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The Value of US Government Data to US Business Decisions

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The US government is a major producer of economic and financial data, statistics, analysis, and forecasts that are gathered, compiled, and published as public goods for use by citizens, government agencies, researchers, nonprofits, and the business community. There is no market transaction in the publication and dissemination of these government data and therefore no market-determined value.

The purpose of this paper is to outline and augment our understanding of the value of government data for business decision-making. We provide an overview of the topic, including results from government reports and a private sector survey. We then provide concrete examples of how these government data are used to make business decisions focusing on three sectors: automotive, energy, and financial services. Examples of new initiatives by the federal government to open access to more data, exploiting technology advances associated with the internet, cloud storage, and software applications, are discussed. With the significant growth in the digital economy, we also include discussion and insights around how digital platform companies utilize government data in conjunction with their privately generated data (or "big data") to foster more informed business decisions.

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Our exploration of the value of the public good provided by government data is necessarily qualitative, but a common theme is that for private firms, public data is an important complement and baseline to their own data. For example, in a 2017 panel discussion of the importance of government data, one participant noted that the big data now produced by many businesses are not sufficient to support optimal business decisions. Value is derived when "a firm's own data are complemented with a wide range of data that are collected by the government. Federal data are comprehensive, covering the entire US, and, as a result, are useful for benchmarking and supplementing businesses' own data. They're also consistent with many data series spanning decades, allowing comparisons across place and over time" (Project at Brookings and American Enterprise Institute 2017; Brooks et al. 2017).

We believe that government support of data development and access to data is a competitive advantage for both existing and new US businesses. We see a risk that declining government support will lead to an erosion in the quality of public data and the value it provides to US businesses. As of FY 2017, total funding for the government's 13 principal statistical agencies stood at $2.257 billion (Office of Management and Budget 2018). By our calculations, this represents an 8.7 percent decline in real dollars from the 2004–2013 average budget for these agencies (based on Economics and Statistics Administration 2014, p. 13).[1] At a time when data capabilities and information technology are advancing rapidly, public data collection and dissemination requires ongoing investment and modernization to keep pace with rapid economic structural change.

Broad Assessments of the Value of Public Data to the Business Sector

Two US Department of Commerce reports and a recent survey of business economists provide broad-based assessments of the value of public data to the business sector.

US Department of Commerce Reports

A report from the Economic and Statistics Administration (2014) provides substantive documentation regarding the value of government data for professional managers at US businesses.

The report includes a summary of "government-data–intensive sectors" (GDIS) including businesses that "rely heavily on government data in their production processes" (p. 31). These include investment analysts, database aggregator firms, market researchers, benchmarkers, and others. The report estimated the 2012 GDIS

[1] To estimate inflation-adjusted outlays, the authors used the Personal Consumption Expenditure price index, produced by the US Bureau of Economic Analysis. For comparability, costs of the 2010 Decennial Census are omitted from the 2004–2013 average, and preliminary costs of the 2020 Decennial Census are omitted from the government statistical budget in 2017.

revenues at $220.8 billion (p. 41). This sector has grown substantially as digital platform companies combine government data with internally generated big data to create analytic tools and platforms that inform a host of business decisions.

A more recent comprehensive estimate of GDIS revenues will require an update of this data obtained from the 2012 Economic Census, and initial release of more recent data will begin in September 2019. However, other data sources strongly suggest that the GDIS sectors have been growing substantially since 2012. For example, the Census Bureau's 2015 report of "Statistics of US Businesses" (SUSB) includes information on payroll outlays and number of employees in GDIS. As of 2015, the payroll outlays were $197.8 billion and 2.721 million employees, up 25.0 and 11.3 percent, respectively, since 2012.[2] The Bureau of Economic Analysis (BEA) data on GDP by industry includes gross output in current dollars for NAICS code 51930—internet publishing and broadcasting and web search. As of 2017, BEA estimates this industry had gross output of $176.9 billion, a 92 percent increase since 2012, and well above the revised 2012 output of $92.2 billion in output published in a November 2018 BEA release.[3]

Table 1 provides a snapshot on several private and public companies that rely substantially on government data to undertake their business activities in government-data–intensive sectors. Business revenues are substantial and have grown, in part because of new technologies enabling greater value creation through analytics. Growth in the value-added of government data has been enhanced by the ability to link directly to government data sources through application programming interfaces (API). Beyond this electronic access, businesses employ more sophisticated, cloud-based tools, which provide for the integration of government and big data to undertake analytics. Advancements in technology mean government data are now leveraged for even greater value across many different industries.

The Economic and Statistics Administration (2014) report also features a number of "data-driven" business decisions, which give concrete examples of the ways in which many firms use government data. For example, a large retailer used data from the American Community Survey (ACS) produced by the US Census Bureau to target customized inventories tailored to suburban and urban purchase attributes (p. 19). A small business in Texas received "customized market research from the US Commercial Service (in the International Trade Administration at the US Department of Commerce), which assisted the company in its penetration of

[2]The Statistics of U.S. Businesses (SUSB) dataset from the US Census Bureau can be found at https://www.census.gov/programs-surveys/susb/data.html. These totals include annual payroll outlays for NAICs codes 5191 (Other Information Services), 5313 (Other Activities Related to Real Estate), 5416 (Management, Scientific, and Technical Consulting Services), and 5419 (Other Professional, Scientific, and Technical Services). While not all of the activity in these NAICS codes can be attributed to support for data-driven business decisions, it does provide some sense of the magnitude of how government data generates value added in the business community.

[3]Bureau of Economic Analysis, https://apps.bea.gov/iTable/index_industry_gdpIndy.cfm. GDP-by-Industry, Underlying Detail of Industry, "Economic Accounts: GDP by Industry," "Table U: Gross Output by Industry," Billions of Dollars, November 2018.

Table 1
Some Firms in the Government-Data–Intensive Sector: Revenue and Market Capitalization

Company	*Revenue ($ millions)*	*Market cap ($ millions)*
Public		
Acxiom	930	3,770
IHS Markit	3,890	20,160
Nielsen	6,660	9,350
Redfin	430	1,430
Thomson Reuters	11,410	31,600
Zillow	1,190	7,740
Private		
Bloomberg LP	9,400	NA
ESRI	1,000	NA
Haver Analytics	3	NA
Mapquest	210	NA
McKinsey	10,000	NA
Truven Health	610	NA

Source: Data for public companies obtained from www.finance.yahoo.com; includes latest four-quarter trailing revenues and market cap as of October 11, 2018. Private company data are estimates from Gale Business Insights as of October 2018.

export markets (p. 21). Businesses use producer price data to inform price adjustments to sales and purchase contracts (p. 25). A large pet supplies retailer used Census Bureau data to optimize new store locations and to inform decisions about merchandise planning and advertising (p. 34).

Another way to gauge the use of government data by businesses is with Input–Output Accounts produced by the Bureau of Economic Analysis (2018). For input–output (IO) code 514, which includes data processing, internet publishing, and other information services, the BEA accounts indicate a total output of $189 billion in 2016, up by 26.4 percent as compared to 2012.[4] Admittedly, not all of the value of this industry is represented by government data. Even so, it represents only a portion of the government-data–intensive sector as defined in the Economic and Statistics Administration (2014) report.

The Economics and Statistics Administration (2015) followed up with a more focused study of business use in an assessment of the American Community Survey (ACS), an annual US Census Bureau survey of households that gathers detailed demographic data on jobs and occupations, educational attainment, home ownership, and other topics. As of November 2014, nearly 4,000 businesses subscribed to the ACS email updates, accounting for 12.3 percent of the subscriber base (p. 32).

[4]IO Code 514 includes NAICs codes 5182, 51911-2, 51919, and 51913. These industries are data processing, hosting & related services, libraries and archives, news syndicates, internet publishing & broadcasting & web search portals, and all other information services (NAICs codes can be found here: https://www.census.gov/eos/www/naics/).

The report gives a number of examples of how firms use the ACS. For example, businesses use it to inform their decisions about site selection and other commercial real estate decisions (pp. 33–34). Demographic information culled from the ACS is analyzed in conjunction with a businesses' proprietary information on sales in order to determine market share and other benchmark metrics (pp. 33–34). The ACS is used to develop business plans for product and marketing decisions. As part of this effort, businesses combine data on sales and store attributes with local demographic data to understand if they are positioning products properly to optimize sales (p. 34). This report highlights business demand for more and better government data to assist in their growth and development.

National Association for Business Economics Survey

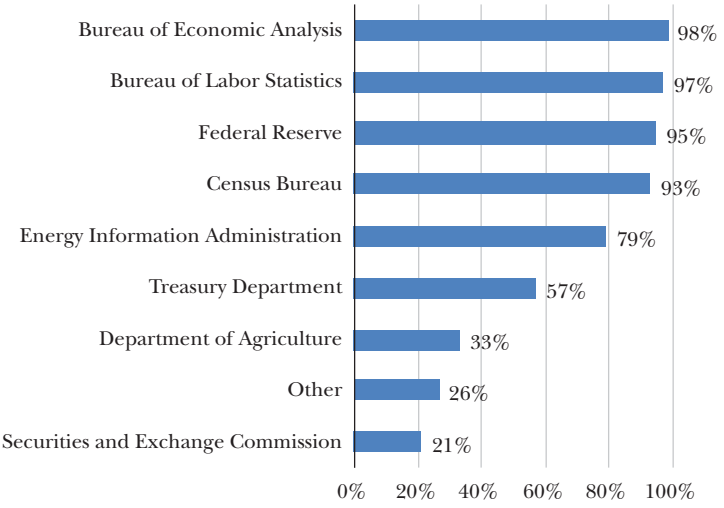
The National Association for Business Economics (NABE) conducted a survey of its private sector members on the use of government data (for details, see Appendix 1). The survey was administered during April–May 2018 and included 14 questions regarding survey respondents' use of government data to inform business decisions. Just under 60 NABE members responded to the survey from a mixture of industries, including service industries like finance, insurance, and real estate, as well as goods-producing industries. Sixty-four percent of the respondents noted that their employer sells products and services through digital platforms.

Ninety-five percent of the respondents replied yes to the question, "Are government data important to analyses and forecasting that drive business decisions?" Figure 1 displays responses to the survey question, "From which of the following agencies do you obtain data to inform business decisions at your firm, or firms with whom you work or consult?" When NABE members were asked how they rated the importance of specific types of government data they used from these agencies in order to inform business decisions, the top five responses were: 1) Employment and unemployment; 2) Prices and wages; 3) GDP; 4) Population; and 5) Income and profits.

Respondents were also asked to evaluate the usefulness of government data as inputs into a host of decision-making processes at their companies. On a scale of 1 to 5, with 1 being not critical and 5 being very critical, about half of respondents rated the following decisions as most critical (a response of 4 or 5): capital spending decisions; price-related decisions pertaining to cost-of-living adjustments for workers; finance-related decisions, such as discount rates for pension funds or recommendations regarding asset allocation; and interest rate decisions, such as when to borrow or lend and at what duration and/or cost.

Concrete examples of important uses of government data included the development of models used to project defense spending by industry, state, and occupation; infrastructure investment spending; or industry footprint analysis at the state and regional level. One respondent noted that government data on health care allows for the development of models to help healthcare facilities decide which services to expand geographically and how many providers and support staff would be required to meet projected demand. Another respondent noted that the firm

Figure 1
NABE Survey Question: "From which of the following agencies do you obtain data to inform business decisions at your firm, or firms with whom you work or consult?"



Source: National Association for Business Economics (NABE) Survey on Use of Government Data to Drive Business Decisions, April–May 2018.

uses data from the US Department of Agriculture on production and prices to estimate demand for diesel engines in the agriculture sector. Respondents in the finance, insurance, and real estate services industries are particularly intensive users of government data. Another respondent noted the importance of data use for "[s]etting loan and deposit rates. Keeping senior management informed of key government data releases and implications for financial markets."

There is likely to be sample selection bias associated with these survey results—after all, those that value government data are most likely to respond to the survey—but the types of data valued and examples of use nonetheless provide insight into how the public good of government data enhances business decision-making.

A more recent survey conducted by Bi-Survey.com (2018) captured the views of over 600 respondents regarding the type of data used for decision-making. Despite the growth in large, internally generated datasets, this survey found that the growth in the use of external data sources for business decision-making was somewhat higher. Over one-half of the companies surveyed use at least five external data sources, while nearly 25 percent stated that they use more than 10 external data sources. The survey did not ask for the source of the external data, and we are not able to ascertain if most, if not all, of these external data sources are published by government entities. However, the results confirm that external data, including public data, are a complement to the increased generation of large amounts of internal data that companies produce. Growth in the use of big data suggest increased value created by public data.

Examples from Three Industries: Automotive, Energy, and Financial Services

Automotive Sector

The US automotive industry, and more broadly, the transportation sector of the economy, is large and diverse. In 2017, the value-added of automotive transportation-related industries was 3.7 percent of GDP, or $713.5 billion.[5] Consumer and business purchases of vehicles exhibit procyclical behavior. Both the supply chain and product sales of the industry are global in nature. Thus, business decisions rely on insights and forecasts regarding economic activity, including short- and long-term behavior of GDP, inflation, interest rates, commodities, and exchange rates—for the US economy and global economies.

Table 2 shows examples of the data required to inform business decisions in the automotive industry in the short-run and the long run (based on the career experience and ongoing professional contacts of the authors). In addition, Manyika et al. (2013) describe government data used in the transportation services industry to drive business decisions. Transportation sectors included in their study are marine shipping, air, passenger autos, and rail.

An example of a short-run business decision is the modeling of automotive demand conditions and the near-term outlook, which is necessary to make informed decisions about production rates at assembly plants. US government data are combined with internally generated and other private sector data, allowing experts in each of these subject areas to collaborate with team members from other functions within the company: for example, marketing and sales, finance, credit, product development, and the business operations running the plants. In turn, the US government data support sales forecasts, management of desired inventory levels, and expected competitor behavior and pricing in order to make business decisions regarding production at the assembly plant level.

Long-term business decisions at an automotive company require additional data and modeling to perform analyses, including investment decisions regarding assembly plant expansion or site location, and assumptions of revenue growth based on vehicle industry pricing projections. Businesses also rely on government data for their financial forecasts which, in turn, influence pricing of leases and loans, healthcare cost projections, cash management, pension funding, securitization funding, and other financial decisions. As another example, the use of government data emanating from GPS satellites has improved decisions around supply-chain management, logistics, mapping, and route planning (Manyika et al. 2013, p. 31).

The ongoing evolution of the transportation industry into electrified, connected and automated vehicles (EVs and CAVs) rely on government data as well. The Center for Open Data Enterprise (2017) summarized the results of a White House Roundtable on Open Data for Economic Growth, held on July 25, 2017.

[5] Bureau of Economic Analysis, GDP by Industry data as of November 1, 2018.

Table 2
US Government Data Used for Short-Term and Long-Term Auto Industry Decisions

Short-run indicators	*Long-run indicators*
Auto sales (BEA)	Auto sales (BEA)
Consumer credit (Federal Reserve)	Auto production and assemblies (Federal Reserve)
Consumer price index for new vehicles (BLS)	Consumer credit (Federal Reserve)
Consumer price index for all items (BLS)	Consumer price index for new and used vehicles (BLS)
Disposable personal income (BEA)	Consumer price index for all items (BLS)
Employment and Unemployment (BLS)	Disposable personal income (BEA)
Energy prices (BLS and EIA)	Energy prices (BLS and EIA)
GDP (BEA)	GDP (BEA)
Interest rates (Federal Reserve)	Consumer spending and income distribution (BLS and Census)
Inventories (Census)	Household wealth (Federal Reserve)
Regional income, prices, and consumer spending (BEA and Census)	Industrial production and capacity utilization (Federal Reserve)
	Interest rates (Federal Reserve)
	International trade and investment (BEA and Census)
	Inventories (Census)
	Population (Census)
	Regional and state GDP, disposable personal income, and prices (BEA, BLS, Census)
	US Federal Budget (OMB, CBO, Treasury)
	US Federal Government Debt (Treasury)
	Vehicle miles traveled and travel attributes (DOT)

Source: Author's assessments based on professional work at Ford Motor Company.
Note: BLS is Bureau of Labor Statistics; BEA is Bureau of Economic Analysis; EIA is Energy Information Administration; OMB is Office of Management and Budget; CBO is Congressional Budget Office; DOT is Department of Transportation.

The transportation sector participants included auto manufacturers, auto insurance companies, public transportation organizations, and companies that provide vehicle-sharing and other innovative models (p. 5). Participants noted that they use information on public transit systems to develop web and mobile applications for consumers, while auto companies use government data on transportation to support the development of autonomous vehicles. Insurance companies rely on transportation data, specifically accident statistics to estimate incidence probabilities in order to derive market pricing for premiums.

Energy Sector

Firms in the energy sector include crude oil producers, refiners, oil servicing companies, electric utilities, natural gas producers, coal companies, nuclear companies, pipeline producers, and suppliers of energy-related equipment and

components such as windmill turbines, solar panels, other renewable energy sources, and battery storage units.

The Energy Information Administration (EIA) is an independent statistics and analysis agency within the US Department of Energy, created in 1977 in the aftermath of the first OPEC oil shock (Government Printing Office 1977). It provides timely energy statistics and forecasts on every dimension of the energy sector. These data include sources and uses of energy by type and geography, prices of energy by type, short- and long-term forecasts of the energy sector, including several types of disaggregation (for example, by country, by region within the United States, and by end-use such as residential, commercial building, manufacturing, and transportation). The EIA also measures energy imports and exports and provides data on drilling activity in the offshore and shale fields across the United States. By law, EIA's data, analyses, and forecasts are independent of approval by any other officer or employee of the US government.

For energy-intensive industries such as durable goods manufacturing, chemicals, construction, and transportation, obtaining information about energy price trends is vital to gauging the outlook for energy costs, demand, and supply conditions. Energy consulting companies depend on government data as a starting point for market analysis. For example, an analyst of these data at an energy consulting firm noted that weekly data on pricing and inventories drive the short-term price of crude oil and energy-related financial products in the futures markets. In turn, energy producers utilize the futures markets in order to hedge against adverse swings in pricing and to inform decisions about production rates. Decisions on refinery runs rely on inventory and demand information as well as product pricing. Import and export decisions are based on whether the crude and crude-related products will be needed in the US market, which starts with understanding recent data and trends. Investments about physical storage are based on these data. One concrete example is the use of EIA diesel fuel price data in rate-setting for interstate trucking. EIA energy consumption surveys for building infrastructure are used as benchmarks for many private decisions on utility services and design criteria for offices, schools, hospitals, shopping malls, and private residences.

Because of the comprehensive nature of the statistics and forecasts from the Energy Information Administration, very few business decisions in the energy sector are not informed by these government data. Private companies lack the legal authority of the EIA to acquire and disseminate data, and so are unable to duplicate EIA's breadth and depth of transparency. It is, arguably, one of the most valued government datasets available to the public for free.

For career development purposes, Carnegie Mellon University (2018) posts a comprehensive list of 30 energy consulting firms on its website. All of these companies would, in principle, rely on government data in order to undertake analysis and recommendations for their clients. Government data from the Energy Information Administration is vast and free.

Beyond the energy sector, market pricing of the outlook for energy prices affects the outlook for inflation, interest rates, and a wide range of asset prices,

including the value of the dollar. Energy futures prices are also a function of Energy Information Administration data on demand and supply statistics. These datasets also underpin assessments of inflation which are embedded in the prices of Treasury inflation-protected securities (TIPS). These, in turn, influence economists' and policymakers' forecasts of inflation, which are a key input for monetary policy decisions and expectations for consumer spending.

Financial Services Sector

Financial services firms include commercial banks, asset management firms, equity brokerages, credit unions, and finance companies. Financial services firms are arguably one of the most intense users of US government data, employing data from the Securities and Exchange Commission (SEC), finance-related data from the US Department of the Treasury, and all types of economic and demographic data.

A central application of government data is the stress-testing of the balance sheets of "systemically important financial institutions." This exercise, which must be completed at least annually (large banks have to test themselves semiannually) requires firms to estimate the impact on their capital bases of two adverse economic and financial scenarios (Board of Governors of the Federal Reserve System 2018).

The stress-testing process involves extensive econometric modeling. Credit losses are projected using a combination of borrower characteristics and macroeconomic variables. Prominent in the latter category are GDP and its components, unemployment measures, and personal income. Both state-level and US aggregate data are utilized. Considerable use is made of Federal Reserve data: household debt and asset levels from the Financial Accounts, as well as data on interest rates, consumer credit, bank assets and liabilities, and money supply. When banks monitor credit conditions for the credit management process, they use aggregate data on corporate and household debt, along with the Federal Reserve's survey of lending conditions called the Senior Loan Officer Survey. National and regional house price data are produced by the Federal Housing Finance Agency. Strategic planning exercises also often employ US Census Bureau data containing a wide range of information on demographics and wealth.

Financial companies described a number of uses of "open" (including US government) data at a 2017 forum held by the Center for Open Data Enterprise (2017, pp. 3–4), in collaboration with the Office of Management and Budget. For example, open data helps financial firms assess businesses seeking financing, from startups and small businesses, to larger companies. It informs a variety of investment decisions involving companies, specific sectors, real estate, currencies, commodities, and other assets. Financial firms use data on companies, professional licenses, property, court records, and more to detect fraud and mitigate risks. Open data aids firms in their research on national and global financial outlooks to understand consumer behavior, identify and quantify risks, and optimize their strategies. Financial institutions use demographic and social, economic, and labor data to assess loan applicants, which allows for the possibility of offering loans to those with no or limited credit history.

Data on consumer credit quality and economic conditions drive decisions and credit allocation in the primary and secondary markets for mortgage finance.

Financial firms often forecast aspects of the US economy, both for internal planning and as a product used by clients. The forecasts rely on a broad range of data on output, prices, labor markets, income, and other areas. Macroeconomic forecasting models rely heavily on public data. Macroeconomic Advisers' US model, for example, uses over 1,000 variables, with over 90 percent represented by government data (according to Ben Herzon, an Executive Director at the firm).

Corporate executives in the financial services industry recognize the critical role that government data perform in their decision-making. The chief executive officer of Northern Trust, Michael O'Grady, stated:

> Northern Trust, and the financial services sector more generally, relies heavily on the economic data produced by governmental agencies. Stress testing for capital adequacy, performance planning, and risk measurement would be nearly impossible without it. Timely and high-quality information not only aids our operations, it contributes to the stability of our financial system. Our industry strongly supports adequate investment in this very critical resource.[6]

Open Data Initiatives and Value Estimation

Most government data are publicly available, free of charge, and available for download from government websites. However, the federal government has been undertaking many activities to provide open access to more data by utilizing technology advances that in turn facilitate the development of new business models, software applications, and strategic uses of public data. Open format data are machine readable through "application programming interfaces" (APIs) at zero cost and are available to any sector of the economy—government, academia, business, and other organizations (Dietrich et al., *Open Data Handbook*, undated).

Open government data is recognized by many government officials and business people as a strategic asset for economic growth and business opportunity in a world where investment is increasingly driven by intellectual capital (Zinnbauer 2018). The World Bank (2014) documented case studies of companies that have grown to valuations of more than $1 billion through the use of open data, including the real estate company Zillow and the navigation service Waze, among many others.

The McKinsey Global Institute (MGI) published a report that estimated the value of open data in seven sectors: education, transportation, consumer products, electricity, oil and gas, health care, and consumer finance (Manyika et al. 2013, p. 9). The estimate of value added from open data was $300–450 billion in health care, and $210–$280 billion in consumer finance. For the electric power sector, Manyika et

[6] Statement provided to the author by Carl Tannenbaum, Executive Vice President and Chief Economist at Northern Trust.

al. (p. 60) highlighted the importance of data from government regulatory agencies and from the Energy Information Administration as inputs for capital investment and productivity performance. The Federal Energy Regulatory Commission (FERC) is responsible for regulating the interstate transmission of natural gas, oil, and electricity. It also regulates natural gas and hydropower projects and does environmental impact assessments and cost calculations, which inform the assessment of pass-through of capital investment outlays to consumers in the form of rate increases.

One potential value of government data results from increased competition and efficiency. This possibility is acknowledged in the disclosures of large, global information providers that provide research, analytics, and forecasts to a substantial business client base. In their 2017 annual report, the firm IHS Markit (2017) alluded to the importance of government data in their "Risk Factors" description:

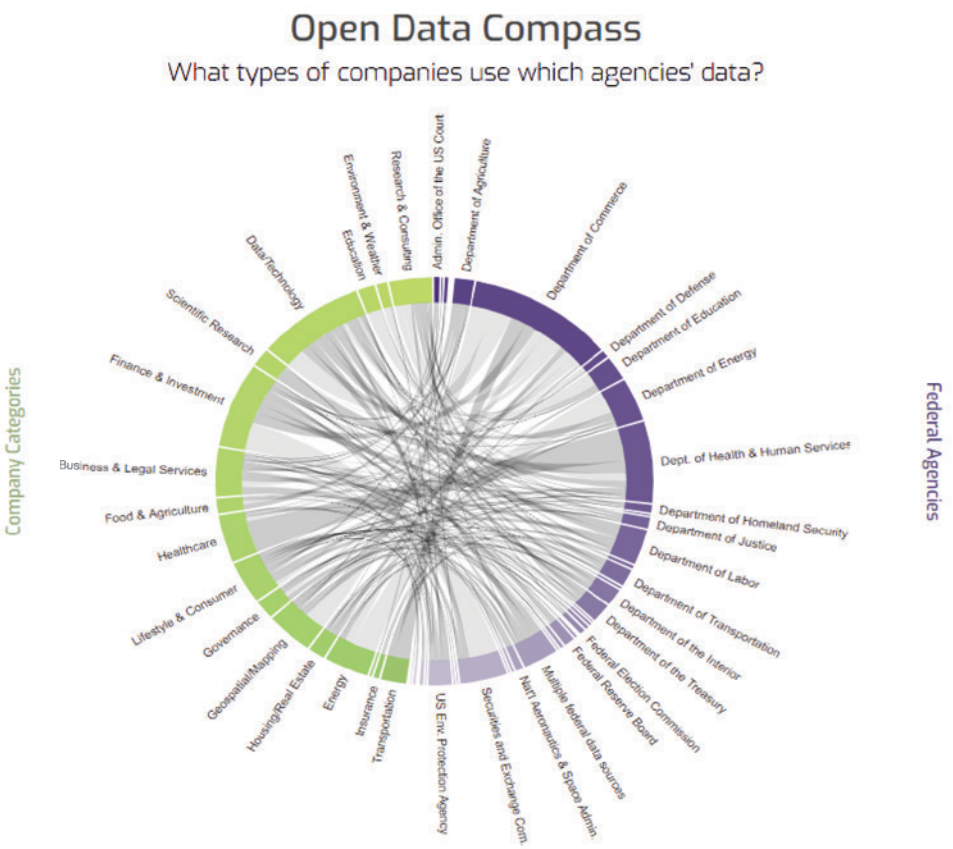
> *Some of the critical information we use in our offerings is publicly available in raw form at little* or no cost. The internet, widespread availability of sophisticated search engines, pervasive wireless data delivery and public sources of free or relatively inexpensive information and solutions have simplified the process of locating, gathering, and disseminating data, potentially diminishing the perceived value of our offerings. While we believe our offerings are distinguished by such factors as currency, accuracy and completeness, and our analysis and other benefits, our customers could choose to obtain the information and solutions they need from public, regulatory, governmental or other sources. To the extent that customers become more self-sufficient, demand for our offerings may be reduced, and our business, financial condition, and results of operations could be adversely affected (p. 21).

Magalhaes and Roseira (2017) undertook an innovative approach to assess the use of open government data at 178 firms across nine US industries. They analyzed 178 companies that use open government data, which they then classify into twelve categories depending on how the data are used to create value. Their results show that data can be leveraged as business intelligence, process optimization, product/service improvement, and research and development (pp. 7–8).

The Center for Open Data Enterprise (2017) has also spurred other research on how government data are used by businesses. It developed the "Open Data Impact Map" which includes more than 500 examples of US firms that use open government data as a business resource (p. 2).

New York University hosts the Governance Lab, or GovLab, which "works to improve people's lives by changing how we govern, using technology-enabled solutions and a collaborative, networked approach." GovLab initiated Open Data 500, an effort to focus on identifying companies using government data for a variety of business objectives (http://www.opendata500.com/us/). Open Data 500 compiled the flows from government data agencies to sectors of the US economy. Figure 2, taken from their website, shows sources of government data by sector of the economy. Finance and technology sectors are the largest recipients of government

Figure 2
Sources of Government Data by Sector of Economy



Source: The GovLab @ NYU Open Data. 500 http://www.opendata500.com/us/.

data inflows. Open Data 500 also focused on small and mid-sized businesses, many of which were startups that relied heavily on open data for their business success.

A case study on the Kellogg Company published by the Center for Open Data Enterprise and Accenture (2017) analyzed how government data helps "guide business investments, develop new products and services, and foster innovation" (p. 4). The company employed data using "problem-centric" and "discovery-centric" approaches (p. 4). A problem-centric approach combines proprietary and publicly available data to address specific organizational challenges. A discovery-centric approach allows a "data analytics team to identify new correlations and trends by fostering intellectual curiosity" (p. 4). Both approaches help the company generate increased revenue, reduce costs, and better meet customer needs.

One database of substantial benefit to the private sector has been the open access to National Oceanic and Atmospheric Administration weather data. It facilitated the creation of The Weather Company, a business whose digital assets were

acquired by IBM for $2 billion in 2015 (as reported in McMillan 2015). The US Department of Commerce entered into an agreement with the Weather Company and other business partners to unleash even more weather-related big data for business use. IBM subsequently purchased The Weather Company and has expanded the application of weather data to business decisionmaking with new artificial intelligence and modeling tools (IBM undated). These data drive business decisions about insurance pricing, and retail and healthcare sector preparedness related to storm activity, to name just a few uses. Experts at the Center for Open Data Enterprise are expanding the documentation and analysis of open data benefits to private businesses (Gurin 2017).

Use of Government Data by Digital Platform Companies

Digital platform companies, which rely on web-based transactions and information exchange with customers and other businesses, often combine their organically grown data with open government data to produce analytics that contribute to increased operational efficiencies, reduction in costs, and inventory and distribution management, and offer new revenue-generating services. We interviewed three data scientists and economists at digital platform companies who asked that their comments remain anonymous. All three indicated they use government data from different agencies to supplement the big data derived from their online businesses.

One company has an application that uses government data on retail market activity and interest rates to engage with their online customers. This application is viewed as a marketing tool by management and has been determined to be effective in engaging with customers and providing them with valuable information. Extensive use of data from the American Community Survey, the Consumer Expenditure Survey, Treasury Department data on aggregate tax receipts, Census Bureau data on demographics and retail sales, Department of Commerce data on weather, and labor market data were cited as important sources. The company uses these data to gauge emerging market trends, as well as the market size, which serves as a benchmark against which the digital platform company can assess its competitiveness and market growth.

Hiring decisions are often especially reliant on analysis of government data. To determine the need for employees in certain markets, some companies used Census Bureau, Bureau of Economic Analysis, and Bureau of Labor Statistics data to quantify the market size for their products and services. An analysis of state and metro area data and immigration and demographic trends allowed company analysts to make recommendations to management regarding the size of the professional labor force to hire in order to meet projected demand. Since labor costs are a substantial factor input for this firm, analysts were able to conduct a "bottom up" approach in order to match labor with demand conditions in local markets.

Conclusion

The value of government data is difficult to measure, but it is clearly a substantial strategic asset for the US business sector. Such data are used by a wide range of companies from auto producers to digital platform companies, and for purposes that include production and investment decisions, marketing and inventory management, and long-range strategic planning. They are also of paramount importance in undertaking assessments of the financial health of banks and the overall stability of the US financial system.

The value of government data seems to be increasing. Technology advances have allowed for an ever-increasing amount of data to be made easily accessible to citizens, businesses, and state and local governments. Data have growing added value for businesses in an information economy increasingly driven by intellectual capital, and this has allowed for new business formation and facilitated transparency and competition. While companies are generating ever-increasing amounts of big data from their own operations, it is often the combination of proprietary data with comprehensive government data that provide critical context and allow for maximum strategic benefit (a public good externality). Given the relatively low cost of government data production and the still rapid pace of information-related technological change, it is sound public investment to support budgets that will allow the US government statistical agencies to expand the quality, scope, access, and timeliness of their efforts.

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