



INVESTMENT REPORT  
2021/2022



# Recovery as a springboard for change

Data annex

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## **Investment Report 2021/2022: Recovery as a springboard for change.**

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### **About the Report**

The EIB annual report on Investment and Investment Finance is a product of the EIB Economics Department. It provides a comprehensive overview of the developments and drivers of investment and its finance in the European Union. The report combines an analysis and understanding of key market trends and developments with a more in-depth thematic focus, which this year is devoted to Europe's progress towards a digital and green future in the post-COVID-19 era. The report draws extensively on the results of the annual EIB Investment Survey (EIBIS) and the EIB Municipality Survey. It complements internal EIB analysis with contributions from leading experts in the field.

### **About the Economics Department of the EIB**

The mission of the EIB Economics Department is to provide economic analyses and studies to support the Bank in its operations and in the definition of its positioning, strategy and policy. The director of Economics Department, Debora Revoltella, heads a team of 40 economists.

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### **Disclaimer**

The views expressed in this publication are those of the authors and do not necessarily reflect the position of the EIB.

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**Data annex**

Glossary of terms and acronyms

## Data annex

The availability and quality of the data on investment are critical to supporting effective policymaking. In addition to national accounts, economists need to rely on other sources of macroeconomic data to analyse important aspects of investment, including infrastructure investment and intangible investment, and they increasingly make use of firm-level data.

The EIB has taken important steps towards bridging some of the data gaps by developing an internally consistent methodology to estimate infrastructure investment and public-private partnership (PPP) finance. It also runs a survey on corporate investment and investment finance and has created a database on patents broken down by activity, based on patent data counted using the European Patent Office's PATSTAT database. Finally it has developed a database on investment in climate change mitigation. This annex outlines these datasets and provides references to detailed methodological notes.

### Estimating infrastructure investment in the European Union

Data on infrastructure investment or its financing sources are not available in a ready-to-use form. Over the years, the EIB has developed a methodology to estimate infrastructure investment.

The basic idea is to use Eurostat's national accounts data on gross fixed capital formation (GFCF) in the sectors commonly considered to be "infrastructure sectors" (education, health, transport and utilities) to construct estimates of total and government infrastructure investment (Wagenvoort, de Nicola and Kappeler, 2010). Non-government infrastructure investment is then derived as the difference between the two.

Next, the aggregate non-government infrastructure investment is broken down into project-based and corporate infrastructure investment. Project-based infrastructure investment consists of public-private partnership projects and non-PPP projects. These components are obtained from IJ Global, where EPEC<sup>1</sup> data assist in delineating the portion represented by public-private partnerships. The total remaining after project-based infrastructure investment is subtracted from the non-government figure therefore serves as a proxy for corporate infrastructure investment.

Finally, Eurostat data on gross fixed capital formation in other buildings and structures were made publicly available after the publication of Wagenvoort et al. (2010). Thanks to these data, a more precise proxy for infrastructure investment can be used. These data have the advantage of excluding many non-infrastructure investments — such as investments in trucks or in other machinery and equipment (included in total fixed assets) — and therefore reduce the risk of overestimating infrastructure investments. The Eurostat data also enable us to differentiate between gross fixed capital formation in the transport sector and in the information and communication technology (ICT) sector (which were previously grouped together), giving us a more granular view of individual investment trends across different sectors.

Although the data on gross fixed capital formation in other buildings and structures capture infrastructure investment more closely, a few caveats remain. The most important one is that the data do not enable us to distinguish between GFCF in total fixed assets and in other buildings and structures for the government sector. We therefore have to calculate an approximate total for government investment in other buildings and structures. To do so, we use the following formula:

$$GGFCF(obs) = GGFCF(tfa) * \left( \frac{\text{government net capital stock}(obs)}{\text{government net capital stock}(tfa)} - \text{implied depreciation} \right),$$

1 European PPP Expertise Data Centre (EPEC) data portal: <https://data.eib.org/epec>

where  $GGFCF(obs)$  and  $GGFCF(tfa)$  are, respectively, government GFCF in other buildings and structures and in total fixed assets, where implied depreciation is derived for the total economy as:

$$implied\ depreciation = \left( \frac{total\ economy\ net\ capital\ stock(obs)}{total\ economy\ net\ capital\ stock(tfa)} - \frac{GFCF(obs)}{GFCF(tfa)} \right)$$

We therefore use the share of other buildings and structures in the government net capital stock as a proxy for the share of government GFCF in other buildings and structures (adjusted for differences in depreciation rates). In other words, we assume that the share of government GFCF in other buildings and structures is equal to its historical share.

Note that applying this formula requires us to make two minor data adjustments. First, when data on the net capital stock of a country are missing, we replace the missing value with the average net capital stock of the region in which the country is located (Western and Northern Europe, Southern Europe or Central and Eastern Europe). Second, to deal with outliers, we set negative implied depreciation differentials equal to zero.

## EIB Investment Survey

### General module

The EIB carries out an annual survey of firms in the European Union (EIBIS general module) with the aim of monitoring investment and investment finance activities and capturing potential barriers to investment. The survey covers approximately 12 500 companies across the European Union and the United Kingdom every year and slightly more than 800 firms in the United States for the last three waves. It is administered by telephone (in the local language) and takes an average of 20 minutes to complete. The first wave of the survey took place in 2016 and the survey completed its sixth wave in 2021, with interviews held between April and July 2021.

Using a stratified sampling methodology, the EIBIS general module is representative of all 27 Member States of the European Union, the United Kingdom and the United States. It is representative of four firm size classes (micro, small, medium and large) and four sector groupings (manufacturing, services, construction and infrastructure) within the individual countries.

Firms have to have a minimum of five employees to be interviewed, with full-time and part-time employees counted as one and employees working less than 12 hours per week excluded. Eligible respondents are employees in senior positions with responsibility for investment decisions.

The survey is designed to build a panel of observations over time, and is set up in such a way that survey data can be linked to firms' reported balance sheet and profit-and-loss data (see EIBIS-Orbis matched dataset below). Approximately 40% of the companies interviewed in each wave are companies that have already taken part in the survey in the previous wave.

The EIBIS general module complements pre-existing information on investment activities in the European Union. It adds a firm-level dimension to the macroeconomic data available and thus facilitates a more fine-grained analysis of firm investment patterns. It also adds to existing firm-level surveys at a national level by providing full comparability of results across countries. The survey complements the European Commission investment survey by asking a much wider set of qualitative and quantitative questions on firm investment activities. It rounds out the European Central Bank/European Commission SAFE survey by focusing on the link between firm investment and investment finance decisions.

**Table 1**  
**EIBIS at a glance**

|        |  |
|--------|--|
| 27     | EU Member States are all consistently represented by the survey — more specifically, non-financial enterprises with at least five employees and belonging to NACE categories C to J. |
| 4      | industry groupings and size classes determine the representativeness of the data within almost every member country.   |
| 11 920 | firms belonging to the European Union participated in the last wave of the survey.   |
| 802    | US firms participated in the last wave of the survey.  |
| 43%    | of all firms participating in the last wave responded in at least two consecutive waves.   |
| 89%    | of firms surveyed in 2021 agreed to be contacted again for next year's survey.   |

The EIBIS is a very powerful instrument built according to the highest scientific standards. To guarantee top quality, every step of the survey process is executed and closely monitored by experts in the field. All steps — sampling and weighting, questionnaire development and translation, the fieldwork, and quality control and data processing — are also subject to strict controls and validation. More information on these technical aspects can be found in the technical report produced by the market research company conducting the survey (Ipsos MORI, 2020). Table 1 presents key numbers about EIBIS.

All aggregated data using the EIBIS general module in this report are weighted by value added to reflect the contribution of different firms to economic output more closely. The aggregate survey data and a detailed account of the survey methodology are available on [www.eib.org/eibis](http://www.eib.org/eibis).

### Representativeness of the general module

The EIB Investment Survey is designed to be representative for the European Union, the United Kingdom and the United States at a country level and for most countries at a country-industry-group and country-size-class level.

In a recent EIB working paper (Brutscher, Coali, Delanote and Harasztosi, 2020), we assessed the data quality of the EIBIS in three steps. First, we benchmarked the sampling frame from which all survey respondents are drawn, the Bureau van Dijk Orbis database, against official statistics to see how well our sampling frame captures the relevant business population.

Second, we compared the final EIBIS sample against firms drawn at random from the same sampling frame and compared statistics constructed from the financial information included in that sampling frame. The purpose of this exercise was to assess whether and to what extent firms' willingness or unwillingness to participate in the survey may have led to a selection bias.

Last, we compared aggregate statistics calculated from the final EIBIS sample to corresponding statistics from Eurostat and the Organisation for Economic Cooperation and Development (OECD). In addition, we compared statistics based on financial information calculated from the EIBIS to the counterpart data obtained from the CompNet database. This purpose of this exercise was to evaluate both the level and dynamics of the financial information calculated from firm-level data.

Overall, the results from all three steps are very positive. First, the assessment of the sampling frame (a comparison of the Bureau van Dijk Orbis dataset with the Eurostat Structural Business Statistics (SBS) for the European Union and the United Kingdom<sup>2</sup> for the relevant sector/size classes) showed coverage ratios (number of firms in Orbis /number of firms in the SBS database) between 75% and 100% for the majority of countries. The ratio is between 50% and 75% in a few countries, and in only four — Cyprus, Greece, Luxembourg and Poland — does the coverage ratio fall below 50%.<sup>3</sup>

<sup>2</sup> For the United States, the statistics were compiled from the US Census Bureau and the Bureau of Economic Analysis.

<sup>3</sup> An important driver of the positive coverage ratio is that the EIBIS samples firms with five or more employees. Coverage ratios tend to be higher for larger firms, so excluding the smallest firms from sampling significantly boosts coverage.

The sampling frame must cover a high percentage of the population of interest for the EIBIS survey results to reflect what is happening in the non-financial corporate sector in the European Union. However, this condition alone is not sufficient because, like any other survey, the EIBIS runs the risk of selection bias if there are systematic differences between firms that are willing to participate in the survey and firms that are not.

Secondly, to test whether (and if so, to what extent) the EIBIS sample is subject to such selection issues, we compared the distribution of a set of financial ratios in the final EIBIS sample against those of five samples drawn at random from the same sampling frame. The financial ratios were calculated using information in Orbis. The idea was that statistically identical distributions between the EIBIS sample and the random samples would provide evidence that selection bias does not pose a major issue for representativeness and vice versa.

Using a Kolmogorov-Smirnov approach to compare the two samples, we find that for almost all countries, the percentage of variables for which the null hypothesis of equal distribution in the EIBIS and random samples is rejected is very low, suggesting a high degree of resemblance between EIBIS and the random sample.<sup>4</sup> In other words, comparing the final EIBIS sample with a series of random samples from the same sampling frame provides little evidence of sampling bias in our data.

Finally, a comparison of the financial information from Orbis for firms in the final EIBIS sample to CompNet data also suggests good coverage of both EIBIS and Orbis information. The CompNet data are based on a “distributed micro-data approach.” Relevant data are extracted from often-confidential firm-level datasets available within national central banks or national statistical institutes and aggregated so that the confidentiality of firm data is preserved. The outcome of CompNet is a wide range of indicators at the country-sector-size-class level.

To assess the final EIBIS sample, we reproduced the same country-sector-size-class level indicators using the Orbis information for firms in the EIBIS (where possible) and compared them to those in the CompNet dataset. What we found is a very close match between the two datasets, with the financial variables in the EIBIS and the CompNet database showing very similar trends.

More information on both the general module and the add-on module in the EIB Investment Survey is available upon request by email to [eibis@eib.org](mailto:eibis@eib.org).

### Add-on module 2021

The add-on module changes every year to provide the EIB with the flexibility it needs to respond to new priorities. In 2021, the add-on module functioned as both an extension module for respondents who completed the general module and agreed to answer some additional questions, and a completely new survey for “fresh” respondents who went through a full set of questions that took approximately 20 to 25 minutes to answer. Approximately 80% of the questions in the full add-on module survey (put to “fresh” respondents) were taken from the general module. The add-on module aimed to gain additional insights into how COVID-19, climate change and digitalisation impacted companies’ investment needs across the European Union.

The 2021 add-on module targeted non-financial small and medium enterprises operating in the manufacturing and services sectors. It was administered in all 27 EU Member States, polling companies in NACE categories C, G and I with a minimum of five employees. No add-on module interviews were conducted in the United Kingdom or United States. Again, eligible respondents were employees holding senior positions in their companies with responsibility for investment decisions and how these are financed.

<sup>4</sup> The Kolmogorov-Smirnov (KS) test is a nonparametric statistical test for the equality of probability distribution between two samples. Unlike a t-test, KS does not just compare the means of a variable, but also tests the null hypothesis that two samples are drawn from the same distribution by quantifying the distance between the empirical distribution functions of two samples. It therefore compares the shapes of the two distributions and evaluates whether the vertical differences between them are statistically significant.

Similar to the general module, the Bureau van Dijk Orbis dataset was used as the sampling frame for the add-on module in all countries. All data in this report that are taken from the EIBIS add-on module are weighted by value added to reflect more closely the contribution of different firms to economic output.

More information on both the general module and the add-on module in the EIB Investment Survey is available upon request by email to [eibis@eib.org](mailto:eibis@eib.org).

### EIB Municipality Survey 2020

In 2020, the EIB Municipality Survey polled 685 municipalities in the European Union on their infrastructure investment activities and associated barriers.

The survey was administered by telephone (in the local language) among mayors, treasurers and/or municipalities' chief civil engineers. It took a median average of 20 minutes to complete. Fieldwork took place between June and August 2020. As part of the survey, 685 municipalities were interviewed in all 27 Member States, split across the following country groupings (regions).

**Table 2**  
**Number of interviews per country grouping**

|                             |     |
|-----------------------------|-----|
| Western and Northern Europe | 268 |
| Southern Europe             | 168 |
| Central and Eastern Europe  | 255 |

The sample frame from which municipalities were randomly selected was a comprehensive list of European municipalities. All larger municipalities were eligible to be included in the exercise. The exact size of the cut-off was decided country by country to ensure a minimum number of interviews for each country, which was between five and 57 (depending on the population size). The survey results can therefore be interpreted as reflecting the views of larger municipalities in each country.

Regional and European Union-wide figures are weighted based on the urban population in each country to take size differences into account. Within each country, the answers are unweighted, which gives each municipality the same weight.

More information about the design of the Municipality Survey can be found in the 2020 EIBIS technical report. The publication is available at [www.eib.org/eibis](http://www.eib.org/eibis).

### EIBIS-Orbis matched dataset

This report includes analysis based on a dataset that combines firm-level information from Bureau van Dijk's Orbis with the EIBIS — the EIBIS-Orbis matched dataset. The matching was carried out by the current survey provider Ipsos to preserve firms' anonymity. Orbis is a proprietary dataset that contains firm-level accounting information and ownership data, gathered and standardised according to a global format that makes accounting data comparable across jurisdictions. Items from the balance sheet and profit-and-loss accounts have been used to construct standard financial ratios that reflect firms' financing activity and financial health. All data were reviewed following standard cleaning procedures to eliminate outliers and inconsistencies. Negative values for fixed assets, total assets and other stock variables were removed and all ratios have been winsorised at 1%.

The matched dataset complements the cross-sectional perspective of the EIBIS with time series information starting in 2000. Custom panel datasets used in several analyses in this report were constructed thanks to this dataset.

## Patent data

Patents grant the applicant exclusive rights to produce or use a specific new device, apparatus or process for a limited period. More specifically, the legal protection gives patent-holders the exclusive right to make, use, sell or import the patented invention for a set period of time, usually 20 years from the filing date, in the country or countries covered.

By providing protection and exclusivity, a patent encourages investment in research and the subsequent innovative work that will put inventions to practical use. By providing temporary exclusive rights to intellectual property, patents give their holders a competitive advantage. Patents can also be licensed or used to help create or finance a spin-off company. Patent-holders, therefore, can derive value from patents even if they are unable to manufacture the product (as is the case of universities, for instance).

A patent filing contains a wealth of technical information that can be useful for follow-up inventions. In addition, the elaborate and well-structured information stored in patent documents facilitates systematic and objective quantitative analyses that can provide insights into technological progress. Indicators based on patent statistics are widely used to assess the inventive and innovative performance of a country or a region. As such, patents reflect a country's inventive activity and its capacity to use and develop knowledge for potential economic gain.

In addition to containing technical details about the innovation in question, patent applications also disclose material on prior inventions, such as any other relevant patents. While patent statistics can be used to measure innovation, statistics on patent citations can be used to assess the spread of knowledge and technology.

Nevertheless, some caveats exist for patent-based indicators. First of all, the propensity to patent varies by technological domain and country. Second, not all innovations are patented (for reasons of secrecy, for example), and not all patented inventions are innovative or even marketable products. Obtaining a patent does not necessarily mean the patented technology is important or has any commercial value. The value of patents varies widely. Last, some patent activity stems from strategic behaviour (such as blocking out or scaring off potential competitors) rather than innovative and valuable R&D efforts.

## PATSTAT

The patent data used in this chapter are sourced from PATSTAT (Worldwide PATent STATistical Database). PATSTAT is a patent statistics database held by the European Patent Office (EPO) and developed in cooperation with the World Intellectual Property Organisation (WIPO), the Organisation for Economic Co-operation and Development (OECD) and Eurostat.

PATSTAT was founded in 2006 and concentrates on raw data, leaving it up to licensed users to create indicators. PATSTAT's raw patent data are collected from more than 100 regional and national patent offices worldwide, including the most important and largest offices such as the EPO, the United States Patent and Trademark Office (USPTO), the WIPO, the Japanese Patent Office (JPO) and the Chinese Patent Office (SIPO).

PATSTAT is a relational database: more than 20 related tables contain information on relevant dates (filing, publication, grant, etc.), applicants and inventors, technological domains, references to prior art, etc. The database is updated twice a year, in the spring and autumn. The data sourced for this report were produced in collaboration with the Centre for Research and Development Monitoring (ECONOM) in Belgium.

## Investment in climate change mitigation

Climate change mitigation investments are spread across many economic sectors, they have diverse effects on greenhouse gas emissions and the data sources have varying degrees of accuracy and consistency.

The estimates drawn together in this report are organised under the following headings: renewable energy and energy networks, energy efficiency, transport infrastructure, agriculture forestry and land use, and R&D spending on low-carbon technologies.

These categories correspond to the EU taxonomy: low-carbon activities (such as renewables, electric vehicles and afforestation that are compatible with a 2050 net zero carbon economy); transition activities (such as building renovation that contribute to a transition to a zero net emissions economy in 2050 but that are not currently operating at an expected optimal level); and enabling activities (such as smart technologies and R&D that facilitate low-carbon performance, substantial emissions reduction or environmentally sustainable investments).

### Renewable energy

The International Energy Agency (IEA) provided estimates of total investment in renewable energy for the regional blocs (European Union, United States and China). These are based on public information and IEA estimates of capacity additions, combined with estimates of investment costs. End-use renewables (such as rooftop solar thermal) are included in renewable generation. The amount is larger for China than for the United States and European Union.

A proportion of investment in networks is assigned to renewable energy. First, network investment is divided between maintenance (replacement of existing lines) and expansion. All expansion is assigned to renewables, as very little non-renewable capacity is being installed.

The remaining investment in maintenance is divided between renewable and non-renewables according to the share of renewable energy in total generation capacity.

### Energy efficiency

The IEA provides estimates of investment in energy efficiency for the United States, China and the European Union from 2014 to 2020. In broad terms, the methodology for calculating these estimates looks at the additional cost of an energy-efficient alternative over and above the less efficient alternative that serves a similar purpose. In the automotive sector, for example, many manufacturers make eco models that are more expensive than the regular model. The cost difference, under the IEA methodology, is assigned to energy efficiency investment. The IEA describes the methodology in detail in its Energy Efficiency Investment Report.

### Transport infrastructure

The OECD International Transport Forum (ITF) collects data annually from its member countries, covering investment, maintenance spending and capital value of transport infrastructure. Data are collected from transport ministries, statistical offices and other institutions designated as official data sources.

The lack of common definitions and practices to measure transport infrastructure spending hinders comparisons between countries. While the survey covers all sources of financing, a number of countries exclude private spending. Coverage of urban spending also varies between countries. Indicators such as the share of GDP needed for investment in transport infrastructure depend on a number of factors, such as the quality and age of existing infrastructure, maturity of the transport system, geography of the country and transport intensity of its productive sector. Caution is therefore required when comparing investment data between countries. However, data for individual countries and country groups are consistent over time and useful for identifying underlying trends in levels of spending. Definitions and methods are addressed in a companion report (International Transport Forum (ITF), 2013).

For the United States, the data sources have changed. The 1992-2003 data are from the US Department of Transportation (Bureau of Transportation Statistics, 2005). The 2004-2015 data are from Railroad Facts,

published by the Association of American Railroads.<sup>5</sup> Since 2004, the data have covered only Class 1 Railroads. Class 1 Railroad capital expenditure accounts for roughly 94% of total railroad capital expenditure.

## Forestry

Eurostat data for gross fixed capital formation in forestry up to 2018 are available for the European Union. Data are extrapolated to 2020 assuming a constant ratio to total GFCF. For the United States, data are available from the Bureau of Economic Analysis up to 2020. No data are available for China.

## Research and development

The latest research results on the status, forecasts and R&D investment figures for low-carbon technologies are sourced from JRC-SETIS (Joint Research Centre Strategic Energy Technologies (SET-Plan) Information System). Government R&D figures are sourced from the IEA, International Monetary Fund, OECD and various government agencies. Corporate R&D is sourced from the Joint Research Centre of the European Commission for key quoted companies in all clean energy sectors according to Energy Union priorities. The data were made available in current prices in billions of euros rounded to the nearest hundred thousand.

## Inflation and exchange rates

Data are presented in real 2019 EUR million. Source data are on different bases and the following procedures were used to convert them to real 2019 EUR million.

- IEA investment data

IEA investment data are in real 2019 USD billion. These were converted to real 2019 euros by applying the average 2019 exchange rate (from Eurostat). Where necessary, the data are further converted to current EUR million using the GDP deflator for the European Union. The GDP deflator is derived from the Eurostat data by rebasing to 2019=100. This rebasing preserves the implied inflation rates year by year.

For the real data in euros, these procedures preserve the growth rates in the IEA data.

- OECD data and Eurostat data on forestry and transport

These data are in current prices in euros and are converted to real 2019 euros using the applicable GDP deflators. The country-by-country deflators are derived from the Eurostat data and rebased to 2019=100 as described above. Use of the country-specific deflators takes account of differences in inflation in different countries. This is the best procedure for making country comparisons. However, note that the method does not necessarily maintain additivity — the sum of the deflated countries does not equal the deflated total.

<sup>5</sup> See capital expenditure table on <https://www.aar.org/>.

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