

STATSAMERICA

User Guides

Innovation Intelligence

Introduction

The Innovation Intelligence Index (II3) distills and simplifies a broad array of data and measures that can serve as a signal for innovation activities and potential. There are several indexes because one index doesn't tell the whole story. The bundle of indexes at different levels of specificity provide the means to compare and contrast similar regions or geographic boundaries to one another. The ***purpose of the II3 is to generate questions*** that, in turn, may be able to answer the critical question: Why do some regions prosper and others do not? By enabling the user to understand a region's current capacity for innovation, together with other characteristics that may highlight a region's economic strengths and weaknesses, one can gain insights for strategies, policies and investments the accelerate growth and economic well-being.

How to use the data

II3 provides a robust set of relevant, research-tested measures of innovation and regional competitiveness that are considered the must-have elements toward greater prosperity. You will note that entrepreneurship (or business formation), human capital and industrial evolution play prominent roles in the II3 data sets. As you use the tool, consider the foundational elements that are currently in place for future, innovation-driven economic growth.

As you compare your region –county, metro area, economic development district or state – with other regions, our hope is that the II3 will spark many “why” questions for you and your colleagues. We hope that the II3 will help you understand your region's past and current performance, and what possibilities there may be for the future. For example, the II3 should help in:

- Evaluating innovation capacity and its potential in your region
- Producing a snapshot of how the region is doing now across the dimensions of the index – human capital, knowledge creation, business dynamics, employment and productivity and overall economic well-being
- Comparing yourself to peers within your state and across the nation

Building human capital, creating new businesses and expanding innovative capacity are difficult. Regions typically want to attract talent and investment. Regions also want to retain the good qualities, from established firms with good hiring prospects to healthy environmental

amenities to reliable health and family services. It is rather like gravity: keeping the good stuff on the ground and simultaneously pulling better stuff to the ground.

The Innovation Intelligence Index is composed of multiple parts, categorized in terms of inputs and outputs. What are the necessary ingredients – inputs – that, when combined, generate new ideas, better products and services and greater productivity? The next question is: How do we know that innovation is occurring? The latter is more difficult than one may think. One may say that “I know innovation when I see it.” Trouble is, much, if not most, innovation happens inside the building away from the prying eyes of data collection. Few get to see it.

As a result, researchers and data collectors typically use patents as an indicator of innovation, as do we, but we also use indirect measures for innovation outputs. Our thesis is that no one is going to innovate if it makes a product worse, more expensive, reduces product features or otherwise makes a product or service less attractive to the consumer. In simple terms, innovation will increase productivity, profits and incomes. As a result, we include measures for economic well-being as an innovation output. As noted above, the first breakdown of innovation measures are inputs and outputs.

Inputs

- **Human Capital and Knowledge Creation** suggests the extent to which a region’s population and labor force have the know-how to engage in innovative activities.
- **Business Dynamics** gauges the competitiveness of a region by measuring the entry and exit of individual firms – what might be called the creative destruction measures.
- **Business Profile** measures local businesses and the resources available to entrepreneurs and businesses.

Outputs

- **Employment and Productivity** describes a region’s economic growth, regional desirability and the direct outcomes of innovation.
- **Economic Well-Being** is not so much a set of indicators for innovation as it is a set of metrics that show the regional standard of living relative to other places, but it can also be used to monitor and evaluate other economic performance outcomes.

Geography

A region is a geographic analytical unit. Many use the term “geography” interchangeably with region. (Indeed, we use the super-script “g” for a region in our equations.) For inter-regional comparisons, one must compare counties with counties or metros with metros; that is, maintain consistent geographic boundaries. The I13 index and its component parts are calculated for several regional, or geographic, types: county, economic development district, metropolitan statistical area and state.

County: Not all county definitions are the same, unfortunately. For consistency, and because Census (pseudo-) counties can be aggregated to form a boundary for which data items such as gross domestic product by county exist, we use the U.S. Bureau of Economic Analysis (BEA) counties as the base county unit of analysis. BEA combines two Census geographies in Hawaii and multiple Virginia geographies, such as independent cities and their surrounding area into counties that are equivalent to all other counties across the U.S. These counties typically have a town or city as a county seat and contiguous surrounding area. (That is, if the county isn't a dense urban area.) Additionally, we have combined areas in Alaska due to data non-disclosure, time series and source data availability issues. In all, there are 3,110 counties.

Metro: We include all April 2018 definitions for metropolitan areas from the Office of Management and Budget (OMB).

Economic development district: The U.S. Economic Development Administration may designate a region as an Economic Development District (EDD) if a region requests it and the area meets certain qualifications as outlined in U.S. Code 13 CFR 304.1. This tool uses the August 2021 vintage of EDDs.

Variables in the Innovation Index

The II3 is an update of the Innovation Index 2.0 (II2) and we point to the report for the II2 for the definitions and details for a majority of the variables in the II3:

<https://www.statsamerica.org/ii2/reports/Driving-Regional-Innovation.pdf>. That report details why these variables are included in the innovation index and presents the research rationale along with short lists of reference material that were used in our deliberations about what measures and data to use to build an innovation index.

Not much has changed from II2 to II3, except updating the data to make it more current. That said, there have been some additions to, as well as subtractions from, the portfolio of II2 variables as presented in the report. There have also been several replacements and modifications. That is, after reviewing the available data or reconsidering the construction of some measures, we made a few adjustments and improvements. This user guide is intended to show readers how to use the indexes and measures in II3. Therefore, all modifications to II3 are collected in a separate document available on the Reports page of II3.

Human Capital and Knowledge Creation Index

Higher levels of human capital are associated with higher levels of innovation and faster diffusion of technology. Human capital and knowledge creation affect the degree to which a county's labor force is able to engage in innovative activities. Growth in a county's workforce ages 25 to 44 signifies that a county is becoming increasingly attractive to younger (arguably more energetic) workers — those more likely to contribute to innovation. Counties with high levels of human capital are those with enhanced knowledge, measured by educational

attainment, patent diffusion, knowledge spillovers, STEM degree holders and occupations, and the share of high-tech employment.

Possible Questions to Ask of the Data

To what extent does your region's human capital match your aspirational peer regions? To what extent is your region's potential for innovation constrained by its concentration of human capital? To what degree has the region leveraged its higher education assets, whether the institutions themselves or the faculty and researchers? If your region graduates many STEM-degree earners, what would it take to keep them within the region? Would that talent be attractive to new industries and employers considering a move? To what degree do "traditional" or anchor industries – like textiles in the southeast – increasingly need integrated systems and connectivity? Are those higher-tech services available? Are there patents and technologies in your region that are overlooked by would-be entrepreneurs?

Business Dynamics Index

Business dynamics in the form of entry and exit is the mechanism by which outdated ideas and industry practices are replaced by new and potentially revolutionary ones. This process of creative destruction — a term and concept introduced by the economist Joseph Schumpeter — is the hallmark of a thriving and dynamic economy. This dynamic is at the heart of competition: creating new industries, invigorating old ones and relegating inefficient practices to the pages of history. As such, exit and entry drive the growth and prosperity of individual firms, as well as the economy at large. This is a central focus of research in both economics and management.

In particular, an expanding body of research focuses on the geographic dimension of entry and exit, the effect on the formation and growth of firms, and the associated implications for local and national economies. As older, inefficient and marginally productive capital is destroyed, new, efficient and productive capital is created. This implies that productivity variability is likely linked closely to job reallocation, as workers matched with unproductive capital lose their jobs and new, more productive couplings of labor and capital are made.

This section focuses on the creation of new firms and the availability of venture capital (VC). The latter — investment — is needed for new firms to achieve market scale and venture capital tends to follow the passions and vision of venture capitalists. More recently, the lion's share goes into "tech" but not all VC is technology. VC funds can flow into a wide range of products and services, from meat substitutes to real estate ventures to pharmaceutical molecules. It doesn't all go to Silicon Valley, but a vast majority does. The unevenness of VC regionally is one reason why the indexes top out at 200; VC in the valley would be off the charts and those locations with even modest VC investments would not register at all on a heat map.

Possible Questions to Ask of the Data

Does your region show a broad industry spectrum of new businesses, or does your region seem overbalanced in certain, lower-paying industries such as hospitality or personal services? If you

are taking the long view, perhaps you can track VC flows into regions that have similar characteristics to yours in terms of education levels or occupational capacities. When companies change ownership or the chief executive officer, they are more likely to relocate. Does your region have an infrastructure, cost of living or lifestyle advantage in contrast to where the company started?

Business Profile Index

What is the business environment of a region? The Business Profile Index attempts to gauge this by measuring local business conditions and resources available to entrepreneurs and companies. The components identify the possible resources a region might offer that can lead to growth and subsequent innovation. These resources can be found in the form of capital (foreign investments), connectivity within one's own or with other regions, and proprietorship.

Is the region attractive to investors? Foreign direct investment (FDI) measures the degree to which foreign or domestic companies are investing in the region relative to a U.S. average. Researchers at the IBRC have found that a modest percent of FDI flows are explained by the presence of related industries (aka industry clusters). Artisan cheese-making firms don't tend to invest in Indiana or Ohio. Auto manufacturing firms don't typically invest in Vermont.

Connectivity and broadband access are vital components of a region's infrastructure, especially for businesses, agriculture operations, or small-scale manufacturing firms. Proprietorship is a rough measure of entrepreneurial activity and signals the degree to which workers may have migrated from working in a "safe" job in a large, established company to the "gig economy." Finally, the research team incorporated measures of average small establishments (which are considered nimble and responsive), average large establishments (which are thought to have more resources to invest in research and development), and a measure of the proportion of small firms in high-tech industries that are, likely, early in their life cycle. This last measure was created to respond to recent literature on industry life cycles and compares the values for each industry to the national average in order to detect which regions are growing in exceptional ways.

Possible Questions to Ask of the Data

Are regions with characteristics similar to our own attracting FDI? In what industries do we specialize? Is your region constrained by the lack of utilities or distance to market? Is your broadband and connectivity improving over time, and why or why not? Based on your local knowledge of the region, are the larger firms investing in continuous product improvement? Are the smaller firms growing? (Secondary employment data from official government sources – such as what are published on StatsAmerica – cannot report and identify individual company names. But local knowledge about a company that started in a small store front and has moved to larger facilities might be a good indication that the firm is growing.)

Employment and Productivity Index

This index describes economic growth (i.e., gross domestic product), job growth and the direct outcomes of innovative activity. There are three general indicators: productivity (or GDP per worker), industry growth, “latent innovation” (or the hard-to-measure sophistication of industry production) and the classic, go-to measure, patents. Measures in this index suggest the extent to which local and regional economies are moving up the value chain by producing more sophisticated and differentiated products and are increasing the high-value talent pool. As mentioned above, no one is going to “innovate” if it doesn’t result in higher wages, higher profits, expanded employment and improved social outcomes. The variables in this index begin to show the results and benefits of innovation.

Possible Questions to Ask of the Data

In what type of technologies are the patents produced in your region? Is your patenting rate increasing or declining? Patents with technologies that can be commercialized might be considered “jobs for the future” if those products are manufactured domestically. Is your region tracking and keeping up with higher-technology industries? What are the complements to those industries, like occupations or supply chains, that will either attract or retain these enterprises?

Is the regional GDP per worker increasing over time? (Historically, wages have risen with increases in productivity and profits.) To what degree can your GDP per-worker be explained by higher costs of living? (This question cuts both ways. The higher cost of living in Silicon Valley means that firms must pay more per employee to keep talent, and that higher pay inflates GDP – which is mostly pay and profits. The lower cost of living in Kansas translates to not having to pay higher wages and salaries.)

Finally, to what extent are industry clusters contributing to your region’s job and wage growth? Groups of related industries, or clusters, tend to share a labor force, supply chains and knowledge spillovers which are, in turn, a key competitive regional advantage. In which industries is your region specialized? (Analysts use location quotients to find their region’s specialization, but many set the bar very low – at one – and thus are concentrated or specialized in many industries. An LQ of 1.2 would be more appropriate even though many regional analysts use an LQ 1.5 as a threshold to get a more unambiguous picture on industry specializations. After all, a region can’t be specialized in nearly everything.) To what degree can your region further develop your industry clusters of specialization? Would your region’s specialization attract FDI in an industry related to your region’s clusters? Why or why not?

Economic Well-Being Index

As with the Employment and Productivity Index, this well-being index signals the benefits of innovation but one or two links lower in the causality chain. Growth in GDP is desirable, but the follow-on question is the degree to which wages have improved and to what degree the economic benefits of innovation are shared equally. Innovative economies are thought to

generally improve economic well-being because residents earn more and have a higher standard of living. Decreasing poverty rates, increasing employment, in-migration of new residents and improvements in personal income signal a more desirable region in which to live.

These well-being measures and indexes are another way to measure changes in the standard of living in the region.

Possible Questions to Ask of the Data

Unlike the measures and indexes organized around innovation capacity or activities – like STEM occupation concentrations or business formation in the tech sector – this collection of data and measures are probably better used to monitor changes in a region’s attractiveness for residents to happily stay or for newcomers who will spark new ideas and economic growth.

It would be advantageous for a user of the I13 or for anyone drafting an economic development strategy or attempting to attract FDI to show the trends in the raw data or the measures the data were used to construct. Recent trends could be visualized as simple charts or spark lines that show progress toward regional goals, or simply “getting better” or not.

The following set of measures are well-established and are relatively self-explanatory:

- Per-Capita Personal Income Growth
- Change in Annual Wage and Salary Earnings per Worker
- Change in Proprietors’ Income per Proprietor
- Income Inequality–Mean to Median Ratio
- Average Poverty Rate
- Average Unemployment Rate
- Government Transfers to Total Personal Income (that measures the degree of dependency on government income programs)
- Average Net Migration

While income inequality may be easily understood, the measure may not be self-explanatory. Comparing the region’s average household income with the region’s median, or “middle” household income shows how income is skewed. The inverse is used because high inequality is considered a negative outcome; thus, higher values denote more equality between the poorest and the richest residents. Smaller values denote that the income distribution is less equal. A novice to the I13 may also stumble over government transfers, as the term is a little opaque. Government transfers are another way to say federal income support payments. Examples include Social Security for supporting seniors, low-income support programs, such as food stamps, or temporary income support through unemployment insurance during economic

downswings. Economic vibrancy is usually inversely related to a region's dependence upon government transfers.