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FEP FACULDADE DE ECONOMIA UNIVERSIDADE DO PORTO

Cost Behaviour – an empirical investigation for Euro Area Countries

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Dissertation

Master in Finance and Taxation

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2018

Biographical note

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She completed high school in 2013 at Escola Secundária da Trofa with a final average of 19 values. There she was member of the Students' Association.

On a professional level, the only experience she had was an internship at a prestigious consulting firm with a worldwide presence. This internship took place within the scope of this master's degree, between October 2017 and March 2018.

Acknowledgements

I would like to thank my supervisors (PhD Professor Samuel Pereira and PhD Professor Elísio Brandão) for all guidance they gave me, from the beginning, starting with the selection of the theme of my dissertation until the end, with the realization of it. Certainly, without their assistance it would be almost impossible to achieve this work. Additionally, I would also like to thank a lot PhD Professor Francisco Vitorino, because although he was not my supervisor, he was always available to help me in econometric issues.

To all my colleagues in Master and to all the professors I had during my academic life, thank you very much for your contribution to the person I am today.

Last, but not least, I would like to thank all the support that my family and friends, specially Francisco Fernandes, gave me during this journey. It was an amazing period of my life, precisely because I managed to overcome myself and achieve the goals that I set myself, but without them it would never be possible.

Abstract

Costs are an important component for businesses as they affect the results and hence the firm position. Therefore, to understand how they vary with changes in output and what factors influence them is fundamental, not only for managers, but for all agents related to organizations.

The traditional theory predicts the existence of two types of costs, the variables and the fixed ones. However, an alternative hypothesis has emerged that accounts for an empirical phenomenon, the "cost stickiness", and later the "anti-stickiness", in which the behaviour of costs is based on discretionary management decisions, under different circumstances.

In this paper, we show that the operating costs of Euro Area companies are sticky, since in the face of a positive change in sales costs increase more than decrease when sales fall by the same amount. In addition, we have documented that this phenomenon is reinforced in countries where labour law is more rigid and those whose intervention by the Troika has been necessary, because these two aspects increase the adjustment costs.

Keywords: cost behaviour, stickiness, anti-stickiness, deliberate resource commitment, adjustment costs.

Resumo

Os custos são uma importante componente para as empresas, uma vez que afetam os seus resultados e, consequentemente, a sua posição. Por isso, perceber como variam face a alterações do *output* e quais os fatores que os influenciam é fundamental, não só para os gestores, mas para todos os agentes relacionados com as organizações.

A teoria tradicional prevê a existência de dois tipos de custos, os variáveis e os fixos. No entanto, tem surgido uma hipótese alternativa, que dá conta de um fenómeno empírico, o *"cost stickiness*", e posteriormente o *"anti-stickiness"*, na qual o comportamento dos custos é baseado nas decisões discricionárias de gestão, perante diferentes circunstâncias.

Neste trabalho, mostramos que os custos operacionais das empresas da Zona Euro são *"sticky"*, uma vez que perante uma variação positiva das vendas os custos aumentam mais do que diminuem quando as vendas baixam no mesmo montante. Adicionalmente, documentamos que este fenómeno é reforçado nos países em que a lei laboral é mais rígida e naqueles cuja intervenção da Troika foi necessária, pelo facto destes dois aspetos aumentarem os custos de ajustamento.

Palavras-Chave: comportamento dos custos*, "stickiness", "anti-stickiness",* escolhas deliberadas de gestão, custos de ajustamento.

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1. INTRODUCTION

Understanding cost behaviour is one of the most important issues in cost accounting. This investigation is not only from a theoretical stand point, but also the practical implications for all entities, especially for companies, since their purpose is to maximize their resources to maximize their profits. Obviously, in pursuit of the main goal of companies, costs should be minimized and accounting researchers, as well as practitioners, acknowledge the importance of a firm´s cost structure to firm performance. Thus, this study is part of a recently emerging stream of research aiming to expand our understanding of cost behaviour and point out which factors are vital to explain that behaviour, whether exogenous or endogenous to the company itself.

Traditional cost behaviour models in the accounting literature distinguish between fixed and variable costs with respect to changes in the level of activity. In fact, a fundamental premise of cost accounting is that there is a symmetric relationship between variations in activity and in costs. So, a 1% increase in activity results in an increase in costs by a certain amount, as well as, a 1% decrease in activity level results in a decrease in costs by the same amount.

Recent research documents the empirical phenomenon of *"sticky costs"*[1], which is inconsistent with the traditional model of fixed and variable costs, because these costs neither behave like fixed or variable costs. However, we cannot say that the traditional theory is totally wrong or must be disbelieved. But, underlying the traditional cost behaviour model are several assumptions which, apart from simplifying the real world, distance the model from the way costs behave. So, it is acceptable that empirically we find a different cost behaviour.

[1] Formally, costs are "*sticky"* if they respond less to decreases in activity than they raise for an equivalent activity increase.

In fact, these recent studies have documented strong evidence of asymmetric cost behaviour and attributes it to a theory of deliberate managerial decisions in presence of adjustment costs (*Anderson et al, 2003*, hereafter, *ABJ*). These deliberate decisions have not been associated with manipulation or other reprehensible acts in the literature related to subject, but an optimal choice to maximize resources.

Recent literature on dynamic factor demand in economics have modelled formally these decisions *(e.g., Bentolila and Bertola (1990), Hamermesh and Pfann (1996), Dixit, (1997), Goux et al. (2001))*. These studies explicitly model the dynamic optimization problem faced by companies, in the presence of adjustment costs and having a future horizon and show that the optimal resource commitment decisions are generally asymmetric. Therefore, this derives the cost accounting notion of cost stickiness as a direct consequence of optimal decisions with adjustment costs. Thus, insofar as managers recognise the trade-off associated with the adjustment costs, their choices are expected to introduce a more complex dynamic in cost behaviour, resulting in cost stickiness patterns. Also, considering this potential source of asymmetry in cost behaviour, and thus, in variation of earnings, it has also been shown to be informative in forecasting earnings and understanding earnings management in accounting research (*Banker and Chen (2006)*).

The economic theory of optimal decisions with adjustment costs, described above, provides a theoretically sound potential explanation for the widely documented empirical patterns of cost stickiness, however it is not the only plausible one. For example, expectations of managers about future activity level can also have a strong impact in cost behaviour. *Banker et al. (2014)* noted that the resource expansion associated with activity increases is subject to managerial discretion and argued that this discretion can lead to anti-stickiness[2] when managers are pessimistic about the future. Another possible explanation is that stickiness may also arise due to manager's empire-building[3] behaviour.

[2] The term *"anti-stickiness"* was coined for the first time by *Weiss (2010)*. However, Weiss just showed that costs could be *"anti-sticky"* if they decrease more when sales fall than they increase when sales rise equally, but he didn´t establish when they are likely to be anti-sticky. *Banker et al. (2014),* contributed to answer this question.

[3] It is a characteristic of managers who want to grow the company or group, building an "empire".

Our focus will be testing the central implication of the economic theory of optimal decisions with adjustment costs. If cost stickiness reflects deliberate resource commitment decisions by managers who face adjustment costs, then the degree of stickiness must be like the magnitude of these costs. However, it is not easy to identify a reliable proxy for adjustment costs in general. Therefore, we will use indexes of employment protection legislation (*EPL*), which are compiled and reported by OECD for most of developed countries as reliable proxies for adjustment cost associated with labour. A stricter *EPL* reflects greater adjustment costs for labour, and the economic theory of sticky costs predicts that firms in a country with stricter *EPL* provisions will exhibit greater cost stickiness, which lead us to predict a positive relation between country-level *EPL* strictness and firm-level cost stickiness.

In this respect, and to the best of our knowledge, it is the first time that cost behaviour will be dealt with in the scope of this Master. So, this paper contributes to the literature in three different ways. First, using *Banker et al. (2013)*, as the basis of our work, we replicate the models using data for a sample of manufacturing sector firms from 15 Euro Area[4] countries, which allow us to expand their study. Also, the vast literature on the subject, usually studies cost behaviour for American firms. Our sample of Euro Area countries and the period that we purpose to study constitutes an innovation. Finally, the introduction of macroeconomic variables related to the countries under study is also a contribution. The understanding of cost behaviour expands, insofar as it is studied whether this behaviour is inherent to the characteristics of the companies, or if it is also affected by the conjuncture of each country, namely the intervention of Troika[5].

This paper is organised as follows. Section 2 is a brief review of literature and describes different theories of costs behaviour; Section 3 describes the research methodology; Section 4 the empirical results and Section 5 presents some robustness tests. The conclusion is presented in Section 6.

[4] Initially, we collected information from all countries in the Euro Area (19). However, after processing the data, we realized that there was not enough information needed to estimate the models in Cyprus, Ireland, Lithuania and Malta. Therefore, the final sample has data from 15 countries.

[5] Currently, Troika is referred as a decision group formed by the European Commission (EC), the European Central Bank (ECB) and the International Monetary Fund (IMF).

2. LITERATURE REVIEW

2.1. Theories and Explanations for Sticky Costs

The traditional view of cost behaviour distinguishes between fixed and variable costs with respect to changes in level of activity. Fixed costs are assumed to be independent of the level of activity, whereas variable costs are anticipated to change linearly to fluctuations in the level of activity, implying that the magnitude of a change in costs depends only on the extend of a change in the level of activity, not on the direction of the change *(Noreen (1991)).* However, it might be not totally right.

Cooper and Kaplan (1998) and *Noreen and Soderstrom (1997),* were the first authors to detect that, in fact, not all costs could be classified as fixed or variable costs. In their studies, they concluded that some of the costs under analysis increased more when the volume of activity increased than diminished with decreases in activity. Nevertheless, *ABJ* suggest that selling, general and administrative costs respond less to downward changes in activity than upward changes, a phenomenon they refer to as "sticky costs". On average, costs increase 0,55% per 1% increase in sales, but decrease only 0,35% per 1% decrease in revenue in their sample. According to *ABJ*, the prevalence of these costs is consistent with the cost behaviour model in which managers adjust resources in a deliberate way in response to changes in volume and in the presence of adjustment costs[1]. For the first time a model distinguishes within costs that change in the face of changes in the volume of activity, those that change in a "mechanical" way from those that depend on the discretionary choices of the managers. Additionally, *Subramaniam and Weidenmier (2016)* confirm and extend this evidence for costs-of-goods expense.

[1]Briefly, we can say that the adjustment costs are the costs of unexpectedly changing the level of output of a firm, regardless of whether it is an increase or decrease thereof. For example, it may be desirable for a firm to cut down on its output but, doing so will create adjustment costs such as redundancy payments and lower staff morale. On reflection of its adjustment costs, it could be more desirable to keep producing at a sub-optimum level. Similarly, a rapid expansion of output may create problems such as difficulties in negotiating a bigger place to rent and difficulties in hiring more workers. However, this last situation demands that the resources increase, otherwise the output will not be able to increase. Then, as managers recognise the trade-offs that arise because of the adjustment costs, they will reduce resources to a lesser extent when the activity shrinks than they expand when the activity increases, causing cost stickiness.

There are many key factors that affect the way managers decide. For example, when future demand is uncertain, and the firm incurs in adjustment costs if it chooses to reduce or restructure its resources, managers tend to postpone these reductions until they are more certain of the effective fall in demand. It suggests that the stickiness of costs is temporary, because somewhere in the future will be reversed or made effective. So, the stickiness observed over a period may be reversed in the following period and that this feature may be less pronounced when the observation period is longer. In periods of decline in economic activity and consequent fall in sales, managers must decide whether to keep the same resources and support the operational costs of having unused capacity or support the adjustment costs related to the cut in resources. This decision will depend on the likelihood that sales will continue to fall or not. Thus, the stickiness will be stronger when the expectations of managers about the steady drop in demand are low or when the adjustment costs are greater. *ABJ* argue that managers hesitate to eliminate slack resources when they expect a sales drop to be temporary, causing cost stickiness when activity level decrease. However, when it is intended to increase output, it is inevitable to increase resources, since without this it is impossible to increase the level of activity of the firm.

In addition to demand uncertainty, financial risk is another factor that will likely influence manager's decisions. Financial risk can be defined as the potential future inability of the company to honour its financial commitments and has adverse direct and indirect effects for the company. Direct consequences are intuitively identified, since if the company fails to make a financial commitment, its capital costs increase and the probability of having legal problems is higher too. Moreover, after having identified the direct consequences, *Altman and Hotchkiss (2006)*, proved that indirect consequences can be quite significant and are unobservable opportunity costs like loss of stakeholders. Naturally, companies with an already high level of risk tend to prefer a cost structure that fits the circumstances more quickly. So, managers of these firms are more likely to take actions that increase cost elasticity to reduce additional risk, otherwise with inelastic cost structures the vulnerability to demand shocks is higher.

These two factors were extensively studied by *Holzhacker et al. (2015)*, to obtain information on the mechanisms used by companies in response to these two factors. They believe that, in response to the two risk drivers, managers change their resource decisions, to increase their elasticity. In a firm with a less elastic cost structure, the decrease in demand will have a more negative impact on profit than on a company with a more elastic structure, because the same decrease in quantity will decrease a lower proportion of costs. Therefore, as demand uncertainty and financial risk increase, managers will be more likely to explore mechanisms to increase the elasticity of firm´s cost structure. In this regard, managers can take three actions, namely outsourcing, leasing or rental of equipment and restructuring of work contracts to increase the proportion of flexible ones.

Banker et al. (2014), improved the theory of sticky costs and developed empirical models. Prior research has shown that the stickiness of costs is pervasive across different cost categories and different datasets. However, these authors show that *ABJ*'s intuition gives rise to a more complex asymmetry pattern that goes beyond their predictions and combines two processes: stickiness when there is a previous increase in sales and anti-stickiness in the case of a prior reduction of sales. They have justified these forecasts, firstly because, after a prior increase (decrease) in sales, managers' expectations for future sales are more optimistic (pessimistic), since sales changes are positively correlated over time, and behaviour economic studies suggest managers extrapolate past trends. Optimism increase managers' willingness to acquire additional resources when sales increase and to retain some unused ones when sales decrease. One the other hand, pessimism has the opposite effect. Below, they believe that managers retained significant slack resources only if sales decreased in a prior period. When sales increase, the amount of slack carried over into the current period is weak or non-existent. These two effects lead to cost stickiness in the current period only in the case of a prior sales increase, and they generate the opposite predictions of anti-stickiness following a prior sales decrease. In accordance with this finding, it was noticed that the slack resources provoke asymmetry in the behaviour of costs which is determined by the direction of the variation of the sales in the previous period. Overall, the results support *ABJ's* fundamental view that asymmetric costs behaviour reflects deliberate decisions of managers on a "forward-looking"[2].

[2] This term means that managers make their decisions having as horizon the future. Basically, they make decisions not only to affect the present, but also in a more medium-term perspective.

On the other hand, changes in sales may reflect changes in short-term market conditions or longer-term changes in demand for products or services. Therefore, when managers face a decrease in sales, they do not react immediately, in order to perceive the source of the change and then react accordingly. This "delay" causes cost stickiness, as the unused resources are maintained during the period between the volume reduction and the adjustment decision. Another important aspect is that costs become less sticky as revenue declines over several periods, as the expectations of the decision maker are aligned with the sales situation. If sales are constantly declining, managers will inevitably have to dispose of resources, incurring the costs of adjustment.

Prior research of sticky costs has relied on informal arguments about the trade-off that arise with adjustment costs. However, the literature of dynamic factor demand in economics has explored these trade-offs more deeply. In this dynamic context, the optimal level of resources corresponds to the amount at which the marginal adjustment costs incurred per unit of resource in the current period equals the present value of expected net cash flows generated by the marginal resource unit over its service life. When deciding how much to reduce resources when activity levels fall, managers weigh the benefits of more efficient operations against the adjustment costs they must incur. Consequently, this trade-off often causes deliberate retention of some resources that will not be used to avoid incurring adjustment costs. In addition, managers have much less discretion over the acquisition of the necessary resources when the activity increases, since even if they intend not to incur adjustment costs, this will not happen, because without resources, companies are not able to respond to increases of activity. In this way, the asymmetry provoked by managers' choices is caused by optimization decisions.

Despite the importance of adjustment costs in this new theory of cost behaviour, there are also other reasons that explain the sticky behaviour of costs. For example, the character of the manager may have an impact on the behaviour of costs. Authors like *Anderson et al. (2003)* and *Chen et al. (2012)*, report that more empire-building managers are more reluctant to cut resources even in the presence of declining sales, thereby increasing the stickiness of some costs. In addition, when sales increase they are very likely to immediately increase the company's resources. So, if managers engage in empire-building, it can generate cost stickiness, even in the absence of adjustment costs. Additionally, *Banker et al. (2014)* noted that the managers' expectations about the future activity also condition the behaviour of costs, provoking stickiness. Although behavioural factors of managers do not determine the overall structure of behaviour of asymmetric costs, they accentuate or diminish their magnitude. The stickiness can also be conditioned by the existing capacity. *Balakrishnan et al. (2004)* have found, for example, that an organization that operates to the maximum of its capacity when confronted with a reduction in activity responds less than if it encounters an increase in activity.

Despite all explanations for cost behaviour, we believe the theory of optimal resource commitment decisions with adjustment costs provide a theoretically sound explanation for the widely documented empirical findings of costs stickiness. Moreover, according to this theory, these discretionary choices reflect a behaviour desired by the managers, who do optimal choices that increases the value of the company. The same does not happen with other possible explanations, for example with empire building theory. It is assumed that the choices of the managers may not be optimal and be harmful to the proper company, becoming a waste that withdraw value from the company.

2.2. Employment Protection Legislation (*EPL*)

As stated above, the adjustment costs play a central role in the new theory of cost behaviour. However, as the adjustment costs are implicit costs rather than explicit monetary costs expressed in accounting system *(Hamermesh and Pfann, (1996)),* it is not possible to measure this directly and it is not easy to obtain a proxy for these, too. For this reason, a few works have been able to study this relation. They use firm-level proxies specifically for labour factor, such as employee intensity or assets. For exemple, the first authors that document pervasive asymmetries in cost behaviour, *ABJ*, used both proxies. In addition, prior research used the rigidity of the labour market as proxy of the adjustment costs, a country-level proxy. We exploit these country-level proxies, but we also control for firm-level determinants of cost stickiness, following prior literature. In fact, *EPL* has been widely used, and has been shown to be reliable, in prior economics research (*e.g., Long and Siebert (1983); Lazear (1990); Pissarides (1999); Blanchard and Portugal (2001)*). According to *Banker et al. (2013),* the major advantage of *EPL* is that they are exogenous with respect to managers' decisions, so it cannot be manipulated or changed according to the will of the managers.

Historically, the first cases of statutory employment protection date back to the early twentieth century. However, the process of increasingly regulating firing and hiring, since free labour market seems to be inefficient, is a recent system that became to be stable at the 1900s. By contrast, since the global financial crisis in 2008, and according to *OECD (2013)*, there is a clear trend of deregulation of employment protection. Obviously, this tendency is not observed in every OECD countries and they have different levels of employment protection. But, in one-third of them undertook some relaxation of regulations on either individual or collective dismissals, thereby reducing the gap in the stringency affecting temporary and permanent contracts. Interestingly, policy action was more intense in OECD countries that had most stringent legislation before the onset of the crisis, in order to liberalize the labour market. Despite this flexibility, particularly in terms of severance payments and fixed-term contracts, *EPL* still translates into high costs for companies when they decide to lay off.

In this sense, the provisions of the Employment Protection Legislation, such as the rigidity indexes of labour laws, are explored to see if the costs are in fact sticky or not. The asymmetry envisaged by the sticky cost theory might be due to deliberate decisions made by managers facing adjustment costs (such as costs of hiring and firing staff, including severance payments to dismissed workers or search and training costs when new employees are hired, or disposal losses on equipment). The manager's optimal decisions are made by analysing the trade-off between the adjustment costs associated with the hiring or firing of a marginal worker and the net present value of the cash flows (NPV) that this worker must generate during the time he remains in the company. When the activity increases, managers hire additional workers if the marginal worker's NPV exceeds the cost of hiring. On the other hand, when activity decreases, managers will lay off workers, provided that the marginal worker's NPV is negative and large enough (in absolute value) to exceed the cost of redundancy.

The results of *Banker et al. (2013),* show that the relationship between the stickiness of costs and the rigidity of the *EPL* in the data is consistent with the theory that the stickiness of costs reflects the deliberate decisions of managers. In this way, it was found that a company operating in a country with more stringent *EPL* (*i.e.*, higher adjustment costs to reduce labour) will exhibit more cost stickiness, *i.e.* more asymmetry in cost response to changes in sales. In addition, *Caballero (2013)* showed that the rigidity of the *EPL* reduces the ability of companies to adjust to shocks, which corroborates the idea that greater rigidity of the labour law increases the costs of adjustment of the companies, consequently causing greater stickiness of the companies' costs.

It should be noted that there is a vast literature devoted to examining the various aspects of *EPL*, as well as other characteristics of the labour market (*e.g.*, *Hopenhayn and Rogerson (1993); Mortensen and Pissarides (1999); Heckman et al. (2000); Botero et al. (2004)*). They document that *EPL* is the main source of firing costs and that it has important effects on various macroeconomic outcomes, such as unemployment rates and long-term productivity growth. Notably, *EPL* indexes serve as a proxy for firing costs because, although *EPL* provisions impose considerable firing costs, they do not impose any hiring costs. However, our focus is different, because we would like to understand the role of *EPL* in firm-level cost behaviour, more than its role in macroeconomic outcomes.

The next challenge is to identify the most appropriate empirical measure to quantify *EPL* and other control variables associated with labour. In this context, *Botero et al. (2004)* investigated the impact of labour market regulation in 85 countries. To do so, they constructed a set of data that captured such regulations, including three major areas: *i* labour laws, *ii* collective relations laws, and *iii* social security laws. With this information they constructed indicators that summarize the different dimensions of this protection and, finally, aggregate these indicators into indexes. Note that higher values in these indexes correspond to a broader labour protection of workers. This technique is like what OECD has been using to define the *EPL*, which will be our proxy[3].

As we show in previous section, the new theory of sticky costs implies that higher downward adjustment costs lead to greater stickiness in resource adjustment. Because stricter *EPL* increases the magnitude of firing costs, we expect stricter *EPL* to increase the stickiness of labour costs. Since the labour costs account for a large fraction of operating costs, we expect stricter *EPL* to increase the stickiness of operating costs, leading to the following hypothesis:

H1: The more restricted the country's labour law (*e.g.,* higher *EPL*), the greater degree of stickiness of operating costs.

[3] For a detailed summary of the indexes that constitute *EPL,* please see Appendix A.

2.3. The crisis affecting the Euro Area and the intervention of Troika

Despite the central role of *EPL* in our study, we intend to realize the impact that the recent crisis of 2008 may have had on cost behaviour, because this global crisis had a profound impact on financial deregulation that cannot be left aside.

It began in 2007 with a crisis in the subprime mortgage market in the United States of America, and developed into a full-blown international banking crisis with the collapse of the investment bank Lehman Brothers on 2008 September 15th. Briefly, banks had allowed people to take out loans for 100 percent or more of the value of their homes. Then, banks engage in trading profitable derivatives that they sold to investors. These mortgage-backed securities needed home loans as collateral. The derivatives created an insatiable demand for more and more mortgages. The main problem occurred when housing prices started to fall. Hedge funds and other financial institutions around the world owned the mortgage-backed securities. The pooled mortgages were used to back securities known as collateralised debt obligations (CDOs), which were sliced into tranches by degree of exposure to default. In addition, it was created an insurance product called credit default swaps, sold by traditional insurance companies. When the derivatives lost value, these companies didn´t have enough cash to honour their commitments. The whole system was revealed to have been built on flimsy foundations: banks had allowed their balance-sheets to bloat but set aside too little capital to absorb losses. In effect they had bet on themselves with borrowed money, a gamble that had paid off in good times but proved catastrophic in bad.

With the globalization we have come about in recent decades, particularly the interconnection in the financial sector, this banking crisis in the United States has rapidly spread to other sectors of society and to the rest of the world. It was a large symmetric shock with significant asymmetric effects. According to *OECD (2006),* it was not predictable that the world economic situation would become so difficult. It is said that *"economic conditions are projected to continue to improve in the OECD area during the next two years and unemployment rates to continue to fall (…). Economic growth in the OECD are is showing considerable resilience in an environment characterised by geographical tensions, large current account imbalances and high volatility in energy prices*". However, the consequences of crisis are mirrored in the following reports of OECD Employment Outlook 2013 and 2016. The first report indicates that the global recovery from the crisis has been weak and uneven, with increasingly divergent rhythms of development across countries. The main problems identified in this report are a sharp drop in demand, persistent high unemployment rates which causes an increasing income inequality due to the concentration of job losses among low-paid worker and slower growth in real earnings. Once again, it is important to note that the effects of crisis were not uniform across countries, which increased the gap between OECD countries. Eight years after the onset crisis, the report of 2016 says that economy was not recovered yet, especially labour market, despite conditions having slightly improved. In addition, *OECD (2016)* draws attention to the risk of another downturn before the total recovery in many countries.

For this reason, some of the countries most affected by the crisis were intervened by the Troika, with the aim of recovering and correcting some errors, so as not to be so vulnerable to external shocks. In this context, in May 2010, Greece agreed the first rescue plan with the Troika, but in February 2012, the rescue was reinforced with an extraordinary package. Ireland was the second country to be rescued in November 2010. The Portuguese Government advanced to the rescue in May 2011. Finally, Cyprus also enlisted the help of the Troika in March 2013. Before the rescue of Cyprus, Spain had been the last country to intervene, in an operation that took place in June 2012. However, for the purposes of this study we will not consider Spain has an intervened country, since Madrid managed to avoid a bailout plan for the economy, limiting it only to banking.

Theoretically, it is expected that the intervention of Troika in these countries may have affected and continue to affect the expectations of managers and thus the behaviour of costs. The presence of the Troika has imposed a greater restriction on labour legislation and other areas, which means that hiring and/or firing has become more complex and more expensive. In this way, increasing complexity tends to retract managers from engaging in these processes, thus increasing the stickiness of associated costs. Only a few years later, the labour market became less strict, however, despite all efforts to make labour legislation more flexible (because of the Troika intervention), labour market rigidities in those countries (namely in Portugal and Greece) are still higher than in other countries, which is directly reflected in a greater cost stickiness.

In short, as far as we know, it is the first time that this effect has been studied in cost behaviour, which, like the rigidity of the labour law, is an exogenous effect on managers, but profoundly affects their decisions, in particular the decisions related to labour. Therefore, for everything that was previously mentioned, we expect that:

H2: Firms located in countries with Troika's intervention have more stickiness in costs than the rest.

3. RESEARCH METHODOLOGY

In our study, we empirically examine the relationship between employment protection, the intervention of Troika and cost stickiness for firms in the Euro Area member countries. We choose this research setting because it includes a set of developed economies which use the same currency. This aspect was determinant in our choice, because in this way we avoid possible constraints and bias results caused by using of different currencies. In this way, we take advantage of this specificity of the Euro Area, to obtain the truest results possible. Although most of the studies used as a basis for our analysis use data from United States of America companies or located in OECD countries, we consider that our innovative sample can be a contribution to the literature, while allowing us to leverage these studies both in identifying the appropriate empirical measure of *EPL* and in formulating our empirical predictions and models. In addition, measures of *EPL* and other labour market characteristics are reliably and systematically reported for these developed countries, which is a practical aspect essential to our analysis.

3.1. Variables

We use the index c for country, the index f for firm and the index t for the year. Then, the dependent variable is defined as $OPC_{c,f,t}$, that is Operational Costs for firm f, country c and year t. This variable result from the difference between Operating Revenue (*item* OPRE of Amadeus) and Operating Profit/Loss (*item* OPPL of Amadeus)[1] and it is deflated to control for inflation[2].

We use three types of explanatory variables: firm-level variables, country-level variables and control variables.

[1] Although the inclusion of depreciation reduces the proportion of labour costs in the dependent variable, we decided to include it in order to obtain a dependent variable as realistic and complete as possible.

[2] Please note that all variables that were deflated to control for inflation have as base year the year of 2008, that is, they are in constant prices of 2008. For example, to obtain the deflated sales value in the 2009 we use Sales 2009 / (1+ *i*), where *i* is the annual GDP growth rate between 2008 and 2009.

The main firm-level variable is $SALES_{c,f,t}$, defined as Sales Revenue[3] for firm f, country c and year t, (*item* TURN of Amadeus) also deflated to control for inflation. Another important variable is $GDPGrowth_{c,t}$, that is the Real GDP growth for country c in year t, from World Bank Databank defined as the annual percentage growth rate of GDP at market prices based on constant local currency, where aggregates are based on constant 2010 U.S. dollars. The $AssetInt_{c,f,t}$ is the Asset Intensity for firm f, country c and year t, as the log ratio of Assets (*item* TOAS of Amadeus) and Sales, defined as $\ln(\frac{Asset}{Sales})$. Then, we have one of the main explanatory variables, the EPL_c which is the aggregate index of employment protection legislation in country c in year *t*, computed as the mean of *TempEPL* and *RegEPL*, following *OECD (2004)*. $TempEPL_c$ is an index of employment protection legislation for temporary employees in country c in year *t*, from OECD Database, ranges from zero to six, and higher values mean stricter *EPL* and $RegEPL_c$ is an index of employment protection legislation for regular employees in country c in year *t*, from OECD Database, ranges from zero to six, and higher values mean stricter *EPL*.

Finally, we have two dummies variables, namely, $DEC_{c,f,t}$, a dummy variable equal to one when sales decreases and zero otherwise and $TROIKA_c$, a dummy variable equal to one if firm is in Portugal or Greece and zero otherwise.

We use $OPC_{c,f,t}$ and $SALES_{c,f,t}$, since it is the relationship between these two variables that it is intends to study (annual changes in operating costs to contemporaneous changes in sales revenue), following *Noreen and Soderstrom (1997)*. However, this relationship is affected by other county-level explanatory variables, firm-level control variables, following prior studies (*e.g.*, *ABJ),* as well as additional country-level random effects.

[3] We use sales revenue as proxy of sales volume, because it is not directly observable.

According to *ABJ*, the GDP growth and the successive decreases in sales ($DEC_{c,f,t-1}$) can be empirical proxies for optimism and pessimism, respectively. We use asset intensity, $AssetInt_{c,f,t}$, as an additional proxy at firm-level for the magnitude of the adjustment costs that firms face, such as *Banker et.al. (2013)*. Initially, we intended to include a dummy variable *CommonLaw*, separating common-law countries from code-law[4] countries, because prior research (*e.g., La Porta et al. (1997), (1998), (2000)*) demonstrated that the legal origin of a country is one of the main drivers of differences between countries in terms of business management, access to external financing, business regulation, among others. In addition, *Botero et al. (2004)* find strong evidence that the legal origin of a country is an important determinant in both labour regulation and in other markets, concluding that countries have ways of regulating that are pervasive in all activities and shaped by their legal origin. However, in our sample there are not common-law countries. So, it was not necessary to use this dummy variable. Finally, our proxy for labour adjustment costs is *EPL*, following *Banker et.al. (2013)*. Basically, it is the set of rules regarding the dismissal of employees, including procedural restrictions on demission and the rules regarding severance pay levels. This protection imposes considerable firing costs on employers, and the more restricted is the protection, the higher are the costs (*Long and Siebert (1983); Mortensen and Pissarides (1999); OECD (2004)).* About the patterns $v_{1,n}$ and $v_{2,n}$, they capture the cross-country random effects, which are not captured by the explanatory variables of the models, so these terms must be independent of these variables.

[4] The type of legal system used is a key factor in explaining many differences between countries. Generally, the countries are divided into two groups: common-law countries and the code-law. It is said that a country is a common law type when the law is based more on jurisprudence (set of interpretations of the rules of law given by the judiciary) than on the text of the law. To emphasize that in these countries there is also a law that must be complied with, however the main reason for decision is the decision made in previous similar cases. When there is no precedent, judges must "create the right," setting that precedent. On the other hand, in the code-law countries there is a written, systematic and comprehensive declaration of laws when promulgating the code. In simple terms, the law is a systematic list of articles that have been codified and are required by law.

3.2. Sample

The sample includes all active manufacturing firms (NACE 10-32, excluding 18) covered by Amadeus during 2008-2013[5] from Euro Area, with data available for those same years, which led us to an initial sample of 281 518 companies in the 19 Euro Area countries. We exclude the other sectors of activity because the structure of costs and the type of activity are too different which could make our sample too heterogeneous and complex, which must prevent clear results. Then, we follow *Banker et.al. (2013)* in using annual data for our tests and in the application of some restrictions to the data. We use country-specific GDP deflators[6] to control for inflation. The sample includes firm-year observations with positive values for sales, operating costs and assets, because we discard observations when these values are missing or negative for the current year. Additionally, we also discard firm-years if operating costs are less than 50% or greater than 200% of sales for current year.

To limit the effect of extreme observations, we then discard 0,5 % outliers in the right tail for the operating costs (the dependent variable) and for the sales and for total assets (the continuous firm-level explanatory variables). Once again, following *Banker et.al. (2013),* we discard firm-year if sales increased by more than 50% or decreased by more than 33% in the current year[7], because it may reflect mergers or divestitures. The final sample includes 627 778 observations for 104 993 firms in 15 Euro Area countries for the period of 2008-2013.

The descriptive statistics are reported in Tables 1, 2 and 3 and will be discussed in subsection 4.1.

[5] For most countries in Amadeus, data are available only for 2008 onwards. Besides that, information pertaining to the *EPL* is only available up to the year 2013.

[6] The annual GDP deflators are taken from World Bank Databank: http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators&preview=on

[7] These percentage values are the transformation of log-change from ln(2/3) and ln(3/2), which we use in the estimation.

3.3. Empirical Models

Following what has been done we intend to investigate the behaviour of costs that are atypical, considering the traditional theory of accounting. Generally, we consider that the operational costs are variable costs, because they are closely related to the sales and the volume of activity of the company. However, as already mentioned above, some authors show that, in fact, some costs cannot be classified as variables, because they do not behave symmetrically in the face of an increase or decrease of sales.

In this sense, such as *Banker et al. (2013)*, we will use the labour law as a proxy of the adjustment cost of this factor. Moreover, we will include some variables that allow us to capture the importance of the macroeconomic situation in costs behaviour. Finally, we intend to use a variable that allows us to distinguish between the countries that have been intervened by the Troika, from those who did not need this intervention, to test H2. In this context, we begin with the following model of cost behaviour that links annual changes in operating costs $(OPC_{c,f,t})$ to contemporaneous changes in sales $(SALES_{c,f,t})$. The base model[8] of our estimation was presented by *ABJ*:

$$\Delta lnOPC_{c,f,t} = \alpha_0 + \alpha_{1,c,f,t}\Delta lnSALES_{c,f,t} + \alpha_{2,c,f,t}DEC_{c,f,t}\Delta lnSALES_{c,f,t} + u_{c,f,t} \quad (1)$$

where $\Delta lnOPC_{c,f,t}$ is the log-change in operating costs, $\Delta lnSALES_{c,f,t}$ is the log-change in sales, $DEC_{c,f,t}$ is a dummy variable that is equal to one when sales decrease in year *t* and zero otherwise, $u_{c,f,t}$ is a random effect that as zero mean and is independent of any explanatory variable. The slope $\alpha_{1,c,f,t}$ represents the percentage change in costs for 1% increase in sales and the sum of $\alpha_{1,c,f,t}$ and $\alpha_{2,c,f,t}$ represents the change in costs for 1 % decrease in sales. Given the model specification, the slope $\alpha_{2,c,f,t}$ captures the degree of asymmetry in costs behaviour. If it is positive, we are in presence of anti-stickiness, however if it is negative, the costs are sticky. Moreover, if traditional model is valid, $\alpha_{2,c,f,t}$ would be equal to zero and $\alpha_{1,c,f,t}$ equal to one, reflecting proportionality.

[8] This model has been widely used in studies on this subject because it is the standard cost stickiness model.

Our use of log-linear specification follows prior researches (*e.g.*, *Noreen and Soderstrom (1997), Banker et al. (1995)*, *Anderson et al. (2003))*. Usually, log-linear models have several advantages over a linear model. First, the coefficients in the log-linear model have a clear economic interpretation as percentage change in the dependent variable for a 1% change in independent variable. In addition, log transformation makes variables more comparable across firms and moderate the problem of heteroskedasticity, improving the efficiency of estimates.

Since we do not just want to determine whether the costs behaviour is asymmetric, but rather to perceive the source of this asymmetry, we specified the slopes coefficient as:

$$\alpha_{1,c,f,t} = \beta_1 + \lambda_1 EPL_c + \lambda_2 GDPGrowth_{c,t} + \lambda_3 AssetInt_{c,f,t} + \lambda_4 TROIKA_c + v_{1,n} \quad (2)$$

$$\alpha_{2,c,f,t} = \beta_2 + \lambda_5 EPL_c + \lambda_6 DEC_{c,f,t-1} + \lambda_7 GDPGrowth_{c,t} + \lambda_8 AssetInt_{c,f,t} + \lambda_9 TROIKA_c + v_{2,c} \quad (3)$$

where EPL_c is the employment protection legislation index for country c, $GDPGrowth_{c,t}$ is the real rate of GDP growth for country *c* in year *t*, $AssetInt_{c,f,t}$ is the log-ratio of total assets to sales of firm *f* ,country *c* and year *t*, $DEC_{c,f,t-1}$ is a dummy variable equals to one for firms whose sales decrease in the period t-1, $TROIKA_c$ is a dummy variable equals to one for Portuguese and Greek firms, and $v_{1,n}$ and $v_{2,c}$ are country-level error terms.

Briefly, we followed *Anderson et al. (2003)* and *Banker et.al. (2013)* and extend these models by allowing Troika's intervention to affect not only the degree of stickiness ($\alpha_{2,c,f,t}$) but also the slope of sales increase ($\alpha_{1,c,f,t}$). As we discuss above, managers make discretionary decisions, both in decreasing and in expanding resources. However, according to the new theory of cost behaviour, firing costs also affect hiring decisions. Therefore, the intervention of Troika may affect not only $\alpha_{2,c,f,t}$ but also $\alpha_{1,c,f,t}$. Obviously, we expected the same logic for the other introduced variables capable of influencing managers' decisions both in the case of increase or decrease sales. By including variables as GDP growth or asset intensity in the slope of sales increase, we followed *Banker et al. (2013)* that made an empirical model that overcame a problem identified in *ABJ's* study. *ABJ* presumed managerial discretion only for sales decreases and assumed a mechanical behaviour when sales increase. Therefore, *Banker et al. (2013)* nested this specification under the restriction $\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = 0$, which was rejected in their data and in our data too.

By combining Equation 1, 2 and 3, we have our main model:

$$\begin{aligned}\Delta lnOPC_{c,f,t} = {} & \beta_0 + (\beta_1 + \lambda_1 EPL_c + \lambda_2 GDPGrowth_{c,t} + \lambda_3 AssetInt_{c,f,t} \\ & + \lambda_4 TROIKA_c)\, \Delta lnSALES_{c,f,t} + (\beta_2 + \lambda_5 EPL_c + \lambda_6 DEC_{c,f,t-1} \\ & + \lambda_7 GDPGrowth_{c,t} + \lambda_8 AssetInt_{c,f,t} \\ & + \lambda_9 TROIKA_c) DEC_{c,f,t} \Delta lnSALES_{c,f,t} \\ & + \varepsilon_{c,f,t} \end{aligned} \quad (4)$$

where the variables are has described above and $\varepsilon_{c,f,t}$ is the random effect, which combines the residuals from equation 1, 2 and 3. The main parameters of the estimation are λ_5 to test H1 and λ_9 to test H2. We predict that $\lambda_5 < 0$, because H1 implies that stricter *EPL* is associated with a more negative $\alpha_{2,c,f,t}$ indicating cost stickiness. Then, we also predict that $\lambda_9 < 0$ ussing the same logic, but with Troika's variable.

The estimation method we use is ordinary least squares (OLS) like *ABJ*. Though, the inclusion of random effects at country-level $v_{1,c}$ and $v_{2,c}$ presents cross-section correlation in $\varepsilon_{c,f,t}$ of firms within each country. This also introduces heteroskedasticity, since the random shocks $v_{1,c}$ and $v_{2,c}$ are multiplied by $\Delta lnSALE_{c,f,t}$ e $DEC_{c,f,t}\Delta lnSALE_{c,f,t}$, respectively. Moreover, to the within-country correlations across firms, the random shocks may also be correlated across countries, because of global economics events, like the crisis of 2008. To address these problems, we use HAC – Newey-West, that is a tool provided by EViews that allow us to adjust standard errors for the presence of both autocorrelation and heteroskedasticity. As expected, the estimated coefficient values do not change, when compared to the original estimation. But, the adjusted standard errors and associated T-statistics are different. We would like to point out that we performed multiple estimations, with panel data and with unstructured data, with and without fixed effects, to understand the impact of dynamic effects, with the HAC – Newey-West method and without, in order to determine the associated problems with heteroscedasticity and autocorrelation and the results have practically not changed. Thus, we consider that our results are robust enough.

Finally, we will carry out some robustness checks, inter alia, through the estimation of cost stickiness framework developed by *Banker et al. (2014)* that will be presented and estimated in section 5.

4. EMPIRICAL RESULTS

4.1. Univariate Results

The Table 1 presents some summary statistics that allows us to study the main characteristics of our sample, in general. All values are the average for each variable. Then, Table 2 will present one panel for each variable with more details, such as the mean, median, maximum, minimum, standard deviation, Skewness and Kurtosis and the number of observations for each of the 15 countries of our sample (*i.e.,* Austria, Belgium, Estonia, Finland, France, Germany, Greece, Italy, Latvia, Luxembourg, Netherlands, Portugal, Slovakia, Slovenia and Spain). Finally, Table 3 shows Pearson's correlations coefficients to capture the correlation between dependent and independent variables.

Focusing on Table 1, there is a substantial variation in percentage of observations per country. France and Italy together have more the 50% of the total observations, followed by Spain with 20% of the observations. That is why we present in Section 5 a robustness check where we discard France and Italy data from our sample. The results are similar to our main estimates for H1, but different for H2. Portugal is also well represented in our sample, with 9,82% of the data.

Moreover, the crisis of 2008 is well reflected in the univariate results, because as we can see, the mean of AssetInt, ΔlnOPC, ΔlnSALES and GDPGrowth for most of countries is negative. In fact, the sample period under analysis refers to the years of widespread crisis in the world. As discussed above, countries were not all affected equally by this crisis, and this is also exorbitant in our data. As might be expected, the countries most affected by the crisis are those with the biggest declines, namely in sales and GDP growth. For exemple, Greece has the biggest decline in ΔlnSALES (*i.e.,* 0,035) and between 2008 and 2013 on average the GDP growth was -4,965, followed by Latvia and Italy with -1,494 and -1,456, respectively. Therefore, these numbers reinforce the importance of using our Troika´s variable and corroborate what happened, it could be said that these variables have economic significance. In addition, the variation of ΔlnOPC and ΔlnSALES is similar for most of countries however the correlation between them is 0,841 that is high but not perfect, which indicates stickiness.

Finally, H1 implies differences in *EPL* indexes, that range from 0 to 6 where 6 represents the strictest *EPL*. In our sample, the mean *EPL* is 2, 582 which indicates that our countries are moderated, however, there is a considerable variation in overall *EPL* strictness. The Portugal, Luxembourg and France have the highest scores (2,945, 2,998 and 3,012, respectively) whereas Latvia and Austria have the lowest scores (1,781 and 1,841, respectively). The correlation between *TempEPL* and *RegEPL* is - 0,416 which means that the correlation is low, besides we can say that countries with stricter *EPL* for regular workers have greater flexibility *EPL* for temporary workers. For exemple, Latvia has low *EPL* for temporary workers (the lowest for our sample, at 0,875 which is lower than the median 2) but features stricter *EPL* for regular workers (at 2,687 which is higher than the median 2,468). On the other hand, Luxembourg has below-median *EPL* for regular workers (2,246) but has the strictest *EPL* for temporary workers (3,75).

Table 1: Summary Statistics

Country	% of Obs.	AssetInt	ΔlnOPC	ΔlnSALES	GDPGrowth	EPL	TempEPL	RegEPL
Austria	0,04	-0,027	0,022	-0,014	0,546	1,841	1,313	2,369
Belgium	1,75	-0,333	-0,005	-0,008	0,584	2,166	2,375	1,956
Estonia	0,79	-0,489	-0,007	-0,007	-0,684	2,092	2,062	2,121
Finland	2,60	-0,503	-0,016	-0,021	-0,676	1,865	1,563	2,167
France	24,88	-0,465	0,005	0,001	0,342	3,012	3,625	2,399
Germany	2,43	-0,544	0,003	0,004	0,709	1,850	1,021	2,679
Greece	1,47	0,291	-0,035	-0,037	-4,965	2,508	2,541	2,476
Italy	33,66	-0,030	-0,015	-0,017	-1,456	2,374	2,000	2,748
Latvia	0,12	-0,536	0,033	0,033	-1,494	1,781	0,875	2,687
Luxembourg	0,04	-0,169	-0,013	-0,011	0,845	2,998	3,750	2,246
Netherlands	0,23	-0,430	0,002	0,001	-0,052	1,885	0,938	2,832
Portugal	9,82	-0,083	-0,008	-0,013	-1,310	2,945	1,917	3,974
Slovakia	1,09	-0,458	-0,007	-0,009	1,874	2,220	1,813	2,627
Slovenia	1,03	-0,091	-0,011	-0,013	-1,017	1,870	1,667	2,073
Spain	20,04	-0,144	-0,026	-0,031	-1,345	2,530	2,802	2,258
Total	**100**	**-0,202**	**-0,011**	**-0,014**	**-0,863**	**2,582**	**2,529**	**2,635**

AssetInt is defined as $ln(\frac{Total\ Asset}{Sales\ Revenue})$*, ΔlnOPC is the first difference of the logarithm of operational costs, ΔlnSALES is the first difference of logarithm of sales revenue, GDPGrowth is defined as the annual percentage growth rate of GDP at market prices based on constant local currency, EPL is the aggregate index of employment protection legislation, computed as the mean of TempEPL (an index of employment protection legislation for temporary employees) and RegEPL (an index of employment protection legislation for regular employees). The sample includes companies for the 15 Euro Area countries and the sample period is from 2008 to 2013.*

Table 2: Descriptive Statistics per Variable

Table 2 Panel A AssetInt defined as ln((Total Asset)/(Sales Revenue))

Country	Mean	Median	Max.	Min.	Std. Dev.	Skew.	Kurtosis	Obs.
Austria	-0,027	-0,026	1,412	-1,265	0,490	0,027	2,465	248
Belgium	-0,333	-0,387	5,099	-2,602	0,668	1,178	8,200	10979
Estonia	-0,489	-0,480	1,616	-2,967	0,659	-0,108	3,390	4936
Finland	-0,503	-0,512	4,977	-3,829	0,624	0,597	6,703	16321
France	-0,465	-0,485	6,209	-6,857	0,523	0,589	7,865	156174
Germany	-0,544	-0,563	5,273	-3,255	0,591	0,826	8,056	15258
Greece	0,291	0,263	3,168	-1,751	0,568	0,361	3,931	9259
Italy	-0,030	-0,092	4,986	-3,400	0,560	1,178	7,613	211341
Latvia	-0,536	-0,534	1,269	-2,071	0,601	0,207	2,959	730
Luxembourg	-0,169	-0,254	3,071	-1,516	0,713	1,692	8,482	270
Netherlands	-0,430	-0,468	2,905	-2,382	0,619	0,855	5,726	1473
Portugal	-0,083	-0,098	3,690	-6,808	0,626	0,190	4,481	61669
Slovakia	-0,458	-0,476	4,912	-6,309	0,660	0,457	8,757	6816
Slovenia	-0,091	-0,099	2,987	-2,765	0,550	0,291	4,194	6497
Spain	-0,144	-0,174	3,855	-5,691	0,654	0,281	4,396	125807
Total	**-0,202**	**-0,239**	**6,209**	**-6,857**	**0,618**	**0,571**	**5,756**	**627778**

As we can see in Table 2 panel A, the average for AssetInt is negative for all countries of our sample, excepted Greece. A negative $\ln(\frac{\text{Total Asset}}{\text{Sales Revenue}})$ means that Total Assets is less than Sales Revenue, because for a logarithm to be negative, the value to logarithmize must be less than 1. Usually, it is said that this type of firm generates a lot of revenue with little investment and so have a higher associated risk. However, we cannot conclude anything about the performance of our sample, because we only have one ratio. Therefore, it seems to us hasty to draw conclusions about the companies considering the information we have, since the interpretation of a unique ratio can skew our conclusions. In order to understand exactly the performance of the companies, a more in-depth analysis would be necessary, which does not fit directly in the scope of our work.

Table 2 Panel B: ΔlnOPC defined as the first difference of the logarithm of operational costs

Country	Mean	Median	Max.	Min.	Std. Dev.	Skew.	Kurtosis	Obs.
Austria	0,022	0,006	0,633	-0,383	0,169	0,606	3,921	206
Belgium	-0,005	0,000	0,702	-0,752	0,135	-0,203	4,135	9139
Estonia	-0,007	0,000	0,870	-0,744	0,175	-0,142	3,821	4110
Finland	-0,016	-0,012	1,177	-0,985	0,161	-0,109	4,178	13584
France	0,005	0,006	0,934	-1,113	0,129	-0,093	4,688	130114
Germany	0,003	0,009	0,873	-0,632	0,144	-0,254	3,729	12675
Greece	-0,035	-0,029	0,634	-0,766	0,157	-0,068	3,558	7708
Italy	-0,015	-0,011	0,957	-1,113	0,161	-0,122	3,756	175935
Latvia	0,033	0,035	0,491	-0,556	0,160	-0,165	3,241	608
Luxembourg	-0,013	-0,014	0,328	-0,630	0,147	-0,438	4,060	225
Netherlands	0,002	0,005	0,565	-1,166	0,153	-0,925	8,838	1220
Portugal	-0,008	-0,007	1,088	-1,168	0,154	-0,067	4,056	51368
Slovakia	-0,007	-0,003	0,970	-1,068	0,175	-0,140	4,266	5676
Slovenia	-0,011	-0,008	0,617	-0,692	0,161	-0,088	3,233	5405
Spain	-0,026	-0,021	1,266	-1,446	0,160	-0,085	3,904	104812
Total	**-0,011**	**-0,006**	**1,266**	**-1,446**	**0,152**	**-0,140**	**4,075**	**522785**[1]

According to Table 2 panel B, and although we use the logarithm, there are still some cross-countries differences in ΔlnOPC that ranges from -0,035 in Greece to 0,033 in Latvia. The countries of southern Europe have a larger negative mean for this variable than the rest of countries, as expected, once the crisis of 2008 had a brutal impact particularly in these economies. Besides, it is important to note that for all countries of our sample, the maximum value is positive, which means that at least for one year, the operational costs have increased. Interestingly, the countries that reached higher values were Finland, Portugal and Spain.

So, these negative values show clearly the impact of the crisis. It is legitimate to argue that a decrease of operational costs can be interpreted as efficiency gains, however almost every country has negative values, which means that happened something on a global scale, that is, a crisis.

[1] The number of observations for ΔlnOPC is 522 785, because this variable is the first difference of the logarithm, so the year 2008 is "lost". There are 104 993 observations per year, so 5220785+1040993=627778, the total number of observations referred in section 3.2.

Table 2 ***Panel C: ΔlnSALES defined as the first difference of the logarithm of sales revenue***

Country	Mean	Median	Max.	Min.	Std. Dev.	Skew.	Kurtosis	Obs.
Austria	-0,014	-0,006	0,317	-0,394	0,122	-0,321	3,721	206
Belgium	-0,008	-0,003	0,397	-0,595	0,137	-0,180	3,411	9139
Estonia	-0,007	-0,002	0,400	-0,677	0,172	-0,126	2,750	4110
Finland	-0,021	-0,015	0,402	-0,808	0,163	-0,093	2,885	13584
France	0,001	0,004	0,404	-0,746	0,137	-0,099	3,463	130114
Germany	0,004	0,008	0,398	-0,695	0,152	-0,167	3,169	12675
Greece	-0,037	-0,034	0,405	-0,804	0,162	-0,056	3,046	7708
Italy	-0,017	-0,012	0,402	-0,868	0,162	-0,067	2,857	175935
Latvia	0,033	0,032	0,405	-0,378	0,159	-0,025	2,725	608
Luxembourg	-0,011	0,003	0,367	-0,397	0,142	-0,213	3,221	225
Netherlands	0,001	0,005	0,397	-0,397	0,140	-0,122	3,327	1220
Portugal	-0,013	-0,012	0,623	-0,791	0,159	-0,001	2,852	51368
Slovakia	-0,009	-0,002	0,521	-0,669	0,172	-0,044	2,641	5676
Slovenia	-0,013	-0,010	0,662	-0,648	0,167	-0,040	2,834	5405
Spain	-0,031	-0,026	0,405	-0,707	0,161	0,014	2,795	104812
Total	**-0,014**	**-0,009**	**0,662**	**-0,868**	**0,156**	**-0,075**	**2,990**	**522785**[2]

Table 2 panel C presents some descriptive statistics for ΔlnSALES. The analysis is like what we have done before. First, there are some cross-countries differences, where Greece has, once again, the lowest value (-0,037) and Latvia has the highest one (0,033). Indeed, when we put the countries ordered from the lowest value to the highest, either in the ΔlnOPC or in the ΔlnSALES, the order does not change, except for Austria, Luxembourg and Estonia. This means that those who see their sales decline tend to decrease operating costs albeit not being in the same proportion. This fact shows us that in certain situations the costs are sticky, which is consistent with *ABJ* and other authors referred to in literature review.

[2] The number of observations for ΔlnSALES is 522 785, because this variable is the first difference of the logarithm, so the year 2008 is "lost". There are 104 993 observations per year, so 5220785+1040993=627778, the total number of observations referred in section 3.2.

Table 2 ***Panel D: GDPGrowth defined as the annual percentage growth rate of GDP at market prices based on constant local currency, where aggregates are based on constant 2010 U.S. dollars***

Country	Mean	Median	Max.	Min.	Std. Dev.	Skew.	Kurtosis	Obs.
Austria	0,546	1,147	2,808	-3,799	2,141	-1,166	3,141	248
Belgium	0,584	0,783	2,744	-2,253	1,555	-0,492	2,533	10979
Estonia	-0,684	1,937	7,597	-14,724	7,400	-0,881	2,492	4936
Finland	-0,676	0,721	2,992	-8,269	3,734	-1,111	3,076	16321
France	0,342	0,195	2,079	-2,941	1,661	-0,943	2,903	156174
Germany	0,709	1,082	4,080	-5,619	3,166	-0,984	2,983	15258
Greece	-4,965	-5,479	-0,335	-9,132	2,831	0,145	2,084	9259
Italy	-1,456	-1,050	1,687	-5,482	2,314	-0,366	2,194	211341
Latvia	-1,494	-3,548	6,381	-14,402	6,915	-0,735	2,409	730
Luxembourg	0,845	1,093	4,865	-4,359	3,167	-0,317	1,815	270
Netherlands	-0,052	1,403	1,699	-3,768	1,970	-0,873	2,423	1473
Portugal	-1,310	-1,827	1,899	-4,028	1,961	0,258	1,960	61669
Slovakia	1,874	2,819	5,630	-5,423	3,614	-1,066	3,056	6816
Slovenia	-1,017	0,649	3,300	-7,797	3,505	-0,801	2,678	6497
Spain	-1,345	-0,999	1,118	-3,574	1,614	0,096	1,747	125807
Total	**-0,863**	**-0,999**	**7,597**	**-14,724**	**2,429**	**-0,664**	**4,461**	**627778**

This panel D presents the univariate results for GDP growth. As expected, the average value for this variable is negative, ranges from -4,965% in Greece to 1,874 % in Slovakia. The difference between maximum and minimum values is substantial, which indicates great instability. Only Greece could not achieve in any of the years under analysis a positive value for GDP growth. The lowest values were recorded in Estonia, Latvia and Greece. The fact that values fluctuate is good for our analysis, because it creates conditions to study the stickiness of costs in scenarios of optimism (when GDP growth is positive) and pessimism (when GDP growth is negative). Therefore, although the period of our sample is limited and conditioned by the crisis, there are cross-section differences in the level of GDP growth that benefit our analysis.

Table 2 ***Panel E: EPL defined as the mean of TempEPL and RegEPL, range from zero to six***

Country	Mean	Median	Max.	Min.	Std. Dev.	Skew.	Kurtosis	Obs.
Austria	1,841	1,841	1,841	1,841	0,000	NA[3]	NA	248
Belgium	2,166	2,134	2,229	2,134	0,045	0,707	1,500	10979
Estonia	2,092	2,309	2,405	1,842	0,251	0,048	1,073	4936
Finland	1,865	1,865	1,865	1,865	0,000	NA	NA	16321
France	3,012	3,005	3,047	3,005	0,016	1,788	4,197	156174
Germany	1,850	1,839	1,902	1,839	0,023	1,795	4,223	15258
Greece	2,508	2,333	2,776	2,185	0,271	-0,078	1,096	9259
Italy	2,374	2,381	2,381	2,339	0,016	-1,786	4,189	211341
Latvia	1,781	1,781	1,781	1,781	0,000	NA	NA	242
Luxembourg	2,998	2,998	2,998	2,998	0,000	NA	NA	270
Netherlands	1,885	1,879	1,911	1,879	0,012	1,779	4,165	1473
Portugal	2,945	3,034	3,177	2,499	0,245	-0,791	2,167	61669
Slovakia	2,220	2,232	2,232	2,208	0,012	-0,001	1,000	6816
Slovenia	1,870	1,924	1,986	1,670	0,107	-0,892	2,405	6497
Spain	2,530	2,451	2,679	2,305	0,154	-0,221	1,307	125807
Total	**2,582**	**2,388**	**3,177**	**1,670**	**0,356**	**-0,050**	**2,181**	**627290[4]**

Regarding *EPL*, we can say that the analysis of its descriptive statistics must be careful, since it is a normalized index, ranges from zero to six, with no direct correspondence with reality, that is, it is an unobservable variable. In addition, given that the sample has only six years, no major changes to the employment protection legislation are expected. In fact, according to the statistics obtained, just six out fifteen countries have changes during the period of our sample. The degree of labour rigidity is moderate for most countries, however there are important differences, since the maximum value recorded is 3,177 in Portugal (stricter *EPL*) and the lowest value recorded is 1,670 in Slovenia. According to untabled results, the trend has been a slight increase in rigidity in labour law. Only Portugal, Spain, Slovenia and Greece saw their levels of labour rigidity fall, although the decline was not very significant. As such, these countries continue to be those with the highest *EPL* values, excluding Slovenia.

[3] Some countries have NA value for Skewness and Kurtosis, because for these countries *EPL* has the same value for all period of sample.

[4] The total number of observations is not 627 778, because values are missing for *TempEPL* and *RegEPL* between 2008 and 2010 in Latvia.

Table 2 ***Panel F: TempEPL is an index of employment protection legislation for temporary employees, ranges from zero to six***

Country	Mean	Median	Max.	Min.	Std. Dev.	Skew.	Kurtosis	Obs.
Austria	1,313	1,313	1,313	1,313	0,000	NA	NA	248
Belgium	2,375	2,375	2,375	2,375	0,000	NA	NA	10979
Estonia	2,062	1,875	3,000	1,875	0,419	1,790	4,205	4936
Finland	1,563	1,563	1,563	1,563	0,000	NA	NA	16321
France	3,625	3,625	3,625	3,625	0,000	NA	NA	156174
Germany	1,021	1,000	1,125	1,000	0,047	1,795	4,223	15258
Greece	2,541	2,500	2,750	2,250	0,224	-0,330	1,321	9259
Italy	2,000	2,000	2,000	2,000	0,000	NA	NA	211341
Latvia	0,875	0,875	0,875	0,875	0,000	NA	NA	242
Luxembourg	3,750	3,750	3,750	3,750	0,000	NA	NA	270
Netherlands	0,938	0,938	0,938	0,938	0,000	NA	NA	1473
Portugal	1,917	1,938	1,938	1,813	0,047	-1,794	4,219	61669
Slovakia	1,813	1,813	1,813	1,813	0,000	NA	NA	6816
Slovenia	1,667	1,625	1,750	1,625	0,059	0,695	1,483	6497
Spain	2,802	2,688	3,000	2,563	0,202	-0,116	1,132	125807
Total	**2,529**	**2,000**	**3,750**	**0,875**	**0,748**	**0,322**	**1,868**	**627290**

Table 2 ***Panel G: RegEPL is an index of employment protection legislation for regular employees, ranges from zero to six***

Country	Mean	Median	Max.	Min.	Std. Dev.	Skew.	Kurtosis	Obs.
Austria	2,369	2,369	2,369	2,369	0,000	NA	NA	248
Belgium	1,956	1,893	2,083	1,893	0,090	0,707	1,500	10979
Estonia	2,121	1,810	2,742	1,810	0,440	0,704	1,495	4936
Finland	2,167	2,167	2,167	2,167	0,000	NA	NA	16321
France	2,399	2,385	2,468	2,385	0,031	1,788	4,197	156174
Germany	2,679	2,679	2,679	2,679	0,000	NA	NA	15258
Greece	2,476	2,167	2,802	2,119	0,326	-0,004	1,010	9259
Italy	2,748	2,762	2,762	2,679	0,031	-1,786	4,189	211341
Latvia	2,687	2,687	2,687	2,687	0,000	NA	NA	242
Luxembourg	2,246	2,246	2,246	2,246	0,000	NA	NA	270
Netherlands	2,832	2,821	2,885	2,821	0,024	1,779	4,165	1473
Portugal	3,974	4,131	4,417	3,185	0,454	-0,677	1,946	61669
Slovakia	2,627	2,651	2,651	2,603	0,024	-0,001	1,000	6816
Slovenia	2,073	2,222	2,222	1,714	0,213	-0,789	1,743	6497
Spain	2,258	2,214	2,357	2,048	0,114	-0,741	2,248	125807
Total	**2,635**	**2,468**	**4,417**	**1,714**	**0,519**	**1,992**	**7,229**	**627290**

Table 2 panel F and G present univariate results for *TempEPL* and *RegEPL* respectively. The mean value of these two variables do not differ significantly, however it is curious that countries which have the highest values for *TempEPL* has the lowest values for *RegEPL* and *vice-versa*. These values are satisfactory because they once again show differences in our sample that allow us to analyse in detail the impact of employment protection legislation on the behaviour of costs, namely on operational costs, where labour costs are present.

Table 3 Pearson's Correlation

	AssetInt	**ΔlnOPC**	**ΔlnSALES**	**RegEPL**	**TempEPL**	**EPL**	**GDPGrowth**
AssetInt	1						
ΔlnOPC	-0,119	1					
ΔlnSALES	-0,142	0,841	1				
RegEPL	0,114	0,003	-0,004	1			
TempEPL	-0,189	0,025	0,020	-0,421	1		
EPL	-0,120	0,028	0,018	0,268	0,761	1	
GDPGrowth	-0,136	0,266	0,268	-0,095	0,203	0,147	1

AssetInt is defined as $ln(\frac{Total\ Asset}{Sales\ Revenue})$*, ΔlnOPC is the first difference of the logarithm of operational costs, ΔlnSALES is the first difference of logarithm of sales revenue, GDPGrowth is defined as the annual percentage growth rate of GDP at market prices based on constant local currency, EPL is the aggregate index of employment protection legislation, computed as the mean of TempEPL (an index of employment protection legislation for temporary employees) and RegEPL (an index of employment protection legislation for regular employees). The sample includes companies for the 15 Euro Area countries and the sample period is from 2008 to 2013.*

The Table 3 shows Pearson's correlations coefficients between dependent and independent variables. The most relevant results are: *(i)* in general, the correlations between our variables are not very substantial *(ii)* there is a high correlation between operating costs and sales (0,841), however, it is not 1, so the relationship is not perfect. As discussed above, this means that some costs are sticky *(iii)* the Pearson´s correlation between operating costs and sales is the highest, followed by *EPL* and *TempEPL* (0,761). The relationship between *EPL*, *TempEPL* and *RegEPL* is natural, since *EPL* is the mean of these two values *(iv)* GDP growth is positively correlated with operational costs, although the correlation is not strong *(v)* finally, our main independent variable (*EPL)* is positively correlated with operational costs and sales, but the coefficient is higher for operational costs, although these relations are weak.

4.2. Multivariate analysis

We report the main results in Table 4. The Original Model (OLS) presents the coefficients that were estimated from equation 4 using Panel Unbalanced Least Squares. Then, we re-estimated the model but using fixed effects (cross-section and period), because we wanted to perceive if the results would be different considering the potential impacts of the dynamic effects or not. Finally, we did a third estimation with HAC - Newey-West and unstructured data, for the reason that our first estimation showed problems with the classic hypotheses, namely the presence of autocorrelation and heteroscedasticity. This model has the same coefficients of Original Model, however t-statistics are different, as expected, and so the estimators are more reliable.

The results do not differ significantly between these three estimations. For all models, adjusted R_2 (not tabulated) are lower than R_2, thus fulfilling the theoretical assumption. This indicator has a high value which indicates that our models can explain a huge percentage of dependent variable. Additionally, the complete estimation is done only for four years, since we have outdated variables. In panel data estimations there are 104 905 firms included and a total number of observations of 417 588. The unstructured estimation included 417 588 observations after adjustments.

The coefficients of control variables have the expected sign, according to *ABJ*, in all estimations, except for the Asset Intensity. The coefficient associated to the dummy for successive sales decreases is positive and significant at 1% level. When demand fluctuates, managers pay attention to all information about upward or downward trends. Their assessments of the permanence of demand reduction are likely to get stronger as the continuum declines of revenue. So, successive declines in sales are interpreted as sign of permanent lower demand which motivate managers to cut down some resources, resulting in less stickiness.

On the other hand, when GDP growth is positive, managers are more reluctant to adjust immediately the resources, even if sales decrease, because a decline in sales is more likely to persist when the economywide conditions are negative. Therefore, managers would be less willing to reduce committed resources in period of macroeconomic growth than in periods of decline, reinforcing stickiness of costs. As expected, the estimate of λ_7 is negative and significant at 1% level.

The last control variable, Asset Intensity, was expected to generate more stickiness, since adjustment costs are likely to be higher when selling, general and administrative activities rely more on workers and assets owned than services purchased by the company, according to *ABJ*. However, for our data this forecast is not verified, except for the model in which we use the fixed effects.

The main parameters of interest are λ_5 and λ_9, which capture the association between the strictness of employment protection legislation and the degree of cost stickiness and the relation between the intervention of Troika and stickiness of costs, respectively. The significant and negative coefficients on the term that includes *EPL* (-0,031 *** and -0,053 ***) and on the term that includes Troika (-0,056 *** and -0,069 ***) indicate that costs are stickier for firms located in countries where the employment protection in higher and where the crisis of 2008 was more profound and so the intervention of Troika was necessary. These results are consistent with the rationality underling both H1 and H2. Therefore, if sales decrease 1 %, the costs will decrease less 0,031% or 0,053% (depending on the model considered) in countries with stricter *EPL* than in other countries. In addition, for Portugal and Greece the stickiness of costs is also enhanced by the presence of Troika. These two countries react less 0,056% or 0,069% when comparing to the other thirteen countries of our sample.

In summary, our estimates indicate that stricter *EPL* is associated with more stickiness and the intervention of Troika also increased the magnitude of cost stickiness. Therefore, our results support the new theory of cost behaviour, where it reflects deliberate resource commitment decisions made by managers who recognize the implications of adjustment costs.

Table 4 Estimates of the relation between EPL, Troika and Stickiness

Coefficient	Expected Sign	Original Model (OLS)	Model with fixed effects	Model with HAC[5]
β_0		0,001 ***	-0,000	0,001 ***
		(4,96)	(-0,68)	(5,48)
β_1	+	0,934 ***	0,919 ***	0,934 ***
		(103,76)	(62,76)	(87,78)
λ_1		-0,047 ***	-0,050 ***	-0,047 ***
		(-12,99)	(-8,62)	(-10,90)
λ_2		0,002 ***	-0,005 ***	0,002 **
		(2,68)	(-5,42)	(2,25)
λ_3		-0,059 ***	-0,052 ***	-0,059 ***
		(-27,90)	(-15,15)	(-18,35)
λ_4		-0,021 ***	-0,018 ***	-0,021 ***
		(-5,27)	(-2,66)	(-3,82)
β_2	-	0,011	0,064 **	0,011
		(0,78)	(2,45)	(0,72)
$\boldsymbol{\lambda_5}$	**-**	**-0,031 *****	**-0,053 *****	**-0,031 *****
		(-5,61)	(-5,11)	(-5,21)
λ_6	+	0,061 ***	0,024 ***	0,061 ***
		(24,73)	(7,46)	(18,70)
λ_7	-	-0,025 ***	-0,015 ***	-0,025 ***
		(-27,54)	(-9,87)	(-22,21)
λ_8	-	0,002	-0,016 ***	0,002
		(0,83)	(-2,95)	(0,62)
$\boldsymbol{\lambda_9}$	**-**	**-0,056 *****	**-0,069 *****	**-0,056 *****
		(-9,93)	(-5,84)	(-8,48)
R_2		0,688	0,727	0,688
Prob(F-statistic)		0,000	0,000	0,000
Durbin-Watson stat		2,617	2,965	2,617
Prob(Wald F-statistic)		-	-	0,000
Cross-sections included (Firms)		104905	104905	-
Total observations		417588	417588	417588

AssetInt is defined as $ln(\frac{Total\ Asset}{Sales\ Revenue})$*, ΔlnOPC is the first difference of the logarithm of operational costs, ΔlnSALES is the first difference of logarithm of sales revenue, GDPGrowth is defined as the annual percentage growth rate of GDP at market prices based on constant local currency, EPL is the aggregate index of employment protection legislation, DEC is a dummy variable equals to one for firms whose sales decrease in the period t-1, TROIKA is a dummy variable equals to one for Portuguese and Greek firms. The sample includes companies for the 15 Euro Area countries and the sample period is from 2008 to 2013. Coefficient values are listed at the first row and t-statistics are in parentheses. The symbol * means that the variables is significant at 10% level, ** means that the variable is significant at 5% level, and *** means that the variable is significant at the 1% level.*

[5] HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 26.0000)

5. ROBUSTNESS AND ADDITIONAL TESTS

In this section, we will present some additional tests in Table 5, in order to check if our results are robust enough. In this sense, we extend our study, by re-estimate the model after discarding the data for the France and Italy firms, since these firms are more than 50% of our sample and could thus have a disproportionate impact on the estimates. The estimates after we discard the FR and IT data reinforce the importance of *EPL* (λ_5 = -0,156 ***) but changes the expected signal with respect to the effect of Troika (λ_9 = 0,019 ***). Possibility, it is due to the fact the crisis affected more these countries than the France and Italy and so, even when sales decreased after an increase, managers were not confident enough to maintain slack resources and so they cut it.

In addition, we also replace the main index of *EPL* with two more detailed measures, *i.e*, *TempEPL* and *RegEPL*. The equation is very similar to our main model and it is as follows:

$$\begin{aligned}\Delta lnOPC_{c,f,t} = \beta_0 + (\beta_1 + \lambda_{1.1} RegEPL_c + \lambda_{1.2} TempEPL_c + \lambda_2 GDPGrowth_{c,t} \\ + \lambda_3 AssetInt_{c,f,t} + \lambda_4 TROIKA_c)\, \Delta lnSALES_{c,f,t} + (\beta_2 + \lambda_{5.1} RegEPL_c \\ + \lambda_{5.2} TempEPL_c + \lambda_6 DEC_{c,f,t-1} + \lambda_7 GDPGrowth_{c,t} + \lambda_8 AssetInt_{c,f,t} \\ + \lambda_9 TROIKA_c) DEC_{c,f,t} \Delta lnSALES_{c,f,t} + \varepsilon_{c,f,t} \qquad (5)\end{aligned}$$

In this additional analysis, H1 implies that stricter *RegEPL* and *TempEPL* should increase the degree of cost stickiness (*i.e.,* the coefficients of both variables should be negative). In fact, the coefficients are negative and significant at 1% level.

Because cost stickiness may be influenced by the size of the firm, we also control for this aspect by splitting the data into two subsamples of small versus large firms. The separation was done according to the median of number of employees, *i.e.,* when a firm was median or above median was classified as large, but when it was below median, the firm was classified as small. For our sample the median number of employees was twelve. The main results of this robustness check are similar, which reinforces the importance of both the labour law and the Troika intervention in cost behaviour.

Table 5 Robustness Tests

Coefficient	Expected Sign	Subsample excluding FR and IT	Model with RegEPL and TempEPL	Subsample Large Firms	Subsample Small Firms
β_0		0,000	0,001 ***	0,003 ***	-0,003 ***
		(0,22)	(5,00)	(10,35)	(-6,82)
β_1	+	0,596 ***	0,847 ***	0,822 ***	0,846 ***
		(38,86)	(69,43)	(67,28)	(42,41)
$\lambda_{1.1}$		0,111 ***	0,012 ***	0,009 *	-0,011
		(16,96)	(2,93)	(1,75)	(-1,35)
$\lambda_{1.2}$			-0,024 ***		
			(-13,18)		
λ_2		0,001	0,000 ***	0,005 ***	-0,001
		(0,89)	(7,01)	(7,28)	(-0,99)
λ_3		-0,054 ***	-0,060 ***	-0,050 ***	-0,063 ***
		(-17,66)	(-28,82)	(-16,80)	(-17,41)
λ_4		-0,120 ***	-0,062 ***	-0,007	-0,085 ***
		(-22,67)	(-11,14)	(-1,46)	(-12,26)
β_2	-	0,284 ***	0,165 ***	0,059 ***	0,139 ***
		(12,54)	(9,14)	(2,89)	(4,83)
$\boldsymbol{\lambda_5}$	**-**	**-0,156 *****		**-0,054 *****	**-0,086 *****
		(-16,34)		(-6,57)	(-7,49)
$\boldsymbol{\lambda_{5.1}}$	**-**		**-0,080 *****		
			(-14,28)		
$\boldsymbol{\lambda_{5.2}}$	**-**		**-0,013 *****		
			(-4,53)		
λ_6	+	0,047 ***	0,059 ***	0,047 ***	0,056 ***
		(12,74)	(24,01)	(13,04)	(14,32)
λ_7	-	-0,022 ***	-0,021 ***	-0,031 ***	-0,018 ***
		(-18,82)	(-32,39)	(-27,34)	(-11,32)
λ_8	-	0,018 ***	0,006 **	-0,029 ***	0,024 ***
		(4,56)	(2,00)	(-6,67)	(5,30)
$\boldsymbol{\lambda_9}$	**-**	**0,019 *****	**0,019 ** **	**-0,061 *****	**-0,001**
		(2,64)	(2,38)	(-8,19)	(-0,11)
R_2		0,701	0,688	0,752	0,656
Prob(F-statistic)		0,000	0,000	0,000	0,000
Durbin-Watson stat		2,597	2,618	2,570	2,657
Cross-sections included (firms)		43470	104905	51917	50362
Total observations		172992	417588	173160	159630

AssetInt is defined as $ln(\frac{Total\ Asset}{Sales\ Revenue})$*,* $\Delta lnOPC$ *is the first difference of the logarithm of operational costs,* $\Delta lnSALES$ *is the first difference of logarithm of sales revenue, GDPGrowth is defined as the annual percentage growth rate of GDP at market prices based on constant local currency, EPL is the aggregate index of employment protection legislation, computed as the mean of TempEPL (an index of employment protection legislation for temporary employees) and RegEPL (an index of employment protection legislation for regular employees), DEC is a dummy variable equals to one for firms whose sales decrease in the period t-1, TROIKA is a dummy variable equals to one for Portuguese and Greek firms. The sample includes companies for the 15 Euro Area countries and the sample period is from 2008 to 2013. Coefficient values are listed at the first row and t-statistics are in parentheses. The symbol *, ** and *** means that the variables is significant at 10%, 5% and 1% level.*

We also estimate the framework developed by *Banker et al. (2014)*, which show that stickiness documented by *ABJ* represents a combination of two phenomena, that is stickiness when sales increase in prior period and anti-stickiness after prior sales decrease. As mentioned before, these authors explained these patterns due to manager optimism or pessimism following increase or decrease sales, respectively. So, following *Banker et al. (2014),* we introduce interactions with manager pessimism and optimism on both slopes and in the impact of *EPL* and *Troika* on both slopes, which proxies for pessimism and optimism using dummies for prior sales decrease and increase. The new estimation model is as follows:

$$\begin{aligned}\Delta lnOPC_{c,f,t} = \beta_0 + (&\beta_1^{OPT} Inc_{c,f,t-1} + \beta_1^{PES} Dec_{c,f,t-1} + \lambda_1^{OPT} Inc_{c,f,t-1} EPL_c \\ &+ \lambda_1^{PES} Dec_{c,f,t-1} EPL_c + \lambda_2 GDPGrowth_{c,t} + \lambda_3 AssetInt_{c,f,t} \\ &+ \lambda_4^{OPT} Inc_{c,f,t-1} TROIKA_c + \lambda_4^{PES} Dec_{c,f,t-1} TROIKA_c)\, \Delta lnSALES_{c,f,t} \\ &+ (\beta_2^{OPT} Inc_{c,f,t-1} + \beta_2^{PES} Dec_{c,f,t-1} + \lambda_5^{OPT} Inc_{c,f,t-1} EPL_c \\ &+ \lambda_5^{PES} Dec_{c,f,t-1} EPL_c + \lambda_6 GDPGrowth_{c,t} + \lambda_7 AssetInt_{c,f,t} \\ &+ \lambda_8^{OPT} Inc_{c,f,t-1} TROIKA_c \\ &+ \lambda_8^{PES} Dec_{c,f,t-1} TROIKA_c) DEC_{c,f,t} \Delta lnSALES_{c,f,t} \\ &+ \varepsilon_{c,f,t} \end{aligned} \quad (6)$$

where $Inc_{c,f,t-1}$ is a dummy variable equal to one if sales in prior period increase and zero otherwise, and $Dec_{c,f,t-1}$ has the same logic, but for decreases in sales. These two variables are proxies for optimism and pessimism, respectively. The other variables have the same meaning already attributed in the previous model. The parameters β_2^{OPT} and β_2^{PES} capture the impact of the optimism and pessimism on the level of stickiness and anti-stickiness. The main parameters of interest are λ_5^{OPT} and λ_5^{PES}, in relation to *EPL* and λ_8^{OPT} and λ_8^{PES}, regarding the intervention of Troika. First, H1 implies that both λ_5^{OPT} and λ_5^{PES} are negative, because stricter *EPL* might increase stickiness when managers are optimistic and reduce anti-stickiness when managers are pessimists. Then, H2 implies that both λ_8^{OPT} and λ_8^{PES} are negative, since the intervention of Troika should increase stickiness in the optimistic cases and reduce anti-stickiness in the pessimistic case. All results are presented in Table 6.

Table 6 Estimates after controlling for manager optimism and pessimism

Coefficient	Expected Sign	Original Model (OLS)	Model with fixed effects	Model with HAC
β_0		0,001 ***	-0,000	0,001 ***
		(3,82)	(-1,10)	(4,22)
β_1^{OPT}	+	0,898 ***	0,820 ***	0,898 ***
		(67,45)	(40,57)	(66,83)
β_1^{PES}	+	0,980 ***	0,980 ***	0,980 ***
		(81,37)	(57,36)	(61,76)
λ_1^{OPT}		-0,011 **	0,002	-0,011 **
		(-2,14)	(0,29)	(-2,12)
λ_1^{PES}		-0,080 ***	-0,081 ***	-0,080 ***
		(-16,61)	(-11,95)	(-12,57)
λ_2		0,005 ***	-0,004 ***	0,005 ***
		(7,54)	(-3,85)	(6,29)
λ_3		-0,048 ***	-0,045 ***	-0,048 ***
		(-22,74)	(-12,92)	(-15,05)
λ_4^{OPT}		-0,002	-0,016 *	-0,002
		(-0,29)	(-1,81)	(-0,25)
λ_4^{PES}		-0,033 ***	-0,024 ***	-0,033 ***
		(-6,31)	(-3,04)	(-4,19)
β_2^{OPT}	-	0,094 ***	0,208 ***	0,094 ***
		(4,71)	(6,44)	(4,16)
β_2^{PES}	+	-0,022	-0,025	-0,022
		(-1,14)	(-0,84)	(-0,95)
$\boldsymbol{\lambda_5^{OPT}}$	**-**	**-0,086 *****	**-0,124 *****	**-0,086 *****
		(-10,89)	(-9,68)	(-9,71)
$\boldsymbol{\lambda_5^{PES}}$	**-**	**0,021 *****	**0,002**	**0,021 ** **
		(2,76)	(0,13)	(2,28)
λ_6	-	-0,028 ***	-0,016 ***	-0,028 ***
		(-30,94)	(-10,53)	(-24,81)
λ_7	-	-0,008 ***	-0,025 ***	-0,008 **
		(-2,84)	(-4,50)	(-2,11)
$\boldsymbol{\lambda_8^{OPT}}$	**-**	**-0,069 *****	**-0,053 *****	**-0,069 *****
		(-8,49)	(-3,73)	(-7,22)
$\boldsymbol{\lambda_8^{PES}}$	**-**	**-0,049 *****	**-0,076 *****	**-0,049 *****
		(-6,69)	(-5,81)	(-5,04)
R_2		0,689	0,727	0,689
Prob(F-statistic)		0,000	0,000	0,000
Durbin-Watson stat		2,623	2,966	2,623
Prob(Wald F-statistic)		-	-	0,000
Cross-sections included (firms)		104905	104905	104905
Total observations		417588	417588	417588

AssetInt is defined as $\ln(\frac{Total\ Asset}{Sales\ Revenue})$*, ΔlnOPC is the first difference of the logarithm of operational costs, ΔlnSALES is the same for sales revenue, GDPGrowth is defined as the annual percentage growth rate of GDP at market prices based on constant local currency, EPL is the aggregate index of employment protection legislation, DEC is a dummy variable equals to one for firms whose sales decrease in the period t-1, INC is a dummy variable equals to one for firms whose sales increase in the period t-1, TROIKA is a dummy variable equals to one for Portuguese and Greek firms. The sample includes 15 Euro Area countries from 2008 to 2013. Coefficient values are listed at the first row and t-statistics are in parentheses. The symbol *, ** and *** means that the variables is significant at 10%, 5% and 1% level.*

Our results are not consistent with the *Banker et al. (2014)* findings for Selling, General and Administrative costs in the American firms for most of coefficients. We find that, on average for our data, operating costs are not sticky in the optimistic case, since the term $\beta_2^{OPT}$is positive and significant at 1%, when the expected signs was negative. Relatively to anti-sticky in the pessimistic case, the coefficient β_2^{PES} is negative but not significant. The main parameters in analysis are those associated to *EPL* and Troika. The *EPL* coefficient in case of optimism is consistent with theory and so it is negative, however, in pessimism case it not happens. Contrary to what would be expected, the estimate is positive. Finally, the results for Troika´s intervention are similar to our main estimation, where the coefficients are negative and significant at 1 % level.

These findings prove the impact of the crisis in cost behaviour. Actually, the period between 2008 and 2013 was characterized by an extreme pessimism. It is clear in our results, because although *EPL* and Troika increase adjustment costs, managers chose to effectively cut resources, which made anti-stickiness phenomenon increase in presence of higher *EPL*. We believe these results are consistent with this new theory of cost behaviour, although the coefficients have different signs, because the managers were afraid that with the crisis the labour restriction and the intervention of the Troika would increase and therefore the adjustment costs would grow as well.

6. CONCLUSION

In this study, we investigated the costs behaviour, namely the relation between employment protection legislation, the intervention of Troika and sticky cost behaviour. The new theory of sticky costs predicts that many costs arise due to the deliberate resources commitment decisions made by managers. So, adjustment costs play an important role in this new theory, since managers react on changes in output by assessing the pros and cons of actually changing the resources.

The empirical tests of the theory have been hampered by the difficulty of having a direct measure for adjustment costs. For this reason, we use the *EPL* as proxy for adjustment costs with labour factor. Cross-country differences in *EPL* stickiness provide a reliable source of variation in the adjustment costs for labour resources. We also consider that the intervention of Troika increased the adjustment costs, especially those related to labour resources. Based on it, we predict that both aspects mentioned above increase the stickiness of costs.

Our sample includes 104 993 active manufacturing firms (NACE 10-32, excluding 18) covered by Amadeus during 2008-2013 from 15 Euro Area countries (*i.e.,* Austria, Belgium, Estonia, Finland, France, Germany, Greece, Italy, Latvia, Luxembourg, Netherlands, Portugal, Slovakia, Slovenia and Spain). We use many alternative model specifications as panel data, unstructured data, fixed effects and HAC – Newey-West, to control for different problems.

The main results are robust and strongly support our predictions, validating the proposition that deliberate resource commitment decisions are the main explanation for cost stickiness, in the presence of adjustment costs.

Our results have implications for managers and other corporate decisions makers. Choices based on the traditional theory of cost behaviour will overestimate the responsiveness of costs to decreases in the level of activity and underestimate the reaction of costs in the presence of an increase in activity level. In this sense, if managers still making decisions based on traditional theory, they will make decisions that endanger the company.

The main limitation of our study is the fact that the period covered by our analysis not only is too short but also coincides with the years of the 2008 crisis. It does not allow us to be certain if the results are too influenced by the economic environment that has been felt in recent years, although we believe so. In this sense, we suggest that future work on this scope should cover a longer and more diversified period, including years before and after the referred crisis.

Additionally, studying this subject at a more micro level may be a good option for future research, since even within the same country it is possible to obtain different levels of stickiness/anti-stickiness according to the sector studied. Although the manufacturing sector is fairly diverse, our analysis focused more on the cross-county differences and not so much on the specificities of the sectors. So, future research can include more firm-level variables such earnings volatility, share price performance, return on assets or return on equity. Besides that, it can also have some disadvantages. Because we use a large sample with different counties, we were able to demonstrate the impact of economy-wide structural variables on cost behaviour, otherwise it would be impossible.

Finally, the legal origin of counties is fundamental to explain some differences, namely in market labour. Thus, it would be interesting to confront countries with different regimes to perceive if this has an impact on results, as expected or not.

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APPENDIX A

Calculation of the indicators of *EPL* strictness reported in OECD (2004)

For each country, employment protection legislation is described along 14 basic items in *OECD (2004)* and represents the legislative provisions governing the firing of regular employees, which address issues such as severance payment levels or the length of notice period before the dismissal. Additionally, they also reflect some protection for temporary employees, for example, the maximum duration of fixed-term contracts. Moreover, these 14 items can be classified in two main areas:

i) employment protection of regular workers against individual dismissal; and
ii) regulation of temporary forms of employment.

Then, these items are aggregated into summary indexes of employment protection legislation for regular employments (*RegEPL)* and for temporary employments *(TempEPL)*. Finally, when all these indexes are merged we have the overall index of employment protection, *i.e.* EPL_c.

The first step of the procedure of *OEDC (2004)* was therefore to score all the first-level measures of *EPL* in comparable units and so converted each basic item into a numerical score that were normalized to range from 0 to 6, with higher scores representing stricter regulation. The renormalization rules are presented in third column of Panel A and B. After all, it was computed, for each country, an overall summary indicator based on the two subcomponents: strictness of regulation for regular contracts and temporary contracts, as a weighted average of the numerical scores for basic items, with weights presented in Panel C.

Table 7 Panel A EPL for regular employees (source: Table 2.A1.1 in OECD 2004)

Basic Item	Decription	Assignment of numerical scores of strictness						
		0	1	2	3	4	5	6
Item 1 Dismissal notification procedures	**Scale 0-3** 0 when an oral statement is enough; 1 when a written statement of the reasons for dismissal must be supplied to the employee; 2 when a third party (such as works council or the competent labour authority) must be notified; 3 when the employer cannot proceed to dismissal without authorisation from a third party.	Scale * 2						
Item 2 Delay involved before notice can start	**Delay in days** Estimated time includes, where relevant, the following assumptions: 6 days are counted in case of required warning procedure, 1 day when dismissal can be notified orally or the notice can be directly handed to the employee, 2 days when a letter needs to be sent by mail and 3 days when this must be a registered letter.	≤2	< 10	< 18	< 26	< 35	< 45	≥ 45
Item 3 Length of the notice period at	**Notice period in months** 9 months tenure	0	≤ 0.4	≤ 0.8	≤ 1.2	< 1.6	< 2	≥ 2
	4 years tenure	0	≤ 0.75	≤ 1.25	< 2	< 2.5	< 3.5	≥ 3.5
	20 years tenure	< 1	≤ 2.75	< 5	< 7	< 9	< 11	≥ 11
Item 4 Severance pay at	**Months pay** 9 months tenure	0	≤ 0.5	≤ 1	≤ 1.75	≤ 2.5	< 3	≥ 3
	4 years tenure	0	≤ 0.5	≤ 1	≤ 2	≤ 3	< 4	≥ 4
	20 years tenure	0	≤ 3	≤ 6	≤ 10	≤ 12	≤ 18	> 18

Table 7 Panel A (continued): EPL for regular employees (source: Table 2.A1.1 in OECD 2004)

Item 5 Definition of justified or unfair dismissal	**Scale 0-3** 0 when worker capability or redundancy of the job are adequate and sufficient ground for dismissal; 1 when social considerations, age or job tenure must when possible influence the choice of which worker(s) to dismiss; 2 when a transfer and/or a retraining to adapt the worker to different work must be attempted prior to dismissal; 3 when worker capability cannot be a ground for dismissal.	Scale * 2						
Item 6 Length of trial period	**Months** Period within which, regular contracts are not fully covered by employment protection provisions and unfair dismissal claims can usually not be made.	≥ 24	> 12	> 9	> 5	> 2.5	≥ 1.5	< 1.5
Item 7 Compensation following unfair dismissal	**Months pay**	≤ 3	≤ 8	≤ 12	≤ 18	≤ 24	≤ 30	> 30
Item 8 Possibility of reinstatement following unfair dismissal	**Scale 0-3** The extend of reinstatement is based upon whether, after finding of unfair dismissal, the employee has the option of reinstatement into his/her previous job, even if this is against the wishes of the employer.	Scale * 2						

Table 7 Panel B: EPL for temporary employment (source: Table 2.A1.1 in OECD 2004)

Basic Item	Decription	Assignment of numerical scores of strictness						
		0	1	2	3	4	5	6
Item 9 Valid cases for us of fixed-term contracts (FTC)	**Scale 0-3** 0 fixed-term contracts are permitted only for "objective" or "material situation", *i.e.* to perform a task which itself is of fixed duration; 1 if specific exemptions apply to situations of employer need (*e.g.* launching a new activity) or employee need (*e.g.* workers in search of their first job); 2 when exemption exist on both the employer and employee sides; 3 when there are no restrictions on the use of fixed-term contracts.	6 - Scale * 2						
Item 10 Maximum number of successive FTC	**Number of contracts**	No limit	≥ 5	≥ 4	≥ 3	≥ 2	≥ 1.5	<1.5
Item 11 Maximum cumulated duration of successive FTC	**Months**	No limit	≥ 36	≥ 30	≥ 24	≥ 18	≥ 12	<12
Item 12 Types of work for which temporary work agency (TWA) employment is legal	**Scale (0-4)** 0 when TWA employment is illegal; 1-3 1 to 3 depending upon the degree of restrictions; 4 when no restrictions apply.	6 - Scale * 6/4						
Item 13 Restrictions on number of renewals	**Yes or No**	-	-	No	-	Yes	-	-
Item 14 Maximum cumulated duration of TWA contracts	**Months**	No limit	≥ 36	≥ 24	≥ 18	≥ 12	> 6	≤6

Table 7 Panel C: EPL summary indicators at four successive levels of aggregation (source: Table 2.A1.2 in OECD 2004)

Level 4 index	**Level 3 index**	**Level 2 index**	**Level 1 variables (basic items)**	
Scale 0 - 6	Scale 0 - 6	Scale 0 - 6	Scale 0 - 6	Weights
Overall summary indicator (*EPL*)	Regular contracts - *RegEPL* (1/2)	Procedural inconveniences (1/3)	1. Notification procedures	(1/2)
			2. Delay to start a notice	(1/2)
		Notice and severance pay for no-fault individual dismissals (1/3)	3. Notice period after: 9 months	(1/7)
			4 years	(1/7)
			20 years	(1/7)
			4. Severance pay after: 9 months	(4/21)
			4 years	(4/21)
			20 years	(4/21)
		Difficulty of dismissal (1/3)	5. Definition of unfair dismissal	(1/4)
			6. Trial period	(1/4)
			7. Compensation	(1/4)
			8. Reinstatement	(1/4)
	Temporary contracts - *TempEPL* (1/2)	Fixed term contracts (1/2)	9. Valid cases for us of FTC	(1/2)
			10. Maximum number of successive FTC	(1/4)
			11. Maximum cumulated duration of FTC	(1/4)
		Temporary work agency employment (1/2)	12. Types of work for which is legal	(1/2)
			13. Restrictions on number of renewals	(1/4)
			14. Maximum cumulated duration contracts	(1/4)