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Theory and evidence on the economics of energy efficiency. Lessons for the Belgian building sector

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Abstract – *This paper offers a survey of the economic literature on the policy challenges and options available to improve energy efficiency. We emphasize energy efficiency in buildings since it has the largest potential impact in terms of emission of reduction on the demand side and since this impact is too often underestimated. The paper then discusses the relevance of the lessons learned from the survey for Belgium. The resulting picture is not pretty. The Belgian energy efficiency gap is shown to be one of the widest among European countries, and particularly so for buildings. Flanders is ahead of the curve in cashing in on the potential benefits of improved energy efficiency in buildings. But the scope for action is still very large across communities in the country.*

Mots clés – *régulation, politique énergétique, Belgique, structure institutionnelle*
JEL : *H23, L74, O31*

1 INTRODUCTION

For over a decade, a wide range of robust evidence has been showing that energy conservation is not at levels it could be expected to be in a world concerned with climate change (e.g. the World Bank (2010)). Yet the potential impact of an improved efficiency performance is quite significant. More technically, this means that the amount of energy inputs used to run the processes needed to deliver specific outputs, such as heating and cooling, lighting or transportation, could be a lot lower than what it is today. Improving energy efficiency is thus essential to slow energy demand to environmentally sustainable level.

The European Commission argues that Europe can achieve energy savings of 20% by 2020 simply by realizing all cost effective energy savings measures identified for its member countries (European Commission (2011)). This order of magnitude is quite typical of the main simulations available on the pay-offs of efforts to close the

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energy efficiency gap (World Energy Council (2010)). This gap is defined as the difference between the efficiency levels that could be achieved by cost-effective investments in energy efficiency and the (lower) efficiency levels currently observed.

The specific measure of efficiency and its costs effective level to be used to assess the gap have been for some time, and continue to be, a hotly debated topic among economists, as well as between economists, engineers and other scientists. This debate has already been documented by Jaffe and Stavins (1994) almost 20 years ago. It is remarkable, however, that no matter how intense that debate still is, hardly anyone disputes the fact that current energy efficiency has not yet reached levels meeting even the most modest expectations in a wide range of situations. The fact that there are many yet unused opportunities in the world to reduce energy use cost-effectively has been recently reviewed by Gillingham et al. (2009).

Gillingham et al. (2009) find that most specialists agree that the two main areas in which the scope for energy efficiency improvements is the strongest are transport and buildings. The policy debates on the changes needed in the transport sector have been mainstreamed for some time now and have made it to the less technical media. Discussions on the relative value of rail vs. road transportation or on the potential role of increasing the share of hybrid cars in the vehicle fleet are common in the press for instance. This is not yet quite the case for buildings, at least not in a way that matches the importance of improving energy efficiency in general and in Belgium in particular.

The relatively low profile in the public debate of the importance of the building sector is somewhat worrisome. Indeed, it is well established that in most OECD countries, buildings account for over 50% of the electricity use (over 70% in the US according to BTP (2007) and about 40% in Europe according to the European Commission (European Commission (2010)). [1] Worldwide, heating, cooling and powering residential, commercial and government buildings uses 38% of all energy produced, compared with 26% for transportation (IEA (2008a)). [2] Once we include the energy consumed in manufacturing the steel, cement, aluminium, and glass used in building construction, the share reaches over 50%. Because they use energy inefficiently and because they use the wrong energy mixes, buildings are expected to represent about a third of total CO2 emission by 2050 under most business as usual scenarios (IEA (2008b)). However, adopting best practice technology in the sector would contribute 17% of the emission cut needed to meet the climate change targets. Adding the indirect effects of improvement in building design would lead to a total of 30% of the reductions in emissions needed.

Reducing global building-sector emissions would require $1 trillion in additional annual investment based on the technology cost assessment conducted by the World Business Council for Sustainable Development (WBCSD (2009) and Houser (2009)). This may seem to be a huge commitment, but improving the energy efficiency of buildings is the cheapest way to cut emissions according to many studies (McKinsey & Company (2009)). Moreover, for many actors, cost sav-

1. For details on what is happening in terms of energy efficiency in buildings in the EU, see www.build-up.eu.
2. According to the Odyssey indicators, EU27 household energy consumption at home is allocated as follows: space heating: 67%; lighting and appliances: 15%; water heating 14%; and cooking: 4%.

ings achieved will often result in de facto negative costs for these investments (WBCSD (2009)). [3] Indeed, accounting for the evolution of energy prices, energy savings are likely to overcompensate for the cost of improving energy efficiency in buildings, for many, if not most, buildings.[4]

If the potential for gains from improvement in energy efficiency of buildings is so promising, why is it that so little of it is actually being done? In a 2007 report, the IEA summarized and assessed the relative importance of many of the barriers to reducing energy consumption and increasing the use of renewable energy in a wide range of countries. Almost 5 years later, the diagnostic still holds. It argued that, in general, the failures to deliver on energy efficiency, no matter their source, are just as much the result of policy failures as of market failures.

The main market failures faced by consumers and investors typically identified include energy prices failing to reflect total social costs (and prices of technology), limited access to capital and credit market restrictions, lack of information, incorrect risk assessment (i.e. setting a discount rate) and transaction costs associated with the adaptation of desirable consumption and investment behavior. The main policy failures include limited or poor use of instruments available, poor understanding of the drivers of consumers' and investors' decisions, poor assessments of instrument cost effectiveness and poor assignments of instruments across agencies in the public sector.

The main purpose of the paper is to discuss the importance of the problem in Belgium. We address the costs and risks associated with the policy choices and designs, emphasizing the challenges for the building sector. We also explain why the Belgian energy efficiency gap is in fact one of the widest among European countries and why it is particularly wide for buildings. The review of the relevance of the policy design shows that the decentralization of environmental policies has resulted in varying approaches across the country but also with a wide range of successes, with Flanders ahead of the curve on many dimensions in cashing in on the potential benefits of improved energy efficiency in buildings.

The paper is organized as follows. Section 2 reviews the theoretical debate on energy efficiency, its policy implications and what they mean to understand Belgium's policy challenges. Section 3 summarizes the policies in Belgium, comparing them, when possible, to those elsewhere in the OECD. Section 4 summarizes the evidence available on the energy efficiency gap in Belgium. It also documents the strong relative importance of the efforts to be made in the building industry to deliver on the Belgian commitment to fight climate change. Section 5 concludes.

2 WHAT DOES ACADEMIC RESEARCH HAVE TO SAY ABOUT OPTIMAL POLICIES

The lack of adequate consumption, investment and policy decisions by consumers, producers and governments are the focus of much of the academic literature on

3. See Houser (2009) for a good discussion.
4. According to Houser (2009), energy cost savings at current prices would recover most, but not all, of the expenditures to reduce building-sector emissions in line with global goals.

energy efficiency. This section is a summary of that literature. While it tries to be quite encompassing, it emphasizes the results that may be most relevant to understand the Belgian performance, in particular in the building sector.

Initially, much of the literature focused on the consumption and investment decisions. The fact that energy efficiency came at a private (financial) cost was the driver of what appeared to be a failure by markets to get consumers and investors to adopt energy efficient behaviour which would get them to internalize the social cost associated with an overconsumption of energy. In the bulk of that literature, overconsumption of energy and underinvestment in energy saving are due to differences between private and social discount rates and to lack of incentives to behave in a socially conscious way (see Jaffe et al. (2004) for a much more detailed description of this approach to the assessment of energy efficiency). These differences in private and social discount rates also hold across regions within countries and could easily explain the differences in energy efficiency strategies between the various Belgian regions for instance.

From around the early 1980s to the late 1990s, a plethora of empirical studies offered estimates of the quantitative importance of the many factors that could explain the non-adoption of desirable investment and consumption decisions. Many studies have focused on the most obvious factor, energy prices. They have shown that energy prices, as expected, influence technology adoption and innovation (see Popp et al (2009) for a survey). In general, energy prices tend to be too low to lead to the energy efficient decisions — notwithstanding the many complaints heard every time oil price increases lead to gasoline and electricity price increases in most European countries, including Belgium. Clearly, the lack of incentive from the wrong price signals is likely to hurt the most the sectors for which there are a lot of inertia associated with the initial investment decision. Buildings are a perfect example. The energy efficiency concerns are less likely to have been internalized the older the stock of housing.

More complex studies have tried to estimate the discount rates and, the elasticities of consumption and investment decisions to a range of costs associated with energy efficient behaviours. This includes elasticities to financing costs, operating costs, quality costs, search costs and costs associated with the uncertainty of the payoffs of socially desirable behaviours. Most of the studies found that many of these factors could contribute to explain the observed efficiency gap, implying that the gap was rational as it reflected underestimated private costs or misunderstood preferences. Note that not all empirical studies validated this presumption of rationality built in the choices of methods used to assess discount rates until the mid 1990s. Alternative methods such as assessments of discount rates based on option valuation techniques rather than on assessments anchored on observed consumption or investment suggested much lower values for these rates (see Sanstad et al. (1995), Hassett and Metcalf (1993, 1995) for instance.

In addition to this research focusing on an enhancing of our understanding of the drivers of preferences for energy efficiency, there is also a good deal of research looking at the instruments available to address energy efficiency concerns. One of the main areas of research is the large number of instruments offered in the real world to reduce the financing cost decisions aiming at improving energy efficient decisions. These have recently been surveyed by UNEP (2009) in an effort to show

that limited access to finance to improve energy efficiency is a widespread concern. The IEA (2007) actually argued not too long ago that, besides the failure of prices to reflect economic costs, maybe the most important failure is the limited access to capital. In other words, finance matters. The concern is not new. Almost 20 years ago, DeCanio (1993, 1994) already made this point when he found that firms rely on internal hurdle rates for energy efficiency investments and that these tend to be higher than the cost of capital to the firm. A more technical study was recently undertaken by Fuller, Portis and Kammen (2009). It offered a more formal assessment of the fact that, in spite of almost 20 years of experience in energy efficiency financing, limited access to finance is still very much on the agenda for efficiency oriented investment decisions. The challenge is particularly strong for residential and small commercial users. They can actually face much higher finance costs than large businesses and utilities. It may also represent a much larger share of their income, making it harder for them to access the capital necessary to make energy efficiency improvements.

Focusing on the building industry, the European Alliance of Companies for Energy Efficiency in Buildings (EuroACE (2010)) validated the 2007 IEA assessment after looking at over 100 instruments currently in place across the EU. One of its main findings is that, indeed, potential investors often cite lack of appropriate financial mechanisms as one of the main barriers to increased energy efficiency renovations in Europe's buildings. Belgium is rated in that survey as one the worst performers not only in terms of efficiency achievements but also in terms of the menu of cost effective instruments available to increase energy efficiency.[5]

Overall, empirical estimates had offered strong evidence of the substantial potential degree of responsiveness of energy consumption levels and types, as well as energy-efficient technology adoption and innovation to changes in energy prices and many related costs. But none of that evidence was conclusive from a policy perspective. Something was missing. This is why more recent research has gone beyond these relatively standard views on the drivers of behaviour, including sources of what appears to be irrationality in the rejection of cost effective energy efficiency improvements. The most recent research has started to rely on experimental models to identify systematic biases in consumer decision as drivers of suboptimal underinvestment in energy efficiency. It offers interesting complementary results which can contribute why price signals do not always work as expected from standard microeconomics. But is does not really fill in the gaps in the explanations of the failures of energy efficiency policies.

Shogren and Taylor (2008) in their survey of the evidence argue that behavioral economics in the context of environmental policy does not allow a wholesale rejection of rational choice theory. They do however argue that it has been useful in identifying anomalous behavior and make a convincing case to continuing analyzing the economic circumstances, institutional designs, and social contexts in which rational choice theory works and those where it fails to capture observed behavior. A significant volume of research recently reviewed by Neij et al. (2009) has looked into more precise foundations for the micro-motivation of household decision with

5. Table 1 in EuroAce (2010) is quite striking showing how different Belgium's choice of instruments from that of other 16 countries covered in their survey.

respect to energy efficiency. They suggest that an overview of evidence collected by academics shows that the specific design of products can matter. Developing energy efficiency products and assets that meet household's requirements and preferences in terms of prices, brand/designs, performance can significantly contribute to reduce the risks of non-adoption of desirable decisions.

Considered jointly, all these empirical results show that there is no obvious standard ranking of instruments. The mismatch between prices and social costs probably matters the most, but among the other instruments, the cost effectiveness can vary across designs, across agents, across sectors, across countries, across time and according the macro context, including global financial liquidity and the fiscal situation of the governments concerned with energy efficiency. Collectively, independently of the ranking, these results make a strong case for government intervention to address the efficiency gap.

In practice, governments have been intervening, of course. There is a wide literature on the use of taxes, subsidies and educational campaigns to address the externalities, the financing gaps and information failures on costs and benefits of behaviours consistent with energy efficiency. There is however also evidence that a fair share of these efforts have not paid off as fast or as much as expected. Gillingham et al. (2006), for instance, reviewing the literature on environmental externalities from the production of electricity, found that energy prices had not been impacted by government policies enough to get economic agents to internalize these externalities, at least until the mid 2000s. The debate on energy prices in Belgium is still about how high they are becoming, ignoring totally the economic signal prices are supposed to generate to reduce demand.

So, the efficiency gap may be closing but the evidence suggests that governments have not been as successful as they expected. A lot of very interesting research has tried to look at why government interventions to reduce the efficiency gap has not been as effective as expected, in particular why government policies are not managing to speed up building efficiency. Indeed, many governments have introduced subsidies of various types to support retrofitting of old buildings — which constitute the vast majority of the building stock — and new standards are increasingly imposed on new constructions. But the hardest quantitative evidence available suggests that many of these initiatives hardly work as expected. Fuller (2009) shows that of the over 150 loan programs for residential energy efficiency put in place in the United States, less than 0.1% reached their "potential" customers in 2007.

One of the explanations for the poor performance may be insufficient enforcement of otherwise fine policies. This point is validated by a 2010 survey of the progress towards implementation of energy certification of buildings in Europe conducted by Andolero et al. (2010). For Belgium, they find that, as of 2010, it was one of the worst performers, not only in terms of adoption, but also in terms of enforcement of regulations adopted.

Could it be that lack of enforcement and financial support is simply the result of a generalized insufficient budgetary allocation? In many countries, indeed, the fiscal budget constraints seem to be the obvious answer but although there is not a lot of evidence on this point, it is unlikely to be sufficient to explain the slow speed at which the energy gap is closing, even accounting for inertia as in the case of buildings for

instance. So there has to be more to it in view of the many sound business opportunities that energy efficiency can represent and research is starting to catch up with the idea that we collectively may not have been focusing on the right problems. There is indeed a growing volume of research focusing on the agency problems (i.e. the complex interactions between actors with different goals and different levels of information when one actor is responsible to deliver on a commitment made to another actor) built in the assignment of instruments across government actors.

A recent survey conducted by the International Energy Agency (see IEA (2007)) provides extraordinarily useful insights into the drivers of these agency issues that contribute to explain why apparently sound policies don't deliver. The IEA analysis shows that governments tend to underestimate the number of agency issues that arise in the implementation of energy efficiency policies. It also shows that it is easy to underestimate the fact that the sum of minor agency issues can have a large aggregate impact on the efficiency performance of an energy policy. The survey shows, as expected, that better information, communication and education can reduce agency risks. More interestingly, the survey of experiences is quite remarkable in that it shows that the incentive problems are so often anchored into a failure to ensure that contracts force end-users to face total prices. It also shows that the insufficient care in the design of standard regulation can easily explain the lack of incentive to comply. Note that, although the IEA study does not point to this, the case studies also hint at how this can explain why there is a missing market for efficient building since certification can result in market segmentations which progressively lead to the death of some product and service markets (the missing market argument). Finally, the survey shows that incentive issues are quite context specific, suggesting that institutional and general regulatory frameworks and approaches are relevant dimensions that need to be dealt with in choosing policies. Implicitly, this means that for some policies, the concept of best practice can be quite misleading.

Another, more recent, survey of the results of 18 programs in the US and Canada, conducted by Fuller (2009) shows that policy failures are not only about efficiency, but they can also be about equity. She shows that key energy efficiency projects have largely failed to address the financial barriers faced by those most in need of financing. This includes those with the highest energy cost burdens as a percentage of income, low or fixed incomes, poor credit, and those in rental housing. The required credit rating requirements were incompatible with the situation of many potential investors and renters. Most do not address the split incentives between rental property owners who make the investment and tenants who pay the utility bills. Fuller (2009) also argues that part of the problem stems from the limited ability of public and private financial institutions to deal with energy efficiency issues and the associated businesses. Overall, the policy message emerging from that research is that some types of users can actually face much higher finance costs than large businesses and utilities. The level of expenses associated with energy efficiency in relation to their income makers it harder for them to access the capital necessary to make energy efficiency improvements. Ignoring this is a major policy mistake.

To sum up, both theory and evidence have identified many potential policy options to deal with energy efficiency. Both have also showed why many of these options may not work in practice when basic agency issues and behavioural reac-

tions are ignored. The emerging picture is however quite atomized. Most of the analysis has focused on assessment of individual instruments, with the exception of the cost effectiveness assessments recently conducted by EuroAce (2010). All this means that we have a sense of what could work (and prices are very high on that list), but we do not yet have a formal picture of how to pick in the menu of options to get investors and consumers to behave in a socially responsible way in very different types of institutional contexts. For instance, we do not really understand the fact that a successful financing industry has not yet developed to ensure that lack of access to capital can no longer be blamed as an explanation to the residential efficiency gap. Ultimately, what we know from the evidence is that a broader set of determinants needs to be considered and that different determinants will influence households' and businesses' technology choice differently in different markets under different circumstances and for different technologies. This is quite useful for policy evaluation and to inform policy decisions. But it is not enough as evidenced by the Belgian experience discussed next!

3 WHAT ARE THE ENERGY EFFICIENCY POLICIES IN BUILDINGS IN BELGIUM? [6]

To assess where Belgian policies aiming at improving energy efficiency stand, including in buildings, it is essential to recognize that, to a large extent, these policies are driven by guidelines decided at the EU level. Every EU Member State has agreed to submit to the EU a National Energy Efficiency Action Plan (NEAAP) which should cover federal and regional plans. This document will have had to be submitted by each Member State three times by the year 2016: on the 30th June 2007, 2011, and 2014.

These action plans essentially discuss how countries will comply with EU guidelines, including the requirements and minimum targets spelled out in the guidelines and their regular updates. While the 2007 NEEAP had to provide only basic information on targets and measures/instruments, the second and third plan will also have to provide evaluation of the impacts of the preceding NEEAP and/or of the final results with regard to the fulfilment of the energy savings target.

The basic quantitative target built in the plans was defined in the 2006 Directive on Energy End-Use Efficiency and Energy Services (2006/32/EC). It specified an indicative national energy savings target of 9% to 2016. [7] For buildings, the initial document is the 2002 EU Energy Performance of Buildings Directive (EPBD). It was revamped in 2008-2009 to increase incentives to overhaul buildings throughout Europe. The main instruments suggested are minimum performance standards and energy certificates. The explicit associated target was a consumption drop of 5-6% and a matching reduction of CO2 emissions by 2020 (IEA (2008)).

6 IEA (2009) provides a very useful assessment of the overall performance of the Belgian energy sector. Most of the institutional description of this section relies heavily on that publication. Updates and relevant details have been added when necessary.

7. In addition to the 9% target, many countries, including Belgium, have agreed to a non-binding 20% reduction target for 2020.

The latest revamping of the guidelines took place in March 2011. Essentially, it added to the 2006 guidelines a binding target for a doubling of the refurbishment rate of public buildings (to a low level), new energy efficiency criteria for public procurement, new requirements to cut legal obstacles to building renovations, the obligation to establish new rules for energy savings obligation to be imposed on energy companies, mandatory energy audits for large companies and some measures to improve information collection and dissemination on energy performance contracting and energy services companies, e.g. information compilation. [8] Overall, this is roughly the vision in which Belgium needs to fit.

Belgium stands out among EU members in that it is the only country for which the quantitative target of 9% is a commitment made at the regional level (Brussels, Flanders and Wallonia) rather than at the national level. In fact, the federal NEEAP does not mention the final savings target. This also means that there are de facto 4 Energy Efficiency Plans in Belgium, a national one and three regional. For all practical purposes, the main drivers of Belgium's contribution to the EU effort to improve energy efficiency are thus designed at the subnational level. Consistent with the autonomy given to each region, the four different Energy Efficiency Plans vary significantly in the level of information provided. The types of commitments and the instruments adopted vary across plans, and once more the level of detail differs. [9]

The Flemish plan is the clearest and the most detailed. For instance, it already includes specific estimations for the payoffs expected for a number of key measures. The differences in the level of details across regional plans are such that the NEEAP are relatively unclear as to how the various regional initiatives add up to a national savings target. It is thus unclear as to how the federal measures complement the subnational plans to ensure a 9% saving for Belgium or add to the commitment, with a possible higher level of savings associated. According to the IEA (2009), Flanders will contribute 62%, Wallonia 30% and Brussels-Capital 8% to the total reduction expected from Belgium.

Although the implementation of these EU guidelines and vision is thus largely the competence of the three regions since 1989, the federal government also intervenes in setting standards and financing. It is notable that some local governments (communes) have taken the initiative to contribute to the promotion of energy efficiency as well, even if it is not part of their mandate. In view of the complexity of the allocation of responsibilities, and the associated complexity of the instruments available, Belgium also created a coordinating agency in 1992, CONCERE/ENOVER (Concertation État-Régions pour l'Énergie/Energie-Overleg Staat-Gewesten inzake Energie). It is essentially a consultative group created and run jointly by the central and regional governments. One of its main tasks is to gather information, to promote its exchange among the regions, the federal government and internationally and to discuss regional, national and international policies, including those relating to energy efficiency. In addition, in each region, networks of "energy experts" have

9. The 2009 National Climate Plan offers details on policies and measures in each region. Although the concerns are similar and reflect concerns such as greener jobs, greener growth and support to the energy poor, the choice of measures to get to these goals varies across regions, one of the expected characteristics of decentralized policy decisions.

been established to facilitate investment in energy efficiency improvements, conduct energy audits of buildings and to disseminate relevant information.

A detailed analysis of the plans shows that all Belgian regions have clearly recognized buildings as one of their main policy challenges since about a third of the efficiency gap can be attributed to this sector. The challenge is not minor. According to the IEA (2009), about half of the 4 million Belgian dwellings did not meet current building codes in 2009. All government levels will indeed have to be involved in the effort to achieve energy savings in buildings. The federal government is actively involved in stimulating the transformation of the sector. It offers a wide range of fiscal incentives to cover basic and relatively easy improvements such as insulation, boilers and glazing. A specific fund (250 million Euros) has also recently been introduced to improve energy efficiency in housing for low income families. These concerns have been matched by each region and with different approaches. Flanders offers energy renovation loans, while Wallonia and Brussels offer zero interest loans for energy efficiency projects. The federal government is also concerned about improvements in the performance of public buildings. In 2008, it made a commitment to reduce CO2 emissions in public buildings by 22% in 2014 and allocated 100 million Euros to the financing of the related contracts. Each region is also developing its own set of energy performance certificates and requirements for new and old buildings. They do so under the umbrella of the CONCERE/ENOVER to ensure coordination and harmonisation.

4 HOW EFFECTIVE HAVE ENERGY EFFICIENCY POLICIES BEEN IN BELGIUM?

To our knowledge, there is no official full assessment of the energy efficiency performance in Belgium. [10] Although some of the data is available, there does not yet exist a clear set of data matching a clear methodology that could be used to track the efficiency performance in detail and objectively. Table 1 gives a sense of the Belgian situation based on data reported to Eurostat and compares it to the average EU performance in terms of CO_2 emissions and average electricity consumption. Even if these "intensity" measures are not strictly per se measures of efficiency, they gives a good sense of how far off Belgium is from the average EU performance.

The latest data is for 2008 and it shows that, *on all fronts,* Belgium is a poor performer. Although there is no indicator offering a direct monitoring of energy efficiency in buildings, the indicator for energy consumption in the residential sector is a reasonable proxy as the two indicators are highly correlated. The story that emerges is that Belgium is particularly bad on this front. Looking at the other indicators shows that Belgium is a bad performer on all energy efficiency fronts. Its average total energy consumption per capita is about three times the average for

10. It is quite remarkable that demand management and efficiency enhancing measures are hardly touched upon in the Gemix report that discusses the future of the energy sector for Belgium.

Europe. Its CO_2 emissions in transport are also systematically higher than the European average.

Table 1: Energy consumption and CO_2 emissions in Belgium and in Europe

	Belgium			European Union		
	1990	2000	2008	1990	2000	2008
CO_2 Emission/capita (tCO_2/capita)	10.37	11.01	9.19	8.52	7.84	7.65
CO_2 Emission of transport/capita (tCO_2/capita)	2.00	2.36	2.32	1.59	1.83	1.91
CO_2 Emission of residential sector per household (tCO_2/household)	4.63	4.73	3.53	2.94	2.51	2.22
Average electricity consumption per capita (kWh/capita)	4636	5608	4783	1283	1480	1634

Source: Eurostat.

Although there is no official data, we have a good sense of how bad the situation is in Belgium's building energy efficiency thanks to estimates recently released by McKinsey (2009). That report argued that Belgian energy consumption per square meter in residential buildings is more than 70 percent higher than the EU average. McKinsey also argues that, added to Belgium's commercial buildings, residential buildings were responsible for 35% of primary energy demand but they account for about three quarters of buildings' primary energy demand. Within the commercial buildings category, primary energy demand mainly comes from schools (30%), hospitals (30%) and public administration offices (30%).

It may be useful to point out that there are very basic technical reasons why the energy efficiency challenge for Belgian buildings may be tougher than in the rest of the EU. McKinsey (2009) explains that the Belgian building stock is relatively old (because it is characterized by one of the lowest demolition rates in Europe, at 0.075 % per year). This effect is reinforced by the fact that growth in the building stock is only 1% while it is 1.5% on average among its main neighbours. This means that unless specific actions are taken to compensate and force a modernization, the relative energy efficiency of the Belgian building stock is also likely to decrease. Uihlein and Eder (2010) and McKinsey (2009) also point out that it does not help that Belgium is characterized by a much higher percentage of single-family houses than other European countries. Moreover, Belgium also suffers from a lower penetration of energy efficiency features, such as double glazing and insulation, than other European.

Overall, this paints a very dark picture of the Belgian energy efficiency performance but in general, the prospects for a change in the situation seem to be quite good.[11] Indeed, a more positive spin can be put on this data considering the evolution over the last decade or so. All indicators of energy intensity are improving and generally more so than the average for Europe. This implies that Belgium may

be catching up with the best in spite of the particular technical and institutional challenges it is facing. According to the 2009 IEA diagnostic of the Belgian situation, this is the direct result of measures implemented to promote energy efficiency. It is a credible assessment since it took place right before the crisis hit so that lower emissions cannot be credited to lower production. It may indeed be the result of public funding for energy R&D and of the reinforcement of energy security measures for different fuels.

A second positive factor is that the motivation to improve is quite strong since the payoffs would represent about 1% of the projected GDP according to McKinsey(2009). That report has identified a theoretical primary energy demand savings potential representing 29% of the "business-as-usual" scenario by 2030. About half of that improvement will come from buildings (vs 22% for Industry and 21% for Road Transportation). Moreover, looking at the policy opportunities discussed later in the paper, this payoff seems to be realistically achievable under a combination of investments and policy driven behavioural changes, with a strong potential for a positive private NPV for investors in view of the evolution of oil prices. The political support for these measures could be further enhanced by taking in to account the potential job payoffs. For instance, in Wallonia, the Energy Plan for Public Buildings voted in June 2008 is expected to maintain or create about 1200 jobs. McKinsey estimates the number of jobs associated with the energy efficient building industry in Belgium to be around 20,000.

5 CONCLUDING COMMENTS

From a policy perspective, the evidence reviewed here offers a number of relevant lessons--most of them relevant to all sources of energy inefficiencies and not just buildings.

The first is that it is puzzling to see how little attention is paid to the fact that good regulation and good instrument selection and design is easier when information available to the policymakers to design their policies is good. In Belgium, efficiency related information, in particular when it comes to buildings, is simply quite insufficient to be able to identify the specific legislative and regulatory gaps.

Targeting instruments to improve energy efficiency in buildings requires a better understanding of:

i) the dimensions of efficiency on which users of buildings are actually willing to act (i.e. a better understanding of the behavioural drivers of consumption and investment decision-making in the various regions and in the various sectors when it comes to efficiency);
ii) the hidden incentives driving the behavior of renters and owners of buildings;
iii) the way in which equity-efficiency trade-offs can be minimized through proper design of the price structure of regulated goods and services;

11. We don't deal with industrial efficiency simply because it is harder to benchmark internationally in view of the wide variance of industrial structures across the 27 EU countries.

iv) the real importance of the imposition of stronger standards and improved pricing of heating, ventilation and air conditioning (HVACs) and water heating systems that accounts more systematically for the age of the Belgian buildings stock; and

v) the potential role of the banking sector to leverage the public resources available to finance investments in energy efficiency in buildings with positive NPV (and according to the McKinsey study and many other observers, there are many!).

Second, it seems important to have a better sense of the global allocation of fiscal resources made available to close the financing gaps associated with efforts to improve energy efficiency. The total allocation of resources to these efforts has proven to be quite modest and difficult to improve or redesign, including for institutions with enough political leverage to collect information such as the EU, the OECD or the IEA. Moreover, when data is available, most of it focuses on commitment. Very little is public on actual disbursements at the national level. This is unfortunately true for most countries in the EU.

Third, the strong degree of decentralization of environmental policy in Belgium is also a challenge in that it it demands a careful assessment of the optimal assignment of instruments. The various groups of authorities responsible for energy efficiency have so far managed to develop a fairly strong set of instruments to allow Belgium to deliver on its commitment to comply with EU guidelines. However, Belgium is to some extent a caricature of the agency issues discussed in section 4. The degree of autonomy of the various government levels is such that coordination needs are extremely high. The CONCERE/ENOVER is a good step in the direction of a good level of coordination, but it seems reasonable to expect that the implementation of this coordination is unlikely to meet the necessary levels. The 2009 IEA diagnostic still validated that concern and found that overlap and duplication of efforts were too common. Not much has changed since then on this front. This is socially costly and moreover, leads to confusion among consumers and investors.

Finally, monitoring and evaluation of energy efficiency policies and of their effectiveness is particularly weak in Belgium. It is quite remarkable that international or multi-country studies that cover Belgium usually provide a lot more details on what is going on in Flanders than at the national level or in the other two regions. This may be due to the specificities of the organization of the state and of each region, but it probably goes well beyond that. For instance, enforcement of policies is also a lot more complex in this context. The discussion at this stage should no longer be about who is monitoring and who is enforcing, it is about who should be doing it to ensure the desired outcome at the lowest possible cost to society, accounting for the fact that decentralization is a fact of life.

Overall, these conclusions are very consistent with those derived from theories that consider agency problems of institutional environments in which multiple principals need to deal with multiple agents. They do raise the question of the extent to which the choice of instruments and their design matches enough the institutional complexities of the design of energy efficiency policies in Belgium. If there is reason for concern, it should obviously not only be based on this very brief overview of the

incentive issues raised by the allocation of the responsibility for the design, monitoring and enforcement of policies across governments within the country. The case for concern could however very easily be anchored in the very incomplete level of information and the need to rely on approximations to conduct policy analysis in this sector. Evidence matters to sound policymaking. This evidence is lacking in terms of energy efficiency, and in particular in buildings, making a fair diagnostic of the efficiency challenges ahead difficult at this stage. The partial evidence available is however robust enough to hint at serious problems that deserve a full government managed diagnostic of Belgium's policies aiming at getting the country to improve its energy efficiency in general, and in buildings in particular.

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