Big Data Analysis

Investment in Real Time and High Definition[1]

Ali B. Barlas, María Paula Castañeda, Seda Güler, Berk Isa, Alvaro Ortiz, Saide Salazar, Tomasa Rodrigo, Sirenia Vazquez

September 2020

Economists normally rely on information by Statistical Agencies and Central Banks (hard data) and private surveys to firms from the manufacturing and services sectors (soft data) to assess the state of the business cycle. While the official information is carefully designed to understand the state of the business cycle in terms of consistency it also has some shortcomings such as some time lags in the official releases and the qualitative information included in the surveys. A new strand of the empirical literature has focused on tracking the economic activity in real time and high definition, particularly since the Covid-19, given the need to assess the cycle after this crisis. Analysts and Central Banks have reacted either by focusing on more timely soft data indicators like surveys or developing high frequency weekly models (such as the new Weekly economic indexes released by the FED & Bundesbank), while some researchers have started to develop new indicators building on Big Data information. Following our previous work tracking consumption with credit and debit cards transactions, we introduce now a set of novel Big Data indicators to track Investment in Real Time and High Definition extending the individual-to-firm credit/debit card transactions with firm-to-firm bank transactions. We develop a new Big Data investment indicator in real time, with sectorial and geographical disaggregation for Turkey using BBVA transaction data. The results are successful and validated by cross correlations with the official figures, with alternative higher frequency proxies of investment and in terms of improving the forecasting accuracy of our standard nowcasting Dynamic Factor Models. These positive results could be extended to other emerging countries like Mexico and Colombia, but also to developed countries such as Spain, where we also find high correlations of the estimated indices with official figures and monthly proxies of investment. While Turkey´s investment is recovering relatively faster in construction and machinery investment, Spain, Mexico and Colombia show a weaker recovery with construction bottoming out but still lagging machinery investment.

Higher uncertainty enhances efforts for real time assessment

The high uncertainty triggered by the Covid-19 crisis has stressed the need to monitor the evolution of the economy in “real time”. These efforts have been materialized in several ways:

- **Focusing on timely, alternative indicators:** Some analysts have mainly focused on timely indicators such as the soft data surveys (particularly the Purchasing Manager Indexes, PMIs) and other high frequency indicators like electricity production or chain store sales released on daily or weekly basis.
- **Developing higher frequency models:** Some Central Banks introduced alternative higher frequency indicators and developed weekly activity tracker models such as the FED (Lewis, Mertens & Stock, 2020)[2] and the Bundesbank Weekly Activity Index or WAI (Eraslan, S. and T. Götz, 2020).

[1] This economic watch is a short version of a forthcoming working paper Investment in Real Time and High Definition (2020)

[2] Lewis, D., K. Mertens, and J.H. Stock. 2020. “U.S. Economic Activity during the Early Weeks of the SARS-Cov-2 Outbreak,” Federal Reserve Bank of New York *Staff Reports*, no. 920, April.

- **Developing New Big Data Indicators:** A new stream of work[3], including our previous research[4], has focused on the use of daily aggregate information of banking transactions to nowcast consumption and thus track consumption in real time. We update our real time and high definition consumption indicators for seven countries (Spain, Mexico, Turkey, Colombia, Peru, Argentina and USA) on a weekly basis in the following link.

In this economic watch, we take a step forward and **present a novel set of indicators which use real time and high definition information to track investment.** In order to do that, we aggregate (working with anonymized data) the individual-to-firm and the firm-to-firm transactions done through BBVA to measure investment expenditures in real time and high definition in detail for Turkey. We also show how these results can be extended to Spain, Mexico and Colombia. This is particularly important for economists, analysts and policy makers, including central banks, for several relevant reasons: first, investment is more volatile than consumption and the official information usually comes with longer time lags than consumption data, especially in emerging market countries. Second, construction and residential investment constitute an important share of investment and the systemic implications for the banking and financial systems are quite relevant as the global 2008-2009 crisis revealed. Third, granular information on different investment activities and their geography can provide important information on the investment needs and credit allocation, resulting in a more relevant analysis on how productive the economy is.

Investment in real time and high definition: Methodology

Big Data typically works to track the economy and has focused on measuring consumption in real time by aggregating, cleaning and parsing banking transactions in operated Point of Sales (PoS) and transactions done by credit and debit cards. This transaction data can be obtained from a bank individual database (Carvallo et al, 2020, Andersen et al, 2020) or from information compiled by some specific companies (Chetty et al, 2020, Kurst, 2020).

While consumption is basically done by households (a payment from a consumer to a firm), an important share of the investment spending is done by companies (which could be tracked through firm-to-firm transactions). An illustrative example is the case of machinery expenditure, which is registered as a firm-to-firm transaction. However, there are important exceptions such as the purchase of a new house by households, which is considered investment in dwellings in national accounts. Therefore, in order to develop a real time investment proxy we need a database which includes both individuals-to-firm transactions, but also firm-to-firms. Particularly, we need to identify, aggregate and parse the transactions or payments from individuals and firms to other firms. Firms are classified in our data according to their matches with the corresponding NACE codes to identify their business activity in line with the European statistical classification of sectors.

In the case of Turkey, we use the transaction data of Garanti BBVA, which includes all the anonymized monetary transactions done by Garanti BBVA clients. Then, we monitor and filter out the transactions of the corporate clients

[3] A selection of papers, besides the April 14th 2020 draft of this paper, includes Andersen, Hansen, Johannesen, & Sheridan (2020a), Andersen, Hansen, Johannesen, & Sheridan (2020b), Alexander & Karger (2020), Baker, Farrokhnia, Meyer, Pagel, & Yannelis (2020a), Baker, Farrokhnia, Meyer, Pagel, & Yannelis (2020b), Bounie, Camara, & Galbraith (2020), Chetty, Friedman, Hendren, & Stepner (2020), Chronopoulos, Lukas, & Wilson (2020), Cox, Ganong, Noel, Vavra, Wong, Farrell, & Greig (2020), Surico, Kanzig, & Hacioglu (2020).

[4] Carvalho, V, S Hansen, A. Ortiz, J R García, T Rodrigo, J V Rodríguez Mora and P Ruiz (2020), "Tracking the Covid-19 crisis with high-resolution transaction data", CEPR DP No. 14642. Bodas, D., López, J. R. G., López, T. R., de Aguirre, P. R., Ulloa, C. A., Arias, J. M., de Dios Romero Palop, J., Lapaz, H. V., & Pacce, M. J. (2019). Measuring retail trade using card transactional data. Working Papers 1921, Banco de España;

of Garanti BBVA to capture the investment expenditures. Particularly, we identify the inflows to the fixed investment producer firms from the rest of the economic agents, including companies and individuals (all clients). For example, the total number of firms we track for investment expenditures stands at 179,748 during 2019 (23,240 of them in the construction sector and 156,508 in the machinery group), which corresponds to a total number of transactions at 24,663,594 (2,346,696 in construction and 22,316,898 in machinery) with a nominal value of 1,748bnTL (308.2bn$).

Second, we approximate investment demand in one type of asset[5] by aggregating flows or transactions by any firm or individual to the sector which produce the fixed assets. The activities assigned to each type of information are as follows:

- Machinery Investment: transfers or flows from the different economic agents to the sectors of Machinery & Equipment, Media & ICT, Agriculture & Animals, Forestry, Durable Goods, Retail Trade, Textile & Clothing, Transportation and Shipping. Here, we can also include a subgroup of "Transportation" by including Transportation and Shipping.
- Construction Investment: transfers or flows from the different economic agents to the activity of the construction sector.

Third, to make an aggregate investment expenditures indicator, we use the historical shares of the subcomponents in the official data by excluding the share of "Other Investments". They represent approximately 9% of the total investment and at this point we assume they are included in the sub-items we have already generated.

Finally, once we estimate the nominal values for Machinery and Construction investment proxies, we deflate their annual growth rates with the Domestic Producer Price Index (D-PPI) to obtain the real growth rates. As a cross-check, we also deflate the series with the correspondent producer price deflators but given the absence of a complete set of D-PPI individual deflators for all of the components and the fact that results does not change significantly, we opt to use the general D-PPI for all of the components.

Investment in real time and High Definition: The case of Turkey

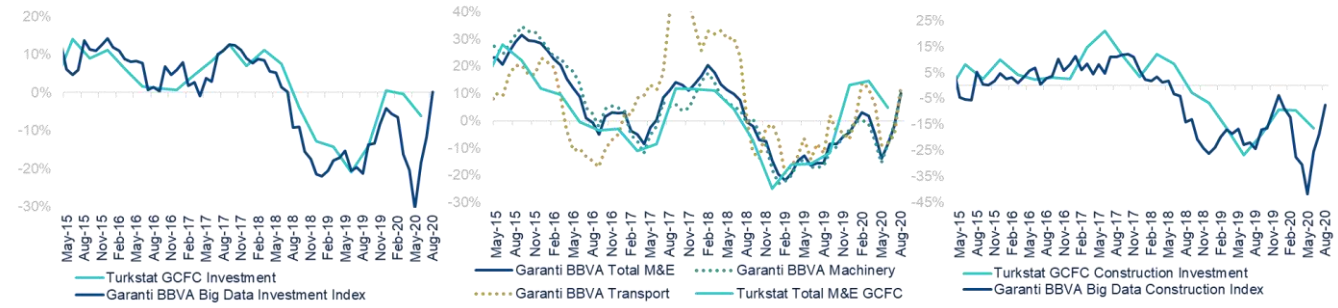
In this section we show the results of our estimations as well as the validation and forecast accuracy exercises. We first check the pattern and correlation of our estimated Big Data indicators with the official indexes and test how the Big Data information compares with alternative proxies outside national accounts. Then, we test whether the inclusion of the indexes improves the accuracy of a standard Dynamic Factor Model for both GDP and Investment.

Figure 1 below shows the Big Data Garanti-BBVA Investment Indices with the official quarterly figures developed by the Turkish National Statistics Office (TURKSTAT). The graph shows that the Big Data indexes have a good fit with the official statistics and the correlation coefficients over the last 5 years (March 2015 to March 2020) are significant and high: 0.88 for the Aggregate Gross Fixed Capital formation, 0.84 for machinery Investment and 0.77 construction investment. Beyond the high correlation for all the general components, the graph illustrates the advantage of using

[5] Garanti BBVA has its own definition of subsectors and these are the following: Media & ICT, Durables Goods, Energy, Finance, Real Estate, Shipping, Construction, Chemistry & Plastics, Public Services, Public Institutions & Municipalities, Mining & Metallic Products, Machinery & Equipment, Forestry, Special Institutions, Retail Trade, Agriculture & Animals, Textile & Clothing, Tourism & Entertainment, Transportation and Other Services. Our starting point has been the selection of sectors where we have chosen the relevant sectors from this classification (the ones operating mostly with capital) taking into account the TURKSTAT and ESA guidelines.

Big Data indicators in terms of updated information as we can incorporate between one and three months of information in advance.

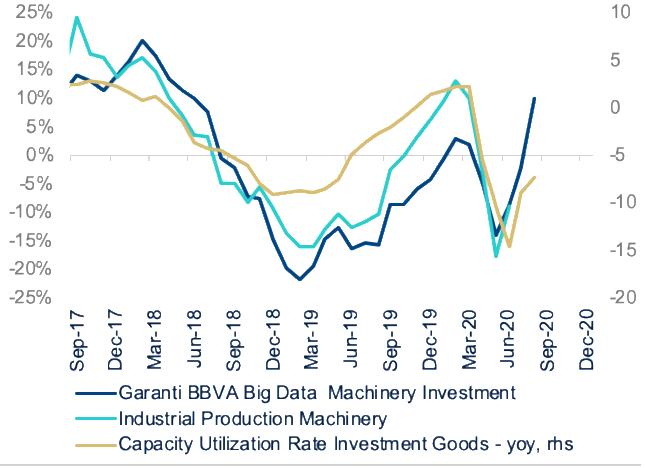
Figure 1. Turkey: BBVA Big Data Investment Index: total and components (YoY, 3 month moving averages)



Source: BBVA Research

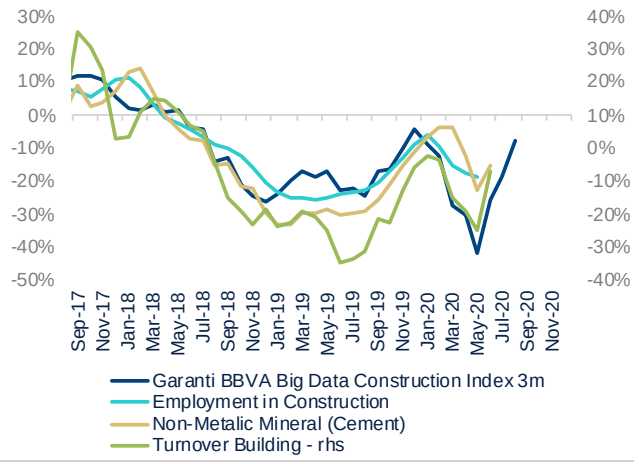
We also validate our Big Data indicators with non-national accounts alternative indicators to assure that what we are measuring is consistent with what is happening according to some high frequency alternative proxy measures of investment. Figure 2 shows the monthly evolution of machinery production and the change in capacity utilization in investment goods. The graph shows a common pattern and the correlation coefficients are again high (0.75 with Industrial Production and 0.79 with the change in capacity utilization). In the case of construction investment (Figure 3), the validation exercise leads to similar results, showing a common and consistent pattern with employment in construction (0.85 correlation), production of non-metallic minerals mainly composed of cement (0.72 correlation) and the turnover of construction (0.90 correlation).

Figure 2. BBVA Big Data Machinery and proxies (YoY, 3 month moving averages)



Source: BBVA Research

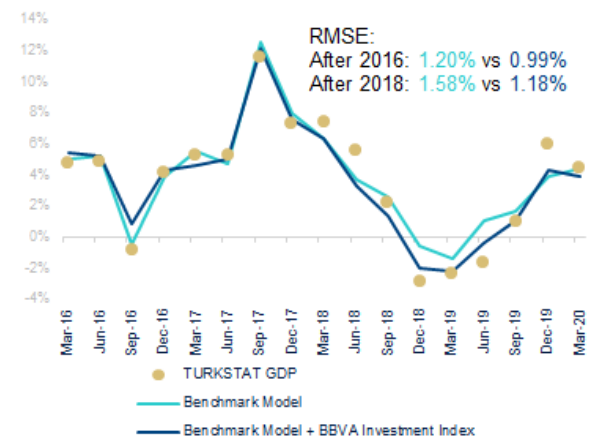
Figure 3. BBVA Big Data Construction and proxies (YoY, 3 month moving averages)



Source: BBVA Research

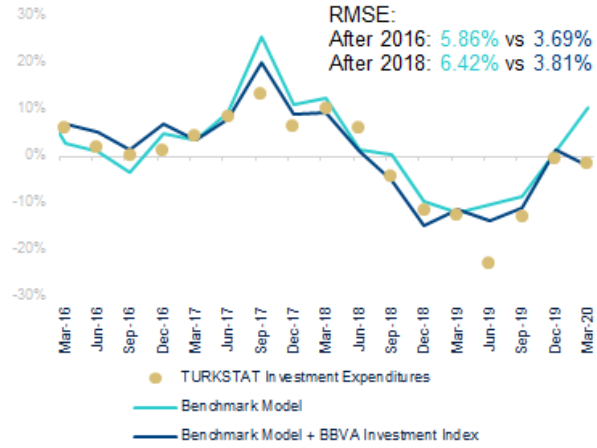
Finally, we test whether the inclusion of this high frequency Investment Index can improve the standard nowcasting models[6].The results are successful (it can be observed in Figures 4 and 5) as they confirm the improvement of the forecast accuracy when we use the Big Data Investment information. For both the GDP and Investment nowcasting models, the inclusion of the Investment Index in the alternative model significantly improves the real-time nowcasting performance with lower Root Mean Squared Errors (RMSE). The RMSE of the sample including the Big Data information is reduced by more than two percentage points (37%, from 5.86% to 3.69%) and remains relevant after the Turkish financial crisis where the error is also reduced (near 40%, from 6.42% to 3.81%). The reduction in terms of the GDP model is obviously lower as investment indicators have a lower share than other components like consumption in the GDP. However, it continues to be significant in both samples, the long sample (near 16%, from 1.20% to 0.99%) and the more recent one after the financial crisis (near 25%, from 1.58% to 1.18%).

Figure 4. Backtests for GDP Nowcast (Benchmark & Alternative Model, YoY)



Source: BBVA Research

Figure 5. Backtests for Investment Nowcast (Benchmark & Alternative Model, YoY)



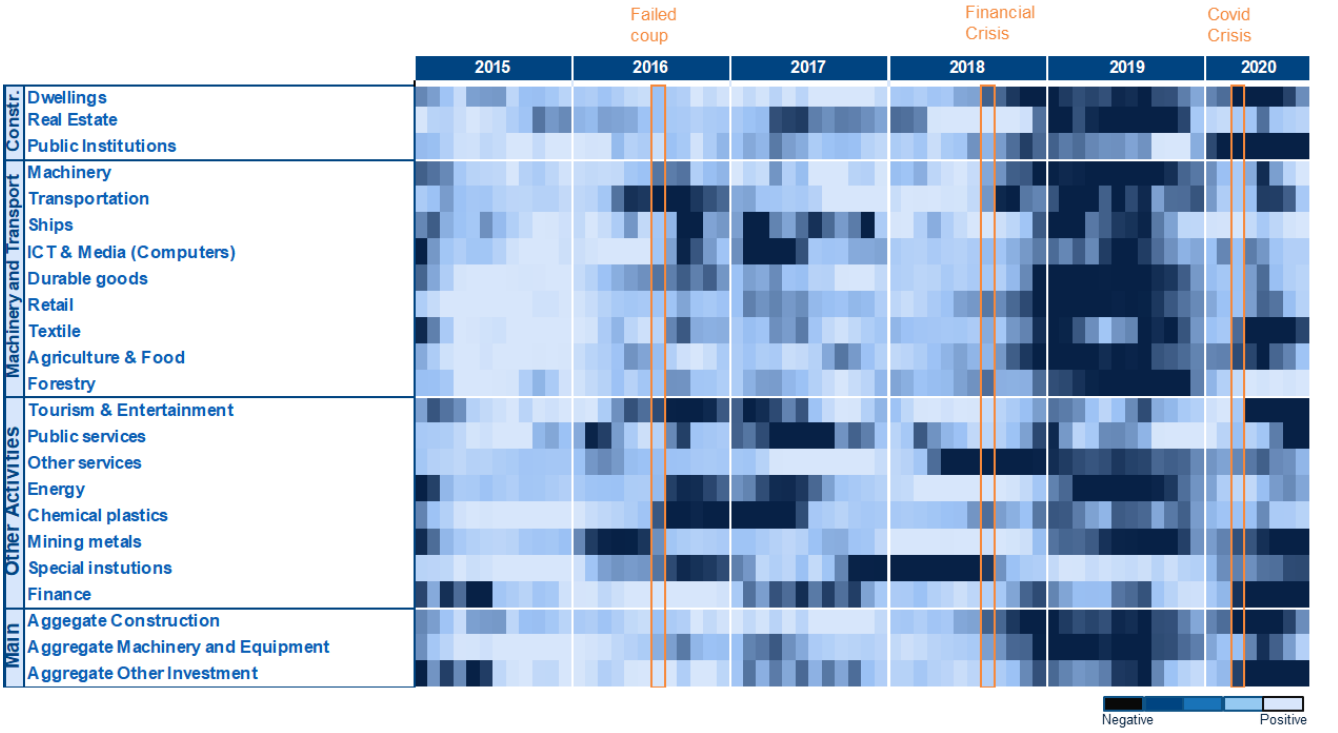
Source: BBVA Research

Beyond obtaining the real time indicators, **the Big Data developed indices present additional advantages by showing the evolution of the investment in high "definition" in terms of sectorial and geographical basis.**

Figure 6 shows the evolution of the Big Data investment flows by different activities grouped by those included in the three big aggregates: construction, machinery and transport and other investments. The heat map shows the year over year evolution of the three month moving averages data to match the quarterly figures that we present month by month in the table. The darker blue colors stand for the 10% low percentile while lighter blue colors represent the higher growth rates of 90% percentile.

[6] In order to track economic activity in real time, we are using monthly Dynamic Factor Models as in the Banbura & Modugno (2014)6 and Modugno, Soybilgen & Yazgan (2016)6, that nowcasts yearly growth rates of GDP and its subcomponents for Turkey.

Figure 6. Sectorial Big Data Investment 2015-2017 (YoY 3 month moving averages)



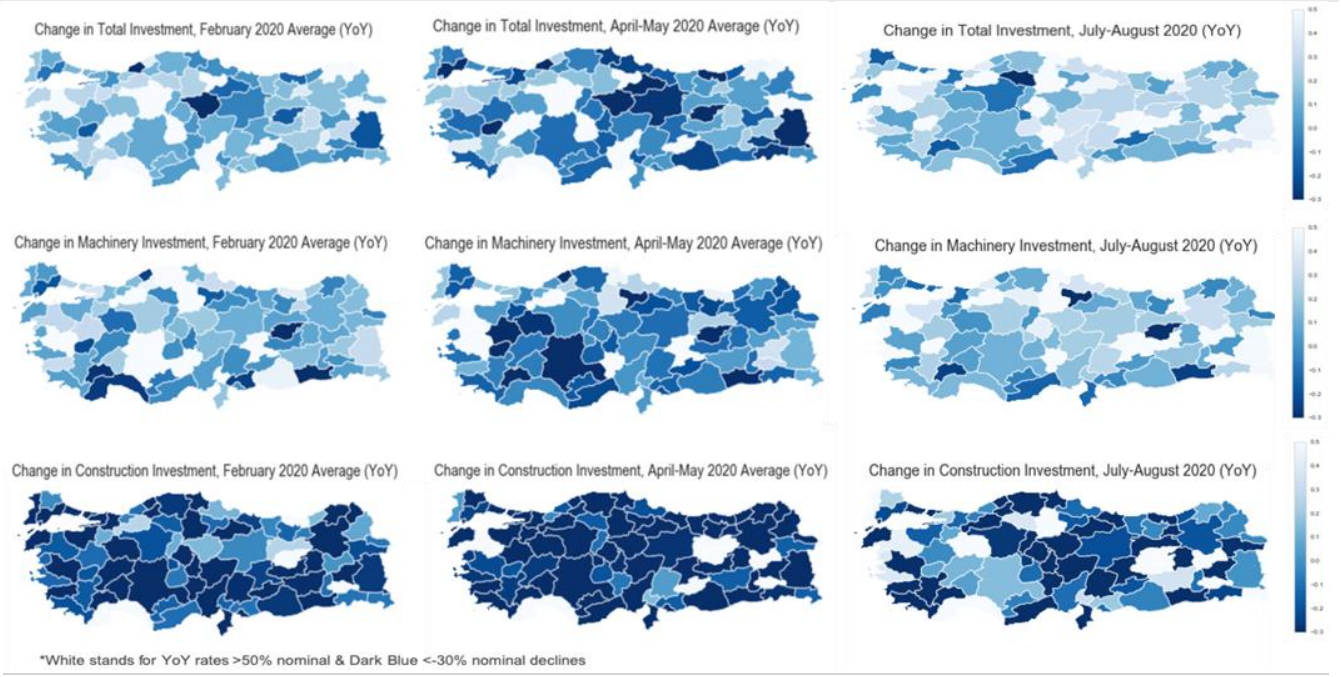
Source: BBVA Research

The evolution of the Turkish economy from 2015 to 2020 (including August) makes Turkey an interesting case of study to assess the impact of different shocks on investment within their sectorial activities. In this period, three important and different shocks hit the economy (marked in orange in Figure 6): the failed coup experience in July of 2016, the financial crisis during the summer of 2018 and the recent Covid-19 shock. The response of the investment to these events has been somehow different as they were of different nature:

1. **The response to the failed coup (political uncertainty shock)** was short lived and concentrated on some specific segments as it is shown by the short term non-homogeneous dark colors in the heat map. The negative impact was mainly observed in transportation, while construction and machinery equipment were not specifically affected and they recovered very rapidly once the initial political shock died out. The impact on tourism was longer, but this was also related to the round of terrorist attacks in the big cities of Turkey that took place at the same time.
2. **The response to the summer 2018 financial crisis (currency shock)** was more intense and homogeneous. After the sharp depreciation of the Turkish lira (near 40%), the capital flows suddenly stopped and credits declined rapidly for most of the activities. The shock to investment started just after the financial crisis for most of the sectors until the end of 2019 when credits started to grow after one and a half year of rapid and deep de-leveraging of the sector.
3. **The response to the Covid-19 (pandemic shock)** has been so far in the middle of the previous two shocks in terms of intensity, homogeneity and length. One special point to mention is the temporary shock to investment in Turkish sectors highly integrated in the global value chains such as textile and automobile sectors (i.e transportation) affected by the shut-down of the external markets. Besides, sectors affected by the mobility restrictions, like tourism and entertainment sectors, suffered the most. Contrary to the previous crisis, public investment did not play the traditional anti-cyclical role as public finances were constrained.

Another important advantage of the Big Data information from BBVA is that the information is geo-localized. This allows to track the inflows on investment activities on regional basis and by sector activity. Figure 7 shows how the Covid-19 shock has affected the different aggregates on geographical basis by showing the average yearly growth rates immediately before the restriction mobility measures were imposed (February 2020), the period including most of the mobility restrictions (April-May 2020) and the recovery and ease of these mobility restrictions (July-August 2020). Figure 7 confirms some of the observations from the sectorial analysis and describes also the geographical response:

Figure 7. Geographical Response of Big Data Investment in big Aggregates to the Covid-19 shock
(Pre Covid-19: February 2020, Covid-19: April-May 2020, Post Covid-19: July-August 2020)



Source: BBVA Research

1. The first important highlight is that the negative effects on investment by Covid-19 shock have not been neither as homogeneous nor as permanent as the 2018 financial shock, neither in sectorial data nor on geographical terms. The key reason for this is that machinery investment response has been more differentiated and dispersed and construction was not experiencing a previous boom this time.
2. The response of machinery investment aggregate shows a rapid recovery after this shock in the post Covi-19 period and its dispersion has been heterogeneous. The big cities such as Istanbul or Ankara were not specially affected relative to other regions, but as we move from the East to the West of the country, we observe higher declines (dark blue patterns). This is not strange at all since it is precisely where the manufacturing industry is mainly located (see Akcigit et al, 2019) and it is consistent with the well-known regional East-West dualism in Turkey (Gezici, Walsh and Kacar, 2017). The fact that the export oriented industries are located also in these provinces can explain the higher impact too. The pattern also suggests that the provinces specialized in products such as metal products and electrical machinery (West & South of Central Anatolia and North Aegean & Thrace region) related with the car Global Value Chain industry experienced sharper temporal declines than the textile Global Value Chain, which had an important presence also in the East Mediterranean regions and East of South Anatolia.
3. The response of the Construction Investment has been more homogeneous and it is also recovering faster so far than during the 2018 financial crisis shock. Facing a more negative than machinery pre-Covid-19 period (as the construction industry was experiencing some de-leveraging consequence of the previous

financial crisis), the initial response was homogeneous and amplified the already weak situation. However, the situation started to improve since June, at least in the big cities and the coast, but with some affected areas (in dark blue in the heat map) in the center of Anatolia and in the middle of the country. Whether this is the result of different allocation of credit or a different response to the macroprudential policies implemented by policymakers during the Covid-19 is beyond this research.

Can we extend the results to other countries? The case of Spain, Mexico and Colombia

In the first sections we have shown the relevance of the Big Data information for the Turkish investment, but can we extend the results to other countries? Here we show that the results of our Big Data Investment Indicators can be extended for Spain, Mexico and Colombia by comparing the evolution of the obtained indicators with the official figures from National Accounts statistics and alternative monthly indicators used as proxies of investment.

The Tables 1 and 2 and Figures 8 and 10 show the estimated BBVA Big Data Investment Indices (for Turkey, Spain, Mexico and Colombia) correlations with the official figures for Gross Fixed Capital Formation (GFCF) and the alternative proxies of investment. The results show that the BBVA estimated indicators present a high correlation with the official figures with the advantage of being available in real time. This provides an advantage in terms of anticipation to the investment official information, which can be also incorporated to standard nowcasting models.

Table 1. Correlation of BBVA Big Data Investment Index and National accounts

	Correlation with National Accounts		
Turkey (Mar 15 - Mar 20)	Total	M&E	Construction
BBVA Real Big Data Investment indicators	0,88	0,84	0,77
BBVA Nominal Big Data Investment indicators	0,83	0,73	0,79
Spain (Mar 18 - Mar 20)			
BBVA Real Big Data Investment indicators	0,78	0,58	0,73
BBVA Nominal Big Data Investment indicators	0,82	0,63	0,75
Mexico (Jul 18 - May 20)			
BBVA Real Big Data Investment indicators	0,84	0,7	0,76
BBVA Nominal Big Data Investment indicators	0,9	0,65	0,78
Colombia (Mar 15 - Jun 20)			
BBVA Real Big Data Investment indicators	0.86	0.76	0.64
BBVA Nominal Big Data Investment indicators	0.82	n.a	n.a

Source: BBVA Research

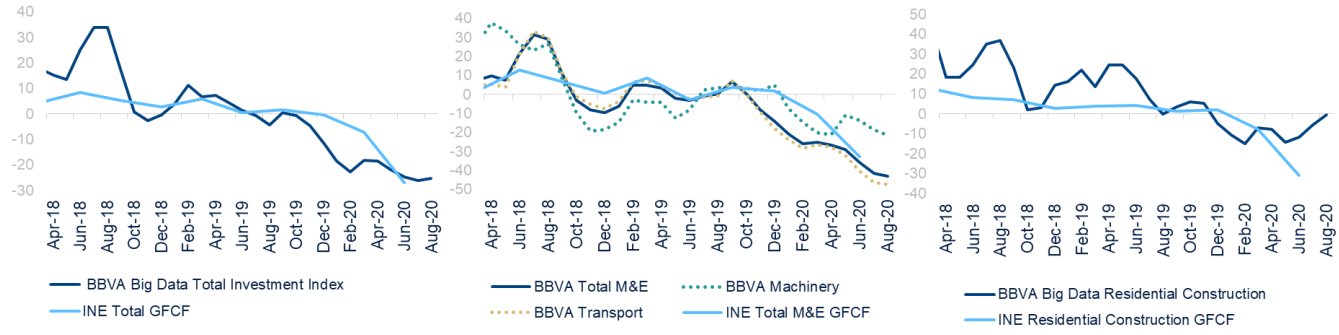
Table 2. Correlation of BBVA Big Data Investment Index and investment proxies

	Correlation with National Accounts	Correlation with BBVA Real Big Data Investment indicators	Correlation with BBVA Nominal Big Data Investment indicators
Turkey (Mar 15 - Mar 20)			
M&E			
Industrial production	0.78	0.75	0.55
Capacity Utilization	0.78	0.79	0.30
Construction			
Employment	0.87	0.85	0.58
Non-Metalic Mineral (e.g. Cement)	0.71	0.72	0.46
Turnover Building	0.77	0.90	0.56
Spain (Mar 18 - Mar 20)			
M&E			
Industrial production	0.72	0.54	0.66
Industrial confidence capital goods	0.72	0.62	0.7
Turnover	0.68	0.51	0.63
Construction			
Employment	0.84	0.73	0.76
Non-Metalic Mineral (e.g. Cement)	0.79	0.77	0.76
Turnover	0.89	0.75	0.64
Mexico (Jul 18 - May 20)			
M&E			
Industrial production	0.82	0.72	0.75
Capacity Utilization	0.8	0.62	0.63
Construction			
Employment	0.86	0.85	0.87
Industrial production	0.99	0.68	0.72
Colombia (Mar 15 - Jun 20)			
M&E			
Industrial production	0.57	0.74	0.54
Electrical equipment	0.72	0.69	0.7
Construction			
Industrial production	0.67	0.77	0.74
Non-metallic minerals	0.78	0.78	0.87

Source: BBVA Research

In the case of Spain (Figure 8 and Table 1), the correlation coefficient for the last 2 years (March 2018 to March 2020) of the BBVA Big Data Total Investment Index with the yearly growth of the official data of GFCF provided by the Spanish National Institute of Statistics (INE) is 0.78, with the advantage that the data is available some weeks in advance compared to the official figures. By components, the correlation with National accounts figures is 0.58 for total machinery and equipment Investment and 0.73 for construction investment. This is also important given the association of the systemic risks with the housing cycle. As shown in Figure 8, the response of investment to the Covid-19 crisis has been different in the main aggregates. While the crisis affected both components, construction investment has started to recover and it is close to the positive territory. Contrary, Machinery equipment continues to adjust, which is mainly the result of the sharp adjustment in transport investment, as machinery experiences a less intense adjustment, although it also continues at negative year over year growth rates.

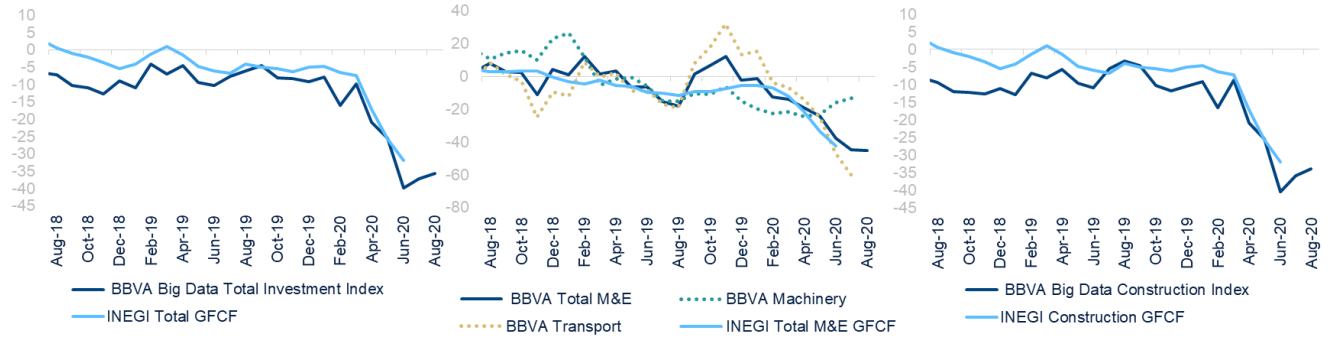
Figure 8. Spain: BBVA Big Data Investment Index: total and components (YoY, 3 month moving averages)



Source: BBVA Research

In Mexico (Figure 9 and Table 1), the correlation between our Big Data indicators for Investment and the official figures is even higher. Particularly, for the last 2 years (July 2018 to May 2020), the correlation coefficient of the BBVA Big Data Total Investment Index and the growth of total investment provided by the National Institute of Statistic and Geography (INEGI) is 0.84. As in the Spanish case, the correlation is slightly higher in the case of construction investment (0.76) than in the Machinery investment (0.7). The high frequency of our indicators is especially relevant to monitor a period of high uncertainty at the current moment given the Covid-19 crisis.

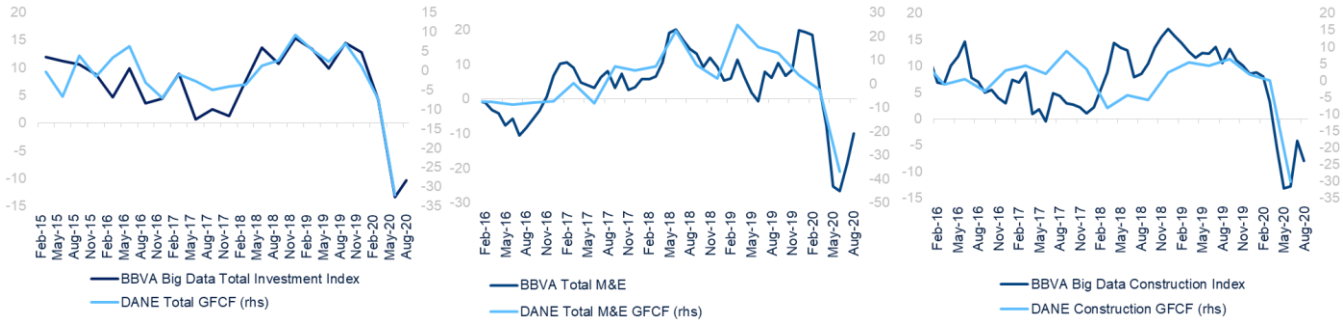
Figure 9. Mexico: BBVA Big Data Investment Index: total and components (YoY, 3 month moving averages)



Source: BBVA Research

In the case of another emerging country like Colombia (Figure 10), the estimated indicators match quite well with official figures too. The correlation coefficient for the last 5 years (March 2015 to March 2020) of the BBVA Big Data Total Investment Index and the official data of GFCF provided by the National Administrative Department of Statistics (DANE) is 0.86. By components, the correlation for machinery Investment is 0.76 and for construction investment 0.64.

Figure 10. Colombia: BBVA Big Data Investment Index: total and components (YoY, 3 month moving averages)



Source: BBVA Research

As in the Turkish case, we validate our developed Big Data indicators by comparing them with higher frequency proxies of official investment data (on monthly basis). Table 2 above shows the results. In the case of Spain, the correlation coefficient between the BBVA Big Data Machinery Investment Index and the industrial confidence on capital goods is close to 0.62, higher than with industrial production (0.54) and equipment turnover (0.51). This positive result holds for construction too, where our Big Data Construction Investment indicator correlates well with cement demand (0.77 correlation coefficient), construction turnover (0.75) and employment in construction (0.73). Therefore, the estimated indicators allows to monitor the investment evolution over time in higher frequency and with higher sectorial and geographical definition as in the case of Turkey.

This robustness exercise gives also positive results for Mexico. The BBVA Big Data Investment Indices correlate quite well with the investment proxies on a monthly basis. In the case of Machinery Investment, the correlation coefficient of the BBVA Big Data Machinery Investment and the industrial production of machinery is 0.72, and it is slightly lower in the case of capacity utilization (0.62). As it happens for Turkey and Spain, the correlation of our estimated BBVA Big Data Construction Investment with the construction proxies is higher than in the case of machinery. Thus, the correlation coefficient of the BBVA Big Data Construction Index with the growth of industrial production for construction is 0.85 and, to a lesser extent, the employment in construction (0.68).

Finally, the same conclusion is hold for Colombia, where the correlation coefficient between the BBVA Big Data Machinery Investment Index and industrial production is 0.74 and 0.69 with electrical equipment. In the case of construction, our Big Data Construction Investment indicator correlates quite well too with cement demand (0.78 correlation coefficient) and industrial production on the sector (0.77).

Conclusion

Big Data held by companies and banks provides an unprecedented opportunity to measure economic activity in real time and high definition (i.e at a granular level on sectorial and geographical basis). This data has an enormous potential for policy makers and analysts to react rapidly to incoming news, particularly in uncertain environments.

We present a novel contribution for the analysis of information in real time and high definition by introducing a new set of Big Data indicators to mimic national accounts investment. We extend our previous set of real time consumption indicators (Carvallo et al, 2020) to include not only individual-to-firm transactions (point of sales transactions through credit and debit cards), but also adding individual and firm-to-firm transactions from all the economic sectors to those manufacturing the fixed assets. Particularly, we develop Big Data indicators to replicate the quarterly national accounts for GFCF (i.e Investment) and its main components (Machinery Equipment and Construction) in real time and high definition. We introduce also high definition data on sectorial and geographical basis for Turkey.

The results are satisfactory and robust to several tests. We validate our results through different perspectives from correlations to national accounts figures, validation of the correlations with higher frequency proxies of investment and the validity of our indicators in order to improve the nowcasting accuracy (reducing the out-of- sample error) and enhancing the information news contribution from Big Data information to a standard dynamic factor model. The high definition of the investment indicators obtained through the Big Data information (i.e sectorial and geographical basis) has proved to be also relevant for analysts and policy makers as shown for the case of Turkey. In particular, we find that the pattern of response of investment to the Covid-19 crisis looks different to previous shocks as the financial crisis of 2018, with a less homogeneous impact and a faster recovery so far.

We extend our results to other developed and emerging countries such as Spain, Mexico and Colombia, obtaining similar results in the correlation exercise. The correlation coefficients are high for both the aggregate investment and machinery and construction for the three countries. In Spain, Mexico and Colombia BBVA Big Data construction investment indicators are recovering somehow, with Mexico and Colombia bottoming out and Spain entering into positive growth territory. On the other side, BBVA Big Data Machinery investment index remains lagging for Mexico and Spain, especially in the latter where the BBVA Big Data transport investment index is still stagnant and machinery remains in the negative territory too. In the case of Colombia, it is also stagnant, but it starts to recover.

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ENQUIRIES TO:
BBVA Research: Azul Street. 4. La Vela Building – 4th and 5th floor. 28050 Madrid (Spain).
Tel. +34 91 374 60 00 y +34 91 537 70 00 / Fax (+34) 91 374 25
bbvaresearch@bbva.com www.bbvaresearch.com