



**Growth and (un)employment:**  
an unified analysis combining Labour  
Market Institutions, Technology, and Monetary Policy

by

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*If you only read the books that everyone else is reading, you can only think what everyone else is thinking.*

Haruki Murakami, *Norwegian Wood*

*We truly believed in something back then, and we knew we were the kind of people capable of believing in something - with all our hearts. And that kind of hope will never simply vanish.*

Haruki Murakami, *Colorless Tsukuru Tazaki and His Years of Pilgrimage*

# Abstract

This thesis provides a detailed analysis on the relationship between economic growth and (un)employment. Although the question of how growth relates to (un)employment has been studied throughout a diverse set of contributions over the past years, only few studies provide an in-depth and critical analysis regarding this relationship. Our motivation is straightforward. Firstly, taking into account the recent economic developments worldwide, further insights into the relationship between growth and (un)employment are crucial to promote an adequate economic policy towards a sustainable recovery. Secondly, in the specific context of the European Monetary Union (EMU), additional knowledge on the linkages between growth, (un)employment and innovation, under a collective bargaining structure perspective, seems critical to assess the type of institutions, as well as the level of bargaining centralisation, that are more likely to ensure a steady economic growth rate. Finally, we try to fill the gap between the existent endogenous growth framework and the baseline labour market models by combining both approaches into a benchmark model.

Chapter 2 provides a critical review and an in-depth bibliometric exercise on the main contributions on the field over the past years. A substantial increase of new effects in the literature (such as the reallocation effect and the disciplinary unemployment effect), and a relative predominance of “formal” and “empirical” methodologies, with a very low weight of articles combining both methods, are some of the main findings.

Chapter 3 proposes a new theoretical framework aiming to understand the link between technological change, skill premium and employment. A skill-biased technological change (SBTC) model is fed with a collective bargaining structure perspective. Our results suggest that the impact of trade unions on technological-bias and on the level of (un)employment crucially depends on the type of labour market framework, meaning monopoly unions *versus* efficient bargaining. Moreover, unions fail to anticipate their impact on the path of technological-knowledge bias.

Chapter 4 introduces a novel analysis combining a Schumpeterian growth model with cash-in-advance (CIA) constraints on R&D, and Labour Market Institutions (LMI). Since interest rate and LMI might shape the amount of profit obtained by each firm and its incentives to continuously innovate through the increase in R&D costs, we explore the optimality of the Friedman rule and the impact of different-design LMI on growth, social welfare and (un)employment. We find that, although the Friedman rule seems to be optimal for all the considered cases, competitive labour market can be suboptimal below a specific threshold level of economic growth, depending on whether there is over or underinvestment of R&D.

Chapter 5 aims to capture the dynamics of the Portuguese unemployment rate. To overcome some lacks in the literature, we propose an exhaustive step-by-step methodology guide to study in detail the behaviour of unemployment time-series. We show that the Portuguese unemployment dynamics is better described by a nonlinear model, and we also analyse the impact of LMI on its asymmetric behaviour, concluding that LMI can affect not only the regimes but also the equilibrium unemployment rate. Hence, strong enough short-run increases in unemployment, as those observed during the recent fiscal consolidation effort, have non-negligible impacts on raising the Portuguese natural rate of unemployment and, ultimately, on lowering economic growth.

**Keywords:** economic growth, employment, unemployment, labour market institutions, skill-biased, wage premium, trade union, interest rate, monetary policy, nonlinear models, hysteresis, cycle asymmetry, bibliometrics, survey.

**JEL codes:** C22, C32, C52, C89, E24, E43, E50, J21, J50, O40.

# Resumo

A presente tese apresenta uma análise detalhada sobre a relação entre crescimento económico e (des)emprego. Embora a questão sobre como o crescimento afecta o (des)emprego tenha vindo a ser estudada através de um conjunto diverso de trabalhos científicos ao longo dos últimos anos, poucos são aqueles que desenvolvem uma análise crítica e aprofundada sobre esta mesma relação. Assim, a nossa motivação é clara. Primeiro, tendo em conta os recentes desenvolvimentos económicos a nível internacional, novas perspectivas sobre a relação entre crescimento económico e (des)emprego são essenciais para promover uma política económica capaz de garantir uma recuperação económica sustentável. Segundo, no contexto da União Monetária Europeia (EME), a promoção de conhecimento adicional sobre a ligação entre crescimento, (des)emprego e inovação, no contexto de uma estrutura de negociação coletiva, parece-nos essencial para avaliar que tipo de instituições, assim como o nível de centralização negocial, asseguram uma taxa de crescimento económica estável. Finalmente, tentamos colmatar as falhas entre os actuais modelos de crescimento e de mercado de trabalho, ao combinar ambos num modelo genérico de análise.

O Capítulo 2 fornece uma revisão crítica e uma análise bibliométrica sobre as principais contribuições na área ao longo dos últimos anos. Um aumento substancial de novos efeitos na literatura (como o efeito de re-alocação ou o efeito disciplinador do desemprego), e uma predominância relativa de metodologias “formal” e “empírica”, com um peso muito pequeno de artigos a combinar ambos os métodos, são alguns dos principais resultados.

O Capítulo 3 propõe um novo enquadramento teórico para estudar a relação entre tecnologia, prémio salarial e emprego, combinando um modelo de *skill-biased technological change* (SBTC) com uma estrutura negocial colectiva. Os nossos resultados sugerem que o impacto dos sindicatos no SBTC e no nível de (des)emprego depende, crucialmente, do tipo de estrutura de mercado de trabalho, *i.e.*, união monopolística *versus* negociação eficiente. Mais ainda, os sindicatos falham em antecipar o seu impacto no SBTC.

O Capítulo 4 introduz uma análise inovadora, combinando um modelo de crescimento Schumpeteriano com restrições de pré-pagamento no I&D, e Instituições de Mercado de Trabalho (IMT). Uma vez que a taxa de juro e a IMT podem afectar o montante de lucros obtidos por cada firma, bem como o seu incentivo para inovar continuamente, através de um aumento dos custos de I&D, nós exploramos a optimalidade da regra de Friedman e o impacto de diferentes tipos de IMT no crescimento económico, bem-estar social e (des)emprego. Os nossos resultados dizem-nos que, embora a regra de Friedman seja óptima para todos os casos considerados, um mercado de trabalho competitivo pode ser sub-óptimo a partir de um determinado nível de crescimento, dependendo da existência de sobre (ou sub) investimento em I&D.

O Capítulo 5 tem como objectivo captar a dinâmica da taxa de desemprego Portuguesa. No sentido de ultrapassar possíveis lacunas na literatura, apresentamos uma metodologia exaustiva, passo por passo, para estudar em detalhe o comportamento da série temporal desemprego. Mostramos que o desemprego Português é melhor descrito por um modelo não linear, e analisamos ainda o impacto das IMT na assimetria de ciclo do desemprego, concluindo que IMT podem afectar não só apenas o regime, mas também a taxa de desemprego de equilíbrio. Consequentemente, aumentos acentuados da taxa de desemprego no curto prazo, como aqueles observados durante a consolidação orçamental, têm impactos não negligenciáveis no aumento da taxa de desemprego natural Portuguesa e, no limite, na diminuição da taxa de crescimento.

**Palavras-chave:** crescimento económico, emprego, desemprego, instituições de mercado de trabalho, enviesamento tecnológico, prémio salarial, sindicato, taxa de juro, política monetária, modelos não lineares, assimetria de ciclo, bibliometria, pesquisa.

**Classificação JEL:** C22, C32, C52, C89, E24, E50, J21, J50, O40.

# Chapter 1

## Introduction

The relationship between economic growth and (un)employment is usually considered a puzzle in Economics. Although the question of how growth relates to (un)employment has been studied through out a diverse set of contributions over the past years, only few studies provide an in-depth and critical analysis regarding its relationship. Questions such as “Is there a positive or negative relationship between growth and (un)employment?”, “What are the main variables linking growth and (un)employment?” or “Does the relation runs from growth to (un)employment, or vice-versa?” have no consensus among scholars and researchers.

This thesis aims to enhance the existent knowledge on the topic by providing some theoretical and empirical guidelines to better understand this question. Our motivation is straightforward. Firstly, taking into account the recent economic developments worldwide, further insights into the relationship between economic growth and (un)employment are crucial to promote an adequate economic policy towards a sustainable recovery. Secondly, in the specific context of the European Monetary Union (EMU), additional knowledge on the linkage between growth, (un)employment and innovation under a collective bargaining structure perspective seems critical to assess the type of institutions, as well as the level of bargaining centralisation, that are more likely to ensure a steady economic growth rate. Finally, we try to fill the gap between the existent standard endogenous growth framework and the baseline labour market models by combining both approaches into a generic benchmark model.

With this purpose in mind, we present four essays. Since each one follows a different type of approach, if combined, they provide a general, solid, and integrated framework to better study and explore this relationship. The first essay presents a bibliometric study relating economic growth and unemployment. The next two examine this link from a theoretical perspective, where a standard endogenous growth

model is combined with Labour market institutions (LMI) and (a) skill-biased technological change (Essay 2) or (b) Cash-in-advance constraints (Essay 3). The fourth essay introduces an econometric study on the behaviour of the Portuguese unemployment and how LMI and economic growth rate affects its dynamics. Hence, this thesis is comprised of six chapters. After this Introduction, which provides a general overview, we present the four essays and a final chapter summarising the main conclusions.

Chapter 2, entitled “Growth and unemployment: a bibliometric analysis on mechanisms and methods”, combines an in-depth survey with a bibliometric analysis regarding the most important works on the field of economic growth and unemployment. Indeed, in the first part of the paper, we provide a critical review and a categorisation of the most important contributions in the field until 2000s. In the second part, we develop a bibliometric analysis in order to identify the evolution pattern of the main research lines, using a quantitative approach. Then, we provide an update of the literature by describing the new theoretical mechanisms and empirical evidence regarding the relationship between growth and unemployment. A substantial increase of new effects (reallocation effect, leapfrogging effect, disciplinary unemployment effect, minimum wage effect, updating technology effect, schooling and working effect, and agglomeration economies effect) and a relative predominance of “formal” and “empirical” methodologies, with a very low weight of articles combining both methods, are some of the main findings.

Chapter 3, “How powerful are trade unions? A skill-based technological change approach”, proposes a new theoretical framework aiming to understand the link between technological change, skill premium and employment, combining a skill-biased technological change (SBTC) model with a collective bargaining structure perspective. In this case, we focus our analysis on the relationship between SBTC and (un)employment, where economic growth path crucially depends on the dynamics of technology and skill premium. Our results suggest that (i) the impact of trade unions on technological-bias and on the level of (un)employment crucially depends on the type of labour market framework, meaning monopoly unions *versus* efficient bargaining; (ii) trade unions can actually increase low-skilled wages without increasing or even implying low-skilled unemployment, if they have some bargaining power and are more employment-oriented than wage-oriented; (iii) unions fail to anticipate their impact on the path of technological-knowledge bias. Furthermore, our framework provides some highlights to explain the relationship between the de-unionization process that occurred in United Kingdom and United States during 1980s and the wage ratio.

Chapter 4, “R&D, Labour market institutions and economic growth: an integrated analysis with cash-in-advance constraints”, introduces a novel analysis combining a Schumpeterian growth model with cash-in-advance (CIA) constraints on R&D, and LMI (namely, trade unions). Since interest rate and LMI might shape the amount of profit obtained by each firm and its incentives to continuously innovate through the increase in R&D costs, we explore the optimality of the Friedman rule and the impact of different-design LMI on economic growth, social welfare and unemployment for a given nominal interest rate. Under the last scenario, we also test the optimality of competitive labour markets and identify the best labour market framework to achieve optimal economic growth and welfare. This relationship between growth, interest rate and LMI is particular relevant within the Eurozone, since countries cannot rely on autonomous monetary policy to foster growth and R&D, and thus, the assessment of the best labour market framework to promote economic growth, innovation and low(high) un(employment) maybe crucial. We find that, although the Friedman rule seems to be optimal for all the considered cases, competitive labour market can be suboptimal below a specific threshold level of economic growth, depending on whether there is over or underinvestment of R&D. Furthermore, countries with lower labour intensity seem to benefit more from coordination in the labour market rather than countries with higher labour intensity.

Chapter 5, entitled “Unemployment hysteresis and cycle asymmetry: A case study”, aims to capture the dynamics of the Portuguese unemployment rate. Firstly, we propose a novel step-by-step methodology to study in detail the behaviour of unemployment time-series. Then, we apply our methodology to the Portuguese unemployment case. In the first part of the chapter, we assess if the series follows a unit root process as to confirm the hysteresis hypothesis. In the second part, we develop a baseline nonlinear model to test for the asymmetric behaviour of unemployment across cycle phases. Our results lend support for hysteresis and show that the Portuguese unemployment dynamics is better described by a nonlinear (rather than by a linear model) with three types of transition variables: (a) annual change of cyclical unemployment (b) annual change of unemployment; and (c) annual GDP growth rate. Furthermore, we also analyse the impact of LMI on its asymmetric behaviour, concluding that LMI can affect not only its regimes but also its equilibrium unemployment rate. Thus, strong enough short-run increases in unemployment, as those observed during the recent fiscal consolidation effort, have non-negligible impacts on raising the Portuguese natural rate of unemployment and, ultimately, on lowering economic growth.

Finally, Chapter 6 states the main conclusions of this thesis and establishes

several proposals for future research.



# Chapter 6

## Conclusions

The previous chapters have made clear that, in order to explore the relationship between economic growth and (un)employment, one has to take into account a diverse number of other variables, in particular: Labour Market Institutions (LMI), Technology, and Monetary Policy. This last chapter briefly summarises what we call “the take-home lessons”.

Chapter 2 provides a critical review and a in-depth bibliometric exercise on the main contributions over the past years. One of the main findings regards with the fact that most published articles focus their approach only on “formal” or “empirical” methods. Nevertheless, it is worth noting that, since 2006, the amount of papers that combine a formal model with an empirical analysis has increased significantly, which could be interpreted as a concern to establish a link between theoretical models without a concrete empirical application and empirical analysis without a solid theoretical support. Furthermore, we also identify several “new effects” that link growth and unemployment. Indeed, our analysis suggested that the effects triggered by a policy maker and the effects related with labour market institutions are the most analysed in published research. More precisely, we have identified at least seven main links: reallocation effect (under certain conditions, it is possible to obtain higher growth and lower unemployment rate through a reallocation of workers); leapfrogging effect (due to a rise in growth rate, a wage increase in one sector is driven by a wage increase in other sectors, leading to higher unemployment); disciplinary unemployment effect (higher unemployment levels will prevent workers from shirk, which leads to higher growth rates); minimum wage effect (an increase in the minimum wage increases the disposable income, which could foster economic growth in some situations); updating technology effect (the possibility of firms to update their technology once a innovation arrives amplifies, under certain conditions, the capitalization effect, leading therefore to higher growth and lower

unemployment); schooling and working effect (the distinction between schooling human capital and productive human capital implies a negative relationship between unemployment and growth); and agglomeration effect (associated in some sectors with efficiency, implying higher growth rates and lower unemployment levels).

Chapter 3 presents a first theoretical model, relating skill-biased technological change (SBTC) and employment, where collective bargaining introduces imperfect competition in the labour market. In this case, the economic growth path crucially depends on the dynamics of technology and skill premium. Hence, we focused our analysis on the role of trade unions and their impact on skill-premium and employment. We find that the impact of trade unions on technological-bias and on the level of (un)employment crucially depends on the type of labour market framework, meaning monopoly unions *versus* efficient bargaining. Our empirical exercise seems to support this result: a decrease in the level of unionization leads to a increase (decrease) in wage dispersion under efficient bargaining (perfect competition) in labour market. Moreover, trade unions can actually increase low-skilled wages without increasing or even implying low-skilled unemployment, if they have some bargaining power and are more employment-oriented than wage-oriented. This relates with the fact that a monopoly trade union fails to decrease the wage dispersion between high- and low-skilled workers as a result of an increase in the relative demand due to technological-knowledge bias. Finally, our theoretical implications can accommodate the impacts of deunionization that occurred in US and UK during the 1980s on the wage premium, as follows: starting with an efficient bargaining framework (i.e., union and firms bargaining wages and employment), the process of deunionization leads to a fall in low-skilled wages essentially due to the technological bias, implying a higher wage ratio.

Chapter 4 presents a second theoretical model, where we combine a standard Schumpeterian growth model with cash-in-advance (CIA) constraints and LMI. We aimed to test the optimality of the Friedman rule, as well as of competitive labour market hypothesis. As we stated before, we believe this question is particular relevant within the Eurozone, since countries cannot rely on autonomous monetary policy to foster growth and R&D and, thus, the assessment of the degree of labour market competition that best promotes economic growth and innovation appears to be crucial. We find that, although nominal interest rate and trade union's markup can be considered as "distortions" within the standard economic growth model, both implying lower economic growth rates, this might not be the case in terms of welfare. On the one hand, the Friedman rule seems to be optimal for all the studied scenarios. On the other hand, in what relates to trade union's markup, we found

that competitive labour market might be suboptimal below a specific threshold level of economic growth, depending on whether there is over or underinvestment of R&D. Furthermore, countries with low labour intensity seem to benefit more from high trade union density (less competitive labour market-goods), rather than countries with high labour intensity. Additionally, higher levels of markup within the intermediate sector imply higher values of trade union's markup, leading to the sub-optimality of competitive labour markets under most of the cases. These results have some strong policy implications concerning monetary policy and labour market framework. If a lower nominal interest rate (meaning the Friedman rule) seems to be suitable for a wide range of parameters (i.e., different type of countries), this is certain not the case for the labour market framework. Hence, for the case of the Eurozone, a "common" labour market setting might be more "inefficient", than a common monetary policy.

Chapter 5 introduces our econometric study regarding the Portuguese unemployment rate. In order to overcome some lacks in the literature, we propose an exhaustive step-by-step methodology guide to study in detail the behaviour of unemployment time-series, and which we applied to the Portuguese case. From the results, six main conclusions can be drawn. First, the hysteresis hypothesis seems to be confirmed for the Portuguese unemployment rate. Second, unemployment behaviour is better described by a nonlinear model (LSTAR) rather than by an AR(5), using three types of transition variables: (a) annual change of cyclical unemployment (b) annual change of unemployment; and (c) annual GDP growth rate. Nevertheless, only the last two seem to correctly capture the cycle asymmetry behaviour and, in what relates to the latter, two unemployment regimes are suggested: a low regime with an equilibrium unemployment of 4.49% and a high regime with 7.11%. Third, from the beginning of the century, unemployment rate seems to be systematically in its high regime. Fourth, the transition between the two regimes appears to be rather fast. Fifth, LMI seem to play an important role in explaining the unemployment dynamics, affecting not only its regimes but also the equilibrium unemployment rate. Sixth, strong LMI appear to contribute to a lower unemployment rate.

Finally, we propose some guidelines for future research on the field. Regarding the formal theoretical analysis, it would be interesting to combine Chapter 3 and Chapter 4 into a general growth model. This could be done by introducing different types of skilled-labour into the model proposed in Chapter 4, which would allow us to better study the interactions between labour market and monetary policy. Furthermore, another research path might include the introduction of education and training as an option to low-skilled workers. This would help us to understand

the link between education, technology and economic growth, within a common monetary policy and/or labour market framework. In what relates to the empirical analysis, it is possible to extend our methodology to other countries and to explore the differences between LMI among Europe and the OECD countries.