CDxports and *CDxjobs* Databases

Data Sources and Methodology

(Updated: February 2021)

I. Description

The *CDxports* and *CDxjobs* databases estimate U.S. goods and services exports and the direct and indirect jobs tied to those exports from all 50 U.S. states plus the District of Columbia and all 435 congressional districts applicable to the 117th Congress.

Annual estimates for goods exports, and the direct and indirect jobs tied to goods exports, are available for more than 100 industry sectors to more than 230 destinations for 2002 to 2020. Annual estimates for services exports, and the direct and indirect jobs tied to services exports, are available for more than 40 detailed services sectors to more than 70 destinations for 2006 to 2019. The U.S. Bureau of Economic Analysis (BEA) updated its sector list with the 2019 export release, and all historical CDxports services data were updated as well to reflect the new categories.[1]

CDxjobs represents estimates of **direct jobs in the state or district** tied to exports from the state or district and **indirect jobs located throughout the United States** tied to exports from the state or district. *CDxports* and *CDxjobs* data at the congressional district level may be summed to derive state exports and state jobs estimates.

CDxports and *CDxjobs* are path-breaking databases. While the U.S. government publishes national export data for all sectors:

- Goods exports for states by sector are incomplete and inconsistent;[2]
- Services exports for states are not available at all, and
- Goods and services exports for congressional districts are not available at all.

While the Commerce Department publishes national direct and indirect jobs estimates:

- Jobs tied to exports are not published for all industries;

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[1] U.S. Bureau of Economic Analysis. "Services Spotlight: 2020 Annual Update of the International Transactions Accounts." Available at https://apps.bea.gov/scb/2020/10-october/1020-international-services.htm#spotlight.

[2] For example, the U.S. Department of Agriculture and Census publish conflicting state agricultural export data, and overlapping product classifications (e.g., USDA considers cheese an agricultural product, whereas Census considers raw milk an agricultural product, but cheese a manufactured food product) prevent analysts from using the two databases together.

- Jobs tied to exports are not available at the state or congressional district level, and
- Jobs data are not available for exports to most countries or regions.

CDxports and *CDxjobs* fill these voids by providing detailed exports and jobs estimates, for all states and congressional districts, to all countries with detailed national export data, in a manner that is internally consistent to avoid double-counting.

This paper details the data sources (Section II) and methodology (Section III) used by The Trade Partnership to estimate state- and congressional district-level exports and jobs.

II. *CDxports* and *CDxjobs* Data Sources

CDxports data are based on U.S. government export and sales data supplemented by production and company information from several private data sources.

State Export Data

CDxports provides aggregate and detailed export data estimates for agricultural products, industrial goods, and services. First, state **agricultural export estimates** draw from three primary information sources: (1) detailed state export data from the U.S. Bureau of the Census ("Census"), accessed through "USA Trade Online," for non-bulk agricultural exports (e.g., those shipped by rail, truck, or containerized seaborne vessels), (2) detailed U.S. national export data from the Census for key bulk agricultural exports (e.g., high-value products shipped predominantly in non-containerized seaborne vessels, such as soybeans and wheat), and (3) state cash receipts data from the U.S. Department of Agriculture (USDA). Second, state industrial **goods exports estimates** come from the Census, accessed through "USA Trade Online." Third, state **services export estimates** draw from two primary information sources: (1) detailed U.S. services export data from the BEA and (2) state-level, value-added output data for U.S. services sectors from Moody's Analytics. However, certain services sectors require alternate sources. For services export categories that are associated with a range of producing sectors (e.g., industrial processes and research and development), *CDxports* draws from industry data published by the U.S. Internal Revenue Service and the National Science Foundation to supplement the primary source data. For transportation services (e.g., air freight and port freight services), *CDxports* draws on port-level, two-way trade data published by Census. Finally, all data on education exports are derived from economic impact estimates from NAFSA: Association of International Educators, available at http://www.nafsa.org/econvalue.

Congressional District Export Data

CDxports apportions state exports to counties using two primary data sources: (1) detailed county sales estimates from the USDA Agricultural Census for agricultural products, and (2) county-level, value-added output data from Moody's Analytics for industrial goods and services sectors. *CDxports* then links county-level export estimates to individual congressional districts

using three additional data sources: (1) county to congressional district relationship files from Census, (2) company location information from U.S. Business List Database, and (3) geographic relationship tables from Zip Code Download. For select sectors where a single location likely drives exports (e.g., one auto plant in a county or a specific port), estimated exports are allocated directly to specific counties and/or districts based on facility addresses.

Jobs Tied to Exports

CDxjobs derives its estimates of direct and indirect jobs tied to exports from a given state or congressional district using domestic employment requirement tables from the U.S. Bureau of Labor Statistics.

III. Methodology

The *CDxports* database apportions exports based on the geographic concentration of production for a given industry. Since production and export data availability differ by product type, slightly different methodologies are used to estimate agricultural, services, and goods exports.[3]

Estimating State Exports

At the state level, we use manufactured goods exports based on origin of movement published by Census for all sectors except agricultural products.[4] State agricultural export data published by Census credit exports of bulk agricultural commodities (e.g., soybeans) to states with large ports (e.g., Louisiana), rather than to the states where the crops actually grow (e.g., Iowa),[5] and state services export data are not published at all, so The Trade Partnership estimated state agricultural and services exports as described below.

Agricultural exports: The Trade Partnership refined its methodology for estimating state agricultural exports in 2019. Previously, all national agricultural exports were apportioned to

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[3] Because state-level export estimates are drawn from multiple sources, the state export totals reflected in the *CDxports* do not match those reported by Census.

[4] "Domestic" export data are not available at the state level for detailed NAICS categories. As a result, all *CDxports* data reflect total exports.

[5] Census acknowledges this problem in its "Known Limitations in Uses of the Data," stating: "In certain cases, the export origin of movement does not reflect the transportation origin. Specifically whenever shipments are consolidated, the state will reflect the consolidation point rather than the origin of movement. This effect is particularly noticeable for agricultural shipments. For these shipments intermediaries located in inland states are shipping agricultural commodities down the Mississippi River for export from the port of New Orleans. In this case, the state reflects Louisiana, the state where the port of New Orleans is located, as the state of origin of movement. The states in which the commodities were grown and originally shipped are lost." See http://www.census.gov/foreign-trade/aip/elom.html#limitations.

states based on each state's share of commodities' cash receipts. As the agricultural commodity sector definitions varied, The Trade Partnership created concordance tables linking commodity cash receipts to the agricultural commodities production data published according to the North American Industry Classification System (NAICS).

Starting in 2019, we limited agricultural reapportionments to high-value, bulk agricultural products (e.g., soybeans). Such estimates were further limited to products shipped by non-containerized seaborne vessels. Focusing on key products improves bulk agricultural export estimates by allowing better matching of exports with cash receipts data. Exempting non-bulk exports ensures the data reflect product- and country-specific trading relationships. The non-bulk changes particularly impact specialty crops grown in limited areas (e.g., pecans) that previously had to be apportioned based on broader agricultural groupings (e.g., nuts).

Services exports: The Trade Partnership obtained state value-added output ("output") data for each sector that exports services (according to national export data). However, because mere production of services does not indicate a likelihood of exporting, further assessment is required. To identify the regions that are capable of producing exportable services, we calculate location quotients (LQs) to determine geographic concentration of production for the given industries. LQs are frequently used in regional economic analyses to determine what makes an individual region "unique," including BEA's Regional Input-Output Modeling System (RIMS) database[6] and J. Bradford Jenson's work on exportable services.[7]

We estimated for each services sector in each state a benchmark output by multiplying the state's total output (i.e., the combined output of all industries) by that services sector's share of total output at the national level. For example, if financial services account for 5 percent of total output at the national level and a state has a total output for all industries of $100 billion, that state's benchmark output for financial services would equal 5 percent of the $100 billion, or $5 billion.[8] As with agriculture, services sector definitions from the information sources varied, so we created concordance tables linking services exports to NAICS services. Conversions and adjustments for such differences are imperfect.

The Trade Partnership developed LQs by dividing the state value-added output from Moody's by the benchmark estimates. An LQ above 1 suggests "surplus" production (i.e., the geographic area is more likely to export that product), while a LQ between 1 and 0 suggests a production "deficit" (i.e., the geographic area is less likely to export that product).

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[6] U.S. Bureau of Economic Analysis. "RIMS II: An essential tool for regional developers and planners." Available at https://www.bea.gov/regional/pdf/rims/rimsii_user_guide.pdf.

[7] Jensen, J. Bradford. 2011. *Global Trade in Services: Fear, Facts, and Offshoring*. Washington, DC: Peterson Institute for International Economics.

[8] The Trade Partnership uses Moody's value-added output instead of BEA's state value-added GDP estimates because Moody's estimates include greater sector detail, which allows us to ascertain the location of production with greater accuracy.

For a state with a production deficit, the Moody's output was adjusted downward in relation to the extent of its deficit. In other words, a state with an LQ of 0.99 experienced a very small downward adjustment, since it was near the expected value, whereas a state with an LQ of 0.01 experienced a very large downward adjustment. Output for states with an LQ above 1 was not adjusted. State export figures were created by allocating to each state a share of national exports for a given services sector based on its share of total, post-adjustment output.

The practical effect of using LQs to adjust regions with output below the benchmark downward is to shift exports to areas with the highest concentrations of output for of a given industry. For example, without adjustments in 2011 both California and New York would show up as top exporters of both computer software and securities transactions on account of the sheer size of their states. However, for computer software, California had an LQ of 1.64 (i.e., a "surplus" relative to the benchmark) while New York had an LQ of 0.37 (i.e., a significant "deficit"). Conversely, for securities transactions, California had an LQ of 0.55 while New York had an LQ of 5.69. Using LQs, the geographic-concentration adjustment allocates more computer software exports to California (and less to New York) and more securities transactions exports to New York (and less to California).

An exception to using state-level output and LQs to estimate services are in the freight and port services sectors (e.g., air versus ocean versus other). The methodology change, effective with the January 2020 release, was made due to an issue where undisclosed U.S. government output data resulted in "ocean" freight services being allocated to inland states such as Kentucky and West Virginia (and further, inland counties in coastal states). Instead, state-level freight and port services exports are allocated based on two-way trade of goods through ports within the states for a given mode of transport. Furthermore, this ensures port-country linkages when estimating services exports. For example, much of the U.S.-United Kingdom airborne trade goes through JFK Airport in New York, while much of the U.S.-China airborne trade goes through O'Hare Airport in Illinois. The new methodology allocates a larger share of air freight and port services exports to the United Kingdom to New York, and a larger share of those exports to China to Illinois.

Estimating Congressional District Exports

County exports: Using the state manufacturing export estimates from Census and the revised state agricultural and new services export estimates, The Trade Partnership used an identical benchmarking process to allocate state export figures to individual counties. We estimated for each sector a benchmark county output by multiplying the county's total output (i.e., the combined output of all industries) by the industry's share of total state output. For example, if auto parts manufacturing accounts for 10 percent of total output at the state level and total county output for all industries is $7 billion, the county's benchmark output for auto parts manufacturing would equal 10 percent of $7 billion, or $700 million. Once again, we developed LQs for all industries for all counties in every state and adjusted output downward whenever LQs were below 1. County export estimates were created by allocating to each

county a share of state exports for a given industry or services sector based on its share of total, post-adjustment output. For example, without adjustments in Texas both the Dallas and Houston areas would show up as top exporters of navigational equipment (NAICS 3345) and basic chemicals (NAICS 3251) in 2012 on account of the sheer size of their cities. However, for navigational equipment, Dallas had an LQ of 1.51, while Houston had an LQ of 0.79. Conversely, for basic chemicals, Dallas had an LQ of 0.13 while Houston had an LQ of 2.96. Using LQs, the geographic-concentration adjustment allocates more of Texas' navigational equipment exports to Dallas, while allocating more basic chemicals exports to Houston.

Allocating counties to congressional districts: County export data are allocated to congressional districts using Census' county and congressional district relationship files and detailed company information that includes industry, county, and 9-digit zip codes. First, we used the Census relationship files to determine the congressional districts from which each county's exports may originate. We then determined the share of county businesses in each industry that fall within each congressional district based on their 9-digit zip code. For counties where all businesses are located in only one congressional district, *CDxports* apportions all county exports to that district. For counties with businesses located in multiple congressional districts, *CDxports* apportioned exports at the detailed industry level according to the share of county businesses in that industry in each district. As noted, in limited cases where a single plant or port likely accounts for all local exports, exports are allocated directly based on addresses of those facilities. NAFSA provides data at the congressional district level, so the apportionment methodology does not apply to education estimates.

Congressional district boundaries normally change once every 10 years, but some states' boundaries have changed more recently due to court challenges. *CDxports* reflects districts for the 117th Congress, including new districts for Pennsylvania created for the 116th Congress. Historical data for changed districts are revised to ensure apples-to-apples comparisons for multi-year trends.

Estimating Jobs Tied to Exports

CDxjobs derives its estimates of direct and indirect jobs tied to the exports from a given state or congressional district using domestic employment requirement tables from the U.S. Bureau of Labor Statistics. Direct jobs are assumed to be located in the state or district, while indirect jobs may be located throughout the United States.

For questions about the methodology used to create *CDxports*, contact Daniel Anthony, 202-347-1041 or Anthony@tradepartnership.com.