R&D Investments for Southern Europe: What does “brain drain” and “re-brain” Mean in the Current 2020 Crises?

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Abstract

While the economic and fiscal disparities between North/West and South/East Member States are obvious, there is now a gap between these “sending” countries when it comes to their highly educated youth population. These disparities have led to deeper gaps in which Southern states are unable to develop as quickly as the Northern states. This, in turn, means that the South is not nearly as equipped to handle crises as swiftly as possible. While Portugal and Greece have made large improvements in regards to “re-brain” initiatives and research and development investments, there is still much more to improve. Meanwhile, Spain and Italy are only falling further behind, especially within the current pandemic environment. While this crisis is only one factor that helps show this gap, it serves to demonstrate how that gap is harmful for nations and can only worsen if the trend continues. Greece is notoriously known for its economic situation after the financial crisis and for its high numbers of brain drain, but the number of R&D increases between 2007 and 2017, have increased and changed more than Spain and Italy. Portugal made a dramatic increase in R&D that specifically addresses underlying issues that facilitated brain drain and has therefore seen an improvement. For all Southern European Member States there needs to be further attempts to address foundational economic issues of the brain drain has led to change for the better.
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Introduction:

The intellectual intra-EU emigration, or the ‘brain drain’ has disproportionately affected the Southern and Eastern EU Member States. As such, Portugal, Italy, Greece and Spain (the Southern European States) are rightfully concerned about the ageing population along with the outflow of highly skilled and educated youth. While the receiving EU members like the UK, Germany, Sweden, etc, have witnessed technological innovation along with economic prosperity, the Southern European States observe stagnation in their economies and in their research and development sectors. While the economic and fiscal disparities between North/West and South/East Member States are obvious, there is now a gap between these “sending” countries when it comes to their highly educated youth population. These disparities have led to deeper gaps in which Southern states are unable to develop as quickly as the Northern states. This, in turn, means that the South is not nearly as equipped to handle crises as swiftly as possible. While Portugal and Greece have made large improvements in regards to “re-brain” initiatives and research and development investments, there is still much more to improve. Meanwhile, Spain and Italy are only falling further behind, especially within the current pandemic environment. All four nations have demonstrated a few capacities that have allowed it to maintain some of its youth population, however, the Southern European States need to address underlying socio-economic issues that threaten such progress. Portugal has been a surprising case in that it has attempted to address these issues by targeting higher education R&D directly. Because all of the Southern European States have similar political and economic foundations, the deviation of Portugal when it comes to youth emigration is an interesting one and upon further analysis, the hope for Portugal can be used to create hope for Portugal, Italy and Greece, particularly in the current 2020 climate.

Case Selection:

All four Southern Member States have seen a drop in their overall economy since the 2008 financial crisis, with Greece being the most severely affected. The role played in the financial crisis by Greece has largely been a contentious one in regards to its direct or indirect effect on the euro. Greece’s economic downfall has been long withstanding and includes decades of falling behind the rest of the European states. Since its entrance into the European Union, Greece has found itself unable to compete economically as is the case for all of the Southern states but it has especially been exacerbated in Greece. Despite this, the four Southern states have had similar economic issues relating to intra-EU migration due to living standards at home. Portugal and Spain have largely followed similar economic patterns while Italy has been staggering far behind, albeit different from the way Greece has been falling behind.

In general, the Southern European states have witnessed reduction of human capital, reduced economic growth, reduced productivity, reduction of tax income, reduction of wages, low innovation and brain waste (high skilled workers are unemployed or employed in low skilled jobs that don't allow these individuals to practice their true potential). Despite high unemployment in all of these Member States, Portugal and Greece have witnessed large investments in re-brain initiatives along with R&D investments. However, the youth returning to Portugal and Greece has not been enough when compared to the amount of people that left to begin with. There is still hope, however, as these countries have realized small pressure on their healthcare systems in light of the current pandemic. Italy and Spain have seen a rise in its labor force that is largely due to the influx of non-EU migrants entering Italy but it has been unable to retain the educated population nor does it seem to attract enough returnees to increase its
educated labor force. Not to mention that Italy and Spain have done little to incentivize R&D investments. In light of the current climate, Italy and Spain have experienced the most pressure on its socio-economic system and will suffer further. Portugal and Greece have managed to improve despite its economic upsets. All four Member States have experienced large influxes of educated individuals leaving their nations, why has Portugal and Greece managed to increase R&D more than Spain and Italy and how does that affect the present and future crises?

**Literary Review:**

The economic situation in Southern Europe, along with R&D investment amongst the Member States have been analyzed individually. As such, it has become clear in the literature that there is a continuously widening gap between North and Southern Europe, particularly in regards to economic and general development. There have been recent crises and events that have changed the prioritization of R&D investments. This is especially concerning in light of the growing disparities between countries in the EU as there are some nations that seem to be more equipped to address these crises than others. Naturally, Southern Europe is falling behind due to economic and political gaps. What does this mean for the future? In order to assess how the Southern European states will take action in the future, it is important to assess why the Southern states have come to exist in these circumstances in the first place. Economic issues alone cannot be the sole factor as other nations have been able to recuperate much faster and more swiftly. While Anna Zamora-Kapoor and Xavier Coller argue that economics and, specifically, the financial crisis has been the main cause of such issues, there is more to assess. While *The Effects of the Crisis: Why Southern Europe?* does serve to display context in which Southern states have witnessed an economic downturn, Kapoor and Coller do not assess the “brain drain” nor the effects of R&D in southern states. Two factors that directly contribute to the disparities between North and South. In other words, it mentions why the Southern states are affected by displaying the context in which they are operating but it does not specify the long-term effects that project more than just economic issues but social ones. Furthermore, while the Southern states were disproportionately affected by the economic crisis, there is no mention of how to mediate this nor how programs can better re-attract citizens that have been affected. Not to mention that recent events in 2020 alone, like the COVID-19 crisis, have shed light on the effects on R&D which is a direct result of the brain drain. It is important to mention that the context in which the Southern European states must act upon have resulted in cyclical disparities that make it impossible for their situation to improve or to, at least, meet the levels at which other EU Member States are acting upon.

**Contribution:**

To begin, the economic status of the four Southern European Member States will be portrayed following the financial crisis in 2008. This shows that these four Member States are equally economically distressed with, perhaps, Greece slightly more impacted. Following that context, the “brain drain” that resulted from that economic status in Southern Europe will be shown. This places the Southern European states in an interesting perspective as the disparities between “sending” and “receiving” nations of young and educated populations. Furthermore, the effects of the “brain drain” and its future projections and impacts will be assessed. The programs and initiatives that attempt to “rebrain” the Southern European states will be looked at. Moreover, it will be assessed whether these initiatives were helpful in closing the gap in research and development (R&D) of these Member States. Lastly, once the limitations of such initiatives
are observed and the effects of R&D investments are apparent, the effects of these actions will be observed amidst an ongoing crisis and what this implies for the future of these nations that have been left behind. While these effects have been analyzed individually, they remain to be further analyzed in the midst of a global pandemic. The disparities between North and South European are obvious in the ongoing pressure on Southern States with two out of the four nations experiencing some improvement.

Analysis:

*The Southern European States’ status post-financial crisis:*

Southern Europe’s experience during the financial crisis left a disproportionate gap between them and the Northern states, both economically and politically. For Greece, Italy, Portugal and Spain, there have been economic issues that have driven citizens away. International perception of these countries is now of economic weakness. While the financial crisis was an issue for the world and all its nations, these four southern nations bared the brunt of the blame within the European Union even though they are western nations.

Between 2007 and 2013, unemployment rates tripled in Greece and Spain to 27.8 percent and 26.3 percent. In Italy and Portugal, unemployment rates did not rise as drastically but these rates still doubled. In Greece, the rate reached below 20% in 2018 and the others the rate averaged 7.5% (Timsit, 2020). After the recession, Greece’s rate rose to 59.5 percent by 2013 with Spain, Italy and Portugal seeing similar rises (EuropeanCeo). While unemployment rates in these four nations have decreased since 2014, youth unemployment rates still remained between 30 and 40 percent in Italy, Greece and Spain.

Considering these circumstances there were attempts to combat these issues and restore the Southern states to economic stability. Since 2009, Southern European states have been encouraged by the EU to implement austerity measures and, in return, they would receive financial assistance from the EU. These austerity measures, however, have resulted in a cyclical process in which the Southern states end up in more debt continuously. The austerity measures reduce a states’ overall participation in the economy which later results in higher unemployment rates (researchgate). While austerity measures are the most common mechanism to reduce debt, they have reduced average household incomes. In Greece, income was reduced by 14%, in Ireland by 7%, in Portugal by 7%, Spain by 5% and Italy by 3% in 2011, as shown by Table A (research gate). Greece and Portugal had the highest austerity package per household.
These economic issues came with political implications that further deepened the Southern states’ crises. As mentioned, international perception of these states was hardly a positive one and, therefore, discouraged investment and/or assistance. In fact, helping these nations in any way was now being considered more a nuisance as opposed to a mutually beneficial deed. As such, Greece, Italy, Portugal and Spain lost their economic and political attractiveness. This is shown by Table B, which demonstrates the national competitiveness of nations as collected by the World Economic Forum. National competitiveness, according to the World Economic Forum, is measured by the institutions and policies within a nation that predict productivity levels. The following figure (Table B) is the Global Competitiveness Index 4.0 which outlines at which level the Southern European states are producing comparatively.

Table 2. Austerity in Europe, 2011.

<table>
<thead>
<tr>
<th></th>
<th>Austerity Package per Household (€)</th>
<th>Austerity Package as % Take-Home Household Income</th>
<th>Austerity Tax and Levy Increase per Household (€)</th>
<th>Austerity Package as % GDP per Head</th>
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<tbody>
<tr>
<td>Germany</td>
<td>283</td>
<td>0.7</td>
<td>134</td>
<td>0.4</td>
</tr>
<tr>
<td>Greece</td>
<td>5,647</td>
<td>13.7</td>
<td>2,898</td>
<td>11.1</td>
</tr>
<tr>
<td>Ireland</td>
<td>3,602</td>
<td>6.7</td>
<td>840</td>
<td>3.8</td>
</tr>
<tr>
<td>Italy</td>
<td>1,131</td>
<td>2.7</td>
<td>468</td>
<td>1.8</td>
</tr>
<tr>
<td>Portugal</td>
<td>2,166</td>
<td>6.7</td>
<td>NA</td>
<td>5.0</td>
</tr>
<tr>
<td>Spain</td>
<td>1,962</td>
<td>4.8</td>
<td>506</td>
<td>3.1</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>1,355</td>
<td>3.2</td>
<td>692</td>
<td>2.0</td>
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Source: Gainsbury, Whiffin, and Birkett (2011).
Note: GDP = gross domestic product; NA = data not available.
As shown, Greece stands at #57, Italy at #31, Portugal at #34 and Spain at #26. Comparatively, Germany stands at #3 with the Netherlands, the UK, Sweden, Denmark, France and Luxembourg in the top 20. Furthermore, between 2000 and 2012, Gini indexes increased for the Southern European states. Greece went from 33 to 34.3, Spain from 32 to 35, Italy from 29 to 31.9. Only Portugal was able to reduce overall inequality amidst the crisis, their Gini index went from 36 to 34.5 (Kapoor et al. 2020). These factors further damage southern European states on the global stage. Domestically, the results are even more cyclically damaging as these factors have resulted in a grand exit of young and educated groups leaving these nations in pursuit of more positive factors elsewhere.
**Brain drain:**

When there is high unemployment and low competitiveness along with high Gini indexes, citizens begin losing confidence in their government and nation. Naturally, when citizens feel that they are unable to find relevant employment along with positive living standards, they seek these beneficial livelihoods elsewhere. The intra-EU migrations are parallel to business cycles as outlined by PLAB. This is especially true in the European Union in which citizens are able to move freely. Young and educated populations, therefore, have left Greece, Italy, Portugal and Spain to other European states in pursuit of better economic and political environments. One third of EU28 movers (17 million) in 2017 were between the ages of 15 and 34 (European Commission, 2019). According to Figure C, the top destinations for EU28 movers in 2016 are Germany, the UK, Spain, the Netherlands and France.

**Figure 4. Destination country of young EU28 movers, by age class, 2016**

![Graph showing the destination country of young EU28 movers, by age class, 2016.

Source: data are from Eurostat, migr_imm1ctz, accessed in July 2018. No data available for Austria, Greece, Ireland, Malta, Slovenia and Romania. For the UK, the unit is not ‘Age reached during the year’ but is ‘Aged in completed years’.

According to (European Committee of the Regions, 2018), Germany (33%) and the UK(20%) were the top destinations for these movers who absorbed more than half while Romania, Poland, Italy, and Portugal were the primary origin countries of these movers. Spain absorbed 9%, France 7% and Italy, Austria, the Netherlands and Belgium, absorbed 5% each (European Commission, 2019). 25% of the EU28 movers aged between 15 and 64 had tertiary levels of education as shown in Figure D:
Per the above figure, most of Greece, Portugal and Spain are sending regions of young educated individuals along with some regions of Italy. Meanwhile, the UK, France, Sweden and Germany are receiving regions. On the left, the areas with the most concentrated population of highly educated individuals is the UK, Denmark and Sweden.

Furthermore, there is a correlation between GDP per capita and youth employment between the sending and receiving regions. As shown in Figure E, the same receiving region have the highest GDP per capita and the highest employment rates for youth ages 25 to 34 (European Commission, 2019).
Overall, Sweden, Ireland, Estonia, Denmark and the UK, who have high employment rates, attracted most of these educated movers due to the “pull” factors that attract such influxes (European Committee of the Regions, 2018). Finland, Greece, Portugal, Spain, some regions of Italy, north-eastern France and most Eastern European states experience the most population loss as characterized by “push” factors in Figure F that drive youth away from nations.

Southern European states (Portugal, Italy, Greece and Spain) have all experienced reduction of human capital, reduced economic growth, reduced productivity, reduction of tax income, reduction of wages, low innovation and brain waste. These “sending” countries have high
unemployment, low wages and poor living standards. As indicated above in Figure F, Spain, Portugal, Italy and Greece have the highest unemployment while Spain, Portugal and Italy have the highest death rate in the business economy.

As such, the outcome of such conditions have resulted in the receiving nations having the highest share of highly educated EU28 movers who also have high employment rates when they move:

![Figure 5. Share of highly educated EU28 movers, NUTS2, 2017](image1.png)

![Figure 6. Employment rates of highly educated EU28 movers, NUTS2, 2017](image2.png)

Source: maps elaborated by the authors, based on Eurostat data edat_lfs_9917 and lfst_r_lfe2emprc, accessed in July 2018.

While population loss in Estonia and Italy is largely due to natural changes (more deaths than births) and is similar to Greece and Portugal, Germany, Spain, Poland and Finland experience positive net migration (European Committee of the Regions, 2018). Between 2010 and 2015, 220,000 citizens left Greece, 75% of which had university degrees and by 2016, only 15% of those who left, returned. In Italy, 160,000 Italians moved abroad in 2018, increasing the total number of young and mostly skilled Italians that left the country since 2008 to two million. In fact, 23% of the population is aged 65 or over, the second highest proportion globally (European Commission, 2019).

In general, these nations are still experiencing a “grand middle-class exodus,” as coined by Dr. Theodoros Papadopoulos. Up until now, there has been a drop in unemployment rates in sending countries but the drop in unemployment rates is due to the youth of Southern European states leaving these countries for a better and more employable middle class somewhere else, therefore, shrinking the labor force size. About 54% of the EU population live in Western Member States in 2015 and that percentage is expected to rise to 59% in 2060 (European Commission, 2019).

**Effects of Brain Drain:**

All countries run the same risk of reaching a demographic time-bomb or a paywall. Populations are aging and there is lower fertility. In Southern Europe, the fertility rate is 1.37 children per woman which is far below replacement level (Timsit, 2020). As a consequence of low fertility, high aging population and high emigration of the educated youth, Southern
countries will have a lower productive potential and an accelerated aging population. According to the UN, Greece is in the top 6 of the Top 10 countries with fastest shrinking populations. In 1980, the 65+ population in the EU was 13% of the total 466 million, in 2015 it rose to 19% of 509 million and is likely to increase to 32% of 521 million. If trends persist, the 65+ population will increase (European Commission, 2018). The analysis warrants concern as movement of high skilled workers to wealthier countries speeds up ageing and population decline in sending countries. The European Commission has estimated that there will be a smaller and more-educated labor force which could lead to a reduction of the amount of people in the labor force which is projected to change from 245.8 million to 214.1 million within four decades. At the same time, post-secondary groups are expected to increase by 45% in the same amount of time (European Commission, 2019).

Aside from future projections of what is to occur, the brain drain has already changed social standards for better or worse. For example, in Spain, familial dynamics have changed. “Breadwinner” dynamics have been broken when it comes to the male figurehead usually being the main provider. This is largely due to the fact that youths can no longer wait to find a good job and instead encourage all members to be employed when they can. While this can be viewed as a positive outcome, the other outcomes can have more negative consequences. Spain’s construction industry has collapsed almost completely. It has also led to “self-fulfilling” prophecies when it comes to social and economics gaps. Because sending regions have been left with smaller populations of young educated individuals, there is a cyclical nature in the long run. The population that stays in the sending region will get older while R&D is lacking which will lead to the sending regions falling further and further behind. As such, the Southern states will continue to be less well-off than the receiving regions who are able to increase R&D and as their population remains young and educated. The gap will only widen. Due to these factors, some states have already begun to consider leaving the EU in general. Because the EU offers free movement of people and labor, intra-EU mobility is easier, which, in this case, has a negative impact for Southern states. Right-wing populist parties have been able to monopolize on these gaps between North and South Member States and have rallied citizens to consider the EU to blame for their economic loss. While there are many factors when it comes to leaving the EU, poor economies and low development are large factors. As such, Italy has threatened to leave the EU while similar issues have occurred in Spain. If these states do not improve, these threats may be more widespread. More and more, impoverished economies have led to further disparities due to differences in R&D between North and South. R&D, in the long run, will continue widening the gap, especially if educated people reside in Northern states.

Economic disparities have seeped into R&D and will affect development in the long run. Projections of even more economic perpetuations as a result of the disparities between sending and receiving nations has warranted concern. Especially for sending regions, whose populations are growing older. The Portuegese Prime Minister has recently expressed his concern in March 2020, in light of various economic and research and development (R&D) changes. Prime Minister Antonio Costa has stated:

"We have to be aware that, despite the fall in unemployment and the improvement in income, the share of salaries in gross domestic product remains significantly below the European average, and well below [that at] the beginning of the century" (Madeira 2020). Action has to be taken and most sending regions seem to be seeking solutions to bring back their educated nationals in order to resurrect their economies through the promotion of R&D. In light of the economic situation in southern Europe, the European Council on Foreign Relations took
an opinion poll in 2019. They found that support for preventing nationals from leaving their
country for long periods was highest in Spain (62 percent), Greece (59 percent) and Italy (51
percent). By comparison, the EU average was 32 percent” (European Commission, 2019). While
opinion polls are largely subjective, there is a desperate need to return educated individuals as
the sending regions will only fall further behind in development in the long-run.

*Projects:*

Governments have already attempted to acknowledge these disparities and have created
initiatives to try to combat the effects of brain drain. The following is a list of 30 initiatives
(European Committee of the Regions, 2018) that aim to create a re-brain in EU countries:

![Table of initiatives](image)

While there are these initiatives that have attempted to address the ‘brain drain,’ these processes
have not been able to assist accordingly. Currently, there exists Greece’s Rebrain Greece
launched in 2019; Portugal’s Programa Regressar launched in July 2019; and Italy’s Rientro dei
cervelli expansion in May 2019 (European Committee of the Regions, 2018). The program in
Greece has offered a pre-tax monthly wage of 3,000 euros to 500 workers between the ages of 28 and 40 if they return to Greece while offering them full employment. The program in Portugal also offers a cash incentive of 2,614 euros, a 50% income tax reduction for 5 years and covers any relocation costs to returning citizens who sign a full-time contract in Portugal (European Committee of the Regions, 2018). Italy’s program offers returnees a 70% income tax break for up to 10 years if these individuals sign a work contract that commits them to stay in Italy for at least two years. However, these programs have had minimal success. For example, only 71 people took advantage of the program in Portugal so far (European Committee of the Regions, 2018). There have been similar initiatives to encourage R&D and simultaneously re-brain their nation. But these initiatives have been ongoing and have had little success as well.

San Sebastian, Spain, in 2011, launched the Talent House which gave 1,325 incoming researchers to establish their business in the Talent House building and service 511 people. R&D investment rose to 194 million euros (2.67% of GDP) in 2014. Furthermore, “Fomento de San Sebastian” created new policies to attract and retain educated youth such as the San Sebastian connecting talent program and the “Residencias connecting talent, visiting professionals program”. The former provided 25 researchers between the ages of 18 and 30, mobility grants (around 1,358 euros each month) to allow them to develop a research project abroad and then return to teach what they have learned. The latter program gives talented youth the opportunity to move to the city for 15 days to two months and are then awarded a grant of about 750 euros (European Committee of the Regions, 2018). In general, the “EURAXESS- Researchers in motion” is a pan-European initiative to support researcher mobility in the EU to encourage brain circulation and avoid brain drain (European Committee of the Regions, 2018). These programs helped attract investment in R&D by attracting new researchers. New infrastructure dedicated to R&D that allow researchers to network with local stakeholders and exchange research information. Such developments improve a city’s reputation which, in turn, can improve quality of life for its residents. As such, people will feel less inclined to leave.

In 2015, Brain Back Umbria began in Italy to establish a Brain back Umbria community on LinkedIn consisting of regional citizens who reside abroad. About 1,074 people mostly reside in the U.S., Spain and the UK. The program involved the creation of 16 start-ups. The project awards research scholarships to two Ubrian citizens living abroad. It also organized “Business visits” and created a project website while disseminating projects on social media and via newsletters. The project proved that social media was a valuable tool to assist with brain drain. It was helpful in collecting data and creating a community of Umbrian citizens residing abroad while tracking reasons why they left the region. “Agenzia Umbria Ricerche” was able to use this information to map key features of Italian movers. In turn, they can come up with actions to take in the region to re-attract those who left (European Committee of the Regions, 2018).

The Thessaloniki Creativity Platform in Greece was established in 2013 to work jointly with the URBACT “My Generation at Work” network to provide opportunities for educated individuals. In total, the collaboration resulted in 7 collaborators and interns working with 190 professionals to promote their work. There were a total of 15 collaborations and 250 professionals benefitted from the networking involved. It also managed to create an “open-door-week-end” in 74 studios and agencies and was visited by 4,000 people. “Crunch” events were created in 2014 with 100 participants (European Committee of the Regions, 2018). As a result, there was a new sense of cultural valorization within an area that used to only contain old warehouses and manufacturing sites left empty following the financial crisis. Before the program, there was no local strategy to support the creative sector. Following the program,
youths were encouraged to establish non-profit organizations to create job opportunities in the community.

**Outcomes:**

After the financial crisis led to an increase in R&D spending in most Member States except Portugal and Spain (Eurostat). While the Southern states have had similar economic trajectories, they deviate when it comes to R&D, why and how? As shown in Figure G, Italy had the most intense R&D compared to the other Southern European states in 2018. Portugal and then Spain followed. Greece has the least intensity out of the Southern states.

As such, many of the Southern European states are not meeting the EU averages of 2.07% of R&D expenditure (% of GDP). None of the Southern European states meet this average. As demonstrated in the following Figure H. However, it is important to note that Italy and Portugal have similarly high intensities while Spain and Greece have similar lower intensities. While political and policy factors and government priorities affect this intensity, the lack of educated individuals definitely contributes. This is further proven as receiving nations like Sweden, Denmark, Germany and France do meet the average and they happen to have the most educated and young population.

Source: OECD Main Science and Technology Indicators Database, 28 February 2020. [http://oe.cd/msti](http://oe.cd/msti)
As Italy and Portugal have similar patterns, as do Spain and Greece, this pattern does not persist when it comes to sectors of expenditure. All of them deviate slightly when it comes to which sector they prioritize. Greece and Italy increased spending in business enterprise while Spain remained the same throughout sectors. Portugal increased higher education expenditure and decreased government expenditure slightly. All of them prioritize business enterprise more but Portugal secondly prioritizes higher education more than the others as shown in the following Figure I:
While it is possible that these projects may have had limited success, Italy and Portugal seem to be increasing their potential gradually. Going back to Figure G, Italy and Portugal are closer to the EU28 average than Spain and Greece are. It's interesting to note that Spain has lower levels of R&D, especially when considering that Spain became the ninth-largest host for foreign direct investment inflows in 2018 that reached about $44bn (€39.7bn). Italy, by contrast, received just $24bn (European Commission 2019). Spain is a more attractive investment than Italy, Greece and Portugal because Spain is swifter to implement reforms to regulation and labor according to the UN. However, Spain is still low in R&D intensity. Its sectors have not changed between 2007 and 2017 in R&D and there has not been a successful initiative that has resulted in a rebrain for Spain.

Why has this foreign investment along with these previous initiatives not alleviated this? Largely the initiatives and investment do not account for underlying socio-economic conditions. There is a clear division between additive vs underlying socio-economic conditions and improvements. The initiatives and investments are additive. Portugal seems to be working directly with underlying socio-economic conditions. The Portuguese prime Minister has stated in 2020, further commitments to handle these underlying conditions. In the midst of a pandemic this month, the Portuguese PM has addressed the effects of economic issues and the brain drain

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*(2016 data instead of 2017)*

*(OECD, 2017)*
that has led to poor R&D. Furthermore, the Portuguese PM states new commitments to handle these issues and prevent further brain drain. He states that the government has put great stress on the need for a long-term agreement on incomes "that aims at convergence with Europe in salaries’ share of GDP…[this is] vital to keep the new generations motivated.” He went on to list goals for Portugal in the coming decade with:

“the aim of reducing the ratio of public debt to GDP to below 100% by 2023, increasing exports as a share of GDP to 50% by the middle of the decade, raising the minimum monthly salary to €750 by the end of the legislature, eradicating poverty among the elderly, ensuring that by 2030 six out of ten young people are attending higher education, and, in that same year, achieving carbon neutrality (Madeira 2020).”

In general, governments should instead focus on public services like healthcare, education, air pollution reduction, corruption reduction and law and order maintenance which seems to be what Portugal is focusing on, due to its heightened R&D expenditure in higher education. Despite brain drain in Portugal, Portugal escaped from the crisis more than the others as Greece has worse fiscal issues and its priorities in R&D may be a contribution to this. The initiatives alone have had little success but new commitments and investments in R&D, especially those that deal with underlying issues like higher education, can explain why Portugal is better suited.

*R&D now:*

There has always been a heavy reliance on a country’s R&D but this is especially true in times of crisis. For Southern European states, however, whose R&D has been negatively impacted by disproportionate gaps in their educated populations due to brain drain, this poses a dangerous risk for their general livelihoods. Amidst the 2020 COVID-19 the consequences of poor R&D intensity seems that much more daunting. This pandemic puts R&D at the forefront of the issue and calls into question a nation’s commitments to R&D for future prevention of crises. With this pandemic in particular, the effects of brain drain on R&D and, coincidently on how the pandemic is handled are clear.

According to Julie Wagner, seven institutions have demonstrated their engagements that are directly involved in COVID-19 development:

- The Melbourne Innovation District (Melbourne, Australia)
- The Milan Innovation District (Milan, Italy)
- The Cortex Innovation Community (St. Louis, United States)
- The Hagastaden Innovation District (Stockholm, Sweden)
- The Pittsburgh Innovation District (Pittsburgh, United States)
- Copenhagen Science City (Copenhagen, Denmark)
- The Knowledge Quarter and St Mary’s Hospital Campus (London, UK)

(Wagner, 2020)

While there are various institutions tasked with dealing with this issue, the list above include one institution in Southern Europe while there are three in Northern Europe. For this purpose, the focus will be on those in Southern Europe.

The Milan Innovation District (MIND) is working on developing research in life sciences and technology with a focus on health and nutrition. It largely emphasizes joint research
activities with Statale University of Milan, the Human Technopole and the Galeazzi Hospital. The district is government led with collaboration with Arexpo and Lendlease. MIND has outlined the following goals and developments:

- Researchers from the Statale University’s Department of Biomedical and Clinical Sciences and Sacco Hospital are analyzing genomes
- the University of Milan Statale sponsors research projects th
- The Italian member of the World Health Organization and chair of the Human Technopole Scientific Board is improving data sharing systems
- Researchers at the Galeazzi Hospital are working to speed up “horizon scanning” for early detection and the development of technology and vaccines (Wagner, 2020)

This is especially necessary since Italy, the U.S. and China have the highest number of cases. Aside from the seven districts mentioned, other governments in the EU have also outlined goals and dealing with this global issue. For example, Spain is currently developing its Spanish Antarctic campaign that is being financed by the Ministry of Science and Innovation. The campaign is spearheading 13 scientific projects to encourage collaboration between the public and private sectors of R&D. The Spanish government has allocated 30 million euros to research projects on COVID. About 24 million of those funds are to go to Carlos III Health Institute (ISCIII) who will develop urgent aid programs to increase knowledge. The remaining funds are allocated to the National Center for Biotechnology at the Spanish National Research Council to develop vaccines (Science Business 2020). Despite the initiatives to rebrain the Southern European states and the increasing funds to the COVID crisis, the damage to R&D by these situations have already occurred in the wake of this year’s crisis.

As shown in the following figure, out of the Southern European states, Portugal has a higher healthcare expenditure with Spain and then Italy following. Greece has a lower healthcare expenditure than the others. France, Germany, Sweden, Denmark and the UK lead in this expenditure once again. It is possible that Portugal is higher than the other Southern European states due to its increases in R&D higher education expenditure.
The healthcare expenditure is still lacking and still falls behind the “receiving” European Member States. Not only has the brain drain affected R&D development but it has also further exacerbated the economic status of these states. As such, this has permeated into the health sector which is directly tasked with handling pandemics such as this one. The figure below connects the health expenditure and how this has affected the number of doctors available to each Member States’ populations. In this figure, Greece has the highest number of physicians but only a small number of generalist medical practitioners. Portugal has less physicians than Greece but more generalist medical practitioners. Italy and Spain have similar numbers of physicians and generalist medical practitioners. Portugal has the leading number of generalist medical practitioners than all of the other Southern European states with about 300 general practitioners per 100,000 population. Portugal even surpasses Northern “receiving” Member States. Greece has the least number of general medical practitioners but highest number of all physicians, suprasing 600 physicians per 100,000 populations (Verelst et al., 2020). In the case of this pandemic, however, it is more beneficial to have higher levels of generalist medical practitioners as opposed to physicians more broadly that have varying specializations due to the dramatically high levels of patients.
Furthermore, the following graph views the number of deaths due to the latest pandemic related to the number of doctors along with the relative pressure on each Member States’ healthcare system:
As shown, Italy has the highest relative pressure on the healthcare system than all of the other Member States for both physicians and generalist medical practitioners. This pressure is then followed by Spain. Greece has the lowest pressure with small pressure from generalist medical practitioners but this is largely due to the low number of practitioners in the first place. Portugal has little pressure in general. While the high pressure on Italy and Spain is due to the number of cases in general that exceeded the number of cases elsewhere in Europe, Portugal and Greece seem better equipped when it comes to having a high ratio between doctors and potential patients.

**Conclusion:**

Spain and Italy seem to be falling further behind as a result of brain drain while Portugal and Greece seem to be improving in research and development. While Spain has had high foreign investment and has created initiatives to re-brain the country, its lack of change or increase in R&D sectors continue to perpetuate the gap between Southern and Northern states. Italy has also had initiatives but has only increased priorities in some sectors of R&D which also widen the gap between itself and other EU Member States. This gap is shown with the circumstances regarding a pandemic crisis that has affected all nations. While this crisis is only one factor that helps show this gap, it serves to demonstrate how that gap is harmful for nations and can only worsen if the trend continues. Greece is notoriously known for its economic situation after the financial crisis and for its high numbers of brain drain, but the number of R&D increases between 2007 and 2017, have increased and changed more than Spain and Italy. Portugal made a dramatic increase in R&D that specifically addresses underlying issues that facilitated brain drain and has therefore seen an improvement. All Southern European nations have had initiatives that attempt to rebrain their country and improve R&D but that alone has not been enough. Greece and, with further emphasis, Portugal, has also increased R&D sectors that attempt to address foundational economic issues of the brain drain has led to change for the better.

After analyzing the four Member States’ economic context along with “brain drain” patterns and its effects on the future of these nations, it is apparent that some are better at addressing underlying-socio economic issues. While all four nations have projects and initiatives for “re-brain,” action must be taken further and must extend into R&D sectors. To address foundational issues, Portugal has directly targeted increasing higher education sectors of R&D and is, therefore, better equipped in the healthcare system. The Prime Minister of Portugal has outlined commitments to address these issues further. While Spain and Italy have been disproportionately affected by the current crises due to large amounts of cases, it directly points to the fact that the aging population is growing more than the educated youth. As such, Spain and Italy need to address the fact that their population must be stable and that R&D is directly affected by the “brain drain” and the governments should address why people are leaving at the root.
References


