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Energy Retrofit in a Post Natural Disaster Context: Effective Driver of Resilient Growth?

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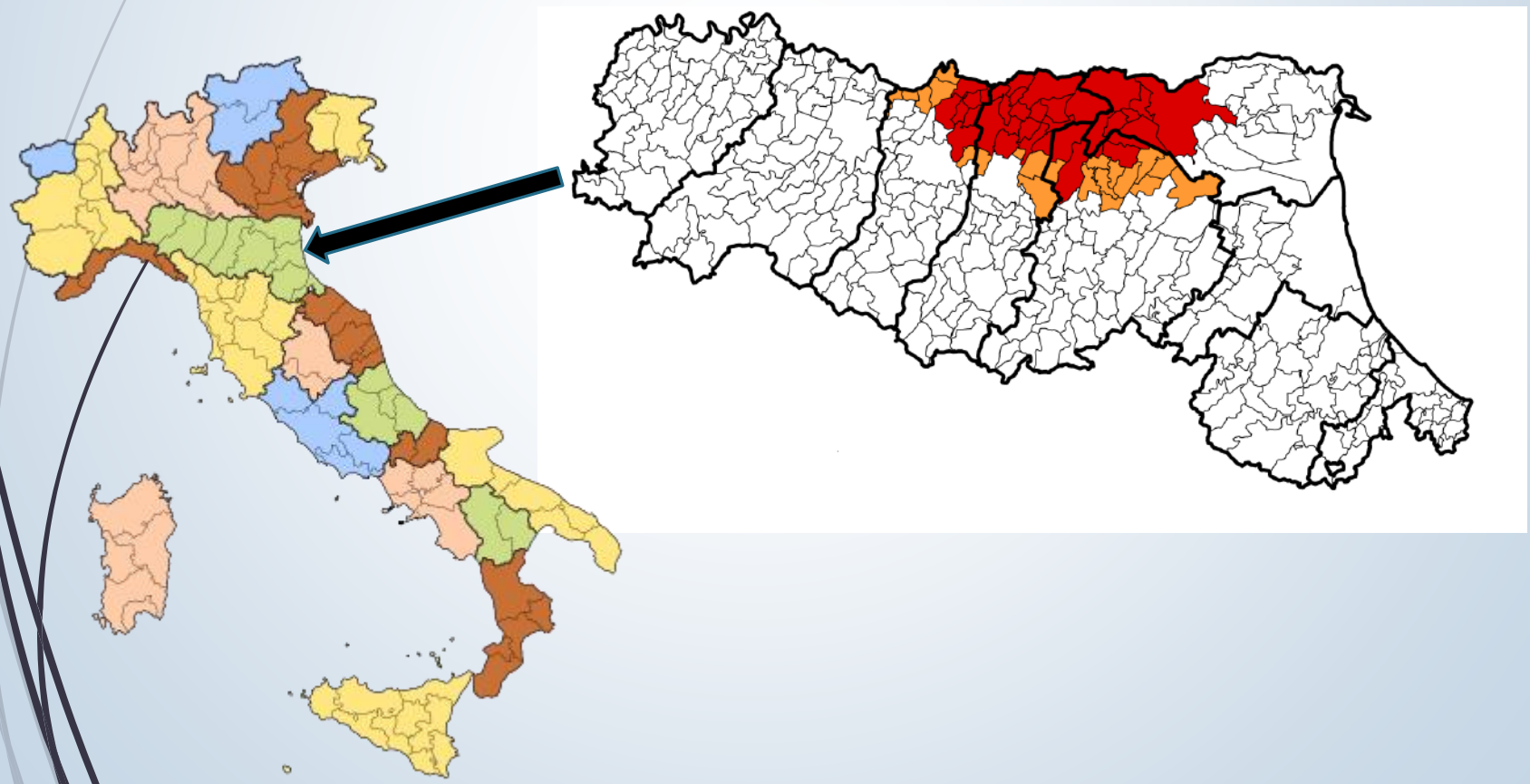
Introduction

In 2012, the northern Italian region of Emilia-Romagna was hit by an earthquake that caused 29 victims, in the provinces of Modena and Ferrara. There were also about 390 injured and about 41,000 people had to leave their homes.



Public economic intervention

The economic impact of the disaster was dismal, with a large number of businesses being forced to stop, suspend or relocate their activities as their assets were disrupted.

In the aftermath of the 2012 earthquake in Emilia-Romagna, the Regional Agency for the Reconstruction collected the requests by firms hit by the natural disaster for contributions to reconstruct, relocate, and recover assets under different chapters of interventions (Agenzia per la Ricostruzione – Sisma, 2012).

More than 5,000 firms applied for the contributions; among these, about 3,500 were taken into consideration. We focus here on those 350 firms who included in their request for the reconstruction contribution also the specific energy retrofit intervention.

Screening

Not all their requests were deemed to be admissible, so that the screening process finally led to the following distribution of decisions by the Regional Agency:

Number of requests for a contribution concerning energy retrofit	351
Number of firms filing at least one request of contribution for energy retrofit	259
Number of firms being denied a contribution for energy retrofit	172
Number of firms being granted a contribution for energy retrofit	87
Euros globally granted for the specific energy retrofit of firms only*	21,571,054

Energy retrofit contribution

On average, each successful firm was granted 247,944 Euros for energy retrofit purposes; this sum represents a contribution to the costs each firm had to face in order to rebuild, refurbish or renovate a building, with an explicit upgrade in term of energy efficiency.

Actually, this sum represents an approximation of the real energy efficiency interventions adopted by firms, since whatever had been rebuilt after the earthquake, even in the absence of a specific contribution expressed in the contribution request, had to comply with the basic current energy standards for newer buildings.

Economics of energy efficiency

There exist a few macroeconomic studies evaluating the impact of green energy investmento on GDP and employment.

For instance, after the American Clean Energy and Security Act, Pollin, Heintz, Garrett-Peltier (2009) calculated that roughly 2.5 million new jobs would be created overall by spending $150 billion on clean-energy investments, while close to 800,000 jobs would be lost if conventional fossil fuel spending were to decline by an equivalent amount.

Economics of energy efficiency

In modelling the combined *net* macroeconomic effects of efficiency, Dunsky Energy Consulting (2008) assessed the three ways in which efficiency generates employment and economic impacts, both positive and negative:

- *Increased demand for efficiency-related goods and services:* Funding energy efficiency programs is a cost to the economy; however, it also stimulates new demand – for example, hiring renovation contractors to weatherize homes generates economic activity and supports employment;
- *Redistribution of savings:* As a result of the energy efficiency improvements, households and businesses save on energy bills. This in turn increases household disposable income, lowers the cost of doing business and/or frees up capital for more productive use in industry;
- *Reduced energy sales:* Reduced energy sales limit utility revenue, at least domestically. This can negatively impact employment, for example by reducing the need to build new power plants.

The economics of energy retrofit

The specific economic modelling and impact of energy retrofit has yet to be implemented in the economics and energy literature. Very few studies tackle the issue of energy retrofit, but none considers the microeconomic impact of energy retrofit on firms and the social environment as a consequence of a natural disaster.

Some studies concentrate on energy policy management, exploring the motivations for public authorities in engaging in Energy Performance Contracts and investigating the contractual terms and externalities from the point of view of the central planner (Polzin, von Flotow and Nolden, 2016); some concentrate on the multiple benefits of energy retrofit for domestic buildings, but neglect the business aspect of retrofitting (Kerr, Gouldson and Barrett, 2017).

The economics of energy retrofit (2)

When considering the crucial aspect of climate change, energy retrofitting plays an important role in the corporate social responsibility (CSR) policy of small and medium enterprises (Laguir, Stekelorum, Elbaz and Duchamp, 2019). The environmental dimension of CSR has been addressed by the European Union in decoupling the environmental deterioration from economic growth (Commission of the European Union, 2001).

This dimension usually aims at managing the environmental impacts of a business along the entire product life cycle, thus fostering a corporation reputation with external shareholders and ensuring the environmental integrity and protection if embraced by internal shareholders.

Energy retrofit and firm performance

Up to now, we are aware of a unique study tackling the energy expenditure decision when internalized in the optimality decision of firms maximizing economic performance: the authors find that environmental expenditure has a negative impact on economic performance through pollution prevention capability, but a positive impact through product stewardship capability (Singh, Ma and Yang, 2016).

In terms of pollution prevention, the closer a company gets to "zero emission", the more difficult further reduction becomes (Hart, 1995), so that decreasing returns in pollution prevention may hinder economic performance.

Energy retrofit and paradoxes

Energy retrofitting may be related to pollution prevention, as the less intensive use of energy also implies less global pollution, but from the point of view of the individual firm lower energy costs can be assimilated to a cost reduction strategy leading to higher performances.

More energy efficiency could have perverse effects on energy consumption, though (Saunders, 1992). This is known as "Jevons paradox", as it is possible that energy efficiency gains will increase energy consumption. This could be particularly negative in terms of decreasing carbon emissions, as the rebound effect could lead to higher consumptions.

Multiplier effect

All in all, energy retrofit contributions can have a multi-level multiplier effect:

1. A static firm-level effect in terms of decreased total costs, likely to support firms' performance in the short run;
2. A dynamic firm-level effect in terms of increased efficiency in perfomance, as the initial investment starts providing returns with lower costs (less energy consumed) after the first period;
3. A dynamic context-level effect, as lower CO_2 production due to energy efficiency has positive spillovers on the community, with firms providing energy retrofit services being involved in the social planning of the local P.A. and the need for containing pollution and CO_2 emissions constantly decreasing

The SFINGE-AIDA database

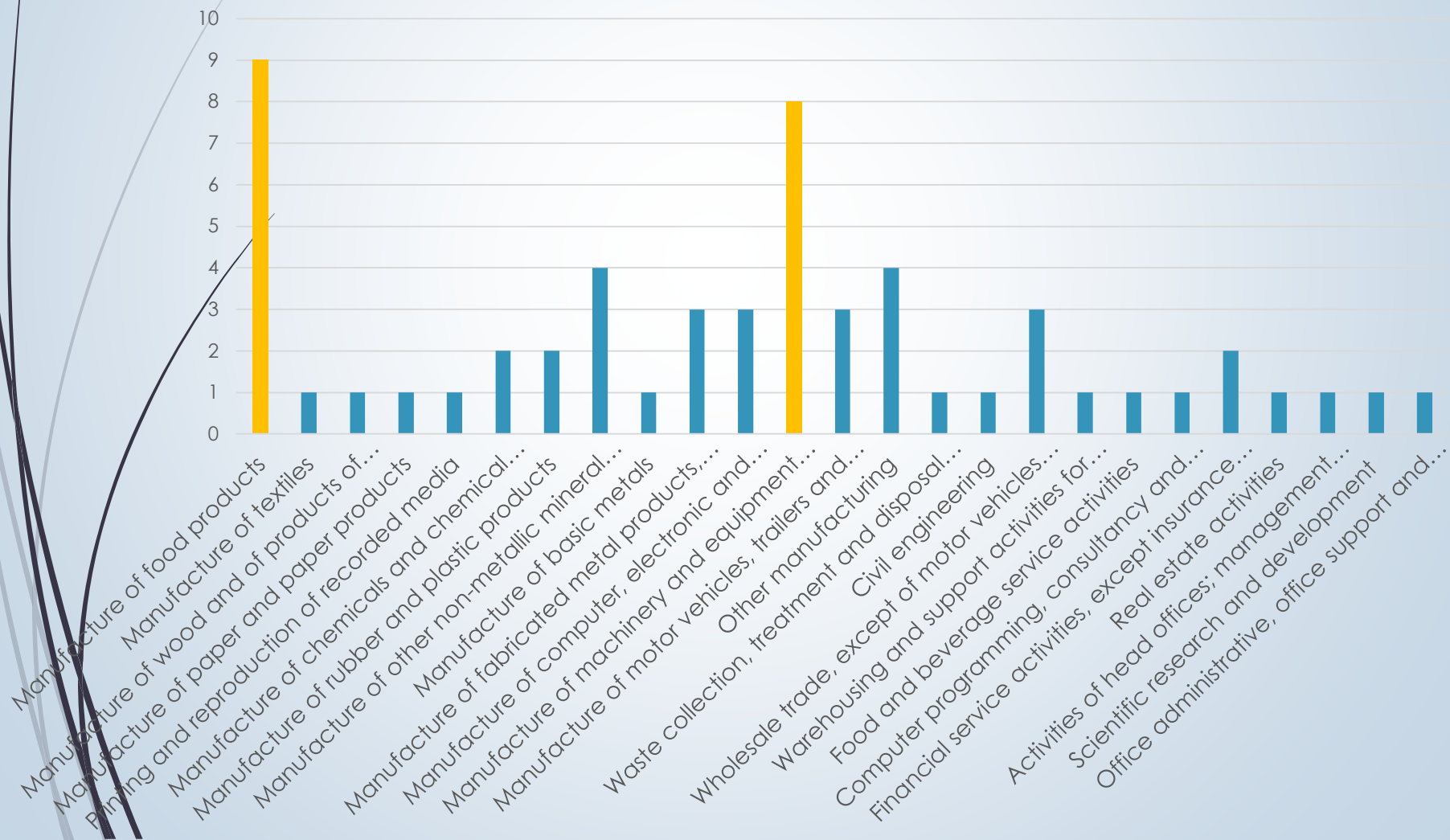
SFINGE SISMA is the web portal through which requests for contributions to the Regional Agency for Reconstruction in Emilia-Romagna must be filed. The requests may concern all the types of damage to business activities, as illustrated in the law provision (Ordinanza Commissariale) nr. 57/2012 and subsequent provisions.

The types of damage, for which a contribution is provided for, are: **renovation or rebuilding of buildings, re-purchase or restoration of capital goods, of inventories and deteriorated PDO (protected designation of origin)/ PGI (protected geographical indication) products.**

The AIDA database (Analisi Informatizzata delle Aziende Italiane) is a Bureau Van Djijk database collecting the balance sheet data of Italian firms.

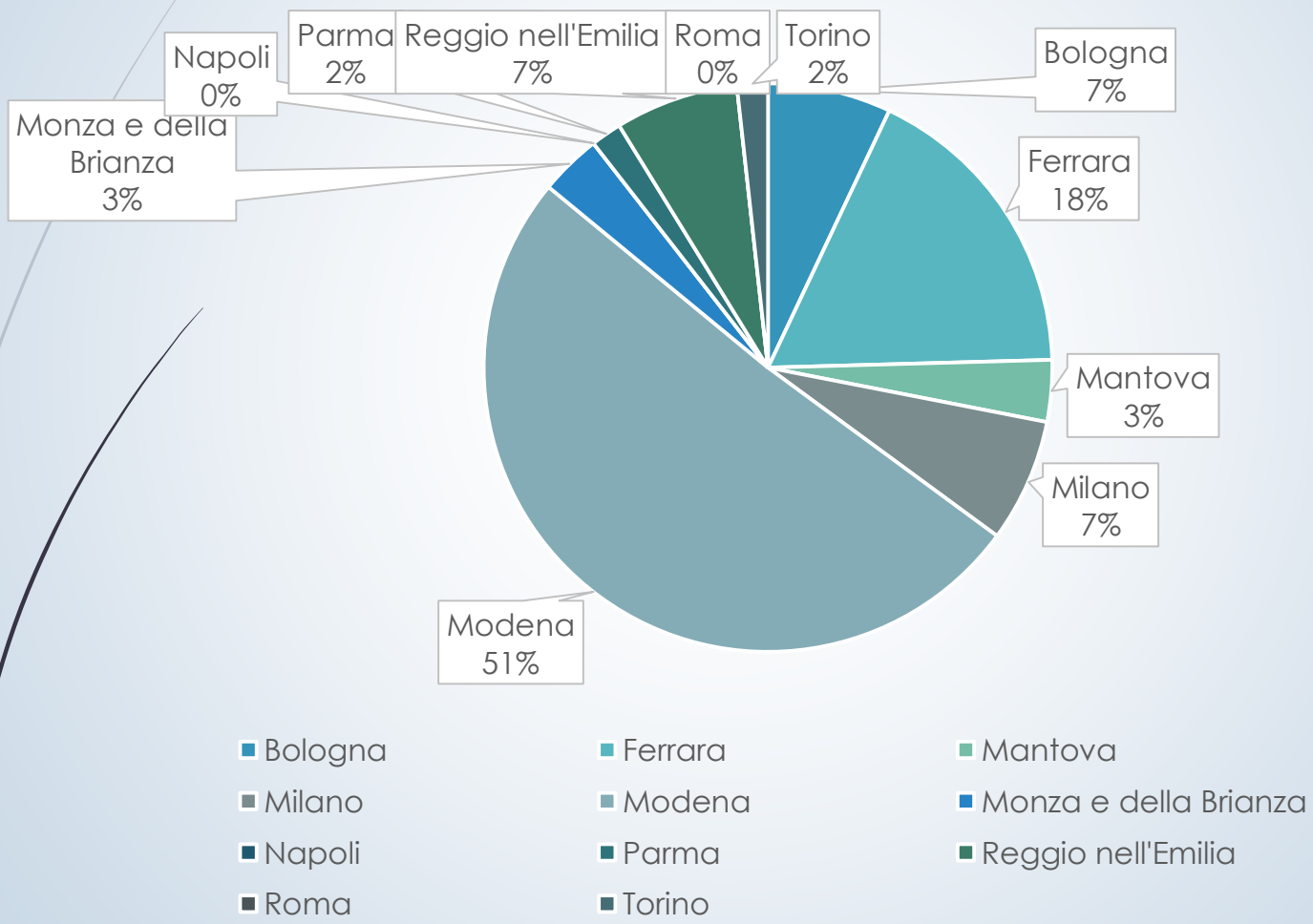
Firms profile

Firms obtaining a contribution for energy retrofit, by NACE 2-digits sectors



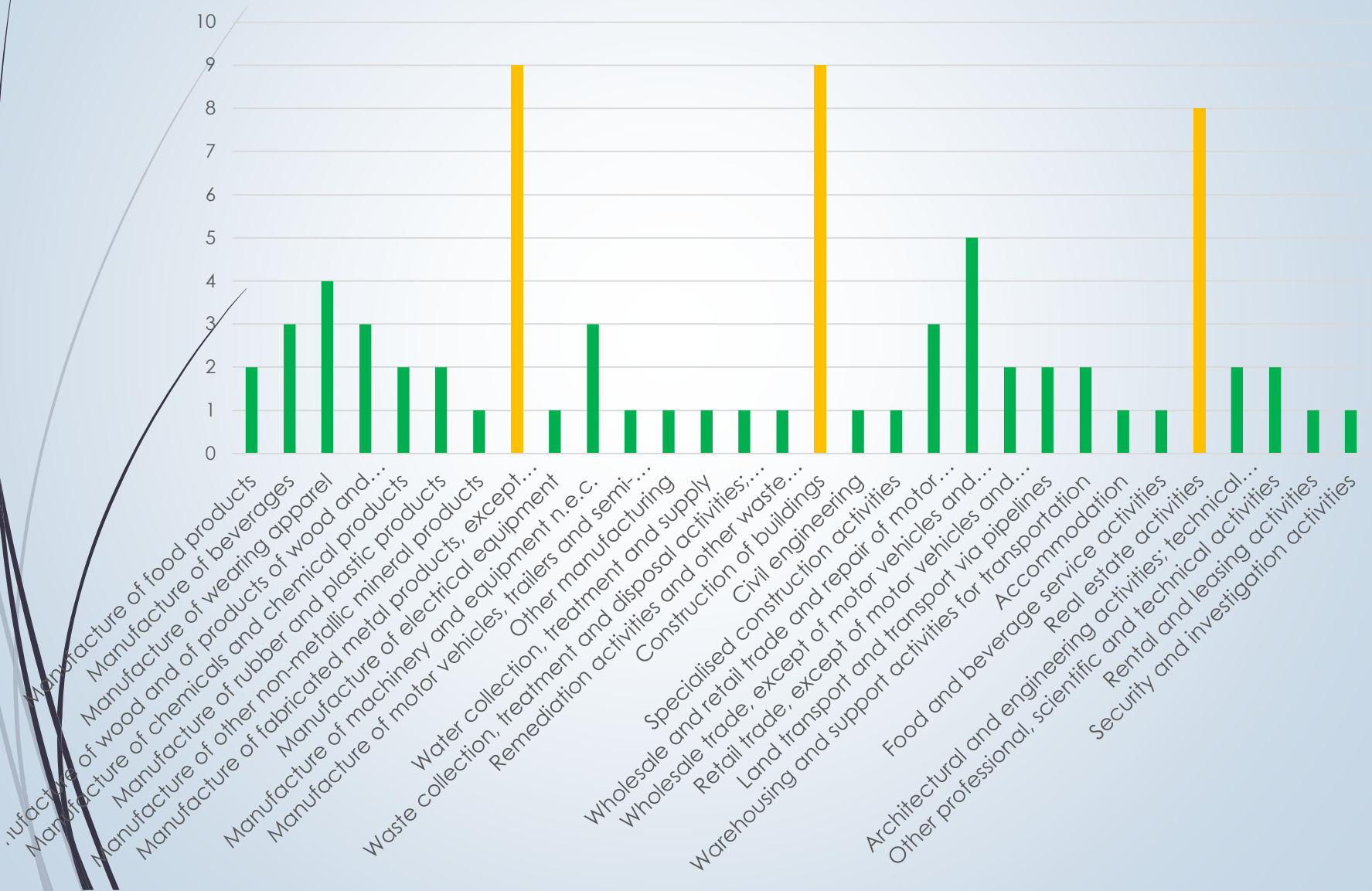
Firms profile

Firms obtaining a contribution for energy retrofit, by province



Firms profile

Firms with NO contribution for energy retrofit, by NACE 2-digits sectors

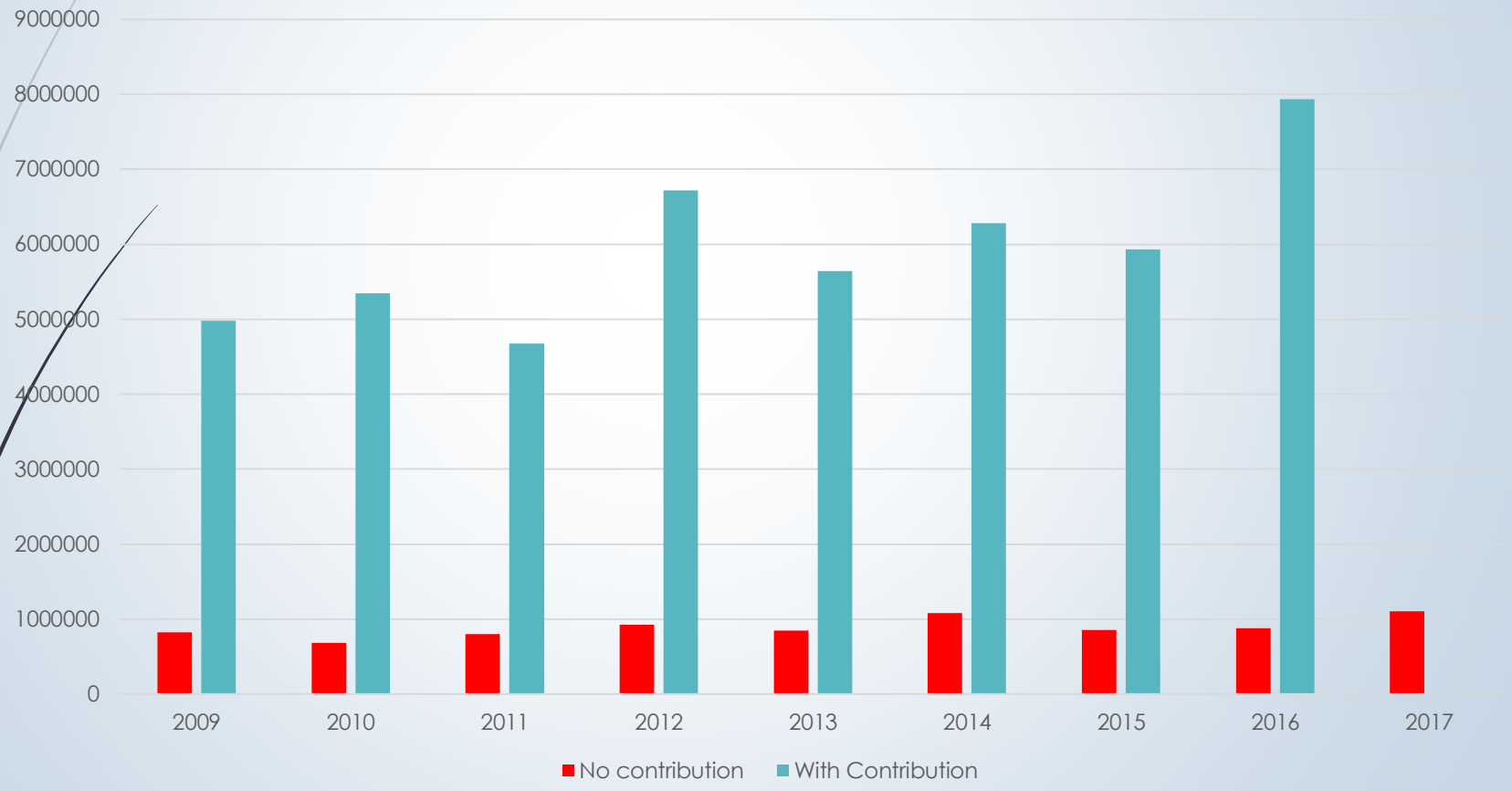


First-level effects. Balance-sheet data of firms

We carried on a preliminary analysis to assess if some multiplier effect is already detectable on firms' balance sheet data. We distinguish between firms having requested an energy retrofit contribution and, respectively, being awarded and not being awarded the contribution by the special Agency for Reconstruction.

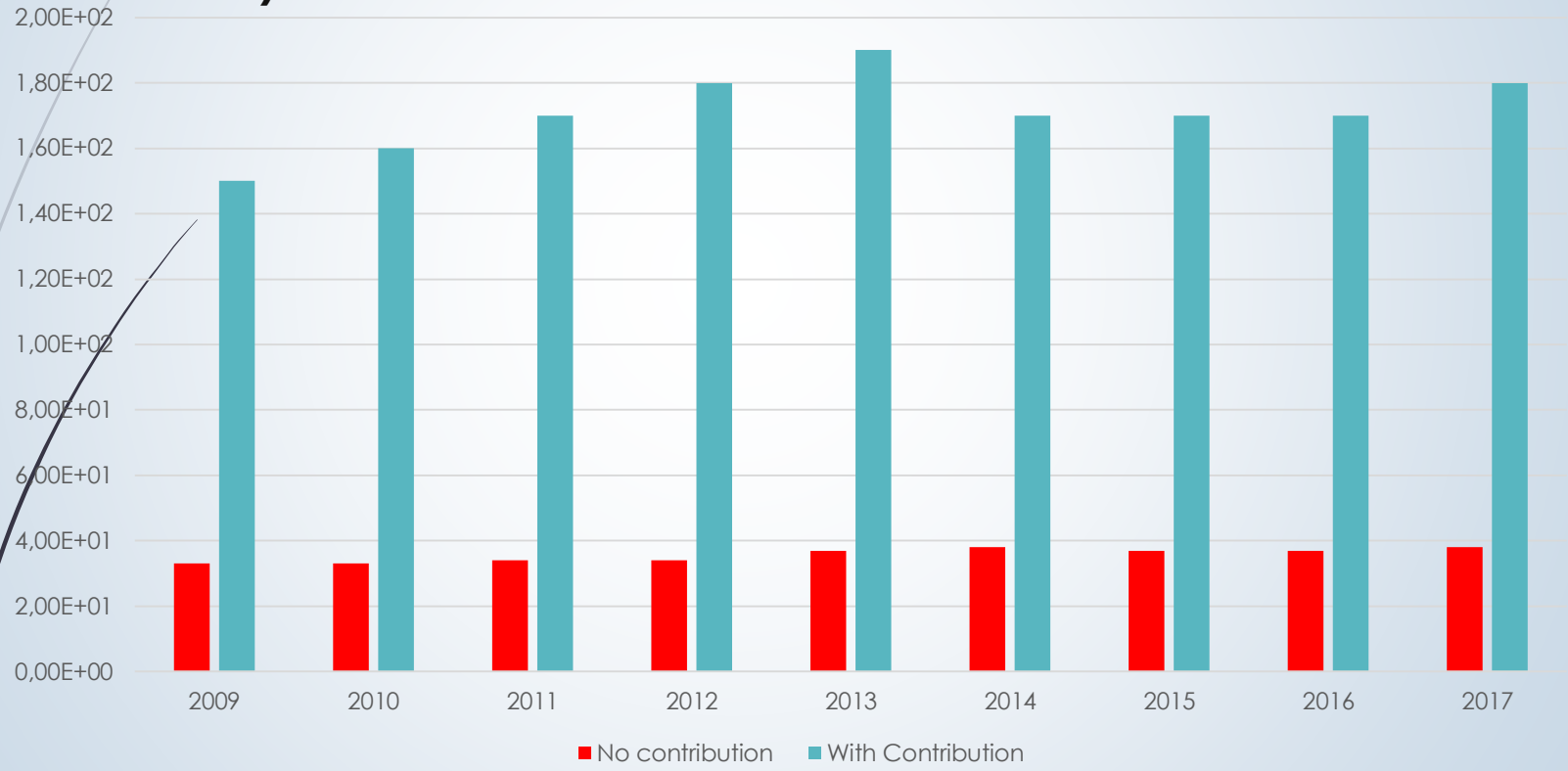
Firm performance and energy retrofit contributions

Median value added, firms with and without contribution for energy retrofit.



Firm performance and energy retrofit contributions

Mean revenues, firms with and without contribution for energy retrofit (Euros/000000)

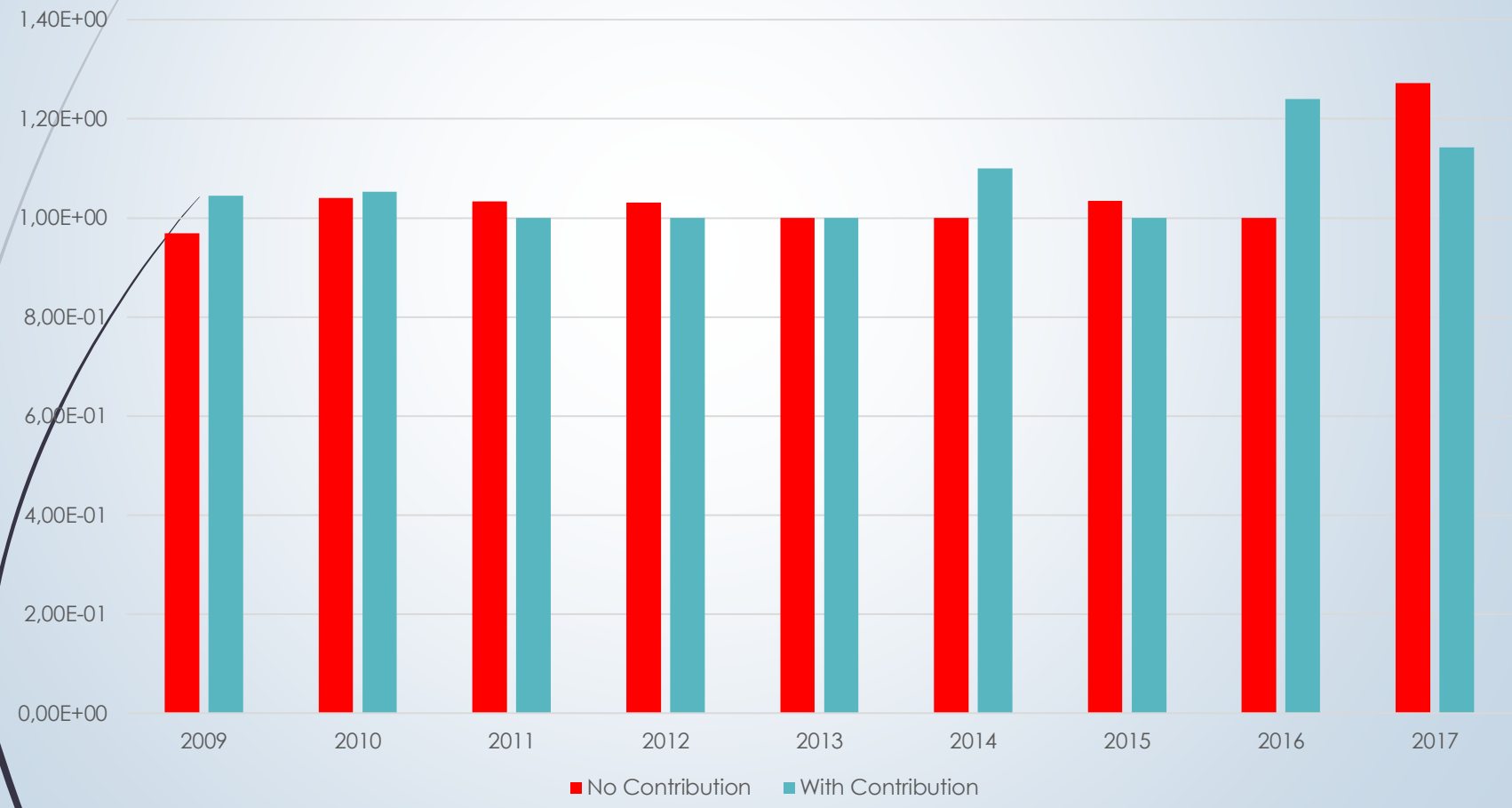


Firm performance and energy retrofit contributions

Total Average Costs/Total Average Revenues, firms with and without contribution for energy retrofit

Firm performance and energy retrofit contributions

Total Median Costs/Total Median Revenues, firms with and without contribution for energy retrofit



Furthers empirical steps

- Evaluate TFP for firms with/without a energy retrofit contribution
- Evaluate the linkages with third party business partners before and after the contribution, with/without a energy retrofit contribution (spillovers)
- Evaluate the trend in revenues/performance in the medium run

Thank you!

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