

NATIONAL REPORT ON O&O– HUNGARY



WP3	Strategy for eco-knowledge
ACTIVITY 3.2	Analysing the environment for ecoinnovation in partner countries
DELIVERABLE 3.2.2	National report on obstacles and opportunities

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1. Abstract

Hungary is a well-developed post-industrial country located in Central Europe and has a strong post socialist history regarding environmental issues. Since the constitutional change of 1989 the country made great steps forwards in environmental protection, land reclamation and eco-innovation but new challenges emerged requiring even more progress.

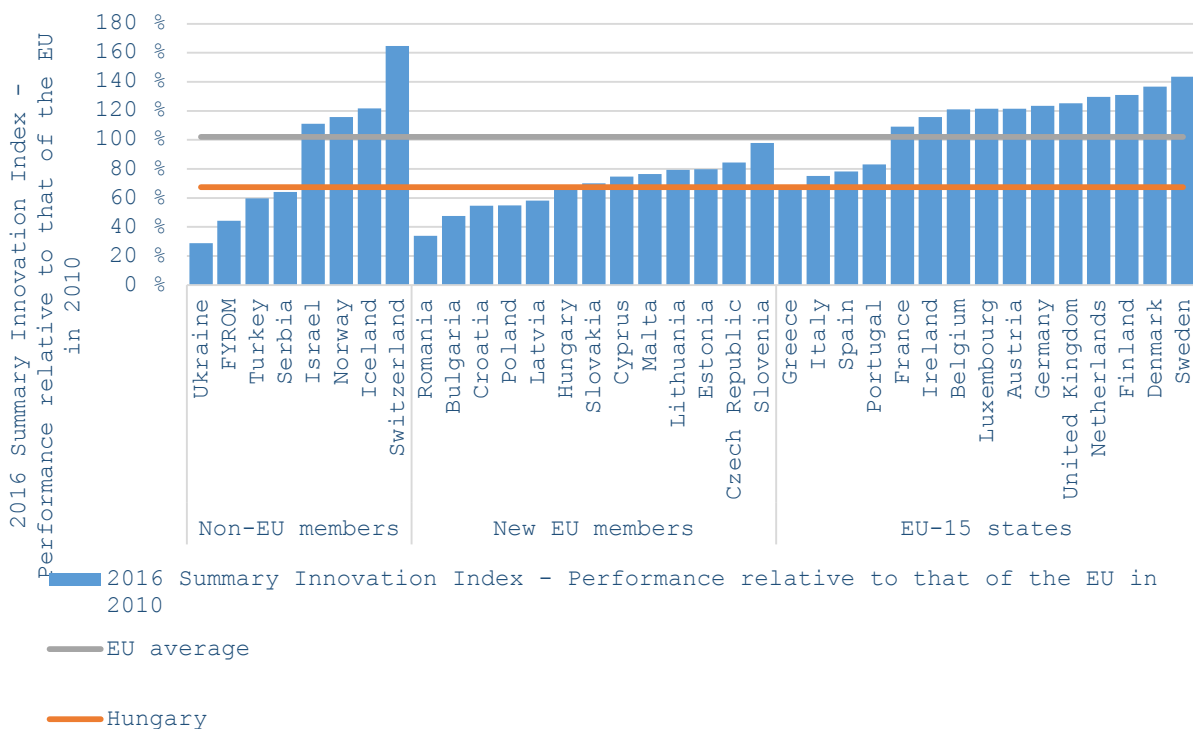
The opportunities in the emergence of new products are somewhat limited by the low R&D output, especially the eco-innovation sector is lagging behind. The limiting factors are the low public expenditures on R&D and the decreasing expenses on education. This can be compensated by the appearance of new types of businesses, namely start-ups for which the business environment of Hungary is very appealing due to the strong presence of venture capital. They can give a significant boost to eco-innovation as these kind of enterprises tend to choose their scope based on social return apart from other business-related considerations.

There are some barriers and obstacles on the long run nevertheless which need to be addressed before a major change could happen. There is no significant support for eco-innovation and this sector remains mainly unknown to this day, this is however a deeper rooted issue since environmental concerns has just really started to become a relevant concern in decision-making and in the public discourse.

Eco-innovation, resource efficiency and alternative energy were required to take a back seat so far due to the financial crisis in 2008, when unemployment, dwindling industry and declining economy had suddenly become a vital problem but as the country is slowly recovering from the concussion caused by the depression, the country could face these rather pressing challenges again. This is reflected by the progress made in some departments of innovation and energy matters, but there is a lot of work to be done, because Hungary is lagging behind in important affairs. The post-socialist heritage of industrial sites are now being almost completely reclaimed which required a huge effort and a considerable amount of experience had been gained in the process that could be exploited more. The public discussion now focuses on different matters, but the awareness of the citizenry is constantly growing and there is now an even bigger demand for environmental thinking than it was before.

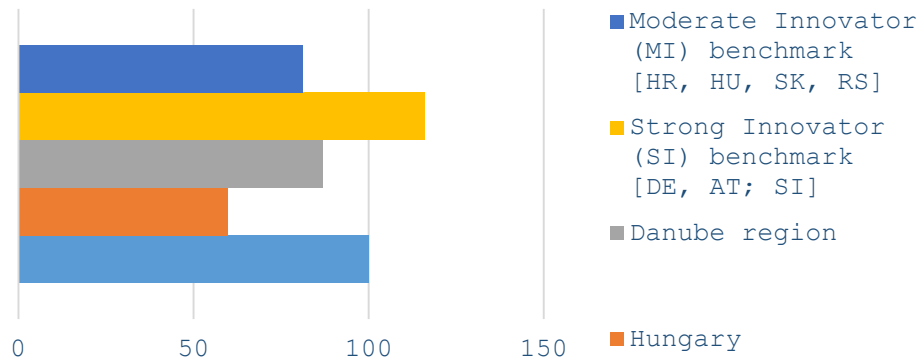
2. Overall National Ranking

Although none of the new EU members met the 2010 EU average of the Innovation Index by the end of 2016 with Slovenia being the best at 97,8%, Hungary is definitely lagging behind reaching only 67,4% of the EU performance which is slightly less than the average of the new members (67,6% and 66,1% compared to the 2010 and 2016 averages) and is only roughly the half of its most important western trade partners, Germany and Austria. In the period of 2010 and 2016, the indicator had been falling with another 3,5% while similar countries such as Latvia (+21%), Serbia (+17,3%) and Poland (+2%) had been performing significantly better. There are countries however experiencing a similar or even higher level of innovation performance drop, namely Romania, whose indicator had been decreasing with a whopping 14,1% and Germany with a surprising 3,7% decrease mainly due to the poor performance of SMEs.



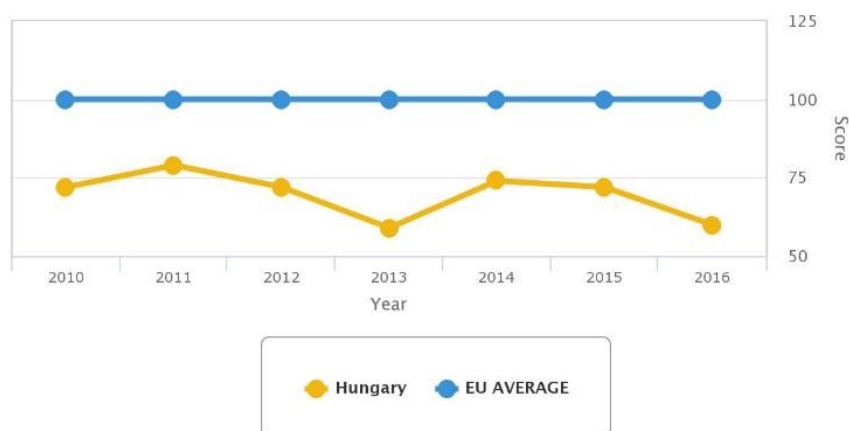
The declining performance Hungary is due to the dwindling private co-funding of public R&D expenditures and the falling sales of new-to-market and new-to-firm innovations - the absolute numbers associated with the latter however are relatively high and fall just slightly short of the EU average.

Eco-innovation index



Compared to the Danube region (including EU members Germany, Austria, Czech Republic, Slovakia, Hungary, Slovenia, Croatia, Romania and Bulgaria) and the 'Moderate Innovator' countries Hungary we can observe a considerable backlog. In fact, Hungary's overall score surpasses only that of Bulgaria and is less than a half of Germany's result, which is a big step backwards since 2010 when the country performed better than 11 others, but it seems that the rest of the EU had been moving forward while Hungary had been marking time, which is only partly true as Hungary shows a highly fluctuating performance. The composite index was 70 in 2010 and 83 in 2011, reached only 60 in 2013 but clawed back to 78.8 and 81 in 2014 and 2015 respectively, only to fall back to 60 in 2016. This spline can be noted on most new member states and most likely it marks the end of the global financial crisis which hit hard the eco-innovation performance of these countries. It seems like the crisis has set back Hungary a bit more than its peers as it was not been able to climb back to the levels it had reached before.

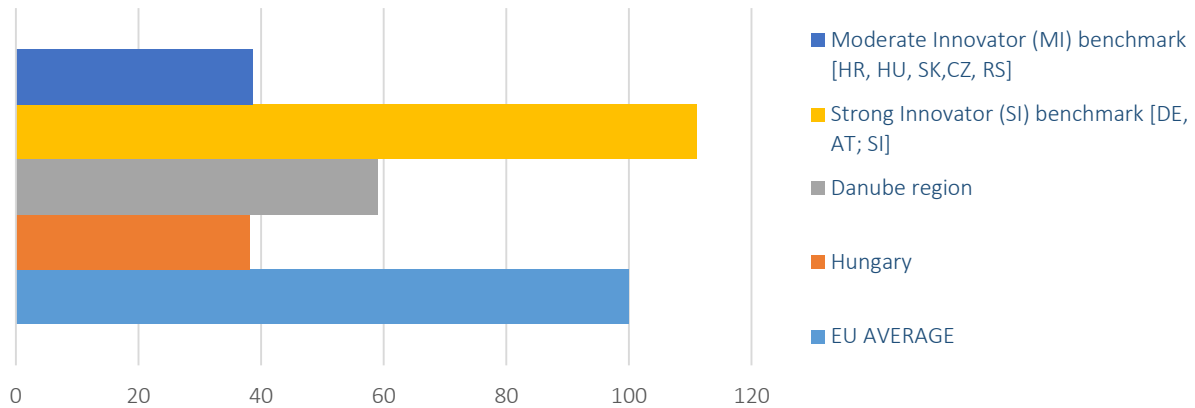
Eco-Innovation Index, 2016, Hungary and EU AVERAGE



The numbers associated with eco-innovation inputs meet the so-called 'Moderate Innovators' level, but fall behind the EU average and even the Danube region. This indicator consists of 'government's environmental and energy R&D appropriations and outlays', 'total R&D personnel and

researchers' and 'total value of green early stage investments'. The numbers decreased to a level that of 2013 from a big peak in 2014: 38 in 2013, 83 in 2014 and again 38 in 2016 respectively.

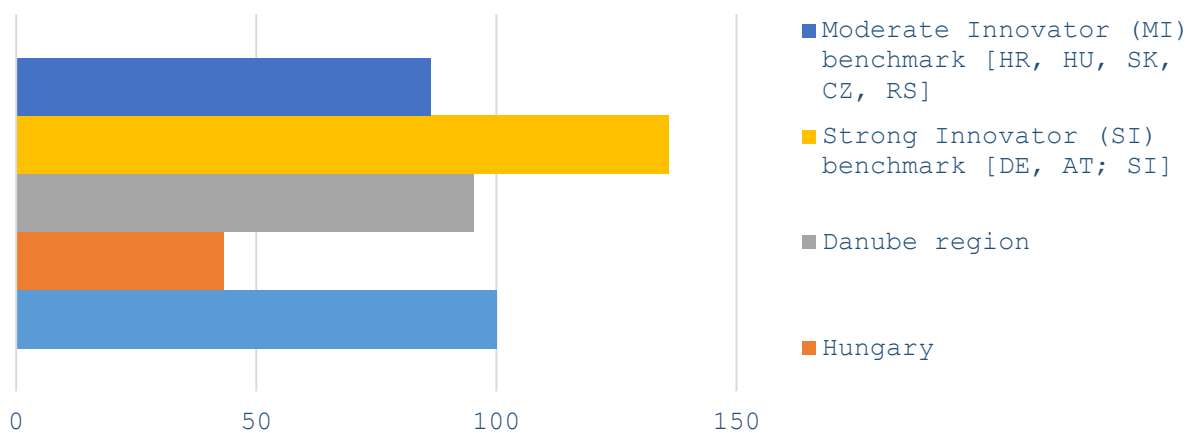
Eco-innovation inputs



According to Eurostat, the first component of this indicator ('environmental and energy R&D appropriations and outlays') decreased slightly from 2013 to 2014, while component 'total R&D personnel and researchers' increased somewhat from 2013 to 2014. A total of 30,79 million USD was put into green early stage investment between 2012 and 2015.

Eco-innovation activities are showing less grim numbers but Hungary falls short in comparison to its peers, even 'Moderate Innovators'. It should be noted, that the amount of ISO 14001 registered organisations is just slightly less than the EU average, and are found in greater proportion than some EU-15 countries, such as Denmark or even Austria. This indicates that the environment is at the top of the agenda for Hungarian enterprises, but there are not so much innovations that serve that program however. The amount of companies that introduced any kind of innovation is proportional to those with environmental benefits to either the end user or the enterprise itself.

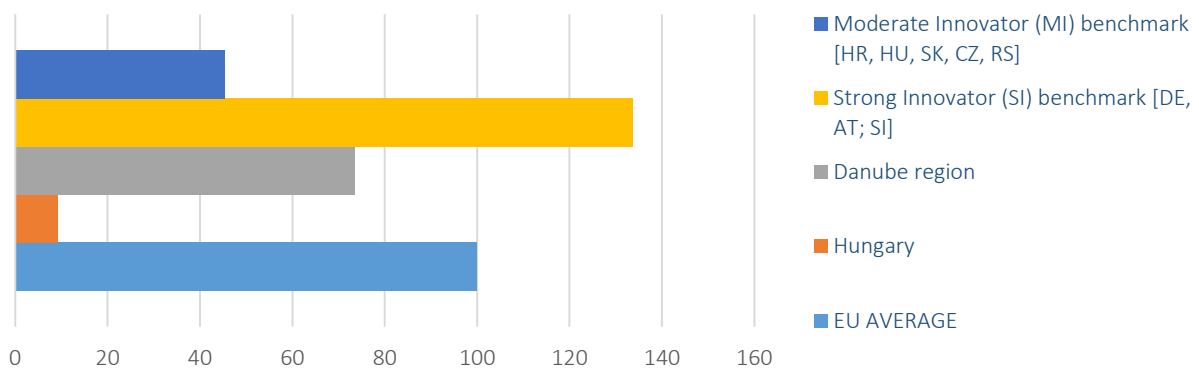
Eco-innovation activities



Eco-innovation outputs reveals a rather lacklustre situation when compared to other countries' figures. This wasn't always the case, Hungary has shown remarkably performance between 2010 and 2013 but was lagging behind ever since. This index consists of three indicators, namely eco-innovation related patents, publications and media coverage.

Patents in environmentally-related technologies, such as energy generation or renewable and non-fossil sources, combustion technologies with mitigation potential, emissions abatement and fuel efficiency in transportation, or energy efficiency in buildings and lighting are considered to be eco-innovation related. The number of patents decreased greatly since 2013.

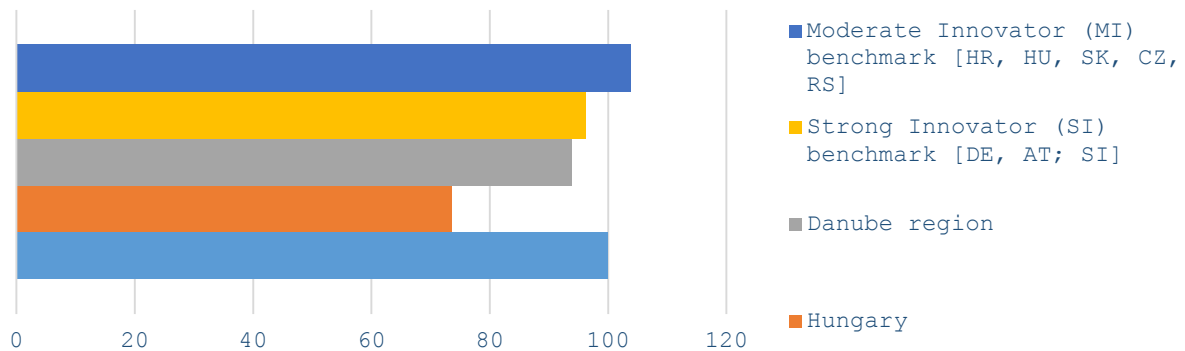
Eco-innovation outputs



The number of academic publications has been decreasing steadily since 2011, while the amount of eco-innovation-related media coverage reached 0 points in 2016.

The resource efficiency indicator is relatively good across the whole EU and Hungary is surpassing even Sweden with 12 points reaching 74% of the EU average. Between 2010 and 2016 the outcomes changed only slightly peaking at 82 in 2014 only to decrease to 74 in 2016. This is mainly due to material productivity which is the ratio of GDP to DMC (domestic material consumption) which was even better than the EU average in 2014 but had been falling (in reality the consumption had been rising) sharply and almost halving to 59 points as of 2016. We believe that this is due to the increase of industrial production in Hungary which have been a long-term government strategy to strengthen the economy of the country and to increase the amount of job opportunities. This process combined with the steadily increasing GDP figures led to the surprisingly strong decrease in material productivity.

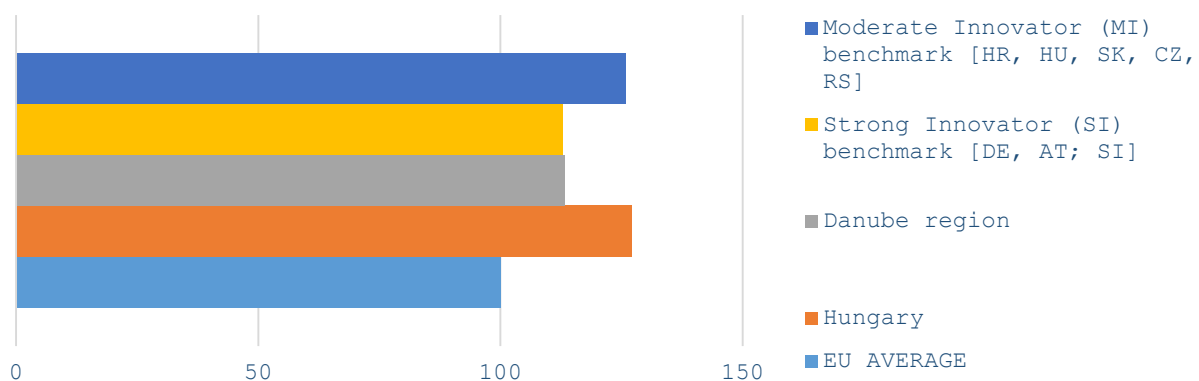
Resource efficiency outcomes



The water productivity indicator was fortunately updated in 2016 as it had been using data collected between 1996 and 2005 before being amended.

Energy productivity and GHG emissions intensity also improved until 2013 and after that this two also began to shrink. This is due to the recovery of the industrial production which was hugely affected by the 2008 financial crisis.

Socio-economic outcomes



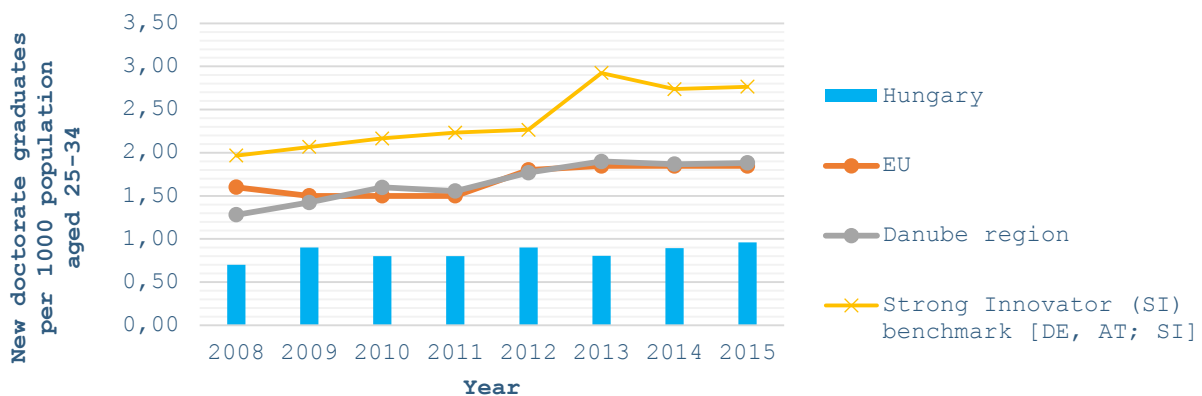
The socio-economic outcomes associated with eco-innovation is where Hungary excels compared to its peers, it is actually the only indicator where it exceeds the EU average. The core industries in this sector are renewable energy, collection and treatment of waste and sewage, air pollution control and recycling/recycled materials. The export of products from eco-industries exceeded the EU average in 2012 peaking at 139 points it had been declining ever since reaching 88 point as of 2016, which is due to other export-oriented industries recovering since the financial crisis of 2008.

The other two components are employment in eco-industries and circular economy, and revenue in eco-industries and circular economy, and it is important to note regarding this two that the source of these two components was changed in 2013 because the NAICS code was changed in 2012 which serves as a basis for selecting the concerned industries.

3. Innovation

3.1 Indicator: New doctorate graduates per 1000 population aged 25-34

The amount of new doctorate graduates is something Hungary falls behind in with only 0,96 new doctorate students graduating in 2015 per 1000 inhabitants aged 25-34 years, while the EU average and the performance of the Danube region countries are being exactly the double of the Hungarian numbers. The trend is not promising as well, in the observed period the amount of new doctorates rising only with 37% compared to the average of the Danube region of 47%.



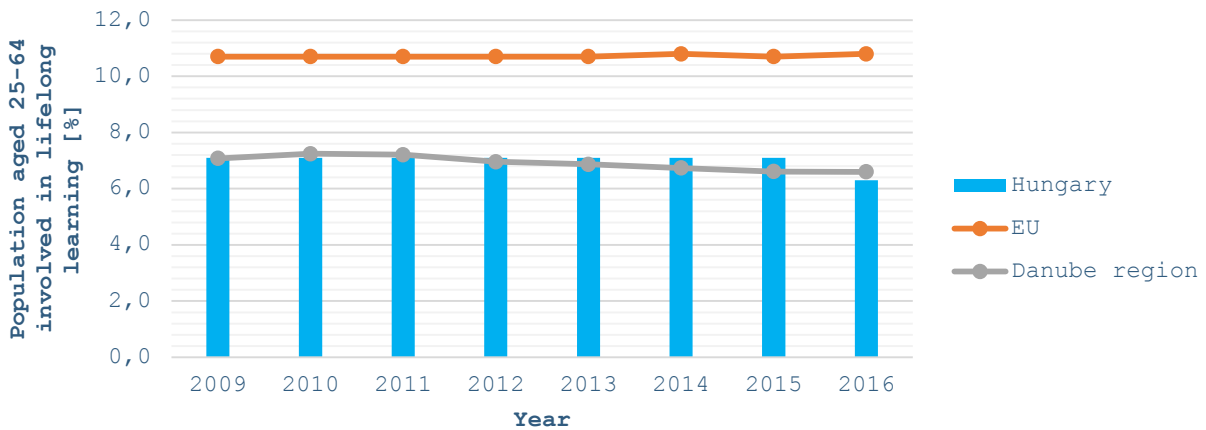
This could might occur due to the career opportunities perceived as doubtful at best in certain areas of study and also the associated moderate wages. The prestige of a doctoral degree is still high in some areas, but not all. It is not known if obtaining a degree would be significantly harder than in other countries, but this low amount of PhD graduates is contradicted by the number of 25-34 year old population having completed tertiary education which is more or less converges to the average of the Danube region being less only with 3%.

OBSTACLE: The insufficient amount of skilled workforce with a PhD degree could hamper the somewhat weak innovation processes and requires importing highly educated workforce to the country.

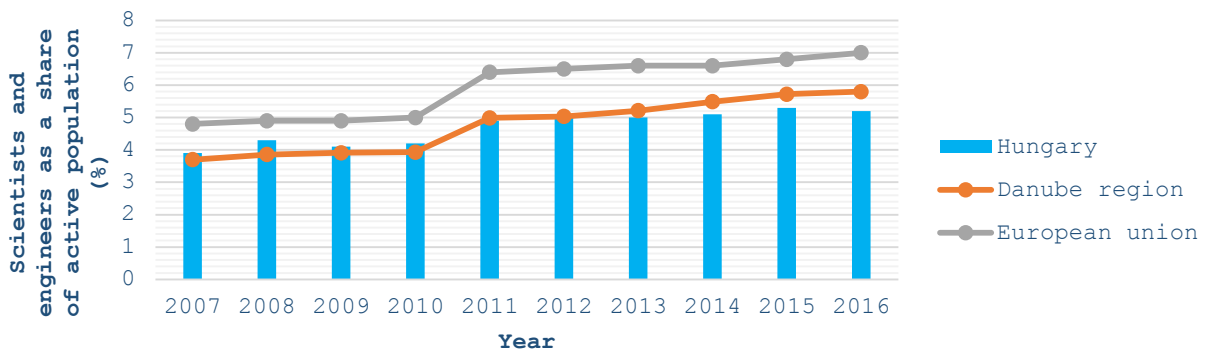
3.2 Indicator: Population aged 25-64 involved in lifelong learning

Lifelong learning has been gaining wide appreciation and the associated educational system is getting more and more developed. The performance of the Danube region and Hungary - which had been showing more or less the same numbers - falls behind the EU average and the gap does not seem to close. This issue should be addressed to increase education especially in older age groups, who have insufficient knowledge in IT and other advanced areas. The government had adopted several, constantly upgraded strategies to implement new measures regarding lifelong

learning.



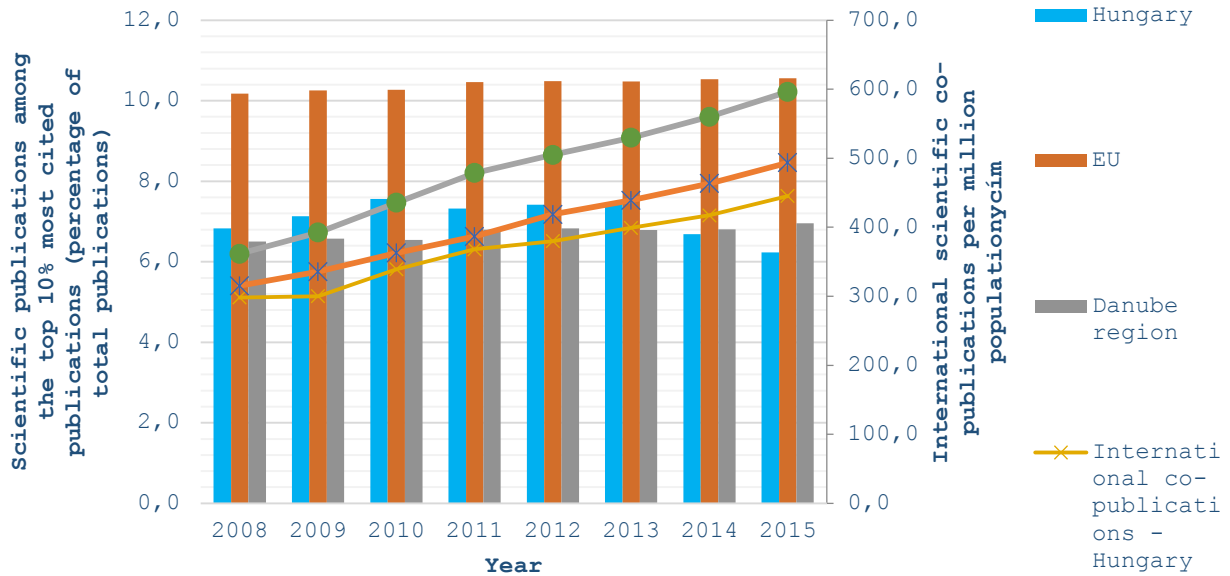
3.3 Indicators: Scientists and engineers as a share of active population



The share of engineers and scientists had been rising in the observed period in Hungary albeit not as much as in the Danube region or in the EU. The recent trends between 2014 and 2016 appear to not favour Hungary since the increase of the share of such highly skilled population had almost stopped rising with only 2%, while it had been continuously climbing in other European countries in the meantime with an additional 6%.

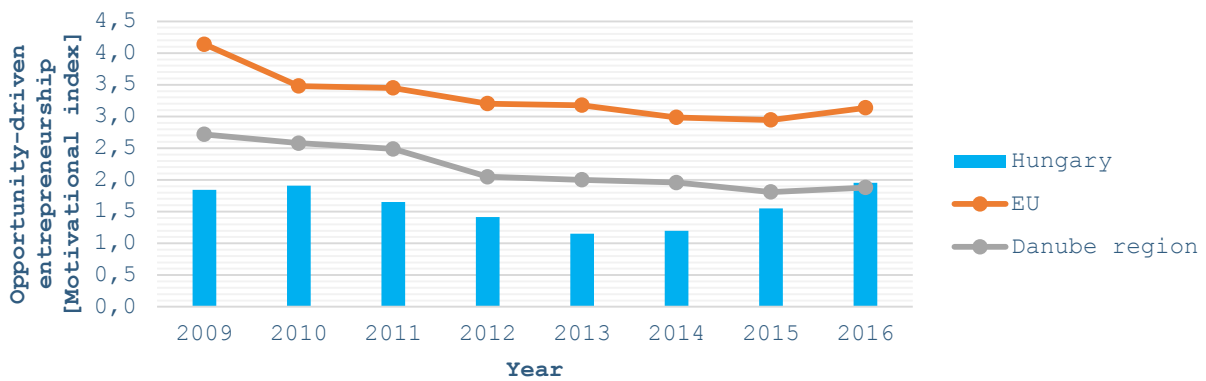
3.4 Indicators: International scientific co-publications and scientific publications among the top 10% most cited publications worldwide

A country that is among the top 20 countries in Nobel laureates per capita is average at best in academic performance and the trends show that the number of scientific publications which are among the top 10% most cited publications decreased considerably between 2013 and 2015 suffering a total 17% loss. The number of international publications had been steadily increasing however almost as much as the average of the Danube region. Compared with the amount of new doctorate graduates it seems like a decent performance nevertheless.



3.5 Indicator: Opportunity-driven entrepreneurship

While the number of opportunity-driven entrepreneurs exceeded the average of the Danube region only in the most recent statistical year of 2016, the trend which can be observed is very promising. More and more people find a chance to start their own business which have been recently amplified by innovative support forms gaining ground.

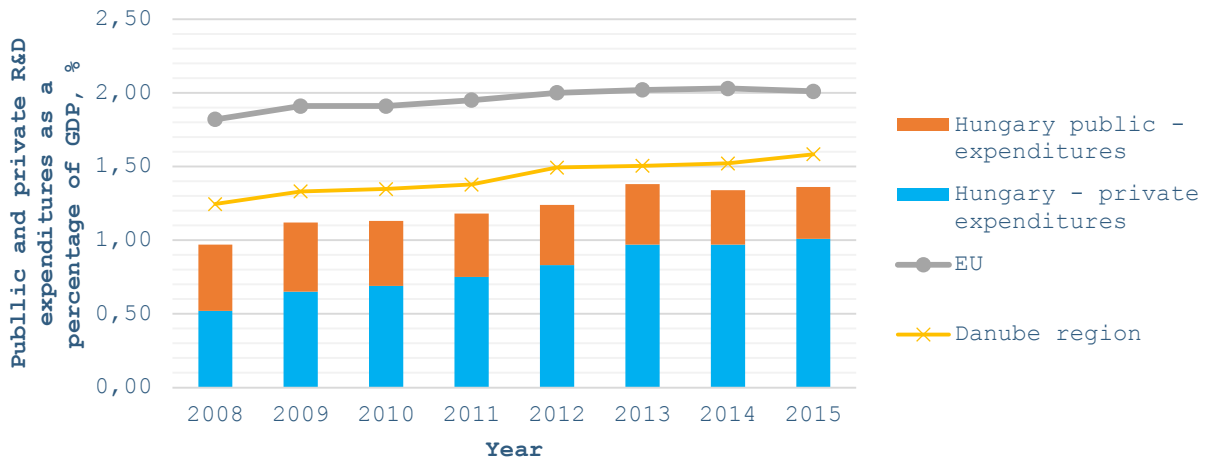


OPPORTUNITY: The rise of the new entrepreneurs can boost employment and can stimulate innovation and R&D.

3.6 Indicator: Public and private R&D spending

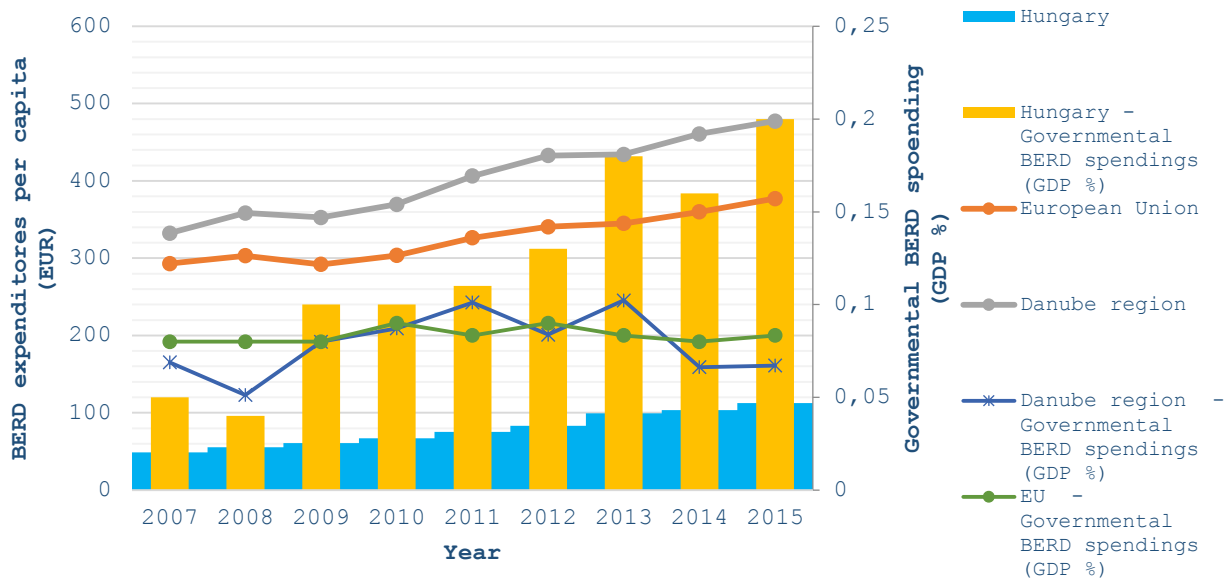
In the most recent years we have seen a decrease of R&D expenditures in the public sector which is a contradictory trend compared to the EU and the countries of the Danube region as well. This process means that innovation is left to be done by the private sector, but domestic companies do little to no innovation, innovation is therefore left to international businesses. This has been confirmed by the low percentage of SMEs introducing marketing and organizational innovations, and it

should be noted that the low innovation potential of the domestic businesses leaves Hungary in a dependent position regarding R&D.



3.7 Indicator: Business enterprise R&D expenditure per capita and public R&D spending

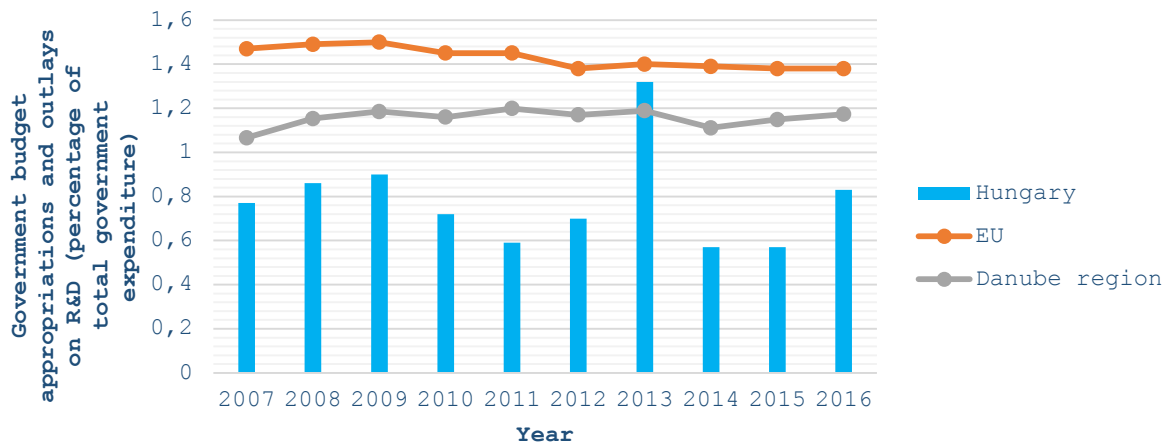
Governmental spending seems to be the most important balancing factor in Hungarian BERD expenditures as it seems to increase more than in proportion than overall BERD expenses, while Danube region and EU overall BERD spending had increased despite the stagnation of government spending.



3.8 Indicator: Government budget appropriations and outlays on R&D

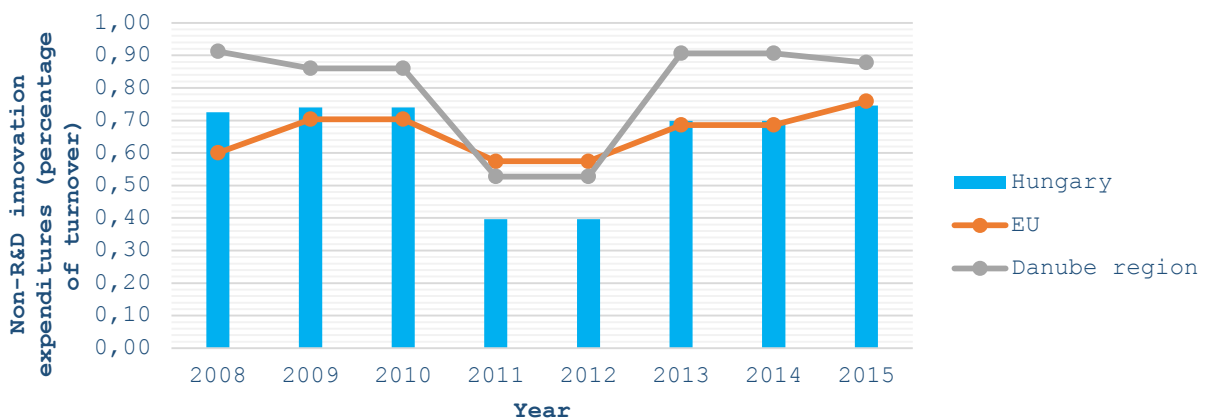
The extent to which the government addresses innovation issues is not proportional to the business R&D expenses (seen previously), which indicates that the public institutions therefore receive a funding which decreases year to year. The expenditures reaching the average of the Danube region only in 2013 generally fall behind in comparison to the EU and Danube region as well, being 0,77% in 2007, 1,32% in 2013 and decreasing to 0,83% in 2016, respectively, whereas the Danube region

governments' spent at least 1,07% on R&D during the observed period.

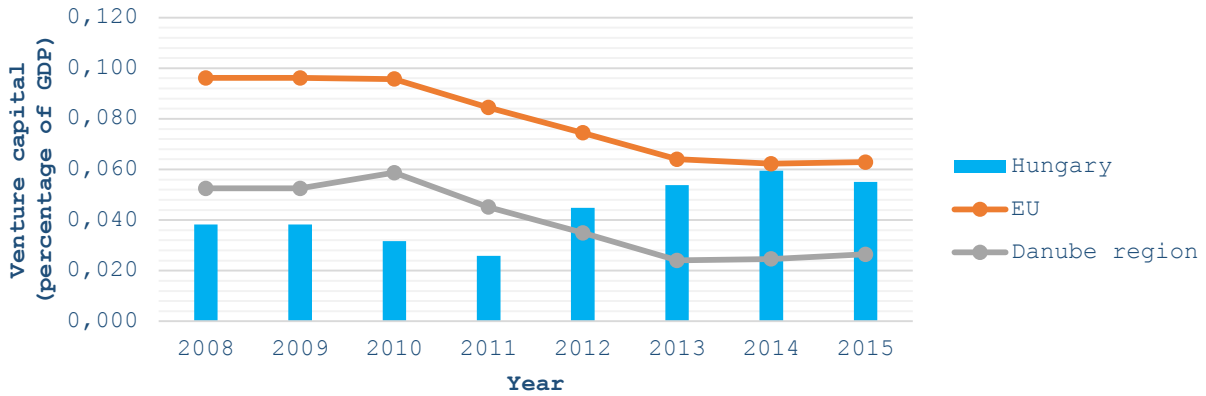


3.9 Indicator: Non-R&D innovation expenditures

While R&D public expenditures are stagnating at a relatively low level, non-R&D innovation expenditures had been reaching EU-levels and sometimes even exceeded it. The percentage was higher between 2008 and 2010 than the EU average, it did not reach however the average of the Danube region in the observed period. After a considerable downturn in years 2011 and 2012 where it hit the bottom sitting at only 0,4% it clawed back to previous levels and has been rising steadily ever since.



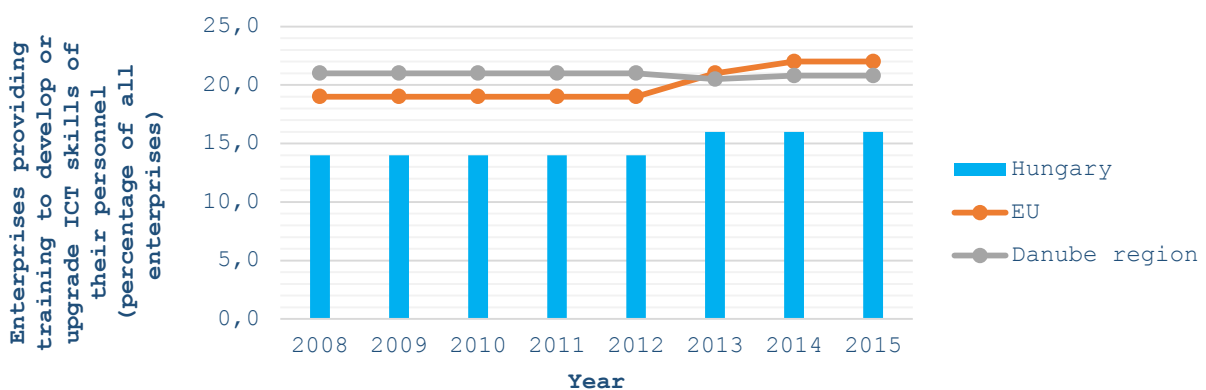
3.10 Indicator: Venture capital



Hungary is the second most developed venture capital market in Central Europe, with the related activities not hindered by the lack of capital but the low level of demand and attractive business plans. The Hungarian capital, Budapest is very appealing to numerous businesses, such as Prezi, LogMeIn and numerous others, all of which can be a subject to venture capital investments. The percentage of venture capital is similar to the EU levels and considerably higher than that of the Danube region.

OPPORTUNITY: The high amount of venture capital can boost the establishment of new businesses and can attract even foreign businesses to Hungary. Due to the nature of tech-oriented companies it can stimulate innovation as well.

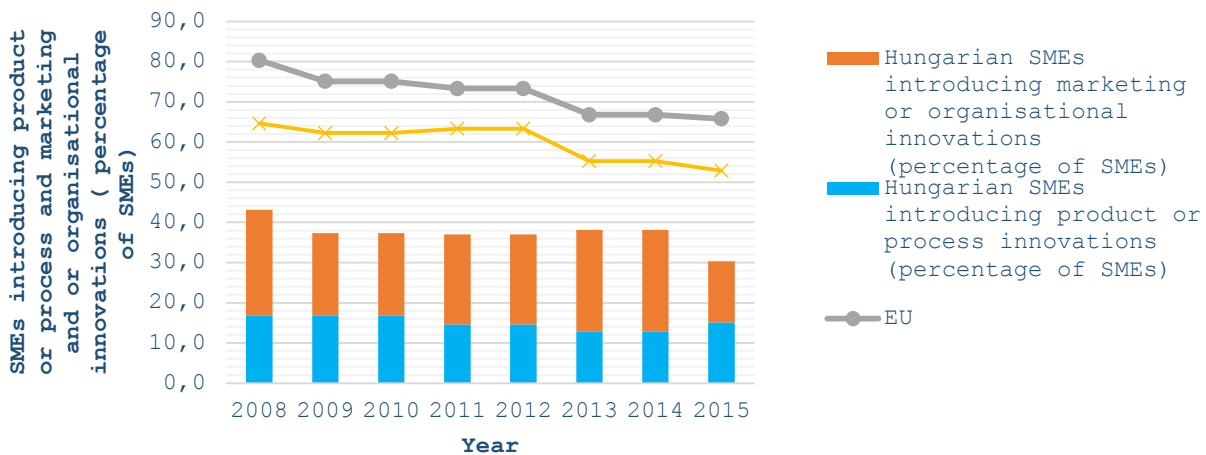
3.11 Indicator: Enterprises providing training to develop or upgrade ICT skills of their personnel



The statistical data behind this indicator was not updated until 2013, but the trends depicted by it are noticeable and very important. The EU and the Danube region both surpass Hungary in this area and although the gap seems to be closing slowly, the difference is still substantial with the Danube region average being 50% higher in 2008 and still being 30% above the Hungarian average in 2015.

OBSTACLE: As Hungarian SMEs fail to introduce innovation it is highly questionable if they will be able to adopt eco-innovative processes, which is further hindered by numerous indicators presented previously.

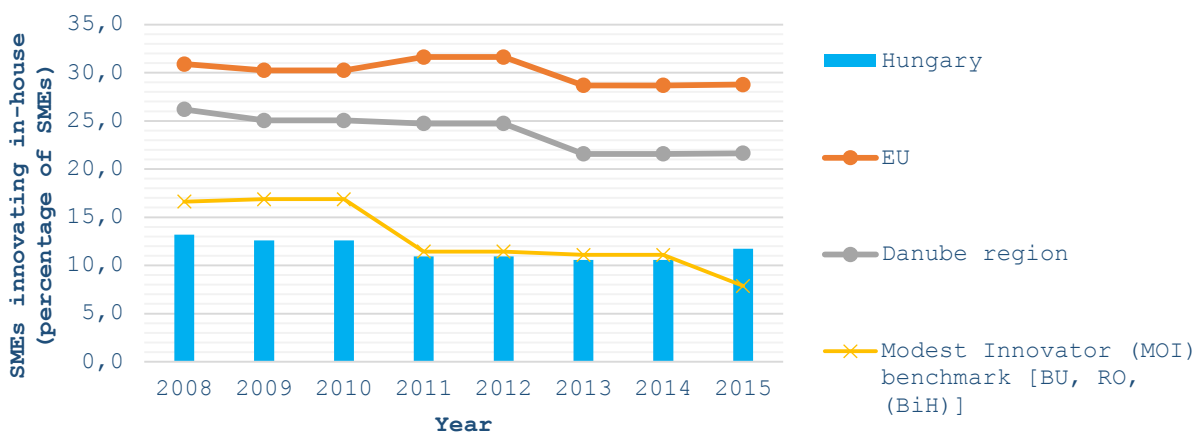
3.12 Indicator: SMEs introducing product or process and marketing and or organisational innovations



The amount of SMEs introducing innovations is less than a half in Hungary than in the EU and substantially lower than the Danube region average and this difference is even bigger in 2015 than it was in 2008 (53% of the Danube region average and 66% of the EU average in 2008 and 46% and 57% in 2015, respectively). Almost half of the SMEs introduced some kind of innovation in 2008 (43,1%) which decreased to only 30,3% in 2015.

OBSTACLE: As Hungarian SMEs fail to introduce innovation it is highly questionable if they will be able to adopt eco-innovative processes, which is further hindered by numerous indicators presented previously

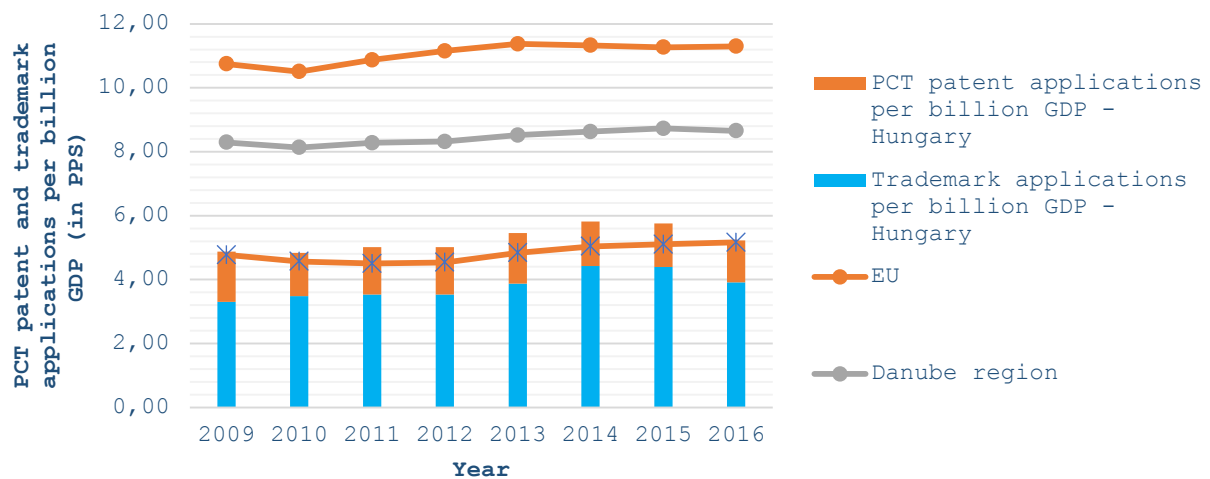
3.13 Indicator: SMEs innovating in-house



The number of SMEs conducting in-house innovations is rather low, and the difference compared to the EU and the Danube region does not seem to lessen, with 13,2% of Hungarian SMEs doing internal research in 2008, while 26,2% and 30,9% in the Danube region and the EU, which has been changed to 11,7%, 21,6% and 28,8% respectively. The Modest Innovator benchmark displaying the performance of Bulgaria, Romania and Bosnia and Herzegovina follows a different path as the only group of countries faring worse than Hungary.

OBSTACLE: As Hungarian SMEs fail to introduce innovation it is highly questionable if they will be able to adopt eco-innovative processes, which could be further hindered by numerous indicators presented previously.

3.14 Indicator: PCT patent and trademark applications per billion GDP

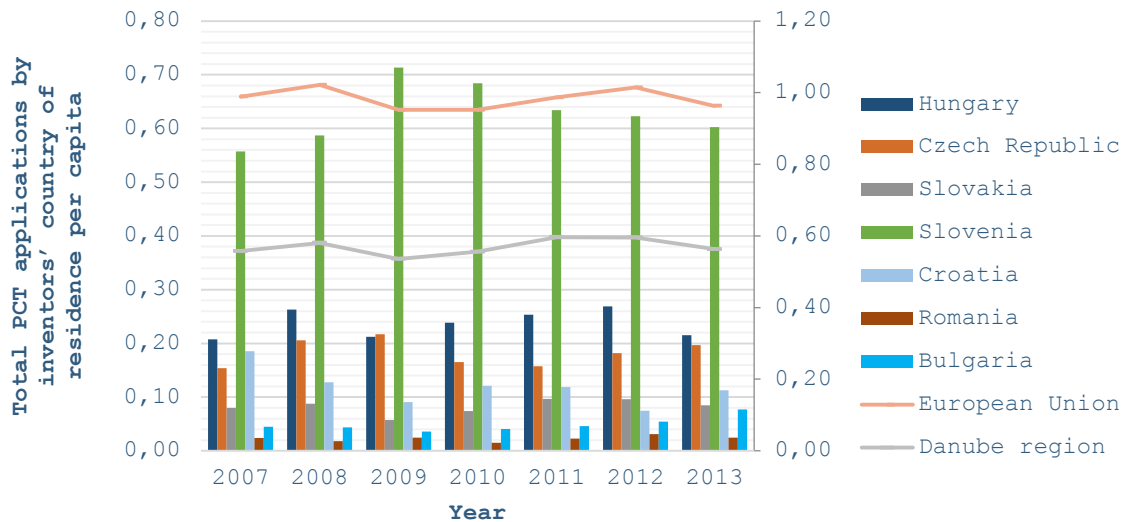


Intellectual property protection can be very important to innovative businesses to ensure that they will be able to harvest the fruit of their work. On average, Hungary falls behind the EU average or the performance of the Danube region, the EU average being generally 100% higher than Hungarian figures, but meets the levels shown by a similar group of countries, the Moderate Innovators. The similarities in the economy - strong industry characterised by assembly plants and suppliers' factories and intellectual asset management being largely unknown to SMEs probably explains this two-speed nature of intellectual property protection.

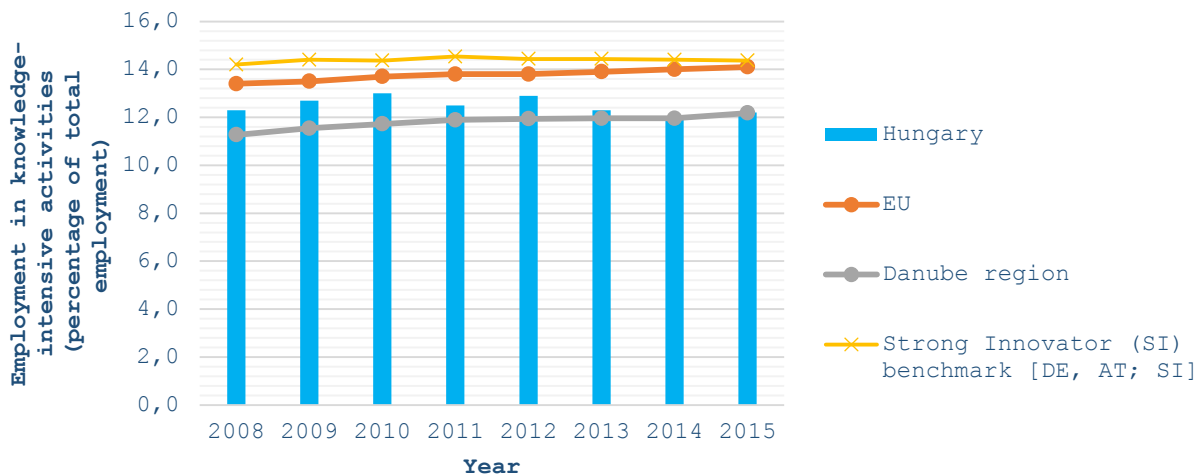
OBSTACLE: SMEs are specifically exposed to the consequences of insufficient knowledge about intellectual property protection and intellectual asset management and may lose part of their income to the competition due to unsatisfactory protection of their innovations.

3.15 Indicator: Total PCT applications by inventors' country of residence per capita

Hungary performs better than most of catching up countries in the area. There was a short increase in the number of patent applications between 2008 and 2012 with the amount of patent applications being 20% higher on average than in 2007 but it fell back to the original levels in 2013. The Danube region had been showing much promising numbers but it is mainly due to Germany's almost tenfold performance, and also inventors residing in Austria apply for six to eight times more patents.



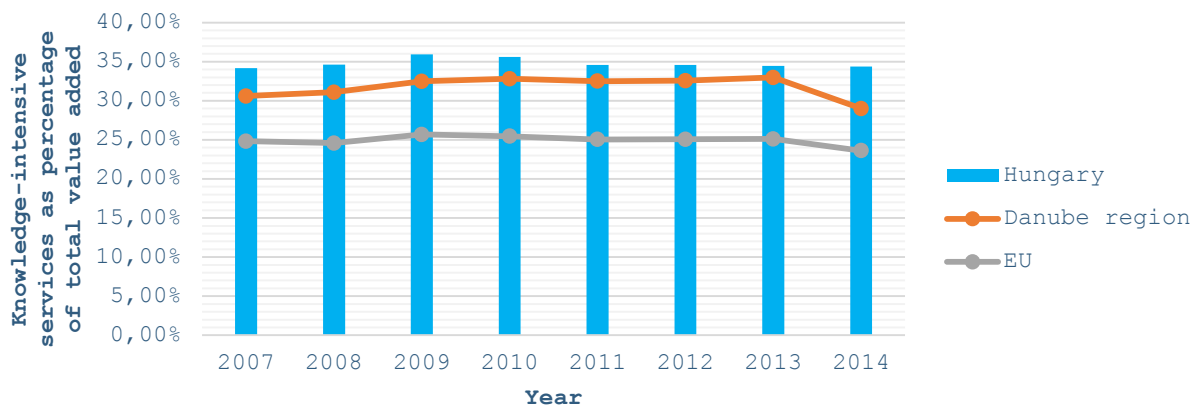
3.16 Indicator: Employment in knowledge-intensive activities



Knowledge-intensive activities are an important of the Hungarian economy with a 12,2% share in the total employment, which is on average 2% less than that of the Strong Innovator benchmark but meeting the average of the Danube region countries. There are some minor fluctuations over time resulting in a slight decrease from 12,3% in 2008 to 12,2% in 2015 reaching a peak of 13% in 2010, while in the meantime Danube region countries had performed a bit better increasing the share of employment in knowledge-intensive activities from 11,3% in 2008 to 12,2% in 2015.

OPPORTUNITY: The relative high share of knowledge-intensive activities in the total employment is an economic strength and a corner reference point which could be built on. These high numbers not only mean the prevalence of these sector but also indicate the presence of high amount of skilled and experienced workforce.

3.17 Indicator: Knowledge-intensive services



The share of knowledge-intensive service displays a steady high performance and has a higher amount value added than the EU or the Danube region. Compared to the previous diagram the higher proportion of the value added to the employment is easily noticeable, putting Hungary in a much more advantageous position relative to the EU or the Danube region. Hungary also seems to fortunately evade the recent shrinkage of the value added by knowledge-intensive services, the number even increased by 0,01% between 2013 and 2014.

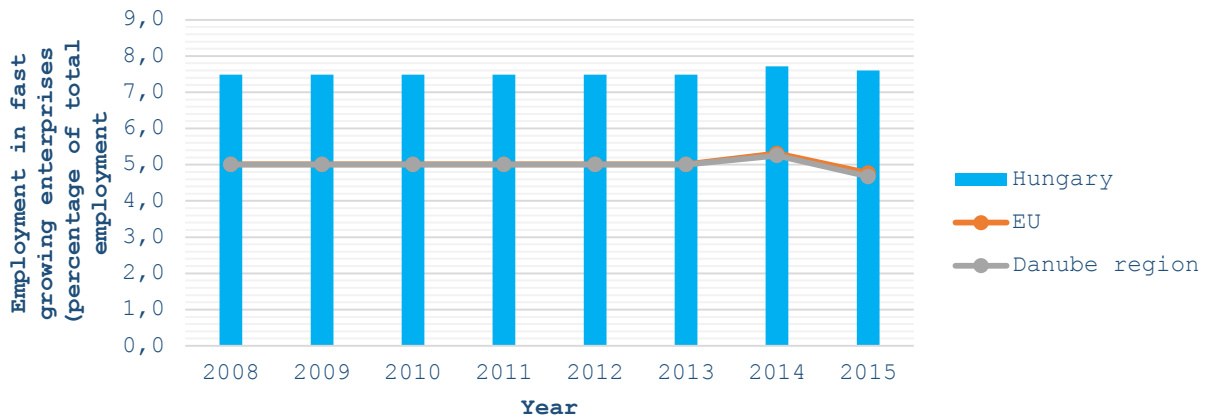
3.18 Indicator: High-technology manufacturing

High tech manufacturing plays a crucial part in the country's economy as the share of value added indicates, exceeding Danube region and EU figures by almost 75% in 2014 and by 64% in 2007. The high share of high-technology manufacturing in the total value added is not only higher than that of the Danube region and the EU, but increases more than its peers.

OPPORTUNITY: The high share of value added by high-technology manufacturing indicates that these industries have a strong presence in Hungary. This can be further increased and exploited by supporting R&D more.

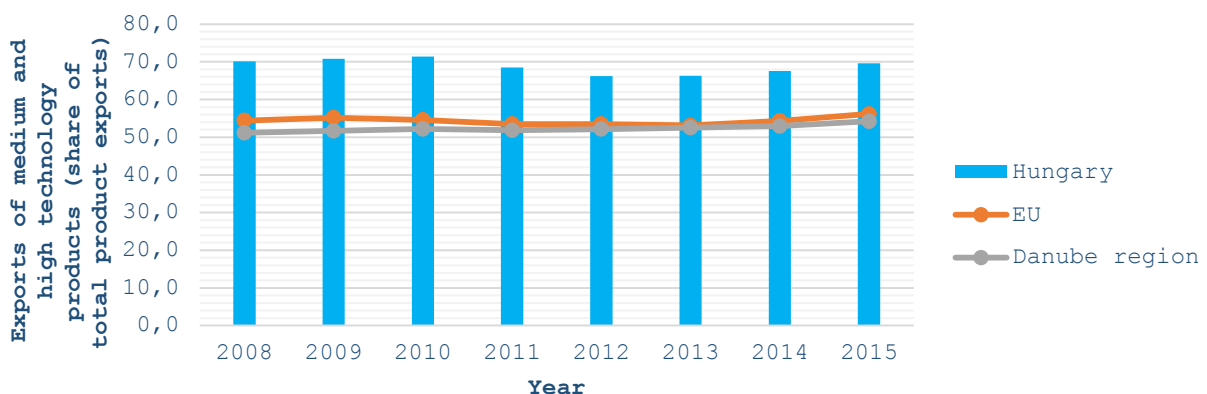


3.19 Indicator: Employment in fast-growing enterprises



The employment in fast-growing innovative firms is the highest among the observed countries in Hungary, surpassing all of its peers in 2015 with Slovakia being the second with a 0,2% lower percentage (7,6% and 7,4% respectively). The data is not provided on an annual basis however, which makes understanding trends a bit difficult, but from what could be observed Hungary retains its edge in these sectors.

3.20 Indicator: Exports of medium and high technology products



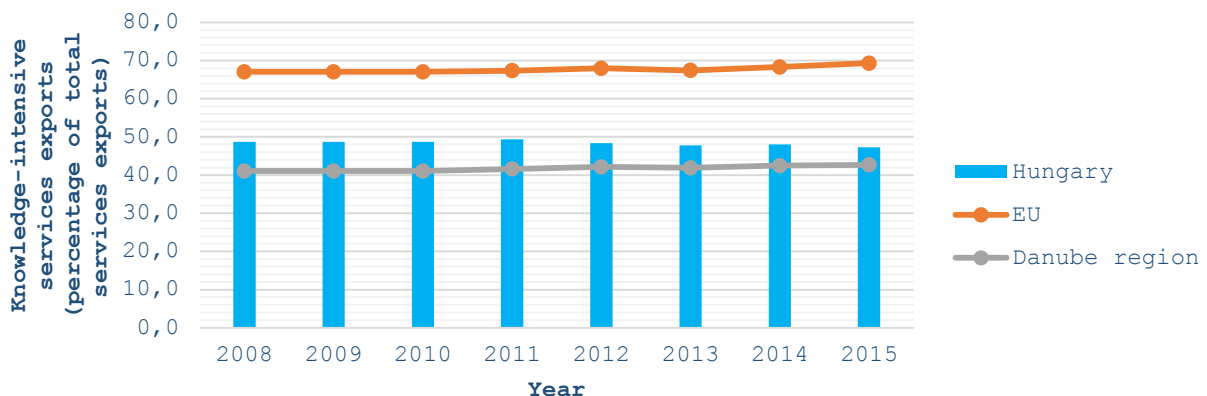
The export of medium and high technology products is another indicator in which Hungary scores the highest in the EU. The high number of car

manufacturers and other factories contribute greatly to this number which is 16,7% higher on average than the Strong Innovators benchmark and a remarkably 26,6% higher than the EU average in the observed period.

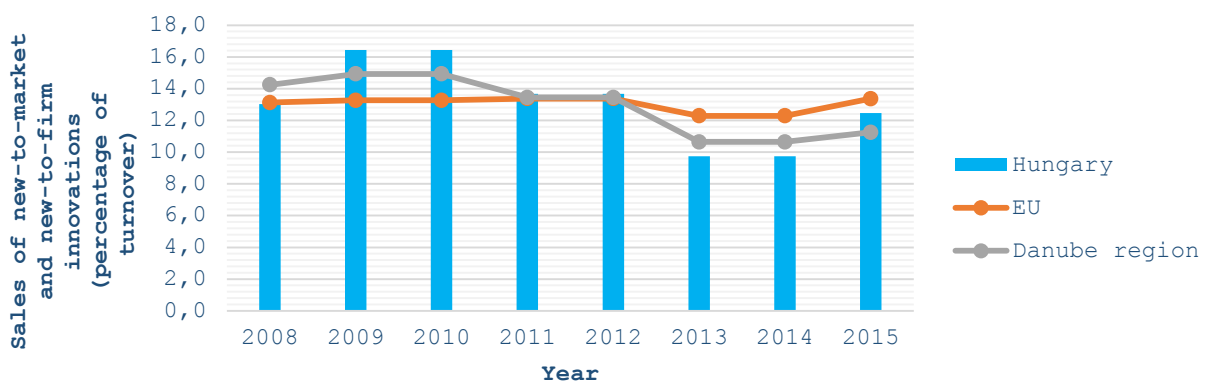
OPPORTUNITY: The vast number of medium and high technology business result in the accumulation of a great deal of knowledge and experience which can attract new investments.

3.21 Indicator: Knowledge-intensive services exports

Sectors which are involved in this indicator are sea and space transport, insurance and pension services, financial services, charges for the use of intellectual property, telecommunications, computer and information services, business services and last but not least audio-visual and related services. The share of these services are usually higher than that of the Danube region countries, but fall short of the EU average. When compared to the Strong Innovator benchmark, Hungary performs only a few percent worse, the difference being 2,9% in 2008 and 4% in 2015, respectively. More importantly, Hungary fares better than all of its neighboring countries.



3.22 Indicator: Sales of new-to-market and new-to-firm innovations

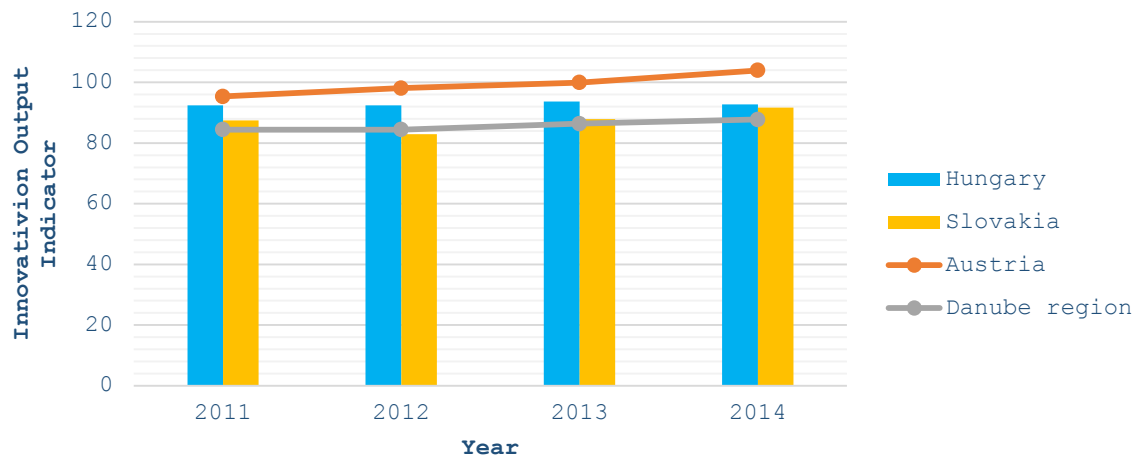


There are some erratic fluctuations to the selling of new-to-market and new-to-market innovations, which are reflected in the more than 60% difference between the 9,7% minimum of 2013 and 2014 and the 16,4% peak in 2009 and 2011. The European trends appear to be much more settled,

while the Danube region showing similar performance to Hungary but with the curve swinging in a more moderate manner.

3.23 Indicator: Innovation Output Indicator (composite)

The Innovation Output Indicator is aggregating different kind of data to make the overall innovation performance more evident and pronounced. Regarding innovation overall, Hungary seem to fare well reaching higher scores than the Danube region average, but the gap between Austria and Hungary appear to be widening over time. Trends show that during the observed period of 2011-2014, the indicator seems to be stagnating increasing with only an annual 0,13%, whereas Slovakia worked off its handicap by 1,57% a year, and Austria increased its advantage by climbing with a whopping yearly 3,01%. The indicator shows that despite the relatively good starting point, Hungary is slowly losing its advantageous position regarding innovation. This had been happening due to the decreasing governmental R&D expenditures which could not be compensated by the other well-performing departments of innovation.



4. Energy

4.1 General overview of the energy sector

The composition of the energy sources in Hungary are very well diversified. The domestic energy production is based on nuclear energy (36,7%), biofuels and waste (27,8%), coal (13,4%), natural gas (12,1%), oil (7,7%), geothermal (0,9%), solar (0,6%), wind (0,5%) and hydro (0,2%) sources.

The total primary energy supply is more than two times higher than the domestic production (25,2 Mtoe - million tonnes of oil equivalent - as opposed to 11,3 Mtoe of domestic supply). The total amount consists of natural gas (29,7%), oil (27,2%), nuclear (16,4%), biofuel and waste (11,7%), coal (9,3%), geothermal (0,4%), solar (0,3%), wind (0,2%), hydro (0,1%). Hungary is becoming more and more import dependent since it does not have access to large quantities of fuels in the country.

The share of renewable energy sources is less than the potentially available supply, and the percentages are considerably lower than that of the leading countries, such as Germany or Denmark.

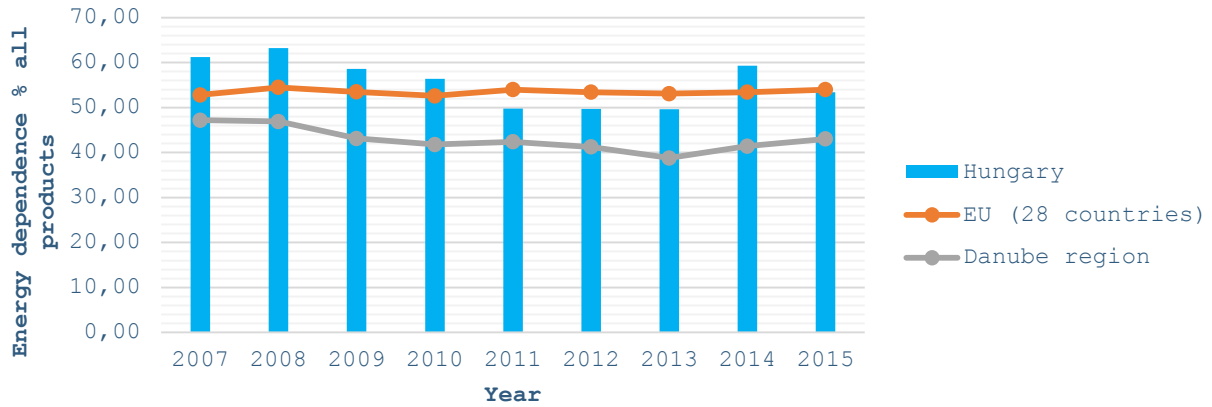
Domestic energy production peaked in 1987 at 16,8 Mtoe and had been declining continuously ever since, decreasing by one-third to this day. The deployment of the Paks Nuclear Plant resulted in a major change in the constitution of energy production resulting in the reduction of coal usage. The total final consumption had been increasing slightly until 2005 and had been fluctuating around the same level ever since.

In recent years retail energy market underwent some major changes: the costs of energy for household had been significantly reduced, which had been applied for electricity, district heating and natural gas as well. This has an unintended impact on retail energy consumption, which stopped decreasing due to the lower consumer prices, the level of consumption however is still lower than the EU average.

4.2 Indicator: energy independence

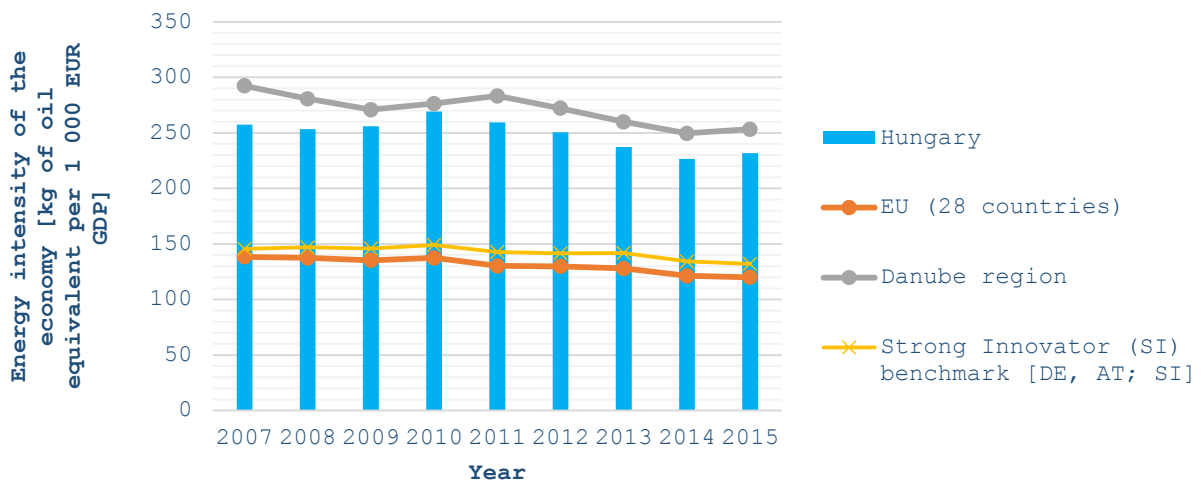
Hungary has no access to substantial amounts of domestic fuel supply, the energy dependence is therefore not lower than the EU average. It had been decreasing from 2007 (61,2%) to 2013 (49,6%), but in 2014 it went back to almost 2007 levels, only to fall below the EU average again. It has to be clarified that variations in energy dependence are large: ranging from 61,9% in Germany (2017) to 17,1% in Romania (2017).

The country hugely leans on natural gas and oil import and other fuels are also scarcely available. The only domestic fuel supply which contributes to significant degree to energy supply is biofuel and waste which is used mainly for district heating purposes.



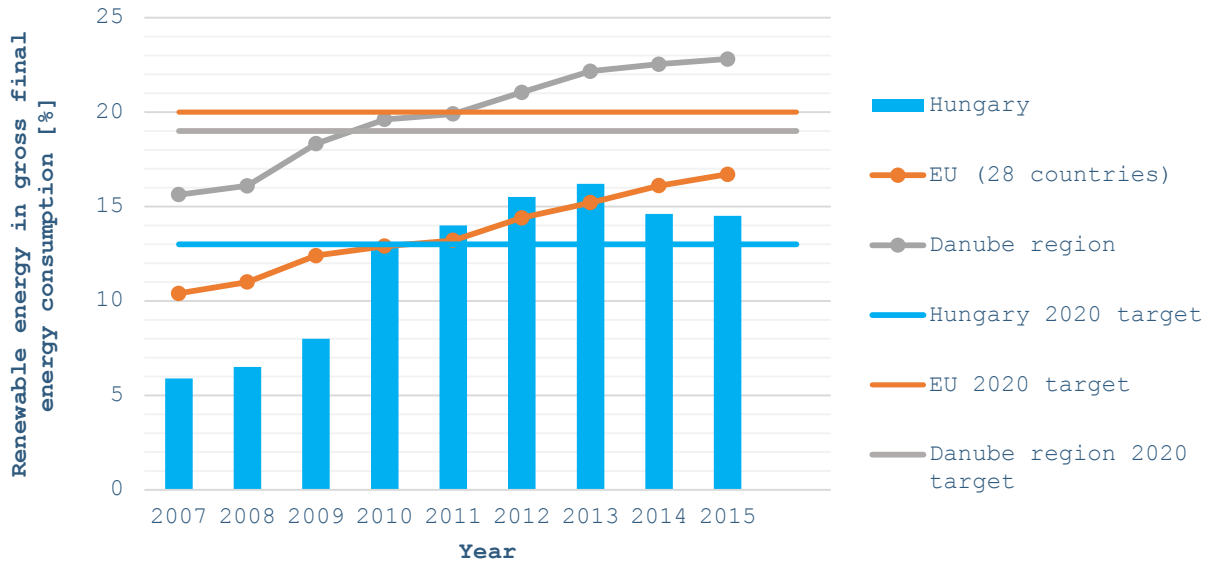
4.3 Indicator: Energy intensity of the economy

The energy intensity of the economy expresses how much energy a country uses to produce the same amount of GDP. Post socialist countries seem to perform worse in this regard. Hungary has successfully started to decrease its energy consumption relative to the GDP but the resurgence of industry after the financial crisis stopped this process from continuing. The country still fares better than the Danube region and also delivers better numbers than most of the post socialist countries.



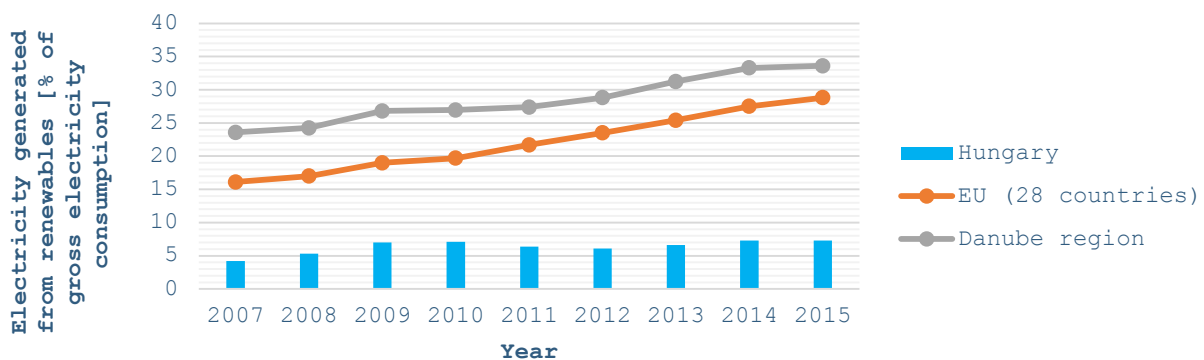
4.4 Indicator: Share of renewable energy in gross final energy consumption

Hungary has already reached its 2020 target of renewable energy shares, although it was a moderate undertaking at only 13%. The EU average was much higher (20%) and the Danube region did not fall behind either (at 19%). The 2015 share of 14,5% is still impressive and is not far behind the EU average of 16,7% but recent trends are looking a bit unfortunate. The government banned the installation of wind farms in the 12 km vicinity of populated areas rendering almost impossible such activities. The constitution of renewables in Hungary leaves something to be desired as biofuel and wastes account for most of the renewable energy supply.



4.5 Indicator: Electricity generated from renewable sources

The amount of electricity generated from renewable sources is rather low in Hungary due to the majority of renewables are used for district heating purposes which produces little to no electricity notably because the co-generation opportunities were seriously narrowed. These figures show that solar, wind and hydro supply contributes in a very small percentage to the total electricity supply, growth rates are matching the numbers of the EU average in the observed period from 2007 to 2015 nevertheless, with the EU average being 78,8% and the Hungarian increase being 73,8%.

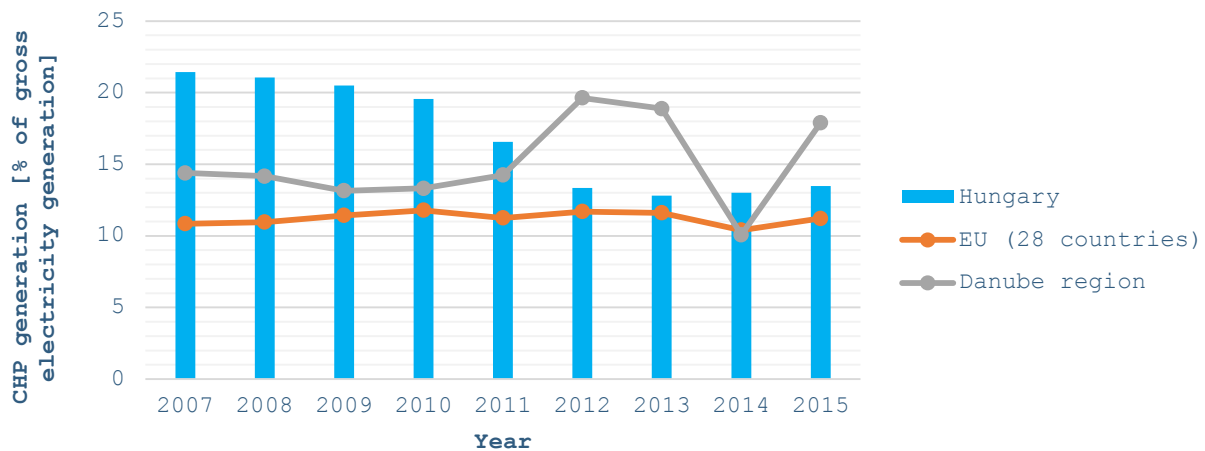


OBSTACLE: While Europe head towards a renewable-revolution, Hungary seems lagging behind in installing new capacities. The amount innovation and industrial capacities associated with renewable energy plants could bypass the country.

4.6 Indicator: Combined heat and power generation

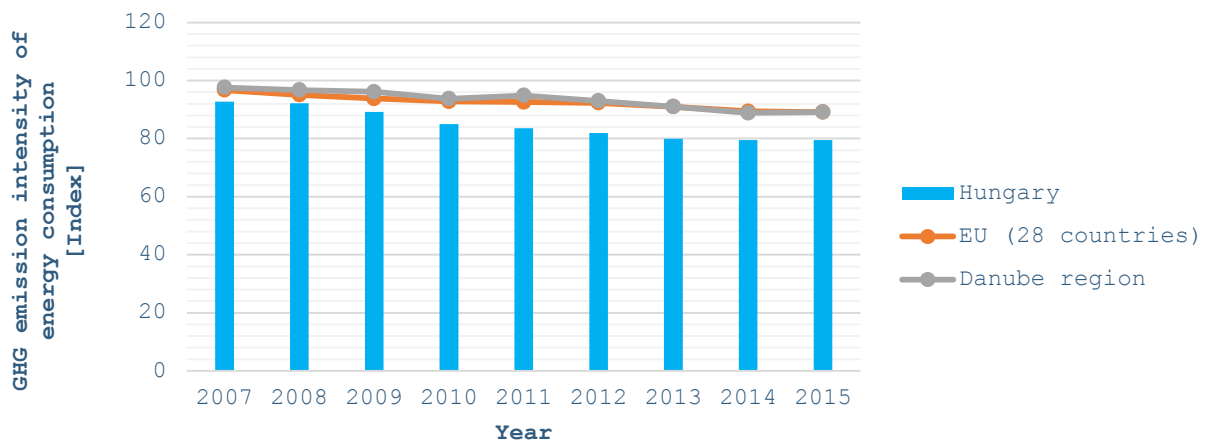
Combined heat and power generation (cogeneration) show rather fluctuating numbers in Hungary and in the Danube region as well. With more and more district heating plants using biomass and wastes as their primary fuel, cogeneration may have to take a back seat in Hungary. A considerably change was that feed-in tariff for CHP ended in Hungary in 2012 which had a dissuasive effect on companies producing district

heating and electricity in the same time, resulting in a 37% decrease in the observed period of 2007-2015, while EU figures remaining generally the same.



4.7 Indicator: Greenhouse gas emission intensity of energy consumption

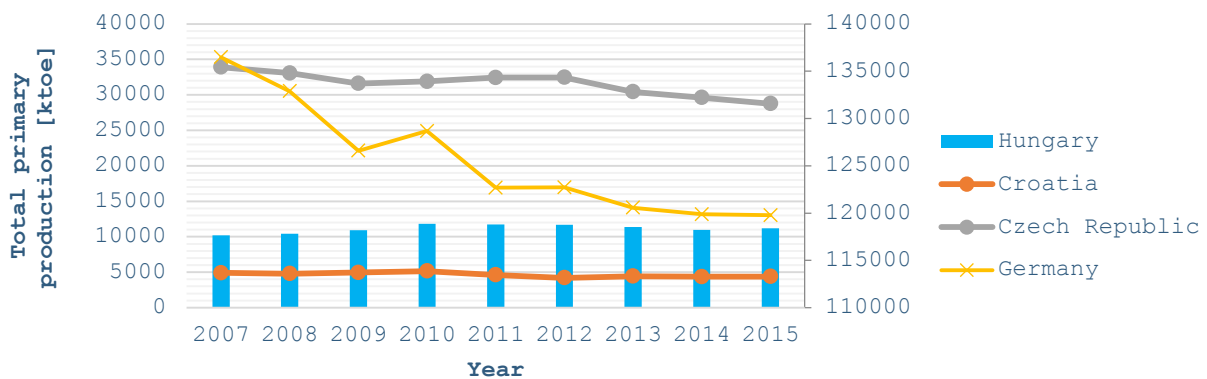
The GHG emission intensity puts Hungary in a favourable position among the countries studied, because it had achieved the biggest decrease in this area, reducing its GHG emission intensity by 14,6% between 2007 and 2015, while the EU numbers on average lessened with only 7,8%, and the Danube region countries with 8,7%. While the GHG emission intensity is only a ratio of the 2000 levels, Hungary ranks the 6th best in GHG emission per capita.



4.8 Indicator: Primary production of energy resource

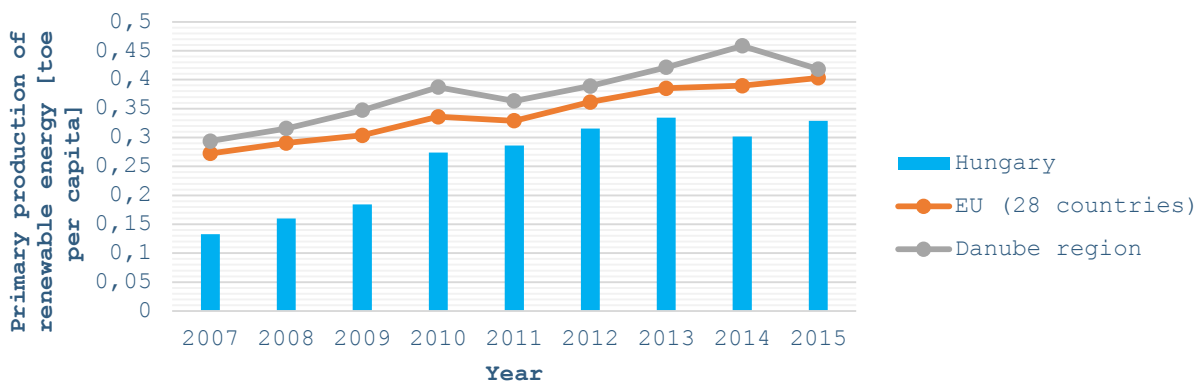
Hungary is one of the few countries which had increased the overall primary production of energy resources in the period of 2007-2015. A prime example of the opposite would be Germany, which decreased its primary production of energy resource by 12,25% in the same time. The constitution of the primary energy resources however might be a bigger concern than the overall quantity, in which Hungary performs surprisingly good increasing the absolute amount of renewable primaries while decreasing others (solid fuels, crude oil, etc.), still nuclear heat remained on more or less the same level. The environmental damages associated with the production of conventional energy resources result

in the decrease of their quantities.



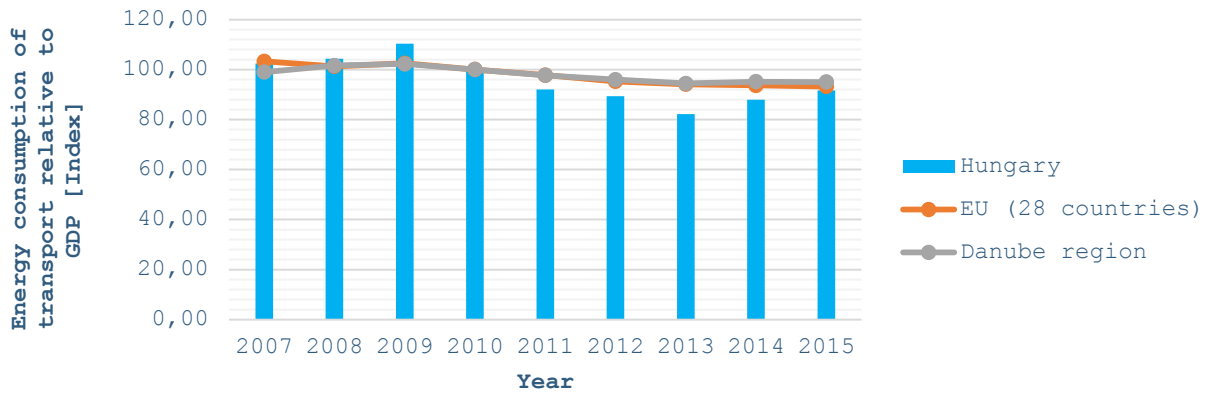
4.9 Indicator: Primary production of renewable energy sources

As a confirmation of the previous chapter, the increase in renewable energy sources could be observed on the diagram below. Hungary took a huge step forward compared to the rather low baseline numbers, and while it did not reach the average of the EU or the Danube region, it displayed the biggest increase in the share of renewables, 242,3%, while the EU average was only 151%. On a side note, biofuels and wastes are the main source of renewable energy in Hungary, which makes this outstanding growth a bit unfavourable.



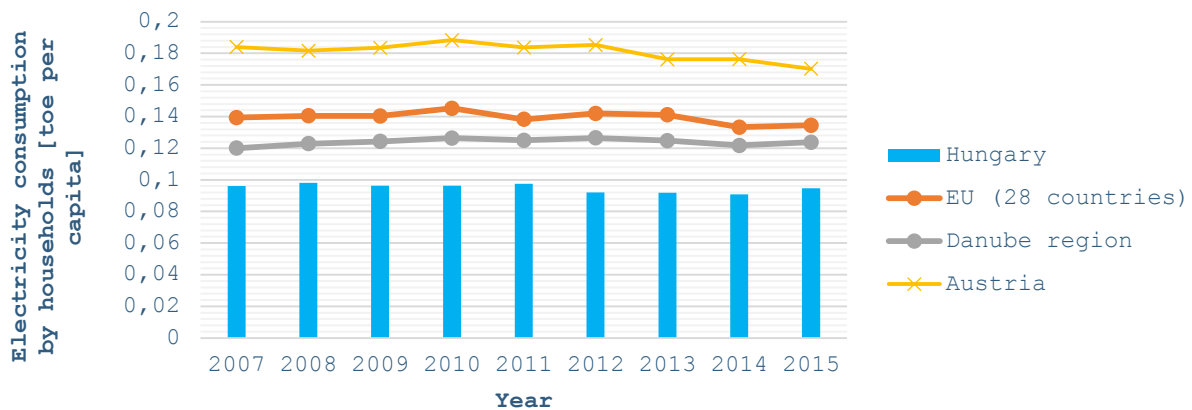
4.10 Indicator: Energy consumption of transport relative to GDP

The ratio of energy consumption of transport and GDP remained fairly stable in most of the EU countries decreasing with 9,8% on average. Hungary is performing rather average, the railway system however is contributes to freight distribution in an above average rate compared to the western countries.



4.11 Indicator: Electricity consumption by households

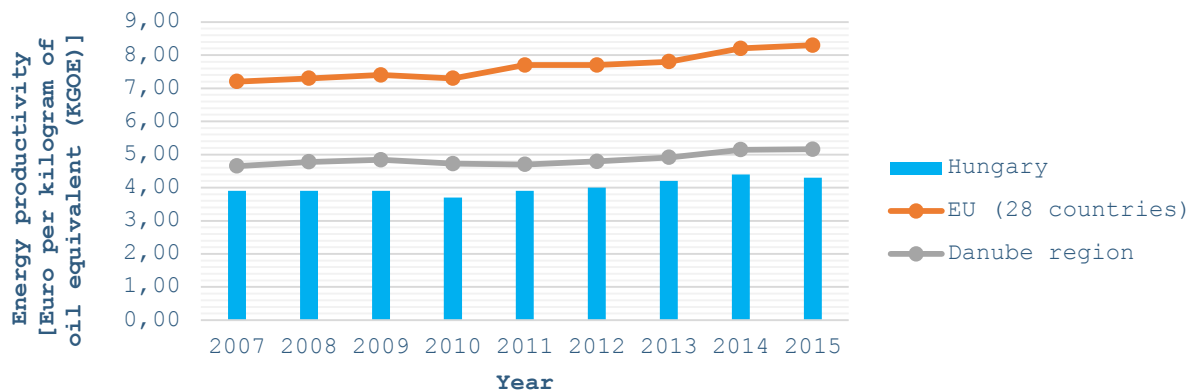
Household electricity consumption includes every type of electricity usage ranging from heating to recreational uses. Countries with a hot climate tend to consume more electricity for cooling, and countries where electrical heating is common spend more electricity for heating. As the constitution of electricity production and the purpose of its utilization can be very different from country to country, we can only observe the absolute differences between various countries. Hungary is one of the countries which consumes less electricity per capita, which is justified by the moderate climate and the relatively low consumption of households. Electricity consumption only decreased with an overall 1,6% in the period of 2007-2015, while European average was 3,6% and countries such as Germany and Austria were able to reduce their consumption by more than 6,5% (6,9% and 7,5% respectively).



4.12 Indicator: Energy productivity

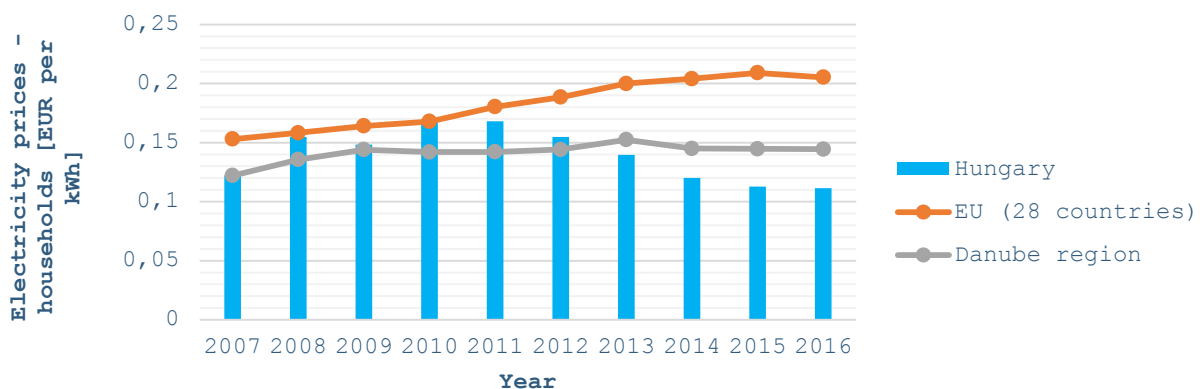
The amount of GDP produced per kilograms of oil equivalents is increasing in every European country, which process could be perceived as a decoupling of the energy usage from the economy and the actual economic performance. Conventional branches of economy, e.g. heavy industry, metal casting, etc. require an enormous amount of energy, but now are not prevalent in the EU. Hungary is falling behind in energy productivity as industry still has a relatively high share in the composition of the economy. Germany, however, still achieves higher levels of energy productivity (more than twice of the Hungarian numbers,

4,3 and 8,9 € per ktoe, respectively) while being an industrious country and in the same time increased its productivity in a bigger percent.



OBSTACLE: The overall energy consumption might be relatively low in Hungary, but the amount of GDP per unit of energy consumption should be seriously developed. This, combined with the low share of renewables mean that the ecological footprint of each product is higher than the optimum.

4.13 Indicator: Electricity prices - households

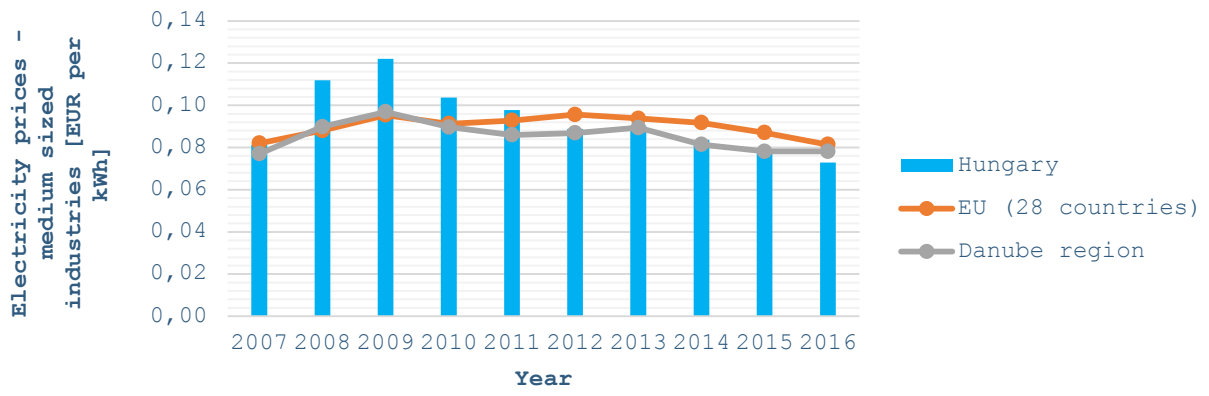


The household electricity prices had been falling in Hungary from 2010 to 2016, mainly because the government initiated a new policy for reducing retail energy costs to mitigate the charges for households. This has led to some major changes in the retail market: for example the sales of natural gas to end-users is now controlled by a single state-owned company to keep the prices on a low level. In the period of 2010-2016 household electricity prices had been dropped with a whopping 35% and while it remained more or less the same in the Danube region, the EU average increased with 22,3% in that timeframe.

4.14 Indicator: Electricity prices by type of user

Conversely to the previous diagram it could be observed that the electricity prices for enterprises converge to the EU average and that of the Danube region in Hungary. A huge peak occurred in 2009, where it exceeded the EU average with 27%, but had been decreasing ever since, and it decreased with more than 40% since the 2009 spike. The Danube region and the average EU prices had fluctuated much less in the

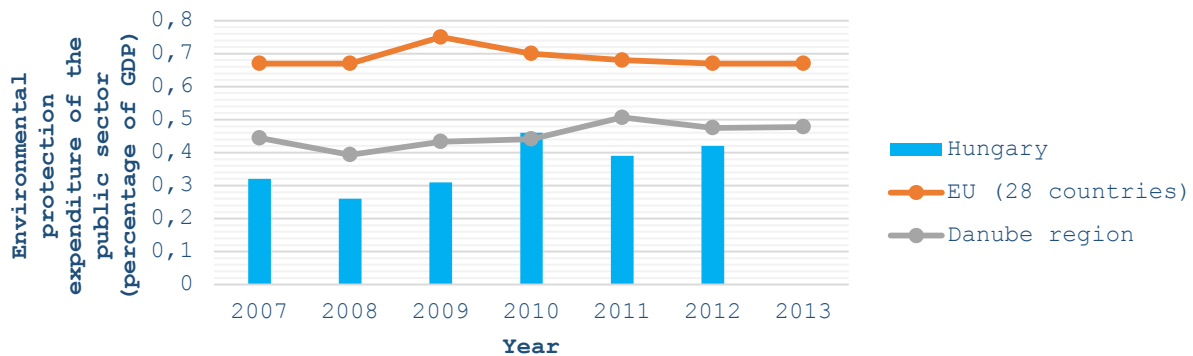
observed period.



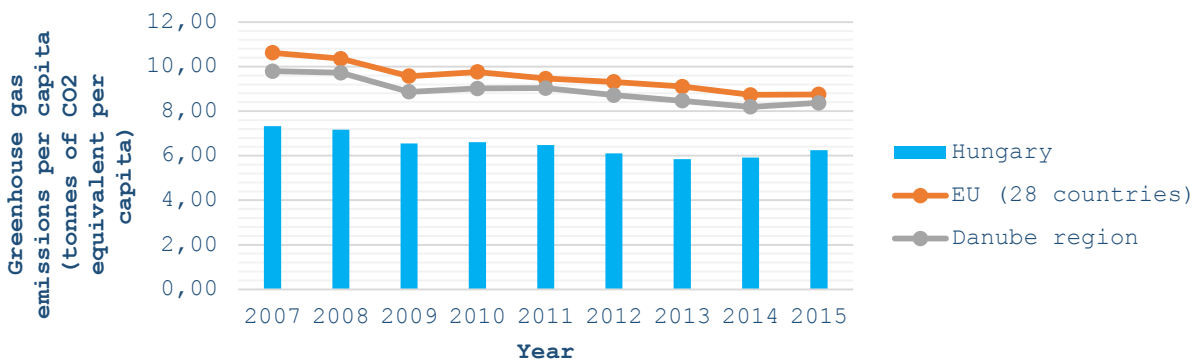
5. Environmental protection

5.1 Indicator: Environmental protection expenditure

There are numerous occurrences of environmental damage in Hungary which are the remains of former mining and industrial activity. The public expenditure for environmental protection usually shows an increasing trend in the post socialist countries, such as Hungary, where it had been increasing with 31,3% , or the Czech Republic with 133,3% between 2007 and 2012. The EU average had not risen in the observed period however, mainly due to the EU-15 countries not having to increase their environmental protection expenses because the earlier cessation of environmentally damaging activities.



5.2 Indicator: Greenhouse gas emissions per capita

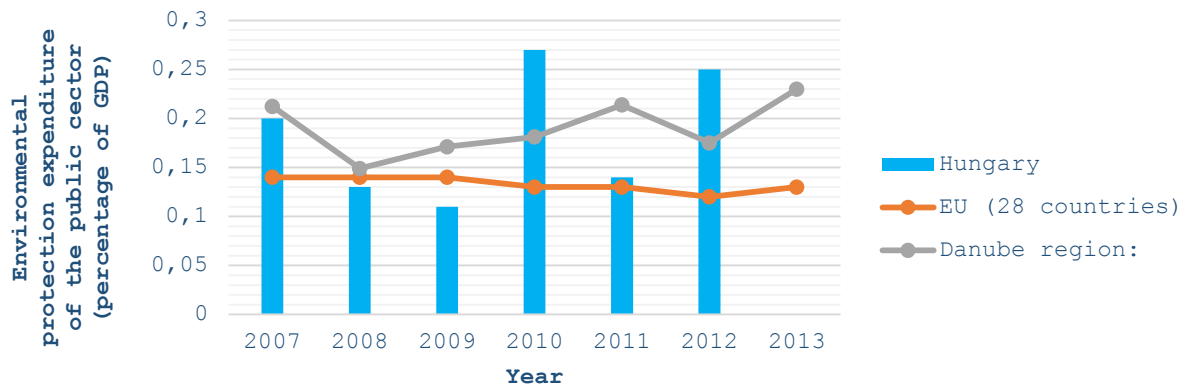


GHG emissions had been showing a very promising trend during the observed period in which almost all countries had successfully reduced their GHG emissions to a certain extent. Hungary started from a relatively good position of only 7,32 tonnes CO² equivalent per capita which had decreased to 6,25, a very healthy 14,4% decrease in emissions. Despite these achievements, the EU-average in GHG emissions reduction reached even more, 17,6% between 2007 and 2015, with the 2015 EU absolute amount being 8,75 however, 2,12 higher than that of Hungary.

OPPORTUNITY: The low level of GHG emissions gives the country a real competitive edge. It might could be related to the relatively low level of total consumption, but if carefully taken care of, the country could serve as a good example on how to keep these emission low.

5.3 Indicator: Total environmental investments of the public sector

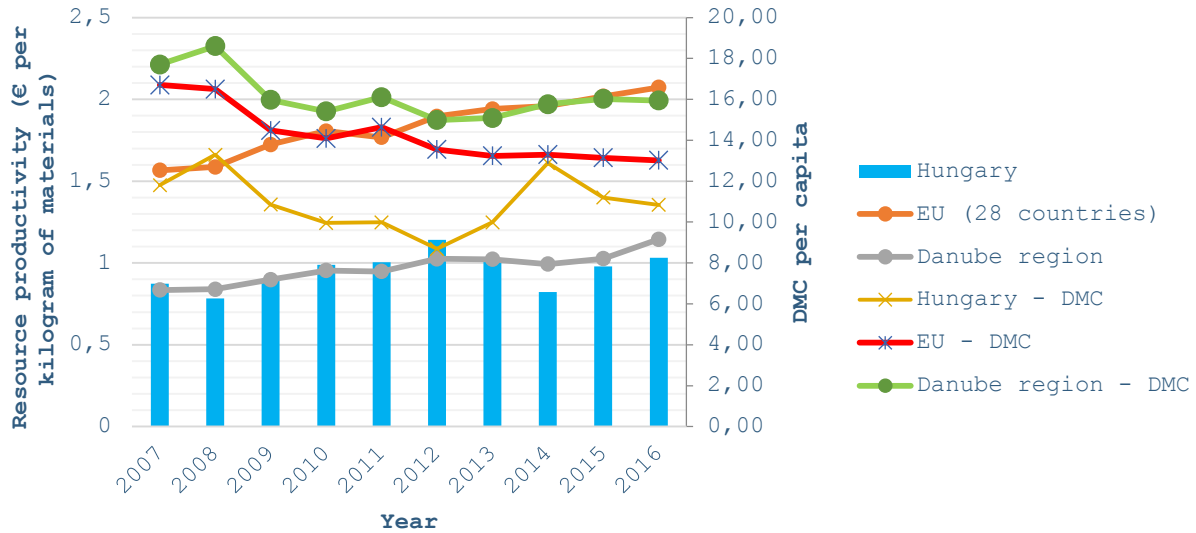
Environmental investments are distinguished from current expenditures and other payments and mainly consist of new waste treatment facilities, reforestation, and investments in energy efficiency, renewables, etc. The numbers show an increasing trend in Hungary and in the Danube region as well, and heavy fluctuation could be observed in the period of 2007-2013, or 2007-2012 regarding Hungary. Hungary had been increasing the sum invested in environment by 25%, while the relevant Danube region numbers had been rising by only 8,3% and the EU had been showing a 7,1% decrease on average.



5.4 Indicator: Resource productivity and domestic material consumption

Resource productivity is based on the ratio of GDP and domestic material consumption (DMC) and is giving us an approximate idea of the amount of GDP generated per kilogram of materials. The resource productivity of Hungary is lagging behind the EU-average and barely reaches the performance of the Danube region. The growth of resource productivity had been reaching more or less the same levels in all of the countries under investigation, increasing with 31,7% in Hungary, 36,3% in the Danube region while climbing to 130,6% on average in the EU, respectively. The ratio of different economic sectors may or may not contribute to the trends which could be observed: the sudden drop in 2014 might be caused by the resurgent industry in Hungary after the end of the financial crisis, which had been having a detrimental effect on the industrial sector of the country.

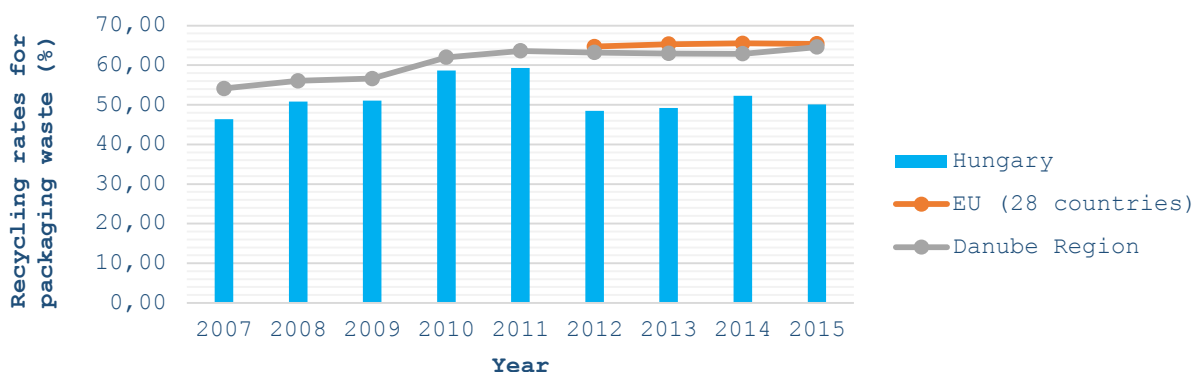
Although the resource productivity of the Danube region is roughly the same as its Hungarian counterpart, the domestic material consumption is much higher in these countries, while it stays even below the EU average.



OBSTACLE: Although the DMC falls between the EU and the Danube region average, the amount of GDP associated with each unit of materials is relatively low, due to the high share of industry. The waste generated by these activities pose a serious environmental threat to the country.

5.5 Indicator: Recycling rates for packaging waste

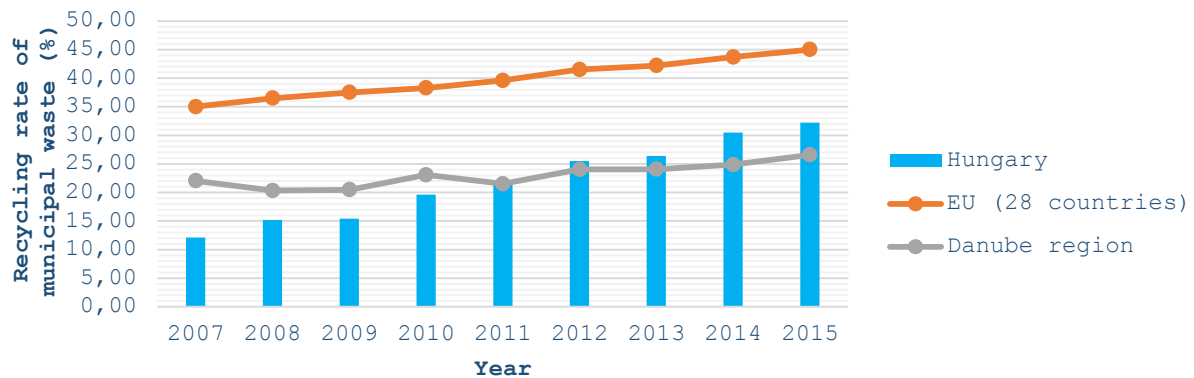
Packaging waste is a major factor in overall waste output as 162,9 kg of packaging waste was generated per inhabitant in the EU as of 2014. This includes wood, cardboard, metal, glass, and plastic most of which are easy to recycle. After a promising start in 2007 to 2011 a sudden drop happened in 2012 due to the abolishment of the Extended Producer Responsibility program instead which the Government of Hungary introduced a new tax regime. This had a clear deterring effect on recovery organizations. The recycling rate for packaging waste had been recovering ever since but it is going to be very difficult.



5.6 Indicator: Recycling rate of municipal waste

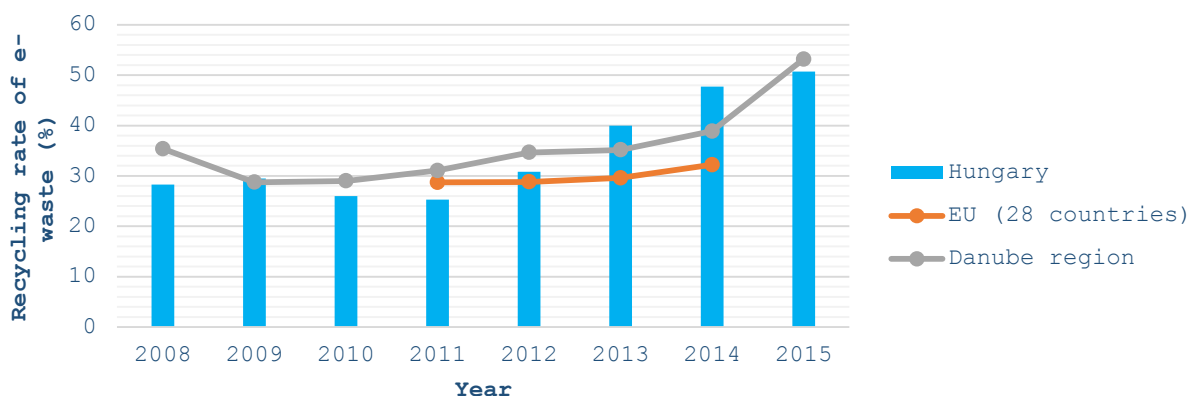
The recycling rate of municipal waste is rapidly growing in Hungary surpassing that of the Danube region countries in 2012. The country increased the rate of municipal waste recycling between 2007 and 2015 by

166,1%, other countries however performed even better, namely the Czech Republic (194%), Croatia (480%) and Romania (3175%) which was possible due to the very low baseline, for example increased the share of recycled municipal waste from 0,4% to 13,1%. Regarding absolute numbers, more developed countries such as Austria and Germany are settled down at around 60% which could serve as a guideline to what numbers are feasible to reach.



5.7 Indicator: Recycling rate of e-waste

The share to which countries are recycling e-waste requires us to very shortly analyse the current market situation to understand the figures below. The percentages are much higher in the new member states (Bulgaria for example reaches 96,5%) and the EU-15 seem to perform worse in this regard. Hungary steadily increased the share of e-waste recycling from 28,3% to 50,7%, a 79,1% increase. Germany, in the same time decreased its recycling by 3,2% reaching only 36,9% in 2014. This could occur due to the lower amount of new electrical and electronic equipment bought on the market, and the presence of a strong secondary market, where discarded products in good condition can be sold. Also the amount of e-waste from other countries should be taken into account as well, for example the outstanding performance of Bulgaria is mainly due to a huge e-waste recycling plant near Sofia which handles e-waste from other countries as well.



5.8 Environmental challenges

Hungary has a rich biodiversity and a variety of natural values, but suffers from different of environmental issues in certain areas. The amount of forest areas and wooded land is more than 22% of the country's area. There are three large water bodies (Lake Balaton, Lake Fertő and Lake Tisza), and two major rivers (Danube and Tisza, the latter suffered from the infamous 2000 Baia Mare cyanide spill).

From a historical perspective the forced industrialization and the associated unsatisfactory planning, hasty investments and constructions, the non-compliance with the almost non-existing rules led to several environmental damages that needed to be remedied. Land reclamation is a still ongoing process at various locations: abandoned mines, tailing ponds are still being worked on. The environmental damage has been done, the pressure however had been considerably reduced.

74% of the household is being supplied by the public sewage system and 97,8% of the waste water generated is being cleaned, the quality of the water however leaves something to be desired with 30% of the potable water not meeting the EU requirements due to the presence of arsenic, ammonia, iron and manganese and the programs initiated to remedy this situation did not succeed completely. The total amount of waste generated started to decouple from the GDP increase and it had halved since the 2000s. Household waste treatment needs to be improved however, there are too many landfills still in use despite the governments' efforts to remedy the situation.

Agriculture still emits pollutants to a large extent, contaminating ground waters and the soils, also the increasing share of monocultures reduce biodiversity and causes the soil to quickly degrade. Forest management sometimes yields unsatisfactory results applying the method of clear-cutting too frequently. Sustainable energy sources are not utilized well enough, the country performs well below its potential.

The amount of pollution caused by the industry is much lesser than it was before the constitutional change of 1989 and the government invested heavily in pollution abatement and control while implementing major legislative and institutional changes.

Transportation emits a significant part of pollutants which are unable to escape from the cities from time to time, resulting in the high concentration of air pollutants. The favourable taxation of company cars makes a major contribution to this adverse situation.

5.9 Environmental legislation

Environmental policy is controlled by the Ministry of Agriculture as of now. The first law dealing with environmental protection was published rather late, only in 1976 and also contained only a handful of specific provisions. The Act LII. of 1995 (Environmental Protection Act) is the currently applicable framework law for environmental protection, and also the Fundamental Law also contains certain criterion about the environment and the nature. The Environmental Protection Act is seeks to

integrate and harmonize the responsibilities of the various concerned institutions and government organizations. The legal environment of this field has been continuously improved, a few matters however will require more attention in the future, such as the legislation of renewable energy sources - building new windmills is currently banned in the 15 km vicinity of populated areas rendering the deployment of new windmills almost impossible, also plant protection, noise and vibration abatement, environmental fees and congestion charges require better legislation.

To ensure the implementation of actions regarding environmental protection, the National Environmental Protection Program has to be renewed every six years, and also certain municipalities are obliged to write a similar program. These documents contain concepts, action plans, strategic reviews and the important environmental processes are continuously monitored and controlled. The progress towards specific goals is constantly evaluated and the EPP can be rewritten if required.

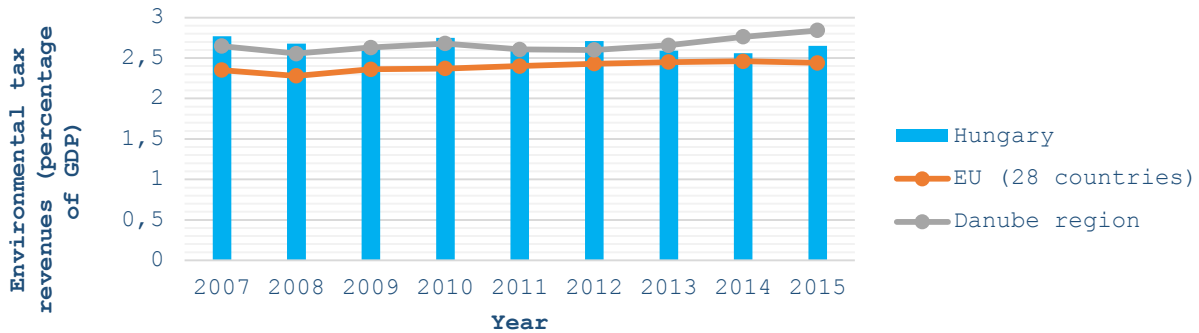
The National Directorate General for Disaster Management is controlled by the Ministry of Interior, and is responsible for protecting and informing the public.

5.10 Environmental taxes

Hungary complies with the EU regarding environmental taxation, which can be organized into four different categories, namely energy, pollution, resource and transport taxes. Hungary raises taxes in every listed categories, which are the following:

- Energy taxes:
 - Product charge on other petroleum products,
 - Excise tax on mineral oils,
 - Energy tax.
- Pollution taxes:
 - Product charge on refrigerators/refrigerating agents,
 - Product charge on batteries,
 - Product charge on packaging,
 - Product charge on commercial printing paper,
 - Product charge on electric appliances and electronic equipment,
 - Environmental pressure fee.
- Resource taxes:
 - Water resource charge,
 - Soil protection levy.
- Transport taxes:
 - Product charge on tires,
 - Motor vehicle taxes.

5.11 Indicator: Environmental tax revenues

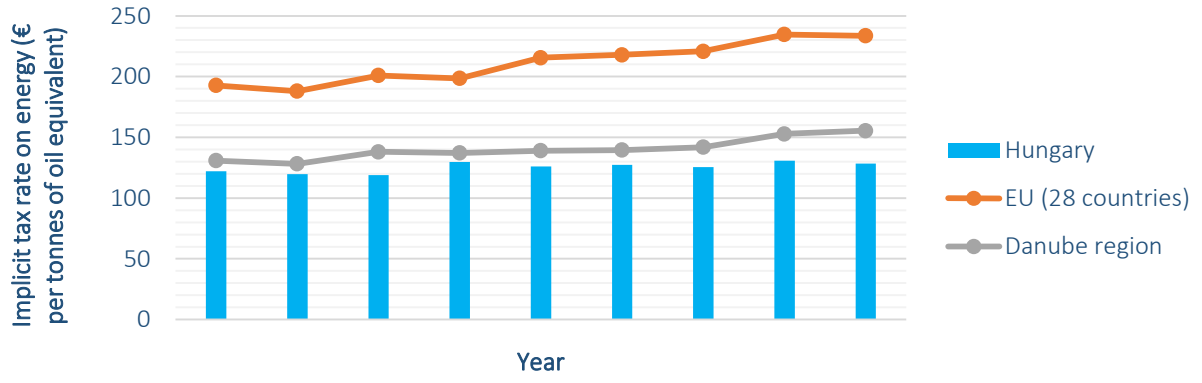


Environmental tax revenues had been remaining more or less on the same level during the observed period and had been being higher in Hungary by just a little than the EU average. These tax revenues include taxation of specific products ranging from petrol to shopping bags and also estimated or measured pollution is subjected to taxation, the common traits is that these have a proven negative impact on environment. Environmental tax revenues expressed as a percentage of all taxes and contributions, which is different in every country pointing more towards the overall tax burdens in a certain country, as the revenue-to-GDP is more or less the same in the EU.

5.12 Indicator: Energy taxes and implicit tax rate on energy

The first indicator aggregates energy tax revenues of different paying sectors, such as households, industry and construction, wholesale and retail trade, agriculture, forestry and fishing, transportation, storage and last but not least services, while the second indicator shows the proportionality of energy taxes on a tonnes of oil equivalent basis. Energy tax revenues is an absolute number and had been decreasing in the observed period in Hungary - peaking at just a bit more than 2 billion EUR in 2008 - by 1,4% while it had been increasing in the EU by 19,2%. This average had been falling behind that of the Danube region and the EU as well, but we have to take into account that this is an absolute number and Hungarian GDP per capita values also lagging behind the EU average.

Implicit tax rate is an aggregated indicator meaning that this is only an average of the taxes paid by different sectors. The constitution of these revenues is a bit different in Hungary than that of the other EU countries, namely the share of households in the total revenues is much lower than the average, which was also indicated somewhat in former chapters, and it appears here as well slightly contradicting the otherwise rising trend of the EU and most of its member countries.



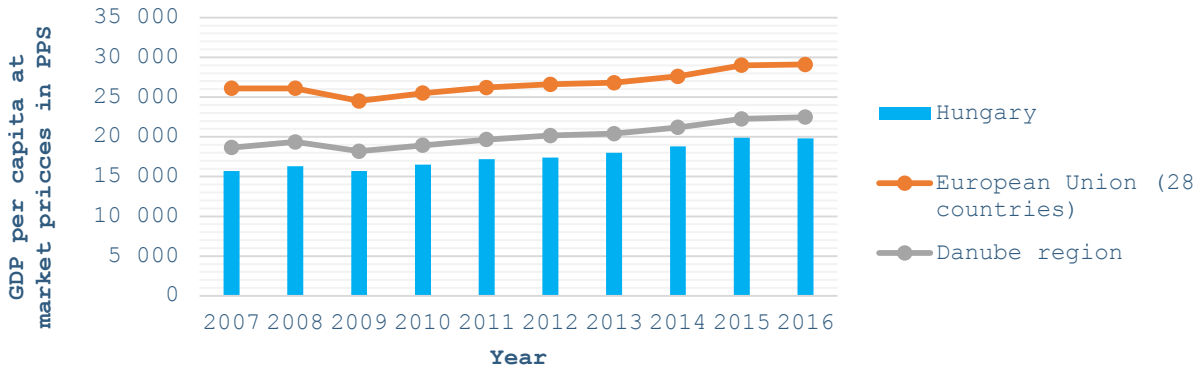
6. Economy and demography

Hungary is the 57th largest economy in the world and ranks 49th in terms of GDP per capita (PPP), and the economy is heavily export-oriented, being the 36th largest export economy in the world. Industry and construction contributed to 27,1% of the employment, while services were accounted for 64,8%, agriculture for 4,8%, and other sectors for 2,7%. The country has a considerable amount of trade surplus: the main trading partners are Germany, Austria, Romania, Slovakia, France and Italy, and it is one of the most popular destination of foreign direct investments in the Central and Eastern European area. The transportation system is extremely Budapest-centric offering only a handful of diversionary routes, and the motorway system is more than 1400 km long as of 2017 and was built in the same fashion as the railway system.

The population had been slowly decreasing since reaching the maximum of 10,709,463 in 1980 to 9,830,485 as of 2016, while ageing and low birth rates becoming major concerns. Life expectancy in 2015 was 71,96 years amongst men and 79,62 for women, presenting a major disparity between the two genders, it has been however continuously increasing since the 1989 constitutional change. The education of the Hungarians is improving, and tertiary education attainment reached 23% in 2014 (32% in the age of 25-34, which is considerably higher in most of neighbouring countries). The unemployment rate is reasonably lower than the EU average, and the employment rate had been increasing since entering the European Union. 26,3% of the overall population was living at the risk of poverty or social exclusion in 2016, which is higher than the EU average but had been decreasing at a greater rate than in most of the member states. Income inequality is lower than in the EU on average, but had been increasing since 2010.

6.1 Indicator: GDP at market prices in PPS

The GDP per capita figures had been increasing in Hungary during the observed period with 2,9% per year, which could be interpreted as a well above average performance compared to the 1,3% gain across the EU. Generally speaking, the countries with lowest GDP were the ones progressing the most between 2007 and 2016 ($r^2=-0,665$, moderate correlation), namely Romania and Bulgaria (6,1% and 3,8% per year, respectively), followed by Slovakia (3,2%) and Hungary.



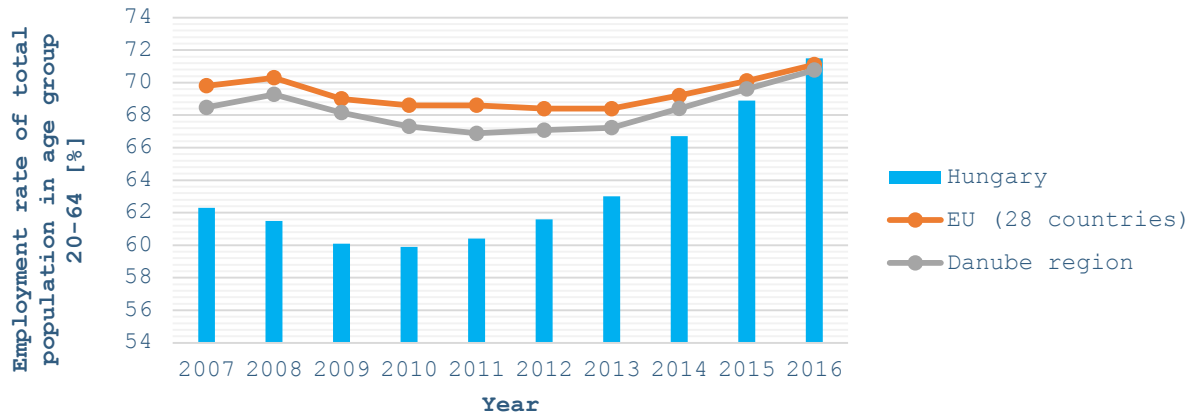
6.2 Indicator: Real GDP growth

Real GDP growth had been heavily fluctuating due to the rapidly evolving economic situation in the world, namely the 2008 financial crisis, which had a detrimental effect on the member countries' economy. Hungary did not fare too well before the crisis, but it seems like recent years have seen some serious increase in real GDP, the annual real GDP growth however have been only 0,6%, yielding a 0,1% lower result than the EU average. Real GDP and PPS measurement seems to had been decoupling in the observed period (0,6% real GDP growth as opposed to 2,9% in PPS) which could eventually balance when adopting the euro as it happened with Slovakia (3,1% real GDP growth versus 3,2% in PPS).



6.3 Total employment rate

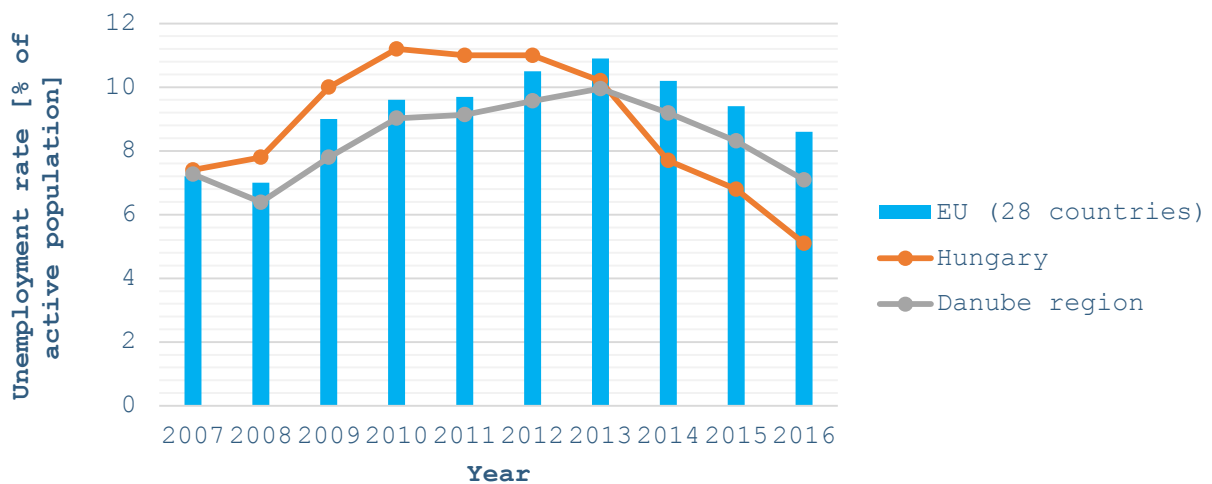
The employment rate was one of the biggest concerns when Hungary and the other new members entered the European Union, because these figures were unfavorable for the candidates. Since then, Hungary had reached the EU average (75%) and slightly exceeded the Danube region average (73,3%). The government introduced the public works scheme in 2011, which has been causing major controversies, its effect on the employment rate is unquestionable however.



OPPORTUNITY: The fast-growing employment rate can contribute to the environmental and innovation goals of the country and if kept high on the long run it could somewhat mitigate the severe ageing and other social problems.

6.4 Unemployment rate

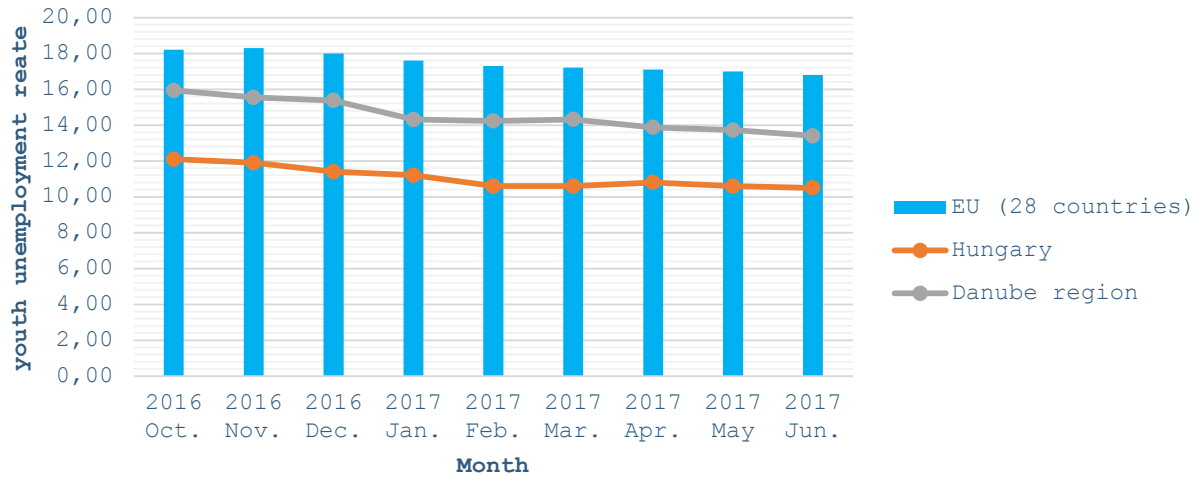
The unemployment rate had reached considerable heights as a result of the 2008 financial crisis, the introduction of the public works scheme have been successfully mitigating this situation however. The decrease did not stop there, the unemployment rate fell below even the EU average and the Danube region average as well, it dropped down to 5,1% in 2016 from 11,2% in 2010. Only a handful of countries such as Germany and Poland were able to surpass Hungary in lowering unemployment in the observed period of 2007 and 2016.



6.5 Youth unemployment rate

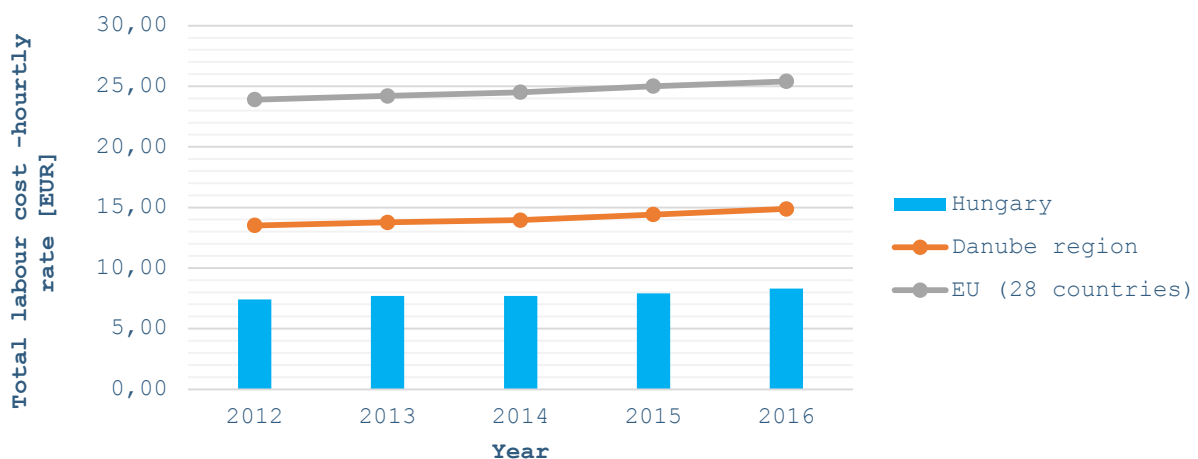
The unemployment of entrants became a subject of public discourse after the economic crisis of 2008. There are numerous initiatives in Hungary aimed at decreasing youth unemployment and helping young people to get their first job even on local levels which are helping to a great extent in mitigating this issue. The youth unemployment rate was therefore

considerably lower than the EU average or the Danube region average in the observed period of the October of 2016 to the June of 2017, being 10,7% in Hungary, 13,4% in the Danube region and 16,8% in the EU, respectively.



6.6 Hourly labour costs

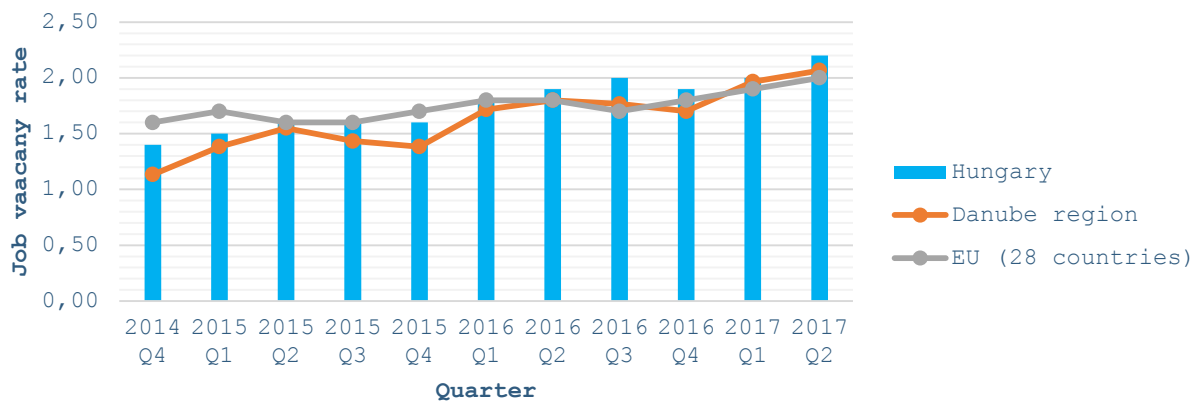
The low labour costs is one of the key advantages of Hungary in certain, labour-intensive economic sectors. Because the data was calculated on a EUR basis the differences between the value of local currencies was not taken into consideration, there difference between the 2012 and the 2016 EUR/HUF exchange rate is around 10%. The absolute numbers did not change to a large extent, the annual growth rate in labour costs was 0,7% in Hungary, rising from 7,4 € to 8,3 € between 2012 and 2016, while in the same period the EU average increased by 2% and the Danube region by 2,1%, respectively.



OBSTACLE: The low labour costs are often interpreted as a competitive advantage, in relation with innovation and R&D however these pose a barrier as it can lead to highly workforce leaving the country.

6.7 Job vacancy rate

The job vacancy rate is increasing at a greater rate than in the EU or the Danube region, reaching 2,2% in 2017 Q2, a 57% increase from 2014 Q1, while it gained only 25% in the EU on average and 82% in the Danube region. The so-called labour shortage is starting to become a matter of concern and a subject for public conversation in Hungary. The lack of qualified workforce in specific sectors and the largely unknown but still significant amount of people emigrating to work in the western EU countries contributes greatly to the increasing rate of job vacancy.

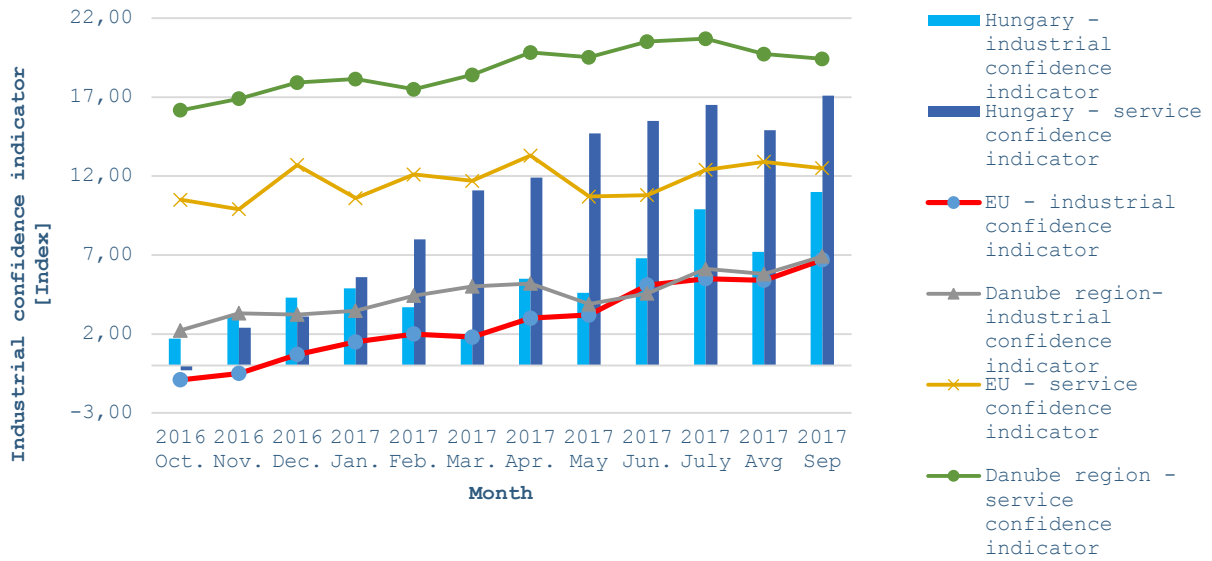


6.8 Indicators: Industrial and service confidence indicators, economic sentiment indicator

The confidence indicators provide a reliable source of information about the economic environment and the future business prospects. The economic sentiment indicator is a composite indicator which summarizes the following indicators:

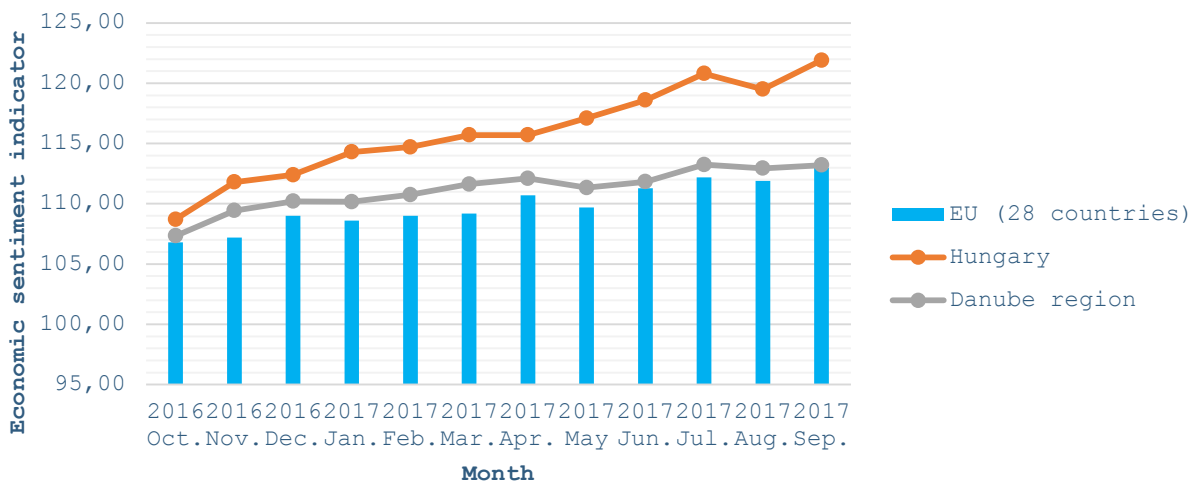
- industrial confidence indicator (40%);
- construction confidence indicator (5%);
- services confidence indicator (30%);
- consumer confidence indicator (20%);
- retail trade confidence indicator (5%).

Both the industry and the service confidence indicator and the economic sentiment indicator had been rising from the October of 2016 to the September of 2017, and Hungary is only surpassed by the Danube region average regarding the service confidence indicator, growth rate however was much higher in the case of Hungary. The economic prospects look much better in Hungary than a year ago, especially in the service sector which increased by 17,4 points from -0,3 to 17,1.



OPPORTUNITY: The recovery rate of the industry and service confidence indicators show that the Hungarian economy is fast to get over the 2008 financial crisis, which indicates that the business are resilient and can quickly adapt to challenges.

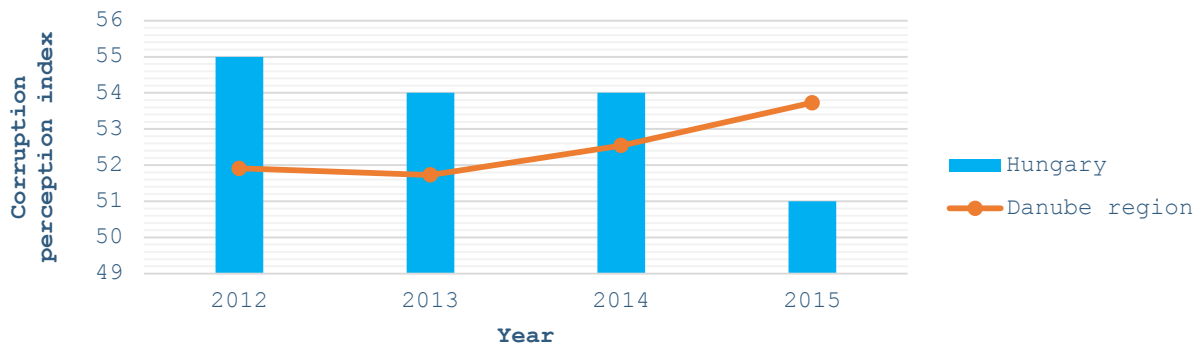
The economic sentiment indicator had been also increasing in a faster rate than the EU or the Danube region. In fact, the Hungarian performance (a 16,1% annual growth) was surpassed only by Montenegro, which was able to increase the economic sentiment indicator by 22,8%. These three indicators display that the economic performance and the future outlook look much better by the end of 2017 with most of the concerns and distress caused by the 2008 economic crisis have been dissapering.



6.9 Indicator: Corruption perception index

The CPI had been unfortunately decreasing in Hungary by 7,27%, from 55 to 51 points. The indicator increased in the Danube region and in most of the European countries in the same period, which makes the Hungarian figures more regrettable. The trend is further confirmed by the recently

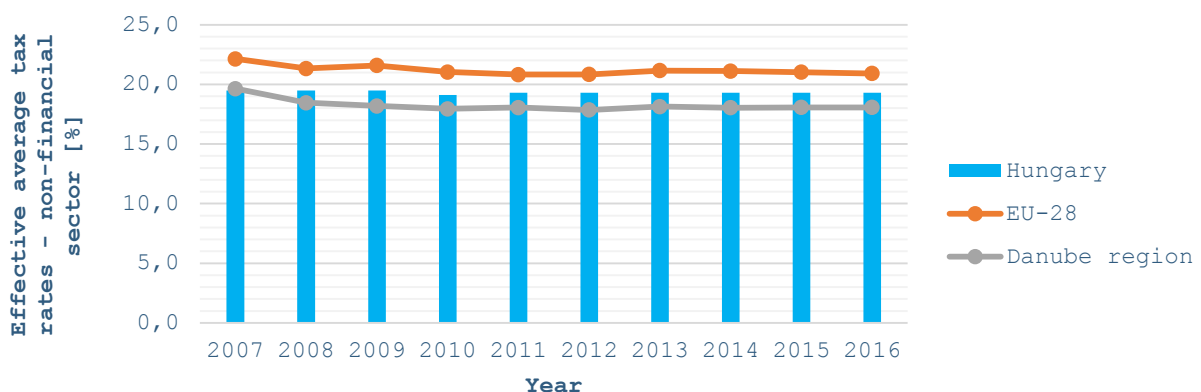
published Eurobarometer survey on corruption which provides detailed information and is based on public opinions. This report also shows for example that more and more respondents think that corruption is acceptable and it is appropriate to give a gift to obtain a public service.



OBSTACLE: The CPI deterioration can have a detrimental effect on soft factors determining the future of the economy, such as trust in the government. Combined with the recent introduction of different special taxes can cause major investments to avoid the country.

6.10 Indicator: Effective average tax rates

The effective average tax rate is calculated on the basis of a hypothetical incremental investment undertaken by a fictional company. The average tax rate is rather stable throughout the whole EU. Hungary performs somewhere between the EU average (which is slightly higher) and the Danube region (which is a bit lower), and the effective average tax rates had decreased from 19,5% in 2007 to 19,3% in 2016.

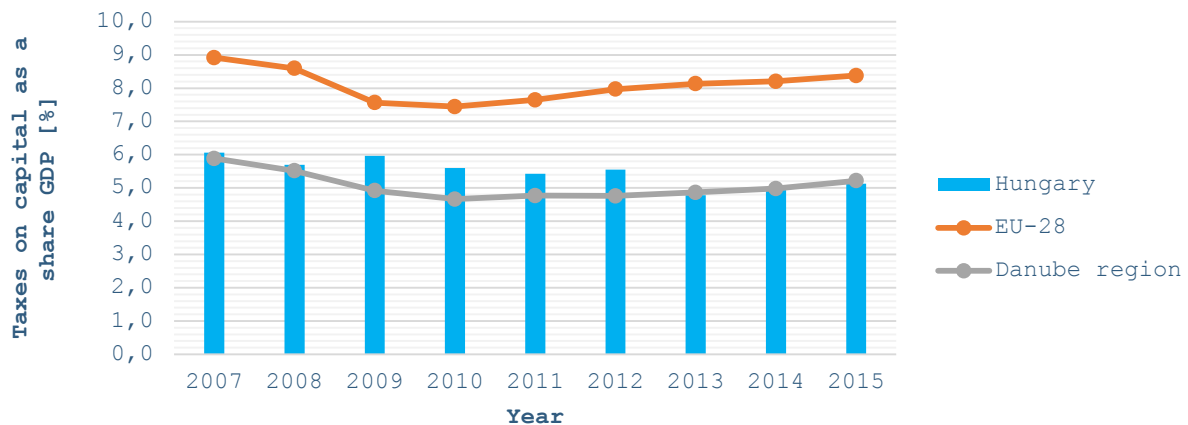


6.11 Indicator: Taxes on capital

“Capital taxes include taxes on business income in a broad sense: not only taxes on profits but also taxes and levies that could be regarded as a prerequisite for entering into production/earning profit, such as the real estate tax, as long as owners rather than tenants are taxed, or the recurrent motor vehicle tax paid by enterprises.” (EC Taxation and

Customs Union; Data on taxation, Annex B: Methodology and explanatory notes)

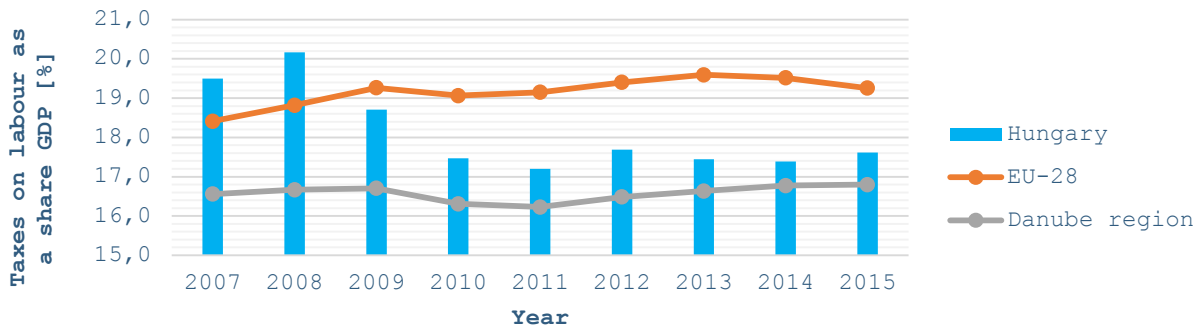
As the explanation attached to the dataset clarifies, not only taxes on profits are included, but other related burdens were added as well. The tax revenues decreased from 6,1% of the GDP to 5,1%, which is more or less in line with the Danube region average, and is more than 3 percents less than the EU average. The neighbouring Austria charges an overall 7,4% which yielded 25 billion € tax revenue in 2015 while Hungary received only 5,6 billion in the same year.



6.12 Indicator: Taxes on labour

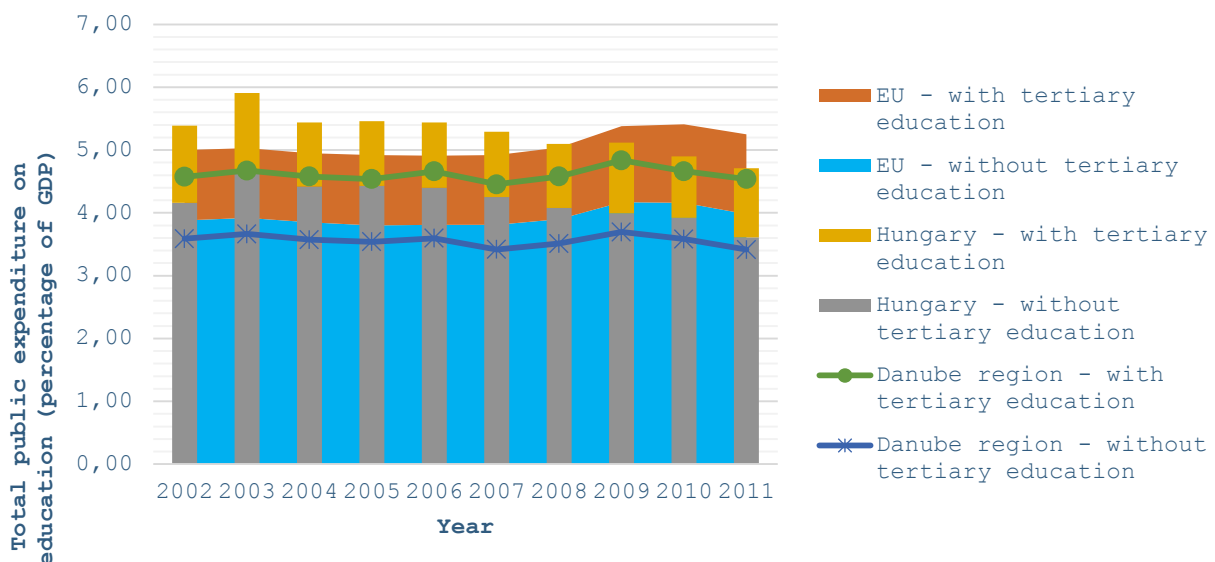
"Taxes on employed labour comprise all taxes, directly linked to wages and mostly withheld at source, paid by employers and employees, including actual compulsory social contributions." (EC Taxation and Customs Union; Data on taxation, Annex B: Methodology and explanatory notes)

The amount of tax revenues on labour are determined by the taxes charged on employment, which consists of income tax (15%), social security contributions (22%, from 1st of January, 2018 will decrease to 20% or 19,5% depending on the increase of the gross wages) and there are numerous charges which are paid by the employers (the 1,5% contribution to training fund for example). The income from these had been decreasing considerably: before 2008-2009 it exceeded the EU average and has been since hovering around 17,2-17,5%, while the Danube region average is slowly catching up, reaching 16,8%, only 0,8% less than the Hungarian performance in 2015. On a side note, the absolute amount of the collected tax revenue in 2015 was more than 19 billion € in Hungary, while in Austria it reached more than 84 billion in the same year, while the percentage compared to Hungary was only 7% higher.



6.13 Indicator: Total public expenditure on education

Hungary used to perform very well regarding education spendings, which has been changing however because while it appears that all of the EU countries are increasing their expenditures on tertiary education, Hungary and Bulgaria did the opposite. The public fundings spent on tertiary education had been dropping to 1,1% in 2016 from 1,23% in 2005, respectively, and the expenses on the other levels of the education had been decreasing in a similar proportion. The situation is not unsalvageable based on the absolute percentages: Hungary still exceeds the Danube region average by 0,17% but falls behind the EU average by 0,54% of the GDP.

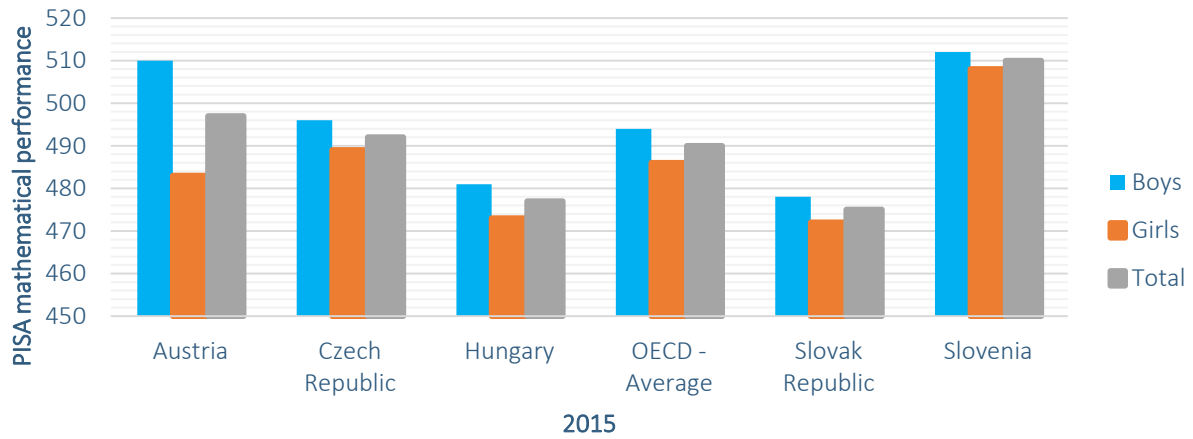


OBSTACLE: The decrease in education expenses can have a long-term side effect on social mobility and social inclusion, and can hinder the transition to a knowledge-based society, and can obstruct innovation as it could cause a shortage of skilled workforce available in the country.

6.14 Mathematical performance of 15-year-old students

The PISA performance measurement is a very valuable tool when comparing

the mathematical, literacy and scientific knowledge of students. The mathematical performance of Hungarian students had been decreasing from the first assessment in 2003: while it reached 490-491 points in 2003, 2006 and 2009 as well, it had been slowly diminished to 477 points (2012, 2015). It should be noted however that most of the countries show a very fluctuating performance.



7. Summary

Though Hungary is a highly-developed country there are some issues on which we hope this study could shed some light, and there also some strongpoints which require to be highlighted.

The eco-innovation performance leaves something to be desired, as the Eco-Innovation index had been decreasing in the period of 2010-2016, starting from below the EU average and had been descending even farther. Hungary is lagging behind in most of the eco-innovation-related indicators, some are looking however worse than others. The eco-innovation outputs: related patents, academic publications and media coverage put Hungary on the end of the list, which hopefully marks and end to the continuous decline in these departments. Hungary still performed remarkably well in eco-industries mainly due to the strong presence of remediation, environmental monitoring and instrumentation and nature protection.

The performance in innovation indicators is varying heavily. Hungary does not contribute in a large proportion to the R&D sector, the privately owned business however save the day in that sector which activities in turn are heavily supported by the government, The inadequate amount of PhD-graduates poses a serious challenge in finding R&D personnel, and the dwindling expenses on education can further deepen this issue. Unsatisfactory ICT knowledge and labour shortage can slow down the expansion of an otherwise fast-growing and innovative sector. SMEs are also having difficulties coping with new challenges and their innovation performance is lacking. There are however opportunities, which can be exploited, namely the strong presence of venture capital in Hungary, and the good examples, such as Prezi, LogMeIn, which operate in Hungary can further advance the spread of startup businesses, while Budapest gives a nice and attractive environment for entrepreneurs with its thriving social life.

Hungary also fares well in knowledge-intensive industries and services, meaning that even though domestic capital may be not very efficient in inducing new innovations and state-of-the art businesses, foreign enterprises can take advantage of the highly skilled and solution-oriented workforce. The employment rate, the value added and the export share of these industries and services could be considered to be very good in an European comparison.

Hungary does not seem to sticking out in energy-related issues apart from a few examples, such as the share of renewable energy sources in electricity production, which is far below the EU-average. The country is performing well regarding greenhouse gas emissions, and the constitution of the primary energy supply is well-balanced.

The socio-economic indicators describe a rather average country, which

achieved very nice results in employment: the employment rate finally caught up with the EU average, and youth unemployment is a considerably more modest issue than in other countries. The low level of hourly labour costs can be interpreted as an opportunity and an obstacle in same time, depending on the viewpoint. The two major problems are the increase of corruption and the decreasing amount of money spent of education.

8. Appendix

8.1 Sources

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