

# REGIONAL POLICIES TO BOOST FIRMS' ENERGY EFFICIENCY AND DISASTER RESPONSE: A COMPARATIVE ANALYSIS

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- ▶ Synopsis
- ▶ The Emilia-Romagna earthquake
- ▶ Rationale for public interventions in energy efficiency
- ▶ Policy actions and beneficiaries firms
- ▶ Case studies: energy efficiency projects
- ▶ Conclusions



# OUTLINE

- ▶ The 2012 earthquake in Emilia-Romagna offered the local government the (unwelcome) opportunity to deploy a vast intervention in terms of improving the energy efficiency of reconstructed/refurbished buildings, not only in the private sector but, most interestingly to us, in the disrupted industrial sectors facilities.
- ▶ The availability of firm-level data allows us to deepen the effects of energy retrofitting in the business sector, a topic generally hard to investigate because of lack of data.
- ▶ We present preliminary data about the Emilia Romagna firms benefitting from the public energy retrofitting cost contribution and present some other international cases of energy efficiency policies specifically targeting businesses and commercial facilities for comparison.

## SYNOPSIS

- ▶ On 20th May 2012, at 4:03 am, an earthquake with a local magnitude of 5.9 on the Richter scale struck the Po Plain. The epicenter was in the province of Modena, in the northern region Emilia-Romagna. Nine days later, on 29th May 2012, another strong 5.8 shock hit the Modena plain once again. The earthquake of May 2012 hugely marked the region: 59 municipalities were affected, constituting, with 550,000 inhabitants, one of the Italy's most productive and export-oriented areas, contributing to almost 2.5% of national GDP and representing 27% of regional value added. The earthquake provoked severe material damages to homes (of which, about 31,000 were left uninhabitable), historical and cultural buildings, as well as buildings for health and social services and commercial and industrial structures, the reconstruction of which was a necessary condition for ensuring the recovery of economic and social activities.

## THE EMILIA-ROMAGNA EARTHQUAKE

- ▶ The damages in the housing sector required funds for reconstruction works for approximately 1.061 billion EUR, against accepted costs of over 2.026 billion EUR. The funds widely covered the costs of reconstruction, and partially also seismic improvement works and the enhancement of energy efficiency. The funds for reconstruction produced a leverage effect on the affected area: it is estimated that for every EUR of public funding, there were only slightly fewer private resources (0.90 €). Such funds, - both public and private -, have been estimated to impact significantly over private housing in the centers affected, because they implied expectations of re-settlement by families, both for their primary residences and to recover part of the buildings destined for rental and the real estate market.
- ▶ The economy was struck as well: damages to the agricultural and agri-industrial sector were estimated to approximately 2.3 billion EUR, the majority of which in the province of Modena: this damage refers not only to crops but also to agricultural machinery and equipment on the farms, as well as the stocks, which particularly affected the Parmigiano-Reggiano supply chain.

## DAMAGES

- ▶ A number of interventions (2027) have been approved for public works, cultural heritage and school buildings, amounting to a total (gross of any co-funding) of 1,654.9 million EUR, around three quarters with public funds. Cultural heritage received the bulk of funding (1,056 million EUR), followed by public works (409 million EUR) and school buildings (177 million EUR).
- ▶ Manufacturing activities damages and reconstruction policies represent the focus of our study. The estimate of damages can be obtained by the "Sfinge" platform, highlighting applications for 1.828 billion EUR, mostly for buildings (75%), and in equal measure instrumental goods, stocks and relocation (12.5%). These investments have a distinguishing feature: they were associated to incentives offered by regional laws for innovation and energy retrofit, so that specific chapters of funding were devised to support energy retrofit in all the possible instances: to restore, refurbish, reconstruct old buildings and for new buildings.

## INTERVENTIONS BY SECTOR

- ▶ Energy efficiency (EE) is among the most intensely discussed and widely implemented targets in the realms of energy and environmental policy. It refers, in essence, to an output-to-input ratio—getting the same level of service or, more contentiously, an equivalent quality-adjusted level of service, from a smaller quantity of energy consumed. Examples include getting the same heating from a high-efficiency furnace or the same cooling from an energy-efficient air conditioner or heater.
- ▶ The European building sector still offers large savings potentials, which have been only superficially tapped. The sector accounts for 40% of Europe's total final energy consumption and is the main contributor to GHG emissions. Around 75% of the building stock is energy inefficient, and at the current 1% annual renovation rate it would take around a century to decarbonise the building stock to modern, low-carbon levels.

## RATIONALE FOR PUBLIC INTERVENTIONS IN ENERGY EFFICIENCY

- ▶ The EU has increased efforts on several fronts to contribute to a more sustainable building stock. Notably, a package of various legislative pieces has been under review with direct benefit for the building sector (including the Energy Performance of Buildings Directive (2010/31/EU) and the Energy Efficiency Directive (2012/27/EU)), the amount of public funds has been increased and tailored for direct investments, for research and market preparation, etc.
- ▶ Since energy retrofitting presents a number of uncertainties for firms, in terms of necessary time to recover the investments, volatility of energy prices, measurability issues, proper definitions of contracts with energy services providers, market failures and therefore sub-optimal investment levels represent an usual outcome.
- ▶ Government interventions therefore represent a second best solution (Lipsey and Lancaster, 1956) to try and fill the energy efficiency gap; «Energy efficient renovation investments, if not supported by government grants, are not financially viable» (Mikulić, Bakarić and Slijepčević, 2016).

## RATIONALE FOR PUBLIC INTERVENTIONS IN ENERGY EFFICIENCY

- ▶ It is possible to interpret the policy intervention in the area affected by the earthquake according to a double criterion: on one hand, to pick the opportunity to promote the retrofit of older buildings, on the other, to preserve the historical sites and original textures of the area.
- ▶ Since the very beginning of the crisis, the institutional response made a clear choice in the reconstruction process, giving up the idea of creating “new towns” and pointing to, conversely, to the restoration, redevelopment and securing of the damaged assets, including the historical and cultural heritage. The basic idea was to refurbish the identity of affected places and enhance social and meeting centers.

## ENERGY EFFICIENCY IN THE AFTERMATH OF RECONSTRUCTION

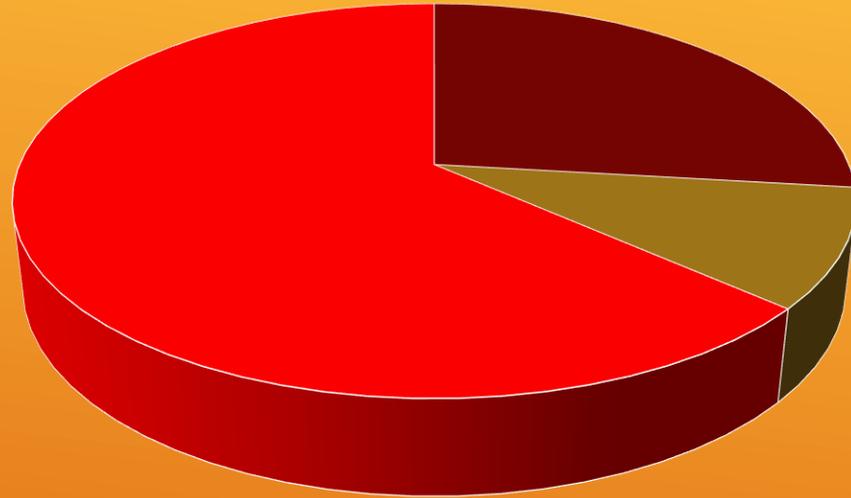
- ▶ In the Emilia-Romagna region, the main normative action in support of the reconstruction after the earthquake was the Ordinanza Commissariale 57/2012 and ensuing provisions, defining the criteria to apply for a contribution concerning the restoring of buildings and ancillary items such as stocks (*scorte*), DOP and GIS products, as well as the costs of temporary relocation of activities. The online centralized system collecting the applications – Sfinge Sisma – enabled the creation of a vast archive of the reconstruction experience in the region.
- ▶ The “Ordinanze” system for the reconstruction of the production system envisaged, usually, a unique application by the beneficiary firm for a contribution concerning the whole set of goods and properties, for funding both the repairs and reconstruction of buildings and of other damaged assets.
- ▶ The application was evaluated by the SII, a specific committee in charge of four different areas of intervention: manufacturing, handicraft and services, trade and tourism, agriculture and agri-food.

## THE EMILIA ROMAGNA EXPERIENCE

- ▶ The associated availability of insurance reimbursements has facilitated, in case of demolition and reconstruction, the realization of buildings with higher unit costs, therefore with a likely higher value in terms of technology and features, if compared to those situations where no insurance reimbursement was available.
- ▶ When looking at the specific topic of energy efficiency, a specific chapter of funding was devoted to those firms including in their application the specific retrofit intervention, that could be devoted either to restoring pre-existing buildings or to the construction of new buildings.
- ▶ For all those interventions including an energy retrofit chapter, the acknowledged and granted cost of funding was increased by 15%.
- ▶ As a result, improved energy efficiency has 1) either been acknowledged by the Agency granting a contribution or 2) been a tacit part of the global renovation or rebuilding of assets in the area.

## THE EMILIA ROMAGNA EXPERIENCE

## Macrosectors

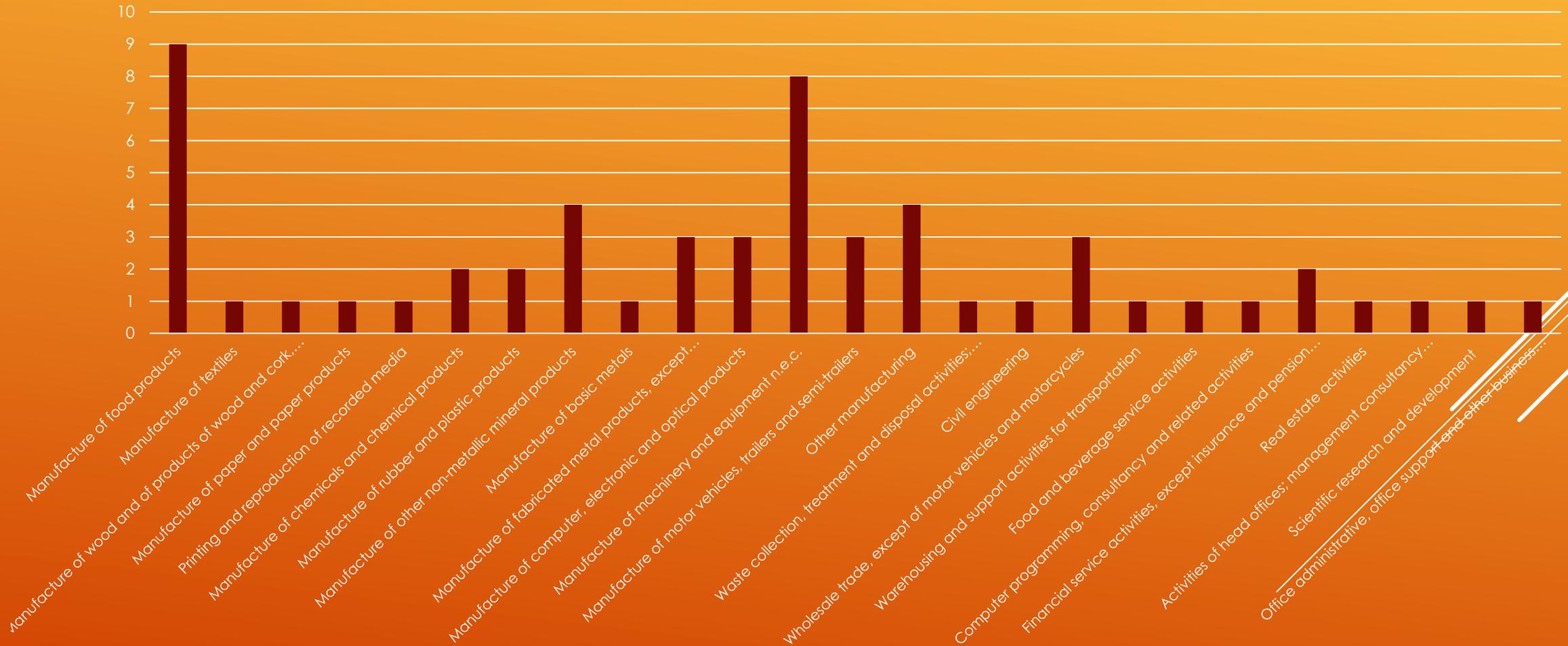


■ Agriculture ■ Trade & services ■ Manufacturing

# BENEFICIARIES FIRMS

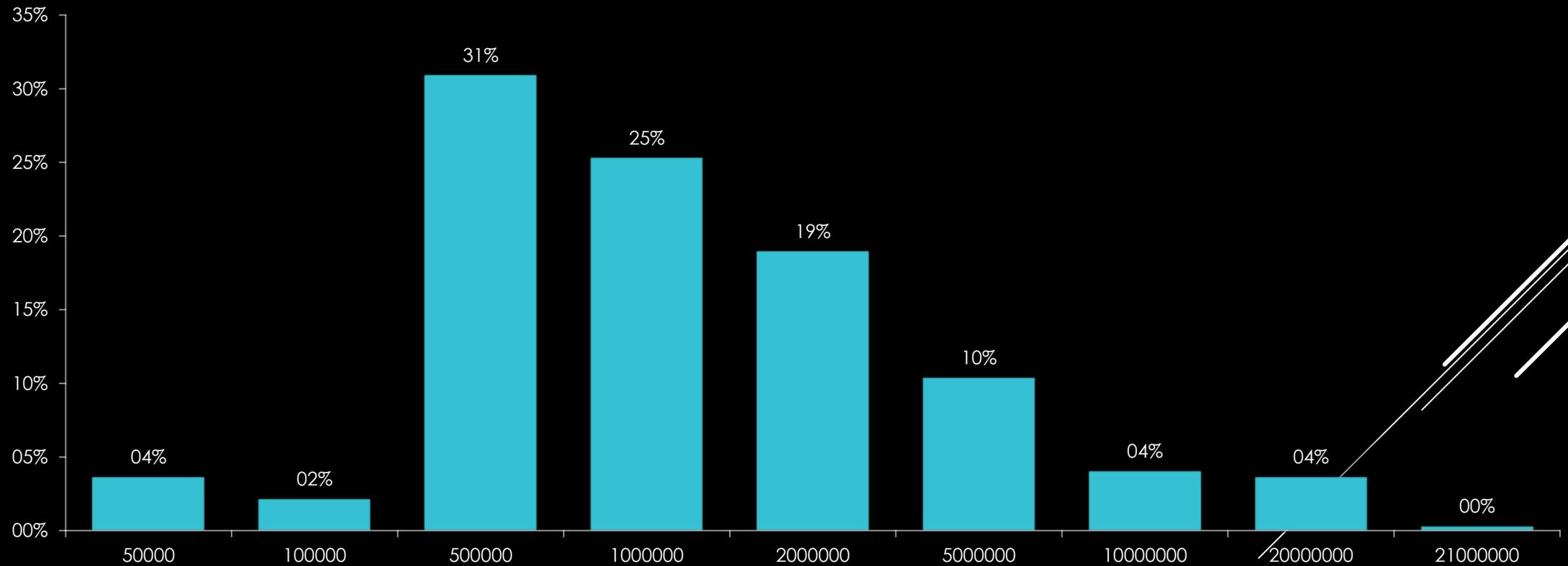
# BENEFICIARIES FIRMS

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



# BENEFICIARIES FIRMS

## Contributions in Euros



- ▶ Most studies in literature deal with private housing retrofit (Mikulić et al. 2016; Oliveira et al. 2014; Hamilton et al. 2013; Liang et al. 2018) as the numbers of buildings, as well as their energy consumption, is usually significantly larger than business buildings and therefore most interventions target private housing; still, firms can receive a primer in terms of higher productivity when saving in energy costs, therefore contributing to value added, jobs and ultimately economic growth, a feature just, eventually, indirectly observable from energy savings in private (non-productive) buildings.

## EXPERIENCES FROM ABROAD IN BUSINESSES ENERGY RETROFITTING

- ▶ The Project commenced in October 2009 and was designed to improve the competitiveness and productivity of Northwest companies
- ▶ The funding of the project came from the European Regional Development Fund (ERDF) and the UK Government's Single Programme funds, which have been managed by the Northwest Regional Development Agency (NWDA) and the Department for Business, Innovation and Skills (BIS).

## **THE ENWORKS PROJECT: “EMBEDDING RESOURCE EFFICIENCY IN KEY SECTORS” (UNITED KINGDOM)**

- ▶ The type of support included a range of audit/reviews, support in audit findings implementation and skill transfer through in-site and open trainings.
- ▶ Overall, by 2013 the project assisted 1 180 firms, assisting 489 people in skill development and inducing CO<sub>2</sub> savings for 320,871 tonnes, representing the 143% of the initial target.
- ▶ The project has assisted firms to implement an average of £18,000 in cost savings (including all the measures implemented through the project) and led to generate average annual sales for £114,000. In terms of jobs, as a result of additional sales generated through assistance from the project a total of 232 jobs were created and 512 jobs safeguarded in beneficiary firms. The net impact from jobs is estimated at £15.0m. In terms of gross value added, the project led to £38.7m increase; the estimated multiplier related to sales is 1.53.

## **THE ENWORKS PROJECT: “EMBEDDING RESOURCE EFFICIENCY IN KEY SECTORS” (UNITED KINGDOM) - 2**

- ▶ The Green Deal is a novel financing mechanism and a framework of advice, assurance and accreditation for the energy efficiency supply chain for homes and businesses. It allows the cost of installing energy efficiency measures to be financed through a charge attached to a property's electricity meter.
- ▶ The Green Deal market covers the domestic and the non-domestic sector.
- ▶ Working hours from insulation activities are expected to increase as well as the number of installers from around 4,700 in 2007 to around 9,800 by 2015. There will also be a positive knock-on effect on the wider supply chain which is expected to employ between 29,000 and 50,000 people by 2015, up from around 22,000 in 2007/8. The assessment report estimated that the ratio between installer numbers and supply chain jobs (manufacturing, supply, distribution, development) was 1:4.75 (i.e. there was 4.75 jobs in the supply chain for each installer job created).

## **THE GREEN DEAL AND THE ENERGY COMPANY OBLIGATION (ECO), (UNITED KINGDOM)**

- ▶ This ratio was used to provide an upper estimate of 46,000 supply chain jobs that would be supported by the policy. A lower estimate was produced by comparing the total capital spending in the sector with the labour to capital spending ratio estimate by Construction Skills (the Sector Skills Council for construction). The ratio of job to capital spending for housing repair and maintenance is 32.6 jobs per £1m output. A total capital investment in 2015 of around £1.08bn would give a number of insulation sector jobs supported of around 35,000 (including installers, meaning supply chain jobs would be around 25,000).

## **THE GREEN DEAL AND THE ENERGY COMPANY OBLIGATION (ECO), (UNITED KINGDOM) - 2**

- ▶ The Industrial Assessment Centers (IAC) program of the Department Of Energy provides free energy audits to small and medium-sized manufacturing firms in the United States.
- ▶ The IAC program has been in existence since 1976 and is estimated to have provided cumulative energy savings of 1,714 trillion BTUs (British Thermal Units) by 2007 (U.S. Department of Energy Industrial Technologies Program 2009).
- ▶ By April 2019, the program recommended 1052 interventions to 152 businesses, amounting to total cost savings for \$29.18 million, of which \$23.92 million of energy savings.

## **ASSESSMENT CENTERS PROGRAM OF THE U.S. DEPARTMENT OF ENERGY (USA)**

- ▶ In 1993, the Ministry of Construction issued a building energy-efficiency standard for hotels (GB501893). In 2005, the GB50189 was revised to include other types of commercial buildings. The standard required that all new buildings should be 50% more efficient than the baseline defined with 1980s building characteristics (Feng, Huang, Levine, Zhou, Zhang, 2014).
- ▶ The latest revision to this standard has been issued by the Ministry of Housing and Urban-Rural Development in 2015, which sets the efficiency level at approximately 30% more than that of the 2005 standard (Hong, Li, Yan, 2015), i.e. equivalent to 65% more efficient than the 1980s baseline. Therefore, along with the constant update of the mandatory efficiency standard- GB50189, energy-efficiency in new constructed commercial building sector has been effectively controlled and improved step by step (Jing, Yisheng, Yong, Nan, Wei, 2016).

## THE GB50189-2005 (CHINA)

- ▶ In 2011 and 2012 the Chinese Government selected four cities - Shanghai, Tianjin, Shenzhen, and Chongqing - to implement pilot commercial building energy efficiency retrofit programs. The pilot program supported deep retrofits to maximize energy savings with subsidies. In total, the programs in the four cities had to finish the retrofit of 4 million m<sup>2</sup> buildings within two years, improving energy performance by 20%, with a central-government financial subsidy of 20CNY/m<sup>2</sup>. The financial agency in each city paid the retrofit subsidy. To ensure retrofit quality and achievement of energy savings, the subsidy was designed to be paid in two or three instalments. The instalments were linked to acceptance of the retrofit project into the pilot program, completion of the retrofit and successful inspection, and operation of the retrofitted building for a defined period with verification of energy savings. Partly, subsidies were tied to the targeted energy saving rate illustrated in the demonstration projects.

## **THE GB50189-2005 (CHINA) - 2**

- ▶ The 2012 earthquake represented an opportunity to retrofit buildings both in the private and industrial sector.
- ▶ The Regional Government of Emilia-Romagna undertook a bold program to support businesses suffering from losses and disruption in order, also, to improve energy efficiency of buildings.
- ▶ A number of firms received specific extra cost contributions (15% of the total) to implement energy efficient solutions.
- ▶ This policy intervention has the potential not only to reduce energy consumption at regional level, but to trigger a macroeconomic multiplicative effect in terms of jobs, value added and sales. Positive externalities will also stem from the action, in terms of energy savings and lower CO<sub>2</sub> emissions.

## CONCLUSIONS

▶ Thanks!

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