THE EFFECT OF A PROGRESSIVE INCOME TAX SYSTEM ON ENTREPRENEURIAL ACTIVITY: EVIDENCE FROM IRELAND

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1. Abstract
This paper portrays the effect of the Irish income tax system on entrepreneurial activity in the country. The purpose of the report was to determine whether tax progressivity has a negative effect on entrepreneurial activity. In addition, the paper aims to determine whether the elevated progressivity of the Irish tax system is hampering the performance of start-up companies. In order to do this, an extensive literature review led to arguing for the over-progressivity of the Irish income tax system, which allowed to develop a hypothesis. This hypothesis was then tested through a quantitative study which aimed to analyse the influence of income tax progressivity on entrepreneurial activity. The study was based on data from fifteen European countries, and the findings displayed a negative relationship between tax progressivity and entrepreneurial activity. Finally, the study addresses the common concern of excessive taxation among Irish entrepreneurs.
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2. Introduction

Entrepreneurship is, as described in the growth theory (Schumpeter, 1976), essential for economic growth. Small businesses account for the highest percentage of job employment in many countries. In addition, regions with high entrepreneurial activity usually display higher levels of output and productivity relative to those with lower entrepreneurial activity (Bosma, 2009). Therefore, it is highly important for a country to maintain a healthy entrepreneurial environment.

An entrepreneur is broadly defined by Kirzner as: “any market participant whose actions are guided by the perception of a profit opportunity” (Baliamoune-Lutz and Garello, 2011). Taxation in general is widely considered to have a significant effect on the profitability of a firm, and therefore has an effect on entrepreneurship (Baliamoune-Lutz and Garello, 2011). The severity of that effect is dependent on several factors. One of these factors is the type of tax system (Cullen and Gordon, 2007). A country’s tax system covers a very broad range of different types of taxes. In regard to entrepreneurship, specifically start-ups, individual progressive income tax was identified as the most relevant type of tax for this study.

The primary focus of this study is Ireland and its progressive income tax system. Ireland, ‘the mecca for large companies’, is known for its astoundingly low corporate tax rate (Roughneen, 2017). However, in tune with the low corporate tax rate, Ireland has the most progressive individual income tax system in place in the EU (Irish Tax Institute, 2015). A progressive income tax is an individual based tax which applies brackets dependent on the amount of a person earns. It is deemed as a more ‘equal’ way, in terms of income, to tax an individual. High-income earners receive a higher tax rate relative to low-income earners (Rosen and Gayer, 2012). By doing so, it is believed that this way of taxation mitigates the issue of income inequality (Denvil and Klara, 2012). Nevertheless, it does bring forth other issues. For example, in the case of Ireland, many companies suffer from double taxation. This means that firms are not only taxed at the corporate level in terms of revenue, but also at the individual level of an owner extracting profits from the firm as wages (Meehan, 2010).

Moreover, the progressive income tax carries a very high tax rate percentage for large profits. This in turn may act as an obstacle for entry into entrepreneurship as well as an incentive to exit early from entrepreneurial projects (Gentry and Hubbard, 2000). The general view on progressive taxation is that it affects entrepreneurship negatively (Baliamoune-Lutz and
Garello, 2011). This, as mentioned previously, reduces entry into entrepreneurship and acts as an incentive to exit entrepreneurship. In the case of Ireland, start-ups are offered solutions which counteract these entrepreneurial barriers. However, these solutions have had mixed success and do not overrule the tax burden on start-ups (Irish Tax Institute, 2015). To narrow down the scope of research, this paper examines the influence of income tax progressivity on entrepreneurial activity, with a focus on Ireland. To provide a better understanding of the topic, the income tax system present in the United Kingdom will also be discussed and compared to the one in Ireland.

The UK, as Ireland, applies a progressive income tax system. However, the income tax system in the UK is less progressive than in Ireland. This means that, in comparison, low-income earners are taxed at an overall higher rate in the UK. However, high-income earners are taxed a lower rate (O’Brien, 2012). The difference in the respective progressive income tax systems, as well as the demographic and cultural proximity of both countries, makes the UK ideal for comparison.

3. Background
Entrepreneurial activity, as defined by Ahmad and Seymour (2008), is “the enterprising human action in pursuit of the generation of value, through the creation or expansion of economic activity, by identifying and exploiting new products, processes or markets.” In order to exploit these opportunities, entrepreneurs must enter the desired market. The entrepreneur can carry out a new entry into a market through the setting of a start-up firm, an existing firm or via internal corporate venturing (Gooderham et al. 2013). In this study, the scope of research will be narrowed down to start-ups. Therefore, the aim is to measure the effect of tax progressivity on enterprise birth rate.

Furthermore, Ireland is and has been considered as a ‘perfect’ environment for firms to operate in. With the low corporate tax rate of 12.5% the country applies (CSO, 2017), that specific consideration is self-evident. However, taxes exist for a reason. That reason is for a country to generate revenue to finance government expenditure. As mentioned in the introduction, while the corporate tax rate in Ireland makes the country a paradise for big multinationals like Apple, Google and Amazon; the income tax rate applied can be seen as making up for the lack of government revenue coming from the corporate tax (OECD, 2017). Due to the low corporate tax rate, other taxes most often are, in some way, higher relative to other EU countries. In order
to sustain a low corporate tax rate, Ireland applies the most progressive individual income tax system in the EU. Those most affected by this system are start-up firms (Irish Tax Institute, 2015).

When starting a business, entrepreneurs must choose the legal form and structure the firm will adopt. In the case of opting for a sole proprietorship or partnership, the business’ profits will be entirely affected by income tax (Meehan, 2010). The progressivity and high marginal tax rates at relatively low levels of income are arguably negative influencers for the profitability of these firms, and therefore act as a barrier to entrepreneurial entry or enterprise births (OECD, 2002). In addition, they may also be responsible for the early exit of entrepreneurs from their start-up projects. Instead, when entrepreneurs adopt a Limited Liability Company structure, the tax rates paid differ significantly. While the company must pay corporate tax, all extracted profits in the form of salaries and dividends are also affected by income tax (Meehan, 2010). In other words, the high progressivity of the Irish tax system can be argued to act as a barrier for entrepreneurial entry, due to the burden it puts on start-up firms wishing to enter a new market.

There is scarce empirical literature on progressive income tax, and the theoretical literature is ambiguous. Most studies conducted focus on the general effect of a progressive tax income on entrepreneurship. This may explain the different conclusion researchers have come to. However, this study will be based on determining whether tax progressivity has any significant effect on the birth rate of start-ups. After establishing a theoretical argument for the over progressivity of the Irish income tax rate and comparing it to a potentially more favourable tax system (that of the UK), a quantitative study will be conducted. This study consists of examining the level of tax progressivity for a number of different European countries, and ascertaining whether it has an effect on the enterprise birth rate in the respective countries. Depending on the results, the previous arguments shaped around the Irish tax system will be proven right or wrong, and a more assertive conclusion will be reached. Therefore, this research will contribute in a positive way to the existing literature on the subject.

The research conducted in this thesis will be done through a descriptive perspective first, and will be followed by a more analytical approach. Firstly, regarding the descriptive purpose, a literature review will be carried out. This will describe the general view in the field of income tax and entrepreneurship. In addition, the existing research on income tax progressivity and
entrepreneurship will also be described. After that, the current situation regarding progressive income tax and start-ups in Ireland will be portrayed. This research will be based on the already available theoretical and empirical data on the topic. Secondly, an analysis of the influence of the progressive income tax on the profitability of start-ups will be conducted. This will be done through the conclusions drawn from the literature review. The results will then be compared to the situation in the UK to establish a deeper understanding of the research question. Lastly, a quantitative study will be conducted in order to confirm the previously argued effect of tax progressivity on entrepreneurial activity. This will serve to back up the arguments built through the theoretical framework through an empirical method.

4. Purpose
The purpose of this paper is to examine the influence of a progressive income tax system on entrepreneurial activity. The effect of income tax progressivity on entrepreneurial activity will be quantitatively tested, as well as theoretically illustrated through the situation in Ireland.

5. Frame of reference
5.1 General view on Income Tax and Entrepreneurship
The general view in the field of income tax and entrepreneurship displays a negative relation between income tax and entrepreneurship. According to Kirzner’s definition of an entrepreneur; taxes, in general, reduce profit opportunities and therefore reduce the incentive of entrepreneurial entry (Baliamboune-Lutz and Garello, 2011). However, looking at the wider spectrum of theoretical literature in this field, different trends can be found. Some existing papers indicate that income tax has an ambiguous effect on entrepreneurship. For example, several studies like those carried out by Domar and Musgrave (1944) and Long (1982b) display a positive effect, which contradicts the general view.

The origin of the division of opinion regarding the effect of income tax on entrepreneurship is based on the different ways of measuring this relationship. The primary methods for evaluating the relationship are conducted through analysing the influence of income tax on the decision to become self-employed and on entrepreneurial risk-taking. Regarding entrepreneurial risk-taking, the literature assumes that higher risk correlates to higher business losses and therefore a higher entrepreneurship exit rate (Gentry and Hubbard, 2000).
Furthermore, Fossen and Steiner (2009) study the relation between income taxes and entry into entrepreneurship through German micro-level data. They base their research on two German tax reforms where taxes were reduced. The study indicated that the tax reductions led to an increase in the probability of becoming self-employed. Therefore, they concluded a negative relation between income tax and entrepreneurship. Fossen and Steiner (2009) concluded in their study that, based on entry into entrepreneurship, the relation between income tax and entrepreneurship is negative. In addition, similar results were obtained in a study conducted by Hansson (2010) on the relation between income tax and entry into entrepreneurship. The data was based on Sweden and the findings concluded a negative relation between income tax and entrepreneurship.

Regarding entrepreneurial risk-taking, Cullen and Gordon (2007) examined the relationship between income tax and entrepreneurship based on start-up firms pursuing projects of high-risk. The study concluded a positive relationship between the two factors. The findings revealed that a cut in income tax reduces the incentive to take risks. The literature regarding entrepreneurship often assumes the entrepreneur to be a risk-loving individual (Baliamoune-Lutz and Garello, 2011). Therefore, in tune with the findings of Cullen and Gordon (2007), the discouragement of taking risks correlates to a reduction in entrepreneurial activity.

Moreover, and contrary to many other studies such as those conducted by Fossen and Steiner (2009) and Hansson (2010), Cullen and Gordon (2007) found that low personal income taxes actually discourage entrepreneurial activity. Their main argument for this was that in the case of entrepreneurial losses, the low tax rates would lead to a lower tax value of offsetting losses. This can be related back to risk, and is applied mostly to risk averse individuals who weigh the chances of making a loss much more significantly than a less risk averse entrepreneur would.

5.2 Progressive Income Taxation and Entrepreneurship

When narrowing the field of income tax and entrepreneurship to the influence of tax progressivity on entrepreneurial activity, it can be found that the amount of studies conducted is relatively scarce. However, the literature available does generally display that higher tax progressivity correlates to a more negative impact on entrepreneurship.

The study conducted by Hansson (2010) measures the impact of a progressive income tax on self-employment through evaluating the impact of marginal and average tax on entrepreneurial
entry. The paper concluded that a progressive income tax reduces entrepreneurship entry when the ability to incorporate is absent. Gentry and Hubbard (2000) found similar results in their research based on US household panel data. Their study concluded that a reduction in the progressivity of income tax correlates to an increase in entrepreneurship entry. Therefore, the relationship between a progressive income tax and entrepreneurship is negative. In addition, Ferede’s (2011) study on the relation between tax progressivity and self-employment display similar results. The paper is based on Canadian provinces and concludes that a reduction in income tax progressivity correlates to an increase in entrepreneurial activity.

However, Gentry and Hubbard (2004) also indicated that in some cases these correlations may differ. Their paper found that if the tax system provides insurance against risk, the relationship between a progressive income tax and entrepreneurship will be positive. They argue that when a higher progressivity in the tax system provides the individual entrepreneur with insurance against risk, it may benefit the overall entrepreneurial activity. This theory applies mainly to countries with highly risk-averse entrepreneurs and therefore a relatively low level of entrepreneurial activity.

In addition, a progressive income tax system supposes increasing marginal tax rates which are directly related to a rise in income. A study carried out by the OECD’s Directorate for Science, Technology and Industry (2002) claimed that lower marginal tax rates enhanced entrepreneurial activity. The reason for this is that lower marginal tax rates allow small firms to invest, hire and grow with more ease, increasing the profitability and entry rates of start-ups. The paper also mentions that while an effort has been made to decrease top marginal tax rates among OECD countries, it is recommended to reduce these rates further as well as broadening the tax base. This is due to the tax burden at the personal level being significantly high for most OECD countries (OECD, 2002).

### 5.3 Taxation of incorporated and unincorporated start-ups

Taxation is a very significant factor in the growth and profitability of any business. However, different businesses are affected differently by taxes. This can be due to the size of the business, the tax reliefs they receive or simply due to the form the business operates in (Incorporated or Unincorporated) (Meehan, 2010). The latter reason means that a major determinant for entrepreneurs to launch a business is the tax treatment they will receive from the government in the country they operate (Liu, 2012). Taxation is not only a determinant for whether to launch
a business or not, but also for the legal form chosen to run the business (Meehan, 2010). When an entrepreneur starts a business, it will generally be structured as a sole proprietorship, a partnership or a limited liability company. The former two mean that the business owner and the firm form a single and unincorporated entity and are taxed jointly through income tax; while the latter makes the firm a separate and incorporated entity from the owner, leaving the firm liable for corporate tax and the owner liable for income tax (Meehan, 2010).

In Ireland, while the corporate tax rate of 12.5% is very attractive, it should be kept in mind that when the profits are extracted by the individual owner (either in the form of salaries or dividends) these will also be liable for income tax (Meehan, 2010). In other words, incorporated firms often suffer from double taxation: They pay corporate tax at the firm level and income tax at individual level. Still, since non-extracted profits are taxed at a very low corporate tax rate and companies can qualify for corporate tax exemption in the first three years of existence, entrepreneurs in Ireland tend to benefit more by setting up their business via a limited liability company (Meehan, 2010). While taxation in Ireland tends to encourage the creation of incorporated firms, this is not the case elsewhere. Taking the example of the UK, 77% of the 3.7 million existing businesses are unincorporated. It is key for the overall economic health in countries like the UK that the government targets reliefs for these firms as well as for incorporated entities (Freedman, 2008).

Similar to the case in Ireland, it seems to be a trend among many countries to have in place corporate tax systems that are more favourable for small firms relative to larger firms (OECD, 2002). While this may be an effort to enhance the growth of start-ups and entrepreneurial activity, the effect of income tax often outweighs that of corporate tax at these early stages of a firm. Therefore, it is advisable to place a higher importance on income tax when aiming to induce entrepreneurial activity and start-up growth.

On the one hand, both the UK and Ireland tax all corporation profits at a steady rate. However, the corporate tax rate in the UK is significantly higher than in Ireland (20% in the UK and 12.5% in Ireland) (Clements, 2016). On the other hand, income is taxed progressively depending on the amount earned by an individual or unincorporated business. While both income tax systems are progressive, Ireland has the most progressive system in the EU (Irish Tax Institute, 2015). The higher corporate tax rate and the lower progressivity of the income tax system in the UK may explain why the rate of unincorporated firms is higher than in Ireland.
5.4 Effect of a progressive income tax system on entrepreneurship in Ireland

The following section will first discuss the entrepreneurial environment in Ireland. Then, it will analyse more in depth whether tax policy and progressivity have a negative effect on entrepreneurship, and the reasons for it. More specifically, it will evaluate the effect that a progressive tax system like the Irish one has on entrepreneurs, as well as their entry and exit from new businesses.

In recent years, the entrepreneurial environment in Ireland has become more challenging. One of the main challenges for entrepreneurs in Ireland is the progressivity level of the income tax system (Irish Tax Institute, 2015). This progressivity discourages sole proprietors, partners and companies to launch and develop businesses, due to the large tax compliance burden they will face (Irish Tax Institute, 2015). Although it is commonly believed that large companies provide most of the jobs in a country, 70% of the active population in Ireland is employed by small businesses, many of which are composed of start-ups. From this, it can be concluded that entrepreneurs do have a significant impact in an economy, and that the tax system should be at least as accommodating for the profitability of start-ups as it is for large companies (Irish Tax Institute, 2015).

A progressive tax system is a system where the average tax rate paid by an individual increases with income (Rosen and Gayer, 2012). Ireland having the most progressive income tax system in the EU leads to low income earners having a low tax burden and higher income earners having a high tax burden. In addition, the income bracket at which a higher tax rate must be paid is relatively low. Individuals that earn less than 34550 EUR a year pay a tax rate of 20%, while individuals who earn more than that amount pay a marginal income tax rate of 40%. This means that they will pay a 40% tax rate on every additional Euro they earn after the 34550 EUR mark. Furthermore, if the Universal Total Charge (USC) and the Pay Related Social Insurance (PRSI) tax payables are added, the marginal tax rate equates to 52% for employees (40% income tax, 8% USC and 4% PRSI) and 55% for the self-employed earning above 100000 EUR (40% income tax, 11% USC and 4% PRSI) (Caulfield, 2016). It is this marginal tax rate and the application of it to a relatively low level of income, as well as the added USC percentage points for entrepreneurs that is hampering the entrepreneurial entry, performance and therefore economic growth in Ireland (Irish Tax Institute, 2015).
Furthermore, countries like Denmark and Sweden have significantly higher marginal tax rates in the higher income brackets than other European countries. However, having the highest marginal tax rate does not necessarily mean that the tax system is more progressive. At the average wage level, the tax burden for an Irish individual is the 3rd highest amongst OECD countries, significantly superior to that of a Swedish or Danish individual (OECD, 2016). This means that the average self-employed individual in Ireland will be subjected to a higher tax burden than the average self-employed individual in most other European countries, due to falling into a higher tax bracket at a lower income level.

While entrepreneurship is a risky activity, it is a common business choice in Ireland. In 2016, the entrepreneurship levels returned to the rates of before the financial crisis of 2008. These levels were equal to 8 in every 100 people between the ages of 18 and 64 being either a fledgling entrepreneur or a new business owner (Fitzsimons and O’Gorman, 2017). This left Ireland ranked 5th in Europe in the TEA index, which measures entrepreneurial abundance. These high entrepreneurship rates have arguably contributed to the country’s recovery from the financial crisis. A significant factor for the encouragement of starting a new business is the variability of income for entrepreneurs. Self-employment leads to a higher income distribution mobility, both upwards and downwards. In other words, a self-employed individual has a much higher income potential than a paid employee (Gentry and Hubbard, 2000). Nevertheless, while Ireland ranks high on entrepreneurial abundance, the country was ranked 17th in the Global Entrepreneurial Index (GEI) in 2015, which measures the health of the entrepreneurial ecosystems in a nation. While this position is high, there has been little improvement over the years (In 2013 they were also ranked 17th), whereas other countries like Germany and the UK jumped several positions between 2013 and 2015 (From 15th to 11th for Germany and from 14th to 4th for the UK) (Ács and Szerb, 2015).

Despite the high entrepreneurship rates in Ireland, the level of business exits is also significantly high. In 2017, 1.8% of the adult population in Ireland exited a business that was discontinued (Fitzsimons and O’Gorman, 2017). The main reason for this is lack of profitability (30% of the cases), followed by family reasons and other job opportunities (19% and 16% of the cases, respectively) (Fitzsimons and O’Gorman, 2017). The high levels of entrepreneurship as well as the high rate of business exits lead to the conclusion that risk aversion in Ireland is relatively low. These figures indicate that the Irish population is willing to engage in riskier business
choices like starting a company, as well as showing low satisfaction when the profits are too low.

According to Gentry and Hubbard (2004), a progressive tax system encourages business entry if there is sufficient insurance against bad outcomes, as long as the population is sufficiently risk averse. In other words, a country where uncertainty avoidance is high tends to improve the entrepreneurial environment when a progressive tax system is in place. This is because they are willing to sacrifice higher profits for job and income security. Matching these arguments with the previously mentioned figures of entrepreneurship entry and exit rates in Ireland, it can be hypothesised that a very progressive income tax system is not favourable for the profitability of Irish start-ups.

With a progressive income tax system like the one present in Ireland, entrepreneurs may be discouraged by the government taking a larger share of the profits from successful entrepreneurs than from less successful ones (Gentry and Hubbard, 2000). This effect is especially present in Ireland, where the highest marginal tax rate is applied after a relatively low-income level (34550 EUR). A deduction in a large share of profits leads to a higher likeliness of lack of profitability and, therefore, a lower rate of entrepreneurial entry and higher rate of exit. This effect on the profits of entrepreneurs is emphasised by the higher tax rate imposed on the self-employed in Ireland. As mentioned previously, high earning individuals (above 100000 EUR a year) who are self-employed, are taxed at a rate of 55%, 3 percentage points higher than employed individuals (Irish Tax Institute, 2015).

It may be concluded from this section that the level of entrepreneurial activity in Ireland is high. This would contradict the argument of the Irish tax system having a negative effect on entrepreneurship. However, there are two main points made regarding the negative effect of the level of tax progressivity on entrepreneurial activity:

Firstly, the elevated tax progressivity is argued to be inhibiting Ireland’s capacity to increase entrepreneurial entry year on year. This is explained through a comparison to the situation in the United Kingdom which, in spite of also having high entrepreneurial levels, has managed to climb up ten spots in the GEM rankings between 2013 and 2015. Moreover, Germany climbed four spots in the same period. However, Ireland remained stationary in 17th place between
those years, which indicates an entrepreneurial underperformance in contrast to the other two countries.

Secondly, the high level of entrepreneurial exit also serves as an indicator that there is room for improvement in the entrepreneurial sector. The paper argues that the high levels of entrepreneurship as well as the high number of business exits in Ireland indicates a non-risk averse population, according to Gentry and Hubbard (2004).

These two points could be the consequence of many different factors. However, since previous literature is consistent in defending that the negative effect of tax progressivity is enhanced when the population is non-risk averse, and Ireland has the most progressive income tax system in the EU, it is accurate to claim that this could be one of the main factors inhibiting entrepreneurial activity. This is why tax progressivity was isolated as the main influencer of entrepreneurial activity for this study. In the quantitative section of the paper, one important criterion for choosing the sample countries was their non-risk averse populations; this was done to increase the validity of the study.

5.5 The effect of a progressive income tax system on entrepreneurship in the UK

The United Kingdom was ranked as the fifth entrepreneurial hotspot in Europe by the World Economic Forum (Gray, 2017). As in Ireland, individuals that desire to start a business must decide what legal form to adopt for their company. In addition, the way each legal structure is affected by taxation is almost identical to that of Ireland. Sole proprietorships and partnerships must only pay income tax, while companies pay corporate tax plus income tax when profits are extracted in the form of salaries or dividends.

The UK has significantly improved the health of their entrepreneurial ecosystem over the years, and managed to jump 10 places in the GEI rankings from 2013 to 2015 (Ács and Szerb, 2015). There are many reasons and measures taken that have led to this significant improvement. An example is the present Entrepreneurs’ Relief that was introduced in 2008, which allows start-ups that qualify for the relief to benefit from a reduction in the Capital Gains Tax (Irish Tax Institute, 2015). In addition, the income tax system that is present in the UK — and that affects the majority of start-ups in the country — has arguably contributed to the mentioned increased profitability of entrepreneurs.
As mentioned throughout the paper, the income tax system established in the UK is a progressive schedule, where individuals are subjected to different tax rates depending on their income. However, the progressivity of this tax system is somewhat lower than the system in Ireland. Earnings below 13072 EUR are exempt from income tax. Earnings between 13073 EUR and 48878 EUR are taxed at 20%, while earnings between 48879 EUR and 170504 EUR are taxed at 40%. Any income that is superior to the upper limit of this last bracket is taxed at 45%\(^1\) (Gov.uk, 2017). These tax rates are much more favourable for entrepreneurial profit, especially at lower levels of income. This explains the higher entry rate and overall superior entrepreneurial health in the UK.

The main difference observable to the Irish income tax regime is that the higher tax rates are applied at much higher income levels in the UK than in Ireland. In other words, lower income earners enjoy much lower tax pressure in the UK than in Ireland. This offers entrepreneurs a higher profit potential in their initial stages of starting a business, which should theoretically lead to increased entrepreneurship as a whole as well as a higher profitability and lower exit rates in the beginning stages of a start-up.

### 5.6 Enterprise birth and survival rates in Ireland and the UK

Two significant entrepreneurial health indicators in a country are the rate at which firms are born and the percentage of these firms that survive in the following years. While both countries have high levels of entrepreneurial activity and are ranked high regarding entrepreneurial health, it has been argued throughout the paper that the pronounced progressivity of the tax system in Ireland may be inhibiting start-up market entry, profitability and the overall potential for further entrepreneurial activity. For this reason, the following section will compare actual figures for enterprise birth rates and enterprise survivability in Ireland and the UK.

Firstly, entrepreneurial activity starts with entrepreneurial entry or, in other words, the enterprise birth rate. Countries with a higher enterprise birth rate are considered to have elevated entrepreneurial activity (Ahmad and Seymour, 2008). Entrepreneurial entry can be measured by dividing the total number of enterprise births in a country in a given year divided by the total number of active enterprises in that country. Looking at these figures for the UK and Ireland in the time period between 2011 and 2015, it can be observed that the average

\(^1\) The tax brackets for Scotland differ slightly (Gov.uk, 2017)
enterprise births in the UK was of 322,217 per year (Gov.uk, 2016), whereas the average enterprise births in Ireland was of 15,521 (CSO, 2016). This number alone does not lead to any conclusion, since the UK’s population and therefore number of active enterprises is significantly superior to Ireland’s. However, when dividing these numbers with the respective number of active enterprises during those five years we obtain an enterprise birth rate of 13.01% for the UK and 6.38% for Ireland (CSO, 2016). This means that the entrepreneurship entry rate is higher in the UK than in Ireland. As supported throughout the paper, the progressivity of the Irish tax rate as well as the high marginal tax rate at relatively low-income levels is a burden for entrepreneurs and may contribute to this lower enterprise birth rate.

Secondly, a major indicator for profitability is the enterprise survival rate within a country, since non-profitable firms will not manage to survive. As mentioned previously, one of the factors that creates a burden for the Irish entrepreneur is not only the progressivity of the income tax system, but also the low-income level at which the highest marginal tax rate applies. For this reason, it is expected that Irish start-ups struggle the most at their initial stages, where income is most likely to be low and the tax burden is significant. This theory is congruent with the actual findings, since the average enterprise survival rate in the first year of existence for Irish firms was found to be 87.2% between 2010 and 2014 (CSO, 2016), which is lower than the UK’s average of 91.2% (Gov.uk, 2016).

By looking at the specific case of Ireland and the UK, there is an inverse relation between tax progressivity and entrepreneurial activity. However, this claim cannot be supported due to the low number of observations and the lack of control of other factors that may also have an influence on this. Therefore, a study needs to be conducted in order to prove the effect of tax progressivity on entrepreneurial activity. This will allow to support the claim and support the argument of the UK having a superior income tax system when it comes to promoting entrepreneurship.
6. Hypothesis
According to Gentry and Hubbard (2000), tax progressivity has a negative effect on entrepreneurship. In this study, it is argued that a progressive income tax system acts a “success tax” for entrepreneurs. The reason for this denomination is that as a tax system becomes more progressive, the government takes a higher share of the profits earned by successful entrepreneurs. Moreover, since entrepreneurs risk earning very low income in the case of not being successful with their start-up business, it can be concluded that a progressive tax will discourage entrepreneurship.

The fact that in theory tax progressivity is inversely related to entrepreneurial activity can help shape the following hypothesis:

“As the progressivity of the income tax system in a country increases, the enterprise birth rate of that country will decrease.”

7. Methodology
There are two main research methods that can be applied to a study of this nature: A quantitative research method or a qualitative research method. Hence, the choice of research for this paper lies mainly between these two alternatives. In turn, these methods involve the collection of quantitative data or qualitative data, respectively. These types of data differ significantly from one another. On the one hand, quantitative research consists of the collection of numerical data which is then employed to explain a particular phenomenon by proving or disproving a premeditated hypothesis (Nayak, 2015). On the other hand, qualitative research refers to a set of descriptive and narrative case studies, where the researcher must identify patterns within the collected data (Nayak, 2015). As opposed to proving or disproving a hypothesis, qualitative data offers the opportunity for more flexible and open-ended interpretation of the findings.

According to Nayak (2015), quantitative research should be used when wanting to test the validity of a hypothesis, when data can be obtained in numerical form, when the data can be obtained in the form of ratios and averages, and when trying to measure a certain trend. These four conditions fit exactly with the investigation requirements of this paper. Firstly, the theoretical framework builds up to the formulation of the hypothesis mentioned previously, which aims to test the effect of a certain factor (tax progressivity) over another (enterprise birth rates). Secondly, the data required to test this hypothesis matches the numerical and ratio
requirements, since both tax progressivity and enterprise birth rates are represented by numerical values between zero and one. Lastly, the objective is to ascertain whether there is any kind of trend between tax progressivity levels and entrepreneurial activity, in order to support the theoretical argument that Ireland’s progressive tax system is hindering entrepreneurial activity. It is for these reasons that a quantitative approach will be taken in order to study the relationship between tax progressivity and entrepreneurial activity.

Moreover, one of the main advantages of a quantitative method is the ability to systematically analyse large amounts of data (Nayak, 2015). This can be done by using certain data analysis programmes such as SPSS. In addition, the quantifiable results obtained by using quantitative methods can be considered objective and, unlike in the case of qualitative studies, the bias factor is very much reduced. This will allow an objective evaluation of the relationship between tax progressivity and enterprise birth rates, which will potentially reinforce the arguments made throughout the theoretical framework of the paper.

Nevertheless, making use of a quantitative method will also lead to certain limitations to the findings obtained in the study. The main disadvantage will be the lack of a human factor in the interpretation of the results (Nayak, 2015). The human factor refers to the flexibility and open-endedness of the data evaluation, which is absent when interpreting numerical results. Moreover, this interpretative advantage allows the author to accommodate the results to the set theory, helping to reach a more fruitful and favourable conclusion to the report. In the case of a quantitative method, if the results do not match the hypothesis the study loses large significance and validity.

7.1 Research philosophy
Identifying the research philosophy of a paper facilitates the creation of a coherent research process by making appropriate and consistent assumptions. This process will bind all elements of the research process together and will help yield a more rational study (Saunders et al., 2009). Generally, there are four types of research philosophies that can be identified and each influence the research process in different ways. These philosophies are positivism, pragmatism, interpretivism and pragmatism (Saunders et al., 2009).

The philosophical stance of the research conducted in this paper is mainly positivist. This can be explained by several different characteristics that normally shape a positivist philosophy.
These include the authors taking an objective stance towards the results, the facts being observable and measurable, and the samples drawn being large, numerical, structured and quantitative (Saunders et al., 2009). Furthermore, the hypothesis tested in the study should be drawn from a theoretical framework which is built through existing literature (Saunders et al., 2009).

These characteristics that shape positivism make it the most suitable philosophy for this paper. This is due to the paper drawing a hypothesis from an analysis on previous literature, which focuses on the effect of tax progressivity on entrepreneurial activity in general and then in Ireland specifically. Furthermore, a quantitative study is conducted to test the extent of the effect of tax progressivity on entrepreneurship. The result of this research will help determine both the effect of tax progressivity on entrepreneurship as well as whether it is a major inhibitor of entrepreneurship in Ireland (due to them having the most progressive income tax system in the EU).

7.2 Research approach

Within the research process of a paper, there are three main types of approaches that can be taken. These are identified as the inductive approach, deductive approach and abductive approach (Saunders et al., 2009). The approach taken has a direct influence on the reasoning of the research process of a paper.

The research approach taken in this paper is mostly deductive. A deductive approach is characterised by the collection of data used to evaluate a hypothesis which is related to a theory, as well as the aim to explain relationships between variables and concepts. In addition, the method should be highly structured to allow it to be readily replicated (Saunders et al., 2009).

In this paper, the analysis of previous literature helps build a proposition or hypothesis which is then subjected to testing. The form of testing is an OLS regression, which is a quantitative and structured method of testing that aims to test the effect of single or multiple variables on another. This explains the choice of a deductive approach in this paper.
8. Method

In order to prove or disprove the stated hypothesis, a quantitative study was conducted where the final aim is to carry out a regression analysis. This regression analysis will serve to indicate whether the progressivity of an income tax system (independent variable) has an effect on the enterprise birth rate (dependent variable). The data was collected for fifteen European countries along five different years, and the aim will be to analyse the obtained results and refer them back to the specific situation of Ireland. The results will help determine whether the highly progressive income tax system present in Ireland has a negative effect on the profitability of start-ups and entrepreneurial activity as a whole. Moreover, the countries chosen for this study are all ranked in the top 35th of the GEI index. This index measures entrepreneurial activity and health, which will minimise the effect of risk as an influencer for enterprise birth rates in this study. This is because the risk aversion of a highly entrepreneurial country can be considered low relative to countries with lower entrepreneurial activity (Scorbureanu and Holzhausen, 2011).

To conduct a study of this type, one of the major stages is the collection of data or, in other words, what data to collect and why to collect it. First, the method used to measure tax progressivity was to obtain the coefficient of Residual Income Progression (RIP). This coefficient is calculated by getting the ratio of one minus the marginal income tax rate to one minus the average income tax rate (Ferede, 2011.) Furthermore, the RIP coefficient and tax progressivity are inversely related: The higher the RIP the less progressive the tax system is. Having this in mind, it is important to know that obtaining a single RIP figure for every country and every year is a challenging task, since marginal and average tax rates differ on an individual basis depending on the income bracket one belongs to (Ferede, 2011.) Since there is no available data that indicates the average and marginal tax rates for each income bracket (Ferede, 2011); the average tax rate, marginal tax rate and therefore the RIP coefficient are all based on the average annual wage rate for each country at each specific year.

There is a specific motivation behind the choice of RIP as a proxy for tax progressivity. According to Govori (2015), a progressive income tax means that an increase in income is proportionally lower than the consequential increase in tax liability. While there are disagreements between which is the most appropriate method to measure the degree of progressivity, the previously stated definition is widely accepted (Govori, 2015).
There are a number of different models that have been suggested in order to measure the degree of income tax progressivity. The coefficient yielded from the use of these models differ in both amplitude and degree of progression.

The first two models are the marginal rate progression and the average rate progression, which measure the change in the marginal income tax rate and average income tax rate, respectively. Both of these models are more simplistic methods than the RIP to measure income tax progressivity, since RIP simultaneously incorporates both average tax and marginal tax in the calculation of the coefficient.

The last alternative model to measure tax progressivity is referred to as the model of Liability Progression, which looks at how many times taxation has increased as income has increased at a given level. However, the paper written by Govori (2015) quotes: “With the exception of residual income progression, all methods of measurement have different range of the values that exceed the magnitude of ±1, even if the average rates are low.” This makes RIP the method that allows to assign a value to tax progressivity most readily. In other words, income tax progressivity is most easily measured when using the Residual Income Progression model, which is beneficial for this paper’s study.

Furthermore, other studies of similar nature have employed RIP as the prime measure for income tax progressivity. Ferede (2011) employed RIP to measure the progressivity of the differing income taxes among the different Canadian provinces. This method was then subjected to various robustness tests which confirmed the validity of the results obtained in that study.

Second, the variable used to interpret entrepreneurial activity was enterprise birth rate. This figure is obtained by dividing total enterprise births in one year, divided by the overall number of active enterprises in that same year. The main sources where the data was drawn from include the statistics bureau for OECD countries (“OECD stats”), as well as statistics platforms for individual countries such as “CSO” for Ireland, “Gov.uk” for the UK and “Statistics Denmark” for Denmark. These sources permitted the collection of figures such as the average wage and marginal tax rates, which consequently permitted the calculation of the average tax rate and the RIP. These also allowed to calculate the enterprise births and number
of active enterprises, which permitted the calculation of the enterprise survival rates for the different countries and years.

Enterprise birth rates are used as the main indicator of entrepreneurship in this paper. This is because this variable is employed as one of the main indicators of entrepreneurship in the OECD statistics databases, which mentions that “the Timely Indicators of Entrepreneurship dataset provides quarterly data on the number of enterprise entries, enterprise exits and the number of bankruptcies. Since new and young firms contribute critically to job creation, innovation and growth, observing recent trends of firm formation provides valuable information to policy makers” (OECD, 2018). In addition, enterprise birth rates were also employed as one of the four main indicators of entrepreneurship in a report conducted by the Canadian government that aimed to analyse the state of entrepreneurial activity in the country (Fisher and Reuber, 2010). The fact that enterprise birth rates is employed as a key indicator of entrepreneurship by official entities such as the OECD and Industry Canada strengthens the motivation to employ it as the main dependent variable in this study. Moreover, due to entrepreneurship being defined as “the activity of setting up a business, taking on risk in the hope of profit” (Oxford, 2018), enterprise birth rates are employed as the only variable to represent entrepreneurship in the empirical section of this study.

Furthermore, the validity of calculating the enterprise birth rates as the number of new firms/number of active enterprises can be assessed by looking at a number of official sources. The following sources state that enterprise birth rates are calculated in the same way as they were obtained for this study:

- The UK’s Office for National Statistics (Office for National Statistics, 2016) states that “new business registrations are referred to as business births and the birth rate is calculated using the number of births as a proportion of the active businesses”.
- The OECD (2007) states that, first of all: “The number of enterprise births is a key variable in the analysis of business demography as other variables such as the survival and growth of newly born enterprises are related to this concept”, and second of all: in order to identify enterprise births, the OECD outlines a number of steps to follow, which include “Step 1: The population of active enterprises should be identified”, and Step 2: “The new enterprises in year xx are a subset of the population of active enterprises in
year xx, which have taken up economic activity between 01.01 and 31.12”. They also state that “The basis of the method to be used is the concept of the population of active enterprises.”

- Chmielewska (2011) (Warsaw School of Economics) states that “Birth rates and death rates are calculated as a proportion of entries and exits of enterprises during the reference year to the mean number of active enterprises in the reference year (in percent)”. 

Besides the two main variables mentioned (RIP and enterprise survival rate), a series of other variables must also be obtained in order to be used as control variables in the regression analysis. That is, factors that will have an impact on the regression results but are not of relevance to this study in particular. These variables can be observed in Figure 1 and include average and marginal tax rates, corporate tax rate and unemployment rate.

Since some start-ups operate as incorporated businesses, corporate tax is a factor that affects a portion of the firms included in the collected data (Meehan, 2010). This makes it necessary to employ corporate tax rate as a control variable for the regression. Furthermore, the unemployment rate helps detect fluctuations in the business cycle that can affect enterprise survival rate, which is why it is also included in the set of control variables (Ferede, 2011). Finally, the average and marginal tax rates for people earning the average annual income are also included as control variables due to the burden they create on entrepreneurs. The control variables were chosen in accordance with previous studies that conducted a regression analysing the effect of progressivity on a certain variable related to entrepreneurship. See for example Ferede (2011), Bruce and Mohsin (2006) and, Kamhi and Leung (2005).

In the “empirical analysis” section of the paper, a correlation analysis will be conducted in order to find the Pearson correlation coefficient between all the variables which will be involved in the regression analysis. This will contribute to the understanding of the extent of the relationship of both between the dependent variable enterprise birth rates and the main independent variable (i.e. tax progressivity), as well as between the dependent variable and the other control independent variables. While, as mentioned in the hypothesis, a positive correlation is expected between tax progressivity and enterprise birth rates, it must be kept in mind that other factors (like those employed as control variables) are likely to influence the dependent variable as well. If the correlation coefficient obtained is significant, these control
variables will be employed in the regression analysis in order to isolate as much as possible the effect of tax progressivity on entrepreneurial activity.

### 8.1 Limitations

While the chosen method for this research paper has the potential to reach valuable conclusions, there are certain aspects that will limit the accuracy and veracity of the results. Aside from the previously mentioned drawbacks of conducting a quantitative study, the following elements can have a somewhat limiting effect on the chosen method:

First, in this paper, an OLS method of estimation is conducted. The limitations of the estimator used, are, amongst others, its failure to account for time-specific effects and endogeneity (Baltagi, 2005). The regression in this paper spans over five years and includes 15 countries. Thus, it combines cross-sectional and time-series data into one, panel data (Baltagi, 2005). The OLS treats the observations for all of the time periods as a single sample. Therefore, it fails to control for year effects, leaving out a lot of information (Baltagi, 2005). A business cycle fluctuation, in a specific year, may have a severe effect on the unemployment rate of that year. However, as the OLS fails to control for such year effects, the aggregate (time-series) trend may have an impact the results of the regression, resulting in more inconsistent findings (Baltagi, 2005). In addition, the OLS fails to address potential endogeneity issues. If the estimates in a regression are contaminated by endogeneity, the results of OLS may be less accurate (Baltagi, 2005). On the other hand, a dynamic model, such as the one applied by Baliamoune-Lutz and Garello (2014), does account for the difference in time, as well as, the cross-sectional data (Baltagi, 2005). As it controls for year effects, it does not, to an extent, allow aggregate (time-series) trends outside the regression have a major impact on the findings. In addition, a dynamic estimator solves the potential endogeneity issue, overlooked by the pooled OLS estimation (Baltagi, 2005).

The regression is conducted under the assumption that the variables are exogenous. However, some variables like the average tax rate and unemployment rate are potentially endogenous. The average tax rate, for example, may be influenced by the success of enterprises. The unemployment rate, on the other hand, may be affected by the birth, or death, of an enterprise. Such factors potentially warrant the OLS results as biased and inconsistent.
Second, factors like risk aversion are not readily measured numerically. Risk aversion was controlled by choosing countries with significantly high entrepreneurial activity. However, the exact influence of risk on the results is not measured in this study and is therefore a limitation to the results.

Third, tax progressivity and even RIP can be measured in various ways. Tax progressivity is complicated to measure and can be calculated by using different methods. While this study calculated progressivity by employing the coefficient of Residual Income Progression, it can also be obtained by other coefficients like the coefficient of progressivity derived from the Gini Index (Suits, 1977). Alternatively, a second analysis employing the coefficient of liability progression would have increased the accuracy and extensity of the study (Govori, 2015).

Fourth, it was mentioned previously in the text that calculating enterprise birth rates as a fraction of newly formed enterprises over existing firms is a valid and commonly used approach. However, the accuracy of the study would have increased by adding an alternative measure of entrepreneurship. The fact that RIP is based on the earnings of individuals, and enterprise birth rates is based on firms, leaves more margin of error than if both variables were based on either firms or individuals. Hence, calculating enterprise birth rates as a fraction of newly created firms over working-age individuals could have lead to more accurate results.

Last, the study is based on a sample of fifteen countries and, in total, seventy-five observations. In comparison to other similar studies, this may be regarded as a small sample and, therefore, the results arguably less reliable. However, this paper follows a strict method of sampling. The chosen countries are all based in Europe and ranked top 35 in the GEI index. This assures similarity among the countries, regarding mainly entrepreneurial activity and risk aversion. Furthermore, the selected countries had to have a progressive income tax system in place to be applicable to the study. These conditions narrowed down the range of countries that could be selected and explains the limited number of observations.
9. Empirical analysis

9.1 Summary of variables

Figure 1. Summary statistics, 2010-2014

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>SD</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise birth rate</td>
<td>0.094</td>
<td>0.025</td>
<td>0.052</td>
<td>0.148</td>
<td>75</td>
</tr>
<tr>
<td>Coefficient of residual income progression (RIP)</td>
<td>0.887</td>
<td>0.076</td>
<td>0.745</td>
<td>1</td>
<td>75</td>
</tr>
<tr>
<td>Average income tax rate</td>
<td>0.270</td>
<td>0.107</td>
<td>0.075</td>
<td>0.466</td>
<td>75</td>
</tr>
<tr>
<td>Marginal income tax rate</td>
<td>0.353</td>
<td>0.113</td>
<td>0.140</td>
<td>0.584</td>
<td>75</td>
</tr>
<tr>
<td>Corporate tax rate</td>
<td>0.255</td>
<td>0.057</td>
<td>0.125</td>
<td>0.340</td>
<td>75</td>
</tr>
<tr>
<td>Unemployment rate</td>
<td>0.095</td>
<td>0.047</td>
<td>0.045</td>
<td>0.261</td>
<td>75</td>
</tr>
</tbody>
</table>

Figure 1 displays a statistics summary for the main variables employed in the study. This summary includes the mean, standard deviation, and minimum and maximum values for each of the different variables. This serves as a tool to identify the range of values in which the different variables fall into. One value worth highlighting is the maximum RIP figure of 1, which was drawn from Iceland in 2010 and represents no income tax progressivity at the average wage level. The reason for this is that on that specific year, a person earning the average wage paid the same marginal tax rate for all their earnings. However, the rest of the sampled years do show a low but existent progressivity in the Icelandic income tax system.

The enterprise birth rate is the main dependent variable of this investigation. Once the regression is conducted, the extent to which the enterprise birth rate varies in response to a change in RIP (income tax progressivity) will be examined. Moreover, the independent variable for this study is the RIP coefficient, which represents the degree of income tax progressivity and is inversely related to it (higher coefficient equals lower progressivity).
As clarified in the methodology, the influence that the last four variables in Figure 1 can have on entrepreneurial activity must be accounted for. This is key to isolate as much as possible the specific relationship that this study is focused on: tax progressivity and enterprise birth rate.

9.2 Correlation analysis

Figure 2. Pearson correlation coefficients between the variables

<table>
<thead>
<tr>
<th>2010-2014</th>
<th>Enterprise Birth rate</th>
<th>RIP</th>
<th>Average tax rate</th>
<th>Marginal tax rate</th>
<th>Corporate tax</th>
<th>Unemployment rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise Birth rate</td>
<td>1</td>
<td>0.244*</td>
<td>-0.037</td>
<td>-0.113</td>
<td>-0.174</td>
<td>-0.084</td>
</tr>
<tr>
<td>RIP</td>
<td>0.244*</td>
<td>1</td>
<td>-0.095</td>
<td>-0.549**</td>
<td>0.028</td>
<td>-0.018</td>
</tr>
<tr>
<td>Average tax rate</td>
<td>-0.037</td>
<td>-0.095</td>
<td>1</td>
<td>0.882**</td>
<td>-0.203*</td>
<td>-0.010</td>
</tr>
<tr>
<td>Marginal tax rate</td>
<td>-0.113</td>
<td>-0.549**</td>
<td>0.882**</td>
<td>1</td>
<td>-0.189</td>
<td>-0.026</td>
</tr>
<tr>
<td>Corporate tax rate</td>
<td>-0.174</td>
<td>0.028</td>
<td>-0.203*</td>
<td>-0.189</td>
<td>1</td>
<td>-0.019</td>
</tr>
<tr>
<td>Unemployment Rate</td>
<td>-0.084</td>
<td>0.018</td>
<td>-0.010</td>
<td>-0.026</td>
<td>-0.019</td>
<td>1</td>
</tr>
</tbody>
</table>

*. Correlation is significant at the 0.05 level (1-tailed).

**. Correlation is significant at the 0.01 level (1-tailed).

The numbers displayed in Figure 2 represent the Pearson correlation coefficients between all the variables (both dependent and independent) employed in this study. This coefficient is defined as a measure of the strength of linear association between two variables (Sedgwick, 2012.) The measure is represented by a numerical value which ranges between -1 and +1. Therefore, all negative numbers represent an inverse relationship between two variables; while all positive numbers show a positive correlation.
There are many Pearson correlation coefficients obtained in Figure 2 that are valuable to this investigation. First and foremost, the results show a positive linear relationship between the main independent variable (RIP) and the main dependent variable (Enterprise survival rate) represented by a correlation coefficient of 0.282. Since RIP is inversely related to progressivity, the coefficient indicates that as tax progressivity decreases (or RIP increases), the enterprise birth rate increases. This data is consistent with the arguments discussed previously which showed Ireland having a lower enterprise birth rate than the UK, while having a more progressive income tax system in place. Having conducted a correlation test with seventy-five observations, the influence of tax progressivity on entrepreneurial activity can be supported more conclusively.

Other relevant correlations include those between the corporate tax rate and enterprise birth rate as well as the unemployment rate and the enterprise birth rate. Both of these correlations show a negative coefficient (-0.174 for corporate tax rate and -0.257 for unemployment rate), representing inverse relationships. In other words, the enterprise birth rate decreases to some extent when the corporate tax rates and unemployment rates rise. This shows the relevance of these factors when analysing entrepreneurial activity and explains why they will be used as control variables in the regression.

The significance level of the data is measured at a 95 % (*) and a 99 % (**) confidence level. Significance is, broadly explained, a term which displays the level of reliability of a certain value (Anderson and Sweeney, 2017). In the case of Figure 1, this can be applied to the correlation between variables. A value which is statistically significant at a 99 % confidence level means that the correlation carries a 1% margin of random error. The values obtained in Figure 1 differ in their significance level and some are ruled out as insignificant to the respective interval levels. For example, the relationship between the average tax rate and enterprise birth rate displayed in Figure 1 is deemed as insignificant at the mentioned confidence level. This indicates that the displayed correlation of -0.037 is not only attributed to these two variables as there is more than a 5% chance it may be affected by a different random variable. The correlation between the RIP and the enterprise birth rate is deemed as statistically significant at the 0.05 (95%) level due to the p-value being less than 0.05. This indicates that there is a relationship between the two specific variables and that at the 95 % level it is statistically reliable. The same applies to those statistically significant variables at the 99% level. However, those variables deemed statistically significant at the 0.01 level indicate that
the displayed correlation between the two variables is slightly more reliable relative to the 95% confidence level.

In order to further explore the relationships portrayed by the correlation coefficients in Figure 1, a multiple linear regression analysis will be conducted employing enterprise birth rate as the main dependent variable and RIP as the main independent variable, together with a total of four control variables to reduce the margin of error.

9.3 Regression analysis
Next, in order to test the dependence of enterprise birth rate (used as a proxy for entrepreneurial activity) on RIP, an OLS linear regression analysis was conducted. While the correlation analysis merely indicates whether there is a linear relationship between two variables, a regression analysis will help to investigate a multivariate relationship between the dependent variable and a combination of the main independent variable with the rest of the control variables. In other words, the dependence of one variable on the combination of another set of variables can be tested.

Since a linear relationship is hypothesised between the dependent variable and the independent variables, the regression can be represented through the following equation:

\[ Y = \beta_0 + \beta_1 * X_1 + \beta_2 * X_2 + \beta_3 * X_3 + \beta_4 * X_4 + \beta_5 * X_5 + \varepsilon \]

This equation portrays that the dependent variable (Y) is affected by the sum of the products between the independent variable and the beta coefficient (β) for that variable, together with the standard error. The standard error of the results was minimised by having a relatively elevated number of total observations as well as employing four control variables. With this, the influence of the main independent variable on the dependent variable can be assessed more objectively.
Figure 3. OLS regression analysis

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Enterprise birth rate</th>
<th>Enterprise birth rate</th>
<th>Enterprise birth rate</th>
<th>Enterprise birth rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIP</td>
<td>0.078*</td>
<td>0.078*</td>
<td>1.136**</td>
<td>1.1**</td>
</tr>
<tr>
<td>Average income tax rate</td>
<td>-0.003</td>
<td>-1.349**</td>
<td>-1.309**</td>
<td></td>
</tr>
<tr>
<td>Marginal income tax rate</td>
<td></td>
<td>1.526**</td>
<td>1.473**</td>
<td></td>
</tr>
<tr>
<td>Corporate tax rate</td>
<td></td>
<td></td>
<td>-0.063</td>
<td></td>
</tr>
<tr>
<td>Unemployment rate</td>
<td></td>
<td></td>
<td>-0.012</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.025</td>
<td>0.026</td>
<td>-1.086</td>
<td>-1.029</td>
</tr>
<tr>
<td>Observations</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.059</td>
<td>0.033</td>
<td>0.258</td>
<td>0.259</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (1-tailed).
** Correlation is significant at the 0.01 level (1-tailed).

The regression table displays a positive coefficient and a statistically significant Residual Income Progression (RIP). This indicates a negative relation between income tax progressivity and enterprise birth rate. The greater tax progressivity (lower RIP) correlates to a decrease in enterprise births. The four different columns represent the four times the regression was conducted, having included an extra control variable in each column. Therefore, the first column displays a regression analysis with only the two main variables and no control variables, while the fourth column shows the regression having included all of the control variables in the analysis.

The first column of Figure 3 is focused on the RIP coefficient. The data displays a coefficient estimate of 0.078. This implies that a one percent change in RIP indicates a 0.078 change in enterprise birth rates, which means that tax progressivity as an isolated variable cannot be used to predict any valuable change in the enterprise birth rate. The low estimate can be explained by the lack of control variables, which must be included in order to account for other factors that complement tax progressivity when analysing its effect on entrepreneurial activity. As displayed in Figure 3, the RIP coefficient estimate is increasing as control
variables are added. This shows that, as more factors are accounted for in the regression, the effect tax progressivity has on the dependent variable increases.

The second column displays the Beta coefficient for RIP when controlling for average tax rate. The coefficient is exactly the same as the one shown in the first column. The reason for this is that since the average tax rate is drawn from marginal rates at different income levels, the effect it has on the dependent variable alone is insignificant. Therefore, it does not have a valuable effect on enterprise birth rate nor it alters the effect RIP has on the enterprise birth rate. However, once marginal tax rate is added as a control variable in the third column, the influence on the enterprise birth rate significantly increases for all three variables. Furthermore, all three coefficients are significant at a confidence level of 99%, signifying an elevated degree of significance for this data. By employing these two control variables, a unit change in RIP means a change of 1,136 in the enterprise birth rate. Also, the adjusted R-squared value increases significantly with the addition of these control variables, showing an increase in the proportion of dependent variable variation that is explained by this linear regression model (0.258 as opposed to 0.033 before adding the control variables).

To present a deeper understanding of the impact of progressivity, the third column incorporates more control variables. As other variables may also influence the enterprise birth rates, it is deemed, in this case, as a necessary action. Previous research considers the unemployment rate and corporate tax rate as possible influencers (Ferede, 2011). The data displayed presents the unemployment rate and corporate tax rate as insignificant at the chosen confidence levels. Therefore, as presented, the effect of the added control variables on enterprise birth rate is very weak. The RIP coefficient estimate experienced a small decrease. However, it is still positive and statistically significant at the 99% confidence level. This indicates that the effect of income tax progressivity on enterprise birth rate is maintained after incorporating the two extra control variables. Furthermore, the decreasing effect of adding unemployment rate and corporate tax rate is also experienced in average income and marginal income tax rate. However, the effect on RIP is very low. Therefore, the control variables unemployment rate and corporate tax rate are not of significant importance to the research. In regards to the average income tax variable, it alone presents very few changes to the analysis. However, mutually added with the marginal tax variable it presents significant change. Thus, the variables average and marginal income tax can be considered to add significant value to this research.
9.4 Diagnostics
When conducting an OLS regression, there are a number of assumptions that grant the validity of the test. These assumptions include the normal distribution of the variables, a linear relationship between the variables, the absence of significant data outliers that could severely affect the results, and the assumption of homoscedasticity of the standardised residuals (Osborne and Waters, 2002). In this paper, three types of tests were run to increase the robustness of the results: a test of normality, a test to identify potential data outliers and a test of homoscedasticity.

9.4.1 Test of normality
Non-normally distributed variables can distort relationships and lead to bias in the results (Osborne and Waters, 2002). Normality can be tested in different ways and, in this case, the normality of the outcome (or dependent) variable was tested through a normal P-P plot of regression standardised residual. According to Yap and Yan (2010), the result of the normality test is acceptable when all the points are aligned in a reasonably similar pattern to the diagonal line in the P-P plot.

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: EBR

![Normal P-P Plot of Regression Standardized Residual](image)

Expected Cum Prob

Observed Cum Prob

1.0

0.8

0.6

0.4

0.2

0.0

0.0

0.2

0.4

0.6

0.8

1.0
As it can be observed from the plot, while some points slightly deviate to the right of the diagonal line, there is no significant divergence from normality in the results. This reinforces the validity of the regression.

Furthermore, there are two main statistical tests that also serve to test the assumption of the normal distribution of the dependent variable. These tests are the Kolmogorov-Smirnov and the Shapiro-Wilk tests.

<table>
<thead>
<tr>
<th></th>
<th>Kolmogorov-Smirnova</th>
<th>Shapiro-Wilk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statistic</td>
<td>df</td>
<td>Sig.</td>
</tr>
<tr>
<td>EBR</td>
<td>.129</td>
<td>75</td>
</tr>
</tbody>
</table>

a. Lilliefors Significance Correction

As shown in the table, both tests are statistically significant (Sig. is below 0.05) and confirm the normal distribution of the dependent variable.

### 9.4.2 Test for data outliers
When conducting a regression, the data must fall into a certain range from the mean. Samples of data that fall more than 3.3 or -3.3 standard deviations away from the mean can be considered outliers (Yap and Yan, 2010). In a linear regression, outliers can have a negative effect on the results and should be removed from the sample (Osborne and Waters, 2002).
As shown in the scatterplot, all the dots fall within 3.3 and -3.3 (on the X axis), which represents no major outliers among the data (Yap and Yan, 2010). This means that no observations need to be removed from the regression.

**9.4.3 Test for homoscedasticity**

An even variance of errors across all levels of the instrumental variables means that the assumption of homoscedasticity is met. This assumption can be examined through a scatterplot of the standardised residuals (Osborne and Waters, 2002). Contrary to homoscedasticity, heteroscedasticity occurs when the standardised residuals are unevenly scattered throughout the scatterplot. This can have a severe negative effect on the findings and possibly be the cause of a Type I error (Osborne and Waters, 2002).

As shown in the scatterplot above, there are no significant hints of heteroscedasticity amongst the data. While the variance of errors is larger closer to zero (on the X axis), it is more due to the abundance of residuals next to zero than to a presence of heteroscedasticity. The scatterplot shows a random distribution of the standardised residuals, and there is no hint of bow-tie shaped residuals nor fan-shaped residuals. These shapes are clear indicators of heteroscedasticity (Osborne and Waters, 2002), and can lead to bias in the results.
10. Conclusions
The effect, in terms of the impact on entrepreneurial activity, of the different sorts of income tax systems is an area of widespread attention. This is due to the importance of entrepreneurship to the well-being of a country’s economy. A number of studies have examined the relation between income tax and entrepreneurial activity, and the conclusion of those studies display differing results as they are conceived through different type of measurements. However, the general trend of results shows a negative impact of income tax progressivity on entrepreneurial activity.

In Ireland, the extremely high level of income tax progressivity is believed to pose a serious burden on the country’s entrepreneurial activity. The aim of this paper was to theoretically argue the effect of the progressive income tax system in Ireland on entrepreneurship, both the consequences and the potential benefits from adopting a less progressive tax system like the one present in the UK. Then, the quantitative study carried out measured the extent of the effect of tax progressivity on entrepreneurial activity, in order to reinforce the arguments made in the frame of reference.

The conducted study compiled aggregate data of fifteen European countries between the years of 2010-2014. The chosen countries are all ranked in the top 35 of the Global Entrepreneurship Index (GEI). As mentioned previously, the method of choosing countries through the GEI index is done to mitigate the influence of risk aversion on enterprise birth rates. Enterprise birth rate was employed as a proxy for entrepreneurship activity, while the degree of income tax progressivity was measured through the coefficient of Residual Income Progression (RIP).

The regression analysis showed that the RIP coefficient has an inverse relation with income tax progressivity. This means that a more progressive income tax system reduces enterprise birth rates and therefore entrepreneurial activity. Furthermore, this implies that Ireland’s current income tax system is hampering the country’s entrepreneurial performance. In addition, the results allow to attribute part of the entrepreneurial success of the UK to their lower income tax progressivity.
11. Discussion
This section will further discuss the results obtained in the study and relate it back to the theory, in order to evaluate the effect of the highly progressive income tax system on entrepreneurial activity in Ireland. Keeping the study results in mind, it will be evaluated whether the arguments discussed are relevant and allow to corroborate the presented conclusions. In addition, the limitations of the report as well as suggestions for further research will be discussed.

The data collection stage confirmed the claims made in the theoretical framework of the report, which referred to the higher progressivity of the Irish tax system relative to that of the UK, as well as the consequent lower enterprise birth rates. Looking at the five different years that were analysed, Ireland showed an average RIP coefficient of 0.7619, compared to the 0.8032 figure for the UK. This significantly lower RIP coefficient proves the average progressivity of the Irish tax system is higher than that of the UK. Moreover, this coefficient is not only lower that the UK’s coefficient, but it was also the lowest average RIP collected from the entire sample. This finding is also on track with the previous claim of Ireland having the most progressive income tax system in the EU (Irish Tax Institute, 2015). Furthermore, the enterprise birth rates were found to be lower in Ireland than in the UK, as mentioned in section 8 of the report.

Regarding the accuracy of labelling Ireland as having “the most progressive income tax system in the EU”, this was not just determined after using the RIP as a variable. Several sources such as the Irish Tax Institute, the European Commission and the OECD stated that Ireland has the most progressive income tax system in the EU. This was then confirmed by analysing this tax system employing the RIP. When breaking down the figures for income taxation in Ireland and the other countries employed in this study, it was confirmed that Ireland had the lowest RIP coefficient and therefore the most progressive income tax system at the average wage level.

In addition, the results portrayed under the “empirical analysis” section of the report will be summarised. The correlation analysis showed a linear relationship between the two main variables of the study: the RIP coefficient and the enterprise birth rate. While these results are on the right track to prove the hypothesis (“As the progressivity of the income tax system in a country increases, the enterprise birth rate of that country will decrease.”), they do not show anything beyond a linear relationship between the two variables. In order to reach a more compelling and valid conclusion, it was necessary to find the effect that a change in one of the variables had on the other variable. In order to do this, a regression analysis was conducted,
where the dependent variable was the enterprise birth rate and the independent variable was the RIP coefficient. Moreover, a set of control variables were added to the analysis in order to increase the accuracy of the study. The regression coefficient for the RIP was 1.1, indicating that a change of 1 in the RIP leads to a corresponding change of 1.1 in the enterprise birth rate.

Taking into account the results of the regression analysis, it can be deduced that a reduction in income tax progressivity does have a positive effect on the enterprise birth rate. Therefore, the previously proposed hypothesis can be accepted. In addition, while the existence of other factors that may affect enterprise birth rates limit the accuracy of the study, the results do provide a basis to argue for the over-progressivity of the Irish tax system. For this reason, moderately reducing the level of progressivity of the income tax system in Ireland could further boost the country’s already powerful entrepreneurial engine (Fitzsimons and O’Gorman, 2017).

As depicted in the analysis of the UK’s entrepreneurial environment, a less progressive tax system like the one established in the UK can lead Ireland to increase entrepreneurial entry rates, decrease entrepreneurial exit rates and increase entrepreneurial health as a whole. Moreover, the hypothesised low risk aversion among Irish entrepreneurs would enhance the negative effect of tax progressivity on enterprise birth rate. As mentioned in section 6 of the report, the high entrepreneurial entry and exit rates in Ireland argue for a low level of risk aversion among entrepreneurs who, according to previous research (Gentry and Hubbard, 2004), are negatively affected by tax progressivity. For that reason, although the empirical study does not account for risk aversion, the effect of tax progressivity on entrepreneurial activity could be enhanced in a non-risk averse country like Ireland, since tax progressivity discourages risk-taking (Ferede, 2011).

The empirical section of this paper mainly draws inspiration from the study conducted by Ferede (2011). The study conducted by Ferede (2011) applies the same method of regression, which is the OLS. However, unlike Ferede’s paper (which focused solely on Canadian provinces) the quantitative study conducted in this paper diverts its attention to Europe. That is, while the method is similar, this paper differs empirically.

The theoretical background of Ferede’s paper focuses on the effect of tax progressivity on entrepreneurship in Canadian provinces. Instead, this paper’s theoretical framework focuses on the effect of tax progressivity on entrepreneurship in general, and then focuses more
specifically on the situation of Ireland. This single-country analysis is then contrasted to the situation in the United Kingdom and enhances the understanding of the issue as well as helps develop a hypothesis. Nevertheless, the main theoretical argument of both papers defends the negative effect of tax progressivity on entrepreneurial activity.

The empirical section of this paper extends on the one conducted by Ferede (2011) in that this paper examines the impact of tax progressivity on fifteen European countries in the EU, and therefore provides a different and broader perspective to the research on tax progressivity and entrepreneurship. This differs from Ferede’s (2011) study, which focuses solely on Canadian provinces. Ultimately, while the conclusions of both papers indicate a negative influence of tax progressivity on entrepreneurship, they cannot be comparable since the theoretical and empirical backgrounds differ significantly.

In reference to Baliamoune-Lutz and Garello (2014), both studies evaluate a similar sample of fifteen European countries. However, this paper’s frame of reference analyses the issue generally and then narrows down to pay special attention to the situation in Ireland. This is done through describing the current entrepreneurial environment in Ireland and is backed up by existing and relevant literature.

The main conclusion drawn from analysing previous literature is that the elevated progressiveness of the income tax system could be one of the main inhibitors of entrepreneurial activity. In order to further focus on this issue, a quantitative study was conducted to test whether tax progressivity has an effect on entrepreneurial activity in general (not in Ireland, but in Europe). Depending on the results of this study, the theoretical hypothesis reached through analysing previous literature specific to the Irish situation could be reinforced or discarded. Moreover, the method employed in this paper differs from that of Baliamoune-Lutz and Garello (2014) too, in that an OLS regression is conducted as opposed to a dynamic panel data model. In addition, the proxies employed for entrepreneurship and tax progressivity are different.

To sum up, this paper goes beyond the findings of Baliamoune-Lutz and Garello (2014) in that it employs a different method to answer the research question and that it theoretically implements a single-country analysis that supports the empirical results.
In conclusion, while obtaining inspiration from Ferede (2011), this paper provides an extensive perspective on the impact of tax progressivity on entrepreneurship. By examining fifteen European countries, as well as focusing the attention towards the situation in a specific country, this paper provides a unique contribution to the literature on tax progressivity and entrepreneurship. Thus, making this research significant to the existing literature within the field.

Regarding the use of the pooled OLS estimator that was based on Ferede’s (2011) paper, it has increased the significance of the relation between RIP and the dependent variable in this thesis due to ignoring panel structure data (Baltagi, 2005). The observations of each country span over five years. As the OLS fails to account for the difference in time, the data of each of the respective years are a mere replica of the same data, due to the reduced variance in RIP and enterprise birth rates in a country from one year to another. This, in turn, increases the degrees of freedom and the significance of the data. This means that the portrayed findings of the impact of income tax progressivity on enterprise birth rates are potentially overestimated. In addition, the pooled OLS estimator assumes that the individual-specific effects are uncorrelated with the independent variables. However, as mentioned in the limitation section, the average tax rate and unemployment may be correlated to individual-specific effects. This means that there is a potential endogeneity issue regarding the independent variables. This increases the probability of bias in the findings of the regression (Baltagi, 2005). Moreover, the existing time-varying endogeneity, and its potential individual-specific effects, has decreased the accuracy and reliability of the displayed findings by over-estimating the impact of income tax progressivity on enterprise birth rates.

To efficiently conduct a regression of this sort, where data for a country is collected for several different years, a panel regression model is best suited. This is due to this model accounting for both the cross-sectional and time-series data (Baltagi, 2005). Examples of such models include the dynamic panel data model applied by Baliamoune-Lutz and Garello (2014) and the Instrumental Variable applied in the paper by Ferede (2011). These models, relative to the pooled OLS, account for potential endogeneity, thus providing a more complete and precise view of the issue at hand.

The OLS regression was used in this paper as reference of the paper conducted by Ferede (2011). Initially, the idea was to conduct a regression with data from one year from each
country. However, since fifteen observations are too few to reach valid and accurate results, it was decided to collect data from five different years from each country. While the number of observations were sufficient to conduct a valid OLS regression once this was done, this procedure negatively affected the estimation and accuracy of the results. In conclusion, while this regression yielded significant results, the influence that RIP has on enterprise birth rates may be magnified.

Finally, the results obtained in this study facilitate the path for further research to be carried out. On the one hand, the effect of tax progressivity on entrepreneurial activity in general can be studied from different perspectives by using different variables as proxies for both tax progressivity and entrepreneurial activity. For instance, tax progressivity can be estimated by using alternative methods to the RIP coefficient, like the index related to the Gini coefficient that Suits (1977) employed in his study of measuring tax progressivity. Furthermore, entrepreneurial activity can be measured by a range of different variables, such as the Total Entrepreneurship Activity (TEA) index suggested by Justo and Maydeu-Olivares (2008) in their paper regarding the indicators of entrepreneurial activity. In short, the usage of different variables to represent these two concepts could lead to differing results.

On the other hand, the effect of tax progressivity on entrepreneurial activity specifically in Ireland can also be investigated further. As mentioned in the “limitations” section, variables such as risk aversion are difficult to measure numerically, which somewhat limits the results of the study. Further research can focus on measuring risk aversion and weighing its influence on tax progressivity affecting entrepreneurial activity. Moreover, a micro-based study can be conducted in order to evaluate the effect of tax progressivity on start-up profitability. Measuring how income taxes affect the profitability of start-up firms would be a great indicator of the extent of the harm that start-ups suffer from the Irish income tax system.
12. List of references


