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Challenging the 'refugee effect'

- a study of the relationship between self-employment and unemployment using panel data covering all 27 EU member states

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Abstract

This essay examines the relation between unemployment and self-employment using panel data covering all 27 European Union member states. The European Union contains of highly heterogeneous economies. A certain degree of heterogeneity is also prevalent within the group 'self-employed'.

The hypothesis tested in this essay is stating that unemployment leads to self-employment in accordance with the 'refugee'-thesis. This hypothesis is rejected on an over-all trend basis following a series of established regressions using robustness checks. Instead a negative relationship between self-employment and unemployment is captured, opposing the 'refugee'-thesis. These results are confirmed when restricting the sample to the countries with the highest unemployment rates year 2012. Smaller evidence for the 'refugee'-effect is found when excluding the countries with the highest proportion of workers in agriculture from the analysis.

Key words: Self-employment, unemployment, refugee effect, labor economics

Thank you.

It goes particularly to my supervisor Zouheir El-Sahli – but also to the students and the staff at the Economic Department at Lund University for creating a good work atmosphere, interesting inputs and suggestions.

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1   Introduction

You might argue that the relationship between unemployment and economic activity is a generally accepted concept that economic scholars agree upon. Higher levels of economic activity is, according to this notion, followed by lower levels of unemployment. This relationship is felt particularly acutely in many of todays stagnating European economies; following European debt crisis that erupted in late 2009. We can observe increased unemployment rates, especially in the economies that have suffered from the greatest economic repercussions (most known group of EU-countries within this cathegory have been abbrevieted PIIGS[1]) (Mead and Blight, The Guardian, 2013). The argument goes that having half of the youth population in unemployment and overall unemployment rates exceeding one quarter of the population shatters the countries economies (Eurostat 1, 2013).

An alternative to employment, and unemployment, is creating ones' own business – and enter self-employment. Hence, a theory – often recited, questioned and well-discussed among theorists especially since late 1980s – is the 'refugee effect'-thesis stating that people in unemployment are pushed into self-employment (cf. Thurik et al, 2008; Parker and Robson, 2004:291). One can simplify this and say that people are forced to create their occupations in times of need. Hence, the following essay tests the 'refugee'-theory on a cross-European Union level. It tries to determine whether we can verify that unemployment increases self-employment. The essay also tests different relationships suggested by earlier academic scholars.

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[1] Short for: Portugal, Ireland, Italy, Greece and Spain

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1.1   Research question

Despite the rather straight-forward "unemployment push"-thesis, saying that unemployment leads to self-employment; previous studies have drawn fundamentally different conclusions when investigating the relationship. Some scholars rely on the possibility of the "refugee effect" (mentioned in the introduction) (cf. Meager, 1992). Others, like Blanchflower (2000), argue that the relationship between unemployment and self-employment is negative for most countries. Some say the causality is reversed; that self-employment (creations of firms, businesses etcetera) is essential to empower entrepreneurial activity, and hence to decrease unemployment. One might argue for, or against, these findings. Therefore, testing the "refugee"-hypothesis over time is an interesting contribution to the discussion. Consequently, the following primal research question is being examined in this essay:

Does unemployment increase self-employment?

The reader should be aware of the many underlying structures that might affect individuals' willingness to start their own businesses. Besides, limiting the research to a certain country, or to a group of countries, is of great importance to make conclusions and comparisons valid. For this reason, and because of the current economic debt crisis and ongoing European harmonization process, the research is made on a cross-"European Union" level using panel data covering all 27 European Union member states.

The single-market aim of the European Union (EU) is something that the reader should keep in mind when reading the essay. The harmonization process that characterizes the EU includes many dimensions – labor market being one of them (cf. European Commission, 2013). However, the economies within the EU are not homogeneous. Nor are the member states homogeneous when you look at their societal, demographical, cultural or even linguistic structure (see: Baldwin and Wyplosz, 2009). Yet, all European economies are industrialized and the last decades' goal to create an internal market makes it important, and interesting, to test whether a general trend can be captured or observed. Given the stated

relationship in the regressions, adjustment will also be made to investigate the impact of the current debt crisis. Hence, resulting in the following secondary research question:

> *Has the relationship between self-employment and unemployment been affected by the recent recession?*

Moreover, the relationship, regarding unemployment resulting in self-employment, is tested using a set of controls. Additional variables have been determined using previous research from the academia.

1.1.1 Hypothesis

Given the previous introduction; the following hypothesis, declared by 'refugee-effect'-thesis, is tested in this essay:

> *Unemployment leads to self-employment*

The hypothesis is rather implicit – increased unemployment pushes people to self-employment (cf. section 3). This notion is tested using data from Eurostat 1 (2013) covering the period 1991 to 2010 for all current EU member states.

1.2   Research Subject

It is rather obvious that the EU is the research subject in this essay. Given the recent increase in unemployment it is interesting to see if any larger tendencies can be captured. But it in not only a valid topic due to the current debt crisis[2], but also due to the continual EU struggle for closure.

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[2] The debt crisis did however - admittedly - play an important role in the pre-face of this essay.

Studies like this can be used to clarify the dynamic structure of the internal market and to see if a general trend can be sorted out in the data. The observant reader will of course ask if unemployment; and other macroeconomic variables being used in this essay, is enough to clarify how self-employment develops over time – and yes, such criticism is valid. This is mainly due to the fact that underlying structures of self-employment might still be highly dependent on the EU-countries' own legal-system, beneficiary system, culture and more. It is nonetheless important to test whether a general trend can be observed – or perhaps even dismissed. The research subject, the European Union, will be further discussed in section 2.

1.3   Limitations

The essay is limited both in time (mainly 1991-2010) and in scope (European Union). Also, in order to know whether a relationship exists one must first look back at the previous findings within the study area. Therefore articles, academic texts and data sets are used in this essay to support my endeavor, which is to examine whether the 'refugee effect' is valid.

The purpose of the study is to see whether a relationship between unemployment and self-employment can be captured on a macroeconomic scale. As the careful reader soon will see – the question 'why unemployment exists?' is notoriously avoided in this presentation. This is not a coincidence; the reason for unemployment does vary but it is not a question that is to be tackled within the scope of this essay. However, due to the hypothesis made regarding unemployment explaining self-employment, a presentation regarding the previous research of the determinants of self-employment is presented.

The stated hypothesis is tested using quantitative data methods with the econometrical data program "EViews 7" (with the econometrical limitations that follows). Also, the data analysis is made on an aggregate level using macro data. However, some of the findings within the microeconomic discourse have been taken into account.

1.4   The structure of the essay

This essay is divided into six different sections, each with additional subsections. The purpose of the structure is to make the research transparent and easy to overlook. After this introductory section a discussion regarding the research subject is presented to clarify some of the dynamics within the EU. That is followed by an analysis regarding findings in previous research. This is done to establish what we know. Afterwards, once I have established 'what we know'[3], the methodology is presented together with a discussion regarding the variables used in the established regressions. That is then followed by a data presentation – and then, finally, a conclusive text is presented along with suggestions for further studies.

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[3] Or perhaps rather 'what we do not know' as the observant reader soon will see.

2 European Union – harmonization process and unemployment

The corner stones of the single market are often said to be the 'four freedoms' the free movement of people, goods, services and capital

(The European Commission 1, 2013)

The four cornerstones of the EU, described in the quotation above, are implying high levels of cross-EU harmonization. In order to obtain this objective various attempts are made to bring down the remaining barriers within various areas (The European Commission 1, 2013; see also: Tallberg, 2010). The economies that join the EU must fulfill a series of criterion. Requirements include the existence of functioning market economy along with political stability (democracy) and the adaption of the previously introduced EU-law, EU-dictates and regulations (Baldwin and Wyploscz, 2009:32). These requirements are stated in the "Copenhagen Criteria's" (Ibid, 2009:32). For the European Monetary Union there are additional requirements that prospective members need to adjust to. These requirements are known as the "Convergence Criteria" (formalized in the Maastricht treaty). Common goals for the EU include balanced budgets, low inflation, low unemployment and more (Tullberg, 2010:58).

A vast majority of the member states are now a part of the European Monetary Union and these countries have given away their internal monetary decision making to the European Central Bank (Ibid, 489-490; 512-513). When looking at monetary unions (or prospective monetary unions) a well-known macroeconomic theory called "the Optimum Currency Area" is often taken into account. It declares that countries forming a monetary union are to be combined in

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such a way that the area, as a whole, is resilient to asymmetric shocks[4] (Baldwin and Wyploscz, 2009:330).

That said, Krugman and Obstfeldt (2006:550) argue that the European Monetary Union (EMU) have been driven by the two main objectives; to make EU a 'unified market' and to secure Europe's place in the 'world monetary system'. The first objective is clearly linked to the 'single market' goal – where removals of barriers between countries are central for market unification (cf. Krugman and Obstfeld, 2006:550-551). Yet – when examining the "Optimum Area"-thesis Baldwin and Wyplosz (2009:340-341) find that many obstacles remain. The remaining barriers discussed involves labor mobility and fiscal transfers (transfers between regions to adjust to shocks) (Ibid, 2009:339-340). This might give some explanation to the shock asymmetry following current crisis.

When observing the data it appears as if the debt crisis is somewhat asymmetrically affecting specific countries, and areas, within the EU more than others (see: Eurostat 1, 2013). The following statement from the European Commission illustrates this:

> *The EU is the only major world region where unemployment is not falling. The overall unemployment rate of the EU is currently heading towards nearly 10.5% that of the euro area is about 11%, the highest rate since the start of EMU. Since the start of the crisis in 2008, the number of jobs lost totalled about 5 million the EU, 3 million in the euro area*

(European Commission 2, 2012:1)

The statement points at how asymmetric the distribution of unemployment is across the EU, whereas some areas face great unemployment rates at the same time as the annual, short term, trend might go in the opposite direction (when looking at the entire European Union). Failure to follow the requirements sat up in

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[4] Asymmetric shocks are shocks (demand or supply) that affect certain regions – for more information about economic shocks (on demand or supply side) I recommend Burda and Wyplosz (2009).

the previously introduced "Optimal Currency Area"-thesis[5] (OCA) could be one reason. When looking at the labor mobility, which is the most relevant criteria in the OCA-thesis for this essay, studies find poor degrees of labor mobility within the EU (Baldwin and Wyploscz, 2009:338; Krugman and Obstfeld, 2006:567). Hence, when the currency area is compared to the USA data points at the conclusion that individuals in EU tend to withdraw from the active population, and instead stay at home rather than move to find a new job (Ibid, 2006:567).

Fig.1: *Unemployment in the European Union, 2012 (Eurostat 1, 2013). The abbrevations used are the official according to EU-standard (listed in appendix 2).*

Figure 1 illustrates the distribution of unemployment in the EU made with data from the Eurostat 1 (2013). Two abnormalities can be observed, namely Spain and Greece, where overall unemployment rates exceed 20 percent. This figure can be compared to the unemployment rates one year before the crisis erupted (in 2008), illustrated in figure 2.

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[5] The criterions will not be discussed further here due to the low relevance. But they include:' Labour Mobility', 'Trade openness', 'Product Diversification', 'Fiscal Transfers', 'Homogeneity of preferences' and 'Commonality of Destiny' (Baldwin and Wyplosz, 2009:340; cf. Ibid, 2009:315-347).
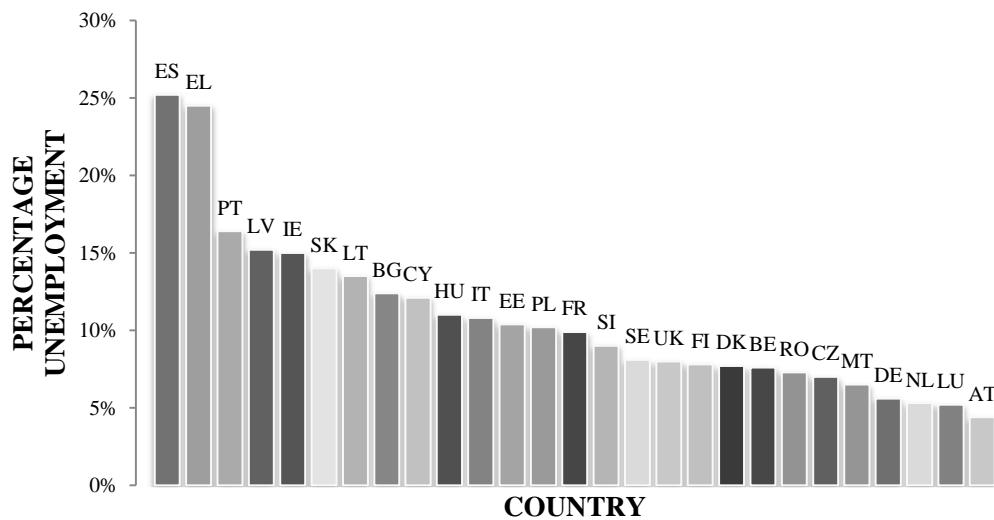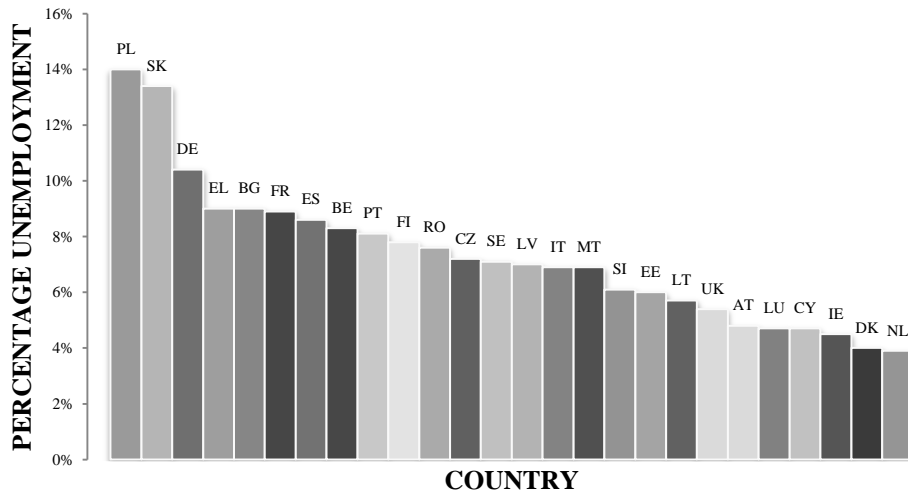
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Fig.2: *Unemployment in the European Union, 2008 (Eurostat 1, 2013). The abbrevations used are the official according to EU-standard (listed in appendix 1)*

When comparing the two charts above it is clear that the distribution of unemployment is varying a lot between the member states. The average annual unemployment rate was less than 10 % for 14 countries in 2012 – compared to 23 countries four year earlier. Still, some countries had even lower unemployment rates in 2012 compared to four years earlier (most notably Germany). As I previously insinuated, it can be concluded that the European Union do not consist of homogenious internal economies but rather diverse industries and structures (cf: Baldwin and Wyploscz, 2009). This is an important aspect to keep in mind when we discuss and compute the relationship of self-employment and unemployment, as I have done in the following sections.

Self-employment is more prevalent in some countries than others (cf. Blanchflower 2000; Meager, 1992). It could be argued that this is due to the fact that some sectors is more "self-employed"-biased than others. 'Agriculture' is a sector that is often particularly linked to self-employment (Meager, 1992:91, Blanchflower, 2000:478). Going back to the EU, findings suggests that countries like Portugal appear to be more agriculture-biased than the rest, which then should account for distortions in the overall trend (cf. Maciera, 2009:46).

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3   Previous research

The established study subject is by no means homogeneous despite the harmonization process that, especially during the last two decades, has been prevalent in the EU. In the last section we saw that the EU is not made up by a homogeneous group of countries; in fact it seems like many regional and country specific differences exists. Also, the distribution of self-employment varies across the different member states (it is argued to be partly due to the economic structure of the countries, cf. Remeikiene and Startiene, 2009:910). Additionally, we saw that unemployment is particularly widespread in some countries (especially Spain and Greece, Eurostat 1 2013).

3.1   Unemployment

Unemployment can be considered to be an economic imbalance where the supply of labor is greater than the demand of labor (Bosworth et al, 2006:401). A state of imbalance is a generally undesired phenomenon – and so is unemployment. Consequently, Reize (2001:1) argue that politicians tend to apply 'active labor market policy' and intervene on the market to reduce levels of unemployment and increase country-wide production. As noted by Reize (2000), self-employment is often viewed as a way to increase growth, in order to decrease unemployment. Unemployed persons face restricted economic purchasing power and more limited budget constraints. Additionally, the societal loss discussed by Bosworth et al (2006:401) that follow unemployment must also be taken into account. This loss is due to the fact that people in unemployment, in a sense, are equal to work force being lost. Labor services, and labor stocks, cannot be stored. Accordingly, one year of unemployment for a person is equal to one year of work simply being wasted (Bosworth et al, 2006:401). The different attempts to intervene on a political level, as well as the academic research in the field, imply

the great importance of unemployment reduction[6]. Self-employment is often seen as a way to ignite growth and decrease level of unemployment (cf. Parker and Robson, 2004:287). Besides, observed development of unemployment is by no means static, and tends to follow the economic activity.

The relationship between unemployment and economic activity is commonly formalized in the 'Okun's law'-thesis (Burda and Wyplosz, 2009:287). It states that decreased unemployment rates are associated with increased output for the economy (normally calculated as level of GDP) (Burda and Wyplosz, 2009:287). The originally formalized notion that 1 % decrease in unemployment is associated with a 3 % increase in output has been re-estimated numerous times (cf. Lee 2000 and Prachowny, 1993). The different re-estimations presented by scholars strongly suggest that the relationship is not static and that the degree correlation may vary over time and depending on the regions used in the analysis (cf. Burda and Wyplosz, 2009). Despite the different re-estimations, evidence suggests that the basic relationship is valid, thus enhancing us with a rather solid implication. As the level of economic activity is decreased, businesses have to shut down and firms have to get rid of personnel, resulting in increased unemployment.

3.2   Self-employment

Meanwhile unemployment follow economic trends the argument goes that on an individual level workers look at their coming cash flows when deciding whether to take a job (employment) or create their own jobs (in other words entering self-employment)(Rieze, 2000:3). An unemployed person will choose self-employment if the expected earnings are higher, compared to the alternatives (being outside the labor force, employed or unemployed) with the possibility of closure in mind (Rieze, 2000:3). Given the risks involved in self-employment it is then said that self-employed require higher gains' (Carroll and Mosakowski, 1987:573).

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[6] Such an argumentation could – admittedly – be disputed especially given the search theory suggesting a "equilibrium unemployment" due to the matching process between the unemployed and the right employee (cf. Borjas, George J. (2009:510), *Labor Economics*)

Furthermore, self-employment is sometimes seen as a proxy for entrepreneurial activity (cf. Audretsch et al, 2001). As far as such a conclusion goes, it contains a fairly inconclusive definition of the term 'entrepreneurship'. It ignores many of the dimensions that entrepreneurial activity makes up. This is partly due to the inadequate discussion regarding definition of entrepreneurship where the term is not well-defined. Carroll and Mosakowski (1987:571) explain that entrepreneurship in a sense is 'innovative activities' and/or the 'founding of new corporations'. Hence, throughout this text self-employment has not been viewed as a proxy for entrepreneurial activity, which follows the argument that such an approach would add another layer of arbitrary grouping to the analysis. The other type of grouping is the fact that self-employment is discussed in aggregate terms, despite the fact that self-employed do not, by no means, contain homogeneous group of individuals (Blanchflower, 2000:478; Meager, 1992).

3.3 Previously found determinants of self-employment; the relationship between self-employment and unemployment

The given relationship between unemployment and economic activity is also prevalent for economic activity and self-employment. This is illustrated in figure 3.

Fig. 3: *Relationship between economic activity, unemployment and self-employment (modeled after Meager, 1992:89).*

The stated relationship on the left, in figure 3, suggests that there is an indirect relationship between economic activity and self-employment due to the fact that

labor market (as we discussed earlier) is highly associated with economic activity (Meager, 1992). The right-side relationship is explaining the direct effect of economic activity on self-employment.

If true; the findings result in issues when using proxies for economic activity to determine self-employment together with unemployment as economic activity is involved in both processes (Meager, 1992:89). With the figure above in mind you can argue for two relationships. The first one states that unemployment forces people into self-employment (also known as the 'unemployment push' and 'refugee' effect) (Remeikiene and Startiene, 2009:904). The other relationship is the 'pull-effect' – stating that firms are more likely to fail in economic recessions; or that the incentives to be self-employed are lower in such times (Meager, 1992:89). We are therefore dealing with two opposing forces that might drive the development of self-employment in different direction.

Studies often focuses on this relationship and try to determine whether there is an 'unemployment push' into self-employment or if the relationship is of opposite character – meaning that self-employment pulls down unemployment (pull effect/prosperity pull) (cf. Remeikiene and Startiene, 2009). These attempts are criticized on many different remarks – but one important critique is how self-employment is treated as homogeneous group despite the great diversity within the group (Meager, 1992).

Nevertheless, in previous studies a common argument is that self-employment is particularly wide-spread in some sectors, especially agriculture, and that research trying to observe a relationship should control for agriculture impact (cf. Blanchflower, 2000:478). Controlling for agricultural significance in the economy is something researches need to take into account. However, the counter-argument against this approach is that the findings would miss an important aspect of self-employment if they ignore the impact of agriculture (Meager, 1992:91). Also, ignoring agriculture does not, as discussed by Meager (1992), make self-employment homogeneous. This objection must then in be put in the real world context whereas agriculture evidently is more self-employment-biased. It is nevertheless rather naive to adjust for agricultural impact and then ignore the additional need for specifications to clear the data from remaining issues.

Reize (for Germany, 2000:9; 24) is studying of the transition from unemployment to (and from) self-employment. He comes to the conclusion that

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occupation is selected on individual utility basis rather than it being associated with unemployment in particular. His results are challenging the 'push'-effect (given in the stated hypothesis). Other like, Evans and Leighton (for USA, 1989), find that more time in unemployment reads higher odds of entering self-employment. They claim that unemployed workers "[…] are more likely to enter self-employment" (Evans and Leighton, 1989:529).

Both of these studies, Reize (2000) and Evans and Leighton (1989:530), also argue that people with higher educational attainment face greater probability to enter self-employment. On the contrary – Blanchflower (2000), examining data from various OECD-countries, discusses how the people with the least education face higher probability to enter self-employment (though finding smaller evidence for the probability for higher education to be associated with self-employment to).

Rieze (2000:20) also discusses how age of the unemployed plays a vital role in the entry to self-employment. A research being discussed by Rieze (2000), originally provided by Evans and Leighton (1990), come to the conclusion that unemployed between 35-40 years are more likely to enter self-employment. Similar conclusions regarding age and education affecting self-employment are drawn by Rees and Shaah (1988).

Going back to the two opposing theories of a 'push'- or 'pull'-effect of unemployment on self-employment – Remekiene and Startiene (2009) argue that the 'prosperity pull' dominates on a domestic levels due to changes in revenues that occur over the business cycle. The existence of the 'prosperity'-pull could then be explained by looking at the prospective future value streams for individuals (as discussed in section 3.2). Hence, Parker and Robson (2004:292) argue that when examining at the risk associated with starting a firm; the alternative (being employed) is more certain in economic stable times. The decreased risk following economic stability suggests a negative relationship between unemployment and self-employment.

Furthermore, Parker and Robson (2003) argue that personal income taxes might decrease the incentives, and willingness, to be self-employed. This willingness is on a general note defined by Reize (2000) and is cited below as based on:

[…] individuals financial endowment, human capital, risk aversion, wish for
independence, social and family networks and other factors determining
preferences as well as costs and benefits

<div align="right">(Reize, 2000:3)</div>

Carroll and Mosakowsky (1987) investigate incentives such as the ones described in the quotation above. Their conclusion is that the decision to be self-employed is highly affected by individual experiences of self-employment – prior jobs or having self-employed parents.

Other researchers argue that men are more likely to be self-employed (Blanchflower, 2000) and high capital possession is also linked to an increased probability (for manufacturing and wholesale, Bates, 1995:148, 153). The different factors that determines self-employment, some discussed in this section, does vary between the various scholars. The suggested reasons for failure in previous studies have also been denoted to multiple reasons. Remekiene and Startiene (2009:910) argue that the exclusion of important aspects of self-employment such as gender gap, religion and economic state of a country may be the reason for previously failed attempts. Meanwhile Meager (1992) discusses that modeling with level, and stocks, is inadequate to determine what affects self-employment. Meager (1992) introduces a theoretical attempt to study the inflows and outflows of self-employment. Previous attempts to put all types of self-employment into one group is here said to be based on an assumption of homogeneity, which is not the case (as I discussed in section 3.2). Bögenhold and Staber (1993) agree, and they state that the:

[…] generic character to this category are simplifications or plainly mistaken

<div align="right">(Bögenhold and Staber, 1993:467).</div>

Meager (1992) and Bögenhold and Staber (1993) criticizes the attempts to examine an aggregate level relationship between self-employment and unemployment, due to the great heterogeneous aspects of self-employment. When carefully examining the determinants for self-employment one finds that they include (as proposed in this section) gender, opportunity earnings, tax rates,

education, risks and age (of self-employed). However, the determinants might also be highly occupation dependent. Some jobs are for instance regulated from self-employment entry (due to restrictions) as Meager (1992) discusses, for instance medicine jobs.

However, much of the criticism, stated by Meager (1992) and Bögenhold and Staber (1993), against the different efforts to clarify the relationship and self-employment in aggregate terms, can directed towards the research being conducted in this essay as well. However, my goal is not to put different types of self-employment into the same group (despite the data approach in section 5). In this study I am merely interested in determining if an overall trend can be captured. The variety of findings discussed here implies a certain degree of interest within the academia for these types of studies.

4   Methodology

I have been estimating OLS[7]-regressions using panel data covering all the 27 EU member states to test the established hypothesis, regarding unemployment leading to self-employment, with data sets from Eurostat 1 (2013). The data dates from 1991-2010 for the variables included in this analysis. A step-wise variable testing is provided all controlled for fixed effects (annual and country) partly due the result in a series of 'Redundant Fixed Effect'-tests in EViews 7 (calculated with the help from the EViews User guide II, 2010:672-674).

The first regression examined is described in the equation below:

$$selfemploymentrate = c + a(unemployment\ rate) + e$$

In the second step of the analysis I have first added lags, and then additional variables (listed in table 1 below).

$$selfemplrate = c + a(unemployment\ rate) + additional\ variables + e$$

In order to correct for issues, that I suggest might affect the results, another set of regressions using first-differences are also included. I choose to call the variables created with first-differences 'delta variables'. These sets of regressions show how the change in self-employment can be explained by change in in unemployment.

$$Delta\ \text{self-employment} = (\text{self-employment})_t - (\text{self-employment})_{t-1}$$

And for "delta unemployment":

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[7] Ordinary Least Square

$$Delta \text{ unemployment} = (\text{unemployment})_t - (\text{unemployment})_{t-1}$$

All 'delta-variables' in this essay are calculated using this first-difference approach. Throughout the essay emphasizes lies on the first-difference approach.

$$Delta\ selfempltrate = c + a(delta\ unemplment\ rate) + delta\ (additional\ variables) + e$$

In table 1 the main variables are listed along with their assigned code. More information about the calculations and the Eurostat data (Eurostat 1) used can be viewed in Appendix 1.

VARIABLE	CODE
Self-employment rate	SELFEMPLOYMENTRATE
Unemployment rate	UNEMPLOYMENTRATE
Real GDP growth rate	REALGDPGROWTHRATE
Unemployment benefits per unemployed	UNEMPLBENPERUNEMPLOYED
First-difference of self-employment rate	DELTASELFEMPL
First-difference of unemployment benefits per unemployed	DELTAUNEMPLBENPERUNEMPLO
First-difference of unemployment rate	DELTAUNEMPLBENPERUNEMPLO
Self-employment rate without agriculture	DELTASELFEMPLAGRI

Table 1: *Variables included in the calculations and their assigned codes*

4.1   Data set

All data being analyzed in this essay have been obtained from the Eurostat database (Eurostat 1, 2013). Eurostat is the statistic division of the European Union that collects and publishes European statistics (Eurostat 2, 2013). Harmonized methodology is used by Eurostat to make the data comparable and thus compatible with macroeconomic studies like this one (Eurostat 2, 2013).

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4.2   Determining the dependent variable

As the reader might have realized, in this essay self-employment is the dependent variable studied. Mainly it is due to the hypothesis regarding the unemployment push that we want to test. But it is also important to distinguish this approach from studies of the so called 'Schumpeterian effect', where reverse causality is discussed (Audretsch et al, 2001:4). Of course the 'Schumpeterian effect' regards entrepreneurial activity as the entity that decreases unemployment, and given previous discussion (in section 3.2) such a definition is not given in this essay. However; this is something that has been taken into account when formalizing the presented study.

Moreover, the use of self-employment stock variables has been criticized. The critique from Meager (1992) is that researchers need to separate cyclical trends and that the relationship is wrongly specified due to the heterogeneous aspects of self-employment. Meager (1992) is particularly opposing the use of "self-employment rates" as the independent variable as it is in fact, according to him, explained by its denominator employment (which of course is decreased when unemployment is high). He points at earlier works by Bögenhold and Staber (1989) and states that it seriously affects the outcomes. Bögenhold and Staber (1993) responded in a reply to Meager (1992) declaring that even if the criticism is valid they still hold on to their argument:

> *We are concerned that Meager´s critique is driven more by a focus on statistical requirements than by an interest in the substantive nature of the problem […] Searching for model specifications to minimize the collinearity among explanatory variables, and evaluating models and individual variables in terms of explained variance will generally not provide the best answer to that question"*
>
> (Bögenhold and Staber, 1993:466-467)

In other words, the use of rate (or levels) is perhaps not an optimal way of explaining the connection but one most often simplify when determining at general effects and outcomes. Despite this, the critique from Meager (1992) is

taken into account in this essay. Therefore, self-employment rate is calculated as the proportion of active population (using data from Eurostat 1, 2013). Due to the changes in the size of active population (especially in the EU as seen in section 2) over the business cycle it can then be said that much of the critique is valid towards this approach as well.

4.3   Determining the main independent variable(s)

As far as determining the independent variables one should be aware of the limitations that exist concerning the data and its availability. The previous discussed relationship between unemployment and economic activity does problematize the use of both of these variables in a regression (due to their interdependence) (Meager, 1992:88). It could then be argued that unemployment is an inadequate estimator of the economic development as the whole trend is not captured by unemployment. Therefore, growth rates for GDP have been used to capture many of these prevalent variations. The use of growth rates can most certainly be criticized on the given accounts.

Also, as previously discussed, government intervention on labor market is common. When looking at prospective earnings for an individual (discussed in section 3.3) one could argue that the different interventions should be taken into account. Accordingly, individuals look at their potential gains' in the decision making process (Rieze, 2000). With that in mind the opportunity cost to labor (self-employment and employment) is partly the money received from government in different schemes. Benefits might decrease the willingness to work – and hence, the willingness to become self-employed. A variable has been included that measure unemployment benefits per unemployed. It has been calculated using annual expenditures on unemployment protections (under the category social protections in Eurostat 1, 2013) divided by annual unemployment figures.

5   Results

Given the stated relationship discussed above; a number of step-wise regressions have been established. In this section I have used both rates and annual changes in the variables. The first-difference approach is presented along with the level analysis to correct for biased effects that might still be present. The method can be compared with the one used by Fölster (2001:142) who is using a similar approach when looking at how taxes affect self-employment.

The issue of determining the right coefficient covariance method to run the regressions on did cause some issues. Two types of methods were examined – White period and White Diagonal. The method that is used when all countries are included is the "White period"-method. It deals with cross-section error heteroskedacticity and error serial-correlations (see: country clustering, EViews 2, 2011:611-612). The other method, White Diagonal, does not deal with clustering (serial correlation in cross-sections) – but does however deal with all heterskedastic errors. It is reasonable to say that clustering is necessary. However, the "white-period" method assumes great number of cross-sections suggesting cautiousness in the analysis (EViews 2, 2011:611-612).

5.1   The simple model

In the first simple model investigates the way unemployment is affecting self-employment using the whole data set to see whether a long term trend can be captured. This long-term data set stretches from 1984 to 2012.

Variable	Coefficient	Std. Error	t-Statistic
Constant	(0.145930)***	0.006035	24.18053
UNEMPLOYMENTRATE	(-0.157698)***	0.067604	-2.332664
R-squared	0.951041		
Prob(F-statistic)	0.000000		

Table 2: *Self-employment rate and unemployment rate (1984-2012) (Eurostat 1, 2013) ***=2 % significance, **=5% significance and *= 10 % significance*

Using the simple one-way regression I find that unemployment rate is significantly affecting the self-employment rate (lagged effects are ignored). The relationship states that self-employment rate is negatively affected by increased unemployment.

The next step was to examine how changes in self-employment rate can be explained by changes in unemployment rate (using first-differences).

Dependent Variable: DELTASELFEMPLRATE

Variable	Coefficient	Std. Error	t-Statistic
C	(-0.000539)***	4.65E-06	-115.9910
DELTAUNEMPLRATE	(-0.099167)***	0.013669	-7.254637
R-squared	0.234620		
Prob(F-statistic)	0.000000		

Table 3*: First-differences of self-employment and unemployment (1984-2012) (Eurostat 1, 2013) ***=2 % significance, **=5% significance and *= 10 % significance*

The results in the first-difference analysis validate previous findings regarding a negative level effect. This negative effect is here rather small as a 10 % increase in unemployment rate is associated with a merely 0, 99 % decrease in self-employment. Next the results using both level and lagged effects will be inspected. The testing (with up to three years' lags) resulted in the outcomes presented in table 4 and table 5.

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Independent variable	Coefficient	Std. Error	t-Statistic
C	(0.143239)***	0.008793	16.29059
UNEMPLOYMENTRATE	(-0.254605)***	0.078035	-3.262709
UNEMPLOYMENTRATE(-1)	(0.104115)**	0.045241	2.301310
UNEMPLOYMENTRATE(-2)	(-0.068201)	0.050111	-1.360980
UNEMPLOYMENTRATE(-3)	(0.088597)	0.089342	0.991654
R-squared	0.960957		
Prob(F-statistic)	0.000000		

Table 4*: Self-employment rate explained by unemployment rate level and lagged terms (Eurostat 1, 2013) ***=2 % significance, **=5% significance and *= 10 % significance*

Dependent Variable: DELTASELFEMPLRATE

Independent variable	Coefficient	Std. Error	t-Statistic
C	(-0.000665)***	2.00E-05	-33.20224
DELTAUNEMPLRATE	(-0.106541)***	0.025927	-4.109325
DELTAUNEMPLRATE(-1)	(0.000637)	0.026660	0.023911
DELTAUNEMPLRATE(-2)	(-0.009934)	0.039500	-0.251483
DELTAUNEMPLRATE(-3)	(0.038837)	0.027861	1.393955
R-squared	0.264307		
Prob(F-statistic)	0.000000		

Table 5: *First-differences in self-employment rate and unemployment rate level and lagged terms (Eurostat 1, 2013) ***=2 % significance, **=5% significance and *= 10 % significance*

The tables (4 and 5) above show the outcomes from the lagged term analysis. The result is somewhat ambiguous – on one hand the direct relationship appears negative and significant (for both relationships on a 1% level). At the same time it seems like a positive effect of unemployment rate on self-employment rate could be associated with a lag. Nevertheless, the result is not confirmed when examining in the first-difference method. The calculations, in the first-difference models, suggesting a lagged effect of unemployment on self-employment showed no significance. These two relationships will be tested further.

As the reader might have expected, later on we will restrict the sample to 1991-2010 due to the data availability and to make comparisons valid. The reason for not restricting the sample in this sub-section is to show the overall trend for a longer time period.

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5.2　　　Robustness

In this section the original regression has been amended to test the robustness of the relationship. Discussions regarding the variable determination can be viewed in section 4. The regressions are modeled step-wise.

Dependent variable: Self-employment rate

MODEL 1: YEAR: 1991-2010			
Independent variable	**Coefficient**	**Std. errors**	**T-statistic**
Constant	(0.137997)***	0.005431	25.40860
unemployment rate	(-0.231349)***	0.083980	-2.754808
unemployment rate(t-1)	(0.146514)*	0.086826	1.687447
MODEL 2: YEAR: 1991-2010	**Coefficient**	**Std. errors**	**T-statistic**
Constant	(0.133213)***	0.005248	25.38198
unemployment rate	(-0.165498)**	0.078302	-2.113576
unemployment rate(t-1)	(0.086503)	0.083641	1.034216
gdp growth rate	(0.047004)**	0.023217	2.024575
MODEL 3. YEAR: 1991-2010	**Coefficient**	**Std. errors**	**T-statistic**
Constant	(0.136999)***	0.008032	17.05678
unemployment rate	(-0.191186)**	0.082560	-2.315714
unemployment rate(t-1)	(0.102635)	0.076471	1.342145
gdp growth rate	(0.042854)	0.028847	1.485559
unemployment benefits per unemployed	(-4.72E-07)**	2.10E-07	-2.249303

Table 6: *Self-employment rate models (1991-2010) (Eurostat 1, 2013) ***=2 % significance, **=5% significance and *= 10 % significance*

The outcome in the first model (in Table 6) is showing, a significant, direct negative effect of unemployment on self-employment. It seems like a positive effect of unemployment on self-employment might be associated with a lag. Evidently, the lagged term, driving self-employment up, is used in both additional models (model 2 and model 3) due to the outcome in model 1.

GDP growth rate have been added in the second model due to the many aspects of economic activity that are not entirely captured by unemployment. However, the critique (especially from Meager, 1992) against such an approach is that unemployment is already highly affected by economic activity. This results in unobserved dependence between the explanatory variables. This is something that

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must be taken into consideration (as discussed in section 4). Moreover, the lagged unemployment rate variable is not significant.

Finally, the last model (in table 6) suggests that 'unemployment benefits per unemployed' are negatively affecting self-employment rates. The level unemployment-variable is significant on a 5 % level in all models.

Dependent variable: Delta self-employment rate

MODEL 1: YEAR: 1991-2010			
Independent variable	**Coefficient**	**Std. errors**	**T-statistic**
Constant	(-0.000796)***	9.93E-05	-8.019190
Delta unemployment rate	(-0.088440)***	0.030896	-2.862513
Delta unemployment rate(t-1)	(0.003030)	0.031745	0.095440
Delta unemployment rate(t-2)	(-0.029690)	0.053334	-0.556688
Delta unemployment rate(t-3)	(0.027996)	0.041243	0.678802
MODEL 2: YEAR: 1991-2010	**Coefficient**	**Std. errors**	**T-statistic**
Constant	(0.000300)	0.000438	0.684340
Delta unemployment rate	(-0.118334)***	0.026574	-4.452952
real gdp growth rate	(-0.034725)**	0.017475	-1.987107
MODEL 3. YEAR: 1991-2010	**Coefficient**	**Std. errors**	**T-statistic**
Constant	(0.000383)	0.000508	0.753714
Delta unemployment rate	(-0.136365)***	0.039007	-3.495918
real gdp growth rate	(-0.037916)*	0.021045	-1.801709
Delta unemployment benefits per unemployed	(-3.25E-07)**	1.53E-07	-2.131550

Table 7: *First-differences self-employment rate models (1991-2010) (Eurostat 1, 2013) ***=2 % significance, **=5% significance and *= 10 % significance*

In order to confirm the results we look at the findings from the first-difference approach (table 7). The level effect persists and appear significant on a 2%-level throughout the whole process. However, the probability of a lagged effect (cf. section 5.1) is rejected. Furthermore, unemployment benefits (per unemployed) have a significant negative impact on self-employment (P-value=0, 0338).

5.2.1 Restricted time frames

Next we are examining the results when restricting the sample to the period 1991 to 2008. This is done to test the original relationship, but also see whether the current

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debt crisis have affected to the results (though only two years of crisis due to data limitations).

Dependent variable: Delta self-employment rate

MODEL 1: YEAR: 1991-2008			
Independent variable	**Coefficient**	**Std. errors**	**T-statistic**
Constant	(-0.001104)***	7.27E-05	-15.17407
Delta unemployment rate	(-0.111764)***	0.044902	-2.489086
Delta unemployment rate(t-1)	(0.029199)	0.048158	0.606319
Delta unemployment rate(t-2)	(-0.025305)	0.057585	-0.439443
Delta unemployment rate(t-3)	(0.039190)	0.043189	0.907419
MODEL 2: YEAR: 1991-2008	**Coefficient**	**Std. errors**	**T-statistic**
Constant	(-0.000112)	0.000601	-0.185857
Delta unemployment rate	(-0.099000)***	0.031952	-3.098402
real gdp growth rate	(-0.023855)	0.020870	-1.143065
MODEL 3. YEAR: 1991-2008	**Coefficient**	**Std. errors**	**T-statistic**
Constant	(-0.000530)	0.000837	-0.632509
Delta unemployment rate	(-0.109377)***	0.046221	-2.366365
real gdp growth rate	(-0.010676)	0.029895	-0.357117
Delta unemployment benefits per unemployed	(-3.68E-07)*	1.89E-07	-1.949247

Table 8: *First-differences self-employment rate models (1991-2008) (Eurostat 1, 2013) ***=2 % significance, **=5% significance and *= 10 % significance*

The time-restricted model validates previous findings when looking at the first-difference models. In the ordinary approach (not using first-differences) these results could not be confirmed and unemployment rates are no longer showing any significance (see: Appendix 2).

5.2.2 **Looking at groups of countries**

When restricting the sample to only the PIIGS-countries (using first-differences) I find that the results could not be confirmed as the regression as whole did not show any significance (probability for the F-stat > 0,05) (cf. Westerlund, 2005). The results from the regression in this set can be viewed in appendix 2[8]. However, a redundant test to examine the validity of fixed effects rejected the use of fixed effects (results in appendix

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[8] Note that the coefficient covariance method white (diagonal) is used in this regression due to the restricted number of cross-sections. However – the results is confirmed in both methods of analysis.

2). This is most likely something that affects the outcome. Yet, in the ordinary rate approach the regression is significant. In this case the negative relationship between unemployment and self-employment is confirmed (cf. Appendix 2).

When instead restricting the sample to the ten countries with the lowest unemployment rate levels (year 2012) I found no significance for the explanatory variables. However, when examining the countries with the highest unemployment rates I found that the negative level effect is valid (cf. Appendix 2[9]).

5.3   Additional testing

In a last attempt to clarify the relationship I have been excluding the countries with the highest proportions of workers in agriculture. The share of the active population in agriculture for all these countries has exceeded 5 % throughout the last decade (2000-2012). The excluded countries are: Bulgaria, Greece, Lithuania, Hungary, Poland, Portugal, Romania, Slovenia, Ireland, Cyprus and Latvia (Eurostat 1, 2013). Furthermore, the regressions have been calculated following the previous established robustness checks (cf. section 5.2)[10]. The result from the last regression in the set is presented in table 9.

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[9] Same as previous footnote, white diagonal is used.
[10] White diagonal is used here to

Dependent variable: Delta self-employmentrate

Variable	Coefficient	Std. Error	t-Statistic
C	(0.000459)	0.000562	0.817137
DELTAUNEMPLRATE	(-0.078210)	0.057905	-1.350668
DELTAUNEMPLRATE(-1)	(-0.059662)	0.037321	-1.598630
DELTAUNEMPLRATE(-2)	(-0.058427)	0.035516	-1.645097
DELTAUNEMPLRATE(-3)	(0.076943)***	0.037439	2.055169
REALGDPGROWTHRATEMY	(-0.016198)	0.028890	-0.560681
DELTAUNEMPLBENPERUNEMPLO	(-3.40E-07)	2.10E-07	-1.621728
R-squared	0.376013		
F-statistic	2.997918		
Prob(F-statistic)	0.000000		

Table 9*: First-differences self-employment rate models when excluding countries with over 5 %
annual agriculture labor (as a share of active population) (1991-2010) (Eurostat 1, 2013) ***=2 %
significance, **=5% significance and *= 10 % significance*

The result in table 9 suggests a positive relationship, between unemployment and
self-employment, associated with a 3-year lag for the included countries. The
negative effect of unemployment of self-employment is not persistent.

Finally, in a last attempt to reduce the agricultural impact, and see whether
agriculture is causing any distortions to the data, I excluded skilled agriculture
workers from the self-employment rate calculation. I use the same step-wise
regressions as discussed in section 5. Observe, the time frame has been altered which
is due to the data availability of self-employed workers in agriculture. A proxy for
the self-employed in agriculture is used, it includes: "Skilled agricultural, forestry
and fishery workers" (Eurostat 1, 2013).

Dependent variable: Delta self-employment rate without agriculture

MODEL 1: YEAR: 1993-2010			
Independent variable	**Coefficient**	**Std. errors**	**T-statistic**
Constant	(0.000239)***	6.91E-05	3.464007
Delta unemployment rate	(-0.086423)	0.060518	-1.428052
Delta unemployment rate(t-1)	(-0.0600129)**	0.026311	-2.280855
Delta unemployment rate(t-2)	(-0.004074)	0.042790	-0.095214
Delta unemployment rate(t-3)	(-0.019170)	0.059360	-0.322940
MODEL 2: YEAR: 1993-2010	**Coefficient**	**Std. errors**	**T-statistic**
Constant	(0.000559)	0.000373	1.499321
Delta unemployment rate	(-0.080099)	0.055036	-1.455386
Delta unemployment rate (t-1)	(-0.063797)***	0.019633	-3.249490
real gdp growth rate	(-0.008035)	0.014446	-0.556212
MODEL 3. YEAR: 1993-2010	**Coefficient**	**Std. errors**	**T-statistic**
Constant	(0.000942)**	0.000452	2.084615
Delta unemployment rate	(-0.106225)*	0.064346	-1.650843
Delta unemployment rate (t-1)	(-0.066035)***	0.023103	-2.858265
real gdp growth rate	(-0.019776)	0.018587	-1.063994
Delta unemployment benefits per unemployed	(-2.79E-07)*	1.48E-07	-1.888029

Table 10: *First-differences models excluding agriculture labor from self-employment rate (1993-2010) (Eurostat 1, 2013) ***=2 % significance, **=5% significance and *= 10 % significance*

The calculations verify the previous findings regarding a negative relationship between unemployment and self-employment. However, tests found that the level effect is not significant throughout the process. Instead a one year lag is seemingly associated with the effect. Quite contradictorily results are found when restricting the sample to period 1993 to 2008.

Dependent variable: Delta self-employment rate

Independent variable			
MODEL 1: YEAR: 1993-2008	**Coefficient**	**Standard errors**	**T-statistic**
Constant	(0.000189)	7.39E-05	2.559810
Delta unemployment rate	(-0.040627)	0.042476	-0.956485
Delta unemployment rate(t-1)	(-0.047592)	0.030358	-1.567686

Table 11: *First-differences models excluding agriculture labor from self-employment rate (1993-2008) (Eurostat 1, 2013) ***=2 % significance, **=5% significance and *= 10 % significance*

In the agriculture controlled model (1993-2008) unemployment is not significant. I maintain that it is likely due to the fact that the other variables in the regressions

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have not been cleared from agriculture impact. Also, the arbitrarily selected years (due to availability) included in the analysis do question the value of these last results.

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6   Conclusions

In the previous section I have investigated the way unemployment rate affects self-employment rate. The stated causality can be disputed and therefore it is something that should be taken into account.

The European Union has many heterogeneous aspects, despite the recent trends of cross-member state harmonization. This leads to issues when trying to determine relationship like the one being discussed here. Nevertheless, a few interesting results were found. The first result is that unemployment has had a negative impact on self-employment when examining the results for the entire European Union. The results were not confirmed when excluding the countries with the highest portion of agriculture workers (as a share of active population). In fact, this set of regressions even found evidence for the existence of an 'unemployment-push' (even though the push is associated with a lag). Nor could the relationship, a negative level effect of unemployment on self-employment, be confirmed when including only the countries with the lowest unemployment rates level in 2012. One explanation for this, observed abnormality, could be that many of the agriculture-based economies are absent when restricting the sample to the countries with the lowest unemployment rates. As previously discussed in section 3; 'agriculture-businesses' are often particularly linked to self-employment. However, the critique against this approach from Meager (1992) is that the exclusion of agriculture does not make the group homogeneous which is something that must be taken into account (cf. section 3). Also, the whole data set have not been cleared from agriculture impact and to say that the regression is wrongly specified is not a too farfetched statement. When altering the time frame to be able to remove agriculture workers from the group 'self-employed' I found a negative effect of unemployment on self-employment associated with a one-year lag. However, the results from those regressions were found insignificant when restricting the sample to 2008 rendering the results questionable. I maintain that it is not one of my main findings.

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The second result is that unemployment benefits might have had a negative impact on unemployment. That said, I do not rule out the need of additional robustness checks to see if this relationship is valid. Nevertheless, the established relationship might suggest (cf. section 3) that increased opportunity earnings (i.e. increased beneficiary levels) reduce willingness to enter self-employment.

The third finding is that the negative relationship is confirmed when restricting to the sample to the countries with the top-10 highest unemployment rates. I initially expected the opposite for these countries, as I thought that the need to create a job in these countries is greater than in countries where unemployment is lower. This notion follows the discussion regarding unemployment being influenced by economic activity (cf. discussion regarding Okun's law, section 3.3). The relationship, between unemployment and economic activity, might have affected the outcomes of the regressions (cf. Meager, 1992 and figure 1 in section 3.3). However, I hold that the use of a proxy for economic activity is necessary to capture many of the remaining fluctuations.

The results, in the first and the third findings, confirm the most crucial result in this essay – which is the fact that the hypothesis related to the 'refugee-effect' could not be confirmed. The overall trend is showing that self-employment is negatively affected by unemployment. You might interpret this and say that when unemployment is increased people have to shut down their businesses and self-employment is reduced. A more profound way would be to examine individuals' prospective earnings (discussed in section 3) as earning potentials are lower when level of economic activity is decreased. It might also be due to the higher risks following economic uncertainty; meaning that self-employed require higher gains' in economic unstable time (Parker and Robson, 2009).

I do not rule out a possibility that the recent shock might have affected the results as the assigned value to the first-difference in unemployment is lower in the robustness checks for period 1991-2008 compared to the period 1991-2012. Furthermore, the time-altered model, using the ordinary rate level approach, could not validate the discussed negative rate level findings. It might be due to distortions in the labor market structure following the crisis. Another explanation is that this type of modeling is inadequate. Nevertheless, the established negative relationship of unemployment on self-employment should be dealt with cautiousness.

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This is due to the many aspects of country specific character that must perhaps also be taken into account (discussed in section 3). Lastly, the results might have been affected by the movements (in and out) of the active population (discussed in section 2 cf. Baldwin and Wyplosz (2009)).

6.1 Further studies

Studies like the one presented here does provide general implications regarding the development of self-employment and unemployment. However, the heterogeneous aspects of self-employment, and the country specific variances, do imply that studying self-employment as a group is somewhat pre-mature and over-conclusive. Given the outcome of this essay, suggesting a negative relationship between unemployment and self-employment, studies of more industry-based and work-related character would be interesting. Of particular interest would be to look into industry-based relationships on a cross-European level.

As for the study subject examined in this essay – I am convinced that more studies related to self-employment is needed on a cross-EU level. However, the problem with such an attempt would be the great heterogeneous aspects of self-employment reflected in the types of industries that are most prevalent in each country. Therefore, a suggestion is that future studies of the cross-EU relationship focuses on comparing countries, or country-clusters, in order to get more precise and distinct outcomes. Also, studying self-employment inflows and outflows, as suggested Meager (1992), could be a way to sort out the remaining omitted issues in the data. However; I find that due to the unsatisfying data, such an approach is still far off.

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Summary

This essay tests the ´refugee effect´-thesis (suggesting that people in unemployment choose self-employment). It examines at the relationship between self-employment and unemployment on a cross-EU level using panel data covering all member states (1991-2010). The hypothesis tested states that 'unemployment leads to self-employment'.

In the analysis of previous studies, quite contradictorily results are found. Some of these findings are taken into account and tested for. Furthermore, the many heterogeneous aspects of the EU are discussed.

Three trends were found in the data analysis:

- The results suggest a negative impact of unemployment on self-employment (1991-2010 and 1991-2008) (using a first-difference approach).

- The negative impact of unemployment on self-employment is confirmed when restricting the sample to the countries with the highest unemployment rates (year 2012).

- Unemployment benefits might have a negative impact on self-employment. It is assumed that this is due to an increased opportunity earning potentials.

Due to the outcomes, the hypothesis is rejected. It is yet important that unobserved interference might have affected the results partly due to the specifications provided. In conclusion; the results reflect a certain degree of despair in the discourse and the issues involved in examining the relationship between self-employment and unemployment.

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Appendix 1

1. **Countries included in the analysis**

Country	Code (abbreviation)
Belgium	BE
Bulgaria	BG
Czech Republic	CZ
Denmark	DK
Germany	DE
Estonia	EE
Ireland	IE
Greece	EL
Spain	ES
France	FR
Italy	IT
Cyprus	CY
Latvia	LV
Lithuania	LT
Luxembourg	LU
Hungary	HU
Malta	MT
Netherlands	NL
Austria	AT
Poland	PL
Portugal	PT
Romania	RO
Slovenia	SI
Slovakia	SK
Finland	FI
Sweden	SE
United Kingdom	UK

(Eurostat 5, 2013)

2. **Variables used:**

Variable	Calculation/Explanation	Eurostat 1 (2013) variable code
Self-employment rate	Annual number of self-employed [1000s] divided by the annual number of active population [1000s] [all age 15-64]	[lfsa_esgaed] [lfsa_agan]
Unemployment rate	- [age 15-64]	[lfsa_urgan]
Real GDP growth rate	Following the growth rate formula: $$\frac{real\ growth\ rate_{\,t} - real\ growth\ rate_{t-1}}{real\ growth\ rate_{\,t-1}}$$	[nama_aux_gph]
Unemployment benefits per unemployed	Governmental annual spendings on unemployment (as a part of social protection) divided by annual number of unemployed. [age 15-64]	[lfsa_ugan] [spr_exp_sum

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Self-employment rate (without agriculture)	Same as for self-employment rates but the number of self-employed have been reduced by the number: "skilled agricultural, forestry and fishery workers". [all age 15-64]	[lfsa_esgais] [lfsa_esgaed] [lfsa_agan]

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Appendix 2

The different results presented in this Appendix are sorted according to the order they are presented in. Significance levels: ****=2 % significance, **=5% significance and *= 10 % significance*

1. **Restricted model using rate levels.**

PANEL LEAST SQUARE, FIXED EFFECT (DUMMY VARIABLES): COUNTRY AND YEAR

Dependent variable: self-employment rate			
MODEL 1: YEAR: 1991-2008			
Independent variable	**Coefficient**	**Standard errors**	**T-statistic**
Constant	(0.134193)***	0.005431	24.70702
unemployment rate	(-0.177255)*	0.100690	-1.760392
unemployment rate(t-1)	(0.142783)	0.097906	1.458375
MODEL 2: YEAR: 1984-2008	Coefficient	Standard errors	T-statistic
Constant	(0.127806)***	0.005083	25.14182
unemployment rate	(-0.103765)	0.092151	-1.126027
unemployment rate(t-1)	(0.079919)	0.091668	0.871832
dp growth rate	(0.065543)**	0.028472	2.302052
MODEL 3. YEAR: 1991-2008	Coefficient	Standard errors	T-statistic
Constant	(0.128087)***	0.008513	15.04593
unemployment rate	(-0.115491)	0.109463	-1.055064
unemployment rate(t-1)	(0.101893)	0.086784	1.174096
gdp growth rate	(0.071537)**	0.034492	2.073978
unemployment benefits per unemployed	(-3.48E-07)	2.53E-07	-1.375691

2. **Restricted model examining the PIIGS-countries.**

Dependent Variable: DELTASELFEMPL				
White diagonal standard errors & covariance (d.f. corrected)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.002270	0.000554	-4.095537	0.0001
DELTAUNEMPLRATE	-0.199866	0.050783	-3.935710	0.0002
DELTAUNEMPLRATE (-1))	0.118401	0.068323	1.732965	0.0874
DELTAUNEMPLRATE (-2))	0.059605	0.064206	0.928341	0.3563
D DELTAUNEMPLRATE (-3)	-0.151672	0.065182	-2.326886	0.0228
Effects Specification				
Cross-section fixed (dummy variables)				
Period fixed (dummy variables)				
R-squared				0.352777
F-statistic				1.453501
Prob(F-statistic)				0.106623

3. **Redundant test for model 2 (in Appendix 2).**

Redundant Fixed Effects Tests Equation: Untitled Test cross-section and period fixed effects			
Effects Test	Statistic	d.f.	Prob.
Cross-Section/Period F	0.751782	(23,72)	0.7757
Cross-Section/Period Chi-square	21.523433	23	0.5492

4. **Rate models examining the PIIGS-countries (Portugal, Ireland, Italy, Greece and Spain)**

Dependent variable: self-employment rate

MODEL 1: YEAR: 1991-2010			
Independent variable	**Coefficient**	**Std. errors**	**T-statistic**
Constant	(0.213799)***	0.003286	65.06924
unemployment rate	(-0.218162)***	0.068143	-3.201514
unemployment rate(t-1)	(0.082493)	0.066159	1.246882
MODEL 2: YEAR: 1991-2010	**Coefficient**	**Std. errors**	**T-statistic**
Constant	(0.209183)***	0.004207	49.72582
unemployment rate	(-0.131541)***	0.040098	-3.280477
gdp growth rate	(-0.051543)	0.047305	-1.089585
MODEL 3. YEAR: 1991-2010	**Coefficient**	**Std. errors**	**T-statistic**
Constant	(0.205522)***	0.010786	19.05392
unemployment rate	(-0.135906)***	0.055258	-2.459476
gdp growth rate	(-0.062531)	0.063877	-0.978934
unemployment benefits per unemployed	(-2.38E-08)	8.45E-07	-0.028189

5. **Rate models examining the PIIGS-countries (Portugal, Ireland, Italy, Greece and Spain) with restricted time-frames (1991-2008)**

Dependent variable: self-employment rate

MODEL 1: YEAR: 1991-2010			
Independent variable	**Coefficient**	**Std. errors**	**T-statistic**
Constant	(0.213292)***	0.003331	64.02386
unemployment rate	(-0.224894)***	0.080884	-2.780445
unemployment rate(t-1)	(0.112486)	0.076820	1.464286
MODEL 2: YEAR: 1991-2010	**Coefficient**	**Std. errors**	**T-statistic**
Constant	(0.206967)***	0.004354	47.53129
unemployment rate	(-0.096472)**	0.043159	-2.235242
gdp growth rate	(-0.013281)	0.045194	-0.293874
MODEL 3. YEAR: 1991-2010	**Coefficient**	**Std. errors**	**T-statistic**
Constant	(0.199953)***	0.011099	18.01521
unemployment rate	(-0.086359)	0.061444	-1.405483
gdp growth rate	(-0.004476)	0.076513	-0.058498
unemployment benefits per unemployed	(1.22E-07)	7.85E-07	0.155029

6. **Countries with the lowest unemployment rate levels (in year 2012)**
   Included countries: *Austria, Luxembourg, Netherlands, German, Malta, Czech Republic, Romania, Belgium, Denmark and Finland.*

Dependent Variable: DELTASELFEMPLRATE Method: Panel Least Squares				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.000203	0.000385	0.527778	0.5986
DELTAUNEMPLRATE	-0.012899	0.051616	-0.249907	0.8031
DELTAUNEMPLRATE(-1)	0.121219	0.081324	1.490574	0.1386
DELTAUNEMPLRATE(-2)	-0.080450	0.058728	-1.369873	0.1732
Effects Specification				
Cross-section fixed (dummy variables) Period fixed (dummy variables)				
R-squared	0.255712	Mean dependent var		0.000248
Prob(F-statistic)	0.113749			

7. **Countries with the highest unemployment rates (in year 2012) (Eurostat 1, 2013)**
   Included countries: Spain, Greece, Portugal, Latvia, Ireland, Slovakia, Lithuania, Bulgaria, Cyprus and Hungary

Dependent variable: Delta self-employment rate

MODEL 1: YEAR: 1991-2010			
Independent variable	**Coefficient**	**Std. errors**	**T-statistic**
Constant	(-0.001895)***	0.000565	-3.351696
Delta unemployment rate	(-0.109218)**	0.047735	-2.287995
Delta unemployment rate(t-1)	(0.027261)	0.043977	0.619895
Delta unemployment rate(t-2)	(0.091331)*	0.050575	1.805851
Delta unemployment rate(t-3)	(-0.049377)	0.041228	-1.197635
MODEL 2: YEAR: 1991-2010	**Coefficient**	**Std. errors**	**T-statistic**
Constant	(2.79E-05)	0.000800	0.034904
Delta unemployment rate	(-0.146950)***	0.049410	-2.974111
Deltaunempl rate(-1)	(-0.021882)	0.040707	-0.537536
Deltaunempl rate(-2)	(0.059214)	0.042296	1.399987
real gdp growth rate	(-0.053998)***	0.021117	-2.557118
MODEL 3. YEAR: 1991-2010	**Coefficient**	**Std. errors**	**T-statistic**
Constant	(0.000183)	0.000889	0.206126
Delta unemployment rate	(-0.136539)***	0.056557	-2.414168
Delta unemployment rate (t-1)	(-0.034265)	0.043164	-0.793835
Delta unemployment rate (t-2)	(0.080515)	0.050588	1.591605
real gdp growth rate	(-0.055868)***	0.021891	-2.552120
Delta unemployment benefits per unemployed	(8.13E-07)	5.42E-07	1.500702