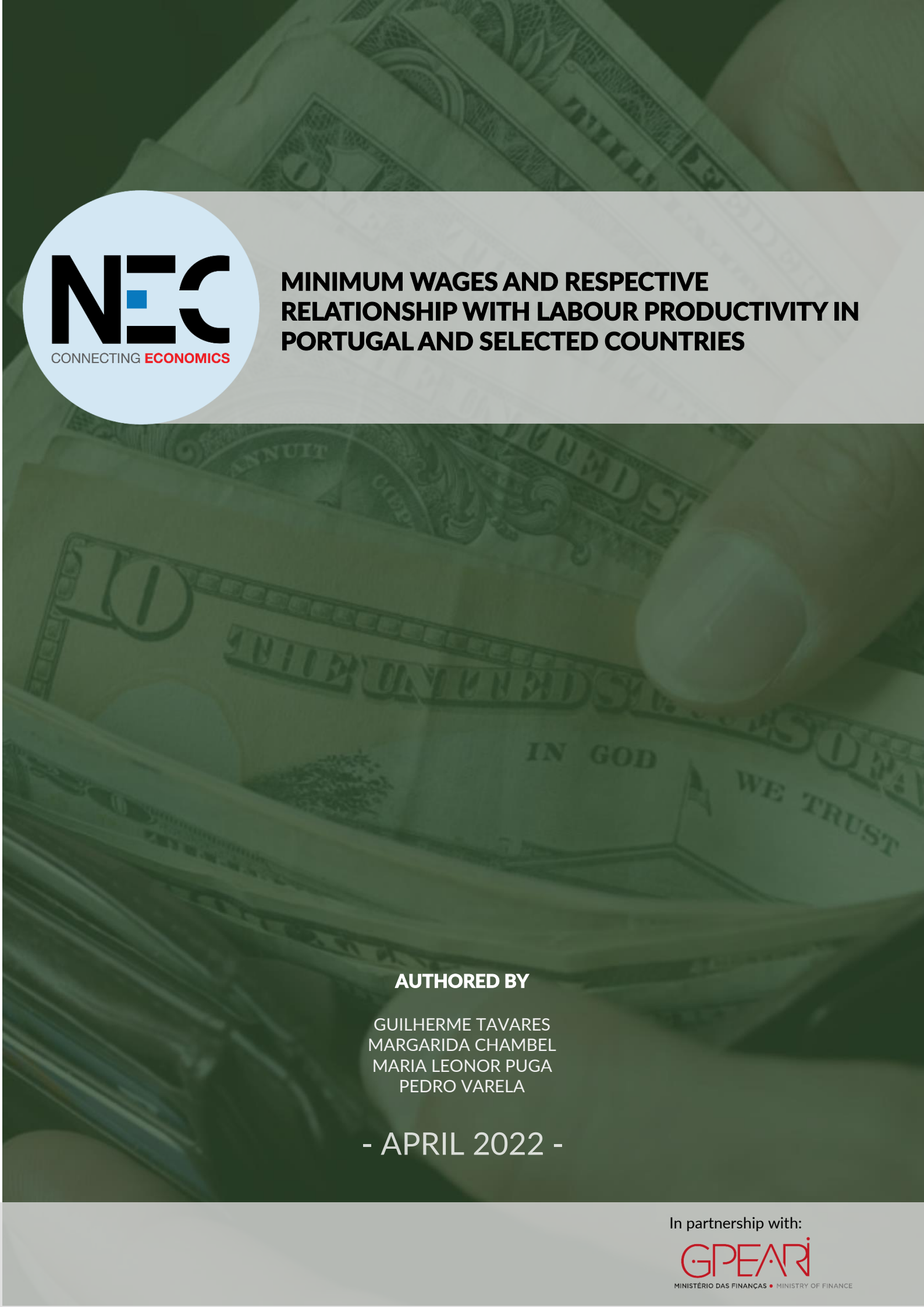

# MINIMUM WAGES AND RESPECTIVE RELATIONSHIP WITH LABOUR PRODUCTIVITY IN PORTUGAL AND SELECTED COUNTRIES


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# Minimum Wages and Respective Relationship with Labour Productivity in Portugal and Selected Countries

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## Disclosure statement

No potential conflict of interest was reported by the authors

# Minimum Wages and Respective Relationship with Labour Productivity in Portugal and Selected Countries


## Abstract

According to the Cabinet for Planning and Strategy for the Ministry of Labor, Solidarity and Social Security, Portugal has 33.9% of employees with ages equal to or over 30 and 23.7% of employees below the age of 25 earning the minimum wage. That's one of the main reasons that led us to the study of minimum wages.

We started to study how are minimum wages set and updated across different countries in Europe, finding that some countries have statutory minimum wages whilst others have not. Then we analyzed whether minimum wages at selected countries of the Euro Area were converging or diverging to the Euro Area average.

We analyzed who were the people most affected by the minimum wage, on which we found that in Portugal there is a higher percentage of women receiving the minimum wage compared to men; also referring to age groups in relative terms, the more affected are the younger ones and the older ones, above 55 years old; in absolute terms, the majority of the people receiving the minimum wage are in the 45 and 55 age group.

Finally, since there is literature supporting the fact that changes in the minimum wage and changes in labor productivity are correlated. We found no evidence of correlation between the real growth rate in labour productivity and the real growth rate in the minimum wage either for Portugal or the other countries in the study.



## Keywords

Minimum wages, Portugal, Euro Area, Labour Productivity

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## 1. Introduction

Probably you already heard that “Portugal is becoming a country of minimum wages”. In fact, according to the cabinet for planning and strategy for the ministry of labor, solidarity and social security, Portugal has 33.9% of employees with ages equal or over 30 and 23.7% of employees below the age of 25 earning the minimum wage and so it is interesting to study minimum wages in the Portuguese sphere and how Portugal compares with their counterparts from the Euro Area.

There are important factors that can be studied that we will cover in this paper so we can understand better minimum wage. Firstly, we will start to see how the minimum wages are distributed across sectors and education levels, how minimum wages are set and updated across different countries, and if the Portuguese minimum wage is converging to the average of the Euro Area countries. Finally, we will be studying the hypothesis that there is a relationship between the change in labour productivity and the change in the minimum wage in Portugal and across the selected countries in the Euro Area.

## 2. Literature Review

When we talk about minimum wages and how they are set we must talk on what measures can we base to increase them. Increases in labour productivity have been pointed out as being hand in hand with increases in minimum wages. “Does Minimum Wage Increase Labor Productivity? Evidence From Piece Rate Workers” by Hyejin Ku for IZA Institute of Labor Economics states that “(…) in response to the 42 cents or 6% increase in the minimum wage, worker productivity (i.e. output per hour) in the bottom 40th percentile of the worker fixed effects distribution increases by about 4.6% relative to that in higher percentiles” also that this is a sign that productivity increases driven by worker effort may help mitigate the higher costs of labor associated with the minimum wage.

The same conclusion is made in the paper “Will Minimum Wage Translate Into Higher Productivity? A Case Analysis of Manufacturing Firms In Malaysia”, written by Jia Xin Lee and Joyce Leu Fong Yuen for the International Journal of Education and Research where it states that workers in labor intensive firms will be affected by the minimum wage policy in the level of productivity since more people earn the minimum wage due to the fact that jobs in these industries need less-skilled workers. However, this may not happen to the same extent in industries where more skilled workers are required.

We can say that given the conclusions of these studies labour productivity growth may be a good indicator to increase the minimum wage since the impact of the higher costs for the firms is diminished by the increases in productivity and that's why we'll be testing this relationship between growth in both variables. The result expected is indeed that it may exist a positive correlation.

## 3. Minimum Wages

### 3.1 Monthly minimum wages and conversion rules

We started this study of minimum wages by analyzing how they're set. The data and information for this group of countries are given by Eurostat ("Monthly Minimum Wages – bi-annual data – country-specific information", as of January 1st, 2021). The minimum wage in countries that define it by government legislation ranges from 332€ (Bulgaria) to 2202€ (Luxembourg). Even between these countries, there are discrepancies in the way minimum wage is set: some countries set a minimum monthly value while in others, the value is given per hour, or even per week (differences in the type of rate), as well as differences in the method of fixing it, with the government as a common player.

When it comes to variation in the type of rate there are three main types: monthly, hourly, and weekly. The monthly is generally the standard, with hourly and weekly rates following a conversion rule to monthly rates. This rate is followed by most of the countries in Europe (Belgium, Bulgaria, Czechia, Estonia, Greece, Spain, Croatia, Latvia, Lithuania, Luxembourg, Hungary, The Netherlands, Poland, Portugal, Romania, Slovenia, and Slovakia). Portugal, Spain, and Greece pay the minimum wage in 14 months, so a conversion rule is adopted (Rate x 14mth / 12 mth). An hourly rate (similar to the one adopted in the United States of America) is adopted by three European countries: Germany, Ireland, France. For them to be comparable to the other countries, a conversion rule is adopted, generally following this formula: Hourly Rate x Weekly Working Hours x 4 (weeks). The number of weekly working hours is different across the three countries. Germany assumes 39.1, like Ireland's 39, while in France the number is 35. Malta's case is singular in the European Union, being the only one to adopt the weekly rate. It compares to the other countries by the following rule: Weekly Rate x 52 (weeks) / 12 (months).

## 3.2 How are minimum wages fixed and updated?

When it comes to the method of fixing and updating minimum wage laws, the most common method is a negotiation between the Government and social partners (generally trade unions which represent employees and employers), in which the Government issues rulings on the matter based on the recommendations emitted by the social partners. The countries that follow that method (with or without small nuances) include Bulgaria, Czechia, Estonia, Latvia, Lithuania, Spain, Hungary, Poland, Portugal, Romania, and Slovakia. Other countries decide minimum wage resolutions exclusively within governmental solutions, including Government organizations. These include Germany (through a Minimum Wage Commission), Ireland (Low Pay Commission and Ministerial Order), France, Croatia, Luxembourg, Malta, The Netherlands (updated twice a year, in January and July), Slovenia. There is another solution used by some countries, with the particularity that the final decision is the outcome of negotiations between social partners, with the Government only carrying the duty to give this outcome legal force, through the issuance of a decree. It is the case of Belgium and Greece (in those cases, the negotiations end up in collective agreements). It is also worth mentioning that in some countries, the updating of the minimum wage rate is attached to numerical variables, such as an automatic indexation (to Consumer Price Indexes and/or evolution of wages), which is a very popular method used in Belgium, France, Luxembourg, Malta, while other similar methods rely on governmental forecasts, mostly on inflation. While inflation and price indexes are the most considered variables by governments and/or social partners when updating minimum wage rates, other variables include wage increases, unemployment level, economic development, employee needs, and cost of living. Moreover, we would like to point out the relationship between minimum wage and productivity levels, which is addressed further in this project work.

## 3.3 The Case of Austria, Cyprus, Finland, and Italy

As stated earlier, some countries do not adopt this perspective on minimum wage, not adopting national legislation regulating the minimum wage rate. To study these cases, we are going to analyze the cases of Austria, Cyprus, Finland, and Italy, which are countries without a statutory minimum wage that use the Euro, €, as national currency.

Austria, Finland, and Italy implemented their minimum wages via collective agreements whilst Cyprus has statutory minimum wages for different groups of workers in different occupations or sectors.

The numbers presented in our study for the minimum wages of these countries are based on the reports by Eurofound "Industrial relations – Minimum wages in 2020: Annual review" and "Industrial relations and social dialogue – Minimum wages in 2021: Annual review".

The data shows us that the countries in analysis that implement their minimum wages via collective agreements have more or less of those agreements established for different sectors.

For instance, in the case of Finland "As the Finnish collective bargaining system is traditionally strongly centralized, the national level has been the most important in setting the framework for changes in wages and working time", there is only one agreement covering the whole sector of domestic cleaners and helpers in offices, hotels and other establishments. "The Finnish collective bargaining system is characterized by a principle of general applicability, which has been in force since the 1970s. (…) employers that are not involved in collective bargaining or are not signatories to a collective agreement must comply with the nation-wide sectoral level collective agreement considered representative in their sector." Due to general applicability, the level of collective wage bargaining coverage is substantially high, the coverage rate of all levels being around 89%, according to the latest available data (Ahtiainen, 2019)."

For Austria, some sectors have only one to two collective agreements whilst others have as much as ten. In general, collective wage agreements are negotiated- almost without exception- at a multi-employer sectoral level. The Austrian labor law gives the right of collective bargaining to the parties above company level with very few exceptions. Currently, no employee in Austria is covered by a national general pat agreement.

In the Italian case, there are multiple agreements for each sector going from 2 to as much as 60 agreements per sector. Ministero del Lavoro e delle Politiche Sociali (the Italian Ministry of Labour and Social Policies) states that "all employers, even those who are not involved with the trade unions, must be sure that their employees receive a wage proportionate and adequate to the quality and quantity of the activities performed, as provided for in article 36 of the Constitution.", that is a wage that has been "(…)established by the trade unions in the National collective labour agreement for the employer's economic category."

The table below shows a selected group of sectors and the number of collective agreements for those sectors in the respective countries we analyzed above.

| Approximate number of collective agreements related to the selected jobs | | | |
|---|---|---|---|
| Job/ Country | Austria | Finland | Italy |
| Domestic cleaners | 1 | 1 | 20 |
| Cleaners and helpers in offices, hotels and other establishments | 2 | 1 | 20 |
| Shop sales assistants | 2 | n/a | 30 |
| Waiters and bartenders | 1 | n/a | 2 |
| Cooks | 1 | n/a | 3 |
| Home-based personal care workers | ~5-10 | n/a | 6 |
| Childcare workers | ~10 | n/a | 40 |
| Agricultural, forestry and fishery labourers, standard employment | ~13 | n/a | 60 |
| Agriculturar, forestry and fishery labourers, seasonal employment | ~2 | n/a | 60 |
| Couriers, newspaper or parcel delivers | ~5-10 | n/a | 20 |

https://distaccoue.lavoro.gov.it/en-gb/Thematic-Areas/Thematic-area-detail/id/3/National-Collective-agreements

https://distaccoue.lavoro.gov.it/AnteprimaPDF.aspx?id=238&lang=it-it

https://www.eurofound.europa.eu/country/finland#collective-bargaining

https://www.eurofound.europa.eu/country/austria#collective-bargaining

**Table 1**: Approximate number of collective agreements related to the selected jobs

For the countries analyzed above, we can observe the minimum wages settled in the agreements for the different sectors. We can observe that the newspaper delivers and couriers within the communications and logistics have lowest minimum wage settled in Finland receiving 8.74€ per hour (1,438€) and 8.99€ per hour in the capital area is compensated also by the number of items they deliver, also other forms of compensation include irregular working hours and working on weekends. Around 16 000 workers are covered by this collective agreement.

In Austria the collective agreement that has the minimum wage settled is the one for standard agricultural workers. This agreement is applied in the State of Burgenland and has wage settled for laborers and support staff of 1.242€, plus holiday bonuses. This agreement covers around 3,000 to 4,000 workers.

In Italy the lowest paid workers among the monitored job groups are the domestic cleaners, applying to non-cohabitant domestic workers with fewer than 12 months and the value settled is 689€.

| Collective agreement related to: | Austria | Finland | Italy |
|---|---|---|---|
| Domestic cleaners | 1,951€ | 1.790€ | 689€ |
| Professional Cleaners | 1.815€ | 1.790€ | 1.316€ |
| Sales assistants | 1.806€ | 1.835€ | 1.760€ |
| Waiters and bertenders | 1.797€ | 1.700€ | 1.648€ |
| Cooks | 1.797€ | 1.700€ | 1.648€ |
| Personal careers | 1.896€ | 2.025€ | 940€ |
| Childminders | 2.089€ | 1.854€ | 1.556€ |
| Standard agricultural | 1.449€ | 1.484€ | 1.020€ |
| Seasonal agricultural | 1.628€ | 1.484€ | 1.020€ |
| Deliverers | 1.682€ | 1.438€ | 1.684€ |
| Average of 3 lowest rates(unweighted) | 1.586€ | 1.469€ | 883€ |

Sources:https://distaccoue.lavoro.gov.it/en-gb/Thematic-Areas/Thematic-area-detail/id/3/National-Collective-agreements;https://distaccoue.lavoro.gov.it/AnteprimaPDF.aspx?id=238&lang=it-it ;https://www.eurofound.europa.eu/country/finland#collective-bargaining; https://www.eurofound.europa.eu/country/austria#collective-bargaining

**Table 2**: Minimum wage across selected jobs for Austria, Finland and Italy and the unweighted average of 3 lowest rates.

In Cyprus there is no basic statutory minimum wage. Nonetheless, the government introduces statutory rates for occupations with otherwise very low pay. There are

statutory rates for seven occupations more thirteen statutory rates for different occupations in the hospitality sector. The lowest of these rates is for the cleaners of offices and corporate premises which earn a minimum of 4.55€ per hour, private guards (4.90€ per hour), and then shop assistants, general office clerks, childcare assistants in nursery and kindergartens, teacher aides, healthcare assistants, cleaners and patient caretakers in clinics and hospitals, earning a minimum of 870€ per month.

## 3.4 Evolution of the convergence of the Portuguese and the sample of countries' minimum wage to Euro Area average

For our analysis it is also crucial to dive into the recent history of minimum wages in the Euro Area, so we can compare the convergence of several countries, the most important of them being Portugal, to the average of this group of countries. The relevant time frame for our analysis are the years between 2011 and 2020. We focused on the following countries in the Euro Area for our sample: Belgium, France, Greece, Ireland, Luxembourg, Malta, Netherlands, Portugal, Slovakia, Slovenia, Spain (notice that we left out of this part of these convergence study countries with no statutory minimum wage plus Germany, which only instituted statutory minimum wage in 2015. Leaving these countries out of this sample will not harm our conclusions since this sample includes countries with similar economic status). Moreover, to analyze the convergence, we will divide the minimum wage in each country by the Euro Area average for each year. For values over 1, a decrease in the value will mean more convergence and an increase will mean divergence. For values under 1, the opposite happens: a decrease will mean a divergence, whereas an increase will mean convergence. We will also analyze the trendline of the calculated proportion. Following the previously explained line of thought, for values over 1, convergence will happen when the trendline is downward sloping whereas, for values over 0, convergence will happen when the trendline is upward sloping.

After performing the convergence analysis, we can distinguish between three different types of countries according to the evolution of their respective convergences: the first group represents countries with a minimum wage higher than the Euro Area average in 2011, the proportion of which decreased until 2020; the second includes countries with a minimum wage lower than the Euro Area average in 2011, the proportion of which increased until 2020; and the third group relates to countries with a minimum wage lower than the Euro Area average in 2011, the proportion of which decreased until 2020.

**The first group – countries with the minimum wage above the Euro Area average which converged to it.**

The first group, as stated earlier, includes countries in which minimum wage in 2011 was higher than the Euro Area average for which the proportion of minimum wage over Euro Area average decreased. It is worth noticing that often these countries are the ones with higher GDP per capita, which might help to explain why minimum wage rates in these countries are above the Euro Area average.

The countries included in this group will be presented in the image below:

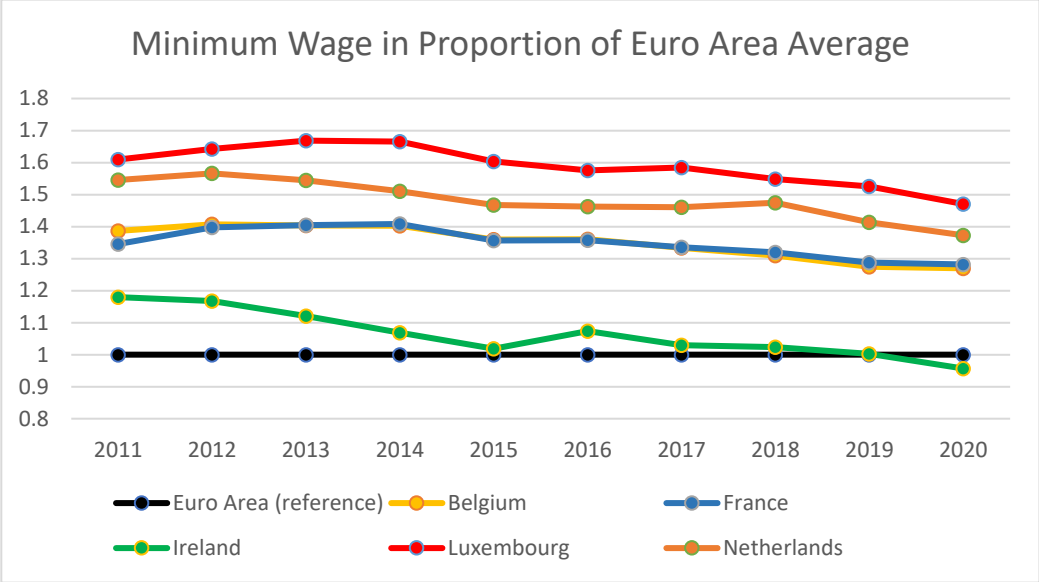



**Fig. 1:** Proportion - Minimum wage/Euro Area average of Netherlands, Luxembourg, Ireland, France, and Belgium

From these graphs we can induce that, as the proportion of the minimum wage in these countries compared to the Euro Area average decreased, meaning that the trendline of the proportion is negatively sloped, increases in the minimum wage of these countries were smaller than the average increase in the community.

It is worth noticing that in the case of Ireland, the decrease led to a proportion in 2020 slightly lower than 1.

**The second and third groups – respectively, countries with the minimum wage below the Euro Area average that converged to it and countries with the minimum wage below the Euro Area average which diverged from it.**

The second and third groups of countries are analyzed in the same topic because both groups are composed of countries whose proportion of minimum wage compared to the

Euro Area average was lower than 1 in 2011 and often belong to the group of countries with lower GDP capita in the European Union, which might help to explain why their minimum wages are generally lower than the Euro Area average.

In the second group, said proportion increased. From there we can conclude that increases in minimum wage rates in these countries are higher than the average increase in the community. We can notice below that Portugal belongs to said group.

The countries in the second group are represented in the graphs below:

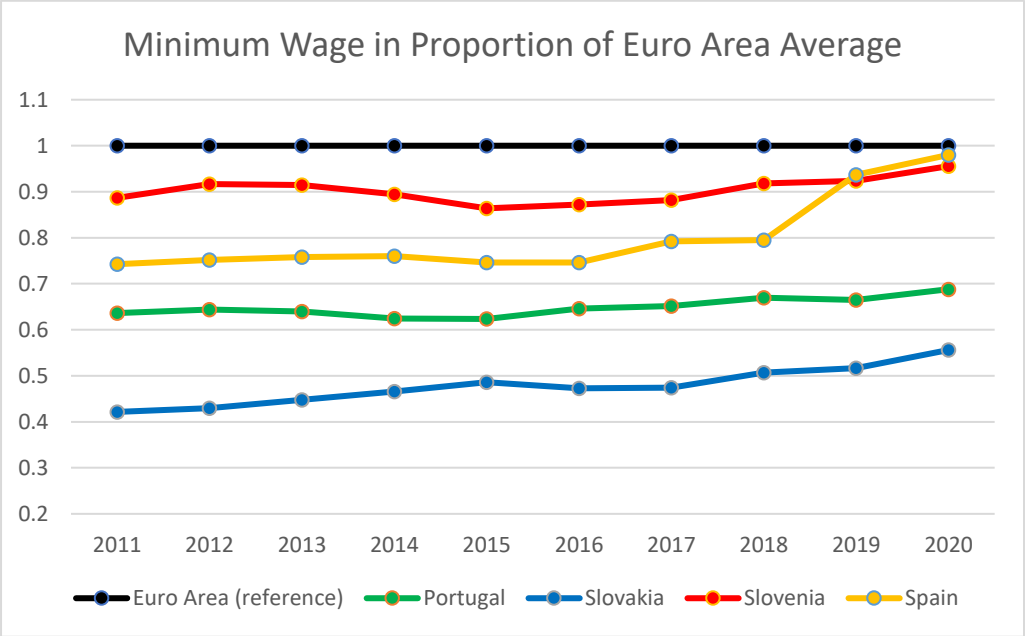



**Fig. 2**: Proportion: Minimum wage/Euro Area average: Portugal, Slovakia, Slovenia, Spain

It is worth noticing that in Spain the increase in minimum wage was such that the proportion of minimum wage over Euro Area average got on par with the latter, and maintaining the trendline, it might surpass the average.

The third group also contains countries with lower minimum wage than the Euro Area average, but the minimum wage of which in the proportion of the latter, decreased over the last 10 years. This means that the increases in the minimum wage rates of those countries were lower than the average increase in the monetary space.

This group only includes two countries: Greece and Malta, as we can see in the graph below.

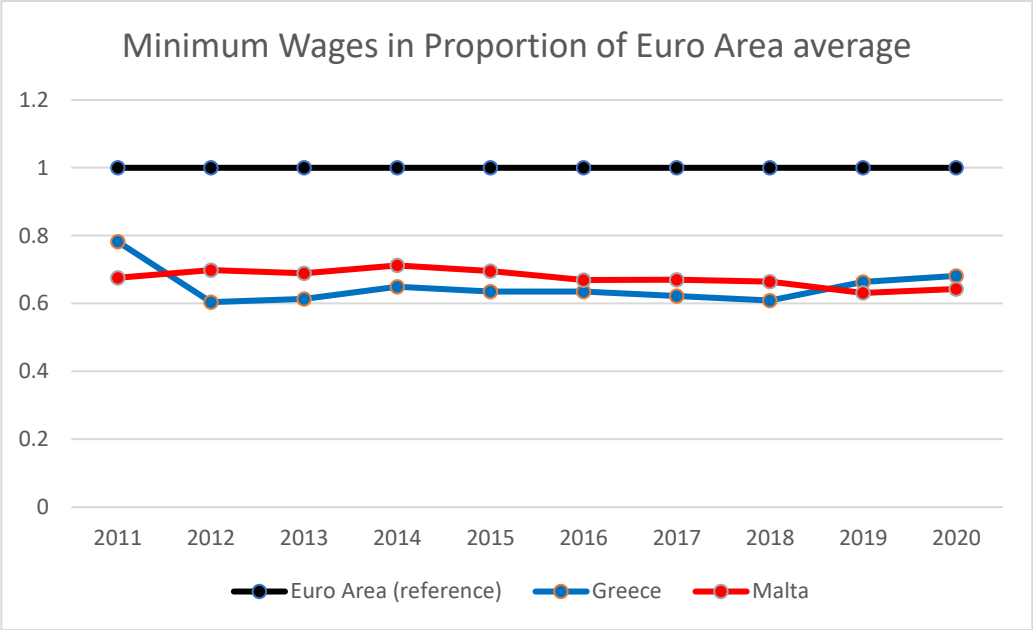



**Fig. 3:** Proportion: Minimum wage/Euro Area average: Greece, Malta

## 3.5 Minimum wage convergence and the Portuguese case

**Possible conclusions on minimum wage convergence and the Portuguese case:**

We can conclude that there is enough evidence of a trend in minimum wage rate convergence: minimum wage rates in Euro Area countries tend to converge to the Euro Area average. In the study that we made, countries with a proportion of minimum wage rate to Euro Area average higher than 1 saw that same proportion decrease to values closer to 1 from 2010 to 2011, and most of the countries with proportions of minimum wage rate to Euro Area average lower than 1 have witnessed an increase in that proportion to values closer to 1 in the same time-span, with the exception of Greece and Malta.

Portugal was no exception to that rule. Being a country with a minimum wage lower than the average between countries that adopt the same currency, Portugal followed the trend of the group of countries of the same group. The proportion followed a negative trend in the years immediately after 2011, after the economic crisis (from 0,63 in 2011 to 0,62 in 2015) following a positive trend afterward (from 0,62 in 2015 to 0,68). We can conclude that despite being a very small increase in the proportion, there is a convergence of the Portuguese minimum wage to the Euro Area average.

## 3.6 Minimum wage according to gender, age, and segment

Now that we know how minimum wages are set and updated across the European Union and which of the Euro Area countries are converging in terms of minimum wage to the European Union average and which are not, we'll study who is affected by these minimum wages, making this distribution by gender, age, and segment.

According to Pritadrajati, the minimum wage has one outstanding goal, to improve the living standards of the poor and to reduce inequality. It is difficult to analyse the implication of minimum wage in education since two opposite forces go against one another, i.e. substitution and income effects. The first one states that increasing the value of minimum wage, or just putting one in place, will reduce the skill premium of the education of a child, which ultimately will reduce the incentives to send children to school. The second one points out that if investment in education goes up due to a higher level of income in households, there is a higher likelihood that children will be more educated and receive a higher wage in the future (Pritadrajati, 2020).

| | | Julho 2021 | | Julho 2020 | |
|---|---|---|---|---|---|
| | | Peso (%) | Distribuição (%) | Peso (%) | Distribuição (%) |
| Sexo | **Total** | **25,8** | **100,0** | **24,7** | **100,0** |
| | Mulher | 29,3 | 51,8 | 27,6 | 51,2 |
| | Homem | 22,9 | 48,2 | 22,3 | 48,8 |
| | Ignorado | 53,3 | 0,0 | 61,9 | 0,0 |
| Grupo Etário | **Total** | **25,8** | **100,0** | **24,7** | **100,0** |
| | < 25 anos | 40,3 | 8,8 | 38,1 | 8,8 |
| | 25 a 34 anos | 25,2 | 21,4 | 25,5 | 22,7 |
| | 35 a 44 anos | 22,3 | 24,0 | 21,6 | 25,2 |
| | 45 a 54 anos | 25,0 | 26,2 | 23,8 | 25,6 |
| | 55 a 64 anos | 29,1 | 17,5 | 26,1 | 15,7 |
| | 65 e + anos | 27,2 | 2,2 | 24,8 | 2,0 |
| | Ignorado | - | 0,0 | - | 0,0 |
| Habilitações | **Total** | **25,8** | **100,0** | **24,7** | **100,0** |
| | Até ao básico - 3º ciclo | 33,3 | 47,5 | 33,6 | 53,1 |
| | Secundário e pós-secundário | 24,1 | 24,4 | 24,6 | 26,9 |
| | Superior | 6,6 | 5,1 | 7,8 | 6,4 |
| | Ignorado | 48,2 | 0,2 | 51,5 | 0,2 |
| | Não definido | 34,8 | 22,8 | 24,8 | 13,4 |

Source: https://www.gpeari.gov.pt/documents/35086/214308/Antonieta-Ministro_RMMG-GEP_Retribuicao-M%C3%ADnima-Mensal-Garantida_Relatorio.pdf/4f6f423f-4cf0-478b-c39d-c5d41b156aee?t=1638793755164

**Table 3:** Distribution of employed workers earning minimum wage by gender, age group, and education (we took the graph from the report "Retribuição Mínima Mensal Garantida - Novembro 2021" from the Cabinet of Strategy and Planning for the Ministry for Labour, Solidarity and Social Security).

In Portugal, it is possible to characterize the RMMG's in two different aspects, gender, and age as well as segment, analysing the workers and the employers' characteristics. The analysis shows that the prevalence of the RMMG is more usual among women in comparison to men. In the graph provided by the GPEARI, it is possible to see the weight

and the distribution of the minimum wage in Portugal in two different years in the same month, July, of 2020 and 2021. It is possible to conclude that 25,8% of the population received the minimum wage six months ago. This value has increased since 2020. One explanation to this is the period of uncertain that the covid-19 pandemic is causing in the world economies and therefore in employment. With economies shrinking, reaching historically negative growth levels, national companies could not keep up, which translated this problem into the national wages. It is also possible to see that besides both are growing, minimum wage tends to ahead act on women than on men. Despite the gap between the same has been decreasing with the empowerment of women, there is still a higher percentage of women receiving the minimum wage in Portugal. Regarding the aging level, it is possible to see that younger individuals are the ones who are the most affected by the minimum wages, almost 40% of the receives are below 25 years old. The pattern shows a U-shaped pattern in terms of weight. However it shows an U-shaped inverted pattern in terms of distribution. That is, regarding relative terms, the more affected people are the younger ones and the older ones, above 55. Regarding absolute terms, most of the people receiving the minimum wages are in the 45 to 55. Finally, there is the educational level. As expected, people with lower levels of education are the ones more affected and the ones who earned more the minimum wage. The trend is a declining one, that is, with the increase in the level of education, the chance to earn a minimum wage gets lower, especially in the ones who have a bachelor's degree.

| | | Julho 2021 | | Julho 2020 | |
|---|---|---|---|---|---|
| | | Peso (%) | Distribuição (%) | Peso (%) | Distribuição (%) |
| CAE Rev. 3 do estabelecimento [2] | **Total** | **25,8** | **100,0** | **24,7** | **100,0** |
| | A Agr., pr. animal, caça, flor. pesca | 44,0 | 3,4 | 41,5 | 3,4 |
| | B Indústrias extrativas | 12,7 | 0,1 | 13,7 | 0,1 |
| | C Indústrias transformadoras | 22,9 | 16,1 | 26,0 | 19,7 |
| | D Eletr., gás, áq. quente/fria e ar frio | 2,3 | 0,0 | 2,6 | 0,0 |
| | E Capt., trat. e d. água; san., resíd. | 28,5 | 0,9 | 17,5 | 0,5 |
| | F Construção | 34,6 | 9,5 | 34,1 | 9,8 |
| | G Com. grosso e ret.; r.v.aut./moto. | 27,0 | 18,3 | 27,2 | 19,3 |
| | H Transportes e armazenagem | 15,7 | 3,0 | 17,7 | 3,5 |
| | I Alojamento, restauração e sim. | 45,3 | 11,8 | 50,0 | 14,1 |
| | J Ativ. Inform. e de comunicação | 6,8 | 1,1 | 7,1 | 1,1 |
| | K Ativ. financeiras e de seguros | 3,8 | 0,4 | 3,8 | 0,4 |
| | L Atividades imobiliárias | 35,2 | 1,8 | 36,6 | 1,8 |
| | M Ativ. consultoria, cient. téc. e sim. | 13,3 | 2,8 | 14,9 | 3,1 |
| | N Ativ. adm. e serviços de apoio | 21,6 | 4,9 | 22,4 | 5,3 |
| | O Adm. Púb. e defesa; seg. social | 34,0 | 6,7 | 2,0 | 0,4 |
| | P Educação | 18,0 | 2,6 | 10,9 | 1,6 |
| | Q Ativ. saúde humana e apoio social | 28,9 | 10,8 | 23,2 | 8,9 |
| | R Ativ. artist., espet., desp. e recr. | 26,4 | 1,1 | 30,4 | 1,3 |
| | S Outras atividades de serviços | 30,7 | 2,4 | 32,5 | 2,7 |
| | T Ativ. famílias empreg. pes. domést. | 45,4 | 0,3 | 45,6 | 0,3 |
| | U Ativ. org. int. e o. inst. extra-territ. | 0,5 | 0,0 | 0,3 | 0,0 |
| | CAE Rev. 2 não inequívocos | 21,4 | 0,4 | 20,9 | 0,5 |
| | Outros (não existentes) | 10,6 | 0,1 | 11,0 | 0,2 |
| | Ignorada | 54,6 | 1,7 | 53,2 | 1,8 |
| Escalão de dimensão da empresa [1] | **Total** | **25,8** | **100,0** | **24,7** | **100,0** |
| | 0-4 pessoas | 47,4 | 30,2 | 48,2 | 32,1 |
| | 5-9 pessoas | 35,6 | 15,0 | 36,4 | 16,0 |
| | 10-19 pessoas | 29,1 | 11,8 | 30,6 | 13,1 |
| | 20-49 pessoas | 23,6 | 12,5 | 24,4 | 13,7 |
| | 50-99 pessoas | 20,6 | 7,9 | 19,4 | 8,0 |
| | 100-149 pessoas | 19,8 | 4,2 | 17,8 | 3,8 |
| | 150-199 pessoas | 20,1 | 2,5 | 17,4 | 2,3 |
| | 200-249 pessoas | 16,8 | 1,6 | 13,7 | 1,3 |
| | 250-499 pessoas | 16,3 | 4,1 | 14,2 | 3,9 |
| | 500-999 pessoas | 16,0 | 3,6 | 8,9 | 2,0 |
| | 1 000 e + pessoas | 11,3 | 6,7 | 6,3 | 3,7 |
| NUTS II do estabelecimento | **Total** | **25,8** | **100,0** | **24,7** | **100,0** |
| | 11 Norte | 29,1 | 38,9 | 28,7 | 40,1 |
| | 16 Centro | 27,0 | 20,7 | 25,4 | 20,3 |
| | 17 Área Metropolitana de Lisboa | 20,3 | 27,4 | 19,4 | 27,6 |
| | 18 Alentejo | 31,7 | 7,4 | 27,0 | 6,5 |
| | 15 Algarve | 30,8 | 5,5 | 29,9 | 5,5 |
| | Ignorada | 15,4 | 0,0 | 16,9 | 0,0 |

Source:https://www.gpeari.gov.pt/documents/35086/214308/Antonieta-Ministro_RMMG-GEP_Retribuicao-M%C3%ADnima-Mensal-Garantida_Relatorio.pdf/4f6f423f-4cf0-478b-c39d-c5d41b156aee?t=1638793755164

**Table 4:** Distribution of employed workers earning minimum wage in Portugal by sector, firm dimension, and region (we took the graph from the report "Retribuição Mínima Mensal Garantida - Novembro 2021" from the Cabinet of Strategy and Planning for the Ministry for Labour, Solidarity, and Social Security).

Now if we analyse from an activity perspective, the higher incidence of minimum wages is in the sectors that do not demand higher skilled labour to perform the jobs, as is the case in agriculture, restaurant, and construction sectors. It is also possible to conclude that as the company gets bigger the number of people that earn the minimum wage decreases. This is probably the result of higher output and a higher propensity to pay higher wages.

So, regarding the question of how minimum wages are defined or what are the components influence it, there are several topics that need to be put in question. Although correlation does not imply causality, it is secure to say that in a small company in the agricultural or restaurant sector, the employees will earn wages close or equal to the minimum one, especially if they are young. This is the result of lower education and probably lower experience, in the case of young employers.

## 4. Is the Real Growth Rate of the Minimum Wage correlated to the Real Growth Rate in Labor Productivity?

Finally, we'll study the hypothesis that the Real Growth Rate of the Minimum Wage is correlated to the Real Growth Rate in Labour Productivity since as we saw in the literature review there are papers, such as "Does Minimum Wage Increase Labor Productivity? Evidence From Piece Rate Workers" by Hyejin Ku for IZA Institute of Labor Economics and "Will Minimum Wage Translate Into Higher Productivity? A Case Analysis Of Manufacturing Firms In Malaysia", written by Jia Xin Lee and Joyce Leu Fong Yuen for the International Journal of Education and Research who found that there might be evidences of correlation between increases in the minimum wage and increases in labour productivity.

To do that, we extracted data for the percentage change from the previous period for the Real Labour Productivity per hour worked, we also extracted the values for the statutory minimum wages for the countries in the test (we tested countries in the Euro Area who had the adopted the Euro as their national currency in 2008 or before and have statutory minimum wage) and computed the nominal growths rates for the minimum wages. After

that, using the data for the Harmonised Index of Consumer Prices, we deflated minimum wages and computed the real growth rate for the statutory minimum wages.
The Harmonized Index of Consumer Prices is used in the Euro Area to measure the change over time in the prices of consumer goods and services purchased by Euro Area households. All the countries in the European Union follow the same methodology when reaching the values for this Index that's why it's harmonized.
GDP per hour worked measures Labour Productivity as it is computed as the total value of all goods and services produced, divided by the total hours of work of all workers engaged in production in each country and in each period (this case yearly). This shows how efficient labour input is when combined with other factors of production. As it is stated in the OECD's website, we have to take into consideration that Labour Productivity only partially reflects the productivity of labour in terms of the personal capacities of workers or the intensity of their effort, since the relationship between output produced (GDP) and the labour input (total hours of work of all workers engaged in production) depends heavily on the presence of other inputs of production, such as capital (machinery, technology, factories) and also organizational, technical inputs and economies of scale. We are using the Real Labour Productivity per hour worked meaning the changes in Labour productivity are real changes in the amount produced since inflation is not accounted for in this variable.

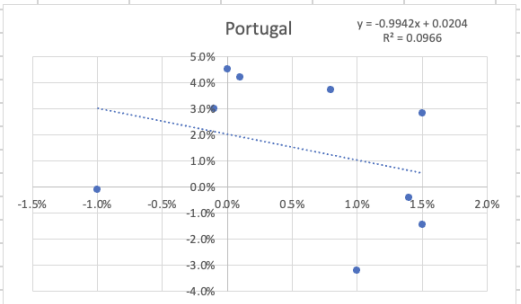
To analyse the correlation between the two variables we plotted a simple regression for the selected countries: Belgium, Germany, Ireland, Greece, Spain, France, Luxembourg, Malta, Netherlands, Portugal, Slovenia, Slovakia; for the years 2011 to 2019. We left out the year 2020 since for obvious reasons, due to Covid-19, it was an atypical year and it would disrupt the regression.

In this regression, the independent variable (Y) is the Real Growth Rate for the Minimum Wage, and the dependent variable (X) is the Real Growth Rate for the GDP per Hour Worked. This is to test if real changes in statutory minimum wages are correlated with changes in the real labour productivity.

$$\text{Real Growth Rate Minimum Wages} = \beta 0 + \beta 1 * \text{Real Growth Rate GDP per Hour Worked} + \varepsilon$$

In the Portuguese case, there was no evidence that a simple correlation could be made between real increases in labour productivity and real increases in the minimum wage. By

looking at the regression analysis, we found that the coefficient of determination, which measures how many of the Y values are predicted by the equation, has a value of 0.096 which is very low, also the multiple R (the same as the coefficient of correlation) has a value of 0.31 meaning only 31% of the Ys are correlated to the Xs, we have also to highlight that even this value has no relevance since the regression line plotted by the excel has a negative slope and it does not make sense that increases in minimum wages are explained by decreases in labour productivity. Down in the table in the line for X Variable 1 we can take some more conclusions. First, there is the p-value, which tells us the certainty with which the variable X impacts positively or negatively the independent variable. For example, if the p-value is smaller than 0.05 we have that there's a bigger probability than 95% (1-0.05= 0.95) that the X variable impacts in a certain direction the Y variable. In this case we have a p-value of 0.4156 which gives no statistical relevance of the impact of the dependent variable on the independent variable for high probability confidence intervals. We can further prove this by looking at the lower 95% and upper 95% in the same line which by containing the zero in the interval [-3.711; 1.723] show that for the 95% confidence interval the variable X doesn't impact the variable Y either positively or negatively but randomly.




SUMMARY OUTPUT

| *Regression Statistics* | |
|---|---|
| Multiple R | 0.3108076 |
| R Square | 0.0966013 |
| Adjusted R S | -0.032456 |
| Standard Er | 0.0284175 |
| Observation | 9 |

ANOVA

| | *df* | *SS* | *MS* | *F* | *ignificance F* |
|---|---|---|---|---|---|
| Regression | 1 | 0.0006045 | 0.0006045 | 0.7485171 | 0.4156091 |
| Residual | 7 | 0.0056529 | 0.0008076 | | |
| Total | 8 | 0.0062573 | | | |

| | *Coefficients* | *tandard Erro* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|---|
| Intercept | 0.0204107 | 0.0115676 | 1.7644668 | 0.1210104 | -0.006942 | 0.0477637 |
| X Variable 1 | -0.994188 | 1.1491256 | -0.865169 | 0.4156091 | -3.711438 | 1.7230626 |

**Fig. 4**: Regression analysis statistics, Portugal.

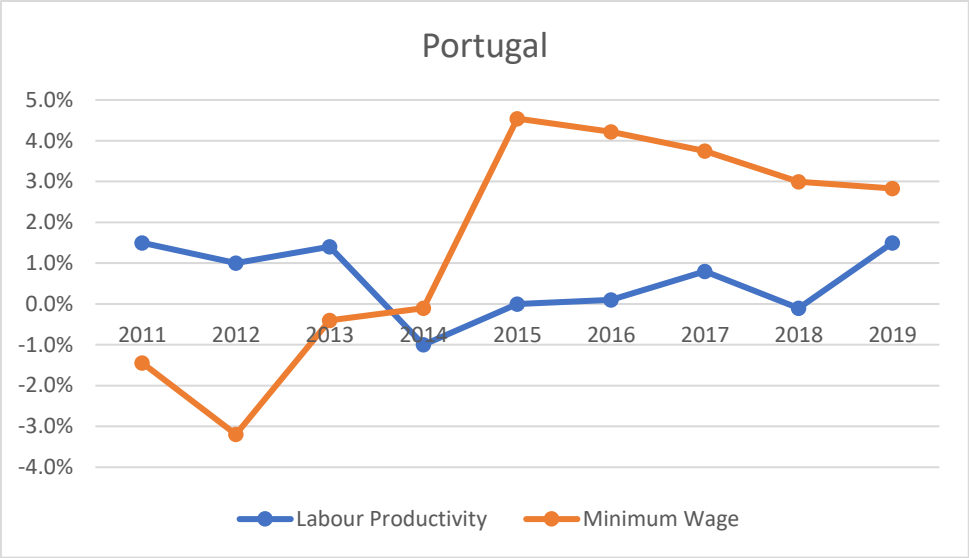



**Fig. 5**: Real Growth in Minimum wages and Labour Productivity in Portugal

As we plot the growth rate for labour productivity and the minimum wage for Portugal for the years in the study, we can easily see why the regression curve gives us such low values for R square and for the other measures of correlation. Since 2014, the growth of the minimum wage has constantly been larger than the growth for the labour productivity which before that, the opposite took place. From 2011 to 2013 a decrease in the minimum wage was happening together with productivity increases, which may be due to the austerity measures that followed the financial crisis in Portugal starting in 2010.

As you can check in the appendix there was not a single country in this study where we could tell there is for sure a correlation between increases in labour productivity and increases in the minimum wage.

## 5. Conclusions

From our study, we were able to derive a few conclusions about the way minimum wage is defined across the European Union, the evolution of the convergence of minimum wage across the Euro Area countries towards their average, the distribution of workers earning the minimum wage by gender, age, and sector and, most importantly, about the correlation between minimum wage and productivity and inflation increases.

First, we found out that countries in the European Union might be divided between countries with statutory minimum wage and countries without a statutory minimum wage and amoung those with statutory minimum wage, there is a possible division by type of

rate (monthly, weekly, and hourly) and how statutes are defined (sole government decision, government and social partners negotiation and agreements by social partners).

Then, we concluded that there is a general trend of convergence of the minimum wages in the Euro Area countries in the sample to the Euro Area average, between 2011 and 2020: in our sample, only two countries escaped that rule (Greece and Malta). In Portugal, the proportion of minimum wage compared to the Euro Area average went up by 6 percentage points from 62% to 68% in the relevant period.

Regarding the distribution of the minimum wage, in Portugal, we found out that as of July 2021, 25,8% of workers received the minimum wage. Of those women are more likely to earn the minimum wage than men. When analysing statistics by age, on relative terms, younger workers, and workers above 55 years old are the most affected ones. Unsurprisingly, workers in jobs that required less skilled labour are the ones that earned minimum wage more often (agriculture, restaurants, construction, as examples), and that workers with lower levels of education are most likely to earn the minimum wage. There is also evidence that suggests that the bigger the company the worker is in, the lower the probability of earning minimum wage.

Regarding the correlation study, the hypothesis test we made does not give us enough statistical evidence to ensure that there is a correlation between labour productivity increases and minimum wage increases either in Portugal or another country in the study.

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## 7. Appendix

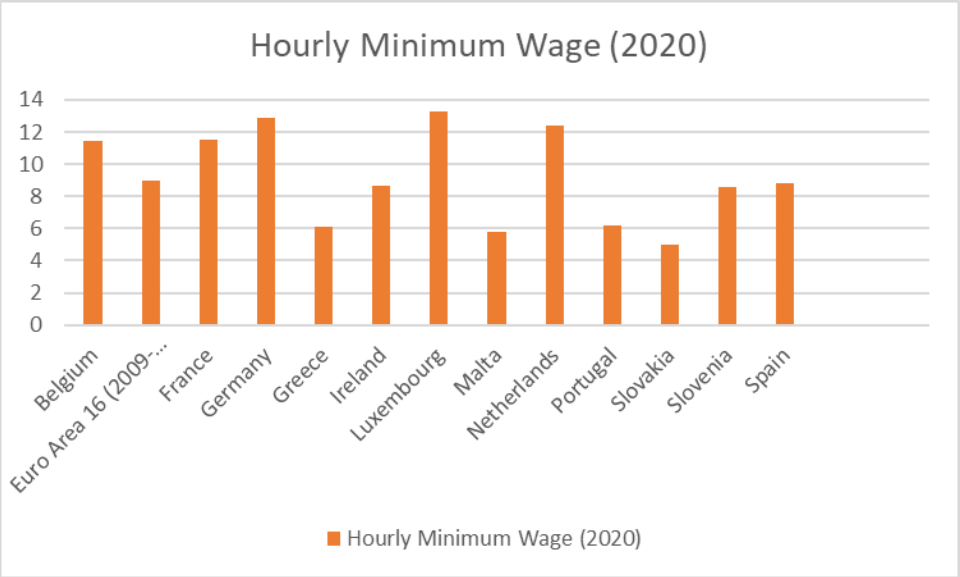



**Fig.6**: Hourly Minimum Wage (2020)

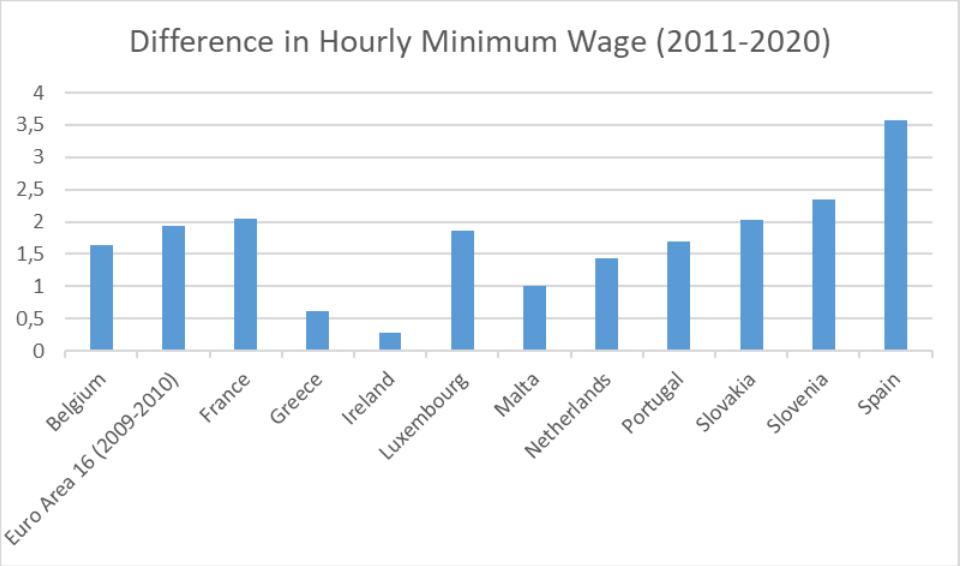


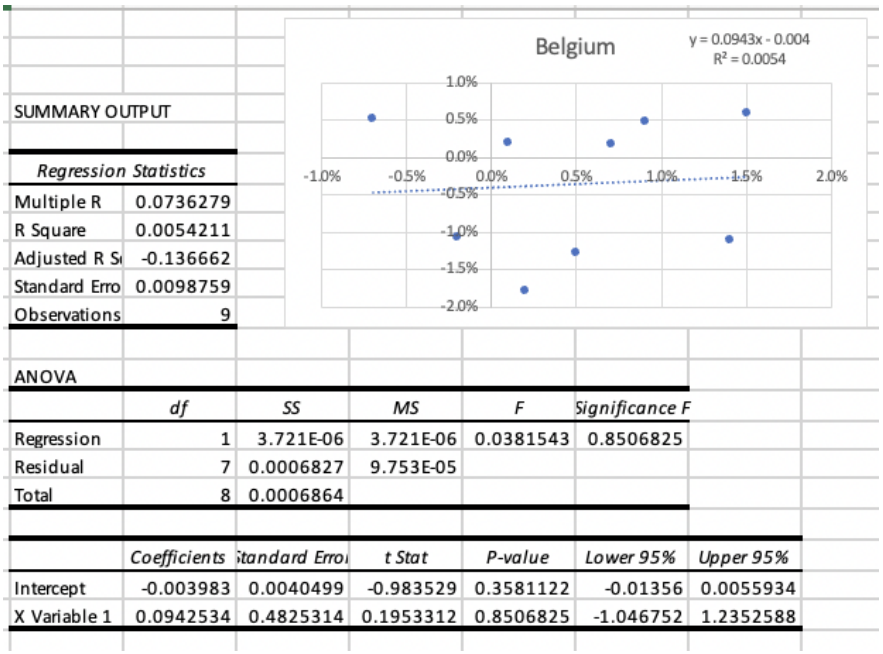

**Fig. 7**: Difference in Hourly Minimum Wage between 2011 and 2020

| Time/GEO | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|---|
| Belgium | -0.7% | 0.5% | 0.9% | 1.4% | 1.5% | 0.1% | -0.2% | 0.2% | 0.7% |
| Germany | 2.6% | 0.6% | 0.5% | 1.0% | 0.5% | 1.4% | 1.8% | 0.0% | 0.4% |
| Ireland | 2.4% | 0.4% | -1.9% | 5.0% | 19.9% | -1.2% | 5.0% | 5.3% | 2.6% |
| Greece | -7.1% | -5.2% | -2.3% | -0.6% | 3.6% | -4.1% | 1.4% | -3.5% | 3.3% |
| Spain | 1.5% | 1.9% | 1.4% | 0.3% | 0.8% | 0.5% | 0.9% | -0.2% | 0.2% |
| France | 1.0% | 0.3% | 1.4% | 1.0% | 0.8% | 0.3% | 2.1% | 0.4% | 0.4% |
| Luxembourg | -1.8% | -0.4% | 1.8% | -0.2% | -0.8% | 2.0% | -1.5% | -1.6% | 0.0% |
| Malta | 0.8% | 2.8% | 2.6% | 4.5% | 6.2% | -5.1% | 6.9% | -1.4% | -4.2% |
| Netherlands | 0.6% | -0.1% | 0.8% | 0.7% | 1.0% | -0.2% | 0.5% | -0.3% | -0.2% |
| Portugal | 1.5% | 1.0% | 1.4% | -1.0% | 0.0% | 0.1% | 0.8% | -0.1% | 1.5% |
| Slovenia | 3.6% | -0.6% | -1.0% | 1.1% | 0.6% | 3.5% | 3.8% | 2.6% | 0.6% |
| Slovakia | 1.5% | 1.5% | 2.4% | 2.0% | 3.5% | 0.4% | 2.3% | 2.3% | 2.3% |

**Table 5:** Real Growth Rate GDP per Hour Worked

| Time/ GEO | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|---|---|---|
| Belgium | 0.5% | -1.3% | 0.5% | -1.1% | 0.6% | 0.2% | -1.1% | -1.8% | 0.2% |
| Germany | -2.0% | -2.3% | -1.9% | -1.1% | 0.5% | -0.4% | 2.6% | -1.5% | 1.9% |
| Ireland | -0.3% | -1.2% | -1.5% | -0.3% | 0.4% | 5.8% | 0.9% | 2.9% | 1.8% |
| Greece | -3.1% | -23.6% | 0.0% | 1.4% | 2.9% | 0.1% | -1.5% | -0.2% | 10.4% |
| Spain | -1.7% | -2.0% | -2.1% | -0.3% | 2.0% | 1.4% | 5.0% | 3.3% | 21.1% |
| France | -0.4% | 1.8% | -1.1% | 0.3% | 1.2% | 0.3% | -0.7% | -0.3% | 0.1% |
| Luxembourg | -1.5% | -0.7% | 1.9% | 1.0% | 1.3% | -0.5% | 1.4% | -1.3% | 2.9% |
| Malta | -2.5% | 1.3% | 0.2% | 1.2% | -0.4% | 0.3% | -0.4% | 0.4% | 0.9% |
| Netherlands | -0.5% | -1.4% | -1.7% | 0.4% | 1.6% | 1.7% | 0.2% | 0.3% | 0.6% |
| Portugal | -1.4% | -3.2% | -0.4% | -0.1% | 4.5% | 4.2% | 3.7% | 3.0% | 2.8% |
| Slovenia | -0.4% | -0.2% | -0.1% | -0.2% | 0.9% | 0.8% | 0.3% | 2.9% | 4.0% |
| Slovakia | -0.2% | -0.8% | 0.8% | 4.2% | 8.5% | 7.2% | 6.6% | 7.5% | 6.0% |

**Table 6:** Real Growth Rate Minimum Wages




SUMMARY OUTPUT

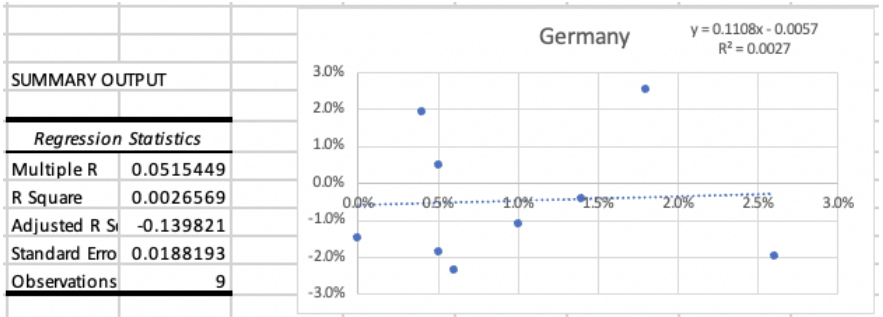
| *Regression Statistics* | |
|---|---|
| Multiple R | 0.0736279 |
| R Square | 0.0054211 |
| Adjusted R S | -0.136662 |
| Standard Erro | 0.0098759 |
| Observations | 9 |

ANOVA

| | *df* | *SS* | *MS* | *F* | *Significance F* |
|---|---|---|---|---|---|
| Regression | 1 | 3.721E-06 | 3.721E-06 | 0.0381543 | 0.8506825 |
| Residual | 7 | 0.0006827 | 9.753E-05 | | |
| Total | 8 | 0.0006864 | | | |

| | *Coefficients* | *Standard Erro* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|---|
| Intercept | -0.003983 | 0.0040499 | -0.983529 | 0.3581122 | -0.01356 | 0.0055934 |
| X Variable 1 | 0.0942534 | 0.4825314 | 0.1953312 | 0.8506825 | -1.046752 | 1.2352588 |

**Fig. 8:** Regression analysis statistics, Belgium.




SUMMARY OUTPUT

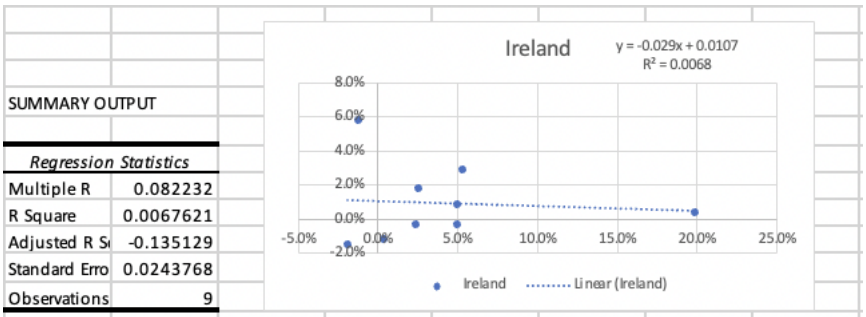
| *Regression Statistics* | |
|---|---|
| Multiple R | 0.0515449 |
| R Square | 0.0026569 |
| Adjusted R S | -0.139821 |
| Standard Erro | 0.0188193 |
| Observations | 9 |

ANOVA

| | *df* | *SS* | *MS* | *F* | *Significance F* |
|---|---|---|---|---|---|
| Regression | 1 | 6.604E-06 | 6.604E-06 | 0.0186477 | 0.8952258 |
| Residual | 7 | 0.0024792 | 0.0003542 | | |
| Total | 8 | 0.0024858 | | | |

| | *Coefficients* | *Standard Erro* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|---|
| Intercept | -0.005707 | 0.0101164 | -0.564165 | 0.5902514 | -0.029629 | 0.0182141 |
| X Variable 1 | 0.110842 | 0.8116936 | 0.1365565 | 0.8952258 | -1.808508 | 2.0301923 |

**Fig. 9:** Regression analysis statistics, Germany.




SUMMARY OUTPUT

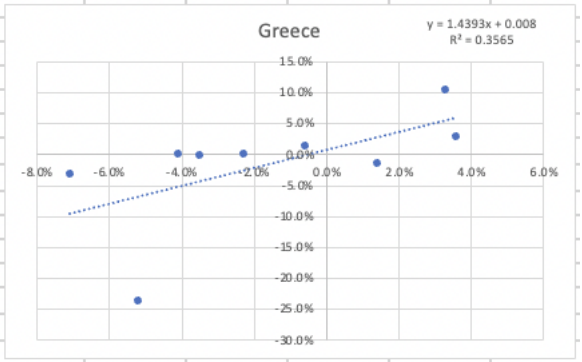
| *Regression Statistics* | |
|---|---|
| Multiple R | 0.082232 |
| R Square | 0.0067621 |
| Adjusted R S | -0.135129 |
| Standard Erro | 0.0243768 |
| Observations | 9 |

ANOVA

| | *df* | *SS* | *MS* | *F* | *Significance F* |
|---|---|---|---|---|---|
| Regression | 1 | 2.832E-05 | 2.832E-05 | 0.047657 | 0.8334195 |
| Residual | 7 | 0.0041596 | 0.0005942 | | |
| Total | 8 | 0.0041879 | | | |

| | *Coefficients* | *Standard Erro* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|---|
| Intercept | 0.0107094 | 0.009837 | 1.0886782 | 0.3123512 | -0.012552 | 0.0339703 |
| X Variable 1 | -0.02905 | 0.1330694 | -0.218305 | 0.8334195 | -0.343709 | 0.2856095 |

**Fig. 10**: Regression analysis statistics, Ireland.




SUMMARY OUTPUT

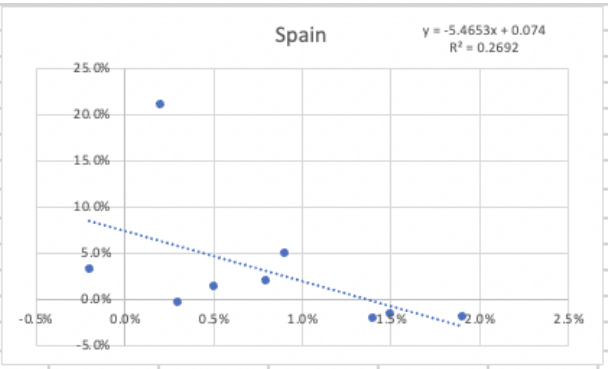
| *Regression Statistics* | |
|---|---|
| Multiple R | 0.597052 |
| R Square | 0.356472 |
| Adjusted R S | 0.264539 |
| Standard Erro | 0.078251 |
| Observations | 9 |

ANOVA

| | *df* | *SS* | *MS* | *F* | *Significance F* |
|---|---|---|---|---|---|
| Regression | 1 | 0.023743 | 0.023743 | 3.87753 | 0.089604 |
| Residual | 7 | 0.042863 | 0.006123 | | |
| Total | 8 | 0.066606 | | | |

| | *Coefficients* | *tandard Erro* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|---|
| Intercept | 0.007996 | 0.028619 | 0.279398 | 0.788014 | -0.059677 | 0.075669 |
| X Variable 1 | 1.439332 | 0.730943 | 1.969144 | 0.089604 | -0.289073 | 3.167737 |

**Fig. 11:** Regression analysis statistics, Greece.




SUMMARY OUTPUT

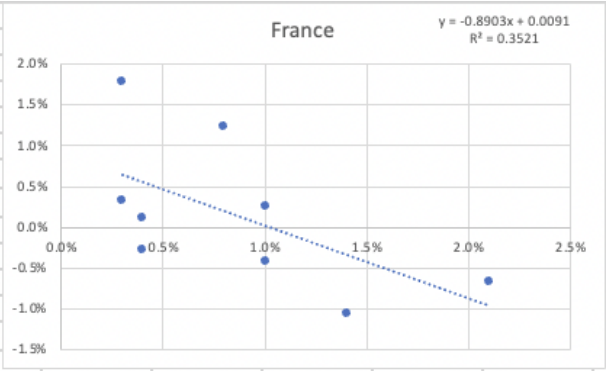
| *Regression Statistics* | |
|---|---|
| Multiple R | 0.51885 |
| R Square | 0.269205 |
| Adjusted R S | 0.164806 |
| Standard Erro | 0.066074 |
| Observations | 9 |

ANOVA

| | *df* | *SS* | *MS* | *F* | *Significance F* |
|---|---|---|---|---|---|
| Regression | 1 | 0.011258 | 0.011258 | 2.578611 | 0.152352 |
| Residual | 7 | 0.03056 | 0.004366 | | |
| Total | 8 | 0.041818 | | | |

| | *Coefficients* | *tandard Erro* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|---|
| Intercept | 0.07402 | 0.035315 | 2.095976 | 0.074311 | -0.009487 | 0.157528 |
| X Variable 1 | -5.465321 | 3.403476 | -1.605805 | 0.152352 | -13.51326 | 2.582622 |

**Fig. 12:** Regression analysis statistics, Spain.




SUMMARY OUTPUT

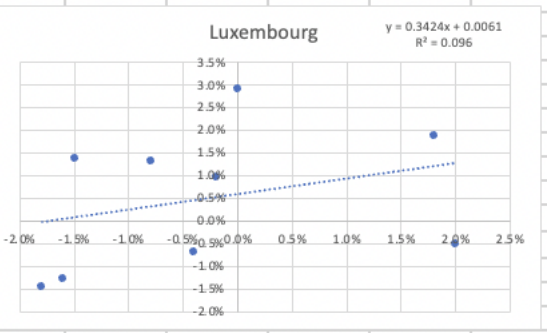
| *Regression Statistics* | |
|---|---|
| Multiple R | 0.593368 |
| R Square | 0.352086 |
| Adjusted R S | 0.259527 |
| Standard Erro | 0.007804 |
| Observations | 9 |

ANOVA

| | *df* | *SS* | *MS* | *F* | *Significance F* |
|---|---|---|---|---|---|
| Regression | 1 | 0.000232 | 0.000232 | 3.803902 | 0.092119 |
| Residual | 7 | 0.000426 | 6.09E-05 | | |
| Total | 8 | 0.000658 | | | |

| | *Coefficients* | *tandard Erro* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|---|
| Intercept | 0.009104 | 0.004692 | 1.940019 | 0.093532 | -0.001992 | 0.0202 |
| X Variable 1 | -0.890327 | 0.456494 | -1.950359 | 0.092119 | -1.969763 | 0.189109 |

**Fig. 13:** Regression analysis statistics, France.




SUMMARY OUTPUT

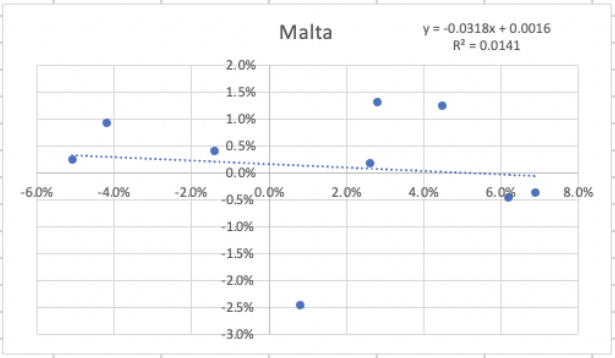
| *Regression Statistics* | |
|---|---|
| Multiple R | 0.309794 |
| R Square | 0.095972 |
| Adjusted R S | -0.033174 |
| Standard Erro | 0.015606 |
| Observations | 9 |

ANOVA

| | *df* | *SS* | *MS* | *F* | *Significance F* |
|---|---|---|---|---|---|
| Regression | 1 | 0.000181 | 0.000181 | 0.743127 | 0.417212 |
| Residual | 7 | 0.001705 | 0.000244 | | |
| Total | 8 | 0.001886 | | | |

| | *Coefficients* | *tandard Erro* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|---|
| Intercept | 0.00606 | 0.005318 | 1.139478 | 0.29199 | -0.006515 | 0.018634 |
| X Variable 1 | 0.342433 | 0.397231 | 0.862048 | 0.417212 | -0.59687 | 1.281736 |

**Fig. 14:** Regression analysis statistics, Luxembourg.




SUMMARY OUTPUT

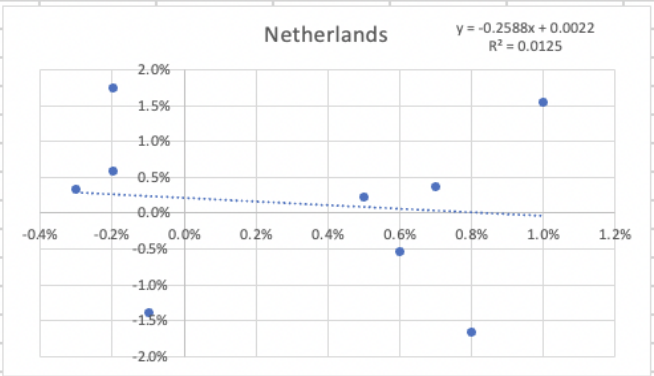
| *Regression Statistics* | |
|---|---|
| Multiple R | 0.11884156 |
| R Square | 0.01412332 |
| Adjusted R S | -0.1267162 |
| Standard Err | 0.01222758 |
| Observations | 9 |

ANOVA

| | *df* | *SS* | *MS* | *F* | *Significance F* |
|---|---|---|---|---|---|
| Regression | 1 | 1.4993E-05 | 1.4993E-05 | 0.1002795 | 0.76072928 |
| Residual | 7 | 0.0010466 | 0.00014951 | | |
| Total | 8 | 0.00106159 | | | |

| | *Coefficients* | *tandard Erro* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|---|
| Intercept | 0.00164208 | 0.00433033 | 0.37920335 | 0.71577772 | -0.0085975 | 0.01188168 |
| X Variable 1 | -0.0318196 | 0.10048215 | -0.3166694 | 0.76072928 | -0.2694222 | 0.20578291 |

**Fig. 15:** Regression analysis statistics, Malta.




SUMMARY OUTPUT

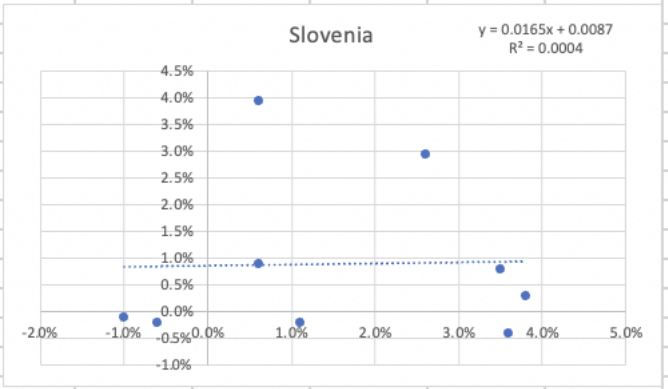
| *Regression Statistics* | |
|---|---|
| Multiple R | 0.11198143 |
| R Square | 0.01253984 |
| Adjusted R S | -0.1285259 |
| Standard Err | 0.01242546 |
| Observations | 9 |

ANOVA

| | *df* | *SS* | *MS* | *F* | *Significance F* |
|---|---|---|---|---|---|
| Regression | 1 | 1.3724E-05 | 1.3724E-05 | 0.0888936 | 0.77424376 |
| Residual | 7 | 0.00108075 | 0.00015439 | | |
| Total | 8 | 0.00109447 | | | |

| | *Coefficients* | *tandard Erro* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|---|
| Intercept | 0.00217351 | 0.00494451 | 0.43958012 | 0.67349224 | -0.0095184 | 0.01386543 |
| X Variable 1 | -0.2588146 | 0.8680674 | -0.2981503 | 0.77424376 | -2.3114678 | 1.79383867 |

**Fig. 16:** Regression analysis statistics, Netherlands




SUMMARY OUTPUT

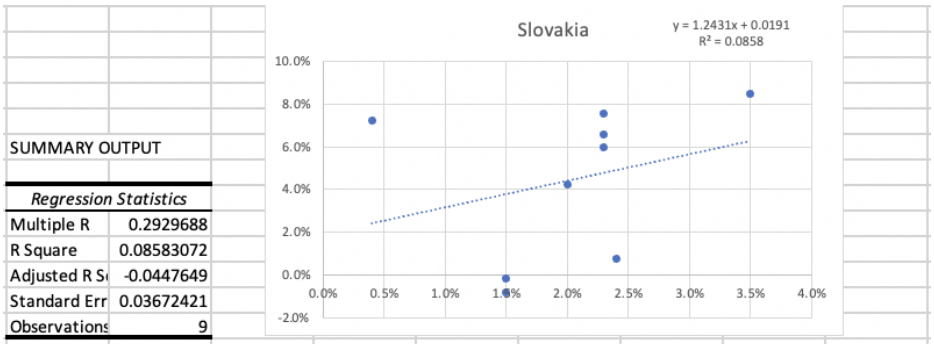
| *Regression Statistics* | |
|---|---|
| Multiple R | 0.01980574 |
| R Square | 0.00039227 |
| Adjusted R S | -0.1424088 |
| Standard Err | 0.01645918 |
| Observations | 9 |

ANOVA

| | *df* | *SS* | *MS* | *F* | *Significance F* |
|---|---|---|---|---|---|
| Regression | 1 | 7.4416E-07 | 7.4416E-07 | 0.00274695 | 0.95966527 |
| Residual | 7 | 0.00189633 | 0.0002709 | | |
| Total | 8 | 0.00189708 | | | |

| | *Coefficients* | *tandard Erro* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* |
|---|---|---|---|---|---|---|
| Intercept | 0.00866159 | 0.0074032 | 1.16998008 | 0.28029713 | -0.0088442 | 0.02616737 |
| X Variable 1 | 0.01651153 | 0.31503751 | 0.05241133 | 0.95966527 | -0.7284338 | 0.76145687 |

**Fig. 17:** Regression analysis statistics, Slovenia




SUMMARY OUTPUT

| *Regression Statistics* | |
|---|---|
| Multiple R | 0.2929688 |
| R Square | 0.08583072 |
| Adjusted R S | -0.0447649 |
| Standard Err | 0.03672421 |
| Observations | 9 |

ANOVA

| | *df* | *SS* | *MS* | *F* | *Significance F* |
|---|---|---|---|---|---|
| Regression | 1 | 0.00088638 | 0.00088638 | 0.65722512 | 0.44422576 |
| Residual | 7 | 0.00944067 | 0.00134867 | | |
| Total | 8 | 0.01032705 | | | |

| | *Coefficients* | *tandard Erro* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* | *Lower 95.0%* | *Upper 95.0%* |
|---|---|---|---|---|---|---|---|---|
| Intercept | 0.01911311 | 0.0333382 | 0.57330955 | 0.58437453 | -0.0597192 | 0.09794543 | -0.0597192 | 0.09794543 |
| X Variable 1 | 1.24314491 | 1.53343255 | 0.81069422 | 0.44422576 | -2.3828469 | 4.8691367 | -2.3828469 | 4.8691367 |

**Fig. 18** Regression analysis statistics, Slovakia

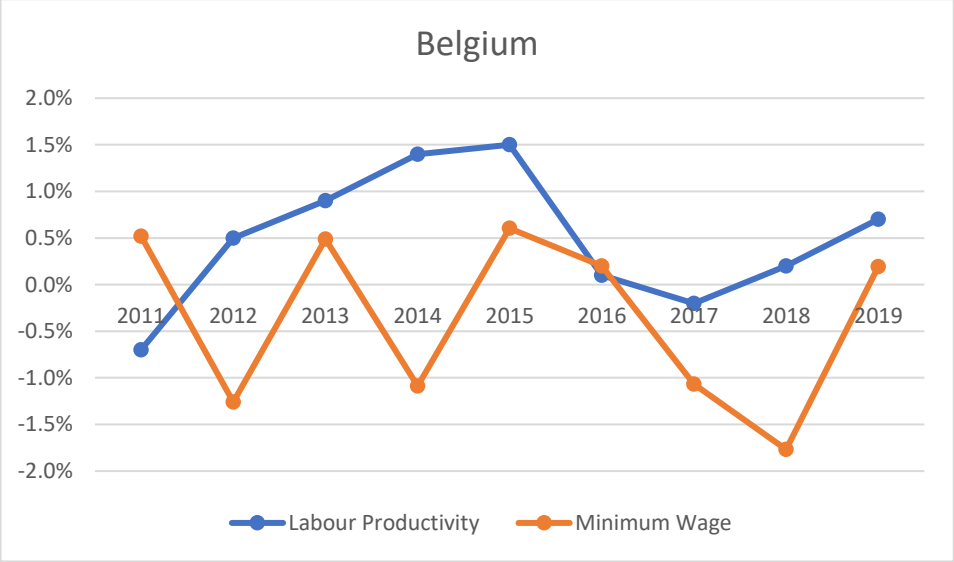



**Fig. 19:** Real Growth in Minimum wages and Labour Productivity in Belgium


**Fig. 20:** Real Growth in Minimum wages and Labour Productivity in Germany


**Fig. 21:** Real Growth in Minimum wages and Labour Productivity in Ireland


**Fig. 22**: Real Growth in Minimum wages and Labour Productivity in Greece

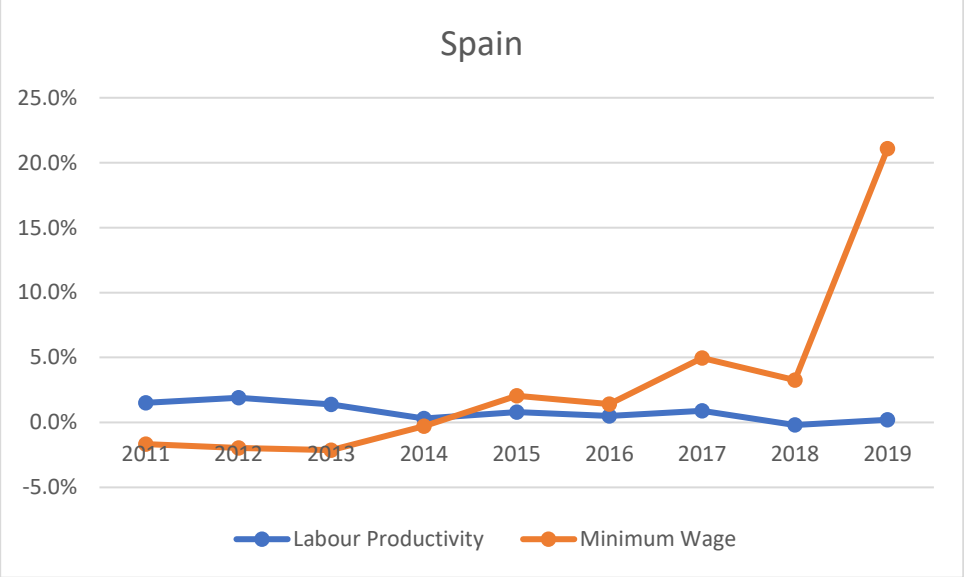



**Fig. 23:** Real Growth in Minimum wages and Labour Productivity in Spain

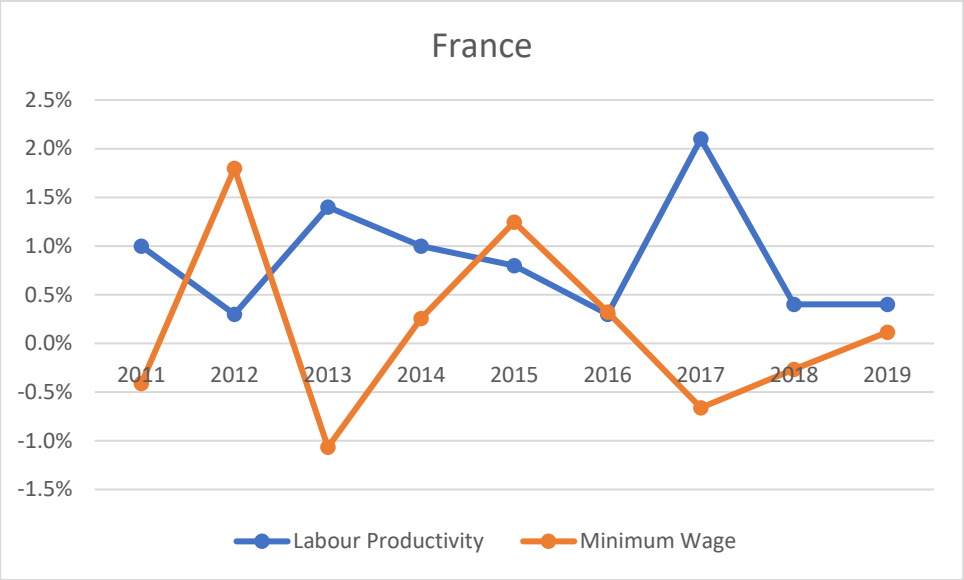



**Fig. 24:** Real Growth in Minimum wages and Labour Productivity in France

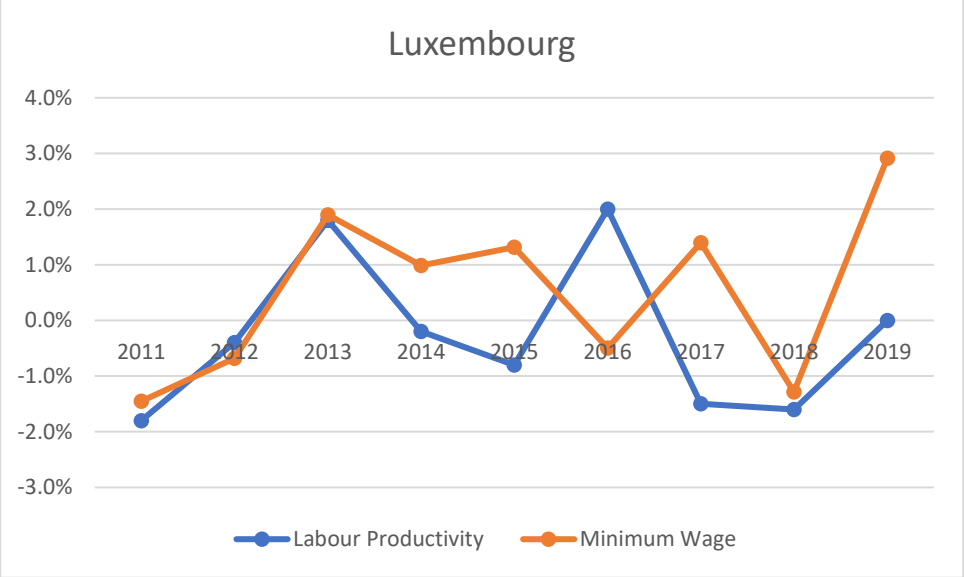



**Fig. 25:** Real Growth in Minimum wages and Labour Productivity in Luxembourg

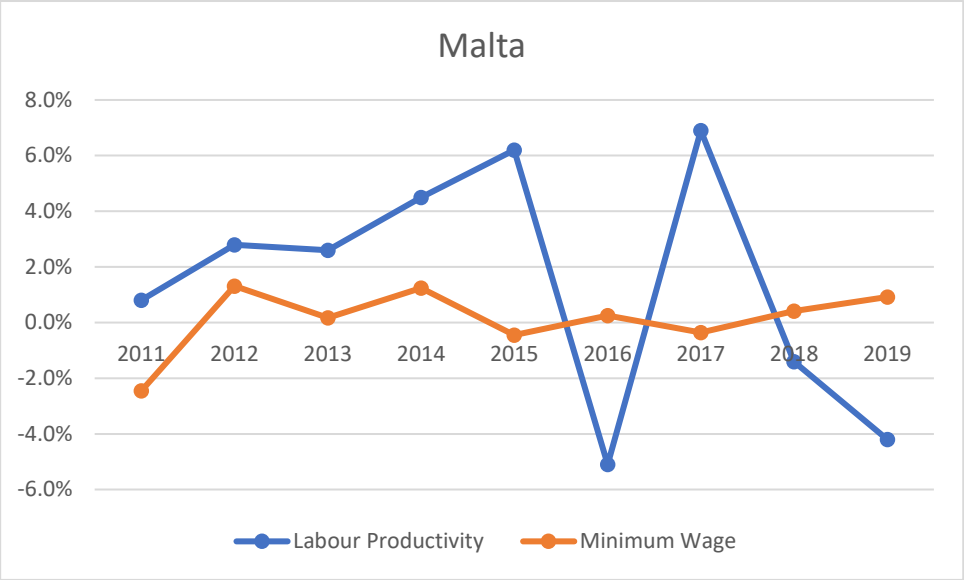



**Fig. 26:** Real Growth in Minimum wages and Labour Productivity in Malta


**Fig. 27:** Real Growth in Minimum wages and Labour Productivity in Netherlands

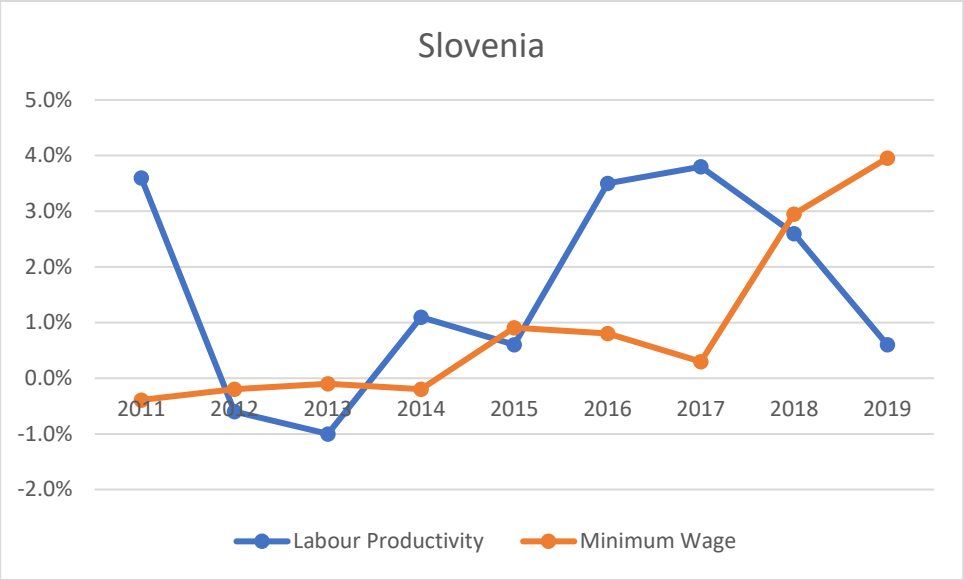



**Fig. 28:** Real Growth in Minimum wages and Labour Productivity in Slovenia

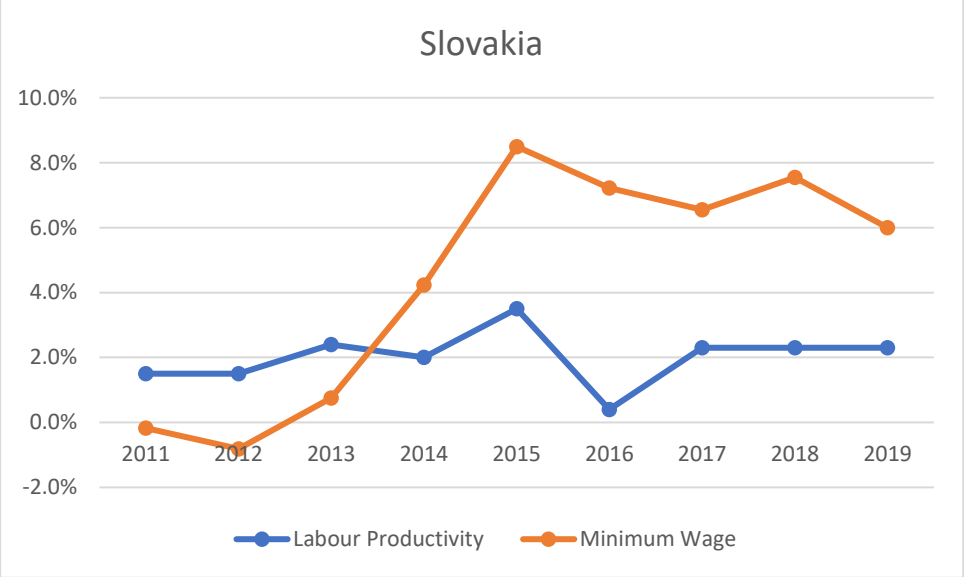
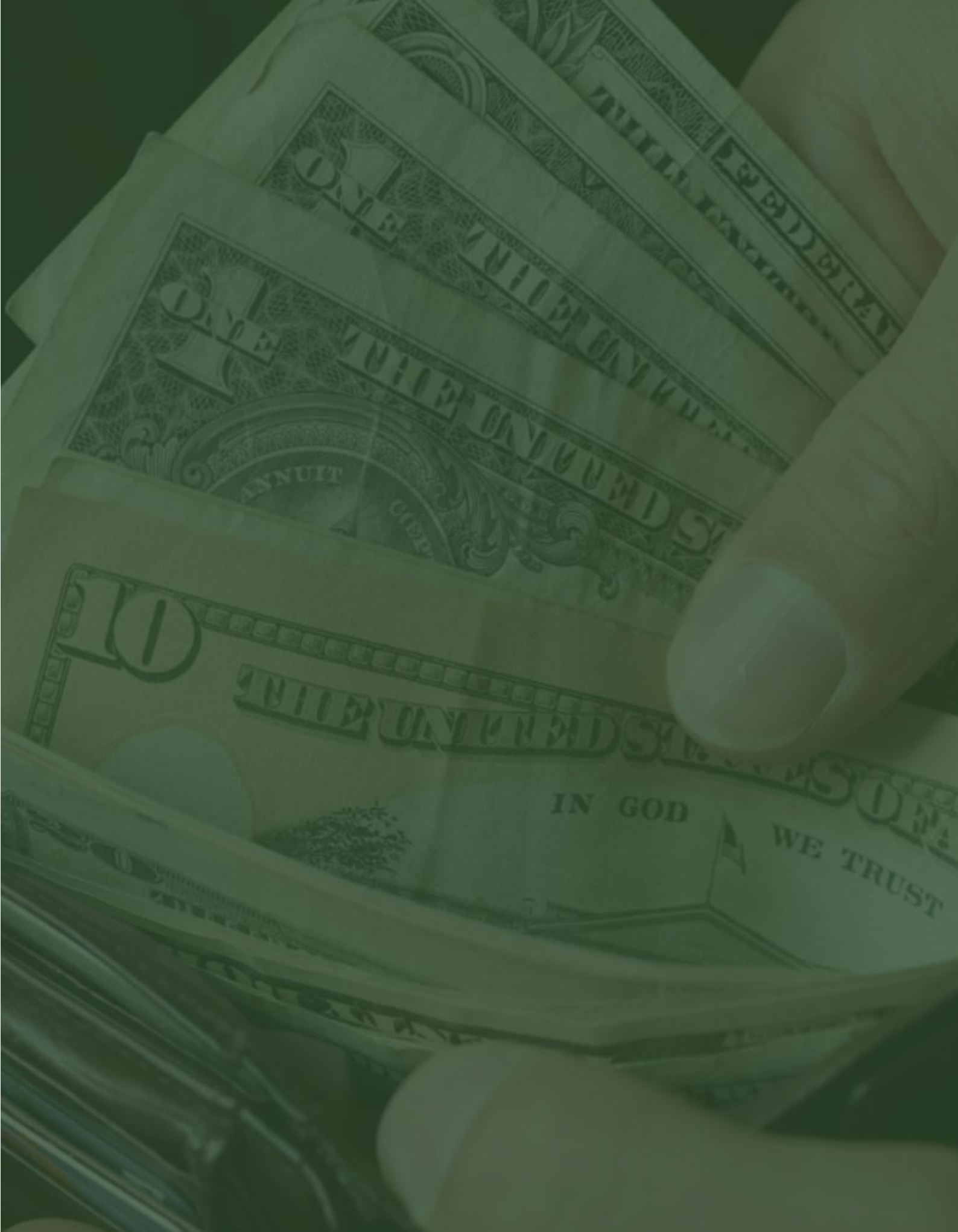



**Fig. 29:** Real Growth in Minimum wages and Labour Productivity in Slovakia

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