cluster Mapping”

Research Foundations of Cluster Mapping

How to go from cases to data and testable hypotheses?

- **Porter 2003:** “The Economic Performance of Regions”, *Regional Studies*
 - Treat the **U.S. economic geography** as the outcome of **a several centuries “experiment”** where the location decisions and survivorship of businesses has **revealed the competitive advantages to industry locations and co-locations** with other industries.
 - The U.S. is the ideal laboratory to observe this experiment because of its **size and breadth of industries** represented and due to the **lack of barriers** for companies to trade or move locations.
- **Delgado-Porter-Stern 2016:** “Defining Clusters of Economic Performance”, *Journal of Economic Geography*
 - Revisited and updated methodology with a novel clustering technique and complementary data inputs

Traded vs. Local Industries

- In a regional economy:

Traded industries serve **national and global markets** and are exposed to competition from other regions and nations



Local industries primarily serve the region's residents, are generally present in every region, and are tied to the growth of the region



Location Quotient (LQ) for an Industry

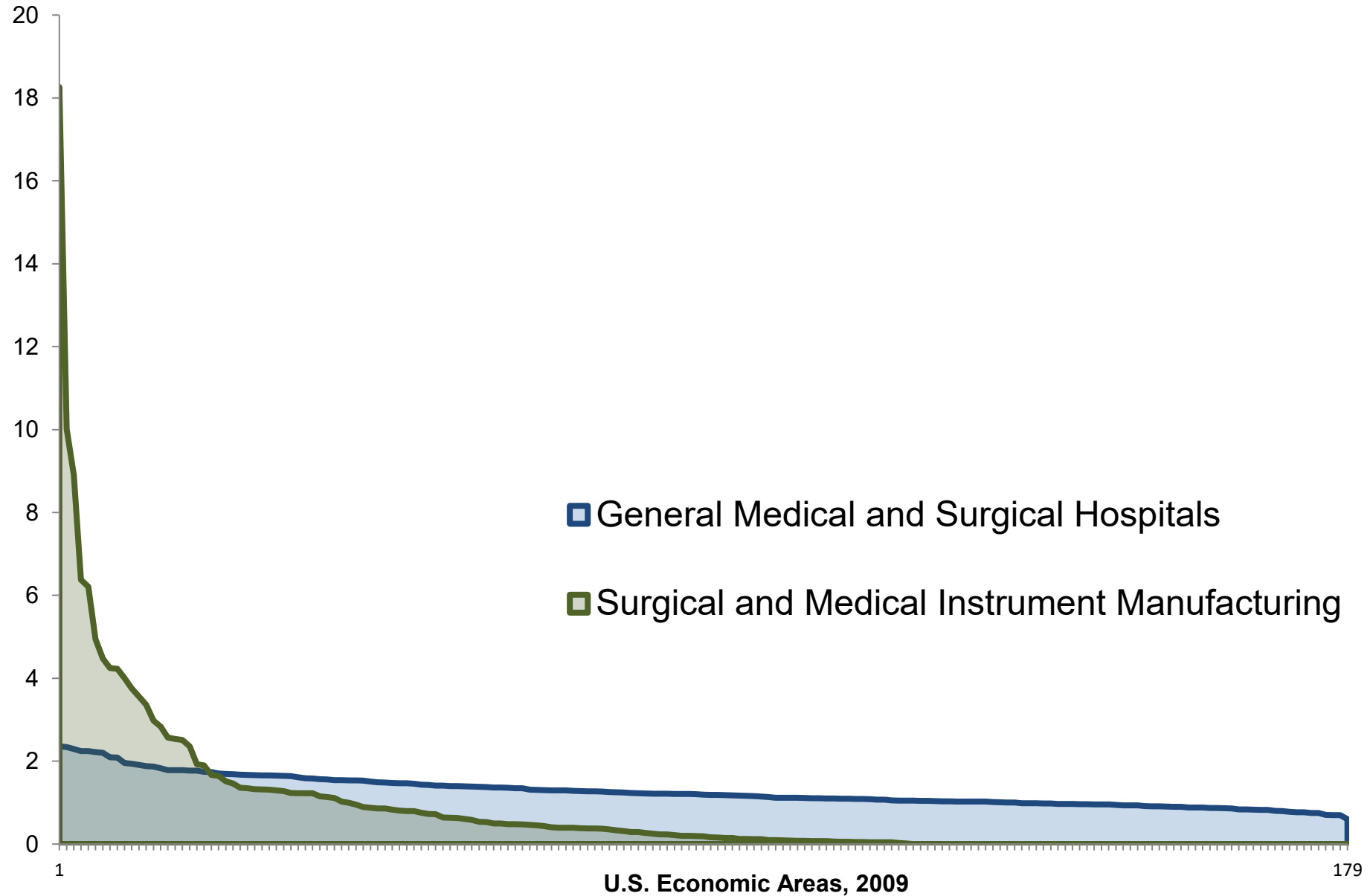
$$\text{LQ} = \frac{\text{Regional employment in the industry as a share of total regional employment}}{\text{National employment in the industry as a share of total national employment}}$$

Example:

$$\text{LQ} = \frac{\text{Automotive employment in Detroit as percent of total in Detroit: 20\%}}{\text{Automotive employment in US as percent of total in US: 4\%}} = 5$$

Regional Employment Specialization Hospitals vs Surgical Instruments

Employment Spec
of Industry
(Location Quotient)



How Important is the Traded Economy?

- 36% of employment, but **more than 50% of U.S. private payroll** are generated in industries that 'cluster'

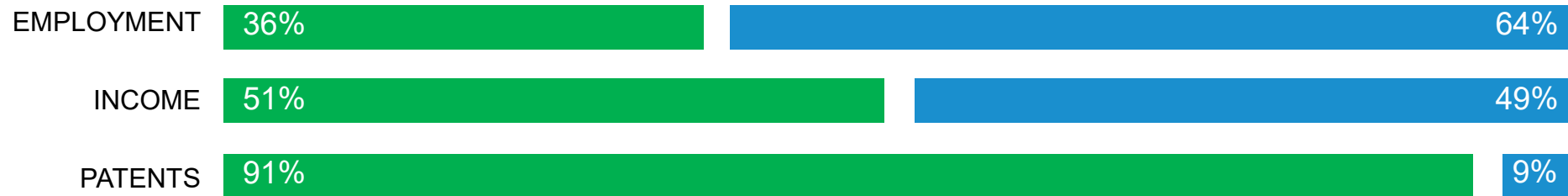
Traded vs. Local Share of the U.S. Economy



- In the traded economy, wages, patenting, and STEM jobs are significantly higher than in the local economy
- What happens within the traded economy? Identify traded clusters

Clusters and the Nature of Competition

Traded vs. Local Share of the U.S. Economy



Traded Industries

- ‘**Spiky**’ across space; 2/3s of all traded industry employment is in strong clusters
- Serve **national and global markets**
- Exposed to **competition from other regions and nations**
- Critical for **prosperity** through higher wages, productivity, and innovation; growth potential set by the global market

Local Industries

- Present **everywhere** at similar levels
- Serve exclusively the **local market**
- **Little exposure to cross-regional competition**
- Important for **jobs**, but lower wages; growth potential limited by size of the local market

Halfway there

Defining Clusters of Related Industries: Novel and Extended Clustering Methodology

- Categorizes industries as **traded** vs. **local** (778 traded 6-digit NAICS).
- Groups traded industries into clusters incorporating multiple measures of inter-industry relatedness:

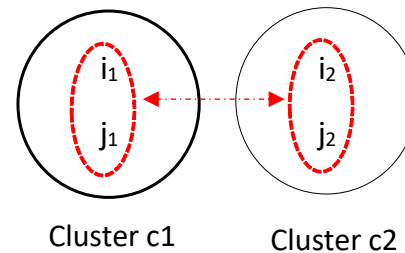
Region-Industry measures	National Industry measures
Co-location of Industry Employment (US Census CBP)	Input-Output Links (BEA National Input-Output Tables)
Co-location of Industry Establishments (US Census CBP)	Occupational Correlation (BLS Occupational Employment Statistics)

- Algorithm that **systematically generates and assesses** alternative sets of cluster definitions – i.e. groups of industries closely related by skill, technology, supply, demand, and/or other linkages.
- Generates **comparable** sets of cluster definitions that cover all regions (i.e., the industries that constitute a cluster are the same for all regions).
- Provides **scores that assess the quality of each set** of clusters (i.e., its ability to capture meaningful inter-industry linkages within clusters).

Defining Clusters of Related Industries

Clustering Analysis

- To derive clusters of traded industries, we use **clustering analysis**: numerical methods to classify similar objects (cities, people, **industries**, firms) into groups (Everitt et al., 2011)
- **Clustering analysis** creates groups (termed clusters) in such a way that objects (industries) in the same group are more similar among themselves than to those in other groups (Within Cluster Relatedness > Between Cluster Relatedness)



Source: Delgado/Porter/Stern, 2016, "Defining Clusters of Related Industries," *Journal of Economic Geography*

Benchmark Cluster: Aerospace Vehicles and Defense

Description: Establishments in this cluster manufacture aircraft, space vehicles, guided missiles, and related parts. This cluster also contains firms that manufacture the necessary search and navigation equipment used by these products.

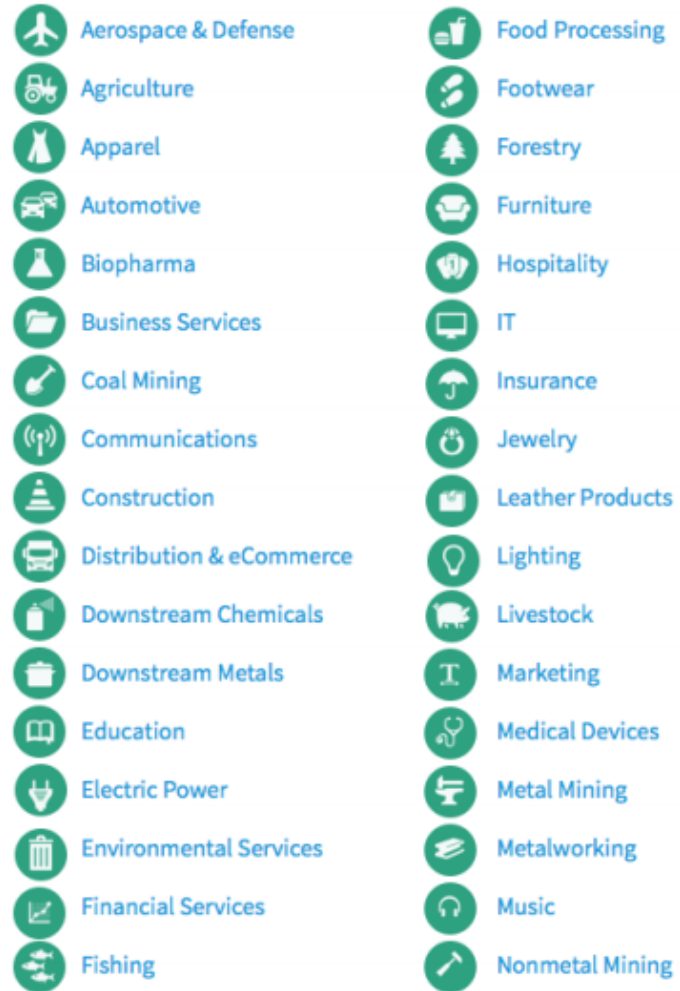
NAICS 7 Industries	NAICS Name	Subcluster Name	Within Cluster Relatedness (WCR_{ic})	
			Rank (1 = best)	Score
336411	Aircraft Manufacturing	Aircraft	1	3.51
336412	Aircraft Engine and Engine Parts Manufacturing	Aircraft	1	1.65
336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing	Aircraft	1	2.21
336414	Guided Missile and Space Vehicle Manufacturing	Missiles & Space Vehicles	1	2.29
336415	Guided Missile and Space Vehicle Propulsion Unit and Propulsion Unit Parts Manufacturing	Missiles & Space Vehicles	1	2.04
336419	Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing	Missiles & Space Vehicles	1	1.98
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing	Search & Navigation Equipment	1	1.76

The seven industries ranked best in this cluster than in any other group

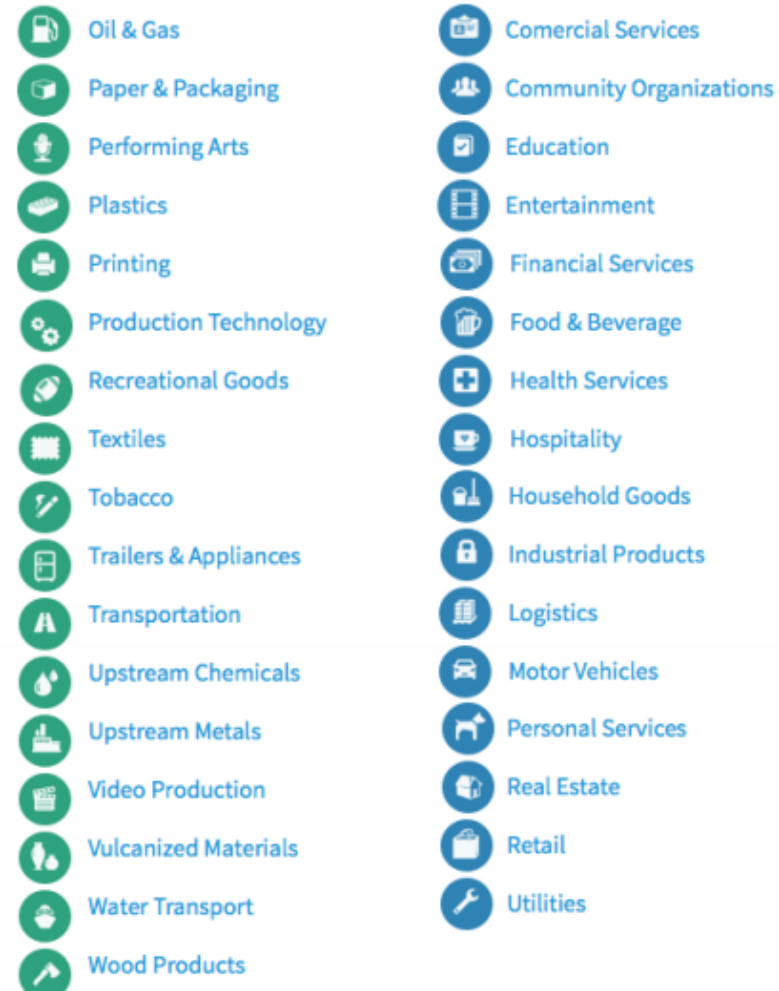
Source: Delgado/Porter/Stern, 2016, "Defining Clusters of Related Industries," *Journal of Economic Geography*.

51 Traded Clusters, 16 Local Clusters

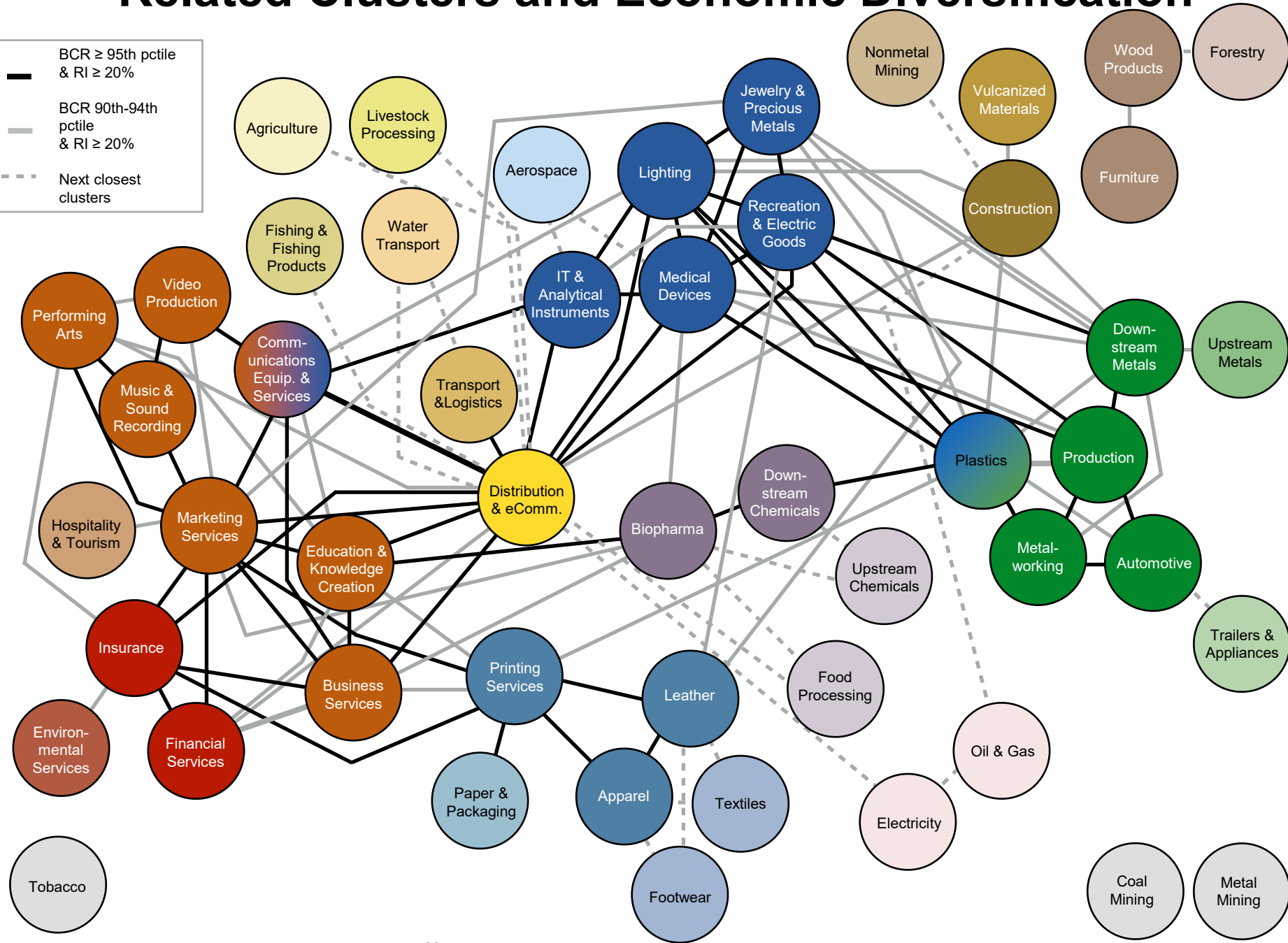
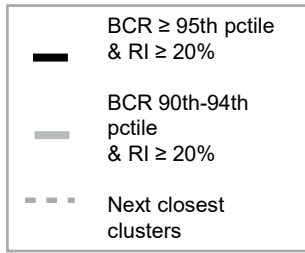
51 Traded Clusters



16 Local Clusters



Related Clusters and Economic Diversification



Impact of Clusters on Regional and National Economic Performance

Research Findings

- Presence of **strong clusters**
- **Breadth** of industries present in the cluster
- Strength in **related clusters**
- Overlap between a region's clusters and those in **neighboring regions**



- **Job** growth
- Higher **wages**
- Higher **patenting** rates
- Greater **new business formation, growth** and **survival**
- **Resilience** in downturns

- Economic diversification occurs primarily **within clusters** and **across related clusters**

Cluster Mapping

Mongolia Cluster Mapping

Detailed Region-
Industry Data

Excellent data from the National Statistical Office



Porter Benchmark
Cluster Model

Adapted to the Mongolian data for this project.



Cluster Database

Data from the National Statistical Office

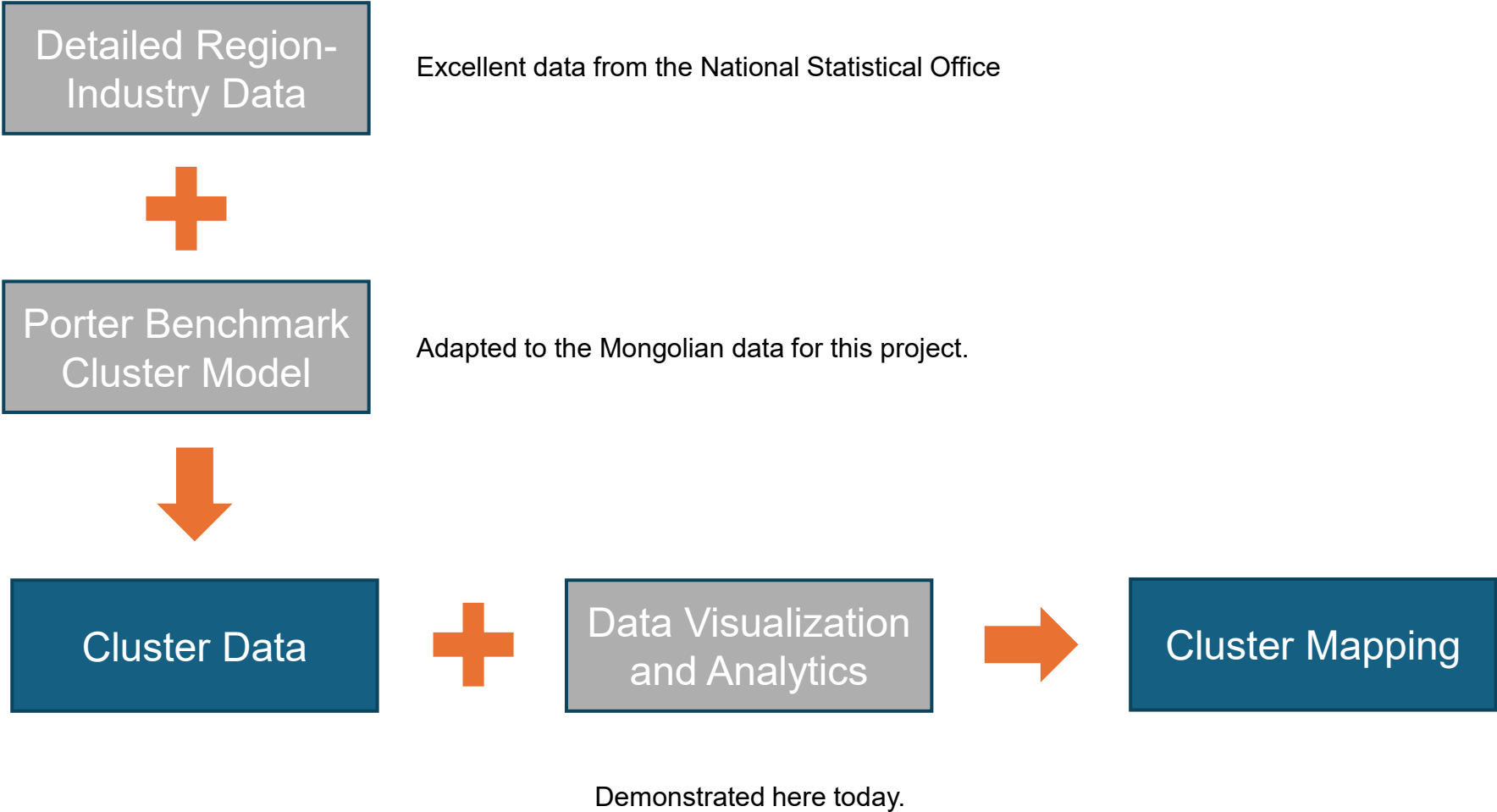
region_name	year	industry_code	industry_name	Number of Enterprise	Employment	Wage, thousand MNT	Sales, thousand MNT
Улаанбаатар	2024	4520	Моторт тээврийн хэрэгслийн засвар, үйлчилгээ	717	3067	46168266.3	903883594.7
Улаанбаатар	2024	4530	Моторт тээврийн хэрэгслийн сэлбэг эд ангийн худалдаа	795	4855	178277990.5	3585780305.5
Улаанбаатар	2024	4540	Мотоцикл, түүний эд анги, сэлбэг хэрэгслийн худалдаа, засвар, үйлчилгээ	45	191	4636145.2	277314148.7
Улаанбаатар	2024	4610	Төлбөр эсвэл гэрээний үндсэн дээр хийгдэх бөөний худалдаа	13129	61422	1110638118.8	19721166646.5
Улаанбаатар	2024	4620	Хөдөө аж ахуйн түүхий эд болон мал, амьтдын бөөний худалдаа	199	682	7471598.9	171071818.4
Улаанбаатар	2024	4630	Хүнс, ундаа, тамхины бөөний худалдаа	994	6141	109782890.4	2547145518.1
Улаанбаатар	2024	4641	Нэхмэл, нэхмэл бүтээгдэхүүн, гутал, хувцасны бөөний худалдаа	112	313	3815176.3	31838775.7
Улаанбаатар	2024	4649	Гэр ахуйн бусад барааны бөөний худалдаа	305	1435	22458618.1	320262362.0
Улаанбаатар	2024	4651	Компьютер, түүнд холбогдох тоног төхөөрөмж ба програм хангамжийн бөөний х	201	1522	49591226.1	786773866.2
Улаанбаатар	2024	4652	Электрон ба холбооны сэлбэг хэрэгсэл, тоног төхөөрөмжийн бөөний худалдаа	274	1100	21967314.1	732618232.1
Улаанбаатар	2024	4653	Хөдөө аж ахуйн машин, тоног төхөөрөмж, нэмэлт төхөөрөмжийн бөөний худалд	233	992	27662628.6	451577016.9
Улаанбаатар	2024	4659	Машин, тоног төхөөрөмжийн бусад бөөний худалдаа	485	3193	99487134.5	1725068234.3
Улаанбаатар	2024	4661	Хатуу, шингэн, хийн түлш, түүнд холбогдох бүтээгдэхүүний бөөний худалдаа	67	702	16434091.7	5015481249.3
Улаанбаатар	2024	4662	Төмөр, төмрийн хүдрийн бөөний худалдаа	49	314	2502644.1	133796908.5
Улаанбаатар	2024	4663	Барилгын материал, техник, сантехник, халаалт, үс түгээх төхөөрөмж болон тэдг	2401	7843	104855962.4	2544755442.9
Улаанбаатар	2024	4669	Хог, хаягдал болон өөр ангид ороогүй бусад бүтээгдэхүүний бөөний худалдаа	31	130	2167608.0	53099613.3
Улаанбаатар	2024	4690	Төрөлжсөн бус барааны бөөний худалдаа	326	3552	66985058.0	1868710195.8

393 codes at maximum detail level

Porter Benchmark Cluster Definition adapted to Mongolia

industry_code_numeric	industry_name	cluster_type	cluster_code	cluster_name	sub_code	sub_name
6201	Computer programming activities	Traded	6	Business Services	4	Computer Services
6202	Computer consultancy and computer facilities management activities	Traded	6	Business Services	4	Computer Services
6209	Other information technology and computer service activities	Traded	6	Business Services	4	Computer Services
6311	Data processing, hosting and related activities	Traded	6	Business Services	4	Computer Services
6420	Activities of holding companies	Traded	6	Business Services	1	Corporate Headquarters
7010	Activities of head offices	Traded	6	Business Services	1	Corporate Headquarters
7020	Management consultancy activities	Traded	6	Business Services	2	Consulting Services
7110	Architectural and engineering activities and related technical consultancy	Traded	6	Business Services	7	Architectural and Drafting Services
7490	Other professional, scientific and technical activities n.e.c.	Traded	6	Business Services	2	Consulting Services
7740	Leasing of intellectual property and similar products, except copyrighted works	Traded	6	Business Services	3	Business Support Services
7810	Activities of employment placement agencies	Traded	6	Business Services	5	Employment Placement Services
7830	Other human resources provision	Traded	6	Business Services	3	Business Support Services
8030	Investigation activities	Traded	6	Business Services	3	Business Support Services
8110	Combined facilities support activities	Traded	6	Business Services	3	Business Support Services
8220	Activities of call centres	Traded	6	Business Services	3	Business Support Services
8230	Organization of conventions and trade shows	Traded	6	Business Services	3	Business Support Services

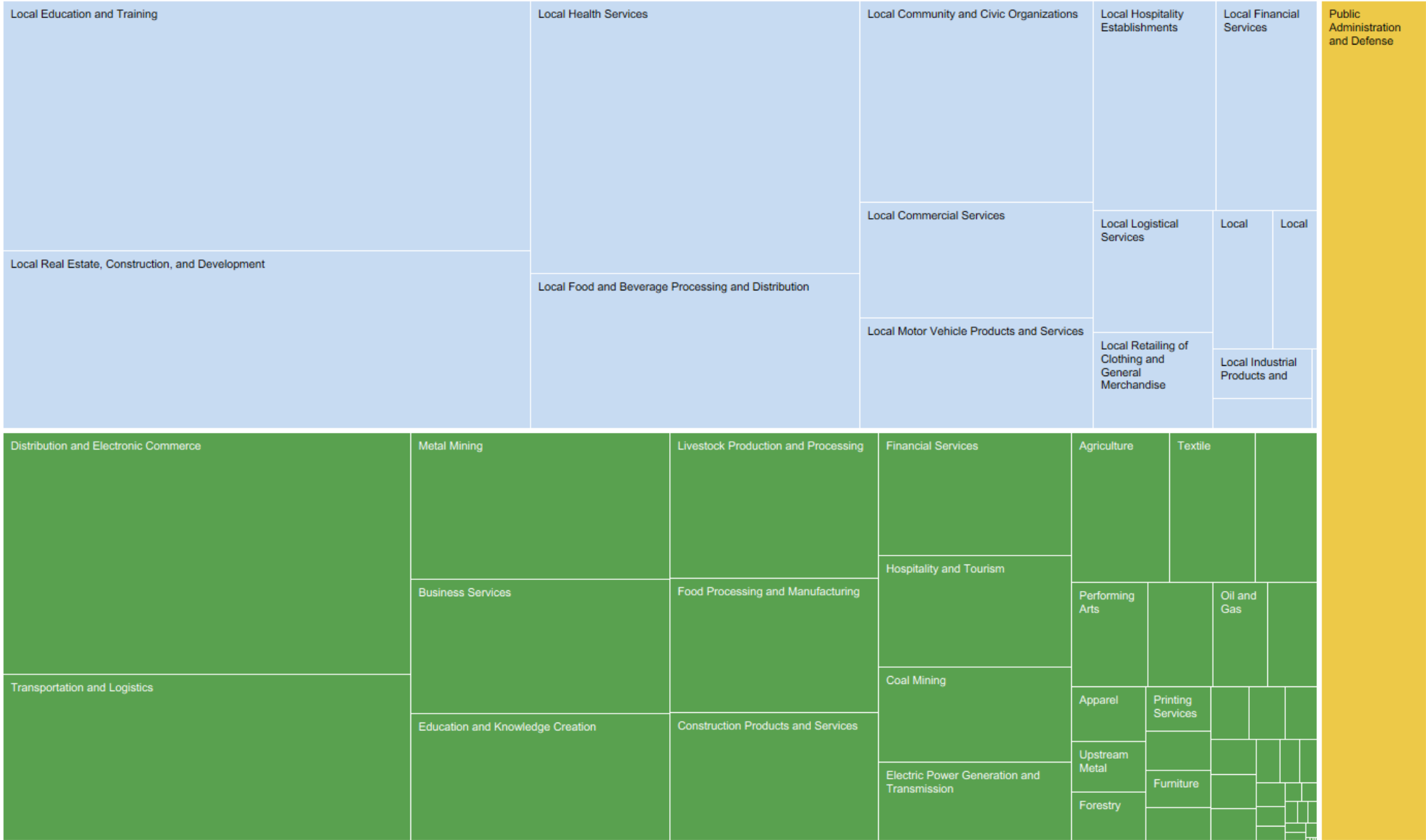
Mongolia Cluster Mapping



Mongolia

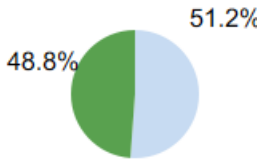
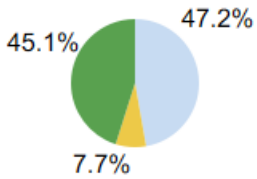
National Cluster Patterns

Mongolia Employment by Local and Traded Clusters plus Public Administration

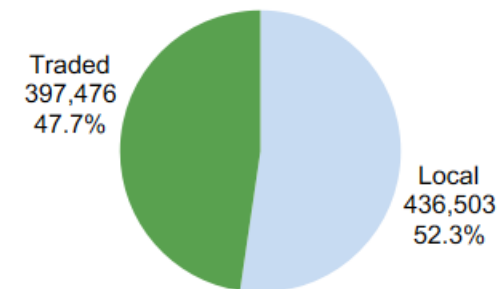
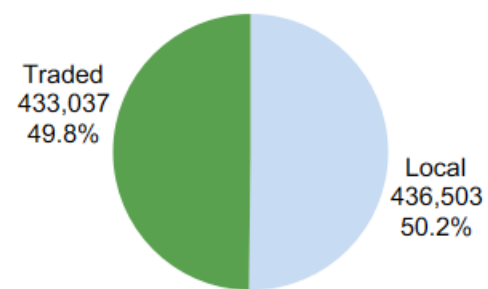
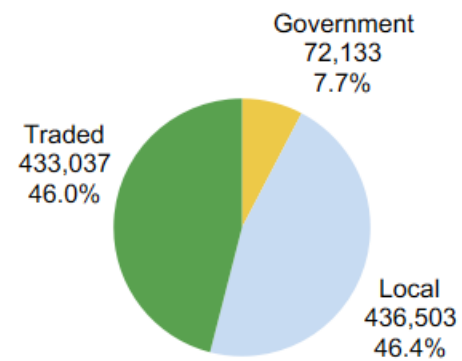


Employment Type

- Traded Clusters
- Local Clusters
- Public Administration

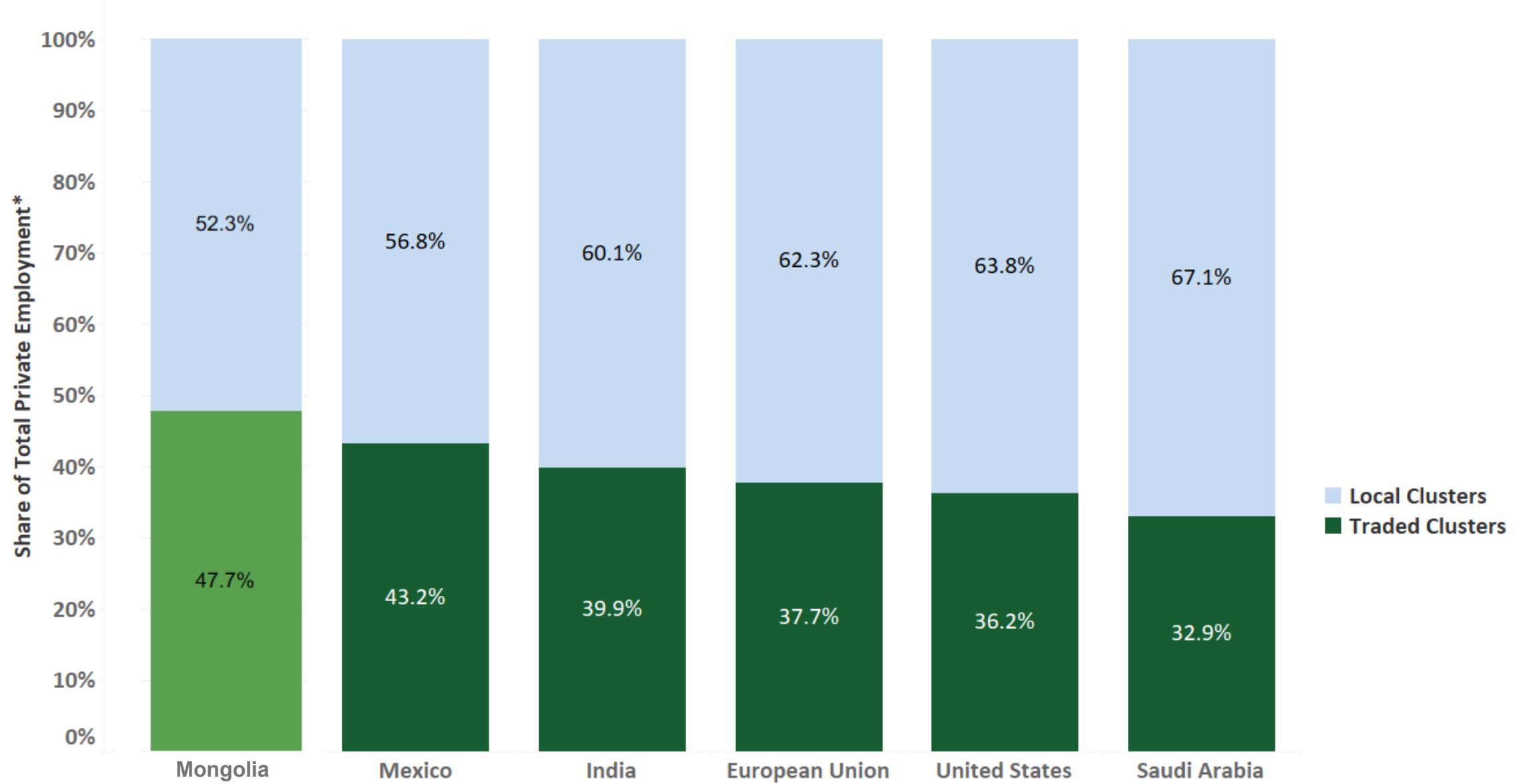


Mongolia Composition by Traded and Local Clusters



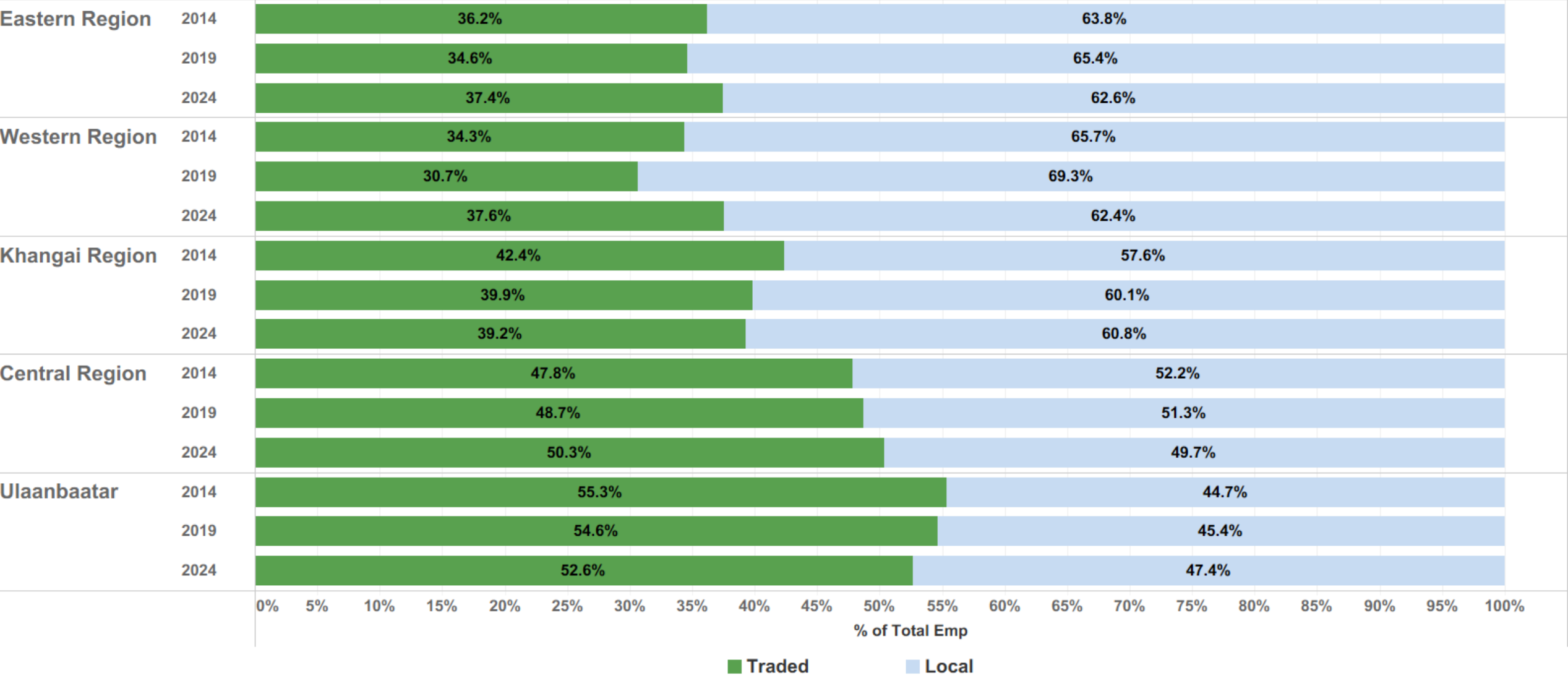
Excluding Agriculture
and Livestock

Mongolia has a higher percentage of employment in Traded Clusters

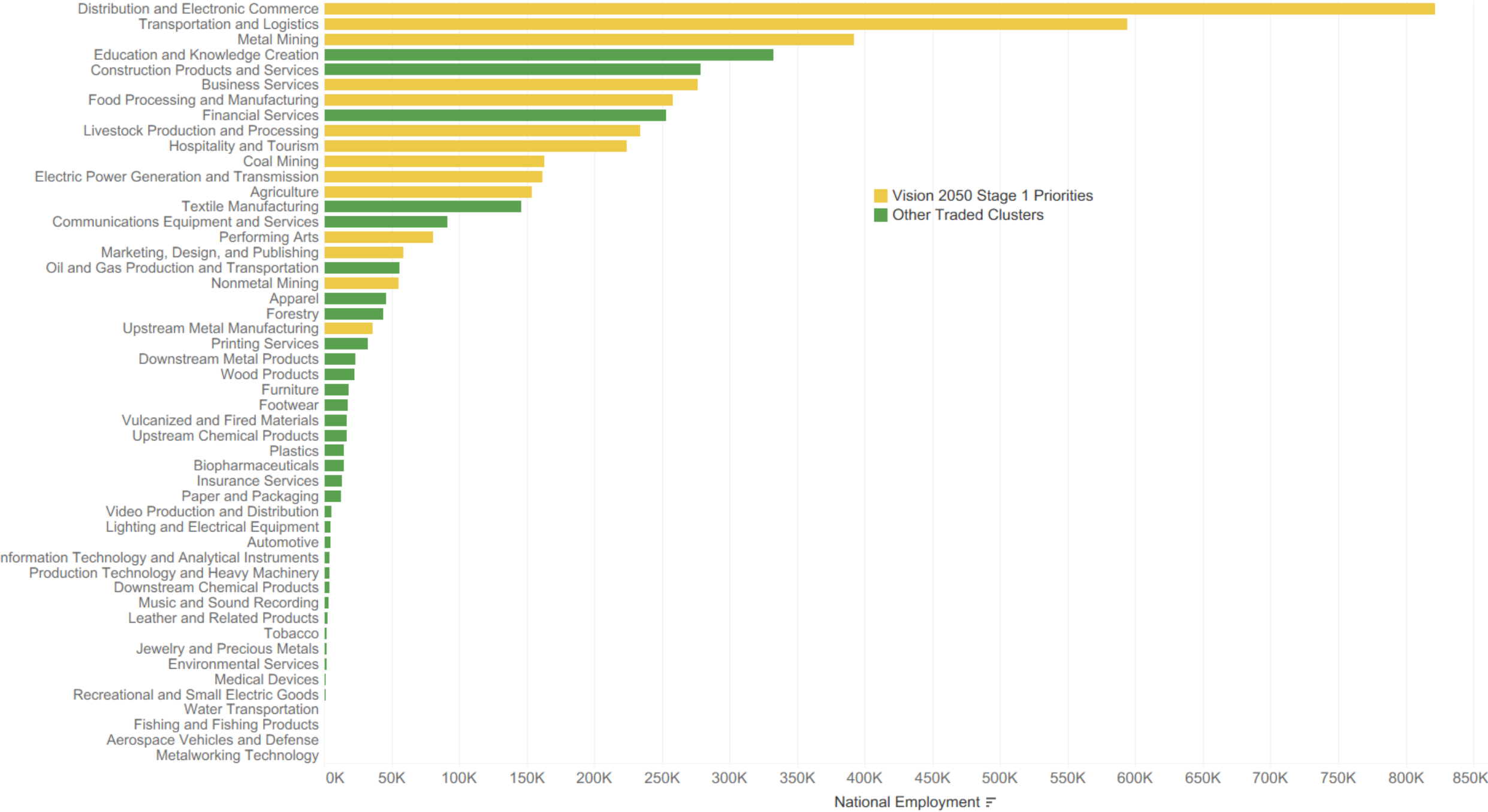


**Agriculture and Livestock labor has been excluded from Traded Clusters in all countries in this analysis for better comparability with India.*

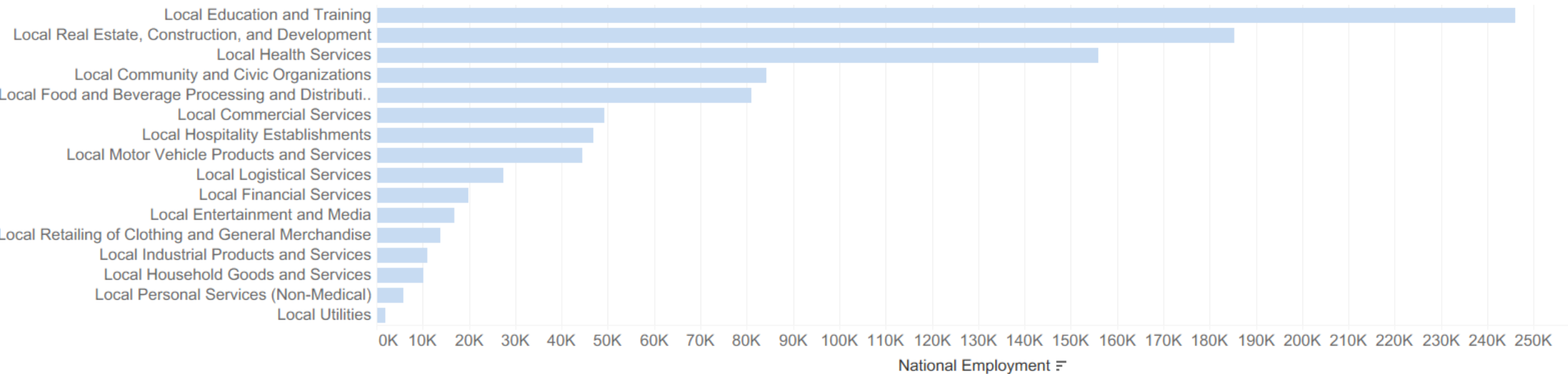
Traded and Local Employment Proportions by Region



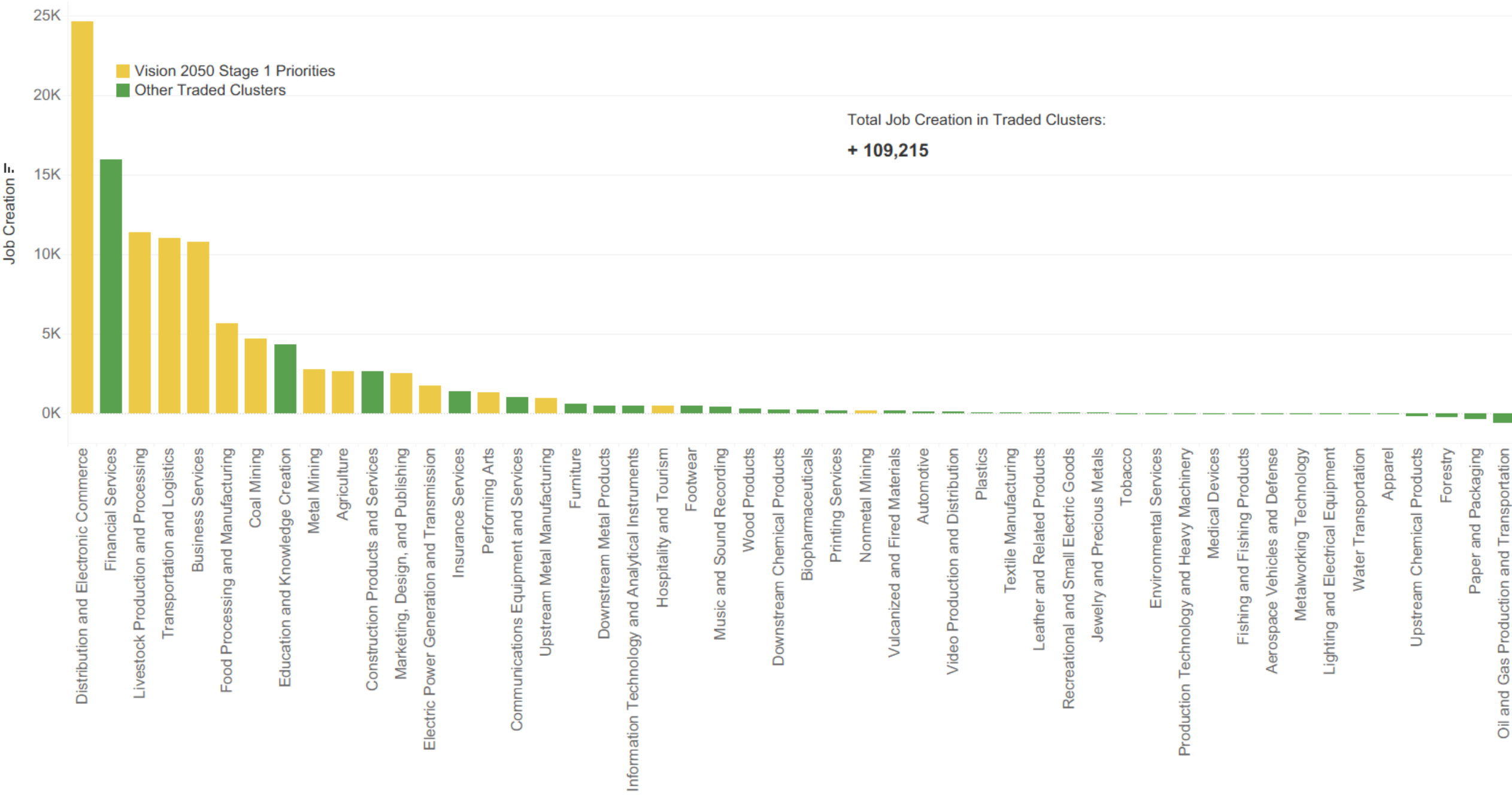
Mongolia Employment by Traded Cluster



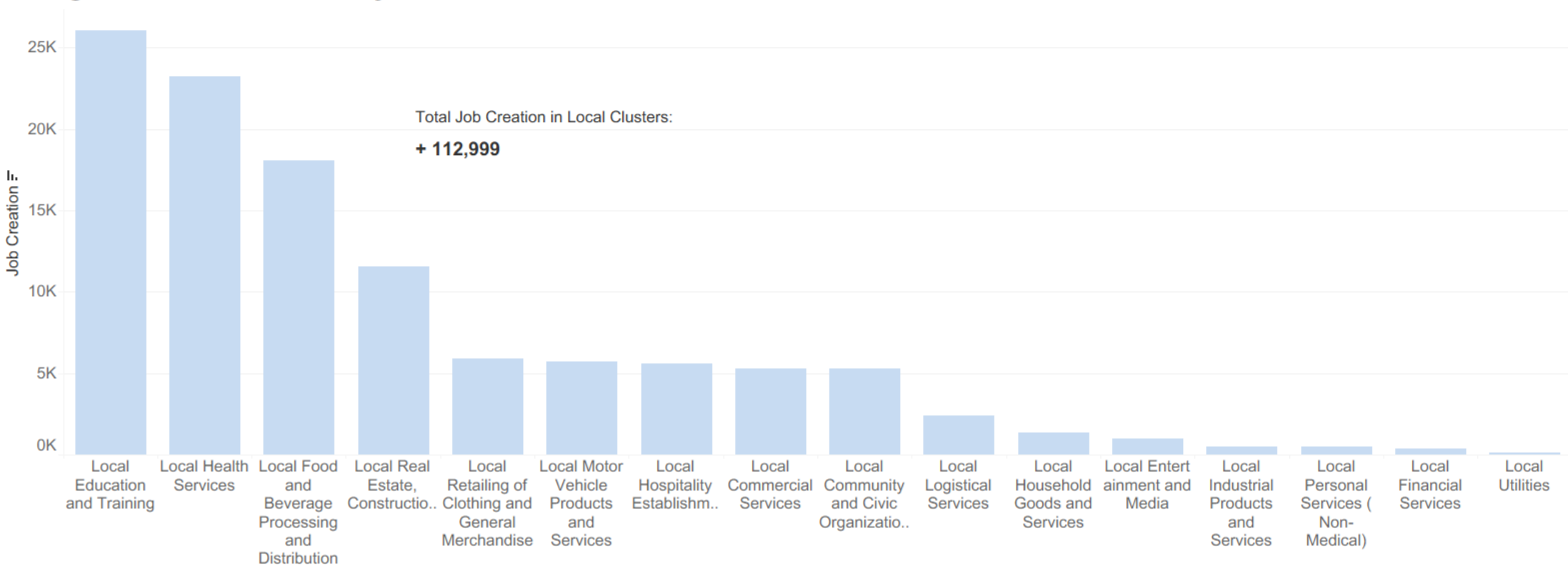
Mongolia Employment by Local Cluster



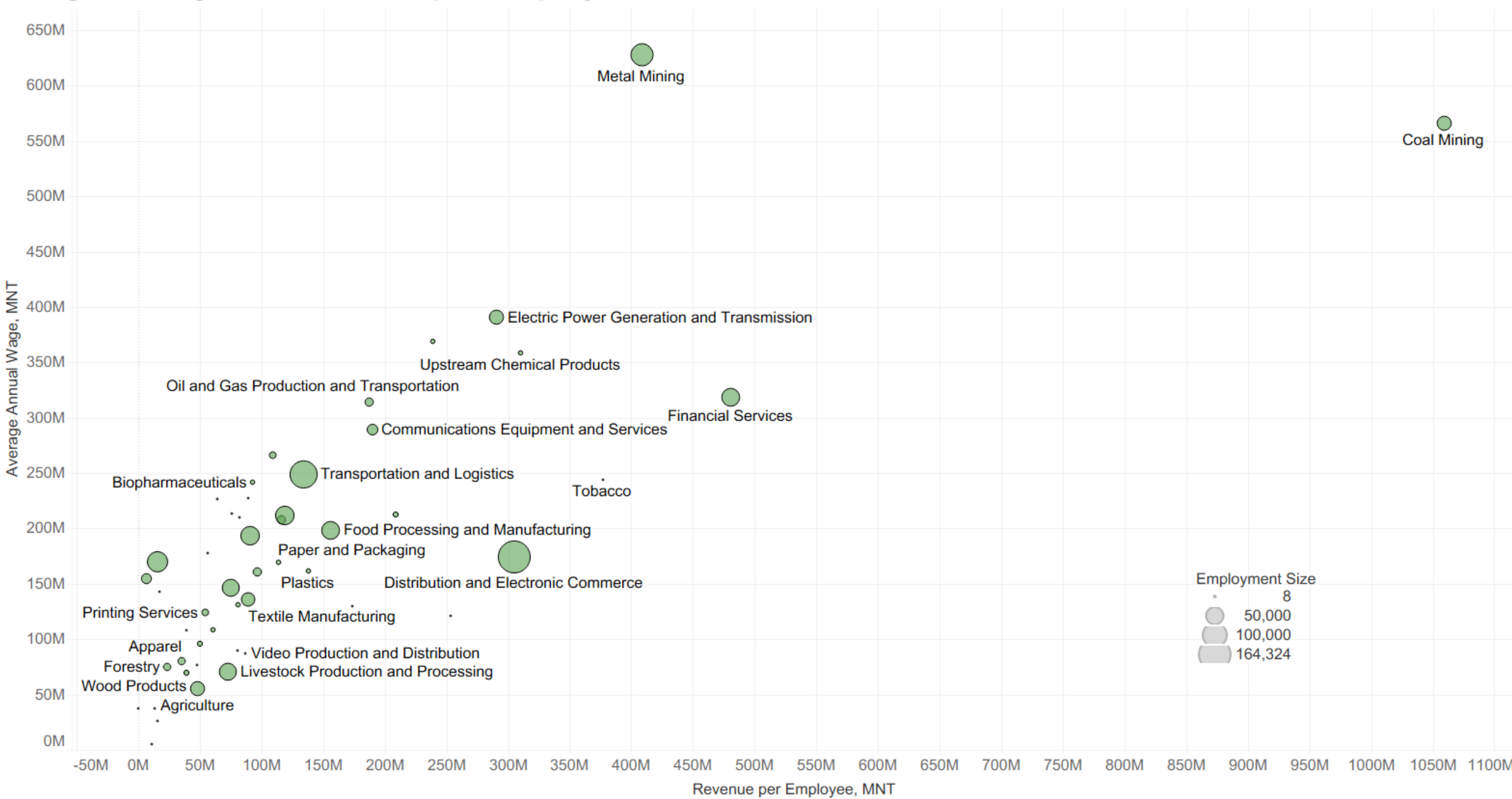
Mongolia Job Creation by Traded Cluster, 2019-2024



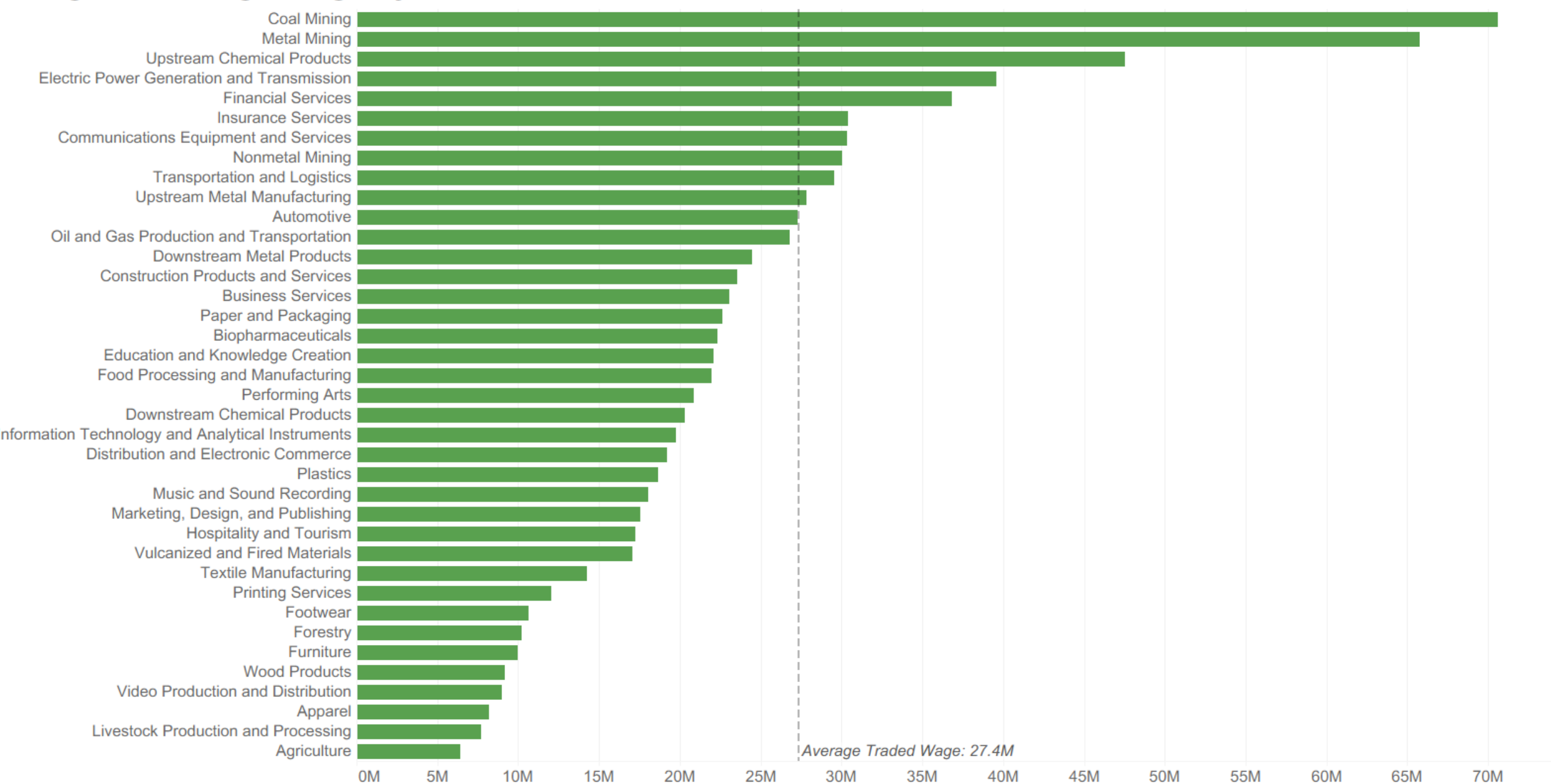
Mongolia Job Creation by Local Cluster, 2019-2024



Mongolia Wages vs Revenue per Employee in Traded Clusters, 2024

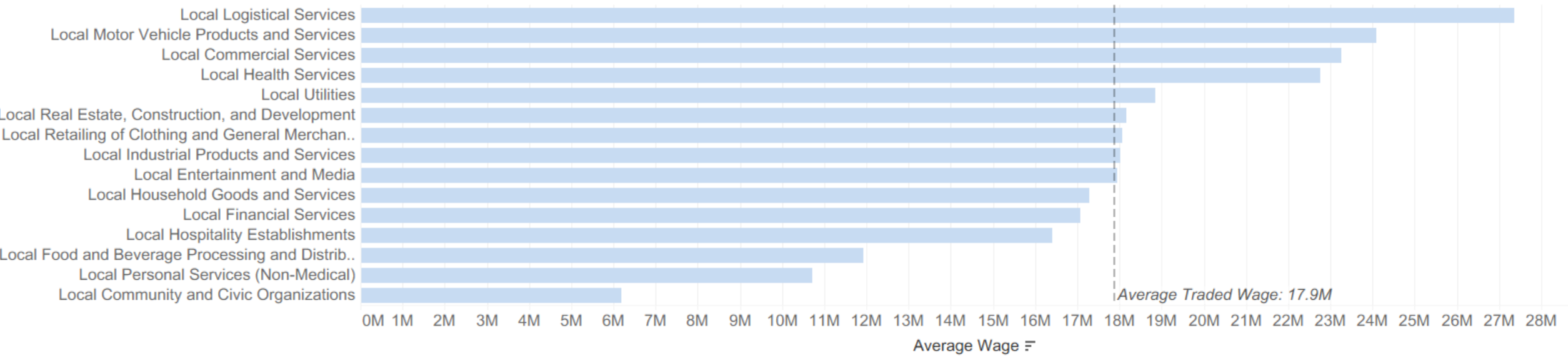


Mongolia Average Wage by Traded Cluster, 2024



*Showing cluster with at least 300 employees in 2024

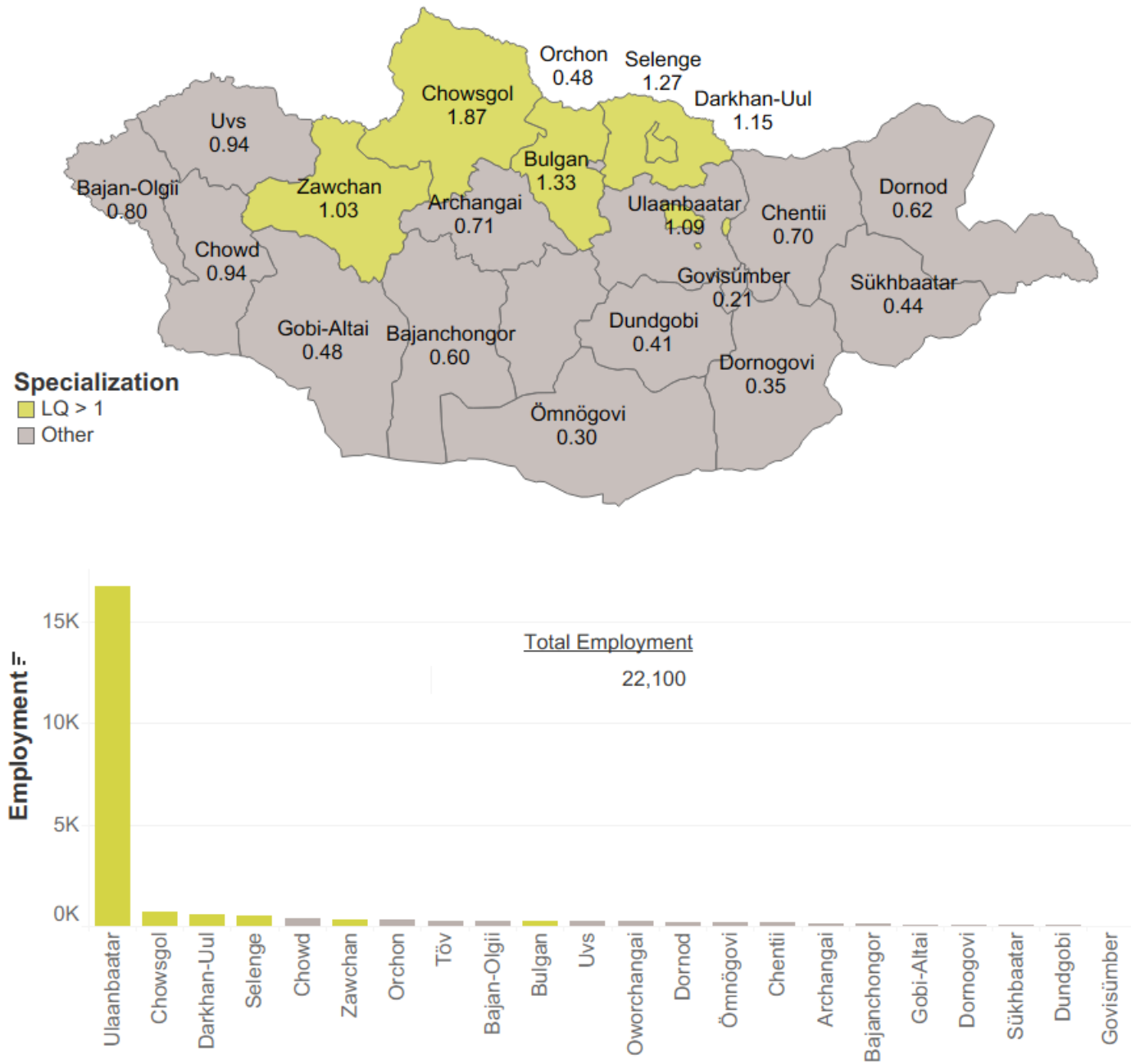
Mongolia Average Wage by Local Cluster, 2024



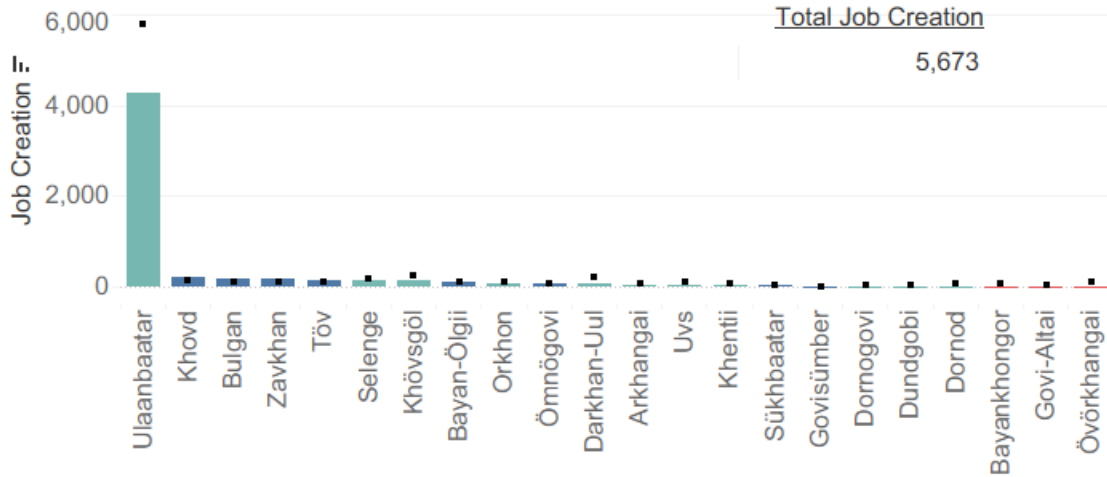
Mongolia

Cluster Perspectives

Food Processing and Manufacturing Cluster, 2024



Job Creation, 2019-2024



Aimag	Current LQ	Current Employment	Job Creation	Current Wage	Revenue per Employee
Khövsgöl	1.87	684	127	6,915,561	53,646,310
Selenge	1.27	526	130	26,257,845	338,640,166
Ulaanbaatar	1.09	16,753	4,267	25,959,911	265,573,456
Darkhan-Uul	1.15	564	73	14,963,754	147,476,886
Bulgan	1.33	269	188	2,438,095	26,115,033
Övörkhanga	0.83	262	-38	11,812,736	91,630,038
Uvs	0.94	268	43	4,955,574	55,815,684
Dornod	0.62	202	3	14,116,692	138,599,028
Bayankhongor	0.60	156	-16	4,724,553	128,750,224
Khovd	0.94	384	202	1,694,960	60,790,156
Govi-Altai	0.48	96	-34	3,998,806	16,153,076
Zavkhan	1.03	302	183	1,269,985	13,232,855
Bayan-Ölgii	0.80	270	100	2,906,900	65,920,046
Arkhangai	0.71	158	49	1,730,729	23,108,360
Khentii	0.70	175	36	5,153,223	48,965,516
Töv	0.86	272	144	1,964,813	39,938,836
Dundgobi	0.41	66	4	7,429,025	49,625,031
Orkhon	0.48	301	85	6,855,912	68,044,309
Sükhbaatar	0.44	86	31	6,407,094	39,241,709
Dornogovi	0.35	94	6	2,605,877	9,566,727
Ömnögovi	0.30	193	76	8,227,218	101,531,698
Govisumber	0.21	19	14	7,524,500	57,007,814

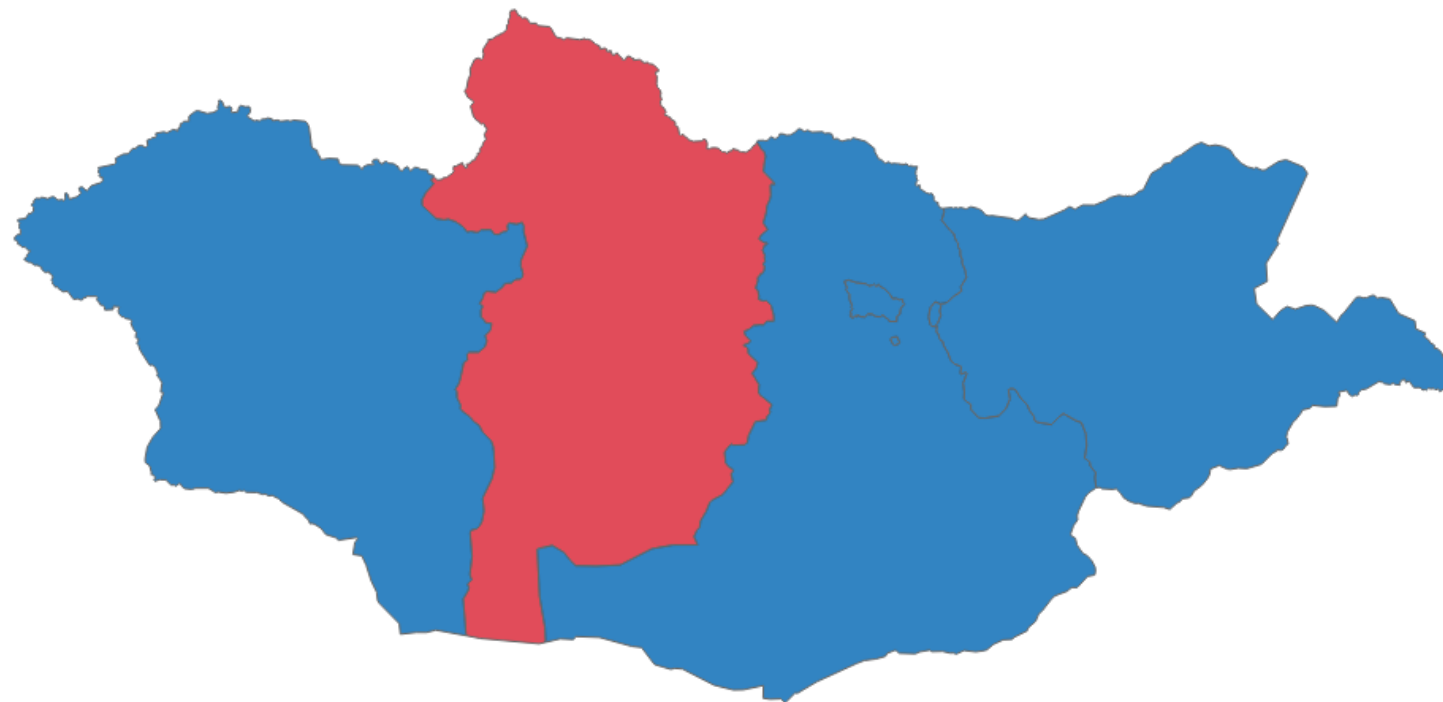
Food Processing and Manufacturing Cluster: Industry Detail

Cluster	Subcluster	Industry Name	Employment			Establishments		
			2014	2019	2024	2014	2019	2024
Food Processing and Manufacturing	Animal Foods	Manufacture of prepared animal feeds	40	61	521	17	21	107
	Baked Goods	Manufacture of bakery products	4,090	5,201	7,200	392	412	503
	Candy and Chocolate	Manufacture of cocoa, chocolate and sugar confectionery	47	72	239	5	4	11
	Dairy Products	Manufacture of dairy products	1,690	2,827	4,231	236	243	499
	Distilleries	Distilling, rectifying and blending of spirits	2,256	1,505	1,457	45	25	24
	Malt Beverages	Manufacture of malt liquors and malt	493	595	649	8	8	9
	Milling and Refining of Cereals and Oilseeds	Manufacture of grain mill products	1,436	1,838	1,494	61	49	61
		Manufacture of starches and starch products	20	62	125	12	6	15
		Manufacture of vegetable and animal oils and fats	7	46	153	2	5	17
	Milling and Refining of Sugar	Manufacture of sugar	1	18	13	1	2	3
	Packaged Fruit and Vegetables	Processing and preserving of fruit and vegetables	238	433	886	31	47	95
	Soft Drinks and Ice	Manufacture of soft drinks; production of mineral waters and other bottled waters	1,832	2,151	2,877	64	99	126
	Specialty Foods and Ingredients	Manufacture of other food products n.e.c.	593	803	766	85	100	166
		Manufacture of prepared meals and dishes	131	360	970	35	68	173
		Manufacture of macaroni, noodles, couscous and similar farinaceous products	52	339	443	21	28	70
	Wineries	Manufacture of wines	86	116	76	6	6	6

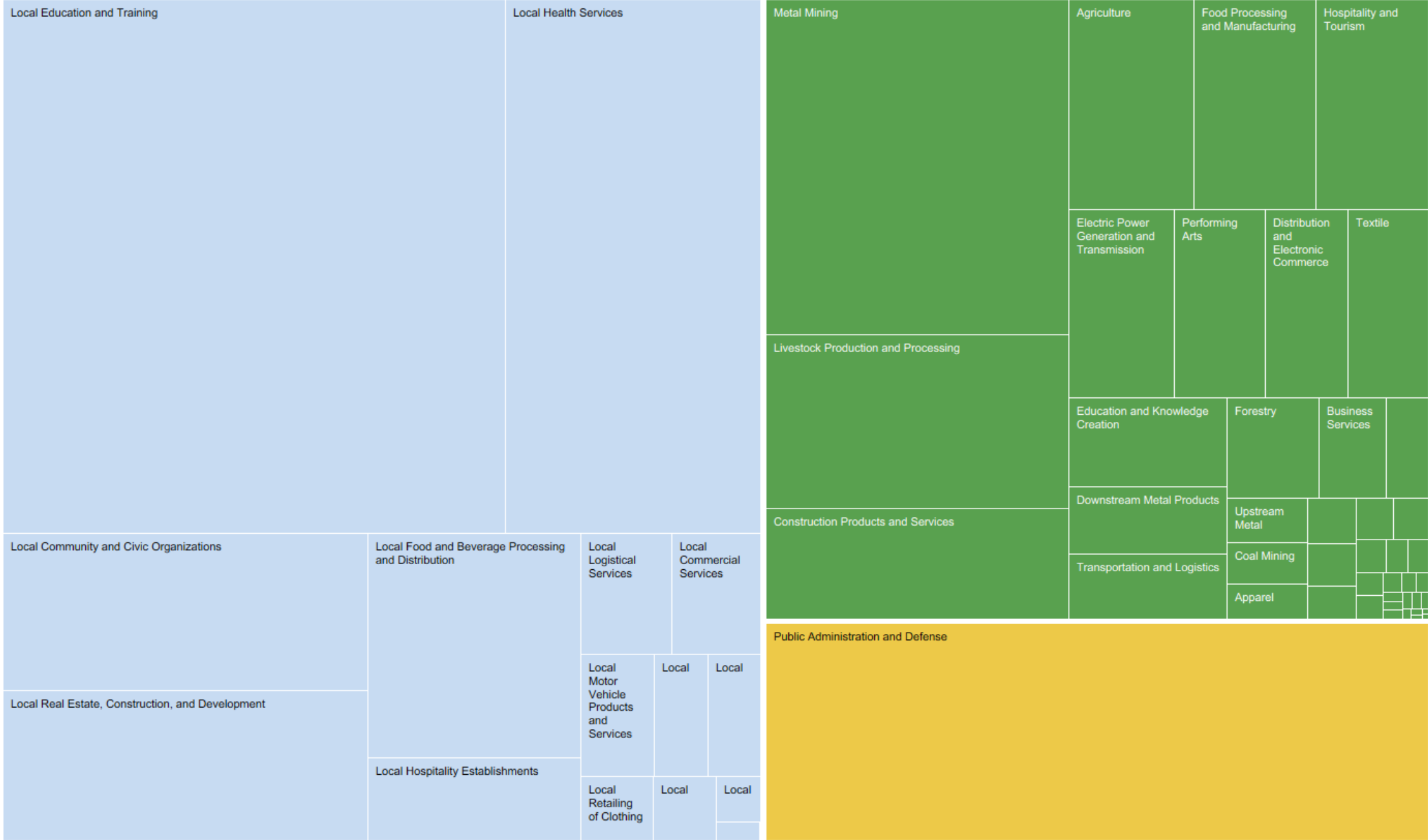
Mongolia Regional Cluster Reports

Khangai Region

Orkhon
Uvurkhangai
Bulgan
Bayankhongor
Arkhangai
Khuvsgul

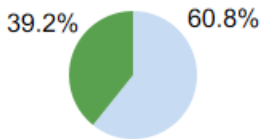
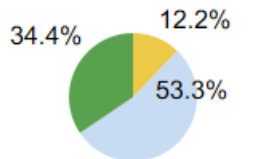


Khangai Region Employment by Local and Traded Clusters plus Public Administration

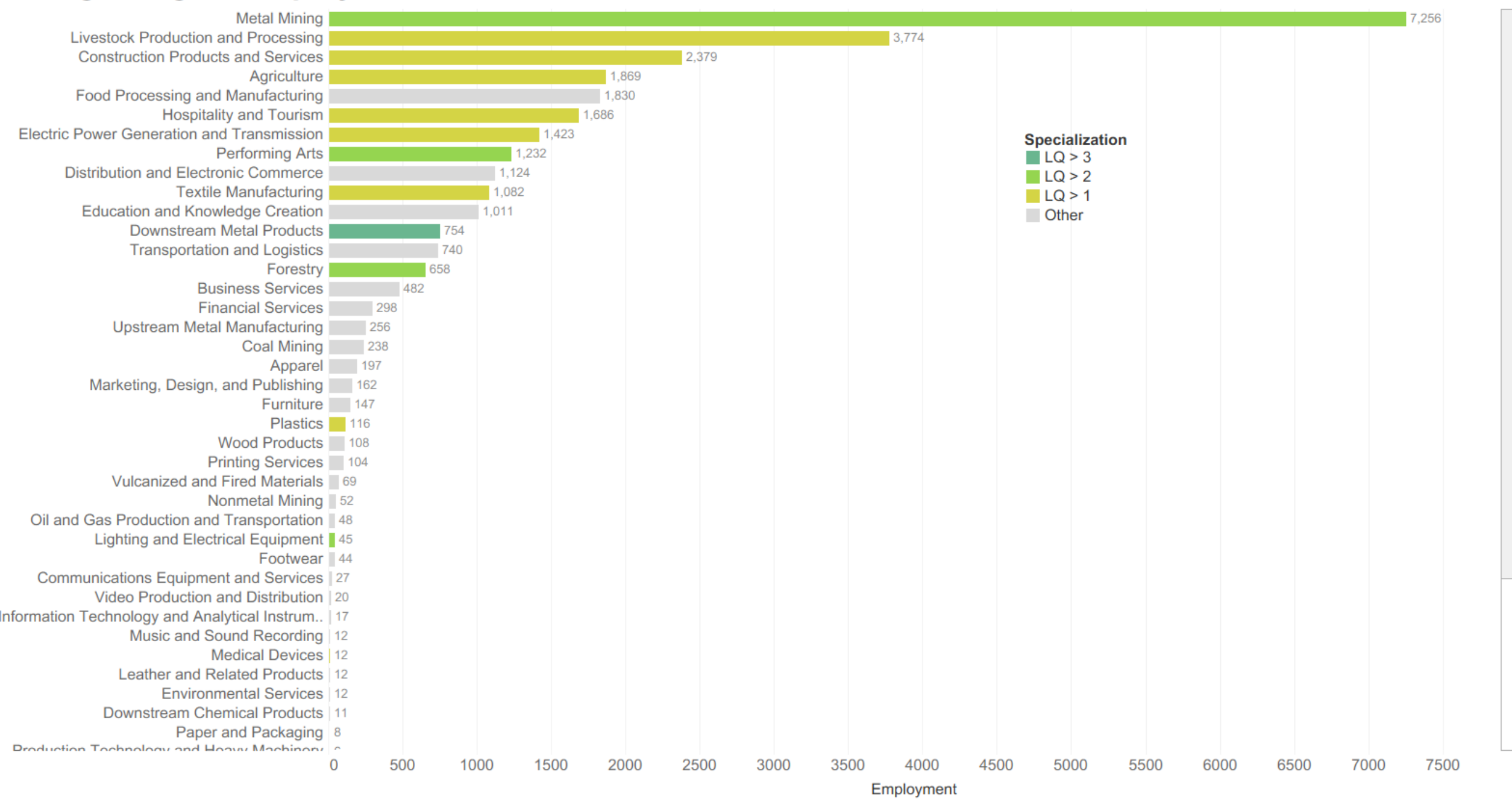


Employment Type

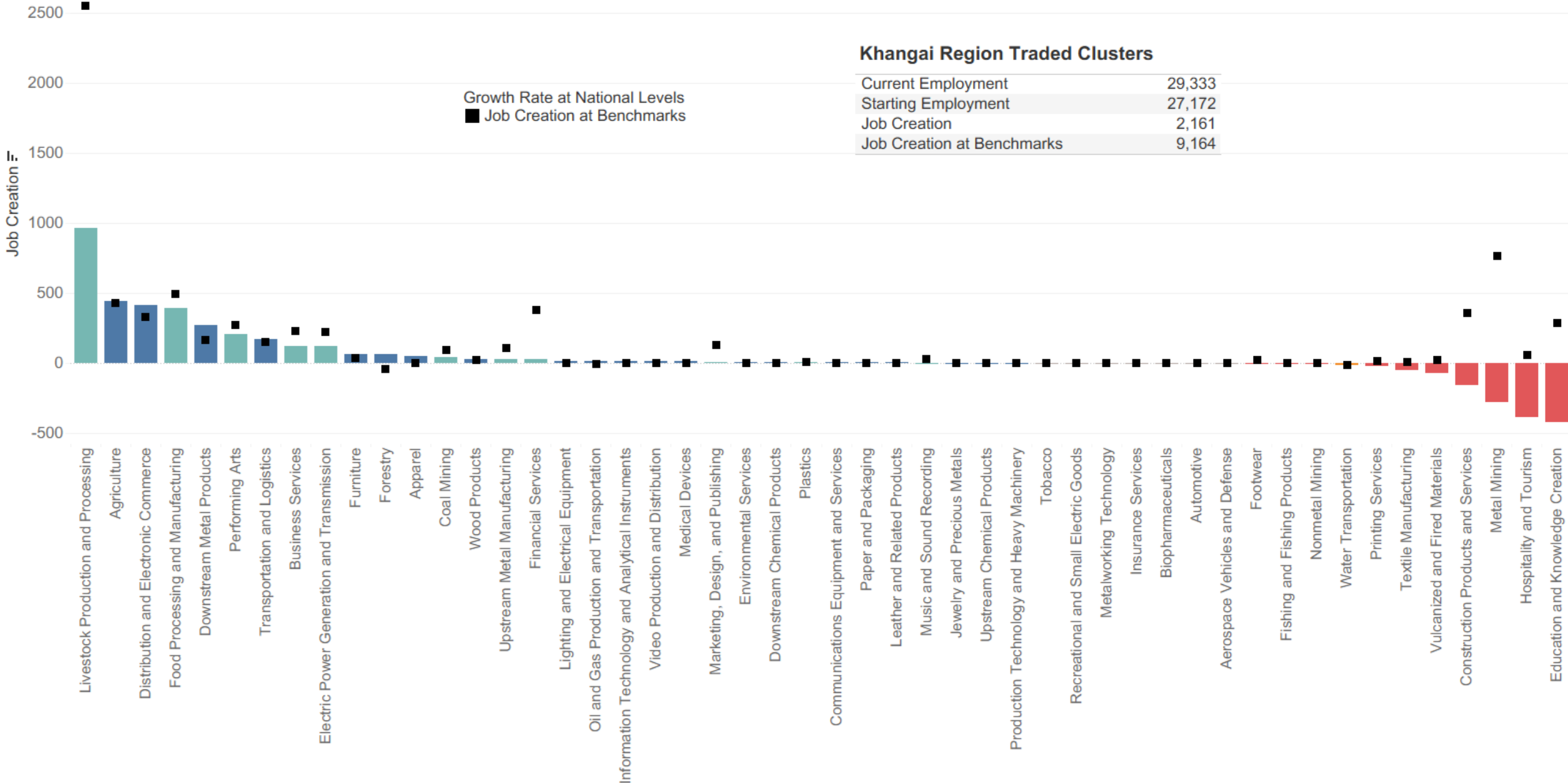
- Traded
- Local
- Government



Khangai Region Employment in Traded Clusters, 2024



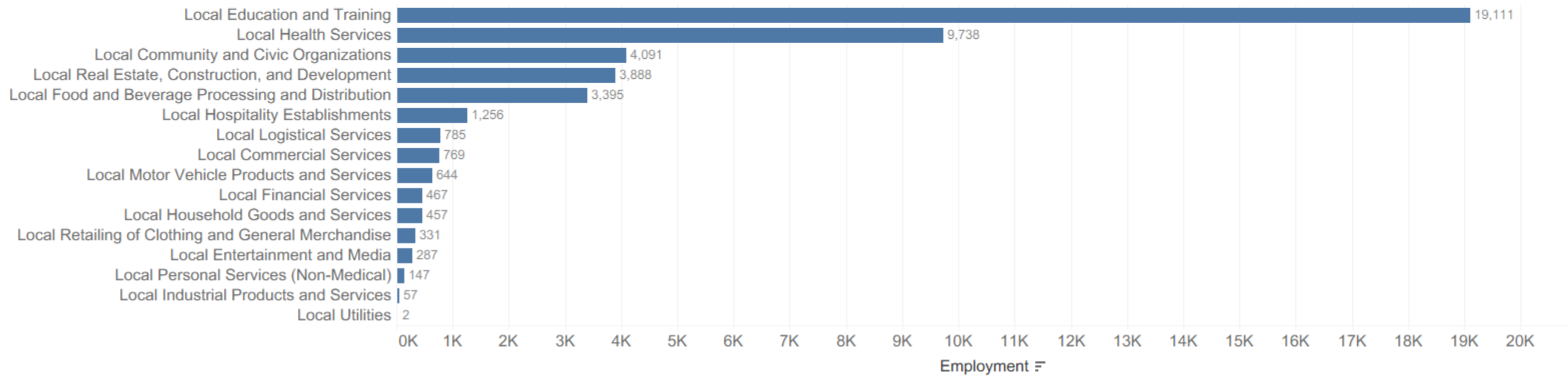
Khangai Region Job Creation in Traded Clusters, 2019-2024



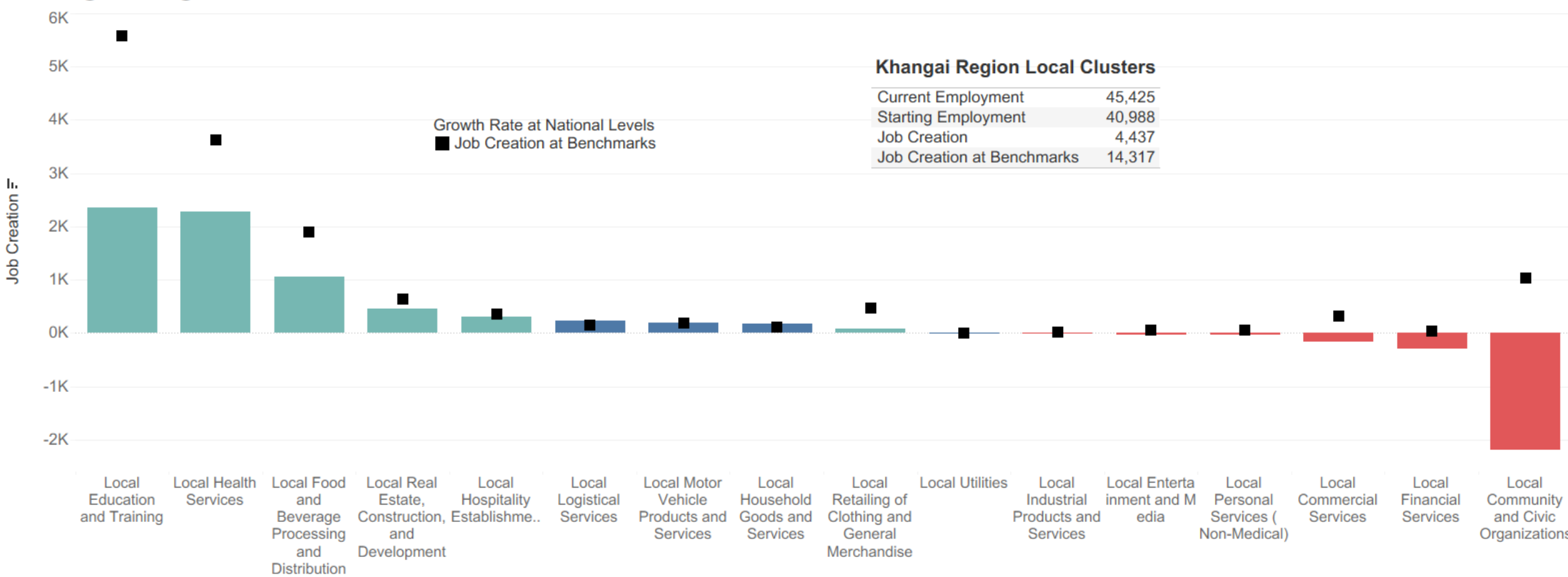
Khangai Region Specialization in Traded Clusters, 2019-2024



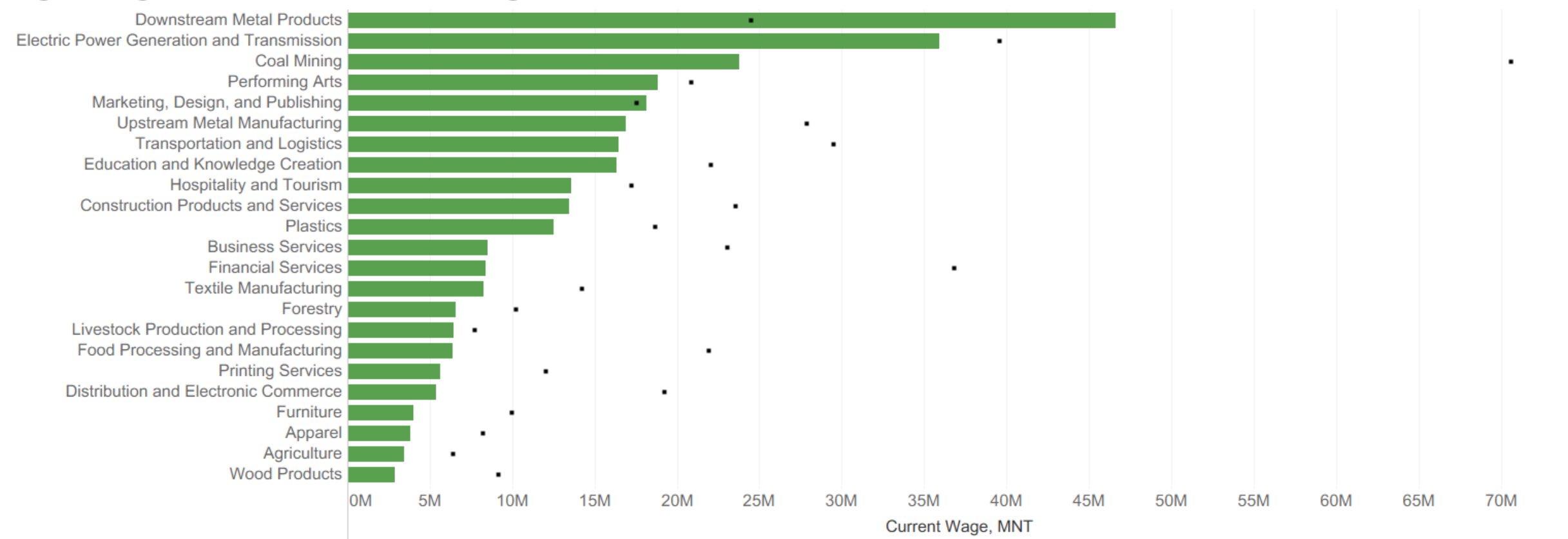
Khangai Region Employment in Local Clusters, 2024



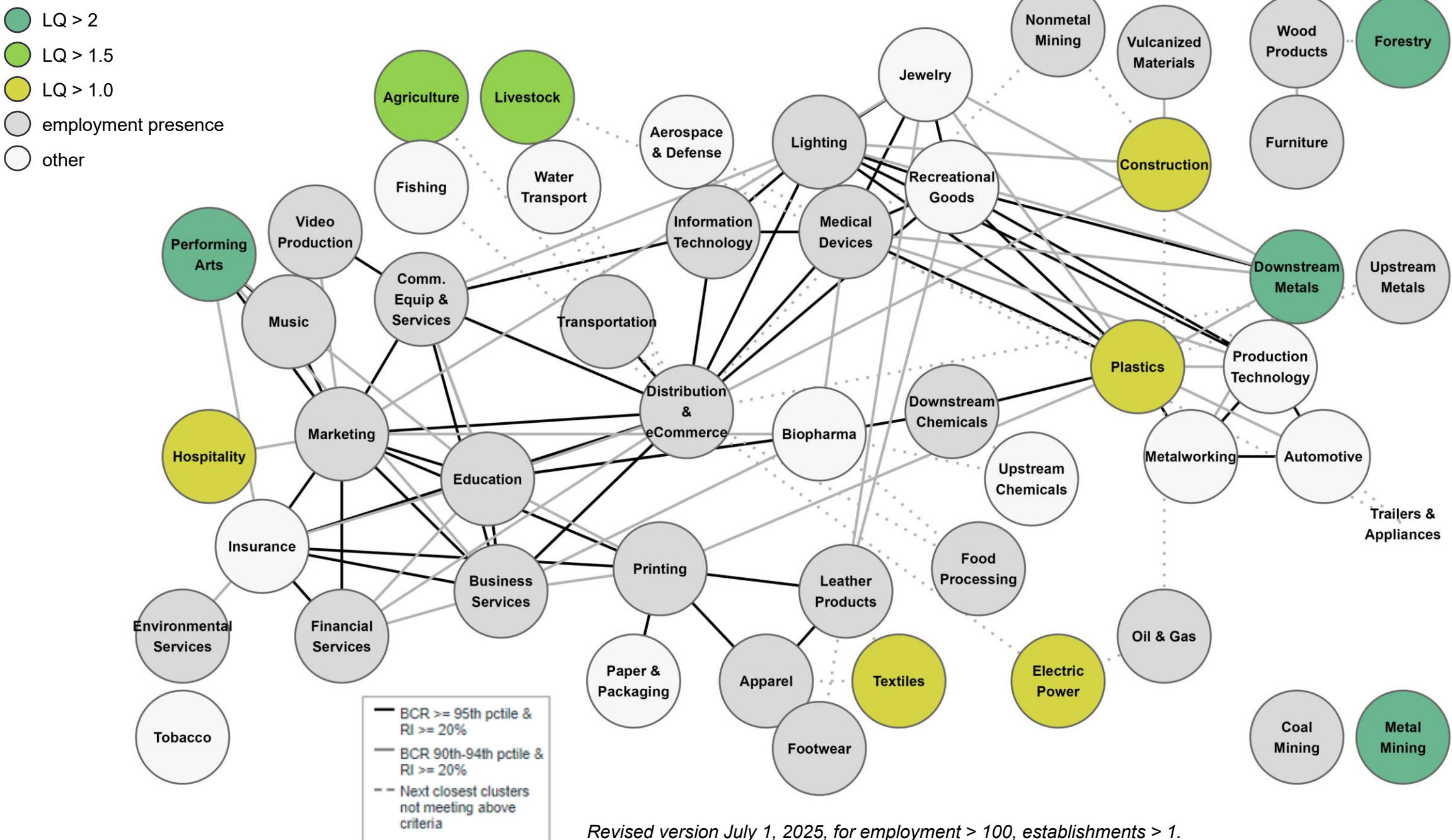
Khangai Region Job Creation in Local Clusters, 2019-2024



Khangai Region Traded Cluster Wages with National Benchmarks, 2024



Khangai Region: Related Cluster Specializations, 2024



Cluster Based Policies

Strategic Action



Data Analysis



**Frameworks for
Economic Development Analysis**

Tools for Mongolia

- Economic Performance
- Social Progress Indicators
- **Regional Cluster Mapping**
- Exports Analysis

**Understanding the dynamics of
productivity growth, innovation, and
economic geography**

```
graph TD; A[Understanding the dynamics of productivity growth, innovation, and economic geography] --> B[Supporting regional policies and policies by regions]; A --> C[Informing sector specific policies (innovation, internationalization, SME upgrading, ...)]; A --> D[Enabling strategic action in local and regional competitiveness efforts]; E[Cluster data provides granular new insights];
```

Supporting **regional policies** and policies by regions

Informing **sector specific policies**
(innovation, internationalization,
SME upgrading, ...)

Enabling strategic action
in local and regional
competitiveness efforts

Cluster data provides granular new insights

From Cluster Mapping to Cluster-Based Policies

- Cluster Mapping provides **critical information** to guide policy action
 - The benchmark cluster definitions are designed to provide robust, comparable data



- How does **industrial composition** (what) and **performance within specific industries** (how) contribute to a location's overall economic performance?
- Where are the hotspots of specific industries, clusters, or groups of related clusters that make them **the most suitable locations for cluster-specific programs**?
- What **opportunities do specific locations have** given their unique cluster portfolio and proximity to a unique set of clusters in neighboring locations ?

Pre-Conditions for Cluster Activation and Development

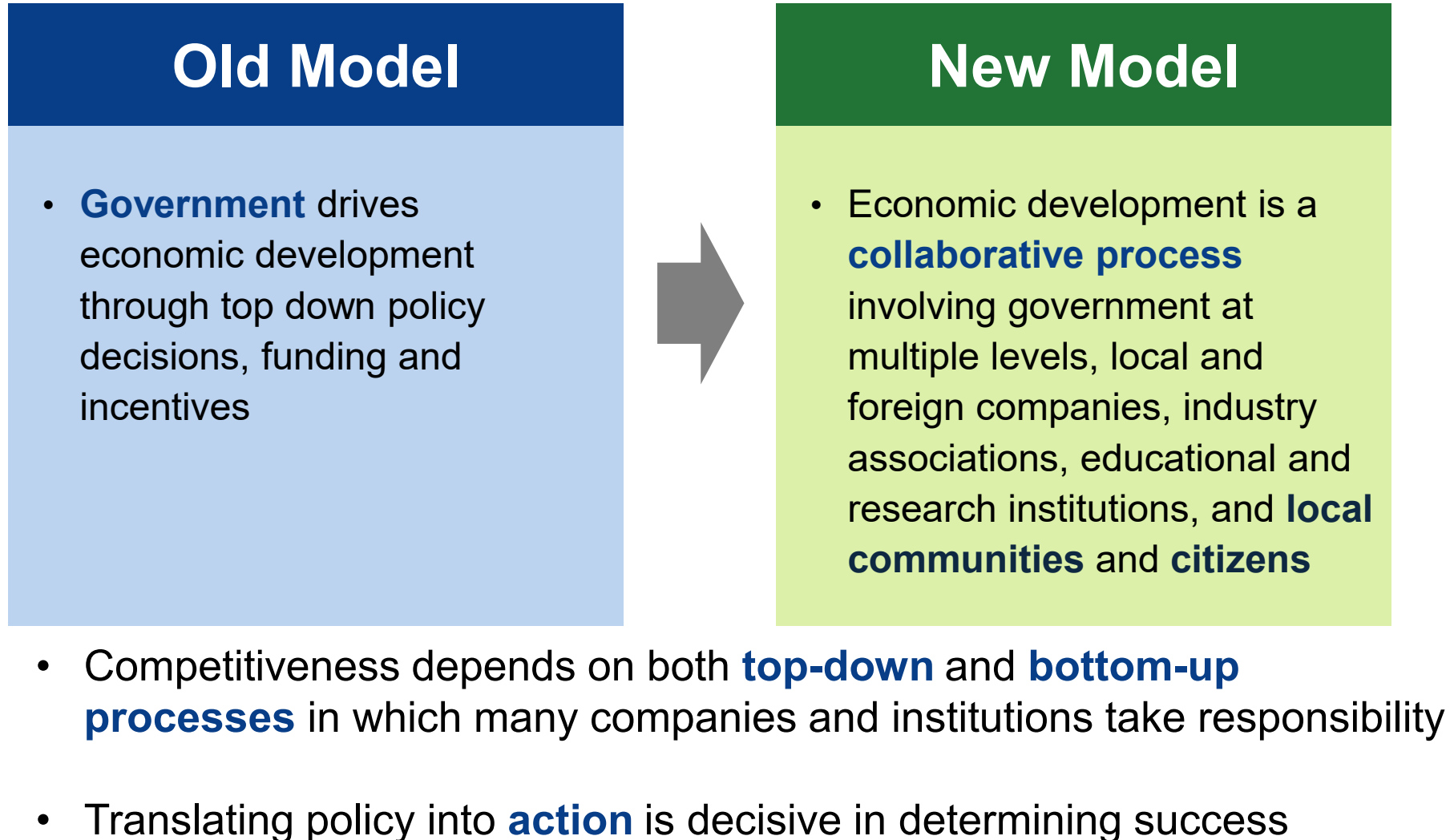
1. A critical mass of locally-based companies or subsidiaries of foreign companies in the cluster who have **met the market test**
 2. Some meaningful **cluster-specific advantages** in the diamond or generalized strengths that are of particular importance to the cluster
 - E.g., unique demand, specialized talent, favorable locations, trusted and appropriate regulatory framework
-
3. The presence of a **world class multinational company** in the cluster with an important investment in the country/region and a commitment to upgrading
 4. Strength in a **closely related** cluster or clusters



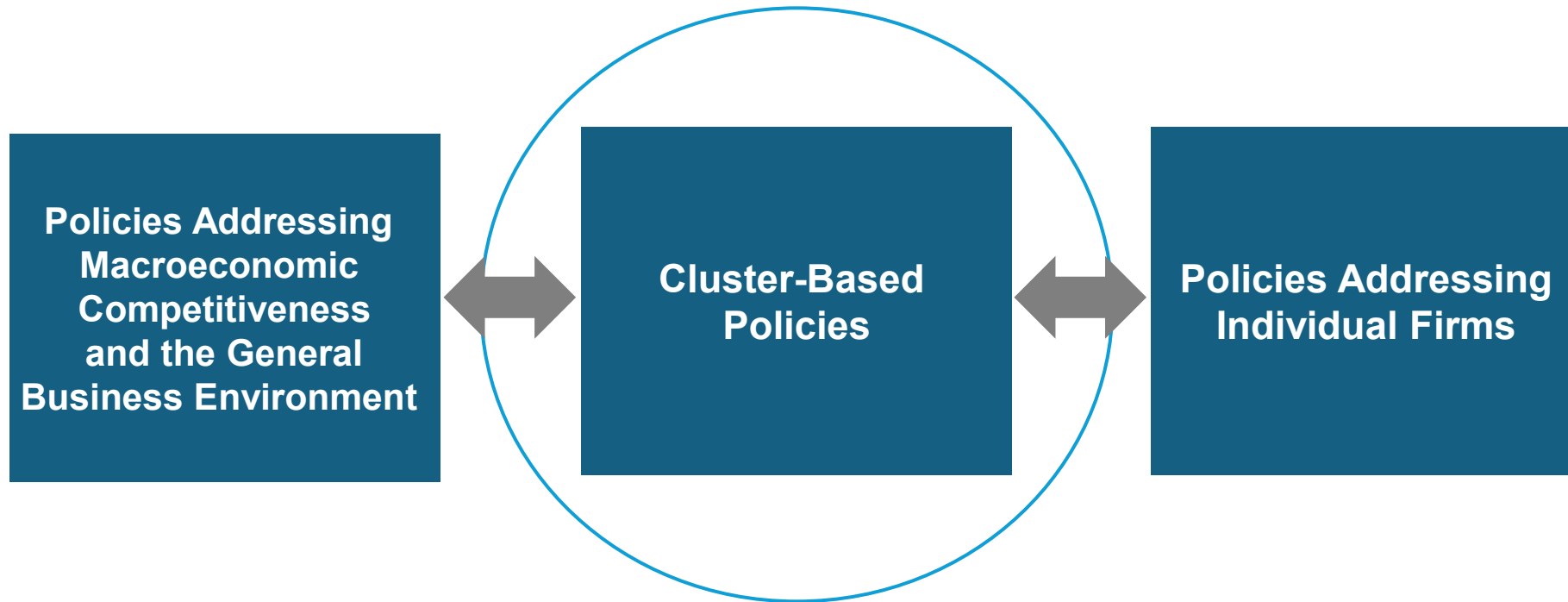
- Meeting **at least two** of these conditions seems to be a basic requirement for success in cluster development
 - Distinguishing **emerging clusters** from **wishful thinking**

The Process of Economic Development

Shifting Roles and Responsibilities

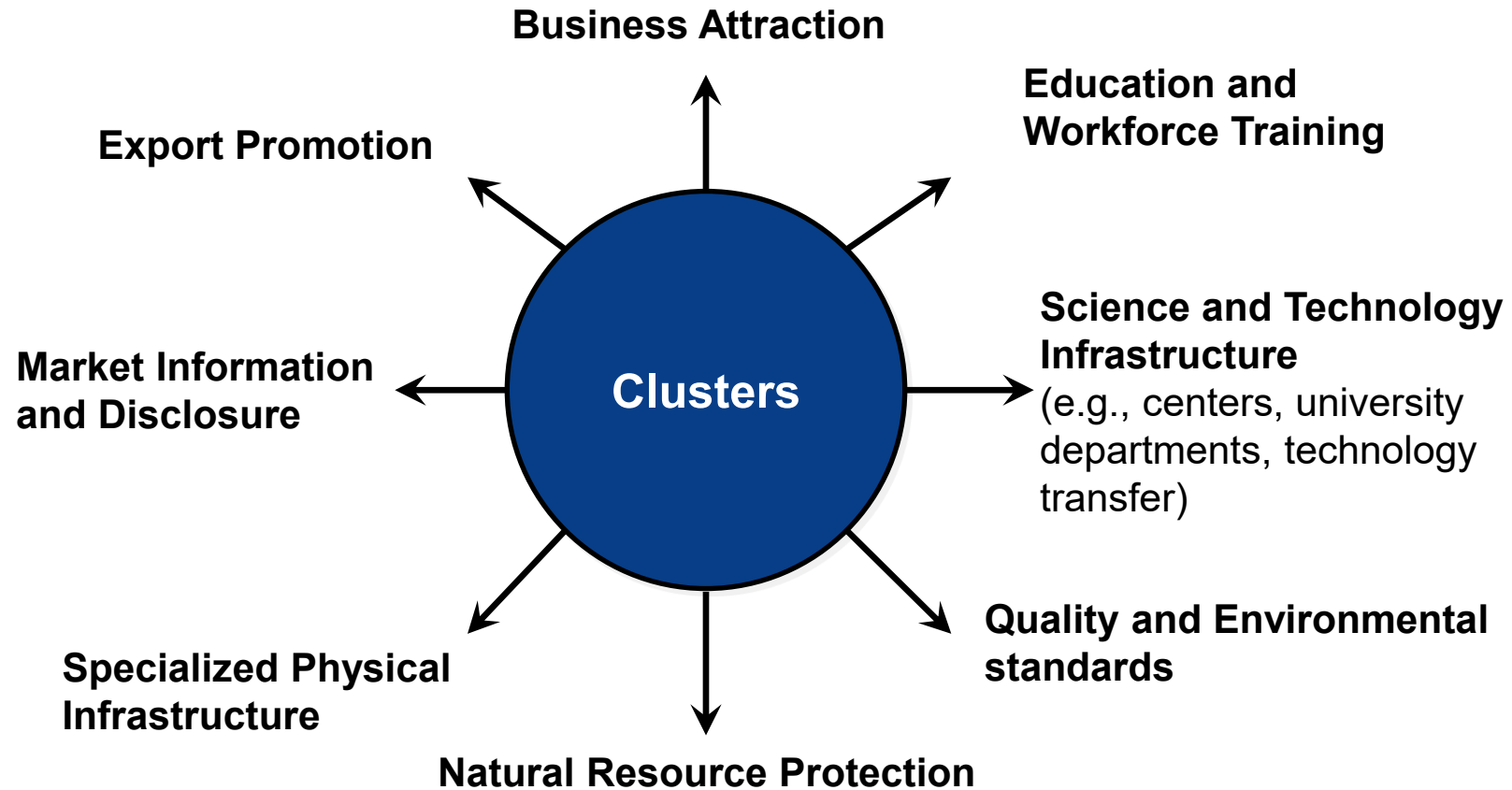


Government Policy Influences on Competitiveness



- **Leverages** the power of linkages across companies to drive rapid economic development
- Policies and investments strengthen **multiple related firms/institutions** simultaneously
- Enhances the effectiveness of **traditional economic policy** areas, such as training, R&D, export promotion, FDI attraction, etc.

Organize Public Policy Around Clusters



- ↓
- Clusters provide a framework for **organizing the implementation** of many public policies and public investments directed at economic development to make them more effective

The Private Sector's Role in Economic and Social Development

- Inform government on the **needs of business** and the **key constraints** holding back company and cluster development
- Collaborate with other companies to improve competitiveness through **trade associations** and other mechanisms
- Work closely with local **educational** and **research institutions** to elevate **quality** and create **specialized programs** to address actual company and cluster needs
- Nurture **local suppliers** and attract **foreign suppliers**
- **Participate actively** in national and provincial department level competitiveness initiatives
- Compete as companies using **shared value strategies** in which businesses address unmet social needs and challenges with a business model (e.g. low income housing, renewable energy)

Institutions for Collaboration (IFCs)

The Australian Wine Cluster

IFCs are collective institutions that foster collaboration and underpin improvements in the business environment

Winemakers' Federation of Australia

- Established 1990
- Focus: Public policy representation of companies in the wine cluster
- Funding: Member companies

Cooperative Centre for Viticulture

- Established 1991
- Focus: Coordination of research and education policy in viticulture
- Funding: Cluster organizations

Australian Wine Export Council

- Established 1992
- Focus: Wine export promotion through international offices in London and San Francisco
- Funding: Government; cluster organizations

Grape and Wine R&D Corporation

- Established 1991 as statutory body
- Focus: Funding of research and development activities
- Funding: Government; statutory levy

Wine Industry Information Service

- Established 1998
- Focus: Information collection, organization, and dissemination
- Funding: Cluster organizations

Wine Industry National Education and Training Council

- Established 1995
- Focus: Coordination, integration, and standard maintenance for vocational training and education
- Funding: Government; cluster organizations

Implementing a Cluster Growth Strategy

- Create a **private sector-led** cluster upgrading program with matching support for participating private sector cluster organizations
- Build on **existing** and **emerging** regional cluster strengths rather than chase hot fields
- Mobilize both **traded** and **local** clusters
- Focus on clusters where the region has **potential competitive advantages**
- Catalyze the formation of cluster-focused **Institutions for Collaboration**
- **Align other economic development policies** with clusters, including targeted workforce development, export promotion and specialized infrastructure and research initiatives
- Involve **both** the **largest companies** and the supporting **SMEs** in the traded and local clusters.