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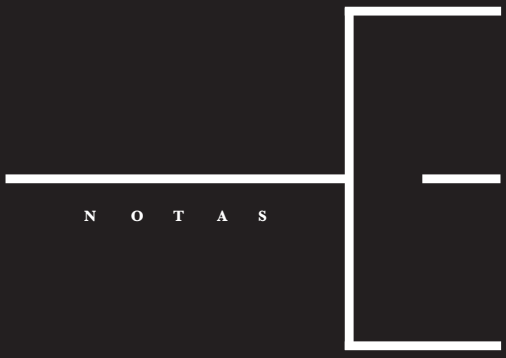

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From Manufacturing Decline to the Rise of Consultancy: A Framework for Time-Consistent Industry Analysis in Portugal (1986-2018)

Do Declínio do Setor Transformador à Ascensão da Consultoria: Um Quadro para Análise Industrial Consistente ao Longo do Tempo em Portugal (1986-2018)

Ernesto Nieto-Carrillo

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ABSTRACT
Since the creation of the Quadros de Pessoal (QP) in 1981, a longitudinal dataset of all Portuguese companies, four industry classifications have been used, hampering the ability to conduct long-term studies on firm dynamics and structural change. This paper proposes a framework for standardising the QP with time-consistent two-digit industry codes to analyse the impact of the ICT revolution on firm growth rates, net job creation, and employment composition across sectors. Our industry-consistent trends confirm the rise and fall of business dynamism and the contraction of manufacturing alongside the expansion of services. However, while the increased dispersion and positive skewness of growth rates and net job creation in ICT services played a crucial role, the technological paradigm shift in Portugal seems to be predominantly reflected in the vertical disintegration of firms and the subsequent substantial growth of administrative support activities.
Keywords: Structural change, deindustrialisation, firm dynamics, industry classification, longitudinal analysis.

JEL classification: D220; L160; L250; L860; L840; O330; O140

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1. Introduction

Over recent decades, most advanced Western economies have experienced a marked decline in the share of manufacturing in total employment. According to Rodrik (2016), while Asian countries and major manufacturing exporters have remained relatively insulated from this trend, the phenomenon has spread beyond advanced economies, with severe consequences for regions such as Latin America. As a result, premature deindustrialisation in peripheral economies has constrained income growth and reduced job opportunities for blue-collar workers.

Despite extensive research on this global process, the lack of firm-level databases that provide a consistent industrial classification over time has hindered a comprehensive understanding of the underlying microeconomic dynamics. Moreover, although globalisation and labour-saving innovations are commonly cited as the main causes (Rodrik, 2016; Tregenna, 2009), deindustrialisation has occurred simultaneously with the rise of the ICT revolution and the associated displacement of technological opportunities across sectors. It is, therefore, crucial to examine how the emergence of the ICT paradigm, in conjunction with globalisation and broader international trade, has changed the employment structure.

The purpose of this article is twofold. First, we present a novel methodology for transforming the Quadros de Pessoal (QP), a longitudinal database covering the universe of Portuguese firms, into a dataset with time-consistent industry codes at the firm level. Second, we analyse changes in the dispersion and skewness patterns in the distribution of firm growth rates, sectoral net job creation rates and, consequently, the composition of employment, with a particular focus on the ICT-driven industries. Given its position as a 'semiperipheral' economy, Portugal provides a crucial setting for understanding these dynamics.

Our industrial homogenisation process allows us to track longitudinally over one million firms across 59 two-digit industries, distributed among 16 aggregated sectors according to the CAE Rev. 2/NACE Rev. 1.1 classification (excluding the domestic work sector, which the QP does not cover) from 1986 to 2018. Our final dataset, with almost eight million year-firm observations, is only comparable to the industry-consistent US Census Bureau's Longitudinal Business Database.

Our results show that although the rise of the ICT technological paradigm led to a significant increase in job creation and business dynamism during the 1990s– particularly in wholesale and retail trade, accommodation and food services, and computer and business support services – this trend reversed after 2000. During the new century, we observe a sustained decline in the dispersion and positive skewness of business growth rates across all sectors, suggesting reduced resource reallocation and diminished contribution from high-growth firms. In addition, our results underline that net job creation, especially in the late 20th century, was mainly due to ICT industries, which followed a long-wave trend. However, the positive effect on employment was limited to ICT services, while ICT manufacturing saw a steady loss of jobs (virtually disappearing by 2018).

Finally, our findings reveal that the decline in the manufacturing employment share over 1986-2018 (from 45% to 22%) has been largely offset by the growth of administrative support activities (from 3% to 14%). This structural transformation indicates that the intersectoral changes driven by the new technological paradigm in Portugal are primarily

reflected in the vertical disintegration of firms. While this process likely yielded short-term efficiency gains, its potential to foster long-term economic growth, innovation, and technological advancement remains limited.

The remainder of this article is structured as follows. The second section provides a brief literature review on technological revolutions and their impact on employment structure. The third section describes the information sources, while the fourth section details the methodology for homogenising industries and estimating trends in industrial dynamics and employment composition. The fifth section outlines the results, and the sixth concludes with final remarks and questions for future research.

2. Technological Revolutions and Employment Structure

Following Kondratiev (1935), several authors argue that capitalist development operates in long waves (Mandel, 1980; Schumpeter, 1939; Shaikh, 1992). According to Schumpeter (1939), these waves are determined by the diffusion of successive technological revolutions. Pérez (2002) and Freeman and Louçã (2001) complement this notion by suggesting that the exploitation and exhaustion of the underlying technological paradigm explain the wave pattern. These technological revolutions are triggered by radical innovations that, via incremental innovations and imitation processes, revitalise declining profit rates by reducing the overall cost structure and opening new avenues for innovation. While technical progress is constant, its pace exhibits discontinuities, primarily linked to the rise and fall of each technological revolution.

The capacity to transform other industries and activities stems from the influence of its associated technological paradigm, understood as the best practice shared by innovators when utilising new technologies, both within and outside emerging industries (Dosi, 1982; Perez, 2010). Thus, after the advent of a radical General-Purpose Technology (GPT), the paradigm is configurated, leading to explosive growth and rapid innovation in new industries. The second phase is characterised by rapid diffusion, where new industries and technological systems flourish due to intense investment and sustained market growth. The third phase maintains accelerated growth with the full deployment of the paradigm across the productive structure. However, when technological opportunities are exhausted, productivity, growth and profits are seriously threatened, encouraging unproductive investments to offset profit squeeze (Perez, 2002).

In terms of sectoral structure, each revolution involves a significant number of new, interrelated products and technologies, resulting in the arrival of new industries. According to Pérez (2010), the core sectors of each revolution can be classified into three main categories: motive branches, which produce widely applicable cheaper inputs; carrier branches, which are the most visible users of these inputs; and infrastructures, which influence the configuration and expansion of market boundaries for all industries. In the current technological revolution, the motive branches would be represented by the semiconductor industry; the carrier branches by computers, software, and mobile phones; and the infrastructures by global digital telecommunications (cable, fibre optic, radio, and satellite), as well as the Internet, email, and other flexible electrical networks.

Lastly, a new techno-economic paradigm is expected to transform the organisation within factories and firms. The widespread availability of personal computers and the rapid evolution in the design of processes and products have eroded the Fordist hierarchical structure, fostering networking both within and outside companies, which is also reflected in the rise of management consultancy services (Bresnahan and Malerba, 1997; Freeman and Louçã, 2001).

As a result, the significant decline in manufacturing employment share (Rodrik, 2016), characteristic of most developed Western economies, is likely to have been offset by industries driven by the ICT technological paradigm (Brynjolfsson et al., 2021; Louçã and Mendonça, 2002; OECD, 2024). In this paper, we document the effects of the ICT paradigm on Portuguese employment, leveraging a homogenised classification of firm-level industrial codes. While the aggregate employment share of this sector is expected to increase, it is crucial to identify which industries have experienced the most significant growth, especially in the context of increased trade openness and the relatively low productivity of Portuguese production.

3. **Dataset**

The primary dataset is the Quadros de Pessoal (QP). Established by Decree-Law No. 479 of 16 June 1976,[1] the Portuguese government mandated that all public and private enterprises employing at least one worker in both the mainland and the islands to submit 'QP' maps. The Ministry of Employment has been responsible for data collection since the initiative began in 1981, although information is only available from 1985 onwards.

The QP provides longitudinal employer-employee information covering enterprise and establishment levels in all sectors (except for 'Activities of households'). Given the mandatory participation of firms with registered employees, the dataset is characterised by high coverage and reliability. Moreover, each firm and worker has a unique identification number, allowing tracking them longitudinally and generating business variables from the establishment and worker data. The employer reports all the information (i.e., firm-, establishment-, and worker-level) and relates to the situation observed in the reference month.

QP includes all types of companies according to their legal nature – including, among others, single proprietorship, general partnership, limited liability firms, and corporations – as well as non-profit and for-profit entities. Variables at the firm level include industry, location, number of employees, number of establishments, sales volume, legal nature, and ownership structure (i.e., domestic and foreign shares), inter alia. As of 2010, QP has two variables that report the total number of workers (full-time and part-time). The former reports the number of workers observed in the reference month (October), while the latter reports the number of workers observed on the last day of October. Before 2010 companies only reported the first variable, so this option is used for the entire period.

As the QP dataset does not contain industry codes at the highest level of disaggregation, we enhance the industry information by including the FUE and SCIE datasets. The FUE file, compiled annually by the National Statistical Office (INE by its acronym in Portuguese) during 1996-2004, was used for coordinating and harmonising information on the business

[1] See Decreto-Lei n.º 479/76 | DR (diariodarepublica.pt).

population. FUE received panel information from the various operations of the INE's statistical collection and production units and integrated administrative records from external entities. We can obtain demographic information, legal form, economic activity (at all levels of disaggregation), and social capital distribution in this database. For its part, the SCIE is a longitudinal dataset that reports the corporate balance sheet, whose responsibility for annual collection has also been in charge of INE. The data is built from a mandatory survey for all companies registered in Portugal and contains information from 2004 to 2018. This dataset reports the structure, industry (at the highest classification level), revenues, output, inputs, and other elements related to companies' economic, financial, and competitive nature.[2] Firms have the same identification number in QP, FUE, and SCIE, a key feature that allows all three datasets to be linked.

4. **Methodology**

4.1. Building time-consistent industry codes

Since the creation of the QP, four industrial classification methodologies have been in place: Portuguese Classification of Economic Activities (CAE by its acronym in Portuguese) Revision (Rev.) 1 (1985-1994), CAE Rev. 2 (1995-2002), CAE Rev. 2 (2003-2006) and CAE Rev. 3 (2007 onwards). These changes introduce limitations for conducting any long-term time-series analysis that requires industrial affiliation. In particular, companies may switch from one sector to another without any real change in the underlying economic activity, distorting the perceived variations in employment and production structures. Fort and Klimek (2018) noted, for instance, that a naive analysis of the changes in US employment composition during 1976-2009 would overstate the increase in service employment by approximately 36 percentage points while overestimating the decline in manufacturing employment by nearly 11 percentage points. Therefore, we aim to classify Portuguese enterprises using a consistent methodology that facilitates the analysis of, among other things, long-term industrial dynamics and changes in employment structure.

Given that the QP dataset includes industry codes with a maximum of three digits from 1985 to 2009 and four from 2010 onwards, we first merged this data with the FUE and SCIE files, which provide codes at the highest classification level (six digits in Rev. 1 and five in Revs. 2, 2.1, and 3). A key advantage of this merger is that all companies in the SCIE dataset were classified exclusively under Rev. 3, allowing us to assign both Rev. 2.1 and Rev. 3 codes to the same QP-SCIE firm from 2004 to 2006, thereby facilitating the harmonisation of classifications.

Subsequently, we applied the following three-step procedure:

i) Using Official Tables for Unique 2-digit Matches in Rev. 2. – The primary source of information is the official correspondence tables produced by the INE. These tables facilitate the reclassification of many economic activities in both directions;

[2] Unlike QP, both FUE and SCIE do not contain single-proprietorship enterprises.

however, disaggregated activities often lack a one-to-one correspondence between classification systems. For instance, code 10850 from CAE Rev. 3, corresponding to the "Manufacture of prepared meals and dishes" industry, is subdivided into five distinct codes in CAE Rev. 2.1: 15130 (Manufacture of meat products), 15204 (Drying, salting and other processing of fishery and aquaculture products), 15335 (Preparation and preservation of fruit and vegetables), 15850 (Manufacture of pasta, couscous and similar products), and 15893 (Manufacture of other miscellaneous food products). Moreover, the official tables only provide correspondences between sequential classifications, making it impossible to directly map a Rev. 1 code to its Rev. 3 equivalent.

Therefore, we decided to harmonise the industry codes at the 2-digit level, using Rev. 2 as the base classification. At this level, this methodology is directly equivalent to CAE Rev. 2.1 and, critically, Statistical Classification of Economic Activities in the European Community (NACE) Rev. 1.1. This approach allows us to assert that, although we cannot pinpoint the exact 5-digit code in Rev. 2.1 corresponding to 10850 in Rev. 3, we can reliably categorise this activity under code 15 in Rev. 2, which represents "Manufacture of food products and beverages."

ii) Using Longitudinal Information for Multiple Destinations. Many activities at the most detailed level may have several 2-digit equivalents in Rev. 2. For example, code 22230 in Rev. 3, which pertains to "Manufacture of builders' ware of plastic," is spread across two different 2-digit codes in Rev. 2: code 25 (Manufacture of rubber and plastic products) and code 36 (Manufacture of furniture). This indicates that, even at the 2-digit level, the official tables do not always provide a singular correspondence after reclassification.

Therefore, in cases with multiple 2-digit destinations, we used the longitudinal data structure to transfer industrial information from the period companies were classified under Rev. 2 to the other periods (before 1995 and after 2006) whenever firms have not changed their economic activity. To illustrate, in the case of multiple destinations of companies operating before and from 2007, we assigned the 2-digit code they had before that year, provided they remained in the same industry after that.

iii) Modal mapping. In only 5.32% of the total observations, we were unable to assign the corresponding 2-digit Rev. 2 code, either through official tables or longitudinal transfer. In these instances, we employed a modal mapping approach. This means that each industry Rev. 1 and Rev. 3 was assigned the 2-digit Rev. 2 code that was most likely to be mapped to in the probabilistic mapping, determined by the mode.

Once this harmonisation was applied, preliminary filtering of the raw data was required. In particular, companies not belonging to the productive sector (e.g., foundations, associations, unions, social security institutions, inter al.) and unreasonable observations (e.g., negative employment) were eliminated.

Our final dataset comprises 1,061,573 firms, resulting in 7,904,664 firm-year observations. Table 1 presents the pooled-sample distribution of observations over 1985–2018 and across the 59 two-digit industries within the 16 aggregated sectors of CAE Rev. 2 (excluding

the domestic work sector, which the QP does not cover). Since the QP also provide worker-level data, our methodology enables the examination of both business dynamics and labour market conditions across industries.

Table 1. Pooled Sample Distribution of Firm-level Observations across time-consistent 2-Digit CAE Rev. 2 Industries, 1985-2018

Section		Division	Firms' observations
A	Agriculture, hunting and forestry	1	310165
		2	32445
B	Fishing	5	17827
C	Mining and quarrying	10	81
		11	28
		12	19
		13	291
		14	24759
D	Manufacturing	15	168309
		16	129
		17	79079
		18	154878
		19	64088
		20	118172
		21	11216
		22	69688
		23	244
		24	20394
		25	23271
		26	88556
		27	8939
		28	193085
		29	61277
		30	101
		31	11510
		32	2616
		33	13043
		34	10224
		35	7102
		36	135625
		37	4914

Section		Division	Firms' observations
E	Electricity, gas and water supply	40	3600
		41	1519
F	Construction	45	972149
G	Wholesale and retail trade	50	422328
		51	667272
		52	1379009
H	Accommodation and food services	55	926405
I	Transport, storage and communication	60	246865
		61	2761
		62	1301
		63	56310
		64	6878
J	Financial intermediation	65	17180
		66	3844
		67	45620
K	Real estate, renting and business support	70	177846
		71	26368
		72	56526
		73	2488
		74	574952
L	Public administration and defence; compulsory social security	75	853
M	Education	80	82733
N	Health and social work	85	272044
O	Other community, social and personal service activities	90	4800
		91	10767
		92	63161
		93	246822
Q	Extra-territorial organisations and bodies	99	188
Total			7904664

Notes: The table reports the distribution of firm-level observations across the time-consistent 2-digit CAE Rev. 2 industries.

4.2. Industrial Dynamics Statistics

A key advantage of our industry homogenisation process is the ability to analyse long-term firm dynamics and understand, among other things, changes in the distribution of

firm-level growth rates, firm and job flows (i.e., creation, destruction, and reallocation), and the composition of employment.

To compute employment growth rates, we follow the approach of Davis et al. (1996), calculated as follows:

$$g_{i,t} = \frac{E_{i,t} - E_{i,t-1}}{X_{i,t}}, \tag{1}$$

where, $g_{i,t}$ is the employment growth rate of firm i in period t; E_i denotes employment and $X_{i,t}$ is the average employment between t and t-1 so that $X_{i,t} = \frac{E_{i,t} + E_{i,t-1}}{2}$. As Haltiwanger et al. (2013) point out, using the average employment as the growth rate denominator aims to neutralise the "regression-to-the-mean" bias. Specifically, since employment in t induces a downward bias and employment in t-1 an upward bias, both effects are expected to cancel out.

In our case, this approach required generating observations for the years a company temporarily did not report to QP – which was interpreted as a temporary closure – and for the year following the last time it reported positive employment – interpreted as a definitive exit. Thus, a temporary closure is one in which a firm reports positive employment in "t-τ," employment equal to zero in "t" and positive employment in "t+τ" (occurring the reopening in "t+1"). Likewise, a definitive closure occurs when the company reports positive employment in "t-τ," employment equal to zero in "t", and the identifier definitively disappears in "t+τ."

We start by analysing the evolution of the employment-weighted growth rate distribution across sectors and 2-digit industries. Afterwards, following Haltiwanger et al. (2009), we computed the Net Job Creation rate (NJCR) as the difference between the Job Creation (JCR) and Job Destruction (JDR) rates, which are just weighted sums of firm-level employment growth rates for the various aggregation levels, as follows:

$$\mathrm{JCR}_{s,t} = \sum_{\substack{i \in s \\ g_{i,t} \geq 0}} \left(\frac{X_{i,t}}{X_{s,t}} \right) g_{i,t}; \tag{2}$$

$$\mathrm{JDR}_{s,t} = \sum_{\substack{i \in s \\ g_{i,t} < 0}} \left(\frac{X_{i,t}}{X_{s,t}} \right) | g_{i,t} |; \tag{3}$$

$$\mathrm{NJCR}_{s,t} = \mathrm{JCR}_{s,t} - \mathrm{JDR}_{s,t}; \tag{4}$$

where $X_{s,t} = \Sigma_{i \in s} X_{i,t}$, and s denotes either the entire economy, size categories, age groups or sectors.[3]

The long sample period allows us to isolate the effect of the business cycle. Thus, to separate the time series into trend and cyclic components, we apply the Hodrick-Prescott (HP) filter. Given the annual nature of the information, the smoothing parameter is set to 100.

[3] The methodology closely follows the contributions by Haltiwanger et al. (2009) and Decker et al. (2016).

Finally, we analyse how the intersectoral variations in net job creation rates influence the employment structure's evolution. These sectoral dynamics and composition have probably been influenced by both the ICT revolution and Portugal's entry into the European Union (and the widespread reduction of trade barriers). So, to map the different trajectories resulting from the emergence of the ICT technological paradigm, we apply the OECD methodology to classify industries as ICT-driven or non-ICT-driven.[4] Furthermore, recognising that the ICT revolution likely transformed business structures by promoting vertical disintegration and the expansion of the consultancy market (Bresnahan and Malerba, 1997; Freeman and Louçã, 2001), we also include the business support services subsector (code 74). A full list of ICT-driven industries at the CAE Rev. 2/NACE Rev. 1.1 two-digit level is provided in Table 2.

Table 2: OECD definition of the ICT sector

CAE Rev.2/ NACE Rev 1.1	DESCRIPTION
30	Manufacture of office machinery and computers
31	Manufacture of electrical machinery and apparatus
32	Manufacture of radio, television, and communication equipment and apparatus
33	Manufacture of medical, precision, and optical instruments, watches, and clocks
64	Post and telecommunications
71	Renting of machinery and equipment without operator
72	Computer and related activities
74	Business services

Notes: The OECD define the ICT sector as a combination of manufacturing and services industries that capture, transmit and display data and information electronically. Due to the limitations in identifying industries at a 4-digit disaggregation level, we could not incorporate the ICT wholesale industry (code 5150). Moreover, following Freeman and Louçã (2001), we included the business services subsector (code 74).

5. **Results**

5.1. Cross-industry growth-rate analysis

The distribution of the growth rate provides important insights into understanding firm dynamics. A high degree of dispersion indicates significant job turnover, typically associated with periods of intense creative destruction (Aghion and Akcigit, 2019; Decker et al., 2014). Moreover, the existing literature documents that the average growth rate masks considerable heterogeneity. The median growth rate tends to be around zero, while growth in the right tail of the distribution skews and conditions average growth. Accordingly, the skew-

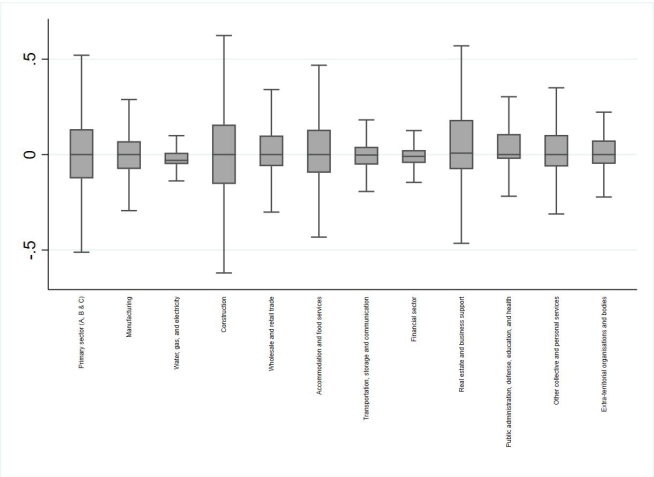
[4] The methodology is available at https://www.oecd.org/digital/ieconomy/2771153.pdf. However, notice that we made some small adjustments as we couldn't identify industries at a level beyond 2 digits.

ness of the distribution further enables examining the presence and impact of high-growth (typically young) firms, which contribute the most to net job creation (Decker et al., 2014; Haltiwanger et al., 2013). Consequently, our industry homogenisation at the firm level allows us to analyse changes in the distribution of growth rates and characterise the evolution of business dynamism across sectors.

Figure 1 shows the distribution of growth rates by sector. We weight by employment to assess their aggregate impact. To facilitate the analysis, we group sectors A (agriculture, animal husbandry, hunting and forestry), B (fishing) and C (extractive industries) together as the primary sector. We also combine sectors L (public administration, defence and compulsory social security), M (education) and N (health and social work) due to their non-profit and public nature.

The results confirm that although the median growth rate fluctuates around zero (except for 'Water, gas and electricity', which has a negative median rate), there is considerable heterogeneity across sectors, marked by different dispersion and skewness patterns. The sectors 'primary activities,' 'construction', 'accommodation and food services,' and 'real estate and business support' show the highest dynamism and dispersion (i.e. a greater distance between the extremes). The opposite is true for 'water, gas and electricity', 'transport, storage and communication' and 'financial activities.' Finally, a greater positive skewness (i.e. a greater distance between the upper extreme and the median) is observed in the 'wholesale and retail trade,' 'accommodation and food services', and 'real estate and business support activities.' Since the median fluctuates around zero, preliminary evidence suggests that these sectors are likely to have made the highest net contributions to aggregate employment (i.e. more job creation than destruction).

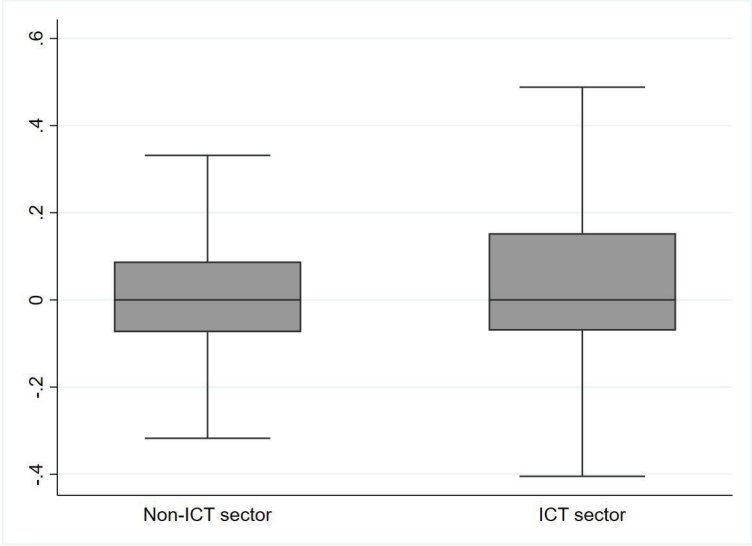
Figure 1: The growth rate distribution by sector, 1986-2018



Notes: The figure shows the employment-weighted box-and-whisker plot for all firms (i.e., entering, continuing, and exiting entreprises) across sectors over 1986-2018. Industries are defined on a time-consistent CAE Rev.2 basis.

Figure 2 characterises the distribution of employment growth rates, distinguishing between Information and Communication Technology (ICT)-driven and non-ICT sectors. The estimates suggest that ICT industries, being younger and driven by the dominant technological paradigm, exhibit greater dispersion and positive skewness. In contrast, the distribution of the non-ICT sector appears to be almost symmetrical. Therefore, the ICT sector seems to have experienced more significant high-growth events and job turnover, leading to a more intense process of creative destruction.

Figure 2: The growth rate distribution across ICT and non-ICT sectors, 1986-2018

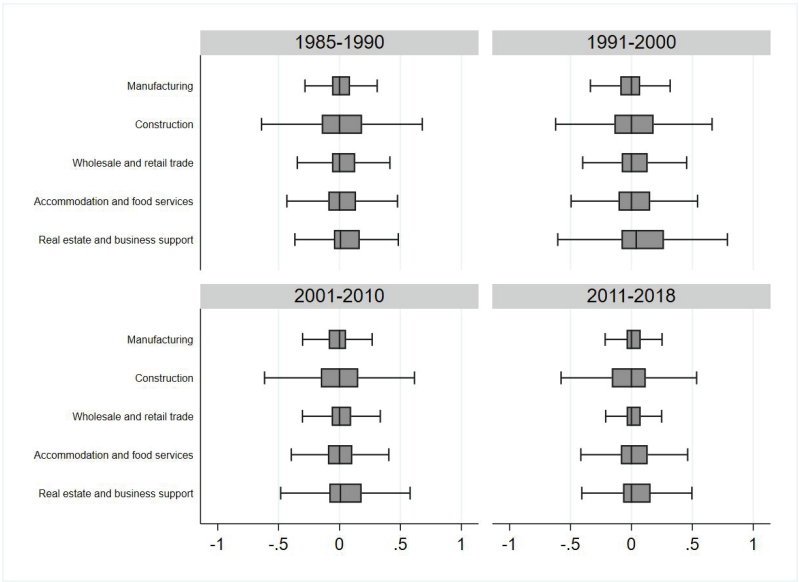


Notes: The figure shows the employment-weighted box-and-whisker plot for all firms over 1986-2018. Industries are defined on a time-consistent CAE Rev.2 basis. The ICT sector is classified by using the methodology developed by the OECD.

We then characterise the evolution of the distribution of growth rates, focusing on the manufacturing and non-financial market services sectors over the periods 1986-1990, 1991-2000, 2001-2010 and 2011-2018. Figure 3 shows that, during the 1990s, dispersion and skewness increased significantly in all sectors except for 'manufacturing,' where change was minimal, and 'construction', which already exhibited high degrees of dispersion and positive skewness in the 1980s. However, it should be noted that the 'real estate and business support services' sector experienced the most pronounced increase in dispersion and skewness over this period. From 2000 onwards, despite intersectoral heterogeneity, the stagnation of the Portuguese economy is mirrored in a widespread reduction in both dispersion and skewness, except for 'construction', which maintained its dynamism throughout the new century

(albeit showing a slightly negative skewness over 2011-2018). These results, therefore, point to a decline in job turnover and the contribution of high-growth enterprises in all sectors over the new century.

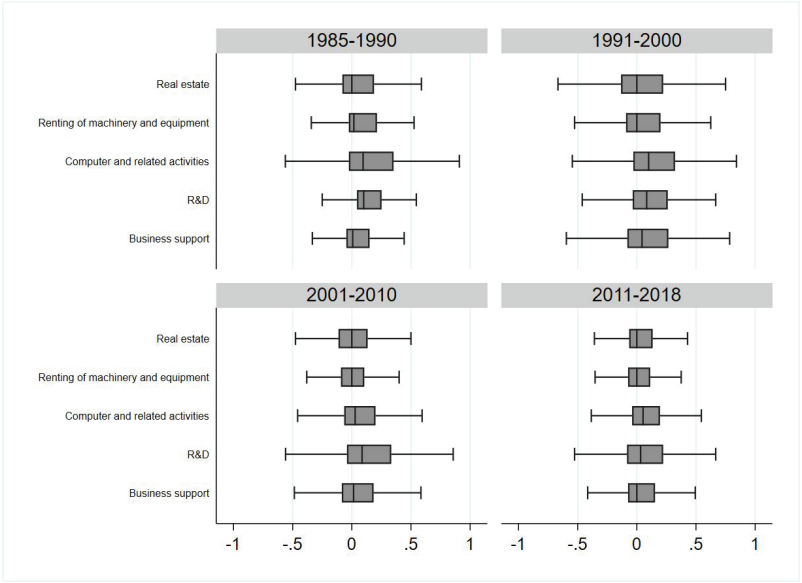
Figure 3: The growth rate distribution by sector and period



Notes: The figure shows the employment-weighted box-and-whisker plot for all firms across sectors for the periods 1986-1990, 1991-2000, 2001-2010, 2011-2018. Industries are defined on a time-consistent CAE Rev.2 basis.

To disentangle the sharp shift in the dynamics of the growth rate of the 'real estate, renting and business support services' sector during the 1990s, Figure 4 presents the evolution of the underlying distribution within its two-digit industries. Four main conclusions can be drawn: i) the dispersion and positive skewness of growth rates increased in all activities during the 1990s; ii) the largest increases occurred in 'real estate activities' and 'business support services,' with the latter showing the most pronounced change; iii) 'computer services and related activities' stood out as having the highest dispersion and positive skewness in both the 1980s and 1990s; and iv) the dispersion and positive skewness of growth rates decreased in all activities since 2000, except for the 'research and development' industry, whose dynamism even increased in the new century.

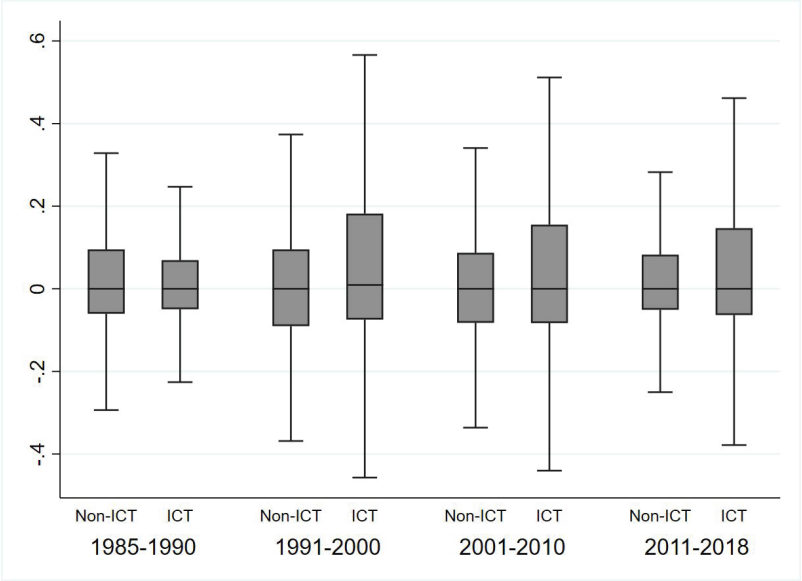
Figure 4: The growth rate distribution within the 'Real Estate, Renting, and Business Support' Sector, by period



Notes: The figure shows the employment-weighted box-and-whisker plot for all firms for the periods 1986-1990, 1991-2000, 2001-2010, 2011-2018. Industries are defined on a time-consistent CAE Rev.2 basis.

It is important to emphasise that three of the 2-digit "Real Estate and Business Support" industries that experienced the more intense growth dynamics towards the end of the twentieth century – namely 'renting of machinery and equipment' (code 71), 'computer services and related activities' (code 72), and 'business support activities' (code 74) – have been driven by the ICT technological paradigm. Accordingly, Figure 5 shows the evolution of the employment-weighted growth rate distribution, broken down into ICT and non-ICT sectors. The estimates show that the non-ICT sector exhibited a wider dispersion of growth rates in the 1980s. However, the relationship reversed since the 1990s. While both sectors experienced increased dynamism in the 1990s, the change in the ICT sector was significantly greater. The distribution's right tail in this sector moved further from the median, indicating a greater presence and impact of high-growth enterprises. Since 2000, dispersion and positive skewness have decreased in both sectors, but the ICT sector has still shown greater dynamism over the last two decades.

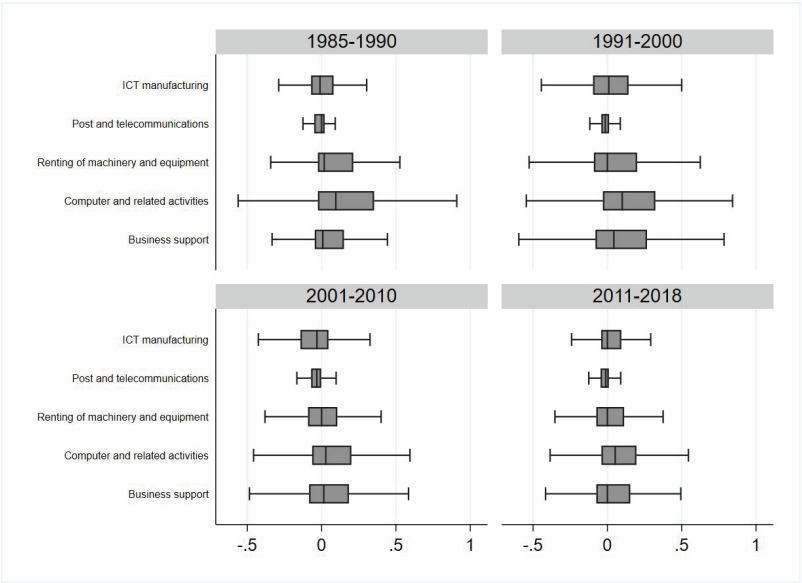
Figure 5: The growth rate distribution across ICT and non-ICT sectors, by period



Notes: The figure shows the employment-weighted box-and-whisker plot for all firms across sectors for the periods 1986-1990, 1991-2000, 2001-2010, 2011-2018. Industries are defined on a time-consistent CAE Rev.2 basis. The ICT sector is classified by using the methodology developed by the OECD.

Figure 6 focuses exclusively on the industries within the ICT sector, distinguishing between ICT manufacturing activities (codes 30 – 'office machinery and computers,' 31 – 'electrical machinery and apparatuses,' and 32 – 'radio, television, and communication equipment') and the rest of the industries. The estimates indicate that while all subsectors experienced a marked increase in dispersion and positive skewness during the 1990s (with minimal changes in the telecommunications sector), ICT services activities (codes 71, 72, and 74) exhibited more substantial shifts than their ICT manufacturing counterparts. Moreover, the figure highlights that, despite a general decline in dispersion and skewness across all sectors since 2000, ICT manufacturing has experienced the largest reductions, with a slightly left-skewed distribution in the first decade of the new century, suggesting that job destruction outpaced job creation rates.

Figure 6: The growth rate distribution within the ICT sector, by period



Notes: The figure shows the employment-weighted box-and-whisker plot for all firms across industries for the periods 1986-1990, 1991-2000, 2001-2010, 2011-2018. Industries are defined on a time-consistent CAE Rev.2 basis. The ICT sector is classified by using the methodology developed by the OECD.

5.2. Sectoral net job creation trends

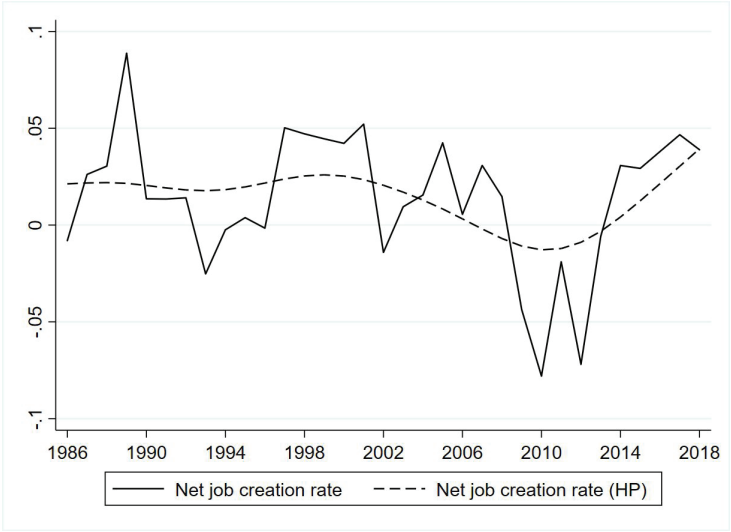
The net job creation rate is defined as the difference between job creation and job destruction, i.e., jobs generated by firms with positive growth rates minus jobs lost by firms with negative growth. The productive heterogeneity of firms shapes this dynamic, mirrored in differentiated entry, growth, and survival patterns (Aghion and Akcigit, 2019; Dosi and Nelson, 2010). However, this phenomenon is also conditioned by idiosyncratic industry characteristics—i.e., demand, technology, information and risk—and (time-varying) technological opportunities. These opportunities influence the likelihood of innovation and the expected rate of return (Dosi and Nelson, 2010; Perez, 2010).

During the sample window, Portugal experienced two major shocks that likely changed the structural parameters of industrial dynamics: the emergence of the ICT revolution and the accession to the European Union (together with a higher degree of globalisation). The former is likely to have modified technological opportunities and intersectoral profit rates, while the latter is likely to have expanded markets and increased the productivity dispersion within them (now including foreign competitors). The differences in the magnitude and evolution of the distribution of growth rates across sectors, observed in the previous

section, stem from these exogenous shocks. This heterogeneity is expected to lead to equally different net job creation patterns and employment composition changes.

Figure 7 shows the evolution of the economy-wide net job creation rate from 1986 to 2018. Our approach, based on firm-level growth rates, is, thus, able to reproduce the growth pattern of the Portuguese economy: a period of persistently high rates in the late 20th century, followed by stagnation and decline in the early 21st century, a prolonged crisis between 2008 and 2013, and a subsequent recovery after that.

Figure 7: The economy-wide Net Job Creation rate, 1986-2018

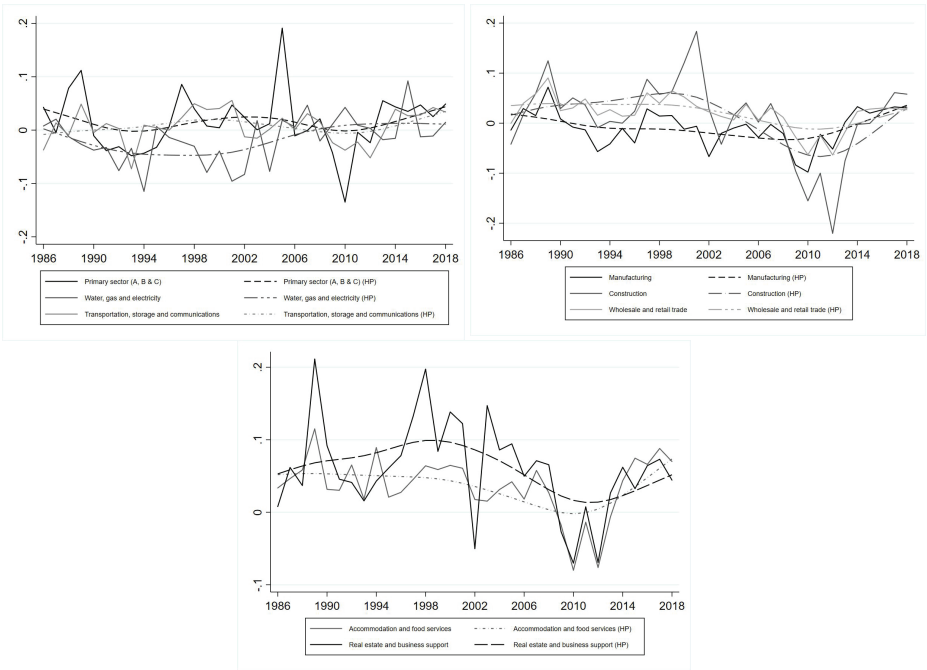


Notes: The net job creation rate is computed as the difference between the job creation and job destruction rates. The job creation (destruction) rate is computed as the employment-weighted average of the absolute value of employment-growth rates of all firms with non-negative (negative) growth rates. Trends are computed by applying a Hodrick-Prescott (HP) filter with a smoothing parameter of 100.

Subsequently, Figure 8 presents the net job creation rates in the most representative sectors. In the 'primary' and the 'transport, storage and telecommunications' sectors, the net rates have fluctuated around zero, indicating that their economic share has relatively constant. This is not the case for the 'water, gas and electricity supply' sector, which has shown persistently negative rates until the new century's first decade. The 'construction' and 'wholesale and retail trade' sectors have, in turn, exhibited consistently high and positive rates, except during the 2008-2013 crisis. In sharp contrast, the manufacturing sector has exhibited secularly negative net creation rates since 1990 (with a slight recovery from 2013), suggesting that job destruction has exceeded job creation. Finally, in line with the growth rate analysis, the 'accommodation and food services' and the 'real estate, renting and

business support activities' sectors have maintained positive net rates, especially towards the end of the twentieth century, with the latter sector standing out for its upward trend over this period, with rates above 10% at various points in the analysis.

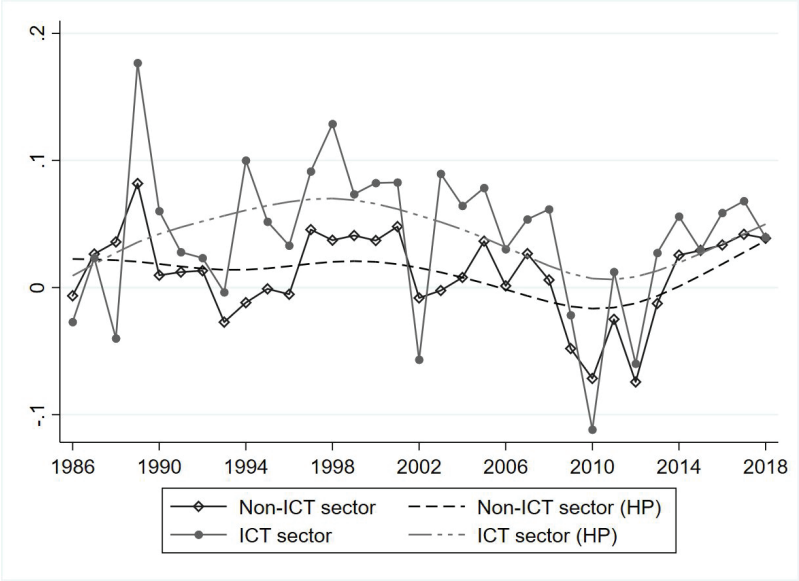
Figure 8: Net Job Creation rates rates by sector, 1986-2018



Notes: The net job creation rate is computed as the difference between the job creation and job destruction rates. The job creation (destruction) rate is computed as the employment-weighted average of the absolute value of employment-growth rates of all firms with non-negative (negative) growth rates, by sector. Trends are computed by applying a Hodrick-Prescott (HP) filter with a smoothing parameter of 100. Industries are defined on a time-consistent CAE Rev.2 basis.

Figure 9 shows the evolution of the net job creation rate, distinguishing between ICT-driven and non-ICT-driven sectors. The estimates confirm that net job creation in the ICT sector has followed a 'long-wave' pattern, with an expansionary phase at the end of the 20th century and a recessionary phase after that (although there has been some recovery in the last decade). In addition, the results show that the net job creation rate has been consistently higher in the ICT sector than in its non-ICT counterpart, especially in the 1980s and 1990s. As a result, Portugal's late 20th-century expansion appears to have been primarily fuelled by the rise of industries shaped by the ICT technological paradigm.

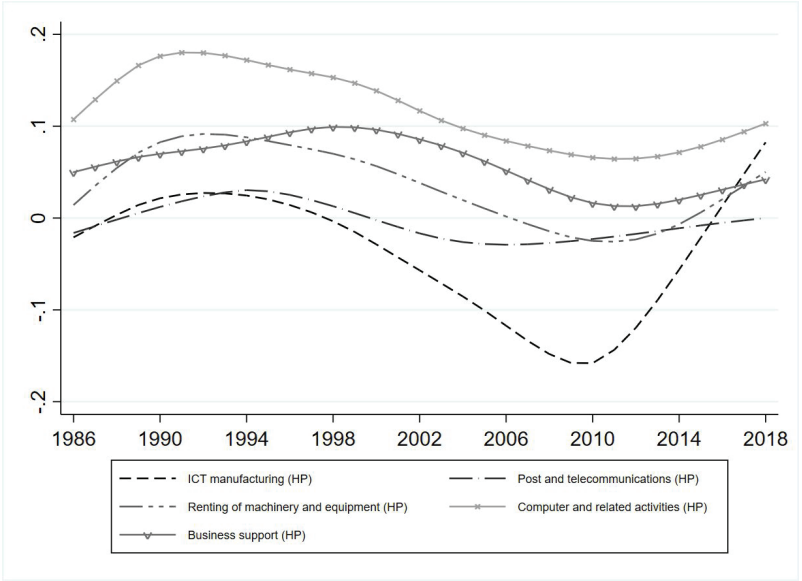
Figure 9: Net Job Creation rates rates across ICT and non-ICT sectors, 1986-2018



Notes: The net job creation rate is computed as the difference between the job creation and job destruction rates. The job creation (destruction) rate is computed as the employment-weighted average of the absolute value of employment-growth rates of all firms with non-negative (negative) growth rates, by sector. Trends are computed by applying a Hodrick-Prescott (HP) filter with a smoothing parameter of 100. Industries are defined on a time-consistent CAE Rev.2 basis. The ICT sector is classified by using the methodology developed by the OECD.

Finally, Figure 10 indicates that the 'long-wave' pattern is evident across all ICT activities. However, sustained positive employment growth is only observed in ICT services, i.e., 'renting of machinery and equipment,' 'computer and related activities,' and 'business support activities.' Instead, the 'post and telecommunications' sector experienced modest net job creation in the late 20th century, followed by net job losses. Critically, our estimates further confirm that, despite a brief upward trend in the late 1980s, the ICT manufacturing sector experienced significant and prolonged net job destruction from 1992 to 2010, after which a steady recovery began. Therefore, these structural trends suggest that the ICT revolution in Portugal, in the context of rising trade openness, has mainly boosted the growth of ICT services. In sharp contrast, ICT manufacturing has been marked by persistent net job destruction, particularly up to the Great Recession.

Figure 10: Net Job Creation rates rates within the ICT sector, 1986-2018



Notes: The net job creation rate is computed as the difference between the job creation and job destruction rates. The job creation (destruction) rate is computed as the employment-weighted average of the absolute value of employment-growth rates of all firms with non-negative (negative) growth rates, by industry. Trends are computed by applying a Hodrick-Prescott (HP) filter with a smoothing parameter of 100. Industries are defined on a time-consistent CAE Rev.2 basis. The ICT sector is classified by using the methodology developed by the OECD.

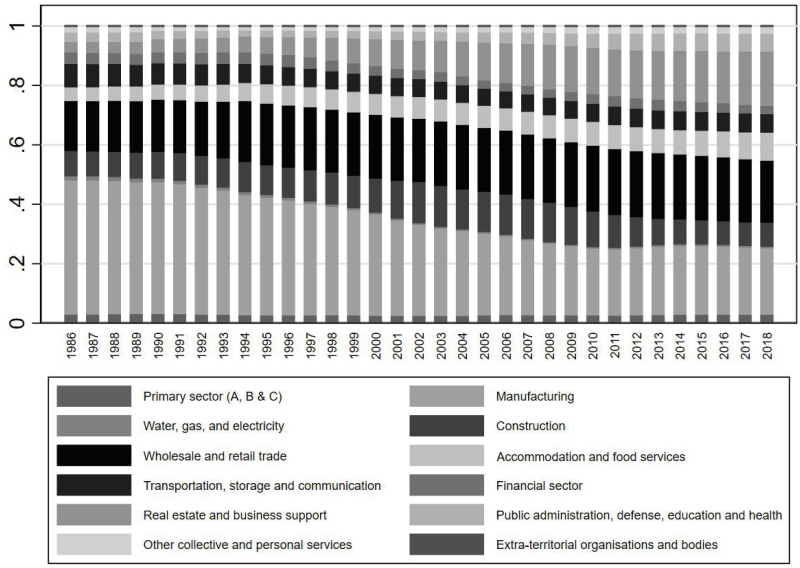
5.3. From manufacturing to consultancy

Due to the differentiated impact of exogenous institutional and technological shocks and the resulting heterogeneity in the evolution of sectoral net job creation rates, some industries are expected to have increased their aggregate share (through above-average net job creation rates), while the opposite is true for those facing relatively lower technological opportunities or higher international competitive pressure (which may reduce the expected return of followers (Aghion et al., 2005)).

Figure 11 accordingly shows the evolution of employment composition in the Portuguese economy. In line with previous trends, we observe a sharp decline in the manufacturing sector, whose share in total employment fell from 45.1% to 22.2% between 1986 and 2018. This decline in manufacturing has gone hand-in-hand with a rise in the 'wholesale and retail trade', 'accommodation and food services', and, most notably, the 'real estate and business support activities' sectors. The latter increased its share of employment from 3.5% to 18.2% over the same period, while the former two sectors expanded from 16.8% to 20.9% and from

4.5% to 9.4%, respectively. These results thus mirror the deindustrialisation pattern and the service sector's corresponding rise that has characterised developed Western economies in recent decades (Rodrik, 2016; Tregenna, 2009).

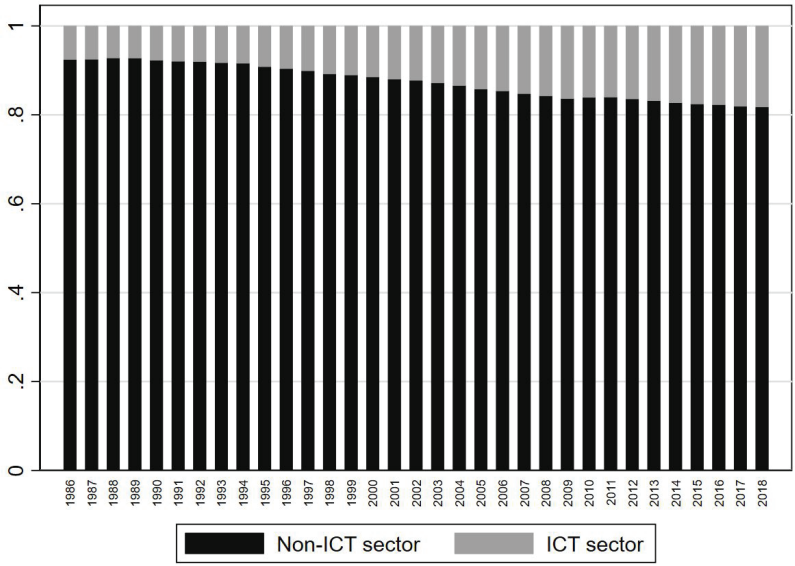
Figure 11: The evolution of the Portuguese employment structure, 1986-2018



Note: Industries are defined on a time-consistent CAE Rev.2 basis.

A technological revolution brings about structural change, typically shifting the composition of employment towards sectors driven by the new dominant paradigm (Freeman & Louçã, 2001; Gordon, 2012; Perez, 2002). As previous trends have shown, net job creation has been consistently higher in the ICT sector. Figure 12 confirms this, showing that the ICT sector's share of total employment increased significantly from 7.5% in 1986 to 18.3% in 2018 – an increase of around 11 percentage points. Our findings thus highlight the ICT paradigm's significant role in reshaping the employment landscape. Nevertheless, the Portuguese economy remains fundamentally dependent on old sectors, which still account for more than 80% of total employment.

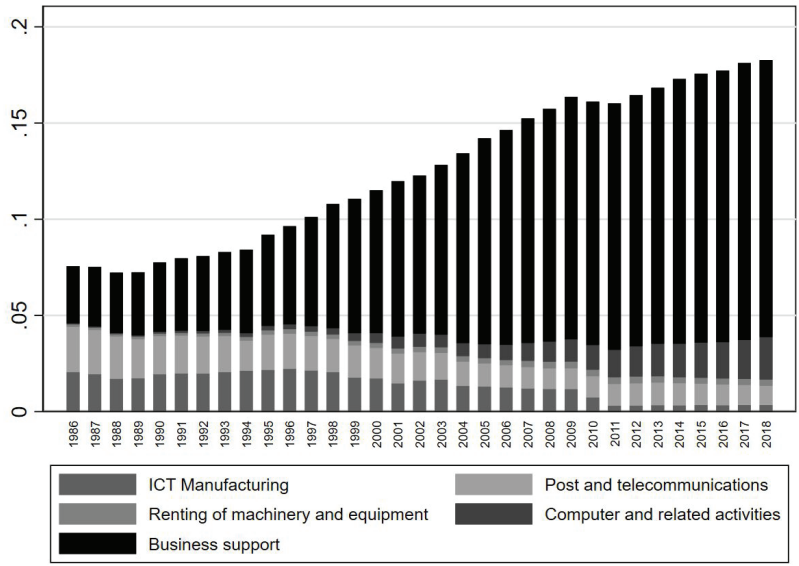
Figure 12: The evolution of employment composition between ICT and non-ICT sectors, 1986-2018



Notes: Industries are defined on a time-consistent CAE Rev.2 basis. The ICT sector is classified by using the methodology developed by the OECD.

Finally, Figure 13 breaks down the evolution of the share of the ICT sector in its component industries. On the one hand, the results confirm that the expansion of the ICT-driven sector in terms of total employment is mainly evident in two service industries: computer and related activities, with an increase from 0.05% to 2.2% between 1986 and 2018 and most of all, business support activities, with an increase from 2.9% to 14.4%. The latter sector seems, therefore, to have absorbed most of the contraction in aggregate manufacturing. On the other hand, the results confirm that ICT manufacturing has instead contracted sharply after a slight growth in the 1990s. Its share of total employment fell from 2.1% to less than 0.4%.

Figure 13: The evolution of the share of ICT industries in total employment, 1986-2018



Notes: Industries are defined on a time-consistent CAE Rev.2 basis. The ICT sector is classified by using the methodology developed by the OECD.

Our findings, therefore, suggest that ICT manufacturing – involving the production of microprocessors, computers, semiconductors, and digital equipment, all central to the ICT revolution – has all but vanished from the Portuguese economy, limiting the country's potential for innovation and technological development. Conversely, while computer services have increased their share in total employment, the broader impact of the ICT technological paradigm has been largely concentrated on expanding business support activities (code 74). According to the CAE Rev. 2 classification, this sector is devoted to assisting businesses with administrative and promotional functions, as shown in Table 3. The growth of this sector is a clear result of the vertical disintegration of enterprises made possible by ICT technologies such as the Internet, computers and digital software. This disintegration has probably led to overall efficiency gains due to increased flexibility, reduced fixed costs, economies of scale and specialisation in management support tasks. Nevertheless, its contribution to technological progress, innovation and long-term economic growth is likely to be limited.

Table 3: CAE Rev. 2 Business support activities (code 74)

74110	Legal activities
74120	Accounting, auditing and tax consultancy activities.
74130	Market research and opinion polling.
74140	Business and management consultancy activities.
74150	Holding company activities.
74201	Architectural activities.
74202	Engineering and related technical activities.
74300	Technical testing and analysis activities.
74401	Advertising agencies.
74402	Advertising media management.
74500	Personnel selection and placement.
74600	Research and security activities.
74700	Industrial cleaning activities.
74810	Photographic activities.
74820	Packaging activities.
74850	Secretarial, translation and addressing activities.
74860	Call centre activities.
74871	Organisation of fairs, exhibitions and other events.
74872	Other Miscellaneous business service activities.

Notes: The table reports the list of activities classified within the business support services industry (code 74) according to the Portuguese Classification of Economic Activities (CAE) Revision 2.

6. Conclusions and Future Research

This research aimed to investigate the impact of the emergence of the ICT technological paradigm on the employment structure of a semiperipheral economy such as Portugal. To this end, we introduced a novel methodology that allows us to transform the *Quadros de Pessoal*, a longitudinal data covering the universe of Portuguese firms in all sectors, into a dataset with a time-consistent industrial classification from 1986 to 2018. Our approach seeks to understand the micro and macro drivers of structural change. Therefore, we focus

on intersectoral shifts in the distribution of firm growth rates, net job creation and employment composition. Understanding this phenomenon is crucial in the context of a general decline in the share of manufacturing in advanced economies.

The analysis of growth rate distribution reveals persistent intersectoral heterogeneity in dispersion and skewness. A significant increase in business dynamism was observed in the 1990s, mainly driven by ICT-driven services such as computing and business support. However, since 2000, dispersion and positive skewness have declined across all sectors, indicating reduced reallocation and fewer contributions from high-growth firms. Notably, despite the rise of the ICT technological paradigm, dispersion and skewness in ICT manufacturing sharply declined, showing levels below those seen at the end of the 1980s.

These heterogeneous firm-level growth dynamics – shaped by time-invariant industry characteristics, time-varying technological opportunities, the competitive environment, and within-industry productivity dispersion – subsequently led to equally differentiated net employment growth patterns across sectors. In particular, structural trends show that, in the late 20th century, sectors such as accommodation and food services, wholesale and retail trade, and real estate and business support activities, experienced positive and above-average net job creation rates. In contrast, manufacturing and utilities exhibited predominantly negative rates. Moreover, our findings highlight that net job creation was primarily driven by ICT industries, which followed a long-wave pattern. However, the positive impact on employment was confined to ICT services, while ICT manufacturing experienced secular net job destruction until the first decade of the 21st century.

The ICT revolution has certainly fostered structural changes within industries and enterprises. However, in terms of intersectoral shifts, the evolution of the Portuguese employment composition finally confirms that while ICT services with higher value-added and innovation potential experienced modest growth, ICT manufacturing virtually disappeared. The contraction of manufacturing's employment share (from 45% to 22% in 1986-2018) was instead reflected in an expansion of wholesale and retail trade, accommodation and food services and, primarily, activities supporting administrative business functions, with the latter sector increasing its aggregate share from 2.9% to 14.4% over the same interval.

The rise and fall of business dynamism, coupled with the increased growth activity in ICT-driven sectors, supports the view that capitalism evolves in long waves shaped by successive technological revolutions. The steep decline in manufacturing employment thus appears to be part of this structural process. However, while technological opportunities are expected to shift towards emerging sectors with each revolution, our findings suggest that how a new technological paradigm unfolds is influenced by country-specific productive and institutional characteristics. In Portugal, except for computer services, the decline of traditional manufacturing has not led to an increase in high-value-added ICT goods and services but rather the opposite. Although the rise of consulting services is indeed a result of the vertical disintegration enabled by the new technological paradigm and its automation and networking technologies, it is likely to have limited long-term benefits for growth, technological progress and innovation.

In a context of secular stagnation and potential exhaustion of the ICT paradigm (Gordon, 2012, 2015), it is therefore essential to reorient public policies towards strengthening the aggregate stock of knowledge and the absorptive capacity of firms, equipping them to

adapt to new general-purpose-technologies such as artificial intelligence and those aimed at energy transition. Such a setting may benefit new entrepreneurs with lower opportunity costs of technology adoption (Arrow, 1962; Holmes et al., 2012). In an environment of increased international free trade, the decline of manufacturing and the growth of low-value-added sectors further underline the need to rethink industrial policy. Investment incentives, access to technology, lowering barriers to entry and fostering competition appear to be crucial, especially for emerging industries. Finally, strengthening the links between basic science and applied technology is essential to uncover and harness unexplored innovations.

Our findings have theoretical and policy implications that require further research. Key questions include whether technological revolutions narrow or widen technological gaps between countries. How has Portugal's accession to the EU and the resulting increase in productivity dispersion in enlarged markets affected the decline of manufacturing and the limited growth of higher value-added ICT industries? Is there room for protecting infant industries? Did this change in the productive structure affect job quality and income growth? These questions should be a priority for future research.

Data Availability Statement

The final correspondence tables and the codes used for the industry homogenisation process are available upon request from the author.

References

Aghion, P.; Akcigit, U. (2019) Innovation and Growth: The Schumpeterian Perspective. In Matyas, L.; Blundell, R.; Cantillon, E.; Chizzolini, B.; Ivaldi, M.; Leininger, W. ;. Marimon, R. ; Steen, F. (Eds.), *Economics without Borders: Economic Research for European Policy Challenges*, Cambridge University Press, 29-72

Aghion, P.; Bloom, N.; Blundell, R.; Griffith, R.; Howitt, P. (2005) Competition and Innovation: An Inverted-U Relationship. *Quarterly Journal of Economics*, 120(2), 701-728.

Arrow, K. J. (1962) Economic Welfare and the Allocation of Resources for Invention. In National Bureau of Economic Research (Ed.), *The Rate and Direction of Inventive Activity: Economic and Social Factors*, Princeton University Press, 609-626.

Bresnahan, T.; Malerba, F. (1997) *Industrial Dynamics and the Evolution of Firms and Nations: Competitive capabilities in the World Computer Industry*. Centro studi sui processi di internazionalizzazione, Università commerciale'Luigi Bocconi'.

Brynjolfsson, E.; Rock, D.; Syverson, C. (2021) The productivity J-curve: How intangibles complement General Purpose Technologies†. *American Economic Journal: Macroeconomics*, 13(1), 333-372.

Davis, S. J.; Haltiwanger, J.; Schuh, S. (1996) Small business and job creation: Dissecting the myth and reassessing the facts. *Small Business Economics*, 8, 297-315.

Decker, R. A.; Haltiwanger, J.; Jarmin, R. S.; Miranda, J. (2014) The role of entrepreneurship in US job creation and economic dynamism. *Journal of Economic Perspectives*, *28*(3), 3-24.

Decker, R. A.; Haltiwanger, J.; Jarmin, R. S.; Miranda, J. (2016) Where has all the skewness gone? The decline in high-growth (young) firms in the U.S. *European Economic Review*, 86, 4-23.

Dosi, G. (1982) Technological paradigms and technological trajectories. A suggested interpretation of the determinants and directions of technical change. *Research Policy*, 11(3), 147-162.

Dosi, G.; Nelson, R. R. (2010) Technical Change and Industrial Dynamics as Evolutionary Processes. In B. Hall & N. Rosenberg (Eds.), *Handbook of Economics of Innovation*, North-Holland, 52-127

Fort, T. C.; Klimek, S. D. (2018) The Effects of Industry Classification Changes on US Employment Composition. *CES Working Paper Series*, 18(28), 1-23.

Freeman, C.; Louçã, F. (2001) *As Time Goes By: From the Industrial Revolutions to the Information Revolution*. Oxford University Press.

Gordon, R. J. (2012) Is U.S. economic growth over? Faltering innovation confronts the six headwinds. NBER Working Paper Series, WP 18315, 1-23.

Gordon, R. J. (2015) Secular stagnation: A supply-side view. *American Economic Review*, 105(5), 54-59.

Haltiwanger, J.; Jarmin, R.; Miranda, J. (2009) Business Dynamics Statistics: An Overview. *SSRN Electronic Journal*, *January* (1), 1-8.

Haltiwanger, J.; Jarmin, R. S.; Miranda, J. (2013) Who creates jobs? Small versus large versus young. *Review of Economics and Statistics*, **95**(2), 347-361.

Holmes, T. J.; Levine, D. K.; Schmitz, J. A. (2012) Monopoly and the incentive to innovate when adoption involves switchover disruptions. *American Economic Journal: Microeconomics*, 4(3), 1-33.

Kondratiev, N. (1935) The Long waves in economic life. *Review of Economics and Statistics*, 17(6), 105-115.

Louçã, F.; Mendonça, S. (2002) Steady change: The 200 largest US manufacturing firms throughout the 20th century. *Industrial and Corporate Change*, 11(4), 817-845.

Mandel, E. (1980) *Long Waves of Capitalist Development: A Marxist Interpretation*. Cambridge University Press.

OECD. (2024) OECD Digital Economy Outlook 2024. In *OECD Digital Economy Outlook 2024* (Vol. 1).

Perez, C. (2002) *Technological Revolutions and Financial Capital*. Edward Elgar Publishing Limited.

Perez, C. (2010) Technological revolutions and techno-economic paradigms. *Cambridge Journal of Economics*, 34(1), 185-202.

Rodrik, D. (2016) Premature deindustrialization. *Journal of Economic Growth*, 21(1), 1-33.

Schumpeter, J. A. (1939) *Business Cycles: A Theoretical, Historical and Statistical Analysis of the Capitalist Process*. McGraw-Hill.

Shaikh, A. (1992) The Falling Rate of Profit as the Cause of Long Waves: Theory and Empirical Evidence. In A. Kleinknecht, E. Mandel, & I. Wallerstein (Eds.), *New Findings in Long-Wave Research*,The MacMillan Press LTD, 174-194

Tregenna, F. (2009) Characterising deindustrialisation: An analysis of changes in manufacturing employment and output internationally. *Cambridge Journal of Economics*, 33(3), 433-466.

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Growth and Convergence in Portugal: Historical and Policy Experiences at National and Metropolitan Level

Crescimento e Convergência em Portugal: Experiência Histórica e Políticas a Nível Nacional e Metropolitano

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Daniel Diaz

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ABSTRACT
Contrary to other EU countries, Portugal has become relatively poorer for almost a quarter of century. Growth decomposition exercises show that this is due to a reduction in capital accumulation and a sharp fall in total factor productivity. There are areas in which the country can act to reduce the fall, by capitalizing on national comparative advantages and the diverse but complementary features of its two largest metropolitan regions, Lisbon and Porto. However, this requires policy changes.
Keywords: Economic growth; growth decomposition; economic policies; regional economics; demographics; European Union.

JEL classification: F4; F6; H00; J1; O1; O4; O5.

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1. Introduction

Portugal is a small country, with just 1.5% of the GDP (in nominal terms, 1.8% in purchasing power parity, PPP), and 2.3% of the population of the European Union: both figures also show a decreasing trend. It is a very open economy, with international trade (imports and exports of goods and services) representing more than 100% of GDP and a great dependence on external capital flows. These features interact with a productive structure overwhelmingly made up of micro-enterprises concentrated in traditional and low-technology sectors that have difficulty accessing credit and that invest little, and with a centralized and cumbersome state. The integration process with the European Union (EU) and what it represents – namely, free access to large external markets and sources of capital, monetary and institutional stability, significant and prolonged financial flows for the support of reforms and investment – potentially provide a way out of some of these dilemmas, but has been so far used in a less than optimal way. This paper tries to explain historically why this happened and suggest some alternatives to better explore the windows of opportunity open to the country.

2. A Historical Analysis of Economic Convergence in Portugal[1]

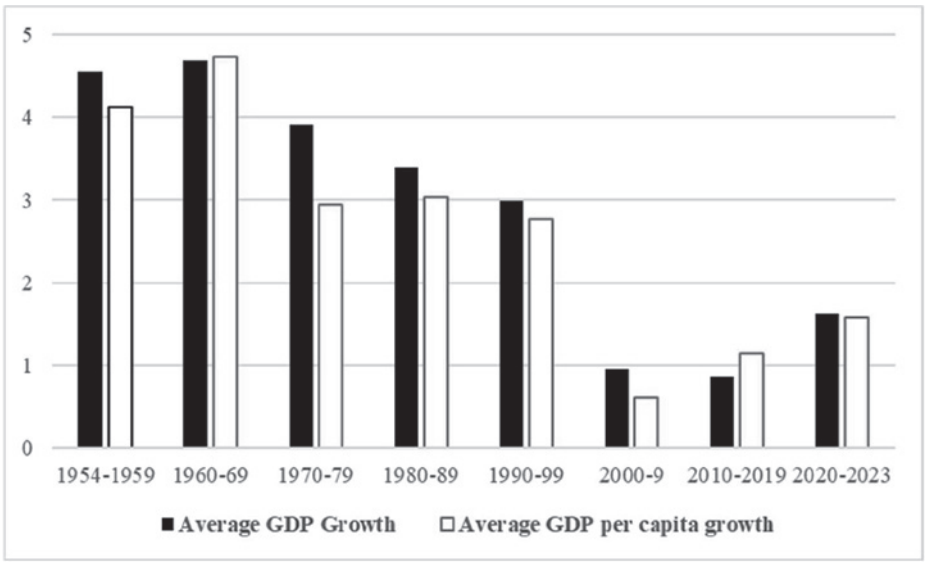
2.1. Convergence Before EU Accession

Portugal was under a dictatorial regime between the military coup of 1926 and another military coup in April 1974, the famous "Carnation Revolution". During most of the dictatorship period, namely from 1933 to 1974, Portugal was under the so-called "Estado Novo" (the "New State"), a nationalist, corporatist and autarchic regime that, however, implemented a series of economic liberalization and integration measures, particularly after the end of the Second World War. Namely, the country benefited from financial support from the Marshal Plan, having joined the Organization for European Economic Cooperation (OEEC) – the body created to manage disbursements from the Marshall Plan in 1948 (the OEEC became later the Organization for Economic Cooperation and Development, OECD, in 1961), it also joined the European Free Trade Association (EFTA) in 1960 and signed a free trade agreement with the European Economic Community (EEC, the predecessor of the EU) in 1972.

The real integration unleashed by those actions was led by a historically unique set of large and diversified family-owned Portuguese industrial and financial conglomerates: the Companhia União Fabril (CUF) Group, the Champalimaud Group, the Espírito Santo Group, Banco Português do Atlântico, Banco Borges & Irmão, Banco Fonsecas & Burnay and Banco Nacional Ultramarino, which, according to some estimates, had a combined turnover of around 75% of the Portuguese GDP of 1974 (CUF Group, for example, was ranked among the 200 largest companies in Europe in the early 1970s, being the largest in the Iberian Peninsula: see Ferreira da Silva et al , 2015).

[1] For a longer description of Portugal's performance across many dimensions during part of this period, see Mateus (2013) and Amaral (2022).

Figure 1: Average growth in GDP and GDP per capita in Portugal, in %.



Source: BdP and INE (SLEP).

As a result, Portugal registered a strong process of liberalization and economic integration that lasted from the mid-1950s to 1973. This liberalization occurred simultaneously with the country's accession to international trade blocs and organizations and was parallel to a global cycle of economic development and integration, and resulted in significant "real convergence" effects – that is, the approximation of the country's level of development to that observed in more advanced economies: as a matter of fact, these were larger than those observed during its period as an EU Member State.[2] Specifically, the average growth rate of GDP and GDP per capita during the period between the mid-1950s and the Portuguese EU accession in 1986 was twice as high as during the post-EU accession period: namely, it was respectively 3.9 % and 2.0% for GDP growth, and for GDP per capita growth, the values are 3.4% to 1.9%: see Figure 1).[3]

It should also be borne in mind that during this period Portugal was involved in military conflicts in its "overseas provinces" from 1961 until 1974. It also faced a succession of major economic and political shocks with the end of the "Estado Novo" dictatorship – including the temporary expropriation and nationalization of most large national private companies,

[2] See Barros and Garoupa (1993).

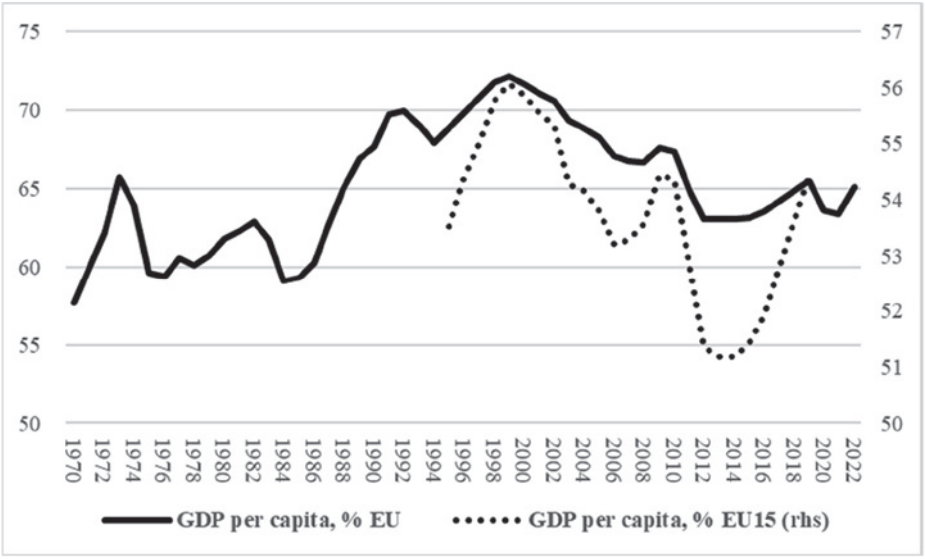
[3] The values come from the "Long Series for the Portuguese Economy" (SLEP, in Portuguese) database, a joint analytical effort by the Bank of Portugal (BdP) and the National Statistics Institute (INE) that provides consistent economic series dating back to the beginning of the 1950s.

the exile of their owners, as well as massive outflows of capital from the country, in parallel with a "decolonization" shock and the influx of hundreds of thousands of inhabitants from its overseas provinces in just a few months. This was aggravated by oil shocks of 1973 and 1979, leading to internal and external imbalances that culminate in two IMF programs in 1976/77 and 1982/83.

2.2. Convergence *After* EU Accession

Portugal submitted its application for membership of the EEC on March 28, 1977, with official negotiations taking place between October 1978 and March 1985: Portugal became an EU Member State on January 1, 1986. However, the process of Portugal's real economic convergence stalled relatively soon afterwards: from around 60% of EU per capita GDP in 1986 (a figure lower than that observed before the shocks of the mid-1970s), it reached a peak of around 72% in 1999, but fell back to around 65% in 2022, a value lower than in 1973 (see Figure 2: if we use as a reference value not the EU aggregate, but only the so-called "EU15", which is a set of higher income countries before the EU enlargements to less developed countries in Central and Eastern Europe in 2004, 2008 and 2020, the picture is the same). The minimum of the series is observed – not surprisingly – at the nadir of the euro area crisis, roughly stagnating afterwards.

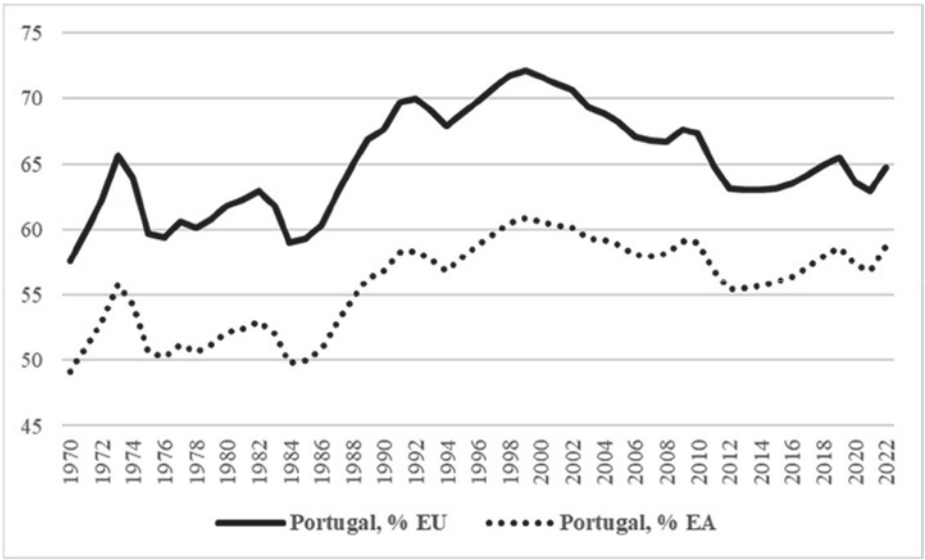
Figure 2: Portugal's GDP per capita as a percentage of the EU's GDP per capita



Sources: World Bank and Eurostat.

The figures above are in constant values but there are other important variables to take into account in such a comparison: namely, the difference in terms of price level (Portugal, a relatively poorer and less productive country than the EU average, have lower prices for non-tradable goods and services) and the share of active population employed (since GDP reflects the value added by this component of the population). Therefore, in Figure 3 we use a series of GDP per capita for the employed population in terms of purchasing power parity (or PPP, i.e., adjusting for differences in price levels) for a comparison between the EU average, the euro area and Portugal.

Figure 3: GDP in PPP per capita of the employed population in Portugal, as a percentage of the equivalent value of the EU and the euro area (EA)



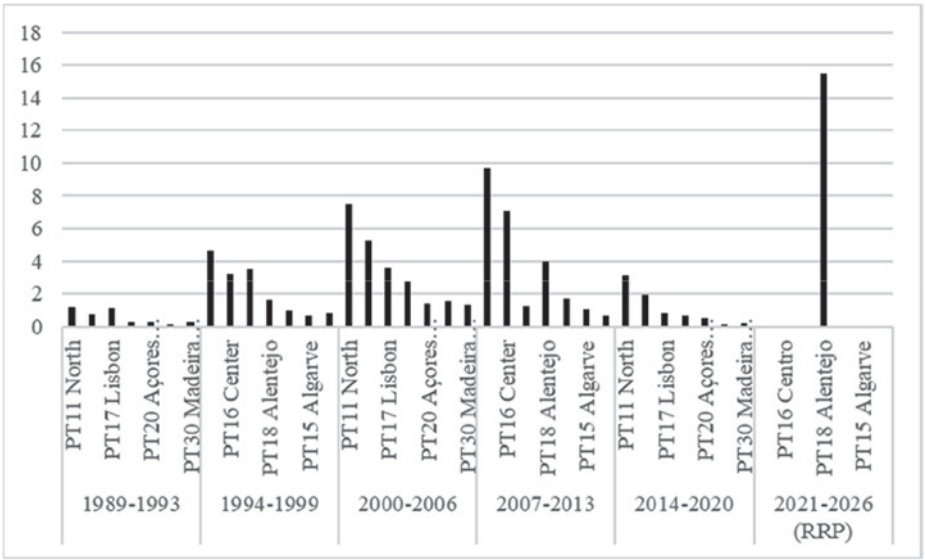
Source: World Bank.

Even though the levels are slightly different, the results of this comparison are essentially the same as those obtained with the series in Figure 2: the level of GDP per capita in relation to the EU reaches approximately 66% in 1973, before the "Carnation Revolution", had fallen to 59% in 1985 before Portugal's entry into the EU, reached a maximum of 72% in 1999, then falling to below 65% (again, below the value of 1973) in 2022. Again, the minimum is during the euro area crisis, followed by a plateauing.

This result is puzzling. After all, joining the EU in 1986 enabled Portugal a tax-free access to a very large market for exports, while joining the euro – the common European currency, in 1999, not only eliminated the economic costs of a separate currency for interactions with

other euro area economies – Portugal's largest economic partners, but implied more favorable financing conditions and less uncertainty for all economic agents in the country: both should have supported higher economic growth, all else constant.[4] Furthermore, Portugal has also benefited from very significant and long-term EU unilateral transfers: when one adds up all the different types of EU support over time, the total value is close to half of Portuguese GDP (see Figure 4). Namely, through, *inter alia*, the European Regional Development Fund, the Cohesion Fund, the European Social Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund, the EU unilaterally transferred to Portugal around €76 billion between 1989 and 2020, that is, an average of 1.7% of Portuguese annual GDP for more than 30 years. Additionally, in 2021, around € 15.5 billion was allocated to Portugal through its "Recovery and Resilience Plan" (or RRP, which is, in effect, a national development strategy focused on the so-called "digital transitions and energy", although initially presented as budgetary support related to the recession caused by policies to combat the 2020 COVID pandemic: see Governo Português, 2021).[5]

Figure 4: EU Fund Flows to Portugal (€ billion)



Source: European Commission.

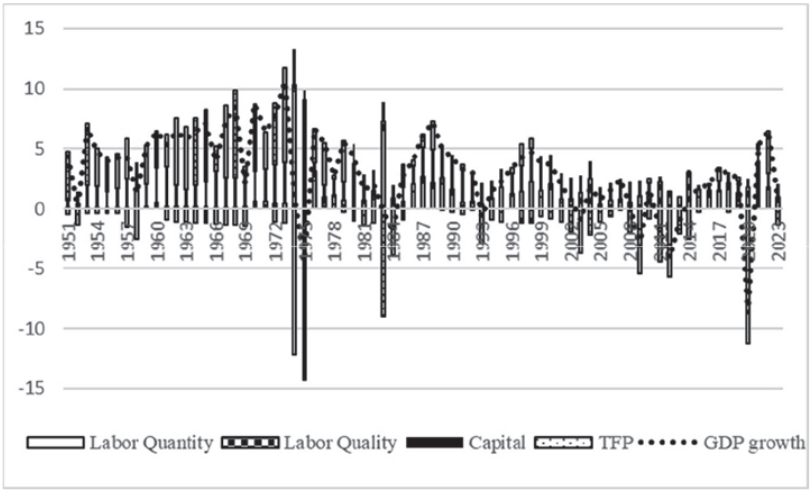
[4] In reality, Portugal's economic integration with the EU in terms of real flows has declined since the introduction of the euro: for example, exports to the EU have fallen from 83% in 1999 to around 70% in 2023. For the travails of the euro area (and other global shocks), see Vinhas de Souza (2024b).

[5] Additionally, Portugal also benefited from access to European Investment Bank (EIB) € 56 billion in loans on preferential terms, and to approximately € 52 billion in loans also on preferential terms granted by EU institutions during the euro area sovereign crisis in 2010-13.

Below we perform a growth accounting decomposition exercise, to understand the effects of those shocks and the underlying drivers of the convergence break down (see Figure 5). Based on the Solow growth model (Solow, 1956), growth accounting exercises assess the relative contribution of labor, capital and technology to the economic growth of a country using a Cobb-Douglas production function, given by $Y_t = AK_t^{\alpha} L_t^{1-\alpha}$, where Y is GDP, K and L are, respectively, capital and labor stock, and A is total factor productivity (or TFP). The contribution of the labor production factor to GDP growth is further distinguished below between labor quantity and quality, the former based on hours worked, while measures of labor quality are based on the skill composition of workers, proxied by their educational attainment level.[6]

The resulting estimates show that the contribution of the *quantity* of work remained at similar average levels before and after accession (around 0.4-0.5 percentage points of GDP), while the *quality* of labor's contribution to growth almost doubled (from 0.4 to 0.7 percentage points). However, the contribution of capital to growth decreased by around 30% (from 2.0 to 1.5 percentage points), while the contribution of total factor productivity (TFP, a factor representing technological advances) became negative (from 1.6 percentage points before EU accession to -0.6 afterwards). In other words, Portugal's reduction in growth and convergence is associated with these falls in investment and TFP (Conselho para a Produtividade, 2019).

Figure 5: Decomposition of growth drivers for Portugal, 1951-2023



Source: Conference Board.

[6] See de Vries and Erumban (2022), for a deeper description of the growth decomposition methodology and of the data series used in it. For a recent application of this methodology to a non-EU country – namely, China, see Vinhas de Souza (2024a).

Using a simple unconstrained Chow test to determine the point of any eventual structural break in those series yields different dates: for GDP and TFP growth, the break date is 1975, while for labor quality and capital the breaks are respectively in 1999 and 2000 (labor quantity has no structural break in the series). What could lie behind these breaks? The related ones for GDP and TFP happened at the same time as the "regime change" of 1974, while the break in labor qualification coincides with the (cumulative) effects of increased spending and wider availability of more education in Portugal from mid-1986 onwards. As for the break in capital accumulation, it happened at the same time as two external competitiveness shocks for Portugal in the late 1990s/early 2000s: first, the 2004 entry of new members states from Eastern Europe in to the EU, which was preceded by association and trade agreements that largely liberalized trade with the bloc already from the late 1990s (Vinhas de Souza, 2004) and, secondly, China became a member of the World Trade Organization in 2001.

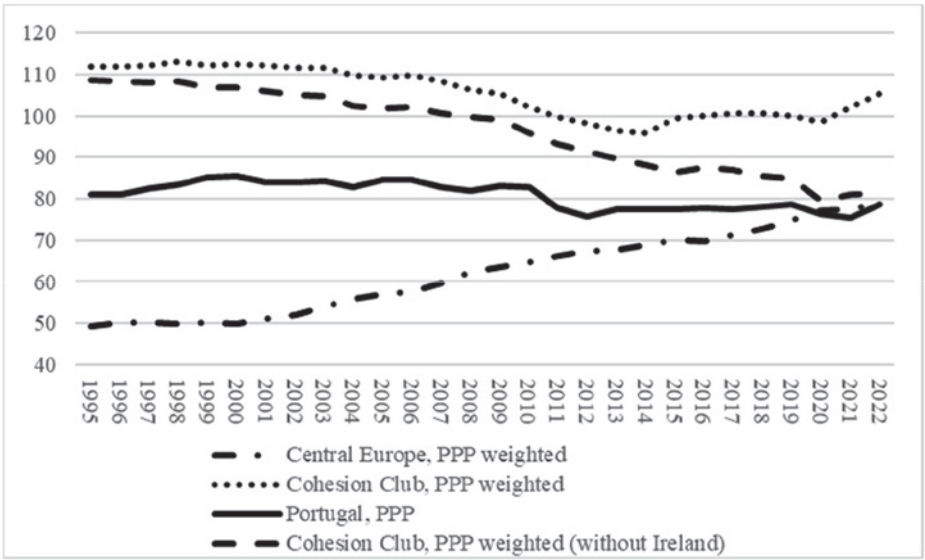
A stalling of economic convergence after joining the EU is not observed in other countries that joined the bloc and also benefited from the influx of significant EU funds, from countries in Central and Eastern Europe that have more recently entered the EU – all of which have essentially experienced continuous processes of convergence towards higher levels of GDP per capita – to Ireland, which became a member of the EU in 1973 and joined the euro area in 1999. However, there are several other examples of stalling and "divergence" in what one could call the "Cohesion Club". These are EU members in South Western Europe that have also generally benefited from the unilateral transfer of resources from the EU for several decades that have a similarly negative (or even worse) performance as Portugal in terms of convergence: Cyprus, Spain, Greece and Italy (see Figure 6).[7]

All countries in the "Cohesion Club" have experienced a prolonged process of divergence, from Greece (a drop of almost 31% between its maximum point of convergence in relation to GDP per capita in EU PPP in 2004 and 2022), to Italy (a 29% drop between 1995 and 2022), Spain (a 20% drop between 2006 and 2022) and Cyprus (a 12% drop between 2008 and 2022): these numbers imply drops that are between two and five times more serious than that observed in Portugal, and this despite transfers from the EU that in some cases were even more significant than those received by Portugal (in relation to GDP). It is noteworthy that they happened in different moments –albeit clustered throughout the 2000s, and none at the same time of Portugal's break. The only real exception among members of the "Cohesion Club" is Ireland, which opted for a development strategy based on creating favorable conditions for foreign private investment (either from the EU or outside the EU), complemented with investment in fixed and human capital (Ireland went from 90% of EU GDP per capita after accession to 290% in 2022, recording the second highest per capita income in the EU, after Luxembourg).[8] Broadly speaking, this is a similar strategy to that adopted by EU Member States in Central and Eastern Europe (Gill and Raiser, 2012).

[7] These are also the countries – together with Ireland – that were most affected by the sovereign debt crisis in the euro area (see Vinhas de Souza and Tudela, 2012).

[8] There are known issues with Irish GDP estimates, given the way foreign companies record their profits, and alternative measures reduce the size of the expansion, but this does not change the results of the comparison (see Honohan, 2021).

Figure 6: Convergence, Central and Eastern Europe, "Cohesion Club" and Portugal



Note: The series were aggregated with weights derived from the GDP in PPP of each Member State in relation to its group.
Source: European Commission.

A comparative exercise in decomposing growth factors using the same methodology and series as above helps to understand what led to this result (see Table 1). It demonstrates a clear and common drop in the contribution of growth factors since the entry of these countries into the EU, and an even greater drop since their entry into the euro area (which happened at about the same time as the external competitiveness shocks described above): this drop is particularly serious and affects more factors in Italy and Greece. Especially worrying is the fact that the TFP has become negative in all these countries. The main exception in Table 1 is Poland, where EU Accession coincides with an increase in the contribution of most growth factors (bar TFP, but which still remains positive, unlike the other countries).

Table 1: Average values for the growth decomposition exercise for "Cohesion Club" countries and for Poland

	A: Whole Sample	B: Since EU entry	C: Before EU entry	D: Since EA entry	*B-C Difference*	*C-D Difference*
PT: GDP	3.1	2.0	4.4	1.0	(2.4)	(3.4)
PT: Tqt	0.4	0.4	0.5	(0.0)	(0.1)	(0.5)
PT:Tqa	0.5	0.7	0.4	1.0	0.3	0.6
PT: C	1.7	1.5	2.0	1.1	(0.4)	(0.8)
PT: TFP	0.5	(0.6)	1.6	(1.1)	(2.2)	(2.7)
EL: GDP	3.1	1.1	6.0	0.3	(4.8)	(5.6)
EL: Tqt	0.2	0.3	(0.1)	0.2	0.4	0.3
EL:Tqa	0.5	0.5	0.6	0.3	(0.1)	(0.3)
EL: C	1.1	0.8	1.5	0.5	(0.7)	(1.0)
EL: TFP	1.2	(0.6)	3.9	(0.8)	(4.4)	(4.6)
IT: GDP	2.7	2.4	6.1	0.4	(3.7)	(5.7)
IT: Tqt	0.0	(0.0)	0.6	0.1	(0.7)	(0.5)
IT:Tqa	0.2	0.2	0.4	0.3	(0.2)	(0.1)
IT: C	1.4	1.3	1.6	0.8	(0.3)	(0.8)
IT: TFP	1.1	0.9	3.5	(0.7)	(2.6)	(4.2)
ES: GDP	3.6	2.2	5.0	1.6	(2.8)	(3.4)
ES: Tqt	0.2	0.8	(0.4)	0.6	1.3	1.1
ES:Tqa	0.4	0.4	0.4	0.4	0.1	0.0
ES: C	1.6	1.4	1.9	1.3	(0.4)	(0.6)
ES: TFP	1.4	(0.5)	3.3	(0.7)	(3.7)	(3.9)
CY: GDP	4.2	2.3	5.0	1.7	(2.6)	(3.3)
CY: Tqt	0.9	0.6	1.0	0.4	(0.4)	(0.6)
CY:Tqa	0.3	0.4	0.3	0.4	0.1	0.1
CY: C	1.9	1.4	2.1	1.1	(0.7)	(0.9)
CY: TFP	1.1	0.0	1.6	(0.2)	(1.6)	(1.8)
IE: GDP	3.4	3.5	3.1	2.6	0.4	(0.4)
IE: Tqt	0.1	0.4	(0.6)	0.5	1.0	1.1
IE:Tqa	0.3	0.3	0.3	0.3	(0.0)	(0.1)
IE: C	2.4	2.8	1.3	3.8	1.5	2.4
IE: TFP	0.6	(0.1)	2.0	(1.9)	(2.0)	(3.9)
PL: GDP	2.8	3.7	2.2		1.4	

	A: Whole Sample	B: Since EU entry	C: Before EU entry	D: Since EA entry	*B-C Difference*	*C-D Difference*
PL: Tqt	0.1	0.6	(0.2)		0.7	
PL:Tqa	0.3	0.5	0.1		0.4	
PL: C	1.5	2.1	1.1		1.1	
PL: TFP	0.9	0.4	1.2		(0.8)	

Notes: PT: Portugal, IE: Ireland, ES: Spain, EL: Greece, IT: Italy, CY: Cyprus, PL: Poland. GDP: real GDP growth, Tqt: Contribution of the quantity of the labor factor, Tqa: Contribution of the quality of the labor factor, C: Contribution of the capital factor, TFP: total factor productivity.
Source: Conference Board.

To add light to the Portuguese case, section 3 will provide a deeper look at investment (e.g., the capital factor of production) and the ecosystem of Portuguese private companies' post-1974 and its relationship with public policies, while section 4 will present a more detailed analysis of the labor factor of production.

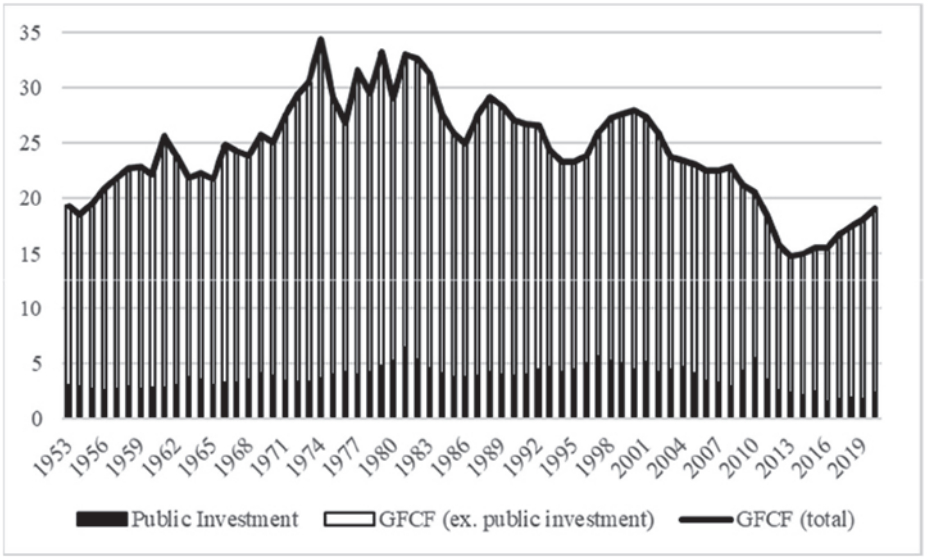
3. Firms, Investment and the State in Portugal

After the dismantling of large private family conglomerates with the "Carnation Revolution", Portugal's economy became heavily dominated by "Small and Medium Enterprises" (SMEs): only 0.1% of all Portuguese companies are now classified as "large" (i.e., with more than 250 employees and an annual turnover exceeding €50 million: of the 1.4 million Portuguese companies in 2021, less than 1400 had this status, none of which are comparable in scale with the pre-1974 groups), but *96% of all companies are classified as "micro"* (i.e., with less than 10 employees and less than €2 million in annual turnover).[9]

Portuguese companies currently also tend to operate in less sophisticated and non-tradable sectors: for example, only 5% of Portuguese companies in 2021 are in the manufacturing sector, 16% in retail trade, 8% in restaurant services and accommodation and 4% in the real estate sector. Taking this profile into account, the private sector invests little in general, and even less in research and development activities, or R&D (below 1% of GDP in 2020): gross fixed capital formation (GFCF), including public investment, fell from 35% of GDP in 1974 to 19% in 2020 (Figure 7).

[9] For comparison, 1.4% of U.S. companies are classified as "large" – an order of magnitude more than in Portugal, and 79% as "micro".

Figure 7: Gross fixed capital formation (GFCF) and public investment (% of GDP)

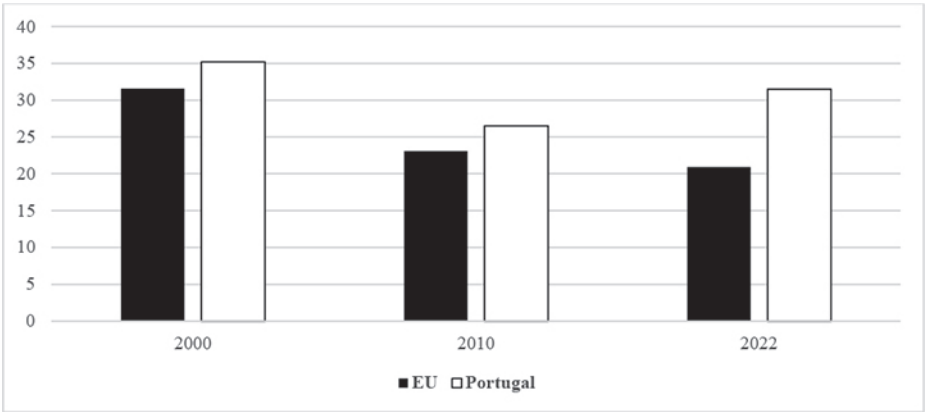


Source: BdP and INE (SLEP), IMF.

Furthermore, an unusually high number of Portuguese companies are (formally) *systematically loss-making*: according to the Ministry of Finance, between 1998 and 2021, on average, more than 43% of Portuguese companies showed negative results *every year*, but this did not translate into a renewal of the Portuguese business ecosystem (while 48.6% of companies in 2020 were not profitable, only a quarter of this number closed their doors). One reason for this is that these mostly small businesses face high tax costs and a burdensome regulatory environment, both considerably above EU averages, which also leads to a significant level of informality (see Figures 8 and 9 and World Bank, EBRD and EIB, 2020: the temporary drop observed in corporate taxation in mid-2010 was driven by the adjustment needs and conditions of the IMF/EU adjustment programs during the sovereign rating crisis, and were partially reversed by subsequent governments).[10]

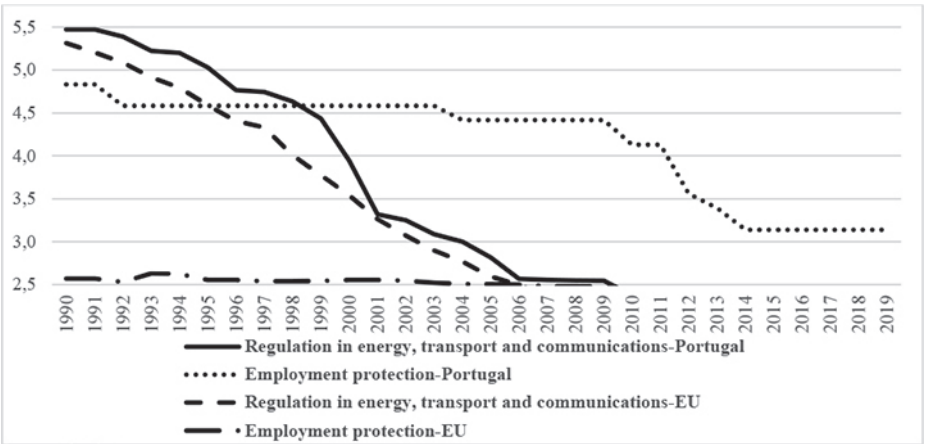
[10] See also "Compare to Grow: National Competitiveness Indicators", Business Roundtable Portugal Association, Lisbon, 2024, which also documents the high "context costs" in Portugal.

Figure 8: Corporate taxation (%)



Source: OECD.

Figure 9: Regulatory Burden

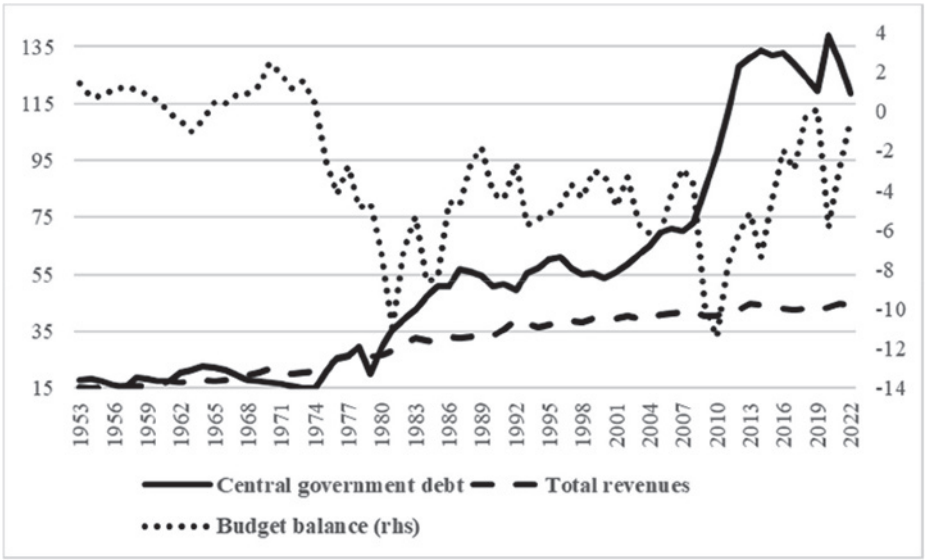


Source: OECD.

This heavier role of the state in the economy is also demonstrated by the fiscal stance of the Portuguese government: it accumulated a public debt stock above 100% of GDP since 2010 (it was below 15% until 1974), had continuous budget deficits since 1975 (with the

exception of a 0.1% of GDP surplus in 2019), and this despite tax revenues having more than doubled in terms of GDP in the same period, from 20% to around 45% (see Figure 10).

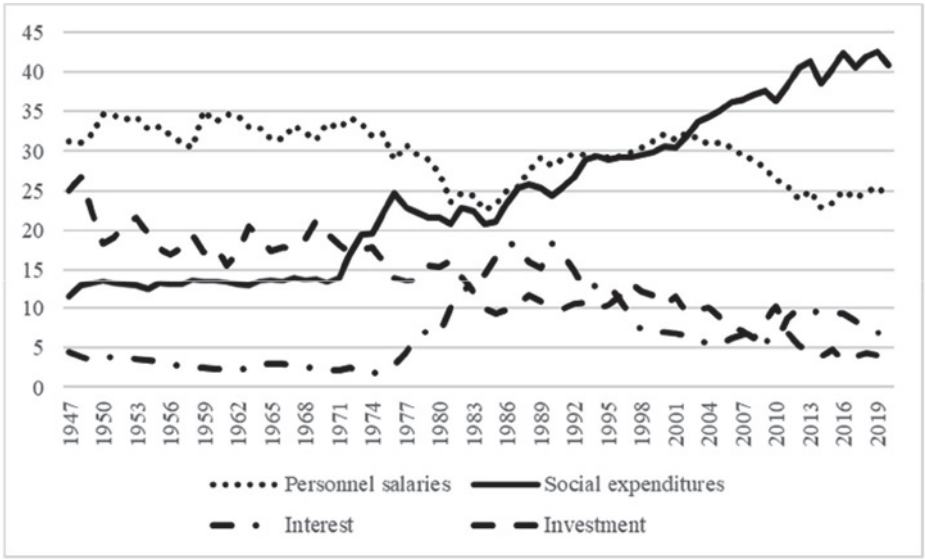
Figure 10: Revenue, budget balance and government debt in Portugal (% of GDP)



Source: BdP and INE (SLEP), IMF.

A greater state role is also apparent in the way the increased revenue is used: namely, expenditure on social benefits (pensions, public health, etc.) have more than doubled in terms of total state expenses, at over 40%, at the same time that investment expenditures have collapsed to less than 5% – around a quarter of what they were in 1974, and a value below what is necessary to avoid the erosion of the Portuguese public capital stock (the most stable item in terms of the state's total expenditure ratio is its "personnel expenses", which remain at around 25%: see Figure 11). The total capital stock in Portugal fell significantly, with the ratio between capital stock (public and private) and GDP being reduced from 3.4 to 2.5 between 1960 and 2019 (IMF, 2021).

Figure 11: Evolution of types of government expenditures in Portugal (% of total)



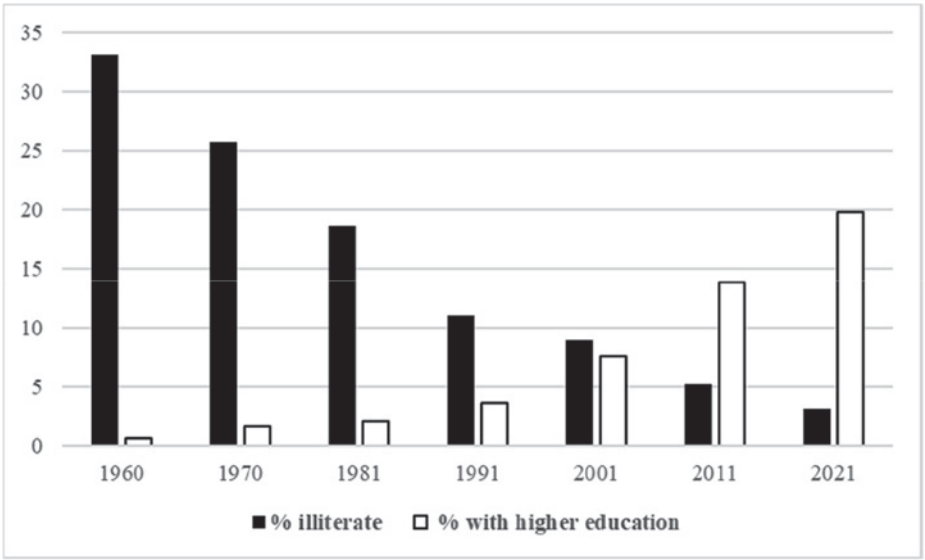
Source: BdP and INE (SLEP), IMF.

These high business "context" costs have negative effects in the productivity of Portuguese companies, and on their tendency to invest (see Amador et al, 2019, and Business Roundtable Portugal Association, 2024). The repeated crises of recent decades persistently and negatively also affected access to finance by Portuguese companies (see Karmakar, 2019).

4. The Role of Human Capital

The most positive point of the growth decomposition in Section 2 was the continued importance of human capital accumulation. The process through which this happened was fundamentally simple: the Portuguese population migrated from rural to urban areas (that is, from lower productivity activities to higher productivity activities), and at the same time acquiring higher levels of human capital.

Figure 12: Education levels of the Portuguese population



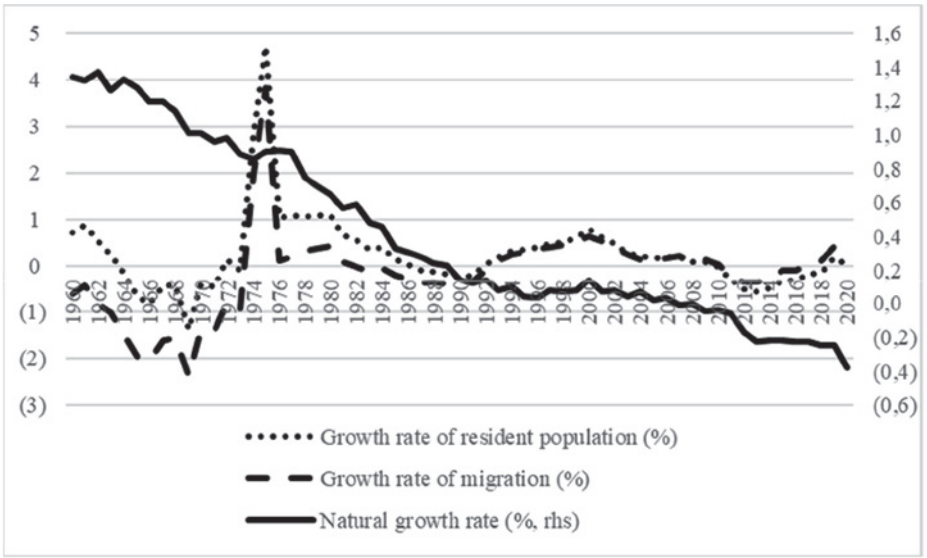
Source: INE, World Bank.

According to INE data, the percentage of the population that in 2020 lived in "predominantly urban areas" was 73.4%, while 12.4% lived in "predominantly rural areas" (compared to almost two thirds of the total population that lived in rural areas in 1960, according to the World Bank). At the same time, levels of human capital rose sharply: from a share of illiteracy of more than a third of the total population in 1960 – parallel to a percentage of the population with higher academic qualifications of less than 1% that year, in 2021 around 20% of Portuguese people had university qualifications and only 3% were illiterate (see Figure 12).

These are notable achievements – and, incidentally, achieved with significant EU financial support for education in Portugal (see OECD, 2022) – from a human, social and economic point of view. However, further increasing the amount of human capital faces restrictions, given the already high percentage of the urban population, and the aging and decline of the Portuguese population (Portugal's population decreased by almost three hundred thousand inhabitants between 2010 and 2020, while life expectancy increased to more than 81 years, compared to 64 in 1960: the drop in population was partially offset by migration, largely from former Portuguese colonies in America and Africa, see Figure 13). On the one hand, further deepening of the quality of human capital appears viable (see Campos and Reis, 2019), since the percentage of the Portuguese population with higher education is still lower than in the EU (although the gap is concentrated in older age groups).

This said, it is necessary to take into account the internal needs for the economic absorption of a more qualified workforce: while Portugal has a long history of emigration, historically concentrated in non-European destinations, this is now increasingly towards other Member States of the EU, given the freedom of movement and establishment granted by EU membership. The upshot is that the country now has *net emigration* (therefore, the decrease in the total population is due to *both* a birth rate below the replacement level – in the case of Portugal, since 1982, and with a figure of 1.4 births per woman in 2021, the lowest in the EU – and the net emigration).

Figure 13: Growth dynamics of the Portuguese population



Sources: BdP and INE (SLEP), and World Bank.

This is also a highly qualified net emigration ("brain drain"), with almost half of all Portuguese emigrants in 2021 having higher academic qualifications (or more than twice their percentage in the Portuguese population). The number of emigrants graduating in 2021 was equivalent to almost 13% of the more than 93 thousand Portuguese students who graduated from higher education institutions that year, which obviously has great costs for the country. It is also important to highlight that the immigrants who partially compensate for this net emigration do not necessarily have levels of incorporation of human capital equivalent to the workers who leave Portugal. On the drivers of this net migration, surveys suggest that the main reason is simply the lack opportunities domestically – INE estimates that almost 24% of those aged between 16 and 24 in Portugal were unemployed at the

end of 2023, compared to around 5% of those between 25 and 74 years old, while those employed in other EU countries received salaries that are often a multiple of equivalent ones in Portugal (see Pires, 2019).

Creating conditions for the internal absorption of this qualified workforce is inherently related to an expansion of more innovative economic activities through more productive private investment, the theme of section 3.

5. **Evaluating Growth Opportunities for Portugal**

The earlier sections of this paper will now be completed by an assessment of the sectors that can be used to enhance Portugal's growth performance at a national level and regionally, namely in its two largest cities, Lisbon and Porto, where around a third of the entire Portuguese population resides and where almost half of the Portuguese GDP is produced.

5.1. At National Level

To assess Portugal's overall competitiveness we use here the "Economic Complexity Index" (ICE).[11] It classifies countries based on the *diversification and complexity* of their export basket, using data from the "Atlas of Economic Complexity" from Harvard University's "Growth Laboratory". In 2021, Portugal ranked 35th in the ICE, a position similar to its historical

[11] Economic complexity uses methods of spectral analysis and network theory to reduce the dimensionality of the data in ways that preserve more information than simple aggregates (see Balland et al., 2021). Specifically, the ECI is a ranking of countries based on the complexity and diversity of their export baskets. "High complexity" countries have a range of sophisticated, specialized capabilities and are therefore able to produce a highly "diverse" set of complex products. Determining the economic complexity of a country depends not only on the productive knowledge of a country, the absolute number of products that it makes, but also on their "ubiquity" (e.g., the number of countries that export the product), and in the sophistication and "diversity" of products those other countries make. The ECI calculation –formally the *second* eigenvector k of the matrix M of measures of "diversity" and "ubiquity" in the production and export capabilities of country c and product p, is show below (after Hausmann and Klinger, 2006):

$$k_{c,n} = \frac{1}{k_{c,0}} \sum_{p} M_{c,p} \frac{1}{k_{p,0}} \sum_{c'} M_{c'p} k_{c',n-2}$$

$$= \sum_{c'} k_{c',n-2} \sum_{p} \frac{M_{c'p} M_{c,p}}{k_{c,0} k_{p,0}}$$

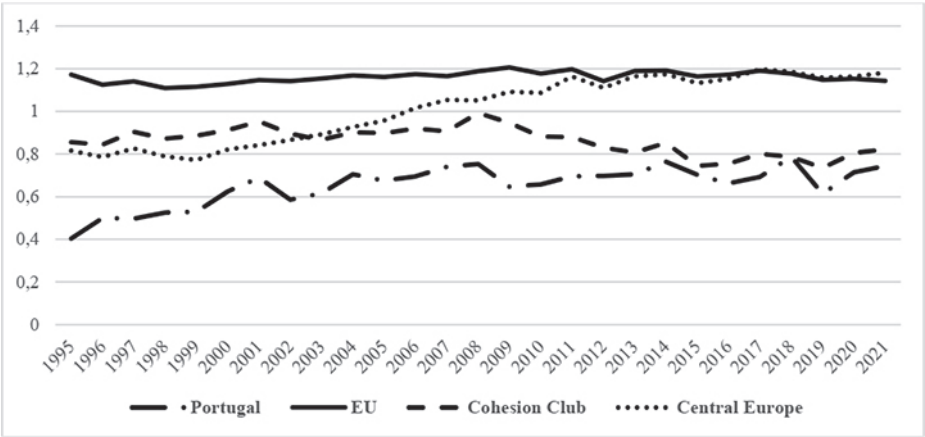
$$= \sum_{c'} k_{c',n-2} M^{c}_{c,c'}$$

where

$$M^{c}_{c,c'} = \sum_{p} \frac{M_{c',p} M_{c,p}}{k_{c,0} k_{p,0}}$$

ranking, which is a sign that the Portuguese economy has maintained its relative global level of complexity. In effect, given that Portugal is slightly more complex than expected for its level of income, this index suggests the country has an upward growth potential. This said, Portugal underperforms the complexity of all its European peer groups, be it the EU as an aggregate (excluding Luxembourg and Malta due to lack of data), the "Cohesion Club" or the Central and Eastern European countries that joined the EU in 2004 and 2007 (Figure 14): the growing economic complexity of the EU members in Central/Eastern Europe is particularly notable.

Figure 14: Comparison using ICE



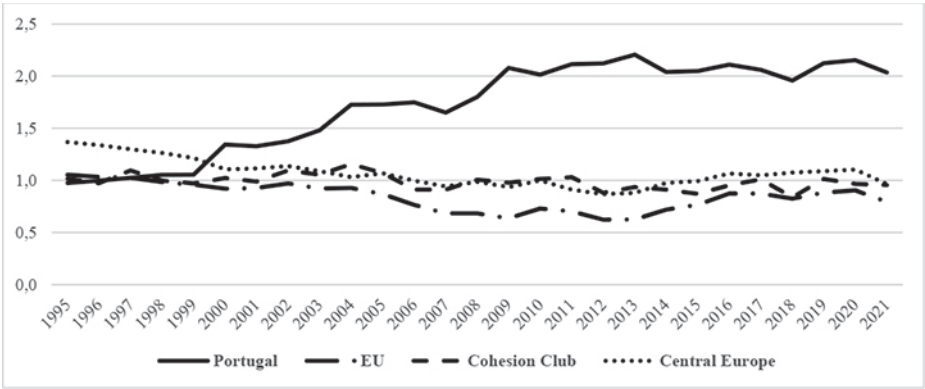
Source: Atlas of Economic Complexity, "Growth Lab", Harvard University.

With regard to the complexity of exports, in 2021 Portugal remained in the lower-middle portion of the distribution, focused mainly on agriculture, services and textiles, while growth opportunities are provided by those products of higher complexity that Portugal exports but in small quantities, such as semiconductors, automobiles and motor vehicle parts. Still other sectors such as chemicals, industrial and electrical machinery play an important role as export-oriented sectors that promote growth. A sign that Portugal is exporting more complex products is the decline of textiles and the rise of vehicles in the period from 1995 to 2021: textiles fell from 1.61% of global share to 0.77%, while the importance of vehicles increased from 0.36% to 0.52%.

Therefore, growth enhancing policies should support the private sector to increase the number of more complex products that it produces and exports. Those would help Portugal to create further links to other more complex products, further boosting growth, beyond the economic gains in diversifying production using already available national know-how to bridge the existing gap in the complexity of Portuguese exports in relation to its EU peers.

However, it is worth mentioning Portugal's improvement in the Economic Complexity Perspective Index (IPCE), a product-level version of the ICE that captures how much the "neighborhood" of complex products defines productive capabilities for a given country (Hidalgo et al., 2007). In other words, the IPCE is a measure of complex products that the country could produce given its existing know-how and capabilities (e.g., a measure of the easiness of economic diversification). Figure 15 shows that, contrary to the ICE results, Portugal would have significant potential gains from international diversification into new products in which the country's performance is below its current capacity and knowledge, compared to its peers.

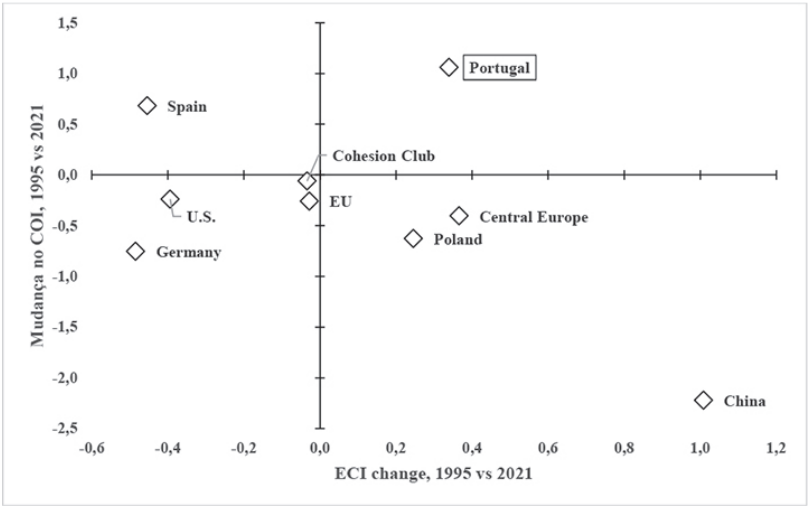
Figure 15: Comparison using IPCE



Source: Atlas of Economic Complexity, "Growth Lab", Harvard University.

Finally, Figure 16 shows the variation in the ICE and IPCE for Portugal between 1995 and 2021. Among the selected countries and groups, Portugal was the only country that improved slightly in the ICE index, *while at the same time improving significantly in the IPCE*. This result confirms that although there has been a merely marginal improvement in Portugal's complexity, *potential unexploited gains* could be very significant.

Figure 16: ICE *vs* IPCE



Source: Authors' calculations based on the Harvard University's "Growth Laboratory" data.

5.2. Lisbon

We now present an analysis of the comparative advantages of the two major metropolitan regions in Portugal using the "Metroverse" tool, another part of the suite of analytical frameworks from Harvard's "Growth Laboratory". In practical terms, this tool estimates a φ measure of similarity (or distance) between products i and j based on the conditional probability of having a Revealed Comparative Advantage (RCA), which measures whether a region x is an effective exporter (RCA>1) of a given good i or not (RCA<1), given that that region has a comparative advantage in good j at time t, and vice versa. The minimum of the pairwise conditional probabilities is given by:[12]

$$\varphi_{i,j,t} = \min\left\{\left\{P\left(RCAx_{i,t}\right) \mid \left(RCAx_{j,t}\right), P\left(RCAx_{j,t}\right) \mid \left(RCAx_{i,t}\right)\right\}\right\}$$

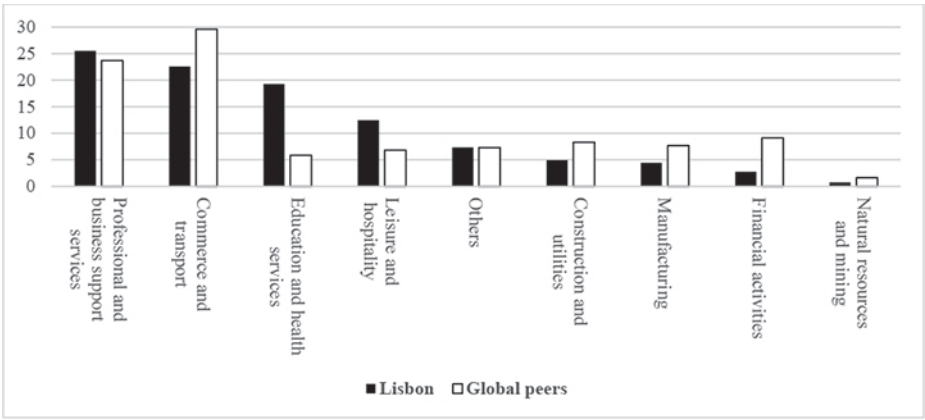
and where the RCA of region r and product p is given by

$$RCA_{rp} = \frac{X_{rp} \Big/ \sum^{r} X_{rp}}{\sum^{p} X_{rp} \Big/ \sum^{r} \sum^{pr} X_{rp}}$$

[12] For a fuller description of its underlying methodology, see Diodato, Neffke and O'Clery (2018).

Lisbon's largest economic sector in terms of employment is professional and business support services, with 25.5% of the city's workers (with the administrative and support services subsector representing 12.3% of employment in the city). Trade and transport (22.6%) is another important sector. Compared to its "global peers"[13] in terms of workforce allocation, Lisbon is relatively more intensive in educational services, hospitals and administrative and support services. Its relative disadvantages are in the financial, construction, manufacturing and commerce and transport sectors, as can be seen in Figure 17.

Figure 17: Comparison of the Economic Composition of Lisbon, 2020



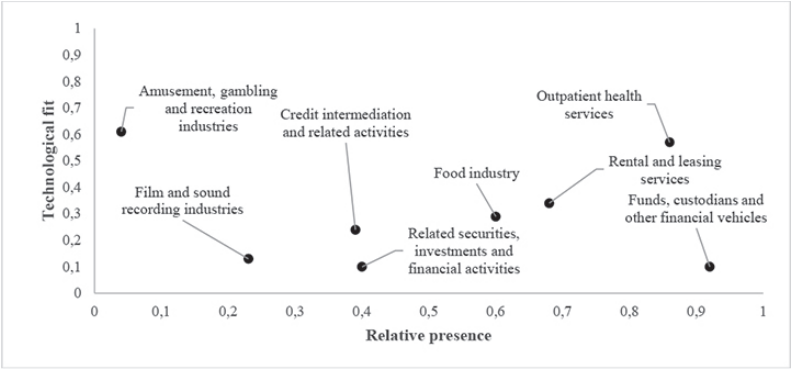
Source: Metroverse, "Growth Lab", Harvard University.

In terms of the relatedness of networks between products –referred to as the "product or industrial space", in Lisbon knowledge clusters[14] are in services, food and durable goods, together representing 85% of employees in the city: these industries are close to those that are already well developed in Lisbon and are sectors of potential growth. Figure 18 shows that promising industries for expansion are health, some financial sectors, media, tourism (therefore, mostly services' sectors) and in food production.

[13] Similar cities in terms of competitiveness in the same sectors. While the tool selects "global peers" automatically using this criterion, the program also allows the choice of specific "global peers" using certain factors (such as population, GDP per capita and/or regional filters: for example, Lisbon can be directly compared with Madrid).

[14] Sets of industries grouped together due to their technological relationship. Industries within the same "cluster" normally share similar knowledge or production capabilities, and they reveal a city's knowledge base and its potential for diversification.

Figure 18. Growth opportunities for Lisbon, 2020

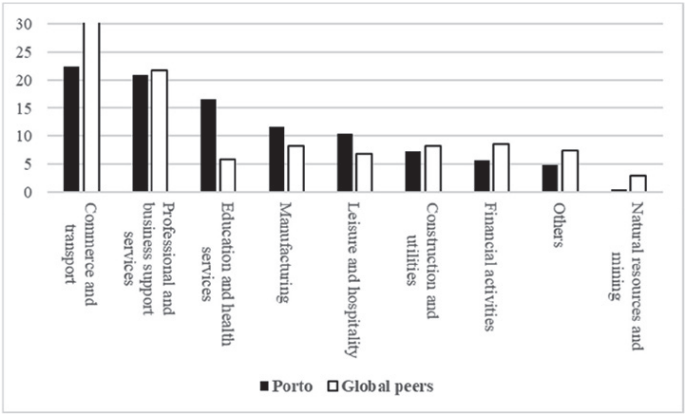


Source: Metroverse, "Growth Lab", Harvard University.

5.3. Porto

Porto's largest economic sector is commerce and transport, with 22.4% of the city's workers, followed by professional and commercial services companies (20.9%, of which administrative and support services are 11%). In relation to similar cities, as shown in Figure 19, Porto is relatively more intensive in educational services, manufacturing and leisure, while showing weaknesses in the other sectors.

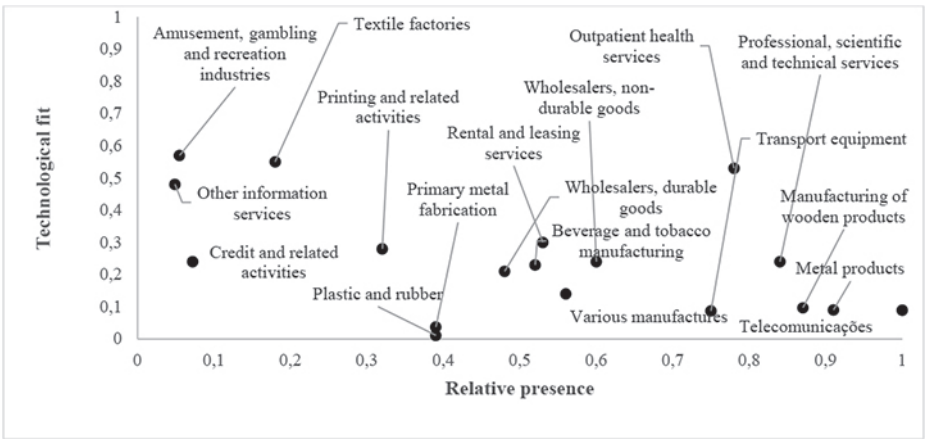
Figure 19: Comparison of the Economic Composition of Porto, 2020



Source: Metroverse, "Growth Lab", Harvard University.

In terms of the industrial space of Porto, the knowledge clusters that are potential candidates for diversification are services, food and durable goods, together representing 82% of the employed population. Given the productive structure of Porto – and in great contrast to Lisbon, the most "promising" sectors are largely in manufacturing industries (with a relatively greater intra-sectoral dispersion than in Lisbon), as illustrated in Figure 20.

Figure 20: Growth Opportunities for Porto, 2020



Source: Metroverse, "Growth Laboratory", Harvard University.

6. Conclusions and Some Policy Recommendations

Portugal has not fully used the opportunities provided by EU accession, and has regressed in terms of relative economic developed for almost a quarter of a century. It will also face serious adverse factors in the future, as its population is aging and shrinking, and its productive structure is heavily biased towards firms that are too small and too concentrated in traditional non-tradable sectors.

The paper concludes that a main reason for this outcome was fall in TFP after the "structural break" of the "Carnation Revolution", and the fall in investment at the time of international competitive shocks of the late 1990/early 2000s, which undermined a national economic development and international integration strategy roughly followed since the 1950s. Policies that modified the distribution and structure of the national entrepreneurial ecosystem and expanded significantly the state's non-productive current expenditures and its regulatory and tax footprints may have contributed to this outcome. More hopefully, the paper also concludes that the country has significant untapped diverse competitiveness potential at both the national and regional levels – namely in Lisbon and Porto, its two largest cities.

This underperformance could therefore be corrected and existing opportunities leveraged by policies that are more supportive of a private sector-led development, incentivizing firms to grow larger, produce more sophisticated products and exit the market faster when they fail, increasing the domestic demand for a more qualified labor force, and by policies that are adapted to the diverse comparative advantages of the regions in Portugal. Other EU countries – within and outside the euro area, from Ireland to Poland – show that such strategy is possible.[15]

Another conclusion of this work is that EU membership is better understood as providing several instruments which, if properly used, can significantly support convergence. However, this positive result depends on the choice and implementation of a specific set of coherent national and local policies (Vinhas de Souza et al., 2018). As a corollary, it also implies preparing the country for that moment when these net positive EU flows will eventually be reduced (or even end, like in the case of Ireland), especially with upcoming further EU enlargements Eastward (Vinhas de Souza, 2024c).

[15] For instance, Naudé and Cameron, 2021, estimate that the reorganization of global supply chains after COVID 19 provides significant further opportunities for external-demand led growth for Portugal. As the process of supply chains has continued after the pandemic, led by security-related movements towards "friend" and "near-shoring", the potential gains could be even higher.

References

Amador, J.; Cabral, S.; Ringstad, B. (2019) Que Custos de Contexto Estão Associados a Produtividade das Empresas Portuguesas? In Banco de Portugal, Departamento de Estudos Económicos, *O Crescimento Económico Português: Uma Visão sobre Questões Estruturais, Bloqueios e Reformas,* Lisboa, 281-287.

Amaral, L. (2022) *Economia Portuguesa, As Últimas Décadas*. Lisboa, Edição Revista, Fundação Francisco Manuel dos Santos.

Balland, P.-A.; Broekel, T.; Diodato, D.; Giuliani, E.; Hausmann, R.; O'Clery, N.; Rigby, D. (2022). The new paradigm of economic complexity. *Research Policy*, 51(3), 104450.

Barros, P.; Garoupa, N. (1993) Convergência Portugal-CEE: Alguma Evidência, FE/UNL, Lisboa Working Paper, n.º 204.

Business Roundtable Portugal (2024) *Comparar Para Crescer: Indicadores da Competitividade Nacional,* Lisboa.

Campos, M.; Reis, H. (2019) Ainda compensa investir em educação? In Banco de Portugal, Departamento de Estudos Económicos, *O Crescimento Económico Português: Uma Visão sobre Questões Estruturais, Bloqueios e Reformas*, Lisboa, 53-60.

Conselho para a Produtividade (2019) *A Produtividade da Economia Portuguesa* (1.º Relatório), Lisboa.

de Vries, K. and Erumban, A. (2022) *Total Economy Database: A Detailed Guide to its Sources and Methods*, The Conference Board, New York.

Diodato, D.; Neffke, F.; O'Clery, N. (2018) Why do Industries Coagglomerate? How Marshallian Externalities Differ by Industry and Have Evolved Over Time, Harvard University Working Paper, no. 89.

Ferreira da Silva, A.; Amaral, L.; Neves, P. (2015) Business groups in Portugal in the Estado Novo period (1930-1974): Family, power and structural change. *Business History*, 58(1), 49-68.

Gill, I.; Raiser, M. (2012) *Golden Growth: Restoring the Lustre of the European Economic Model*, Europe and Central Asia Studies, Washington, D.C., World Bank Group.

Hausmann, R.; Klinger, B. (2006) Structural Transformation and Patterns of Comparative Advantage in the Product Space, Working Paper Series rwp06-041, Harvard University, John F. Kennedy School of Government.

Hidalgo, C.A.; Klinger, B.; Barabási, A.L.; Hausmann, R. (2007) The product space conditions the development of nations. *Science*, 317(5837), 482-487.

Honohan, P. (2021) Is Ireland really the most prosperous country in Europe?, Economic Letter, 1/EL/21), Central Bank of Ireland.

IMF (2021) Investment and Capital Stock Dataset, 1960-2019.

Karmakar, S. (2019) Que Importância tem o Acesso ao Financiamento para o Desempenho das Empresas em Períodos de Crise? In Banco de Portugal, Departamento de Estudos Económicos, *O Crescimento Económico Português: Uma Visão sobre Questões Estruturais, Bloqueios e Reformas, Lisboa* , 147-155.

Mateus, A. (cord.) (2013) *A Economia, a Sociedade e os Fundos Estruturais: 25 Anos de Portugal Europeu*. Lisboa, Fundação Francisco Manuel dos Santos.

Naudé, W.; Cameron, M. (2021) Export-led growth after COVID-19: The case of Portugal, *Notas Económicas*, 52, 7-53.

OECD (2022) *Resourcing Higher Education in Portugal,* Paris.

Pires, R. (2019) Portuguese Emigration Today. In Pereira, C.; Azevedo, J. (Eds), *New and Old Routes of Portuguese Emigration*. Springer.

Solow, R. (1956) A contribution to the theory of economic growth. *Quarterly Journal of Economics*, 70(1), 65-94.

Vinhas de Souza, L. (2004) Financial Liberalization and Business Cycles: The Experience of the New EU Member States in The Baltics and Central Eastern Europe, Deutsche Bundesbank, Discussion Papers Series n.° 23/04, Frankfurt, Germany.

Vinhas de Souza, L. (2024a) Caught in the Middle? China and the 'Middle Income Trap', LUISS Institute for European Analysis and Policy, Working Paper 9/2024.

Vinhas de Souza, L. (2024b) *A Century of Global Economic Crises: Monetary Policy in Search of an Anchor*. UK, Palgrave Macmillan.

Vinhas de Souza, L. (2024c) *Unresolved Business: Enlarging the EU towards Moldova and Ukraine (and perhaps Georgia*), VoxEU, CEPR, UK. Retrived from https://cepr.org/voxeu/columns/unresolved-business-enlarging-eu-towards-moldova-and-ukraine-and-perhaps-georgia

Vinhas de Souza, L.; Dreute, O.; Isaila, V.; Frie, J-M. (2018) Reviving convergence: making EU member states fit for joining the euro area. In Nowotny, E.: Ritzberger-Grünwald, D.; Schuberth, H. (Eds.), *Structural Reforms for Growth and Cohesion: Lessons and Challenges for CESEE Countries and a Modern Europe*, Edward Elgar Publishing, 214-224.

Vinhas de Souza, L.; Tudela, M. (2012) *Euro Area Periphery: Structural Reforms Have Significantly Improved External Imbalances, but Full Resolution May Still Take Years, Moody's Special Comment 144845*.

World Bank, EBRD and EIB (2020) *Enterprise Surveys, What Businesses Experience: Portugal 2019 Country Profile*.

XXII Governo Português (2021) *Recuperar Portugal. Construindo o Futuro – Plano de Recuperação e Resiliência*, Lisboa.

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Fiscal Instruments, Welfare and Inflation: A HANK Approach

Instrumentos Fiscais, Bem-Estar e Inflação: uma abordagem HANK

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ABSTRACT
This study aims at answering two research questions. Firstly, given a change in the VAT rate and a change in targeted transfers, which would impact inflation the most? Secondly, after a negative supply shock, which measure would be more welfare-friendly? We find that VAT changes generate a greater impact on inflation than changes in transfers, both empirically and within the structural model. Additionally, we find that a decrease in the VAT rate, though it generates more inequalities, is more welfare-friendly if it is measured through a utilitarian approach.
Keywords: Fiscal Instruments; HANK; Inflation; Welfare; VAT; Transfers.

JEL Classification: D31; E12; E62; H20

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1. Introduction

Three years have gone by, and the world is still adapting to all the changes that the COVID-19 pandemic brought. Governments all around the world went through massive fiscal expansions in order to try and sustain aggregate demand, and now, many economies are feeling the impacts of such measures, namely, inflation.

The most orthodox way of dealing with inflation has been to let the monetary authority (Central Bank) control it with the use of open market operations and other instruments. However, governments being such a decisive agent in the economy, may also want to get in on the action. In fact, many countries within the Euro Zone may feel a greater necessity of having the government act accordingly to monetary policies, given that, although all the economies have different characteristics, they are under the same monetary policy ruling.

More recently, three European counties have adopted fiscal policies that have been on the spotlight of economic debates. Portugal, Spain and Italy have all adopted measures regarding temporary decreases on the VAT rate for certain bundles of goods. The purpose of these policies have been to alleviate the inflation rates in the countries and give back some purchasing power to the families. The most recent case, Portugal, has seen a decrease in the VAT rate for essential food items, going from the usual 6% to 0%. This policy was put in place back in April 2023 and is still to this day (December 2023) active. Following this fiscal policy, and analyzing the recent studies of a similar policy put in place earlier in Spain, many economists have debated on the implications of such mea- sure. The first question that is being asked is if such measure even decreases consumer prices, and if so, up to which degree. The purpose of such measures have been to fight inflation so, one would expect to see a decrease in the inflation rates when such measure is applied – a pass-through rate. Secondly, such measure can be very costly for the government, thus hurting its budget. Even if such measure is successful in reducing inflation, how big was the cost of such policy? Economists have been wondering if there are alternative options to ease the decrease in the households purchasing power in a way that is more cost-effective. The most commonly mentioned alternative is to increase transfers to the most vulnerable agents in the economy since it has been showed that these are the ones who suffer the most with inflation.

This paper aims at extending the literature regarding these questions. In Section 2 a literature review on the topic is provided. Section 3 provides an empirical exercise using data from Alesina et al. (2017) so as to analyze which fiscal measure – a change in the VAT rate or a change in targeted transfers – will generate a greater impact on inflation. Section 4 is dedicated to constructing a one-asset Heterogenous Agents New Keynesian (HANK) model where we will calibrate it to resemble the Portuguese economy (Section 5), and will evaluate the welfare impacts coming from both types of fiscal policies - Section 6. Section 7 concludes.

2. Literature Review

The use of temporary VAT changes can be considered as a somewhat recent fiscal instrument for governments. By altering the VAT rate, there may be a degree of pass-through to final consumer prices, the measurement of such pass-through rate has been the main focus

of this very much recent literature. The degree to which consumer prices respond to VAT changes is of utmost importance when studying the welfare impacts originating from similar fiscal policy actions, since such elasticity will determine the changes in the households' purchasing power. The main findings of Benzarti et al. (2017) relate to prices asymmetrical responses to VAT changes, concluding that prices respond twice as much to VAT increases than to decreases. More recently, De Amores et al. (2023) conducted a study referring to the Spanish government's decision to temporarily reduce the VAT rate from 4% to 0% for the most necessary goods such as bread, milk, vegetables, fruits, amongst other. The authors compare the price evolution of these goods by analyzing the daily prices available on *Carrefour*'s website – a Spanish supermarket – and comparing them with those on *REWE*'s website – a German supermarket – between the end of December 2022 and the first week of January of 2023. The main findings of this paper point to large pass-through rates for multiple items, with many reaching 100%.

Regarding the impact of transfers on welfare, the literature is more extensive, many authors have studied how transfers may be able to impact the economy's output, while relating such mechanisms to agent's heterogeneity and inequality. Oh and Reis (2012) took notice of the substantial increase in social transfers in OECD countries from 2007 and 2009 and developed a model with idiosyncratic, uninsurable uncertainty regarding income and wealth, as well as nominal rigidities in price setting. The authors concluded that social transfers are expansionary through two main channels: a neo- classical channel which states that the lowering of wealth of marginal workers will induce them to provide more labor; a Keynesian effect suggesting that transferring resources from households with a lower marginal propensity to consume, to those with a higher marginal propensity to consume will boost consumption, aggregate demand and lastly, output. Floden (2001) develops a model with incomplete markets, infinitely-lived households who differ in ability and are hit by idiosyncratic wage shocks. The main question the author wishes to tackle is the effect that variations in public debt and transfers will have on the distribution of resources, efficiency and risk sharing. One of the main findings of the paper is that an increase in transfers can have large welfare gains by providing insurance and redistribution, when using a utilitarian welfare criterion.

With the availability of extensive micro data, modern macroeconomics has been able to depart from a representative agent framework and use instead heterogeneous agents frameworks, which would then change the impacts of shocks on macroeconomic variables (Brinca, 2020). Additionally, Kaplan and Violante (2018) argue that the Great Recession can be considered as a turning point in the literature, by exposing the shortcomings of a representative agent framework to the business cycle analysis. By departing from representative agent framework, the authors argue that results obtained when using heterogeneous agents may be closer to reality, adding that poorer households act more responsive to income effects and less to substitution effects when compared to wealthier households. In this paper, the authors extensively compare the results and mechanisms from a Representative Agent New Keynesian (RANK) and a state of the art Heterogeneous Agents New Keynesian (HANK) model for multiple shocks. Still on the topic, a possible source of heterogeneity across agents is their time preferences. In fact, Carroll et al.(2017) make use of households time preferences to generate more or less impatient agents, which in turn lead to wealth inequality and different marginal propensities to consume amongst them. In their paper, the authors also

mention that aggregate responses to temporary income shocks will be mostly dependent on which agents bear the shock since they will have different marginal propensities to consume.

Much of the literature related to fiscal instruments tries to measure its impacts on the economy's output, denoting it as fiscal multipliers. For this paper, such conclusions will be helpful in order to understand how taxes and transfers may impact the GDP, and through which mechanisms. Using the data and methodology of Ilzetzki et al. (2013) and Brinca et al. (2016) find a strong correlation between the size of fiscal multipliers and wealth inequality. In their paper, Brinca et al.(2016) developed a life-cycle overlapping generations model with heterogeneous agents and uninsurable labor market risk. The authors calibrated the model to multiple OECD countries and found a high degree of sensitivity of the fiscal multiplier to the share of liquidity-constrained agents. More recently, Brinca et al. (2020) concluded that income inequality may originate stronger recessive impacts of fiscal consolidation programs. In their paper, the authors develop a life-cycle, overlapping generations economy with uninsurable labor market risk, and perform three empirical exercises based on the data sets and methodologies from Blanchard and Leigh (2013), Alesina et al. (2017) and Ilzetzki et al. (2013).

From the literature, the framework for the model that is most similar to the one that shall be used in this paper, comes from Brinca et al. (2019). In this paper, it is shown that the fiscal multiplier of government purchases is nonlinear in the size of the spending shock. To prove this, the authors develop a one-asset HANK model where firms are subject to quadratic costs of price adjustment, a Taylor rule is followed by the Central Bank and there is no physical capital, then, the authors calibrate parameters to fit the US economy.

3. Empirical Analysis

In this section I study the impact on inflation coming from fiscal consolidations. These fiscal consolidations can come either through transfers or changes in revenues obtained from indirect taxes on goods and services. Such exercise will provide clairvoyance in the usage of different fiscal instruments and their efficiency in tackling inflation.

3.1. Data

The data used in this study is from Alesina et al. (2017). This data set of fiscal consolidations contains over 3500 measures for 16 OECD countries[1] from 1978 to 2014. When constructing this data set, the authors used a narrative approach, stating that such fiscal consolidations were solely driven by the need to reduce government deficits. Such approach makes it possible to filter out policy actions driven by the current economic conditions, thus guaranteeing that these fiscal policies are exogenous to the business cycle.

In the data set, fiscal adjustments are decomposed as a multiyear plan in which some fiscal adjustments were implemented unexpectedly, whereas others are known in advance.

[1] Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Portugal, Spain, Sweden, United Kingdom, United States.

Such decomposition will be useful for the empirical analysis part of this paper. Additionally, fiscal consolidations are measured as expected revenue coming from changes in taxes, and as alterations of government expenditure relative to the expected level of expenditure if no policy would have taken place. All fiscal plans are scaled to be in percentage of the economy's GDP.

In the initial paper, the authors measure the macroeconomic effects of fiscal consolidations which were divided into tax-based, consumption-based and transfer-based policies, however, the publicly available data set contains detailed information on each fiscal measure, making it possible to split the fiscal consolidations into more specific categories, such as: taxes on goods and services, personal taxes, income taxes, property taxes, corporate taxes, spending on consumption, spending on salaries, spending on investment and spending on transfers.

As previously stated, the purpose of this empirical exercise is to analyze the impact of a fiscal consolidation through transfers on inflation, and compare it with a fiscal consolidation taken place through an increase in VAT revenues. Though Alesina et al. (2017) merely defend exogeneity of the fiscal measures on the business cycle, one can argue that such exogenous attribute may extend to inflation as well. A possible argument could be made regarding the Central Bank's independence in OECD developed countries. Alesina and Summers (1993) studied the independence level of a group of OECD countries from 1955 to 1988, further mentioning that such values have only increased in more recent times. The authors state that, by delegating monetary policy to an agent who is more inflation averse than the remainder of society, should permit a lower rate of inflation. Hence, one can argue that the role to control inflation has been given to Central Banks and not the government, thus extending the exogeneity characteristic of such fiscal consolidations to inflation. Additionally, in order to guarantee that no fiscal policy was created with the intention to combat inflation, all fiscal measures in the data set were studied according to their description, concluding that no mea- sure refers to inflation, or any other related terminology. Having these arguments in mind, for the remainder of the paper, we will assume that these fiscal consolidation measures presented in the original data set are exogenous to the inflation levels of the countries.

3.2. Baseline regression and results

The baseline regression of this empirical exercise is as follows:[2]

$$\pi_{i,t} = \alpha + \gamma_1 Trf^{u}_{i,t} + \gamma_2 Trf^{a}_{i,t} + \gamma_3 VAT^{u}_{i,t} + \gamma_4 VAT^{a}_{i,t} + \gamma_5 G^{u}_{i,t} + \gamma_6 G^{a}_{i,t} + \delta_i + \varepsilon_{i,t}$$

where $\pi_{i,t}$ is the inflation rate measured through the CPI (with base 2010) entailed within the original data set, in country i from the year $t-1$ to t. $Trf^{u}_{i,t}$ is an unanticipated fiscal consolidation through transfers on country i at year t, $Trf^{a}_{i,t}$ is an anticipated fiscal consolidation through transfers on country i at year t, $VAT^{u}_{i,t}$ is an unanticipated fiscal consolidation through indirect taxes on goods and services on country i at year t and $VAT^{a}_{i,t}$ is an anticipated fiscal consolidation through indirect taxes on goods and services on country i at

[2] In the baseline regression all variables relate to the original authors categories, i.e., transfers are originated from "Spending – Transfers" and the VAT variables originate from "Indirect Taxes – Goods and Services".

year t. As controls, unanticipated fiscal consolidations through other government spending, $G^u_{i,t}$, and through other forms of tax code changes, $T^u_{i,t}$, on country i at year t are used, as well as country fixed effects, δ_i. For the purpose of the empirical exercise, we will look into how inflation behaves to anticipated fiscal consolidations coming from transfers ($Trf^a_{i,t}$) and compare its behavior when fiscal consolidations are formed from unanticipated changes in revenues related to indirect taxes on goods and services ($VAT^u_{i,t}$), as these are the events that one may realistically observe in the world.

The following table presents the main results from the baseline regression:

Table 1: Baseline regression based on data from Alesina et al. (2017)

Coefficients	Baseline
γ_1	0.021* (0.011)
γ_2	0.030*** (0.01)
γ_3	0.043** (0.018)
γ_4	-0.005 (0.016)
γ_5	-0.015** (0.005)
γ_6	-0.021* (0.01)
Constant	0.039*** (0.0007)
Observations	566
R^2	0.030
Number of countries	16

Notes: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. Robust Standard errors in parentheses.

Out of the previous table, the coefficients that should be looked into more detailed are γ_2 which relates to an anticipated fiscal consolidation through the transfers channel, and γ_3 associated with an unanticipated fiscal consolidation through changes in revenues linked to indirect taxes on goods and services. A γ_2 of –0.03 means that, for a fiscal consolidation in the amount of 1% of GDP, through a decrease in transfers, inflation will decrease in that year, on average, 3 percentage points, *ceteris paribus*, being significant at a 1% level. When it comes to γ_3, the coefficient is 0.043, meaning that, for a fiscal consolidation in the amount of 1% of GDP, through an increase in revenues coming from indirect taxes on goods and services, inflation will increase in that year, on average, by 4.3 percentage points, *ceteris paribus*, being significant at a 5% level.

The results refer to fiscal consolidations, however, being a linear regression, and, disregarding possible asymmetrical phenomena on the direction of the fiscal measure (as it is not the focus of the paper), in order to understand the impact of a fiscal expansion on inflation, either through an increase in transfers, or a decrease in the revenues coming from indirect taxes on goods and services, one must only invert the sign of the presented coefficients.

These values can be useful when transposing them into the current debates on inflation behavior to fiscal instruments. An important conclusion from the output presented is that, by increasing transfers, inflation in that same year will increase, whereas if agents are aware of announced transfer cuts, inflation will fall, a possible mechanism behind this is the income effect that transfers generate on agents, thus changing aggregate demand, which goes according to macroeconomic theory.

Interestingly, if government revenues generated from indirect taxes on goods and services fall, inflation within the same period will also fall. This result can be seen as a mechanical phenomenon if, for instance, the VAT decreases then, inflation measured through the CPI in that same year is likely to suffer a decrease with a certain degree of pass-through, such topic is now being extensively studied in countries that adopted such fiscal policies, such as Spain and Portugal. Although the interpretation in this empirical exercise does not refer to changes in the VAT rate, the conclusions taken are in accordance with other papers referred in the related literature section.

3.3. Robustness

As robustness tests, four additional exercises were performed. A first test was conducted in order to evaluate if the 4 non-European countries (Australia, Canada, Japan and United States) in the data set could be the source of a different behavior to fiscal policies. As a second robustness test, the regression was restricted to only take into account the values starting from 1994. The reason why one should study the relation between fiscal instruments and inflation starting 1994 is that, within the sample, inflation levels were high and on a decreasing trend for most countries, thus possibly generating a bias when conducting the exercise. In the third exercise, instead of using the authors original categories for transfers and indirect taxes on goods and services, a different approach was taken. In this approach – *Proxy Consolidations* – only fiscal measures containing specific names, definitions, abbreviations were taken into account. This way, one can be sure that only changes related to VAT and transfers targeting the most vulnerable are taken into account.

The last robustness test was made with the lagged values of the explanatory variables, in order to evaluate if, by intervening in year t, inflation would only react in $t + 1$. The following table presents the results for the baseline and compares it with all the robustness tests performed:

Table 2: Regressions based on data from Alesina et al. (2017)

Coefficients	Baseline	European Countries	Year > 1993	Proxy Consolidations	Lagged
γ_1	0.021*	0.021	0	0.021	0.01
	(0.011)	(0.012)	(0.006)	(0.02)	(0.007)
γ_2	-0.030***	-0.030**	-0.013***	-0.030	-0.037***
	(0.01)	(0.01)	(0.003)	(0.019)	(0.01)
γ_3	0.043**	0.043**	0.001	0.046**	0.016
	(0.018)	(0.019)	(0.008)	(0.023)	(0.011)
γ_4	-0.005	-0.009	0.016***	-0.001	-0.013
	(0.016)	(0.019)	(0.004)	(0.01)	(0.018)
γ_5	-0.015**	-0.016**	0	-0.014**	-0.016***
	(0.005)	(0.005)	(0.003)	(0.006)	(0.004)
γ_6	-0.021*	-0.021*	-0.005	-0.017*	-0.008
(0.01)		(0.011)	(0.005)	(0.009)	(0.005)
Constant	0.039***	0.042***	0.02***	0.039***	0.04***
	(0.0007)	(0.0008)	(0.001)	(0.0007)	(0.0008)
Observations	566	422	336	566	566
R^2	0.030	0.037	0.031	0.020	0.022
Number of countries	16	12	16	16	16

Notes: $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$. Robust Standard errors in parentheses.

As shown above, the values for γ_2 and γ_3 are robust to most exercises performed. According to this empirical exercise, if the government conducts an unanticipated expansionary fiscal policy, by reducing their revenues coming from indirect taxes on goods and services, through a decrease in the VAT rate for example, it will generate a greater impact on inflation in that same period when compared to an anticipated fiscal consolidation through a decrease in transfers to households. Once again, although the empirical exercise only refers to fiscal consolidations, one can extend it to fiscal expansions if it assumes symmetric behavior, thus making sure the previously stated conclusions hold.

The empirical exercise exhibited above helps to understand which fiscal instrument, between transfers and indirect taxes on consumption, has the greatest impact on inflation. The coefficients point towards a greater impact from indirect taxes on consumption which is of no surprise given that such taxes are incorporated into the consumer prices up to a certain degree – the pass-through rate. Knowing which fiscal instrument has the greatest impact on inflation is only part of this study. The following sections of the paper are dedicated to developing, solving and calibrating a structural model which will provide conclusions regarding which type of fiscal instrument is more efficient welfare-wise, when governments are faced with a negative supply shock which creates inflationary pressures.

4. **Model**

This section is dedicated to the description of the Heterogenous Agents New Keynesian (HANK) model used in this study, a state-of-the-art model that closely resembles the one presented in Brinca et al. (2019), which in turn closely follows the set up in Auclert et al. (2018). Similarly to the previous papers, this is a one asset economy which is represented by infinitely lived households who face persistent idiosyncratic productivity shocks, and the main source of heterogeneity originates in the agents' discount factors. In this version of the model, agents save through government bonds, and, departing from the previous representations, a consumption tax and targeted transfers have been incorporated in this novelty version of the model.

4.1. Households

In this version of the model, agents live forever and are ex-ante heterogenous regarding their discount factor which can take three distinct values, $\beta \in \{\beta_1, \beta_2, \beta_3\}$. Additionally, the agents face persistent idiosyncratic productivity shocks, e, that follows an AR(1) process:

$$e' = \rho e + \epsilon, \;\; \epsilon \sim N(0, \sigma^2)$$

Every period, agents choose how much to consume, c, work, n, and save, b', so as to maximize the same period utility function subject to a budget constraint. Households follow a CRRA type utility function where they enjoy consumption and get disutility from working, as follows:

$$U(c,n) = \frac{c^{(1-\sigma)}}{1-\sigma} - \chi \frac{n^{(1+\eta)}}{1+\eta}$$

Considering this, the household problem can be summarized by the following Bellman equation:

$$V(e,b,\beta) = \max_{c,n,b'} \left\{ \frac{c^{(1-\sigma)}}{1-\sigma} - \chi \frac{n^{(1+\eta)}}{1+\eta} + \beta \mathrm{IE}_{e'} V(e',b',\beta) \right\}$$

subject to

$$(1+\tau_c)c + b' = (1+r)b + (1-\tau_l)wne + g + d + tt + ttax$$

where τ_c is a consumption tax, τ_l is a labor tax, w is the wage rate, g are transfers from the government, d are dividends and, as an innovation to previous models, tt are included in the budget constraint and are *targeted transfers*, a distinct type of transfer that will be allocated to the 50% poorest agents, whereas $ttax$ is a distinct type of tax that will be allocated to the 50% richest agents.

4.2. Firms

Regarding the firms side, a competitive final goods firm aggregates a range of intermediate goods indexed by j with an elasticity of substitution that is constant and given by $\mu/(\mu-1) > 1$. As for intermediate goods, they are produced by monopolistically competitive firms with a linear production function such as:

$$y_i = F(n_j) \equiv n_j$$

Firms will set a price of p' and are subject to quadratic adjustment costs expressed as:

$$\psi(p',p) = \frac{\mu}{(\mu-1)} \frac{1}{2k} \left[\log\left(\frac{p'}{p}\right) \right]^2 Y$$

The firm's value function is given by:

$$V(p) = \max_{p'} \left\{ \frac{p'}{p} y - wy - \frac{\mu}{(\mu-1)} \frac{1}{2k} \left[\log\left(\frac{p'}{p}\right) \right]^2 Y + \text{IE}\left[\frac{V(p')}{1+r'} \right] \right\}$$

subject to

$$y = \left(\frac{p'}{p} \right)^{-\frac{\mu}{(\mu-1)}} Y$$

Assuming that firms adopt symmetric pricing strategies and taking the first-order condition of the firm's problem, we obtain the following New Keynesian Phillips curve:

$$\log(1+\pi) + k\left(\frac{1}{\mu} - w\right) = \text{IE}\left[\frac{1}{1+r'} \frac{Y'}{Y} \log(1+\pi') \right]$$

Lastly, households receive dividends from owning firms, which equal output net of labor and costs associated with price adjustments: $d = Y - wL - \psi$

4.3. Fiscal and monetary policies

The government budget constraint is defined as:

$$\tau_c C + \tau_l wN + B = (1+r)B_{-1} + G + g + tt + ttax$$

where C is total private consumption, N is the aggregate number of hours worked in the economy, B is privately held government debt (denominated in real terms), and G is public consumption. The monetary authority follows a standard Taylor rule given as:

$$i = r^* + \phi_\pi \pi$$

where r^* is the real interest rate target, π is the inflation rate and ϕ_π is the inflation Taylor rule coefficient. For simplicity, it is assumed that the central bank will target the inflation rate to be zero.

4.4. Equilibrium

For a given distribution of agents in the economy, Φ, the competitive equilibrium can be defined as follows:

1. Taking factor prices and initial conditions as given, households maximize the value function $V(e, b, \beta)$ with the respective policy functions being given by $c(e, b, \beta)$, $n(e, b, \beta)$, and $b'(e, b, \beta)$.
2. Firms optimize their choices regarding prices, employment, and production.
3. Fiscal and monetary authorities follow their rules.
4. The bonds market clears

$$B = \int b d\Phi$$

5. The labor market clears

$$N = \int n(e,b,\beta)\, e d\Phi$$

6. The goods market clears

$$Y = \int c(e,b,\beta)\, d\Phi + \mathrm{G} + \Psi$$

5. Calibration

For the purpose of this study, the model will be calibrated to the Portuguese economy. Some parameters were calibrated based off from their empirical counterparts, whereas the remainder were calibrated using the Sequence-Space Jacobian computational strategy, proposed by Auclert et al. (2021). What follows is a brief explanation on the process behind the choices for the calibrated parameters. Additionally, Table 5 in the Appendix presents a summarized version of the calibrated parameters. Starting off with the Frisch elasticity of labor supply, in this paper it is set to 1 which is considered a standard value in the literature. The net public debt (B/Y) is set to be equal to the IMF's Portuguese annual average from 2001 to 2008 – 0.557. Still from IMF's dataset, the average government expenditure is 0.2712, being the average annual value from 2001 to 2008. According to OECD data, the Portuguese average labor tax was of 28.1%, as such, this is the value attributed in the model. Lastly, given that one of the main purposes of this exercise is to understand how the economy behaves to a temporary decrease in the VAT rate, τ_c is set to 0.06, which is

the rate attributed to goods of first necessity and also the rate which was temporarily changed starting April 2023.

Out of all the parameters, six are calibrated in the model to match data moments – the discount factors, borrowing limit, disutility of labor and the cross-sectional std. of log earnings will match the wealth quartiles, the percentage of Hand-to-Mouth agents, the share of hours worked and the variance of log wages, respectively, thus making the system exactly identified. The computational strategy is set so that it minimizes the following loss function:

$$L\ (\beta 1,\ \beta 2,\ \beta 3,\ b,\ \chi,\ \sigma\epsilon) = ||Mm - Md\ |$$

Table 3 and Table 4 report on the calibration fit for the model.

Table 3: Calibration fit of the benchmark economy, Portugal

Data Moment	Description	Source	Data Value	Model Value
$n^{\sim}$	Average fraction of hours worked 1990-2011	OECD	0.249	0.249
Var(ln w)	Variance of log wages	LIS	0.298	0.298
% of HtM	Fraction of Hand-to-Mouth households	Wave 3 of HFCS	0.28	0.2879
Q_{25}, Q_{50}, Q_{75}	Wealth Quartiles	LWS	0.0058, 0.0821, 0.266	0.0027, 0.0545, 0.2654

Table 4: Parameters Calibrated Endogenously

Parameter	Description	Value
β_1, β_2, β_3	Discount factors	0.904, 0.954, 0.983
$\underline{b}$	Borrowing limit	0.005
χ	Disutility of labor	14.942
σ_ϵ	Cross-sectional std. of log earnings	0.3345

6. **Welfare Analysis**

6.1. Benchmark scenario – negative unanticipated tfp shock

The following subsection refers to the benchmark case for this exercise. In this scenario, an economy was hit with a one-time, unanticipated, temporary, negative supply sided shock which takes some time to dissipate and generates inflationary pressures – *Negative Unanticipated TFP Shock*. For simplicity, the shock is such that it will generate in the first period an

increase in inflation of 1 percentage point, moving from 0% in the original steady state, to 1% in period one. In this scenario, the government will maintain a balanced budget and will use lump-sum transfers/taxes in order to guarantee so.

Overall Economy

When analyzing the Impulse Response Functions presented in Figure 5 and Figure 6 we reach the following conclusions for the overall economy:

1. Output (Y): due to a negative TFP shock, output in the economy will decrease, slowly converging back to its steady-state level after 50 quarters.
2. Real interest rate (r): faced with inflationary pressures, the monetary authority will follow its rule and increase the real interest rate.
3. Wage rate (w): the real wage rate will be pro-cyclical and, as firms become less productive due to a negative productivity shock, they will see the need to decrease wages.
4. Dividends (d): similar to the wage rate, dividends will also decrease, following the expression provided in the model setup section of the paper.
5. Hours worked: following an increase in the interest rate, there will be an intertemporal substitution effect which will provide an incentive for agents to work more in the current period. Additionally, the fall in the wage rate will create an income effect which will make agents wish to work more, as well as an intra-temporal substitution effect by making leisure a relatively cheaper good and thus making agents want to work less. Combining all the effects we observe that the overall effect in the economy is that total hours worked will increase momentarily.
6. Lump-sum taxes: When looking at the government's budget constraint, and knowing that there must be a balanced budget in this scenario, the natural conclusion is for Lump-sum taxes to increase due to an increase in the real interest (it now becomes more costly to honor the debt level).
7. Consumption: similarly to total hours worked, consumption will suffer changes originating from income and substitution effects. An increase in the real interest rate will make the opportunity cost of consuming today greater, and thus, this intertemporal substitution effect will push consumption down. Consumption will also fall due to the decrease in wages, dividends and an increase in lump-sum taxes, giving origin to three negative income effects.
8. Utility: As observed in the impulse response functions, we notice how utility falls and takes a while to recover. This is naturally explained since consumption has fallen and the total hours worked has increased.

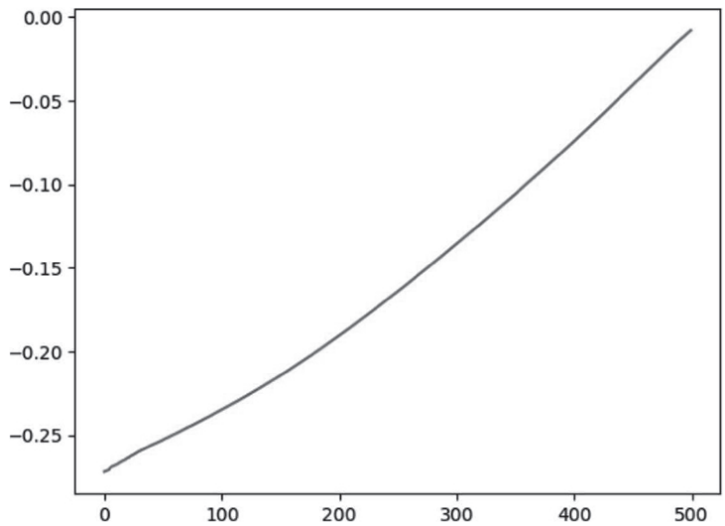
Measuring Welfare

In order to understand the impact of such shock on welfare, we must first compute the welfare state. For the purpose of this paper, the economy's welfare will be measured through a utilitarian approach by summing all the agent's lifetime welfare. Each agent's lifetime welfare is obtained through the net present value of the agent's utility throughout the horizon being studied, discounted by their respective discount factors, as follows:

$$w = \Sigma(\beta^{t-1} u_t)$$

Lastly, we apply the module of this value and calculate the percentage change from the steady-state as if nothing happened, in order to obtain a more conventional analysis regarding how much welfare changed in the economy when hit with the shock. What follows is the change in welfare across the wealth distribution in the economy, ranging from *0 assets* to *500 assets*. Figure 1 shows what is highly portrayed in much of the literature regarding asymmetrical inflation effects. As observed, the poorest in the economy are the ones who have suffered the biggest losses in their welfare. The graphs tell us that, although everyone in the economy has become worst off with such event, the poorest agents have suffered the biggest losses in welfare, registering decreases up to 0,25% when compared to a scenario if there was not *Negative Unanticipated TFP Shock*. A possible explanation is that the poorest agents usually react more to income effects and not so much to substitution effects when compared to the wealthiest, and, as such will suffer bigger decreases on consumption while being required to work more, as stated previously. In fact, that is precisely what is observed when considering Figure 7 and Figure 8 of the Appendix.

Figure 1: % Change in welfare across the wealth distribution



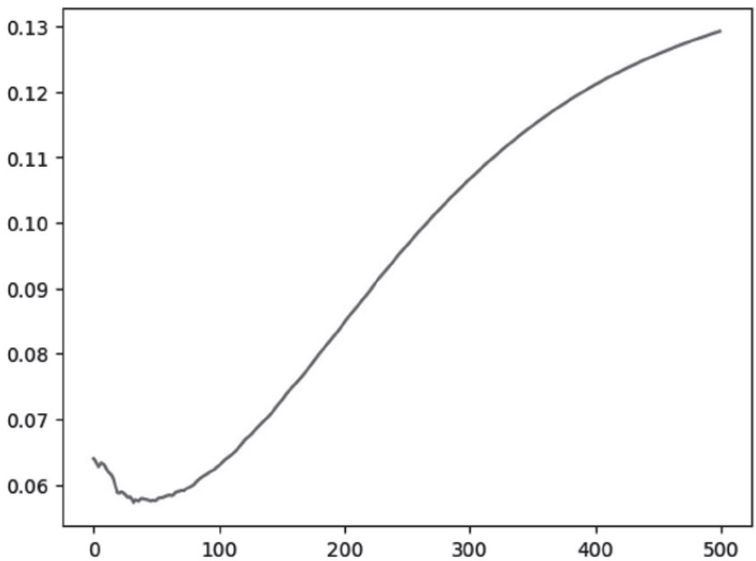
6.2. Vat reduction scenario

In this exercise, when faced with the same previous *Negative Unanticipated TFP Shock*, the government will perform a deficit-financed fiscal expansion policy where it will reduce the current consumption tax in the economy and slowly increase it throughout time in order to be able to repay the newly created debt, in order to clear the government's budget constraint, lump-sum transfers/taxes will be used for all agents in the economy. Looking at Figure 9 and Figure 10 we take the following conclusions:

1. Consumption Tax (τc): As part of the fiscal policy, the government will intervene and reduce the consumption tax, while slowly increase it back to its steady-state level as time goes by.
2. Bonds (B): Being a deficit-financed policy, the government bonds level will increase momentarily, following a defined path of repayment using a combination of both the consumption tax path and lump-sum taxes.
3. Consumption: Facing a lower consumption tax, households will be able to consume more in the economy, effectively feeling a positive income effect. This expansion in consumption will only be temporary but it will serve to expand the aggregate demand of the economy.
4. Output (Y): Though there is still present a Negative Unanticipated TFP Shock, the increase in consumption, and thus aggregate demand, more than compensates for the decrease in productivity, and so, we observe a New Keynesian channel which makes output increase momentarily via an expansion in the demand side of the economy.
5. Inflation: The inflation rate will observe a big decrease in the first period due to the decrease in the consumption tax. This decrease is explained by the pass-through rate which in the model has a value of 100%. As τ_c shifts back to its original value, and the aggregate demand pulls the economy's output upwards, so too will the inflation levels jump. In fact, the increase in the inflation level is such that, up until it converges to the steady-state level (0%), it will always be above the inflation levels if there was no government intervention.
6. Lump-sum Taxes: Taking a look at the lump-sum taxes in the economy, one can observe that these are negative in the first periods, thus becoming effectively lump-sum transfers to households and providing an additional income effect to consumption. Not long after, this variable becomes positive and thus the government starts to repay its debt through lump-sum taxation.
7. Real interest rate (r): faced with inflationary pressures, the monetary authority will follow its rule and increase the real interest rate, given that the inflation tendencies were greater than in the benchmark scenario with no government action, so too will the increase in the real interest rate be greater.
8. Utility: Finally, although there was a *Negative Unanticipated TFP Shock*, government intervention did in fact provide a way to improve the economy's utility, this is driven by the increase in consumption.

We now proceed to analyze the welfare percentage changes in this scenario, as opposed to if nothing in the economy were to happen. As seen in Figure 2, everyone's welfare across the wealth distribution improves with such measure, however, the richest in the economy clearly benefit more. Such measure may create inequalities since VAT by itself is already progressive, and so, by temporarily decreasing it, one could argue it is actually a regressive action. Having in mind that the welfare is measured through the net present value of all utility, and this in turn is dependent on consumption and hours worked, one must look into these variables in order to understand what is going on. Figure 11 and Figure 12 go according to what has been said. There seems to be an inequality generated with such measure where, although everyone is benefiting from such fiscal policy, the poorest have the lowest consumption increase (around 0.35%) whereas the richest consume 0.65% more. The agents at the left side of the wealth distribution are also the ones who seem to be working more hours, having an increase of around 0.70%, this is especially significant when taking into consideration that the richest agents have only increased hours worked by around 0.30%. One mechanism that explains such phenomena is that, due to a great increase in the real interest rate, the agents who hold higher quantities of wealth will feel a big income effect and thus not feeling the need to work as much when compared with the agents that hold little or no amount of assets.

Figure 2: % Change in welfare across the wealth distribution – VAT decrease scenario



All in all, such measure seems to be a success in dealing with overall welfare measured through a utilitarian way. Though it may lead to inequalities, the economy's overall welfare improved by 0.334% if the government did not intervene with such action.

6.3. Robin Hood scenario

This last exercise refers to an alternative scenario where there is still the same *Negative Unanticipated TFP Shock*, but now the government decides to do a deficit-financed fiscal expansion policy increasing targeted transfers which will go to the poorest 50% agents in the wealth distribution. This scenario will have the same debt repayment path as the one in the previous scenario, in order to make the two cases comparable in size. To pay for the debt, the government will increase taxes but only to the richest 50% in the wealth distribution – effectively taking from the richest to give to the poor. To take conclusions regarding this scenario, we will look into Figure 13 and Figure 14 of the Appendix.

1. Targeted Transfers to the poorest (tt): As part of the fiscal policy, the government will intervene and increase targeted transfers to the poorest 50% in the wealth distribution. This policy will dissipate as time goes by, eventually returning to their steady-state levels, zero.
2. Bonds (B): To be comparable with the VAT scenario, the government bonds impulse response function, and therefore its payment path, must be the same.
3. Targeted Taxes to the richest ($ttax$): This variable will be the one which will clear the government budget constraint, and so, it will be whatever it needs to be to account for the increase in spending. As seen in its IRF, this tax is actually negative in the first periods, so, the richest are effectively getting more money, however, this is soon undone and there is a huge spike in order to start repaying the newly created debt.
4. Consumption: Consumption will see a great increase in the early stages due to an increase in transfers to both the poorest and richest, thus creating an income effect for all households in the economy, eventually boosting consumption and aggregate demand.
5. Output (Y): Similarly to the VAT decrease scenario, though there is still present a Negative Unanticipated TFP Shock, the increase in consumption, and thus aggregate demand, more than compensates for the decrease in productivity.
6. Inflation: The original Negative Unanticipated TFP Shock was done in order to produce a inflation rate of 1% in the first period, but now, since we have an increase in aggregate demand through an expansionary fiscal policy (and, contrary to the VAT decrease scenario, no pass-through rate), inflation will actually be higher than 1% in the first period, but fastly converging back to 0. Interestingly, we see that inflation will not be as high in the following periods when compared to the VAT decrease scenario, this goes according to the conclusions on the empirical exercise regarding the magnitude of fiscal instruments on inflation, where we saw that fiscal policy through indirect taxes have a greater impact on inflation.
7. Real interest rate (r): The behavior of this variable is similar to the VAT decrease scenario. However, the increase in the real interest rate is greater due to the higher inflation rate levels in the first periods.
8. Utility: Finally, although there was a Negative Unanticipated TFP Shock, government intervention did in fact provide a way to improve the economy's utility, this is driven by the increase in consumption.

As in the previous scenarios, Figure 3 depicts the change in welfare across the wealth distribution. Contrary to the previous scenarios though, if the government decides to tax the richest 50% to give to the poorest 50%, the ones who will observe greater increases in welfare are the poorest in the economy. However, within the middle of the asset distribution, the middle class will actually suffer welfare losses. Looking at Figure 15 and Figure 16 we can see that the ones who will decrease consumption and suffer the highest increases in hours worked are in the middle of the asset distribution. A possible explanation is that, around the values where we observe this behavior, we are already in the top 50% richest agents of the economy, so they will suffer the greatest burden with such policy, and, at the same time, will not own enough assets for the income effect coming from an increase in the interest rate to compensate. Although the change in overall welfare of this policy is not as big as with the VAT decrease scenario (in this case, the economy's overall welfare only increased by 0.28% as opposed to 0.33% in the previous scenario), Figure 4 demonstrates that this policy provides greater welfare changes up until the poorest 33% agents in the economy, fully including the Hand-to-Mouth agents too. Knowing this, one could argue which measure of welfare should be used for the whole economy. In this paper, a utilitarian approach was used, however, this transfers policy could have brought greater welfare changes to the overall economy if one used a Rawlsian approach, for example.

Figure 3: % Change in welfare across the wealth distribution – Robin Hood scenario

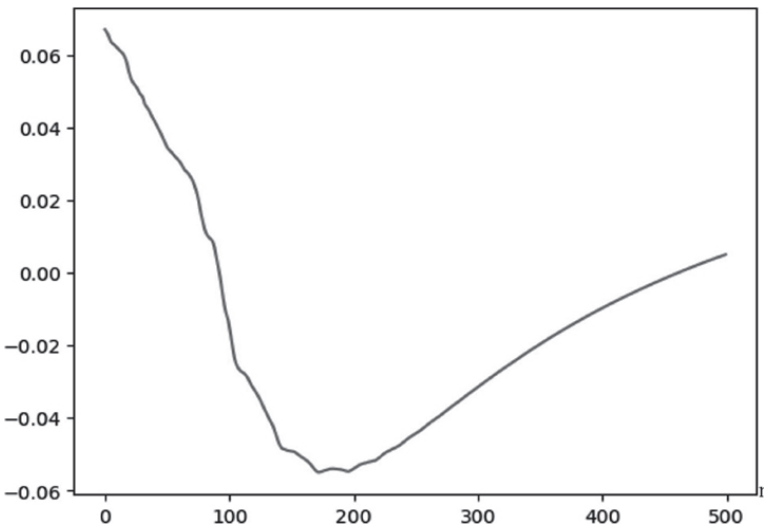
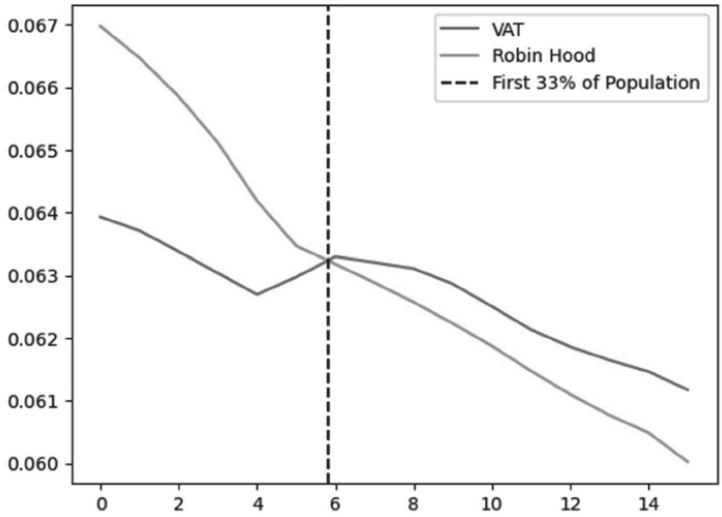


Figure 4: % Change in welfare across the wealth distribution – Scenario Comparison



7. Conclusion

This paper aimed at extending the literature of the effects originated from the recently adopted temporary VAT rate changes across multiple countries, while comparing it with the much debated counterpart policy – an increase in transfers to the most vulnerable. To do so, an empirical exercise was conducted to understand which fiscal policy would generate greater impacts on inflation. Later, a one-asset HANK model was constructed in order to evaluate the welfare impacts on the economy coming from such fiscal actions, while also confirming the conclusions previously taken in the empirical exercise.

This study finds that unanticipated fiscal expansions due to decreases in revenues from indirect taxes on goods and services lead to lower inflation levels, which goes according to current literature regarding the pass-through rate to consumer final prices when there is a change in the VAT rate. Additionally, we find that an anticipated fiscal expansion through an increase in government transfers also increases inflation, but to a lesser degree than when there is a change in revenues coming from indirect taxes on goods and services.

As for the welfare impacts, we find that a *Negative Unanticipated TFP Shock* will negatively impact everyone in the society, and that the poorest are the ones who will suffer the most, thus generating inequality. We show that both a fiscal expansion through a consumption tax decrease or an increase in targeted transfers lead to a higher welfare level if the government did not intervene. Additionally, the results conclude that a fiscal expansion through a VAT decrease will lead to a higher welfare of the economy, measured in a utilitarian way, and will lead to greater inequalities, whereas, although an increase in transfers to the poorest, paid

by the richest, will lead to lower levels of welfare, it will decrease inequality, since the bottom 33% in the wealth distribution will be the ones benefiting the most.

To conclude, though both fiscal policies lead to a welfare improvement, a VAT decrease will generate greater levels of inequality since the richest will benefit the most from such policy. In a richer model, where firms' profits are distributed to asset holders and markups are not constant, a VAT decrease will, in general, not generate a pass-through of 100% (unlike our model), meaning that welfare gains would be more unequally distributed and concentrated on the rich, thus decreasing the welfare gains we document here. It is ultimately up to the society to decide how welfare should be measured and how much should we consider inequality across the wealth distribution. One must also take into account that the inflationary tendencies might have been greater than modeled and that it can be a challenge to compare the two type of policies empirically, since they may not be comparable in size regarding deficit levels.

References

De Amores Hernandez, A.; Barrios, S.; Speitmann, R.; Stoehlker, D. (2023) Price Effects of Temporary VAT Rate Cuts: Evidence from Spanish Supermarkets, European Commission, 2023, JRC132542.

Alesina, A.; Summers, L. H. (1993) Central bank independence and macroeconomic performance: Some comparative evidence. *Journal of Money, Credit and Banking* 25(2), 151-162.

Alesina, A.; Barbiero, O.; Favero C.; Giavazzi, F.; Paradisi, M. (2017) *The effects of fiscal consolidations: Theory and evidence.* Technical report, National Bureau of Economic Research.

Almgren, M.; Gallegos, J.-E.; Kramer, J.; Lima, R. (2022) Monetary policy and liquidity constraints: Evidence from the Euro area. *American Economic Journal: Macroeconomics* 14(4), 309-40.

Alonso-Ortiz, J.; Rogerson, R. (2010) Taxes, transfers and employment in an incomplete markets model. *Journal of Monetary Economics* 57(8), 949-958.

Auclert, A.; Bardóczy, B.; Rognlie, M. ; Straub, L. (2021) Using the sequence-space Jacobian to solve and estimate heterogeneous-agent models. *Econometrica* 89(5), 2375-2408.

Auclert, A. ; Straub, L. ; Rognlie, M. (2018) *The Intertemporal Keynesian Cross* (2018 Meeting Papers 999). Society for Economic Dynamics.

Benzarti, Y.; Carloni, D.; Harju, J.; Kosonen, T. (2017) *What goes up may not come down: Asymmetric incidence of value-added taxes* (Working Paper 23849). National Bureau of Economic Research.

Bernardino, T. (2020) Asset liquidity and fiscal consolidation programs. *Notas Económicas* 51, 69-89.

Bilbiie, F. O.; Meier, A.; Müller, G. J. (2008) What accounts for the changes in US fiscal policy transmission? *Journal of Money, Credit and Banking* 40(7), 1439-1470.

Blanchard, O. J.; Leigh, D. (2013) Growth forecast errors and fiscal multipliers. *American Economic Review* 103(3), 117-20.

Brinca, P. (2020) Modern macroeconomics and heterogeneity. *Notas Económicas* 51, 7-20.

Brinca, P.; Freitas, B.; Mano, M. (2020) *Labor share heterogeneity and fiscal consolidation programs*. CeBER Working Papers, 1-28.

Brinca, P.; Holter, H. A.; Krusell, P.; Malafry, L. (2016) Fiscal multipliers in the 21st century. *Journal of Monetary Economics* 77, 53-69.

Brinca, P.; Oliveira, J.; Duarte; J. (2019) Investment-specific technological change, taxation and inequality in the US. *University Library of Munich, Germany*.

Brinca, P.; Faria-e Castro, M.; Ferreira, M. H.; Holter, H. (2019) The nonlinear effects of fiscal policy. In *Proceedings. Annual Conference on Taxation and Minutes of the Annual Meeting of the National Tax Association*, Volume 112, pp. 1-70.

Brinca, P.; Ferreira, M. H.; Franco, F.; Holter, H. A.; Malafry L. (2021) Fiscal consolidation programs and income inequality. *International Economic Review* 62(1), 405-460.

Broer, T.; Krusell, P.; Öberg, E. (2021) *Fiscal multipliers: A heterogenous-agent perspective*. Technical report. National Bureau of Economic Research.

Carroll, C.; Slacalek, J.; Tokuoka, K.; White, M. N. (2017) The distribution of wealth and the marginal propensity to consume. *Quantitative Economics*, 8(3), 977-1020.

Crossley, T. F.; Low, H.; Wakefield, M. (2009) The Economics of a Temporary VAT Cut. *Fiscal Studies*, 30(1), 3-16.

Ferreira, A. M. A. (2020) Skill-biased technological change and inequality in the US. *Notas Económicas* 51, 167-185.

Flodén, M. (2001) The effectiveness of government debt and transfers as insurance. *Journal of Monetary Economics 48*(1), 81-108.

Floden, M.; Lindé, J. (2001) Idiosyncratic risk in the united states and sweden: Is there a role for government insurance? *Review of Economic Dynamics* 4(2), 406-437.

Fuest, C.; Neumeier, F.; Stöhlker, D. (2021) *The pass-through of temporary vat rate cuts: Evidence from German supermarket retail*. CESifo Working Paper 9149, Munich.

Harju, J.; Kosonen, T. (2014) The inefficiency of reduced vat rates: Evidence from restaurant industry.

Ilzetzki, E.; Mendoza, E. G.; Végh, C. A. (2013) How big (small?) are fiscal multipliers? *Journal of monetary economics 60*(2), 239-254.

Jaravel, X. (2021) Inflation inequality: Measurement, causes, and policy implications. *Annual Review of Economics* 13(1), 599-629.

Kaplan, G.; G. L. Violante (2018) Microeconomic heterogeneity and macroeconomic shocks. *Journal of Economic Perspectives* 32(3), 167-94.

Kaplan, G.; Moll, B.; Violante, G. L. (2018) Monetary policy according to hank. *American Economic Review 108*(3), 697-743.

Malafry, L.; Brinca, P. (2022) Climate policy in an unequal world: Assessing the cost of risk on vulnerable households. *Ecological Economics* 194, 107-309.

Nóbrega, V. M. S. (2020) Optimal taxation and investment-specific technological change. *Notas Económicas* 51, 69-89.

Oh, H.; R. Reis (2012) Targeted transfers and the fiscal response to the great recession. *Journal of Monetary Economics* 59, S50-S64.

Ramey, V. A. (2019) Ten years after the financial crisis: What have we learned from the renaissance in fiscal research? *Journal of Economic Perspectives* 33(2), 89-114.

Sargent, T. J.; Wallace, N. (1981) Some unpleasant monetarist arithmetic. *Quarterly Review* 5(3).

Sierminska, E.; Medgyesi, M. (2013) The distribution of wealth between households. *Research note (European Commission, Brussels 2013)*.

Trabandt, M.; Uhlig, H. (2011) The Laffer curve revisited. *Journal of Monetary Economics* 58(4), 305-327.

Appendix

Table 5: Calibration of one-asset HANK economy, Portugal

Parameter	Description	Value	Source
Households σ	Inverse IES	1.2	Trabandt and Uhlig (2011)
η	Inverse Frisch	1	Consistent w. literature
ρ	Autocorrelation of earnings	0.761	PSID 1968-1997
Firms μ	Steady-state markup	1.1	Consistent w. literature
κ	Slope of Phillips Curve	0.1	Consistent w. literature
Fiscal and Monetary Authorities			
B/Y	Average net public debt	0.557	IMF 2001-2008
G	Average government expenditure	0.2712	IMF 2001-2008
τ_c	Consumption Tax	0.06	Portuguese lowest VAT rate
τ_l	Average Labor Tax	0.281	OECD
ϕ_π	Taylor-Rule coefficient on inflation	1.25	Consistent w. literature

Figure 5: IRF for Output, Consumption, Lump-sum Taxes and Dividends when hit with a Negative Unanticipated TFP Shock – Benchmark scenario

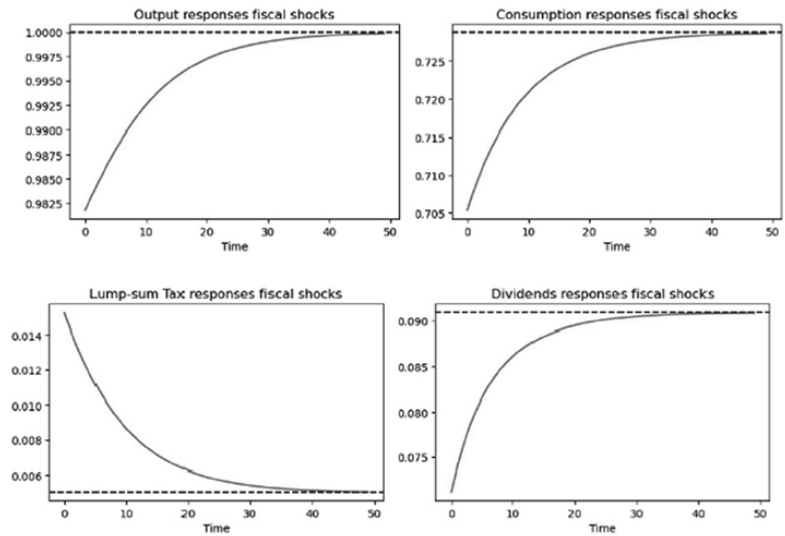


Figure 6: IRF for *r*, Inflation, *i*, Utility, Wage rate and Hours Worked when hit with a Negative Unanticipated TFP Shock – Benchmark scenario

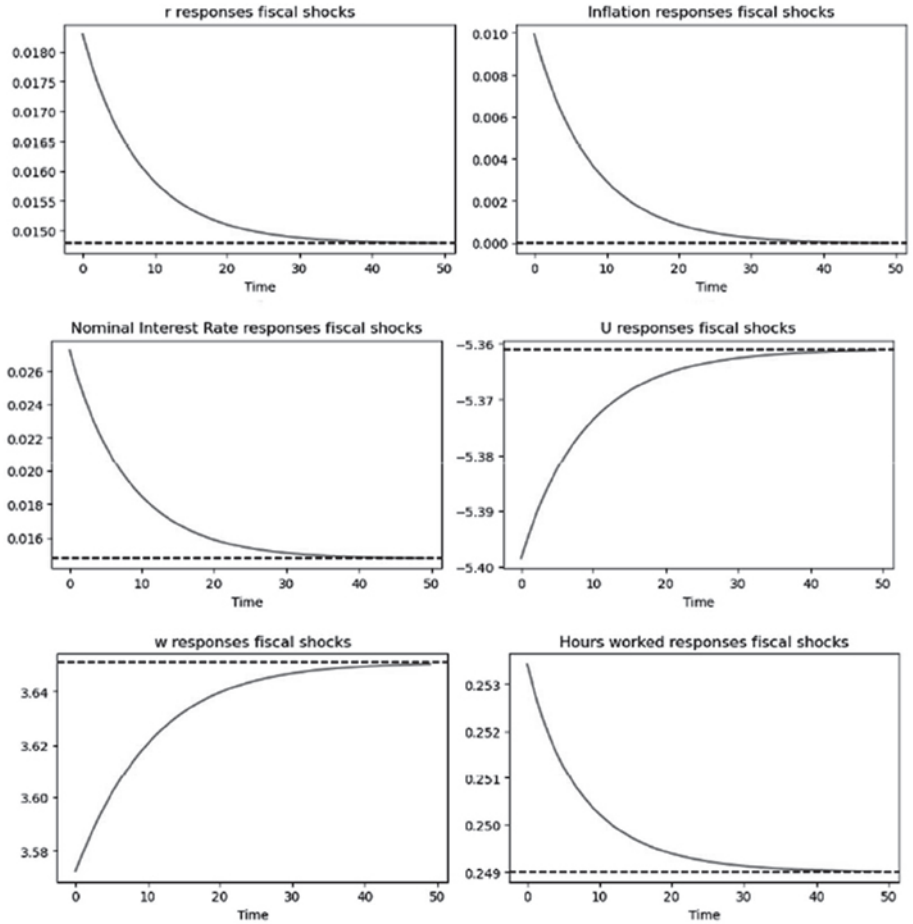


Figure 7: % change in consumption from steady-state when hit with a Negative Unanticipated TFP Shock, across wealth distribution – Benchmark scenario

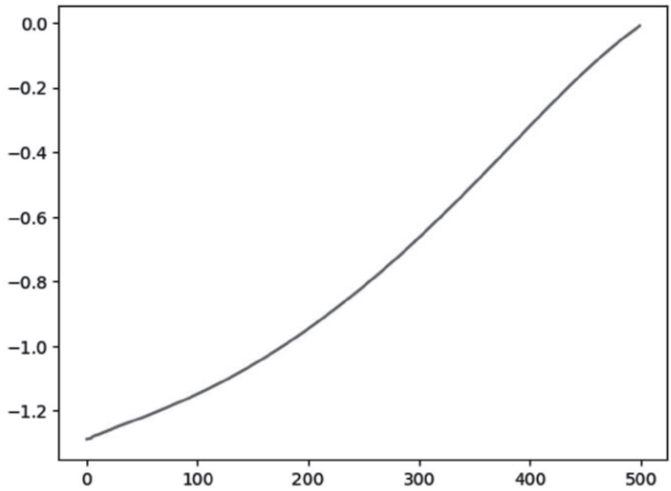


Figure 8: % change in hours worked from steady-state when hit with a Negative Unanticipated TFP Shock, across wealth distribution – Benchmark scenario

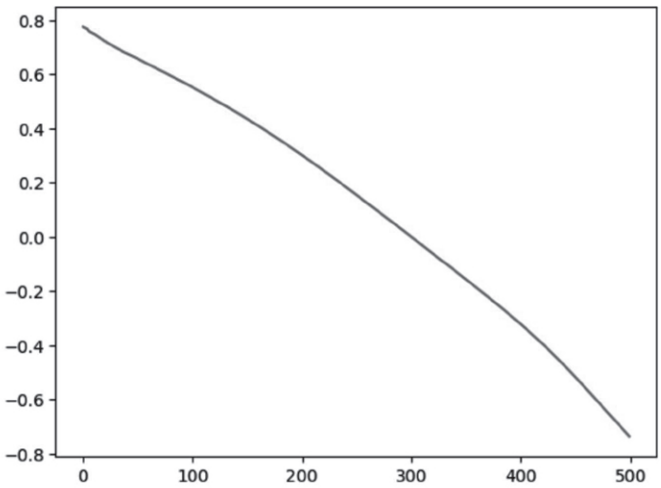


Figure 9: IRF for Output, Consumption, Consumption Tax and Bonds when hit with a Negative Unanticipated TFP Shock and a reduction of the consumption tax – VAT decrease scenario

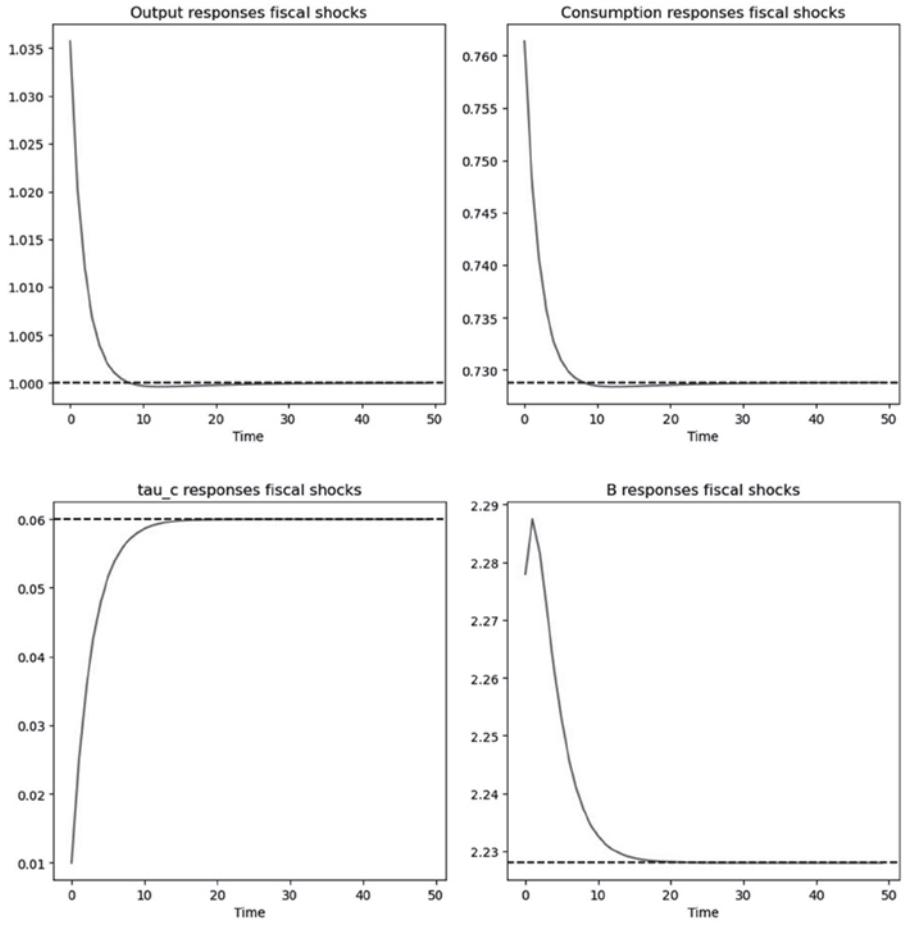


Figure 10: IRF for *r*, Lump-Sum Tax/Transfer, Inflation and Utility when hit with a Negative Unanticipated TFP Shock and a reduction of the consumption tax – VAT decrease scenario

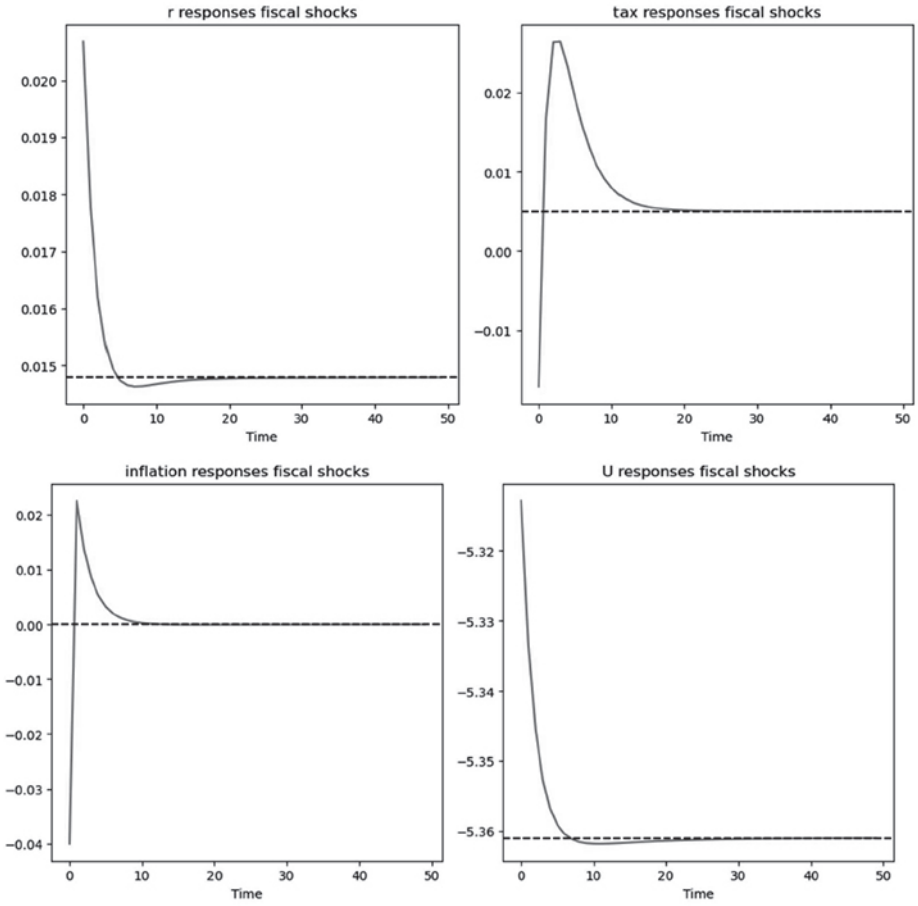


Figure 11: % change in consumption from steady-state when hit with a Negative Unanticipated TFP Shock, across wealth distribution – VAT decrease scenario

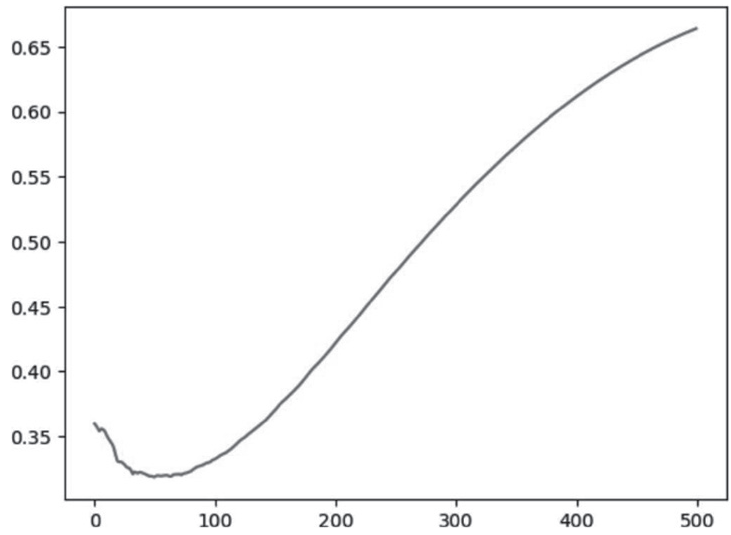


Figure 12: % change in hours worked from steady-state when hit with a Negative Unanticipated TFP Shock, across wealth distribution – VAT decrease scenario

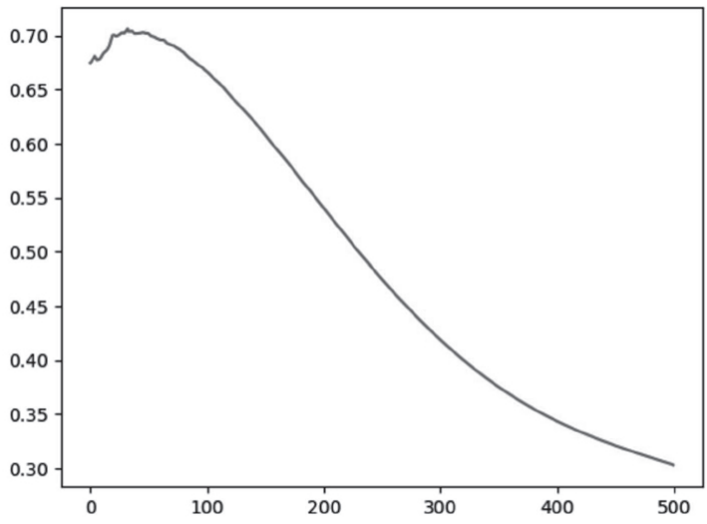


Figure 13: IRF for Output, Consumption, Taxes to the Richest and Bonds when hit with a Negative Unanticipated TFP Shock and an increase in targeted transfers to the poor – Robin Hood scenario

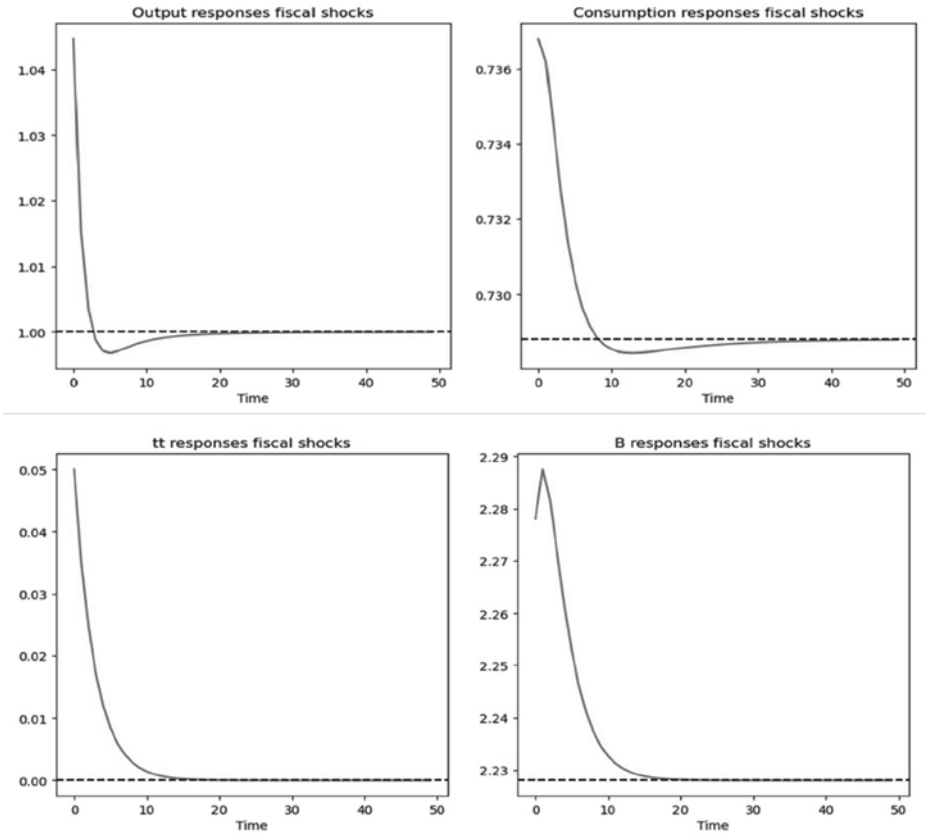


Figure 14: IRF for *r*, Transfers to the Poorest, Inflation and Utility when hit with a Negative Unanticipated TFP Shock and an increase in targeted transfers to the poor – Robin Hood scenario

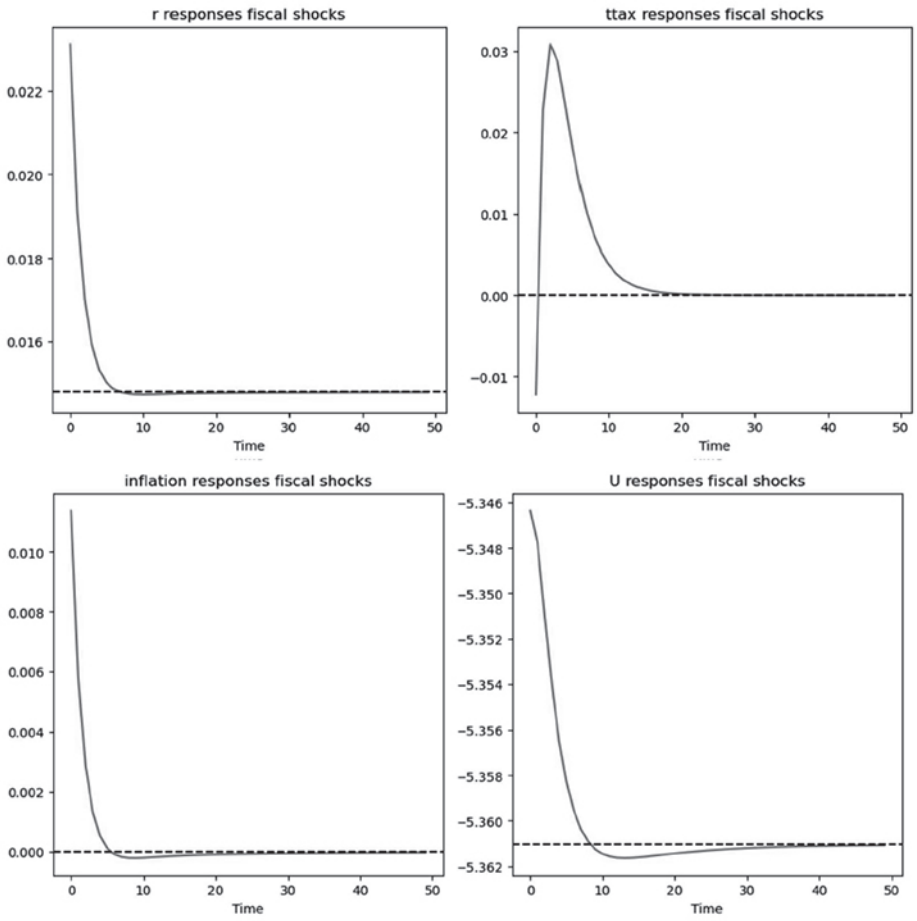


Figure 15: % change in consumption from steady-state when hit with a Negative Unanticipated TFP Shock, across wealth distribution – Robin Hood scenario

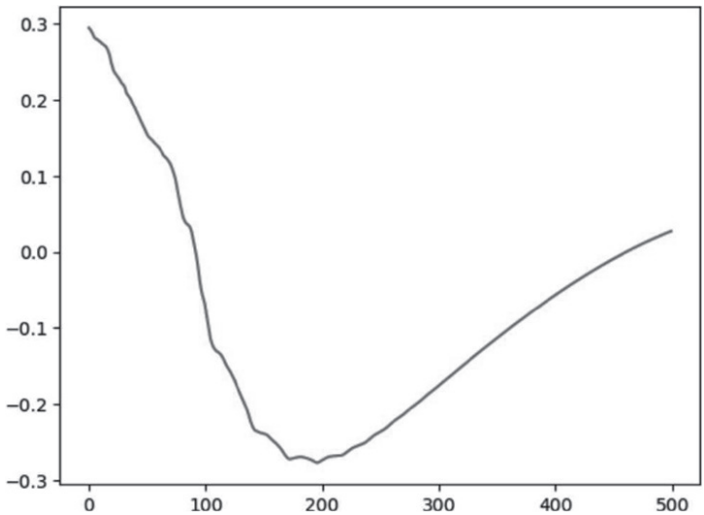
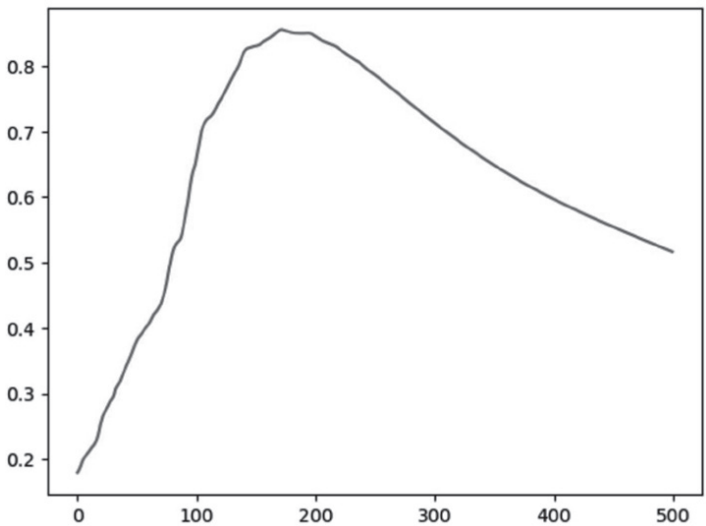


Figure 16: % change in hours worked from steady-state when hit with a Negative Unanticipated TFP Shock, across wealth distribution – Robin Hood scenario



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Exploring the Individual, Socioeconomic and Contextual Determinants Associated with Daily Tobacco Consumption in Portugal

Análise das Determinantes Individuais, Socioeconómicas e Contextuais do Consumo Diário de Tabaco em Portugal

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ABSTRACT
The National Program for Tobacco Prevention and Control reflects awareness of tobacco as a major public health problem in Portugal. To infer which population groups should be targeted, we estimate sex-specific logistic regressions to analyze the determinants of daily tobacco consumption, using the most recent microeconomic data from the Portuguese Health Interview Survey. To assess the existence of inequalities, we calculate concentration indices, ranking individuals by income and education. Nine percent of women and twenty percent of men smoke on a daily basis, with drinking, depression and living in Azores significantly increasing the risk. Secondary (upper) education increases the odds of daily smoking for women and decreases the odds for men. Unemployment increases the odds for men only and depression puts women at significantly higher risk. The results highlight the importance of not only adopting cross-cutting policies to reduce tobacco consumption, but also targeting the most vulnerable to mitigate existing income- and schooling-related health inequity.
Keywords: Daily tobacco consumption, determinants, health inequalities, Portuguese Health Interview Survey, odds ratio, concentration index

JEL Classification: C21; I12; I14.

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1. Introduction

1.1. Context

As tobacco smoking is considered to be a global epidemic by the World Health Organization (WHO) (WHO, 2008, 2021), many countries have implemented policies and legislation aimed at reducing smoking prevalence and thereby improving public health.

The United Nation's Sustainable Development Goal 3 concerns ensuring healthy lives and promoting well-being for all (UN, 2015), and involves the implementation of the WHO Framework Convention on Tobacco Control (FCTC) (WHO, 2003). Following the FCTC, several policies and legislation to reduce tobacco consumption or mitigate its effects on public health (Chung-Hall et al., 2019) resulted in a generalized decrease in the prevalence of smoking in developed countries (Reitsma et al., 2021). Nonetheless, cigarette smoking remains the single most preventable cause of death worldwide, being associated with more than 8 million deaths yearly (Dattani et al., 2023; WHO, 2021).

In the European Union (EU), tobacco is a significant risk factor for the two most common causes of avoidable death: ischemic heart disease and lung cancer (Eurostat, 2023). Tobacco consumption is the main cause of avoidable cancer in Europe, with 27% of all cancers attributable to tobacco use. The EU's health program "Europe's Beating Cancer Plan" (European Commission, 2021) aims at "Achieving a Tobacco-Free Europe" by 2040, meaning a prevalence of consumption of less than 5% by that year and the reduction of 30% from 2010 to 2025.

In Portugal, tobacco smoking remains one of the most pressing public health issues and is a major driver of cancer-related mortality (OECD, 2023). In 2019, 6.17% (1.97%) of men's (women's) deaths were due to tracheal, bronchus and lung cancer, with a risk factor attribution to tobacco of 72.36% (35.81%) (IHME – Institute for Health Metrics and Evaluation, 2020).

Under the National Health Plan 2012-2016, reducing smoking was considered to be a public health priority, which led to the creation, in 2012, of the National Programme for Tobacco Prevention and Control (NPTPC), whose goals were to reduce smoking prevalence, lessen smoking initiation between ages 13 and 18, and increase taxes on tobacco products, among others (OECD, 2023). The NPTPC2020, currently in force, further includes health equity as a priority (Directorate-General of Health of Portugal, 2021) and emphasizes the importance of tobacco control particularly among young women and girls.

The negative health outcomes associated with tobacco use can be estimated in terms of their costs for public healthcare, as well as for the economy in terms of productivity loss (Reitsma et al., 2021; Rezaei et al., 2016), with the global economic burden of tobacco use estimated to be over 1 trillion US dollars annually (Goodchild et al., 2018).

The aim of this work is twofold. First, to examine which factors are the most significant determinants of daily tobacco consumption, providing crucial insights for the elaboration and implementation of effective tobacco control policies. Second, to determine to what extent tobacco use may be unequally distributed across income and education levels, a crucial aspect for addressing and mitigating inequality in the pursuit of health equity.

1.2. Determinants of Tobacco Consumption

Different variables have been found to be associated with an increased likelihood of tobacco consumption, ranging from demographic and individual health behavior to socioeconomic factors including social context.

1.2.1. *Individual Characteristics*

Gender has been found to be a major determining factor of propensity for tobacco use. Although women tend to have a lower prevalence of tobacco use than men, in some countries, including Portugal, there has been an upwards trend on consumption among this group (Carreira et al., 2012; Leite et al., 2019; Reitsma et al., 2021).

Age has also been previously confirmed as an important predictor of tobacco consumption (Ciapponi et al., 2014; Viscusi, 1991), with older adults tending to have a lower prevalence of smoking than younger's (Appel & Aldrich, 2003). In Portugal, for both men and women, the prevalence of current daily smoking was found to initially increase with age, peaking at the age range of 35-44, and then gradually decreasing in the older groups (Machado et al., 2009).

Tobacco smoking is known to cluster with other health risk behaviors, such as physical inactivity, poor nutrition, and particularly alcohol use, meaning that their combination is observed more frequently than predicted if they were independent (Meader et al., 2016).

There is generally a strong negative association between daily smoking and obesity (Mackay et al., 2013; Quintal, 2021; Twardella et al., 2006).

Depression has often been associated with tobacco smoking, with smoking rates increasing with the severity of the disease, although the direction of the causality between depression and tobacco use is still up for debate (Fluharty et al., 2017).

Although tobacco consumption may be associated with lower self-assessed health (Jurewicz & Kaleta, 2020), some studies have identified that individuals who reported better self-assessed health status had higher odds of current tobacco smoking (Semyonov et al., 2012).

1.2.2. *Socioeconomic Characteristics*

One major socioeconomic factor which can affect an individual's propensity for tobacco use is income level (Casetta et al., 2017; Ciapponi et al., 2014). Although higher income has been linked to higher tobacco consumption, lower income has generally been associated with a higher likelihood of tobacco use across all age-sex groups in Portugal (Leite et al., 2019; Machado et al., 2009).

Regarding educational attainment, the sign of the effect is not consensual (Huisman et al., 2005; Nketiah-Amponsah et al., 2018). For most studies, a higher educational level has been associated with a lower prevalence of smoking (OECD, 2019). In this vein, Schaap et al. (2008) found that groups with a higher educational level were more likely to quit smoking than those with lower education, in all age-sex groups. Nevertheless, there is also some

evidence of a direct relationship between higher education and tobacco consumption levels in Europe, namely for women in Southern Europe (Alves et al., 2015; Bosdriesz et al., 2016; Leite et al., 2019; Loring, 2014; Machado et al., 2009; OECD, 2019).

Employment status can also be associated with tobacco consumption (Haustein, 2006). While unemployment can naturally have negative implications for disposable income and income stability, it is also a significant risk factor for various types of substance abuse including tobacco (Henkel, 2011). The significance of unemployment as a predictor of tobacco use has been demonstrated for Portugal (Leite et al., 2019; Machado et al., 2009; Santos & Barros, 2004).

Family relationship status may also play a role, with divorcees being at higher risk of increased tobacco consumption (Alves et al., 2015; Machado et al., 2009; Santos & Barros, 2004). Last but not the least, higher social capital, that captures interactions with other individuals, organizations and institutions, is associated with lower prevalence of smoking (Lindström, 2008).

1.2.3. *Contextual Characteristics*

The context in which an individual lives can also be a determinant of tobacco consumption. One example is given by location (Islami et al., 2015; Reitsma et al., 2021). In Portugal, the Azores region has been afflicted with the highest overall prevalence of smoking in 2005/2006 (Machado et al., 2009), as well as the highest prevalence of smoking for men in 2014 (Leite et al., 2019).

As to the degree of urbanization, some authors argue that the lower access to health information in rural areas may lead to higher levels of smoking, while others state that the greater exposure to advertising in urban areas may lead to higher smoking prevalence and lower likelihood to quit (e.g., Chen et al., 2019; Valiente et al., 2021).

2. **Data and Methodology**

The data used is sourced from the Portuguese Health Interview Survey (PHIS) 2019, a cross-sectional and nationally representative survey which contains information on the individual, socioeconomic, and contextual characteristics of 22,191 representative households (Data Access Request PED- 604037775). Only one individual was selected from each household, with a total of 14,617 valid responses. The target population was the set of all individuals 15 years and older that lived in the Portuguese territory. Data collection took place between September 2019 and January 2020. After dropping all observations with missing values for our variables of interest, our analysis comprises a total of 9,900 observations (5,325 female and 4,575 male respondents).

In line with previous evidence, the variables used in our research are age band, alcohol consumption, physical activity, obesity, depression, self-assessed health status (individual-level variables); income, education, employment and family relationship status, social capital

(socioeconomic variables); and region and urbanization (contextual variables). Full description of these variables is given in Appendix, Table A1.

We estimate logistic regression models separately for male and female, with robust standard errors and then we calculate the odds ratio (OR). In each case, the omitted category acts as a reference for the interpretation of the estimated coefficients, such that the estimated OR either represent an increase or a decrease in the likelihood of tobacco use in comparison to that category.

The logistic model that was estimated is specified as follows:

$$\ln\left(\frac{p(Daily\ tobacco\ consumption)}{1-p(Daily\ tobacco\ consumption)}\right)=\beta_0+\sum_{i=1}^{n}\beta_i X_i \tag{1}$$

where X_i are the explanatory variables listed in Table A1 and β_i are the corresponding logistic regression coefficients. We ran sex-specific regressions to ascertain whether and to what extent certain variables differently affected the odds of daily tobacco consumption across sexes.

Following the regression estimates, we compute concentration indices (CIs). These indices are used to assess inequalities in the probability of daily tobacco consumption, as they encapsulate the information about inequality contained in concentration curves as one concise, easily comparable estimate relying on socioeconomic features.

The standard CI can be defined as:

$$C(h\mid y)=\frac{2\,cov(h_i,R_i)}{\overline{h}}=\frac{1}{n}\sum_{i=1}^{n}\left[\frac{h_i}{\overline{h}}(2R_i-1)\right] \tag{2}$$

where h_i is the variable of interest in which inequality is measured and R_i is the ranking variable (O'Donnell et al., 2008). The value of CI ranges between –1 and +1.

We calculate CIs with robust standard errors, in which individuals are ranked by net income quintile per equivalized adult, and, alternatively, by the level of educational attainment (O'Donnell et al., 2016). A negative/positive CI indicates that tobacco consumption is disproportionately concentrated among lower income (lower-educated)/wealthier (more educated) individuals.

3. Results and Discussion

3.1. Characterization of Male and Female Populations

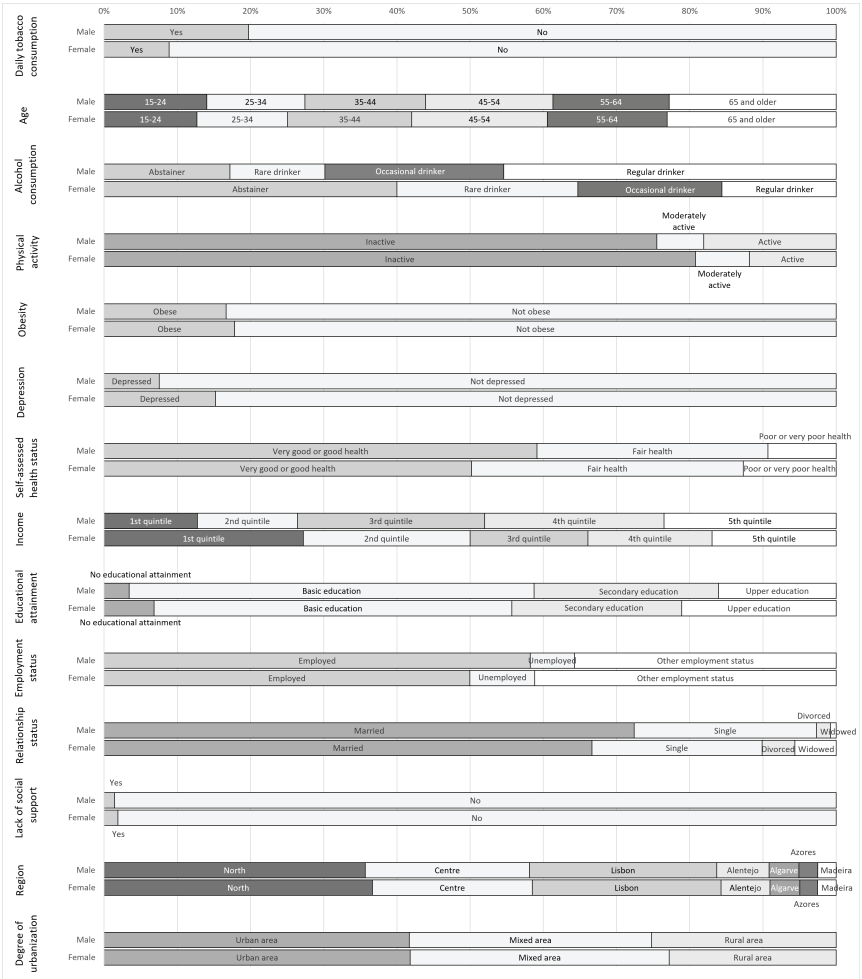
Figure 1 illustrates the share of each category of individual, socioeconomic and contextual variables, for both populations. 19.72% (8.89%) of men (women) are daily tobacco users. The most representative group for both sexes in terms of age is that of 65 years or older. When it comes to alcohol consumption habits, most of the men (women), 45.40%, (40.00%) were regular drinkers (abstainers).

Interestingly, only 7.53% of men reported struggling with depression, less than half of the percentage reported by women, of 15.22%.

Most of individuals, female and male, had attained basic education. Both the shares of men with no educational attainment (3.43%) and upper education (16.07%) were lower than women's (6.84% and 21.08%, respectively).

Most individuals were formally employed. The majority of respondents were married; only 2.70% of men were either divorced or widowed, against 10.13% of women. The lack of social support and data on contextual variables were similar across sex.

Figure 1: Characterization of male and female populations: individual, socioeconomic and contextual variables



3.2. Logistic Regressions

All OR estimates for the male and female populations can be found in the Appendix (Tables A2 and A3). Table 1 summarizes the sign of the effects of all variables on the likelihood of daily tobacco consumption, indicating also when there was no statistical significance.

Table 1: Summary of odds ratio estimates of sex-specific logistic regressions for daily tobacco consumption

Variable	Male	Female
Ages 15-24	(Omitted)	
Ages 25-34	NS	NS
Ages 35-44	NS	+
Ages 45-54	NS	+
Ages 55-64	NS	NS
Ages 65 and older	-	NS
Abstainer	(Omitted)	
Rare drinker	+	+
Occasional drinker	+	+
Regular drinker	+	+
Inactive	(Omitted)	
Moderately active	NS	-
Active	-	NS
Obesity	-	NS
Depression	+	+
Very good or good health	(Omitted)	
Fair health	NS	NS
Poor or very poor health	NS	NS
First income quintile	(Omitted)	
Second income quintile	NS	NS
Third income quintile	NS	NS
Fourth income quintile	NS	NS
Fifth income quintile	NS	NS
No educational attainment	(Omitted)	
Basic education	NS	NS
Secondary education	NS	+

Variable	Male	Female
Upper education	-	NS
Employed	(Omitted)	
Unemployed	+	NS
Other employment status	-	NS
Married	(Omitted)	
Single	NS	+
Divorced	NS	+
Widowed	NS	NS
Lack of social support	NS	NS
North	(Omitted)	
Centre	NS	NS
Lisbon	NS	NS
Alentejo	NS	+
Algarve	NS	+
Azores	+	+
Madeira	NS	NS
Urban area	(Omitted)	
Mixed area	NS	-
Rural area	NS	-

Notes: +/-: increases/decreases the odds of daily tobacco consumption (in comparison to omitted category); NS: not statistically significant at the 5% level.

Among the male (female) population, being 65 years old or more (between 35 and 54) decreased (increased) the chances of being a daily tobacco consumer.

Alcohol consumption habits were the single most significant factor for increasing the likelihood of tobacco consumption, for both sexes: regular drinking had the largest effect on the odds of tobacco consumption, with a more pronounced effect for women.

Being (moderately) active was associated with lower odds of daily tobacco consumption for men (women). Being obese, in turn, significantly decreased the odds of being a daily tobacco user for men but was not significant for women. It is likely that being obese increases health concerns, leading to a decrease in the likelihood of tobacco consumption (Twardella et al., 2006).

Suffering from depression increased the odds of daily tobacco consumption, having a more pronounced effect in women (OR: 2.38) than in men (OR: 1.64). Self-reported health status, on the other hand, did not affect the chances of daily tobacco consumption in any circumstance.

Apparently, income does not influence the odds of tobacco consumption. It is worth noting, nevertheless, that the effect of income might already be captured by variables such as employment status. Educational attainment, in turn, played a role in the likelihood of consuming tobacco. Men (women) who had attained upper (secondary) education had lower (higher) odds of daily tobacco use (OR: 0.33 vs OR: 3.94). Our results thus support the existing evidence about inequality in tobacco consumption (Alves et al., 2015; Leite et al., 2019; Machado et al., 2009).

Being unemployed increased the chances of daily tobacco consumption for men only, while other statuses decreased those chances. Being single or divorced increased the odds of daily tobacco consumption among women only, in comparison to being married.

Women in the Alentejo, Algarve and the Azores regions had higher chances of being daily tobacco consumers (for men, only in Azores). The lower the level of urbanization, the lower the odds of daily tobacco use among females.

3.3. Concentration Indices

Table 2 displays the CIs calculated for the prevalence of daily tobacco consumption across income and education, for both sexes.

Table 2: Concentration indices of daily tobacco consumption across income and educational attainment, male and female populations

CI	Male	Female
Individuals ranked by income quintile	-0.0741 (0.0049)	0.0277 (0.4332)
Individuals ranked by educational attainment	-0.0178 (0.4430)	0.1614 (0.0000)

Note: *p*-value between parentheses, estimated with robust standards errors.

Looking at income as an avenue for tobacco inequity, the negative and significant CI indicated that daily tobacco consumption was disproportionately concentrated among poorer men, although this effect is not very pronounced. Our finding may imply that inequalities have been aggravating since 2006, in comparison to Alves et al. (2015)'s CI of -0.04, although there is not an exact match between the age interval.

Also, education is not innocuous among women. The probability of daily tobacco consumption was concentrated among women with higher levels of educational attainment, supporting the evidence of a reverse gradient for women in Portugal (Alves et al., 2015; Huisman et al., 2005). Accordingly, the main driver of inequality for men appears to be income, while for women it is education.

4. **Concluding Remarks**

The World Health Organization considers tobacco smoking to be a global epidemic, as it is one of the leading causes of preventable mortality worldwide. The present research set out to identify and assess the impact of different individual, socioeconomic and contextual variables on the prevalence of daily tobacco consumption in Portugal, using the most recent data from the Portuguese Health Interview Survey 2019. Additionally, as health equity is one of the priorities established by the National Programme for Tobacco Prevention and Control 2020, we analyzed the presence and extent of health inequalities in tobacco use.

We find that 9% of women and 20% of men are daily consumers of tobacco. Furthermore, alcohol consumption habits, depression, and living in Azores increased the odds of daily tobacco consumption for both men and women, with regular drinking being the variable with the highest (second highest) OR for men (women). Age and education are the two variables for which the effects observed for men and women diverge the most: whereas the odds of tobacco consumption for men 65 years and older were the lowest, the odds for women aged between 35 and 54 were the highest. Likewise, upper (secondary) education significantly decreased (increased) the likelihood of daily tobacco use among men (women). While employment status was only significant in predicting tobacco consumption for men, relationship status and the degree of urbanization was only significant for women.

Alcohol consumption habits and depression increased the odds of daily tobacco consumption for both men and women. Actually, integrated intervention methods, targeted at both at-risk drinking and tobacco dependence, have been shown to provide better results for tobacco cessation than standard treatment, focused solely on tobacco cessation (Alves et al., 2023).

Targeted approaches to addressing health inequality in regular tobacco consumption are desirable, focusing on the most vulnerable, that have the highest likelihood of tobacco consumption and are therefore more exposed to the negative health consequences.

Additionally, interventions aiming to address sex-related inequalities in tobacco consumption should preferably target men with lower levels of income and education, and women with higher levels of educational attainment.

References

Alves, J., Kunst, A. E.; Perelman, J. (2015). Evolution of socioeconomic inequalities in smoking: results from the Portuguese national health interview surveys. *BMC Public Health*, 15(1), 311.

Alves, J.; Perelman, J.; Ramos, E.; Kunst, A. E. (2023) The emergence of socioeconomic inequalities in smoking during adolescence and early adulthood. *BMC Public Health*, 23(1), 1382.

Appel, D. W.; Aldrich, T. K. (2003) Smoking cessation in the elderly. *Clinics in Geriatric Medicine*, 19(1), 77-100.

Bosdriesz, J. R.; Willemsen, M. C.; Stronks, K.; Kunst, A. E. (2016) Tobacco control policy and socioeconomic inequalities in smoking in 27 European countries. *Drug and Alcohol Dependence*, 165, 79-86.

Carreira, H.; Pereira, M.; Azevedo, A.; Lunet, N. (2012) Trends in the prevalence of smoking in Portugal: A systematic review. *BMC Public Health,* 12(1), 958.

Casetta, B.; Videla, A. J.; Bardach, A.; Morello, P.; Soto, N.; Lee, K.; Camacho, P. A.; Hermoza Moquillaza, R. V.; Ciapponi, A. (2017) Association between cigarette smoking prevalence and income level: A systematic review and meta-analysis. *Nicotine & Tobacco Research*, 19(12), 1401-1407.

Chen, X.; Orom, H.; Hay, J. L.; Waters, E. A.; Schofield, E.; Li, Y.; Kiviniemi, M. T. (2019) Differences in rural and urban health information access and use. *Journal of Rural Health*, 35(3), 405-417.

Chung-Hall, J., Craig, L., Gravely, S., Sansone, N.; Fong, G. T. (2019). Impact of the WHO FCTC over the first decade: a global evidence review prepared for the Impact Assessment Expert Group. *Tobacco Control*, 28(Suppl 2), s119-s128.

Ciapponi, A.; Bardach, A.; Glujovsky, D.; Aruj, P.; Mazzoni, A.; Linetsky, B.; Comandé, D.; Gibbons, L.; Casetta, B.; Caporale, J. (2014) *Systematic review of the link between tobacco and poverty: 2014 Update*. World Health Organization, 2, 414.

Dattani, S.; Spooner, F.; Ritchie, H.; Roser, M. (2023) Causes of death. Our World in Data.

Directorate-General of Health of Portugal. (2021) *Programa Nacional para Prevenção e Controlo do Tabagismo 2020*.

European Commission. (2021) *Communication from the Commission to the European Parliament and the Council: Europe's Beating Cancer Plan*. COM (2021) 44 Final.

Eurostat. (2023) *Preventable and treatable mortality statistics. Statistics Explained.*

Fluharty, M.; Taylor, A. E.; Grabski, M.; Munafò, M. R. (2017). The association of cigarette smoking with depression and anxiety: A systematic review. *Nicotine & Tobacco Research*, 19(1), 3-13.

Goodchild, M.; Nargis, N.; Espaignet, E. (2018) Global economic cost of smoking-attributable diseases. *Tobacco Control*, 27(1), 58 LP-64.

Haustein, K. O. (2006) Smoking and poverty. *European Journal of Cardiovascular Prevention and Rehabilitation*, 13(3), 312-318.

Henkel, D. (2011) Unemployment and substance use: a review of the literature (1990-2010). In Current Drug Abuse Reviews, 4 (1), pp. 4-27).

Huisman, M.; Kunst, A. E.; Mackenbach, J. P. (2005) Educational inequalities in smoking among men and women aged 16 years and older in 11 European countries. *Tobacco Control*, 14(2), 106 LP-113.

IHME - Institute for Health Metrics and Evaluation. (2020) *GBD Compare Data Visualization*. Seattle, WA: IHME, University of Washington.

Islami, F.; Stoklosa, M.; Drope, J.; Jemal, A. (2015) Global and regional patterns of tobacco smoking and tobacco control policies. *European Urology Focus*, 1(1), 3-16.

Jurewicz, J.; Kaleta, D. (2020) Correlates of poor self-assessed health status among socially disadvantaged populations in Poland. *International Journal of Environmental Research and Public Health*, 17 (4).

Leite, A.; Machado, A.; Pinto, S.; Nunes, B.; Matias Dias, C. (2019) Daily tobacco consumption and associated socioeconomic factors in the Portuguese population: National Health Interview Survey data 1987-2014. *Revista Portuguesa de Cardiologia*, 38(8), 583-593.

Lindström, M. (2008) Social capital, social class and tobacco smoking. *Expert Review of Pharmacoeconomics & Outcomes Research*, 8(1), 81-89.

Loring, B. (2014) *Tobacco and Inequities. Guidance for addressing inequities in tobacco-related harm*. World Health Organization. Regional Office for Europe

Machado, A.; Nicolau, R.; Matias Dias, C. (2009) Consumo de tabaco na população portuguesa retratado pelo Inquérito Nacional de Saúde (2005/2006). *Revista Portuguesa de Pneumologia*, XV(6), 1005-1027.

Mackay, D. F.; Gray, L.; Pell, J. P. (2013) Impact of smoking and smoking cessation on overweight and obesity: Scotland-wide, cross-sectional study on 40,036 participants. *BMC Public Health*, 13(1), 348.

Meader, N.; King, K.; Moe-Byrne, T.; Wright, K.; Graham, H.; Petticrew, M.; Power, C.; White, M.; Sowden, A. J. (2016) A systematic review on the clustering and co-occurrence of multiple risk behaviours. *BMC Public Health*, 16(1), 657.

Nketiah-Amponsah, E.; Afful-Mensah, G.; Ampaw, S. (2018) Determinants of cigarette smoking and smoking intensity among adult males in Ghana. *BMC Public Health,* 18(1), 941.

O'Donnell, O.; Doorslaer, E.; Wagstaff, A.; Lindelow, M. (2008) *Analyzing Health Equity Using Household Survey Data: A Guide to Techniques and their Implementation*. Washington, D.C.: World Bank Group.

O'Donnell, O.; O'Neill, S.; Van Ourti, T.; Walsh, B. (2016) Conindex: estimation of concentration indices. *Stata Journal*, 16(1), 112-138.

OECD (2019) *Health for Everyone? Social Inequalities in Health and Health Systems*. OECD Health Policy Studies, OECD Publishing, Paris

OECD (2023) *EU Country Cancer Profile: Portugal 2023*. OECD Publishing, Paris

Quintal, C. M. M. (2021) Socioeconomic inequality in food intake and adult obesity in Portugal, CeBER Working Papers No. 1.

Reitsma, M. B.; Flor, L. S.; Mullany, E. C.; Gupta, V.; Hay, S. I.; Gakidou, E. (2021) Spatial, temporal, and demographic patterns in prevalence of smoking tobacco use and initiation among young people in 204 countries and territories, 1990–2019. *The Lancet Public Health*, 6(7), e472-e481.

Rezaei, S.; Sari, A. A.; Arab, M.; Majdzadeh, R.; Poorasl, A. M. (2016) Economic burden of smoking: A systematic review of direct and indirect costs. *Medical Journal of the Islamic Republic of Iran*, 30(1).

Santos, A. C.; Barros, H. (2004). Smoking patterns in a community sample of Portuguese adults, 1999–2000. *Preventive Medicine*, 38(1), 114-119.

Schaap, M. M.; Kunst, A. E.; Leinsalu, M.; Regidor, E.; Ekholm, O.; Dzurova, D.; Helmert, U.; Klumbiene, J.; Santana, P.; Mackenbach, J. P. (2008) Effect of nationwide tobacco control policies on smoking cessation in high and low educated groups in 18 European countries. *Tobacco Control*, 17(4), 248-255.

Semyonov, L.; Iarocci, G.; Boccia, A.; La Torre, G. (2012) Socioeconomic differences in tobacco smoking in Italy: is there an interaction between variables? *The Scientific World Journal*, 2012, 286472.

Twardella, D.; Loew, M.; Rothenbacher, D.; Stegmaier, C.; Ziegler, H.; Brenner, H. (2006) The impact of body weight on smoking cessation in German adults. *Preventive Medicine*, 42(2), 109-113.

UN (2015) *The 2030 Agenda for sustainable development*. United Nations, New York.

Valiente, R.; Escobar, F.; Urtasun, M.; Franco, M.; Shortt, N. K.; Sureda, X. (2021) Tobacco retail environment and smoking: a systematic review of geographic exposure measures and implications for future studies. *Nicotine & Tobacco Research*, 23(8), 1263-1273.

Viscusi, W. K. (1991) Age variations in risk perceptions and smoking decisions. *Review of Economics and Statistics*, 73(4), 577-588.

WHO (2003) *WHO Framework Convention on Tobacco Control.*

WHO (2008) *Report on the Global Tobacco Epidemic, 2008: The MPOWER Package.* 1-342.

WHO (2021). *Report on the Global Tobacco Epidemic, 2021: addressing new and emerging products.*

WHO. (2022) *Physical activity*.

Appendix

Table A1: Variable description

	PHIS2019	Variable	Description
Dependent variable	IN43	Daily tobacco consumption	Daily tobacco consumption (=1 if the individual reports currently smoking daily; 0 otherwise)
Individual variables	Sex	Male	Male (=1 if the individual is male; 0 otherwise)
	AGE_COD2	Ages 15-24 Ages 25-34 Ages 35-44 Ages 45-54 Ages 55-64 Ages 65 and older	Ages 15-24 (=1 if the individual is aged between 15 and 24 years old; 0 otherwise) Similar for the remaining (Omitted category: Ages 15-24) Source: Leite et al. (2019)
	AL1	Abstainer Rare drinker Occasional drinker Regular drinker	Abstainer (=1 if the individual has never drunk alcohol or drank just to taste, or if the individual has abstained from it in the past 12 months due to quitting; 0 otherwise) (Omitted category) Rare drinker (=1 if the individual drank alcohol up to once a month on average in the past 12 months; 0 otherwise) Occasional drinker (=1 if the individual drank alcohol on 2 to 3 days per month or 1 to 2 days per week on average in the past 12 months; 0 otherwise) Regular drinker (=1 if the individual drank on 3 or more days per week on average in the past 12 months; 0 otherwise) Source: Quintal (2021)
	PE6, PE7	Inactive Moderately active Active	Inactive (=1 if time spent on physical exercise in a week is less than 150 minutes; 0 otherwise) (Omitted category) Moderately active (=1 if time spent on physical exercise in a week is at least 150 minutes up to 300 minutes total; 0 otherwise) Active (=1 if time spent on physical exercise in a week is at least 300 minutes total; 0 otherwise) Source: (WHO, 2022)
	BM1, BM2	Obesity	Obesity (=1 if $BM2/(BM1/100)^2$ is greater than or equal to 30; 0 otherwise)
	CD1O	Depression	Depression (=1 if the individual reports suffering from depression in the last 12 months; 0 otherwise)

	HS1	Very good or good health Fair health Poor or very poor health	Very good or good health (=1 if self-assessed overall health status is very good or good; 0 otherwise) Similar for the remaining (Omitted category: Very good or good health)
	PHIS2019	Variable	Description
Contextual variables	HHINCOME	First income quintile Second income quintile Third income quintile Fourth income quintile Fifth income quintile	First income quintile (=1 if the individual's household belongs to the first income quintile; 0 otherwise) Similar for the remaining (Omitted category: First income quintile) Variables computed without separation by sex.
	HATLEVEL	No educational attainment Basic education Secondary education Upper education	No educational attainment (=1 if the individual never attained any formal education; 0 otherwise) (Omitted category) Similar for the remaining (Omitted category: No educational attainment)
	MAINSTAT	Employed Unemployed Other employment status	Employed (=1 if the individual's reported employment status is employed; 0 otherwise) Similar for the remaining (Omitted category: Employed)
	MARSTALEGAL, PARTNERS	Married Single Single Divorced Widowed	Married (=1 if the individual is married or in a common-law relationship; 0 otherwise) Similar for the remaining (Omitted category: Married) Single (=1 if the individual is single and not in a common-law relationship; 0 otherwise) Divorced (=1 if the individual is divorced and not in a common-law relationship; 0 otherwise) Widowed (=1 if the individual is widowed and not in a common-law relationship; 0 otherwise)
	SS1	Lack of social support	Lack of social support (=1 if the individual reported having no one to turn to in the case of a serious personal problem; 0 otherwise)
Socioeconomic variables	REGION	North Centre Lisbon Alentejo Algarve Azores Madeira	North (=1 if the individual resides in the NUTII region North; 0 otherwise) Similar for the remaining (Omitted category: North)
	DEG_URB	Urban area Mixed area Rural area	Urban area (=1 if the individual resides in a densely populated area; 0 otherwise) Similar for the remaining (Omitted category: Urban area)

Table A2: Estimated odds ratio of daily tobacco consumption obtained by logistic regression analysis, male population

Number of observations = 4,575
Wald chi2(35) = 241.92
Prob > chi2 = 0.0000
Log pseudolikelihood = -1533859.9
Pseudo R2 = 0.1128

Daily tobacco consumption	Odds ratio	Robust standard error	z	P>z	[95% confidence interval]	
Ages 15-24	(Omitted)					
Ages 25-34	1.25708	0.3776652	0.76	0.446	0.697647	2.265113
Ages 35-44	1.41359	0.4621504	1.06	0.290	0.7447953	2.682935
Ages 45-54	1.218021	0.4184522	0.57	0.566	0.6211893	2.388283
Ages 55-64	0.6163194	0.2143363	-1.39	0.164	0.3117346	1.218503
Ages 65 and older	0.3031812	0.1124124	-3.22	0.001	0.1465875	0.6270578
Abstainer	(Omitted)					
Rare drinker	1.942416	0.4868789	2.65	0.008	1.188457	3.17469
Occasional drinker	1.890104	0.4144181	2.90	0.004	1.229856	2.904808
Regular drinker	2.136295	0.4662544	3.48	0.001	1.392783	3.276719
Inactive	(Omitted)					
Moderately active	0.8647998	0.2533967	-0.50	0.620	0.4869713	1.535776
Active	0.6094979	0.1122275	-2.69	0.007	0.4248539	.8743894
Obesity	0.6936319	0.1172232	-2.16	0.030	0.4980543	.9660096
Depression	1.64312	0.3981065	2.05	0.040	1.021961	2.641827
Very good or good health	(Omitted)					
Fair health	0.854207	0.1311023	-1.03	0.305	0.6322984	1.153996
Poor or very poor health	0.7047105	0.1938436	-1.27	0.203	0.4110287	1.20823
First income quintile	(Omitted)					
Second income quintile	1.12715	0.2705961	0.50	0.618	0.7040975	1.80439
Third income quintile	1.282074	0.3047913	1.05	0.296	0.8045523	2.043016
Fourth income quintile	1.216823	0.2892205	0.83	0.409	0.7636769	1.938855
Fifth income quintile	1.101209	0.3006299	0.35	0.724	0.6448988	1.880389
No educational attainment	(Omitted)					
Basic education	0.9080585	0.3177402	-0.28	0.783	0.457371	1.802848

Daily tobacco consumption	Odds ratio	Robust standard error	z	P>z	[95% confidence interval]	
Secondary education	0.5257572	0.2033463	-1.66	0.096	0.2463584	1.122027
Upper education	0.3313351	0.1408662	-2.60	0.009	0.1440063	0.7623481
Employed	(Omitted)					
Unemployed	1.936858	0.4522396	2.83	0.005	1.225602	3.060877
Other employment status	0.5138627	0.1226363	-2.79	0.005	0.3218867	0.820335
Married	(Omitted)					
Single	1.344467	0.2847486	1.40	0.162	0.8877114	2.036239
Divorced	1.905716	0.7638789	1.61	0.108	0.868693	4.180711
Widowed	0.8375417	0.453027	-0.33	0.743	0.2901288	2.417809
Lack of social support	1.655756	0.6266933	1.33	0.183	0.7885363	3.476728
North	(Omitted)					
Centre	0.868832	0.1451662	-0.84	0.400	0.6262032	1.20547
Lisbon	0.7982986	0.1676641	-1.07	0.283	0.5289203	1.204871
Alentejo	1.405959	0.2642122	1.81	0.070	0.9727745	2.032044
Algarve	1.185063	0.2139558	0.94	0.347	0.8318833	1.688188
Azores	1.620583	0.2748245	2.85	0.004	1.162309	2.259547
Madeira	0.9280651	0.170081	-0.41	0.684	0.6480131	1.329147
Urban area	(Omitted)					
Mixed area	0.8139208	0.1390753	-1.20	0.228	0.5822864	1.1377
Rural area	0.6992468	0.1325763	-1.89	0.059	0.4822183	1.013952
Constant	0.2820369	0.160476	-2.22	0.026	0.0924658	0.8602619

Table A3: Estimated odds ratio of daily tobacco consumption obtained by logistic regression analysis, female population

Number of observations = 5,325
Wald chi2(35) = 242.53
Prob > chi2 = 0.0000
Log pseudolikelihood = -980870.13
Pseudo R2 = 0.1448

Daily tobacco consumption	Odds ratio	Robust standard error	z	P>z	[95% confidence interval]	
Ages 15-24	(Omitted)					
Ages 25-34	1.875688	0.6909945	1.71	0.088	0.9111334	3.86135
Ages 35-44	2.662109	1.019646	2.56	0.011	1.2566	5.639682
Ages 45-54	2.222769	0.8918648	1.99	0.047	1.012413	4.880123
Ages 55-64	1.49325	0.6091696	0.98	0.326	0.6712525	3.321844
Ages 65 and older	0.7075796	0.3232806	-0.76	0.449	0.2889857	1.732504
Abstainer	(Omitted)					
Rare drinker	2.6583 96	0.5551205	4.68	0.000	1.765524	4.002817
Occasional drinker	3.098463	0.7091946	4.94	0.000	1.978419	4.852598
Regular drinker	3.376313	0.8654498	4.75	0.000	2.042934	5.57996
Inactive	(Omitted)					
Moderately active	0.5127432	0.1863392	-1.84	0.066	0.2515124	1.045298
Active	0.7142547	0.173974	-1.38	0.167	0.443121	1.151287
Obesity	0.8049797	0.1852152	-0.94	0.346	0.5127843	1.263674
Depression	2.377057	0.5265426	3.91	0.000	1.53989	3.669353
Very good or good health	(Omitted)					
Fair health	0.825124	0.1580145	-1.00	0.316	0.5669056	1.200958
Poor or very poor health	0.5814773	0.1996908	-1.58	0.114	0.2966288	1.139862
First income quintile	(Omitted)					
Second income quintile	1.121182	0.2522529	0.51	0.611	0.7213831	1.742556
Third income quintile	1.251254	0.3129594	0.90	0.370	0.7663833	2.042891
Fourth income quintile	1.030045	0.2641127	0.12	0.908	0.6231617	1.702597
Fifth income quintile	1.602645	0.428562	1.76	0.078	0.9488952	2.706802
No educational attainment	(Omitted)					
Basic education	2.398553	1.251897	1.68	0.094	0.862332	6.67151
Secondary education	3.944173	2.185716	2.48	0.013	1.331225	11.68586

Daily tobacco consumption	Odds ratio	Robust standard error	z	P>z	[95% confidence interval]	
Upper education	1.074853	0.6326293	0.12	0.902	0.3391213	3.406773
Employed	(Omitted)					
Unemployed	1.416224	0.3490851	1.41	0.158	0.8736134	2.295856
Other employment status	0.6584011	0.184498	-1.49	0.136	0.3801594	1.14029
Married	(Omitted)					
Single	1.873834	0.4310767	2.73	0.006	1.193745	2.941376
Divorced	2.320176	0.5799554	3.37	0.001	1.42152	3.786943
Widowed	0.6338943	0.2466926	-1.17	0.241	0.2956343	1.359186
Lack of social support	1.280469	0.6653139	0.48	0.634	0.4624841	3.545207
North	(Omitted)					
Centre	1.332725	0.3055637	1.25	0.210	0.8503142	2.088824
Lisbon	1.177818	0.2790743	0.69	0.490	0.7402746	1.873973
Alentejo	2.531161	0.6310532	3.72	0.000	1.552757	4.126064
Algarve	1.644966	0.3837153	2.13	0.033	1.041359	2.598446
Azores	2.452146	0.5564612	3.95	0.000	1.571754	3.825674
Madeira	1.23626	0.2842961	0.92	0.356	0.7877044	1.940243
Urban area	(Omitted)					
Mixed area	0.6608947	0.1310479	-2.09	0.037	0.4480728	0.9748009
Rural area	0.5042578	0.1272266	-2.71	0.007	0.3075321	0.8268272
Constant	0.0099111	0.0069332	-6.60	0.000	0.0025158	0.0390454

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The Economic Study of Politics: Insights and Reflections

O Estudo Económico da Política: Observações e Reflexões

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ABSTRACT
Economic and political phenomena coexist in society, but are often seen as divergent spheres of human action and interaction. A theoretical manifestation of this separation is the assumption that while economic agents act in their own self-interest, political agents are motivated by the public interest. Additionally, it is commonly assumed – if only implicitly – that political agents possess all the necessary knowledge for rational action, effectively portraying political agents as omniscient beings. Drawing on public choice theory and on the economic literature on the nature of knowledge, we review arguments that challenge the two assumptions.
Keywords: Knowledge; public choice; economic calculation; political calculation.

JEL Classification: B53; D72; D83

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1. Introduction

Economic and political phenomena coexist in society but are often seen and treated as divergent spheres of human action and interaction. Two crucial assumptions reify this view. On the one hand, governments are often portrayed as guardians of the public interest and thus act to achieve a social optimum. In other words, they are benevolent. The other crucial assumption is that political agents possess all the necessary knowledge for rational action, effectively portraying political decision-makers as omniscient beings. A prominent example of the use of these assumptions is the celebrated paper on optimal economic growth by Cass (1965).

Obviously, such assumptions are hardly realistic. First, political agents may indeed act in the public interest, but often that is subordinate to their own private interest. Second, as the debates on the challenges of economic planning have made clear, the necessary knowledge is not given or easily obtained due to its inherent properties. Its creation and transmission are contingent upon the existing institutional context. Assumptions of perfect knowledge are, therefore, at best approximations, if not downright misleading.

This short note collects some insights from the relevant literature to reflect on the assumptions identified above. The next section focuses on the public choice challenge to the benevolence assumptions. Section 3 discusses the knowledge problem and argues that it is present in political settings. Section 4 concludes.

2. Is Human Behaviour Bifurcated? Individual Choice in Markets and Collective Choice in Governments

Markets and governments are different in many respects. In markets, individuals are sovereign; in government, choices are made in the name of all citizens. In markets, transactions are voluntary; in government, policies are applied coercively. In economic theory, individuals, *qua* economic agents, have often been assumed to be motivated by self-interest – the *homo economicus* – namely in the neoclassical tradition descending from Jevons (1871). Conversely, politicians, or the *homo politicus*, are typically portrayed as devotees of the public interest – a form of altruism which guides their actions toward the collective good[1]. This section examines the validity of this common assumption of a bifurcation in human behaviour, wherein individuals act out of self-interest within market contexts but exhibit selflessness in political arenas.

This bifurcation assumption was explicitly challenged by James Buchannan and Gordon Tullock in The Calculus of Consent (1962), where they observed that the *homo economicus* and *homo politicus* correspond to the same man. Buchanan and Tullock (1962, p. 13) noted that collective action is essentially the aggregation of individual actions: "the action of individuals when they choose to accomplish purposes collectively rather than individually." They assert that, whether in markets or political settings, individuals are predominantly self-interested

[1] Arrow (1950, 1951) taught us that the notion of the public interest is at best difficult to operationalize and at worst devoid of substantive content, primarily due to the technical challenges involved in aggregating individual preferences.

agents, driven by personal goals – both material and non-material. This is one of the main tenets of the public choice approach to the study of politics. It aligns with the methodological individualism favoured in the Austrian tradition, which traces its origins to Carl Menger (1871/1981) and was later advanced by Max Weber (1922/1978).

The market is a competitive environment, as is politics – a concept taken to extremes in Shakespeare's Hamlet. Just as an entrepreneur makes economic decisions that maximize their own interests in the form of profit, a politician follows the same path but with different means and ends – see Moreira and Alves (2004) for an illustration of this analogy, comparing the decision-making processes of politicians to those of entrepreneurs. Political choices are the joint product of individual choices by voters, lobbyists, members of interest groups, government executives, and other public servants. Public choice theory further integrates economic principles into the study of the political behaviour of these agents by insisting that "the same rational, self-interest-seeking motives that animate human action in ordinary markets be applied to decision-making in the public sector as well" (McChesney and Shughart, 1995, p. 9), modelling political behaviour on the assumption that these agents act in their self-interest, much like entrepreneurs in competitive markets.

This perspective does not negate the potential for governments to produce beneficial outcomes; rather, it emphasizes that what drives governments into doing good or bad is the direction in which incentives are aligned. Institutional arrangements can play a pivotal role in transforming self-interest into a harmony of interests between politicians and the public. Thus, the focus shifts from the moral character of specific actors to the structural incentives embedded within institutional frameworks. Constitutional rules, as foundational elements of institutional design, serve to shape these frameworks, guiding incentives and aligning individual interests with the broader public good (Buchanan and Tullock, 1962).

3. On the Nature of Knowledge: Markets and Politics

The availability of the necessary knowledge for economic coordination is contingent upon the institutional context. Different forms of economic organization are not equally effective in creating and transmitting that knowledge (Hayek, 1945; Boettke, 1997). This is so because that "knowledge […] never exists in concentrated or integrated form" (Hayek, 1945, p. 519). Rather, it exists in "the dispersed bits of incomplete and frequently contradictory knowledge which all the separate individuals possess" (ibid). Knowledge about market opportunities, for instance, is unevenly distributed, often tied to specific circumstances of time and place, making it not only dispersed, but also both contextual and subjective. Indeed, knowledge about the preferences of individuals, their expectations, and the trade-offs they actually face is necessarily subjective. Furthermore, a significant portion of this knowledge is tacit. Not only it is non-articulated, but also non-propositional, thereby making it difficult or even impossible to communicate it linguistically. It was in the context of the Socialist Calculation Debate of the 20th century that economists began to systematically explore the problems posed by the nature of knowledge. That debate addressed the comparative performance of different economic systems in creating and harnessing the fragmented, subjective, and tacit knowledge possessed by individuals (Levy and Peart, 2008).

3.1. How does the market economy handle the knowledge problem?

The economic problem of a community is that of constantly choosing what to produce, how to produce, and how to distribute the results of production. A satisfactory solution to this problem is one in which the agents' preferences are fairly satisfied. However, ideally, any amount produced should use the smallest possible amount of inputs; i.e., besides satisfying consumer preferences (allocative efficiency), production should also be technically efficient.

To solve the economic problem of the community, it is necessary to have a system of allocation which directs the production efforts and a way to discover the best production projects that yield the desired output for the satisfaction of desires (Lourenço and Graça Moura, 2018). The market is a process of both allocation and discovery.

Individuals interact in the market in a decentralized fashion. Although there may be influences such as network externalities (Katz and Shapiro, 1985) or bandwagon and snob effects (Leibenstein, 1950), essentially they independently decide what to consume and how to obtain income (i.e., how to contribute to production). In making those decisions, individuals react to prices. Producers select what to produce and how to produce based on the prices of available resources and the market price of the output. Similarly, consumers decide what and how much to consume based on the trade-offs they face given their income, market prices, and individual preferences. Mises (1920) details that through the interaction of consumers, producers, and owners of the means of production, market prices are updated in accordance with relative scarcities. Individuals then adjust their decisions based on these prices. The pricing system that emerges through market interaction within an institutional arrangement – which includes, among other things, private property rights – is what enables individuals to value means and ends. Agents can rationally choose courses of action by comparing relative prices and allocating the resources accordingly (Mises, 1922).

Market prices act as signals for economic action. If a given commodity becomes scarce for any reason, its relative price tends to rise, signalling to consumers that they should economize on that commodity and to producers that they should mobilize resources toward its production (Jevons, 1871). Note that the information about the relative scarcity of the commodity is relayed through the economic system by price signals even without the affected individuals being consciously aware of such facts. Individuals act as if they were explicitly (and even linguistically) informed about the scarcity, but they do so in response to the incentives created by market price signals. The disperse and subjective knowledge is continuously shared and renewed, allowing producers to identify – and discover – what to produce and best production method to deploy in the production of consumer goods (Hayek, 1945). And similarly for consumers.

Market prices are vehicles for dynamic transportation of knowledge, thereby enabling the determination of the value of means and ends. To the extent that prices express the aggregate outcome of the multiple exchange values, they serve as a primordial tool for rational economic decision-making. Thus, without market prices, the necessary knowledge could hardly be relayed. The market process is essential to solve the economic calculation problem (Hayek, 1940).

3.2. The knowledge problem is also relevant for the study of political phenomena

In the preceding discussion, we argued that successful economic coordination is contingent upon the transmission of the dispersed, contextual, subjective, and tacit knowledge that individuals possess and create through market interactions. Now, we want to suggest that these attributes of knowledge are equally present in the knowledge generated and utilized by political actors – including legislators, executives, voters, and interest groups – in the political sphere.

In Section 2, we argued that politicians tend to behave according to their private interests. The most obvious of these is, of course, the goal of remaining in power. Bueno de Mesquita et al. (2003) addressed the problem of 'political survival' by studying the relationship between the leader and his supporters. In a model applicable to both democratic and autocratic regimes, they demonstrate that, to remain in power, a leader must secure a winning coalition – a subset of the electorate that enables the leader to ascend to and maintain power, expecting special privileges in return. Political leaders secure the support of a winning coalition through a process of political exchange. Specifically, leaders use – or promise to use – the coercive powers of the state to extract resources from the economy, a portion of which is distributed as rents in exchange for political support.

Of course, the capacity of the leader to extract resources is limited, while the potential uses of rents are unlimited. Thus, the leader must engage in some form of political calculation. Abdukadirov (2010) defines political calculation as the process through which politicians determine the value of the political support provided by supportive factions. To be efficient, the distribution of rents cannot be uniform if the value of political support provided by different factions is distinct.

To solve his political calculation problem, the leader faces a challenge: there is no inherent mechanism to evaluate the relative power or value of his supporters and, consequently, their fair share of rents. This is because the necessary information is dispersed among the members of existing factions. Moreover, the leader has no immediate access to citizens' preferences regarding his government.

In light of this, political leaders in both democracies and autocracies often employ various feedback mechanisms. Elections, for instance, serve as tools for political calculation. If this is the case, then elections in autocratic regimes are not merely symbolic: "They provide the autocrat with a pricing mechanism that allows him to evaluate the relative strength of various political factions. Thus, elections help the autocrat to decide which factions should be included in the winning coalition and what their share of rents should be" (Abdukadirov, 2010, p. 369). Other feedback mechanisms include protests, legislatures, and professional and business associations (Acchiardo, 2019).

However, it is not only the leader who faces a knowledge problem. Members of the winning coalition also encounter difficulties: they can hardly estimate the relative value of their support. Additionally, potential challengers to the leader, especially in autocracies, struggle to assess the level of support the leader enjoys.

A fruitful approach to the study of political phenomena must consider the insights on the nature of knowledge that were uncovered in the study of the market processes. Indeed, politics seems to be a special kind of market (Wagner, 2016). Although rent-seeking, lobbying,

and the electoral mechanism are not strictly market actions, they are still guided by market forces such as competition, with rivalry adding intensity to these interactions.

4. **Conclusion**

Public choice theory has challenged the notion of political actors as benevolent guardians by demonstrating that self-interest is also a fundamental driver of political decision-making. This view highlights the parallels between political behaviour and market behaviour, particularly the role of incentives in shaping political actions. This short note has reviewed arguments from the economic literature based on these parallels, focusing on the knowledge problem faced by both economic and political agents. In fact, while political and market spheres are often treated as distinct, the challenges they face in terms of knowledge generation, transmission, and utilization display similarities. Understanding these similarities provides insights into how these systems function.

Just as the dispersed, tacit, and context-dependent nature of market knowledge complicates efficient central planning, political leaders and actors face similar barriers in understanding the preferences of citizens and supporters. Recognizing that politics operates under the same knowledge limitations as markets has important implications. For instance, it shifts our focus from the morality of individual leaders to the importance of designing institutional frameworks that align incentives with the public interest. Accounting for these insights enables a more realistic analysis of political phenomena. This may be particularly important at a time when technological developments are escalating the capabilities of mass control systems.

References

Abdukadirov, S. (2010) The problem of political calculation in autocracies. *Constitutional Political Economy*, 21, 360-373.

Acchiardo, C.-J. (2019) The Dictator's Knowledge Problem. In Hall, J. C.; Harper, S. (Eds.), *Economic and Political Institutions and Development*, Springer International Publishing, 1-20.

Arrow, K. J. (1950) A difficulty in the concept of social welfare. *Journal of Political Economy*, 58(4), 328-346.

Arrow, K. J. (1951) *Social choice and individual values. Cowles Commission for Research in Economics*. Monograph No. 12. New York: John Wiley & Sons.

Boettke, P. J. (1997) Where did economics go wrong? Modern economics as a flight from reality. *Critical Review* 11(1), 11-64.

Buchanan, J. M.; Tullock, G. (1962) *The Calculus of Consent: Logical Foundations of Constitutional Democracy*. University of Michigan Press.

Bueno de Mesquita, B.; Smith, A.; Siverson, R. M.; Morrow, J. D. (2003) *The Logic of Political Survival*. MIT Press.

Cass, D. (1965) Growth in an aggregative model of capital accumulation. *Review of Economic Studies* 32(3), 233-240.

Hayek, F. A. (1945) The use of knowledge in society. *American Economic Review* 35(4), 519-530.

Hayek, F. A. (1940) Socialist calculation: The competitive 'solution'. *Economica* 7(26), 125-149.

Jevons, W. S. (1871) *The Theory of Political Economy*. Macmillan and Company.

Katz, M.L.; Shapiro, C. (1985) Network Externalities, Competition, and Compatibility. *American Economic Review* 75(3), 424-440.

Leibenstein, H. (1950) Bandwagon, snob, and Veblen effects in the theory of consumers' demand. *Quarterly Journal of Economics* 64(2), 183-207.

Levy, D.M.; Peart, S.J. (2008) *Socialist Calculation Debate. In: The New Palgrave Dictionary of Economics*. London, Palgrave Macmillan

Lourenço, D.; Graça Moura, M. (2018) The economic problem of a community: Ontological reflections inspired by the Socialist Calculation Debate. *Cambridge Journal of Economics* 42(1), 1-17.

McChesney, F. S.; Shughart, W. F. (1995) *The Causes and Consequences of Antitrust: The Public-Choice Perspective*. University of Chicago Press.

Menger, C. (1871, [1981]). *Principles of Economics*. Translation by J. Dingwall and B. F. Hoselitz, New York University Press.

Mises, L. von. (1920, [1935]) Economic Calculation in the Socialist Commonwealth. In *Collectivist Economic Planning: Critical Studies on the Possibility of Socialism*, George Routledge & Sons, Ltd., 87-130

Mises, L. von. (1922, [2012]) *Socialism: An Economic and Sociological Analysis*. New Haven: Yale University Press.

Moreira, J. M.; Alves, A. A. (2004) *O Que é a Escolha Pública: Para uma Análise Económica da Política*. Cascais: Principia Editora.

Wagner, R. E. (2016) *Politics as a Peculiar Business: Insights from a Theory of Entangled Political Economy*. Cheltenham, UK: Edward Elgar.

Weber, M. (1922, [1978]) *Economy and Society: An Outline of Interpretative Sociology*. Revised edition by G. Roth and C. Wittich, University of California Press.

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