PORTUGUESE ECONOMIC GROWTH A VIEW ON STRUCTURAL FEATURES, BLOCKAGES

AND REFORMS



BANCO DE PORTUGAL

Economics and Research Department

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Portuguese Economic Growth: A View on Structural Features, Blockages and Reforms

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Cover

Banco de Portugal, tile panel by Querubim Lapa (detail of the artist's original painting)

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Foreword

Carlos da Silva Costa, Governor

The economy of a country always contains two dynamics, with clearly distinct paces.

On the one hand, we have short-term dynamics, namely economic cycles that are recurrent and visible. These cycles reflect periods of growth and contraction in output and employment. It is relatively easy for households and enterprises to perceive these cycles and the impacts they have on their lives. Such dynamics generate instability in the economy and, for this reason, require monitoring that should be as agile as possible, so that the drivers for each cycle can be quickly identified and analysed, and economic policy can contribute to the stabilisation or mitigation of their effects. Banco de Portugal contributes to this task, by continuously monitoring and assessing ongoing economic developments.

On the other hand, in parallel to these economic cycles, comparable to tides that we can observe easily from the shoreline, the economy is subject to structural transformations, slower and deeper. These transformations, which can be compared to the movement of tectonic plates in the depths of the ocean, cannot be seen by the naked eye, but produce indelible effects on the economic and social fabric, with important and disruptive impacts on the lives of households and enterprises. It is the case, for example, of structural losses in productivity, capable of drastically limiting the wealth that enterprises can generate and the wages they are able to pay.

If the institutions responsible for analysing the economies remain exclusively focused on accompanying short-term dynamics, they will lose sight of structural dynamics that condition individual well-being and the wealth and equity of the society, and will consequently be unable to signal the need for measures that anticipate and mitigate their effects. Therefore, Banco de Portugal assumes its mission of assessing the structural reality of the Portuguese economy, identifying corresponding challenges and opportunities.

In this book, the Bank gives continuity to the fulfilment of this mission.

In 2009, Banco de Portugal shared with the Portuguese society a book containing a collection of studies on "The Portuguese Economy in the Context of Economic, Financial and Monetary Integration". On this occasion, the structural implications of the European integration process were explored, namely in terms of the goal of real convergence with our European partners.

Today, the Bank reprises its structural assessment of the Portuguese economy to look at "Portuguese Economic Growth: A View on Structural Features, Blockages and Reforms".

These exercises are undoubtedly relevant as the structural conditions and, in particular, the ability to adapt to the global context determine countries' economic success.

Through this type of initiatives, the Bank aims to embody its strategic purpose of being a centre of gravity and dynamic propeller of the scientific reflection on the structural mutations of the Portuguese economy, aggregating and mobilising the academia, always in a spirit of full openness and close partnership. The goal is to make society aware of the challenges it faces and foster responses based on broad social consensus. The studies published in this work only obey the criteria of strict scientific rigour and reflect the conceptual, theoretical and methodological frameworks of the authors.

The e-book format adopted aims to encourage the sharing of such a reflection. The purpose is to ensure that this work becomes a living reference to the discussions under way. The set of studies that Banco de Portugal here provides to Portuguese society is not a tomb of crystallised thought, but rather a work plan for the future.

Introduction

João Amador

The main objective of policy-makers should be the creation of conditions for sustainable economic growth and the well-being of the population. This requires both awareness about the underlying economic conditions and, most of all, a clear perspective about developments that will shape the social and economic landscape in the coming decades. This is inherently a difficult exercise and subject to high risk. The identification of past developments and underlying structural features is a valuable starting point to forecast future developments. Nevertheless, even if future challenges are correctly assessed, the identification of the correct policies is far from obvious. Amidst all these difficulties, the costs of inaction are potentially very high and decisions targeted at promoting the underlying economic growth conditions of the economy are warranted.

This book aims to contribute to the debate about Portuguese economic growth, leveraging on a large set of past and ongoing analytical work, mostly carried out at Banco de Portugal. This project also benefited from multiple other contributions, notably from economists affiliated to national and international economic policy institutions and to universities. Therefore, the book is a collective effort that identifies several structural features of the Portuguese economy and, whenever possible, points towards challenges to be addressed. Conversely, in some areas, progress is underlined. Nevertheless, it is important to remark that there are numerous dimensions of the Portuguese economic growth that are not covered in the book. Additionally, alternative methodologies and databases could be used, potentially disputing existing conclusions. Overall, this discussion is just one small step in the long journey towards increasing Portuguese productivity and bringing GDP per capita to levels close to those of the best performing countries in Europe.

All sections are written in a relatively simple and concise way, most of them referring to existing studies where a deeper analysis can be found. The short length of the sections and their simplified content aims at facilitating access to a non-specialized audience. The content of the book is subject to the usual disclaimers. Therefore, the opinions expressed in the different sections are those of the authors and do not necessarily coincide with those of Banco de Portugal, the Eurosystem or other institutions where they are affiliated. In addition, any errors and omissions are the sole responsibility of the authors. Finally, some acknowledgments are warranted. Firstly, I am grateful to Nuno Alves, Maximiano Pinheiro and Pedro Duarte Neves for their support and for very useful comments and suggestions to large parts of the book. Secondly, acknowledgments are due to colleagues that worked on the design and computer editing dimensions, notably to Fernando Graça, Marta Figueiredo and Luís Campos.

1. Organization of the book

The book takes a supply side approach, discussing aspects of Portuguese economic growth from the perspective of the production function. This implies focusing on the quantity and quality of inputs, the functioning of markets and the broad institutional setup. The book is organized along eight chapters, each one containing a small number of short sections. Each section formulates a research question relevant for understanding structural features, blockages and reforms with an impact on Portuguese economic growth.

After this introduction, the 1st chapter of the book offers an analysis of the Portuguese potential output growth using estimated models and growth accounting methodologies. The role of capital, labour and technology is highlighted, while also including some aspects on demography and human capital. The questions specifically related to human capital, such as the impact of education on wages and mismatches between worker's qualifications and job requirements, are included in the 2nd chapter. Next, the 3rd chapter of the book discusses some features of the Portuguese labour market, notably the sources of real wage variation, nominal wage rigidities and recent reforms. The 4th chapter of the book addresses questions related to the management and organization of Portuguese firms. These aspects have been increasingly acknowledged in the literature as important drivers of firms' performance and overall productivity. In particular, the profile of Portuguese managers, their experience in foreign markets as a driver of exports and the role of newcomers in the face of crises are discussed.

Alongside with labour, capital is a key ingredient in the productive process. Therefore, investment decisions and its financing are important topics, also in connection with shocks on the banking system. The 5th chapter of the book collects contributions that study the presence of borrowing constraints on Portuguese firms, the impact of bank shocks on investment decisions and the allocation of credit according to the productivity of firms. Discussions about the quality and quantity of inputs, as well as those on the functioning of the labour market, must be complemented by an assessment of firms' dynamics and the implicit reallocation of resources in the economy, which is shaped by existing distortions and by the action of competition forces. This latter set of dimensions constitutes the bulk of the 6th chapter of the book.

Internationalization is not an element of the production function *per se* but it emerges as a key decision by firms, which may strongly determine their performance and thus impact on economic growth. In this setup, aspects related to the participation of Portuguese firms in international trade of goods and services, their resilience in the face of crises, as well as the specificities of those in the tourism sector are addressed in the 7th chapter. Finally, regulatory costs, which are also acknowledged as drivers of productivity, are discussed in the 8th chapter, with a special emphasis on the judicial system.

2. Main insights

In the next decades, one important driving force shaping many world economies is the ageing of the population. This trend is already visible in Portugal. Demographic trends are long-term and extremely powerful forces, with pervasive effects on economic growth. From a supply side perspective, the main consequence of ageing is a lower labour supply, thus affecting potential output growth downwards. A second major force with an impact on the economies in the next decades is the automation of production in combination with an increasing remote supply of services by foreign workers. These developments will put pressure on large segments of the labour market, will change the types of skills needed and will challenge firms' current business models. Another major development going forward is the shift in the balance of global economic power from western economies towards developing nations in different continents. This development will have an impact on trade patterns and investment flows, and is likely to increase volatility, with a bearing on firms' ability to adjust to shocks. Overall, worldwide competition is likely to increase, thus flexibility of the economies will become an even more valuable asset.

The discussion about economic growth in the Portuguese economy must take place against this background of challenges and consider how existing structural features and barriers interplay with future outcomes. The current situation of the Portuguese economy in terms of potential output growth is not very positive. Section 1.1, by Cláudia Duarte, José Ramos Maria and Sharmin Sazedj, presents model-based potential output estimates for Portugal, decomposing observed developments into trends and cycles by mixing dynamic price and wage equations with a version of the Okun's law and a production function featuring capital, labour and total factor productivity (TFP). It concludes that potential output has been decelerating when compared with the dynamism of the late 1980s and confirms that the European financial and sovereign debt crisis had long-lasting effects, with Portuguese potential output diverging from the euro area. The assessment of a disappointing performance of TFP growth is confirmed in Section 1.2, by João Amador, Carlos Coimbra and António *Ribeiro dos Santos*, which offers a growth accounting exercise based on a stochastic international production frontier estimated with Bayesian methods. This methodology signals the existence of sizable efficiency gaps, measured as the distance of the Portuguese economy relative to the technological frontier, given the existing capital-labour ratios. Overall, this section confirms the long standing narrative that structural problems prevail in the Portuguese economy, combining sizable efficiency gaps with relatively low capital-labour ratios.

The ageing of the population has a bearing on Portuguese potential output developments. Section 1.3, by *Joana Garcia, Hugo Reis and João Amador*, presents an enlarged growth accounting exercise and concludes that pure demographic developments, measured by the ratio of population aged 15-64 to total population, will have a very sharp negative contribution to GDP per capita growth up to 2050. In cumulative terms, this negative contribution is sizable, amounting to close to 20 percentage points in 2050. Nevertheless, the contribution from increasing levels of human capital is expected to partially offset the pure demographic effect, with a cumulative contribution amounting to close to 10 percentage points in 2050. Therefore, the adverse impact of demographic developments on Portuguese growth will coexist with a favourable impact from a more skilled labour force.

The skills of the labour force have been a key ingredient for economic growth across the world in the last decades but their role augments when it comes to dealing with the challenges posed by automation and the broader scope of services being traded in international markets. The potential destruction of jobs should be matched with higher flexibility to take up different occupations, which may require new skills and training. Nevertheless, achieving a flexible economy extends beyond workers and labour markets, reaching dimensions like management practices and investment decisions.

It is widely acknowledged that the Portuguese economy has been penalized by a legacy of low qualifications of the labour force. However, progress has been very significant and it is important that it continues. Section 2.1, by Maria Manuel Campos and Hugo Reis, estimates an empirical relationship between education and earnings and concludes that the returns to schooling in Portugal may have recently been shrinking, given the remarkable increase in the average educational attainment of the labour force. Nevertheless, higher educational levels are still generally associated with higher wages and the differential between wages of individuals holding university degrees and those with only secondary education is large and widens across the life-cycle. This assessment is compatible with the conclusions of Section 2.2, by Manuel Coutinho Pereira and Catarina Pimenta, which combines employees' occupations and educational attainment to evaluate educational mismatches. It concludes that there has been a consistent reduction in undereducation, in line with the replacement of generations in the labour market, and the growing number of highly educated workers participating in the labour market, particularly college graduates, has given rise to overeducation only to a limited extent.

The discussion about the challenges posed by automation links with the role of technical versus general skills. The potential gains of the vocational system in youth, associated to an easier transition from school to work, may be offset by less adaptability in later stages of the working life. Section 2.3, by Joop Hartog, Pedro Raposo and Hugo Reis, compares the wage trajectories over the life course of individuals associated with high school vocational track, high school general track, higher education and less than secondary education in Portugal, also comparing these groups in terms of risk measures, such as the coefficient of variation of wages and unemployment rate. As expected, in terms of wages and risk, high school vocational workers are always worse off than those with higher education and better off than those that do not complete the secondary education. When comparing with the high school general track, there is evidence supporting the short-term advantage of the high school vocational education and its disadvantage in the longer-term. Nevertheless, education gains do not just accrue to the individual but also to others in society. Such externalities tend to have a geographical dimension, which is associated to agglomeration effects that may be intensified due to the ongoing technological changes. Section 2.4, by Pedro Freitas, takes up this topic, using an instrumental variables approach to conclude that the concentration of skills has a positive impact on wages. In particular, the municipal concentration of high school graduated workers increases the wages of workers with high school and college graduation.

The effects of the transformations expected for the next decades do not just depend on the qualifications of the labour force. They also strongly relate with the functioning of the labour market in a broader sense, including legislation and wage dynamics. Section 3.1, by Sónia Félix and Pedro Portugal, accounts for the sources of real wage variation in Portugal, specifically measuring the effect of job and worker restructuring on aggregate real wage changes and, indirectly, on firms' productivity. It concludes that wage growth associated with the transition of workers between firms and that of those that stay in the same firms give the highest contributions to real wage growth, while entry and exit of firms seems to play a cleansing role. In this context, the rigidity of nominal wages has been pointed out as a significant distortion in the functioning of the Portuguese labour market. Section 3.2, by Fernando Martins and Pedro Portugal, refers to the role of downward nominal wage rigidities on job destruction, with an impact on economic growth. In particular, during the latest Portuguese crisis it is possible to identify a clear positive relationship between the proportion of nominal wage freezes and unemployment rates. In a different vein, Section 3.3, by Fernando Martins, focuses on recent labour market reforms and concludes that, despite considerable progress, Portugal remains the OECD country with the most stringent regulations for individual dismissals of workers on open-ended contracts. While reforms have narrowed the regulatory gap between open-ended and fixed-term contracts, the duality remains important and segmentation is likely to continue a distinctive feature of the Portuguese labour market.

The ability of the economy to meet the challenges arising in the horizon is strongly dependent on managerial skills and firms' organization. For example, a higher volatility in the world economy will increase the value of managers that can properly deal with crisis events. In this respect, Section 4.1, by Sharmin Sazedj, uses a difference-in-differences approach and argues that newcomer CEOs present a significant advantage in managing firms during difficult times, regardless of their relative knowledge deficit about the firm. In addition, it refers that the high share of owner CEOs and their average high tenure signal that Portuguese firms may find it difficult to adapt to changing markets. Section 4.2, by Giordano Mion, Luca David Opromolla and Alessandro Sforza, complements this view by showing that firms where there is a manager with export experience are more likely to start (or continue) exporting, and are more likely to present higher levels of exports. The presence of a manager with export experience turns out to be as important as the productivity of the firm. Managers are also important regarding the adjustment of firms' organizational structure. Section 4.3, by Lorenzo Caliendo, Giordano Mion, Luca David Opromolla and Esteban Rossi-Hansberg, finds that reorganization is an important source of aggregate productivity gains in the economy, arguing that firms that fail to reorganize in order to grow — possibly

due to institutional impediments or management inadequacy — are unable to exploit available productivity improvements.

Portuguese firms face a legacy of difficulties regarding financing and investment, also in connection with prevailing relatively low capital-labour ratios and the large dependence of bank financing. This poses additional challenges regarding the adjustment to future economic transformations. Section 5.1, by Sudipto Karmakar, refers that firms with significantly higher amounts of leverage and short-term debt found it difficult to refinance in the peak of the crisis and hence reported poor growth performance. This is especially important because, as pointed out in Section 5.2, by Luísa Farinha and Sónia Félix, bank loans are a significant source of funding for Portuguese small and medium sized firms and those that are credit constrained are significantly less likely to invest and survive than their counterparts. In the same vein, Section 5.3, by João Amador and Arne Nagengast, isolates bank credit supply and firms' demand shocks, concluding that the former have a strong and robust negative effect on firm-level investment. In addition, small firms are found to be much more vulnerable to the adverse impact of bank shocks on investment. Moreover, the banking system in Portugal – as in most other countries – is very concentrated such that idiosyncratic shocks to large institutions do not average out in the aggregate, thus having a considerable effect on total lending and hence on investment. The impact of credit to firms on economic growth also depends on its allocation. Despite a shift in new loans from higher to lower risk firms in the latest years, Section 5.4, by Nuno Azevedo, Márcio Mateus and Álvaro Pina, shows that a large share of outstanding credit granted by resident banks goes to firms with very low productivity. This hampers credit reallocation towards firms with higher productivity, which may make it harder for them to invest and upscale.

The pervasiveness of under performing firms that do not exit the market is a challenge in times of structural transformation. These problems partly relate to the lack of competition in the markets but also to administrative burdens. Section 6.1, by *Ricardo Pinheiro Alves and Carlos Figueira*, jointly estimates price-cost-margins and workers bargaining power for a detailed set of markets, concluding that Portuguese labour and product markets are far from the perfect competition paradigm. In the recent years there is some evidence of reductions in price-cost margins in non-tradable sectors, which is beneficial from the perspective of avoiding the over-allocation of resources in such sheltered markets, with potentially adverse impacts on economic growth.

Along with higher educational levels, competition across firms tends to promote innovation, which is a key ingredient for success in

a rapidly transforming world, and pushes unproductive firms out of the market. This is another challenge to be faced by the Portuguese economy. In line with the results from Section 5.4, Section 6.2, by Ana Fontoura Gouveia and Christian Osterhold, presents evidence of a high prevalence of the so-called "zombie firms" in Portugal. While the authors find that there is a positive selection within zombie firms, with the most productive restructuring and the least productive exiting, an important share of these firms are able to remain in the market even if being significantly less productive than their healthy counterparts. By distorting competition and capturing a relevant share of productive resources, the zombies that remain harm the performance of the healthy, more productive firms. A broader view about the efficiency in the utilization of resources in the Portuguese economy, carried out in Section 6.3, by Carlos Robalo Marques, finds that total reallocation of resources, involving the "between effect" of surviving firms and the contribution of entering and exiting firms, had a clearly positive impact on productivity growth in the tradable sector but a negative impact in the non-tradable sector. In fact, the negative performance of total reallocation in the non-tradable sector alone fully accounts for the negative contribution of total input reallocation to productivity developments in the economy as a whole.

Although the above mentioned financial constraints and firm dynamics are important for economic performance, firms' export status is also a key element for success in an increasingly global world. The export performance of firms is affected by a multitude of factors, including management practices, as discussed in Section 4.2, human resources, regulatory barriers and financing conditions. However, only a reduced number of studies has analyzed whether the likelihood of survival differs between exporters and non-exporters, controlling for financial constraints. Section 6.4, by *Paulo M.M. Rodrigues and Mónica Simões*, answers this question, showing that, after controlling for financial variables, exporting firms have on average a higher probability of survival and also present healthier values for financial indicators, which decreases even more the likelihood of exit.

In a changing scenario, with new economies emerging and new technologies at use, performance in terms of international trade of goods and, mostly, services will dictate economic success. Section 7.1, by *Paulo Júlio and José Ramos Maria*, uses a Dynamic Stochastic General Equilibrium model estimated for the Portuguese economy to show that an external demand shock and a productivity (TFP) shock produce similar and lasting positive impacts. Results suggest that both shocks expand GDP, capital, and employment in the short, medium and long term. In addition, export market shares,

defined as the ratio between Portuguese exports and foreign GDP, increase under both simulations. Another important conclusion is that the macroeconomic response outlives the shocks themselves, *i.e.*, the economy continues evolving towards higher production levels even after the exogenous export market share and TFP have achieved their new long-run values.

Shocks are far from being just abstract constructions in models. The sovereign debt crisis in the euro area was a major disturbance, which signaled relevant features of Portuguese firms. Section 7.2, by *Paulo Soares Esteves, Miguel Portela and António Rua,* studies the reaction of Portuguese firms to this strikingly adverse economic episode and unveils their remarkable ability to adjust to new conditions. In particular, the occurrence of a pronounced deterioration of the domestic market translated into an important structural change in the Portuguese economy, with a broader set of firms more oriented towards foreign markets. Even though the above mentioned prevailing limitations associated with educational levels, managerial skills, labour market institutions and financing conditions did not hold back this positive outcome, their absence might have led to even higher export growth rates, in the follow up of a positive export trend that started before the crisis.

In a global world, the internationalization of Portuguese firms is a key development on the path towards economic growth. Section 7.3, by João Amador and Luca David Opromolla, takes a firm-level perspective and shows that Portugal presents a healthy demography of international traders of goods, with high gross entry and exit rates and a significant role for the extensive margin in accumulated terms. Indeed, as mentioned above, entry and exit are important features in markets in order to select the best ideas and the most efficient firms. In any case, despite high mortality rates in the first year of life, the cohorts of exporters in the last two decades have shown a steady path. In parallel, the participation in services trade is also a very important driver of firms' performance, especially in a context where new technologies are making it much easier to provide services remotely. Section 7.4, by João Amador, Sónia Cabral and Birgitte Ringstad, finds that a substantial share of Portuguese non-tourism service traders are active in both export and import flows. Furthermore, there is a high concentration of both exports and imports of non-tourism services in these firms. Compared with firms that only export and that only import, two-way traders tend to be more productive and more profitable. Moreover, as found for international trade in goods, multi-service and multi-country firms are crucial in explaining the level of Portuguese international trade in non-tourism services. In parallel, the ageing of the population, the emergence of new economies with high purchasing power and the frequent travel of workers associated with international provision of services translates into an expansion in tourism services. Portugal has been experiencing substantial growth in this sector. Section 7.5, by *Filipe Caires, Hugo Reis and Paulo Rodrigues,* looks at micro-level data and shows that the number of tourism firms has been strongly increasing and their demography does not differ substantially from that of other sectors, showing that they are resilient and hence not necessarily less productive.

Regulatory barriers play an important role on numerous dimensions of economic activity. In a broad sense, these features are part of the country's technology and can make a difference in terms of the ability to adapt to new technologies and shocks. Section 8.1, by João Amador, Sónia Cabral and Birgitte Ringstad, overviews regulatory costs in the Portuguese economy. It uses specific survey data to link firms' perceptions in a number of regulatory dimensions with their performance, measured in terms of gross value added per worker. The conclusion is that only obstacles related to human resources are identified as having a significant negative relation with productivity both in terms of their importance to firms' activity and in terms of the perceived level of the obstacle. Nevertheless, taking firms' perceptions regardless of their performance, the main area of regulatory costs is the judicial system. Sections 8.2 and 8.3, by Manuel Coutinho *Pereira and Lara Wemans*, precisely focus on features of the Portuguese judicial system. The first of these sections looks at the determinants of demand and productivity in civil justice. As for demand, there is evidence of rationing-by-queuing and important spillover effects from socioeconomic characteristics of regions surrounding courts. Regarding productivity, there is a positive impact associated with the number of incoming cases per judge, judicial staff per judge and specialization. Section 8.3 studies the impact of a reform that waived the intervention of judges in the bulk of enforcement cases and concludes that there has been a positive adjustment of the system to the new rules, reducing the length of such cases. In the more recent period, the greater intensity of resolution in the first years of the case should reflect swifter procedures for identification and seizure of debtors' assets, including the impact of the effectiveness of these mechanisms in promoting voluntary compliance at an early stage. All in all, a swifter judicial system should contribute to Portuguese growth, benefiting both domestic economic agents and foreign investors.

3. Final remarks

Overall, the Portuguese economy presents many structural features that are common to other euro area countries and there is evidence that positive developments have taken place in several dimensions, sometimes as a result of specific reforms. Nevertheless, there are blockages to overcome and the challenges that lie ahead are quite significant. Low labour productivity levels limit the amount of savings available for investment in a context where it is imperative to maintain basic macroeconomic balances. In addition, in a context of global competition for skills, low productivity makes it difficult for firms to pay wages that retain the most talented workers. Therefore, in a world where resources are mobile, the creation of conditions to retain and attract capital, skilled workers, entrepreneurs and researchers must be a priority. In this context, the degree of ambition of the Portuguese society should increase, continuously building on the existing circumstances and not on unsustainable idealized principles, and always with a focus on the coherent implementation and assessment of policies and projects.

The list of questions regarding Portuguese economic growth is long and complex, especially in the context of a changing world economy, whose future contours are themselves hard to anticipate. This book admittedly leaves aside important challenges like the inequality in the allocation of resources, climate change and environmental degradation. Moreover, by their own nature, research results exist to be disputed and potentially replaced by improved versions. If this collection of studies contributes to motivate the discussion about Portuguese economic growth and to implement better policies going forward, its goal will have been fully achieved.

POTENTIALOUTPUT ANDGROWTHACCOUNTING

1.1. Potential output in Portugal and in the euro area: Where do we stand?

Cláudia Duarte, José R. Maria, Sharmin Sazedj

1. Motivation

The economic outlook and growth assessment of a particular country require an overview of potential output estimates. Being Portugal a small country integrated in a large monetary union, with important linkages in terms of labour, capital and technology, it is natural to ask: how does the Portuguese economy compare with the euro area?

Both the *level* and *growth rate* of potential output provide valuable information to assess past, current and future developments, and contribute to design adequate policies. In the short-run, for instance, the difference between Gross Domestic Product (GDP) and potential output levels — the output gap — can provide information about inflationary pressures and reveal the ability (or inability) of the economy to expand without price acceleration. A possible interpretation for this link lies in excess demand paving its way in rigid markets. As the economy evolves towards its long run path, in the absence of additional exogenous disturbances, the output gap should close, and the growth rate of GDP should be equal to the growth rate of potential output.

Higher labour and capital productivity are desirable objectives of any society, as a way to increase potential output and social well-being. In addition to the quantity and quality of inputs, potential output also depends on the talent to efficiently combine these inputs, which is greatly influenced by the role of institutions. The ability of labour and product markets to efficiently allocate resources, with proper incentive mechanisms, and a competitive environment that prevents undesirable economic rents help workers and firms to achieve higher productivity levels. Comparing potential output developments, input markets, or institutional designs in Portugal and in the euro area may help policy-makers to identify areas which justify alternative settings, with a view to maximize social well-being. This Section offers model-based potential output estimates for Portugal and the euro area, following Duarte *et al.* (2019). Observed data is decomposed into trends and cycles by mixing dynamic equations for price and wage inflation with a version of Okun's law and a production function featuring capital, labour and total factor productivity (TFP). A distinctive characteristic of this exercise lies in the assumption that the TFP trend component is an unobserved variable, to be jointly estimated with the remaining unknowns, and thus conditional on the model structure, including on inflation developments. Expectations take an adaptive form. The models are estimated independently for Portugal and the euro area with Bayesian techniques.¹

The main conclusions are threefold. Firstly, results confirm that Portuguese potential output has been decelerating compared with the dynamism of the 1980s and the 1990s, when the unemployment rate below (above) which wage inflation rises (decreases), i.e., the *Non-Accelerating Wage Rate of Unemployment* (NAWRU), remained broadly stable around 5.5%. There is also a confirmation that the financial and sovereign debt crisis of 2010 had long-lasting effects. Current estimates for 2017 place the growth rate of potential output slightly above 1.0% and on an increasing path, which is comparable with mid-2000s' estimates, while the NAWRU is around 8.5% and on a decreasing path.

Secondly, the Portuguese potential output is diverging from euro area estimates since 2003. This evidence adds to the well-known divergence in actual GDP, which reflects both trend and cyclical components, and suggests that structural reforms are needed in order to match the euro area economic performance.

Finally, output gap estimates are typically more volatile in Portugal than in the euro area throughout the entire sample. More recently, we observe a more negative and persistent output gap in Portugal, consistent with larger labour market slack and a relative decrease in wage differentials. In contrast, we detect a relative stability of price differentials during the same period. Results suggest relative inflation expectations as an explanation but further work is needed to shed more light on why nominal developments in product markets did not follow those in labour markets, *i.e.* why the pass through to output prices did not occur.

¹ The main theoretical reference behind the model is Szörfi and Tóth (2018). Almeida *et al.* (2009) and Centeno *et al.* (2009) present alternative estimates and an overview on the Portuguese potential output before 2008.

2. Data

The dataset is quarterly and relies on official national accounts data regarding employment, hours worked, compensation of employees, real GDP and the GDP deflator, and on Labour Force Survey data for working-age population, labour force and the unemployment rate. Price inflation is measured by the annualised growth rate of the GDP deflator and wage inflation refers to the annualised growth rate of compensation per hour worked.

Portuguese data covers the 1980Q1–2018Q2 period. These series where retrieved from Statistics Portugal and Banco de Portugal databases, the latter including the capital stock and historical data prior to 1995.

Euro area data also covers the 1980Q1–2018Q2 period. These series were retrieved from Eurostat, with the exception of the capital stock, which was collected from the macro-economic database of the European Commission (AMECO). Observed data were backdated with the Area-wide model database (Fagan *et al.*, 2001) or with AMECO growth rates, when the former is not available. When only annual data exists, we use spline interpolation methods.

By extending our database to a period prior to the euro area creation, we enrich the analysis with a larger time span and avoid focusing on a sample highly conditioned by the financial and sovereign debt crisis and its long-lasting effects. Additionally, to reduce end-of-period biases, estimates take into account an extension of the sample with projections up to 2021 for Portugal (taken from Banco de Portugal) and up to 2020 for the euro area (taken from AMECO).

3. Model

The analysis in this Section is based on a multivariate filter featuring a production function with unobserved components, such as potential output and the NAWRU. The model decomposes some key observable variables into trend and cyclical components, both of which are unobserved—notably real GDP is decomposed into potential output and the output gap and the unemployment rate into the NAWRU and the unemployment gap.

The unobserved components model uses the production function as a central organizing element—such that developments in potential output can be interpreted in light of changes in production factors and their productivity—which introduces more economic structure compared to statistical filtering approaches. The growth rate of potential output $\Delta \bar{y}_t$ is given by

$$\Delta \bar{\mathbf{y}}_{t} = \Delta \overline{\mathbf{tfp}}_{t} + \iota \Delta \bar{\mathbf{l}}_{t} + (1 - \iota) \Delta \bar{\mathbf{k}}_{t}, \tag{1}$$

where $\Delta \overline{tfp}_t$ is defined as the growth rate of trend TFP, $\Delta \overline{l}_t$ is the change in the trend component of total hours worked, and $\Delta \overline{k}_t$ is the change in observed capital. Further details are available in Duarte *et al.* (2019).

The production function structure allows us to decompose potential output growth into TFP, capital and labour contributions (the latter being further decomposed into the contributions from the labour force, measured in hours, and the unemployment rate). A distinctive characteristic of the model lies on the assumption that TFP is another unobserved variable, to be jointly estimated with the remaining unknowns, as in Szörfi and Tóth (2018). In our model the growth rate of the trend component of TFP is informed by the change in the HP-filtered Solow residual—the residual from the production function after accounting for actual labour and capital data—and is subject to shocks. Changes in trend unemployment (NAWRU) and trend labour force are also informed by low-frequency movements of observed data and are subject to shocks.²

In addition to the Cobb-Douglas production function, the model also includes simple theoretical economic relationships, namely a dynamic version of Okun's law and equations linking output gaps and labour input gaps to nominal developments. Okun's law links the output gap to the unemployment gap, meaning that the latter—a proxy for the level of underutilised resources in the economy—is inversely related with the output gap.

The wage equation assumes that (labour-productivity adjusted) wage growth is conditional on price inflation expectations and on both the labour force gap and the unemployment gap. It should be mentioned that Okun (1962) identified trend unemployment rate as being compatible with "full employment", meaning that the unemployment level would be low enough to result in as much production as possible without generating inflationary pressures. The model also includes a price equation, which determines that price inflation responds to inflation expectations and the output gap. We assume that changes in both wage and price expectations are conditional on past developments and exogenous disturbances.

² Changes in the NAWRU are informed by the variation in the HP-filtered gap between long and short-term unemployment, while changes in trend labour force are informed by the variation of the HP-filtered labour force.

The long-run equilibrium of the model has several appealing characteristics, namely (i) price and wage inflation are constant, (ii) output and labour market gaps are nil, with actual and potential output growing at the same rate, and (iii) real wages grow in line with labour productivity.

4. Results

Figure 1a illustrates the annual change in Portuguese potential output. After a slowdown in the run up to the financial and sovereign crisis of 2010 and a pronounced decline in 2012, model-based estimates point to a recovery of potential output, reaching growth rates around 1.0% in 2017, relatively close to mid-2000s' estimates, yet still considerably below those of the beginning of the sample. These features are relatively common across different models and international institutions' estimates.³

One key factor behind the potential output slowdown throughout the whole sample period is related with the evolution of the capital stock, with a contribution that gradually decreased to below zero, suggesting that investment rates have been insufficient to offset the depreciation of installed capital. Recent developments suggest a slow-moving recovery in the capital stock, mainly spurred by business investment, while public and housing investment are lagging behind. Another structural factor of concern in recent years, and most likely in the years to come, are the demographic developments, namely the decrease in working-age population. In the end of the sample, potential growth is supported by favourable TFP developments, which outweigh negative contributions from both capital and labour.

How do Portuguese developments compare with the euro area? The most striking difference between the two economies is that potential output did not decrease in the euro area—despite some deceleration in growth rates—mainly due to significant contributions from both capital and TFP throughout most of the sample period. Moreover, estimates suggest that potential output growth rates in the euro area are more stable, although the NAWRU has also recorded a slight upward trend. In 2017, the growth rate of euro area potential output stands at 1.6% and the NAWRU at 9.2%. The NAWRU is systematically lower in Portugal than in the euro area over the sample, with the exception of the crisis period. Nevertheless, the

³ See Banco de Portugal (2017).



(a) Growth rates in Portugal | In percentage



(b) Cumulated growth differentials between Portugal and the euro area | Index (1999=100)

Figure 1: GDP and potential output

Source: Eurostat, Banco de Portugal, Statistics Portugal, Area-wide database and authors' calculations.

differences have narrowed considerably compared to the beginning of the sample.⁴

Figure 1b depicts cumulated growth differentials between Portugal and the euro area. The line in the Figure is upward (downward) slop-

⁴ Note that the level of potential output is influenced by the *level* of the NAWRU, while the growth rate is determined by the *change* in the NAWRU.



(a) Differentials in output and unemployment gaps | In percentage points



Figure 2: Differentials in real and nominal developments in product and labour markets

Source: Eurostat, Banco de Portugal, Statistics Portugal, Area-wide database and authors' calculations.

ing if Portugal is growing more (less) than the euro area and, thus, growth differentials are positive (negative). This figure illustrates that while actual GDP was growing above the euro area during most years in the first part of the sample, Portugal registered persistently lower

growth rates during the last two decades, *i.e.* a divergent process.⁵ With regard to potential growth, we find a similar diverging path, which is however less pronounced and highly influenced by the last economic crisis. This implies that the sovereign and debt crisis had both a trend and a cyclical impact.

The main messages remain broadly unchanged when we look at differentials per capita. Although there is some convergence towards the euro area in the most recent period, namely in the case of actual GDP, this reflects the fact that population has been decreasing in Portugal, which is a demographic trend that will eventually take its toll on future growth.

Figure 2a presents the differentials in output and unemployment gap estimates between Portugal and the euro area. The volatile output gap differentials are dominated by the volatility of the Portuguese output gaps (which also tend to be larger). During the last fifteen years, we find consistently lower (and negative) output gaps in Portugal than in the euro area, although the differential has been narrowing in the recent past. In line with Okun's law, periods characterized by a relatively lower output gap are mirrored by higher unemployment gaps, and *vice-versa*. In fact, we find a negative unemployment gap differential in the 1990s and then a reversion to a more pronounced positive differential since the early 2000s.

Figure 2b depicts the evolution of cumulative price and wage inflation differentials. Price and wage inflation were significantly higher in Portugal than in the euro area in the first part of the sample, which explains the positive slopes of the lines in the graph. While both economies went through strong disinflationary processes, the reduction in Portuguese inflation was more significant, narrowing the differential between both economies in the run up to the euro.

The high output gap volatility, together with the acute disinflation that characterized the first two decades of the sample, turn it difficult to reconcile inflation gaps towards the euro area with developments in the output and labour markets. However, in the more recent period, where inflation differentials have narrowed, the persistently negative output gap differential should translate into negative price inflation differentials relative to the euro area. Notwithstanding, price inflation in Portugal remained relatively aligned with the euro area. On the contrary, the consistently higher labour market slack translated into nominal wage adjustments, namely lower wage inflation in Portugal. In other words, there has been a real exchange rate depreciation vis-a-vis the monetary union using wage but not price

⁵ See, for example, Banco de Portugal (2018).

differentials.⁶ This result suggests that the pass-through from wages to prices did not take place in relative terms, or has been at least incomplete. In light of the model this can be explained by relative expected inflation, *i.e.* agents expect a higher price acceleration in Portugal.

5. Caveats

Model specification and results are conditional on several working assumptions. Firstly, the models with euro area and Portuguese data are estimated independently. This implies that international linkages and spillovers are ignored. Secondly, the model lacks a nominal anchor. This implies that inflation targets within the monetary union are ignored. Thirdly, results are also conditional on the law of motion of unobserved variables, for instance on alternative orders of integration for the NAWRU. Choosing between an integration order of 1 or 2 changes the NAWRU's level and volatility, particularly in the Portuguese case. Finally, changes in the sample period have important effects in estimates of some unobserved variable, namely the NAWRU.

6. Final remarks

This Section suggests that the economic divergence that Portugal has been witnessing over the last two decades has both a trend and a cyclical component. The trend component is particularly worrisome given that potential output estimates highlight structural features, which are quite telling about future developments. The results reinforce the case for structural reforms if policy-makers desire to resume a sustainable economic convergence.

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⁶ The real exchange rate depreciation is also visible with unit labour costs. The relative stability of price inflation also holds with the Harmonized Index of Consumer Prices, with or without energy prices, and the private consumption deflator.

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1.2. How have technological progress and efficiency developments contributed to Portuguese growth?

João Amador, Carlos Coimbra, António R. dos Santos

1. Motivation

Total factor productivity (TFP) is an indicator that reflects the ability of an economy to grow over and above the accumulation of inputs like capital and labour and it is typically obtained as part of a growth accounting exercise. Therefore, the analysis of TFP developments is a relevant part of the debate on Portuguese economic growth. However, in order to correctly understand economic performance, GDP growth must be disentangled in such a way that TFP is not obtained as a simple residual, i.e., not just in terms of what is not explained by the accumulation of inputs. Under the broad assumption that every economy can have access to the world technology, which evolves along time for different capital-labour combinations, it is possible to estimate an international stochastic production frontier and decompose TFP as the contribution of technological progress (shifts in the frontier) and efficiency (change in the distance to the frontier).

Intuitively, these two components represent different dimensions to be considered in TFP developments. In conceptual terms, technological progress corresponds to more *productive* techniques, associated with innovations, which are not captured by the conventional methods of computing the stock of inputs. In parallel, improvements in efficiency correspond to better institutional and organizational arrangements, i.e., the more *efficient* use of the current level of inputs and technology. Therefore, for given levels of capital and labour, an economy benefits from the world technological progress, though these gains may not entirely materialize due to efficiency developments. In practical terms the best performers within the set of countries in the sample determine the international frontier, which means that technology can deteriorate if all countries perform worse for each combination of inputs. Moreover, the direct causes for efficiency developments are not identified in this type of methodological approach. Nevertheless, growth accounting exercises based on

stochastic technological frontiers are a step forward in understanding the drivers of growth developments in each period of time.

The seminal contribution in empirical growth literature is that of Solow (1957), which decomposes GDP growth along input's accumulation and TFP. Later, the application of dynamic stochastic production frontiers to growth accounting, notably through Bayesian statistical methods, has been suggested by Koop et al. (1999) for a set of developed economies. A similar exercise was performed by Amador and Coimbra (2007b) for the G7 countries. Our exercise follows this methodological approach and updates the work of Amador and Coimbra (2007a), maintaining all its priors and assumptions, while using a different database and a broader set of countries. The data for GDP, capital and labour is taken from the latest vintage of the Penn World Tables (Feenstra et al. (2015)). The time period covered corresponds to 1995-2014 and the set of countries contains all Member States of the European Union (EU28). This group of countries faces a similar set of institutional constraints, making it likely that they can potentially assess a common technology.

2. The analytical framework

The growth accounting exercise carried out provides results for the contribution of inputs' accumulation and TFP to GDP growth. The TFP contribution is broken down into technological progress and efficiency developments. Moreover, the elasticities of capital and labour to GDP make it possible to disentangle input's accumulation into the contributions of capital and labour. The analysis focuses on three 11 year periods (10 annual growth rates), for which stochastic production frontiers are computed. The decades considered are 1995-2005, 2000-2010 and 2004-2014, covering the initial years of participation in the monetary union, as well as the crisis that followed the 2008 financial turmoil. All results are presented in terms of 10 year average growth rates or contributions.

The dynamic international stochastic production function is assumed to have a translog specification, with a linear trend. As presented in equation 2, for each country i in year t the production function considers capital and labour separately, their interaction and the squares of capital and labour, which is a flexible specification, like:

$$lnGDP_{it} = (\beta_{1} + t\beta_{7})lnA_{t} + (\beta_{2} + t\beta_{8})lnK_{it} + + (\beta_{3} + t\beta_{9})lnL_{it} + (\beta_{4} + t\beta_{10})lnK_{it}L_{it} + + (\beta_{5} + t\beta_{11})lnK_{it}^{2} + (\beta_{6} + t\beta_{12})lnL_{it}^{2}$$
(2)

where K and L stand for capital and employment, respectively.

The sequential Gibbs sampling algorithm was run with 1.020.000 iterations for each decade, with a burn-in of the first 20.000 iterations to eliminate possible start-up effects. The posterior distributions of the relevant parameters show a smooth Gaussian shape, which is compatible with the convergence of the Bayesian algorithm. The posterior median of efficiency levels, i.e., how close the economies are to the technological frontier, in the three decades mentioned above is 89.1, 90.4 and 90.9 per cent, respectively.

3. Growth accounting decomposition

The basic ingredient coming out of the sequential Gibbs sampler is the posterior mean and median for the set of 12 technological parameters, which can be used to compute the elasticity of capital and labour in each country in each year (within each separate decade). These results are presented in Figure 3 for each EU28 country in the decades finishing in 2005 and 2014. The first evidence is that technologies are close to constant returns to scale (with elasticities summing up to nearly 1), which is the expected result. In addition, capital elasticities range from a maximum of 0.8 in Luxembourg to a minimum of 0.3 in Bulgaria in the latest decade. Moreover, labour elasticities increased from the decade ending in 2005 to the one ending in 2014, meaning that the capital elasticities decreased in this period. The Portuguese economy is characterized by relatively high capital elasticities (0.8 and 0.7 in the first and final decades, respectively), meaning that, in the segment of the EU28 production function where Portugal stands, further capital accumulation has a strong impact on GDP levels. In practical terms this highlights the importance of investment as an ingredient in Portuguese economic growth.

In this respect, it should also be noted that capital-labour ratios in the Portuguese economy are relatively low in the context of the EU15. According to the data in Penn World Tables, this ratio stood about 20 per cent below the EU15 average in the period 1995-2005. Although this ratio became closer to the average in the following period, there was a sizable contribution, via reduction of the denominator, coming from the strong job destruction that took place during the latest crisis. Amongst other drivers, the relatively low capital-labour ratios cannot be dissociated from the reduced qualifications of the Portuguese labour force.

Tables 2 and 3 report the results of the detailed growth accounting decomposition for Portugal and the average of the EU28, respectively. The latest decade witnessed a disappointing performance in



Figure 3: Estimated labour and capital elasticities for EU28 countries for periods 1995-2005 and 2004-2014

the Portuguese economy with an average GDP growth of -0.24 per cent. The average posterior Bayesian estimate is very close to this number (-0.22 per cent). Economic growth in the period 2005-2014 was affected by the 2008 global economic and financial crisis and by the following euro area sovereign debt crisis. The sharp correction in the macroeconomic imbalances prevailing in the Portuguese economy, associated with the sudden stop in external financing, had a negative impact on investment and led to the destruction of jobs. The obtained contribution of total input accumulation is small (0.43 percentage points (p.p.)), with capital posting a figure of 0.92 p.p. and labour -0.5 p.p. The contribution coming from technological progress was -0.74 p.p. This contraction in the stochastic EU28 production frontier is compatible with a crisis scenario, with several countries posting negative GDP growth rates. In this context, the Portuguese economy benefited from efficiency gains only to a minor extent (0.09 p.p.).

The comparison of these results with those obtained for the period that corresponds to the preparation and early participation in the monetary union is relevant. The decade ending in 2005 posts an overall better economic performance, driven by capital accumulation but with a negative contribution from TFP developments. The positive contribution from technology (1.10 p.p.) is overturned by efficiency losses (-1.52 p.p.), signaling that structural weaknesses in the Portuguese economy existed before the latest crisis and went beyond input accumulation.

Table 3 presents results for the average of EU28 countries and draws a better scenario for all contributions in both decades discussed. Although the contribution from technological progress was

Decades ending	Observed GDP	Expected GDP		Input		Total F Produc	actor tivity
			Total	Capital	Labour	Technology	Efficiency
2005	2.43	2.83	3.25	2.99	0.26	1.10	-1.52
		(2.09)	(0.13)			(0.55)	(2.13)
2010	0.74	0.86	1.80	1.92	-0.13	0.09	-1.03
		(2.03)	(0.14)			(0.52)	(2.08)
2014	-0.24	-0.22	0.43	0.92	-0.50	-0.74	0.09
		(2.05)	(0.15)			(0.51)	(2.11)

Table 2: Growth accounting results for Portugal

Note: Values in italics in parenthesis stand for interquartile ranges. Observed and expected GDP are presented as percentage average decade growth rates, while inputs and total factor productivity are presented as percentage points (geometric) average decade contributions.

negative in the latest decade, the overall scenario is more benign than in Portugal, notably in terms of efficiency gains. The results are even better if the set of most recent member countries is considered (EU13). This group of countries posted average GDP growth rates of 4.1 and 2.1 percent in the decades finishing in 2005 and 2014, respectively. Their combined TFP contributions to GDP has always been positive. These comparisons put in perspective the results obtained for Portugal and highlight the structural difficulties which existed before the latest crisis that are, to a large extent, still present.

One very important result that is made available by this methodology is the identification of efficiency levels in the economy, which are conditional on the position of the estimated international stochastic frontier. The panels of Figure 4 illustrate segments of the stochastic frontiers computed in terms of capital labour ratio and labour productivity levels. In each of the panels we plot the initial and final year of the decade considered and signal the position of Portugal with black dots. The frontiers are obtained using the estimated technological parameters in each decade and employment is fixed at a level that corresponds to Portuguese employment. With this anchoring and by changing the capital levels we are sure that the relevant segment is being considered.

Decades ending in:	Observed GDP	Expected GDP		Input		Total F Produc	actor tivity
			Total	Capital	Labour	Technology	Efficiency
2005	3.53	3.60	2.27	2.17	0.10	1.04	0.29
		(1.7)	(0.12)			(0.84)	(1.62)
2010	2.38	2.50	2.18	2.07	0.12	0.14	0.18
		(1.6)	(0.16)			(0.81)	(1.54)
2014	1.42	1.31	1.64	1.55	0.09	-0.50	0.17
		(1.5)	(0.15)			(0.78)	(1.43)

Table 3: Growth accounting results for the average of **European Union 28** Note: Values in italics in parenthesis stand for interquartile ranges. Observed and expected GDP are presented as percentage average decade growth rates, while inputs and total factor productivity are presented as percentage points (geometric) average decade contributions.

The important result emerging from the panels of Figure 4 is the existence of sizable persistence gaps in the Portuguese economy. The distance to the stochastic frontier, given the prevailing capital-labour ratios in Portugal explain an important part of the lower labour productivity of the economy. In both decades there was an increase in the capital-labour ratio, although in the latest one this was to a large extent driven by lower employment, but efficiency only slightly improved in the most recent period. Although the methodology is silent about explanations, aspects like the quality of inputs, the efficiency in their allocation across sectors and firms, as well as the institutional aspects are certainly part of the explanation.

4. Final remarks

It must always be borne in mind that results are sensitive to the hypothesis taken and statistical data. In this latter respect, the international data for the capital stock trends are affected by different accounting measures and deflation procedures. International databases like the Penn World Tables try to offer harmonized series, though they may sometimes deviate from national sources. In our exercise, if Portuguese official capital stocks are used and the coefficients estimated for the production function remain those initially obtained, results would be different. The lower capital stock feeds into a negative contribution from this input in the last decade and the lower capital-labour ratio would place the Portuguese economy in a segment of



Figure 4: Stochastic technological frontiers, thousand 2011 US\$

the international production function where technological progress was positive. The hypothesis of fully replicating the exercise with official data for all EU28 countries is not viable due to numerous series breaks and limited time horizon. As for methodological hypothesis, it is important to underline that, although the translog production function offers substantial flexibility, this choice and the assumption of a linear trend for technological progress in each decade affect the results.

The latest decade witnessed a subdued performance in the Portuguese economy. Growth accounting exercises are mechanical by nature but offer a useful assessment of economic performance, especially if other countries are explicitly taken as benchmarks. This is possible to achieve with the stochastic production approach, notably in terms of detailing TFP developments. We confirm the long standing narrative that structural problems persist in the Portuguese economy as there are sizable efficiency gaps, side by side with relatively low capital-labour ratios.

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1.3. What is the role of demography and education on future Portuguese output growth?

Joana Garcia, Hugo Reis, João Amador

1. Motivation

Similarly to other developed countries, Portugal is undergoing profound changes in its age structure as a result of low fertility rates and an ongoing rise in average life expectancy. Over the last years, this process has intensified, and population has started to decline. The impact of the demographic transition is therefore already visible and not only a long-term concern.

Demographic changes are phenomena that can cause profound changes in social, economic and political structures. In particular, there are questions on the impact on public finances, namely in terms of expenditure on health and especially pensions, on the effect of changes to the voters' age structure on the approval of certain policies and, more generally, on the impact on economic growth. In this Section we discuss the main trends implied in demographic projections and their implications for Portuguese economic growth in the next decades.

2. Demographic projections for 2016-2070

Eurostat's latest demographic projections for 2016-2070 point to a marked change in the Portuguese population's age structure over the next decades (Figure 5). This evolution reflects fertility rates below replacement levels and an ongoing increase in average life expectancy (Figure 6). Net migration flows are projected to be positive, but of low magnitude.

Based on the dynamics of these variables, projections show a gradual reduction in total population to around 8.0 million in 2070 (23 per cent less than in 2016), essentially reflecting the trend in the working-age population (15-64), for which a 37 per cent decline is projected (Figure 7a).



Figure 5: Age distribution of the Portuguese population Sources: Eurostat and authors' calculations.



Figure 6: Fertility rate and life expectancy Notes: Shaded area – projections. Total fertility rate – number of births per women; life expectancy – years. Sources: Eurostat and authors' calculations.

In tandem with a decrease in population, ageing is projected to intensify, translating into a gradual increase of the old-age dependency ratio from 32 per cent in 2016 to 67 per cent in 2070 (Figure 7b). The evolution of this ratio reflects a sharp increase in the share of population aged 65 and over combined with an also quite marked decline in the share of the working-age population.



(a) Population

(b) Old-age dependency ratio

Figure 7: Population and old-age dependency ratio Notes: Shaded area – projections. Population – millions of people. Old-age dependency ratio – population aged 65 and over as a % of the population aged 15-64.

Sources: Eurostat and authors' calculations.

3. Impact on economic growth: methodology

The impact of the demographic transition on economic growth may be addressed from different perspectives. We adopted a growth accounting perspective to the detriment of a more complex analysis relying on a macroeconomic model. This exercise is therefore a first approach to the impact of the demographic transition on growth rather than an exhaustive analysis that considers the interaction among different growth factors.

As a starting point, a Cobb-Douglas production function with the following specification has been considered:

$$Y = A(hL)^{\alpha} K^{(1-\alpha)}, \tag{3}$$

where Y represents real GDP, A corresponds to total factor productivity (TFP), h to the level of human capital as measured by the average number of years of schooling of the labour force, L to the quantity of labour, K to the capital stock and α to the GDP elasticity with respect to labour. By using a Cobb-Douglas production function one assumes a unitary elasticity of substitution across factors.

Taking the logarithm and considering the first difference, growth of GDP *per capita* can be written as follows:

$$\frac{\widehat{Y}}{P} = \widehat{A} + \alpha \widehat{h} + \alpha \frac{\widehat{L}}{P} + (1 - \alpha) \frac{\widehat{K}}{P'}$$
(4)

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where P corresponds to total population. So as to isolate the impact of demographic developments in a strict sense, employment *per capita* can be broken down into:

$$\frac{L}{P} = \frac{L}{P_A} \times \frac{P_A}{P_{15-64}} \times \frac{P_{15-64}}{P},$$
(5)

where P_A corresponds to the labour force and P_{15-64} to population aged 15-64. The capital stock *per capita* can be broken down into:

$$\frac{K}{P} = \frac{K}{L} \times \frac{L}{P}$$
(6)

Hence, growth of GDP *per capita* can be broken down into the following contributions:

$$\frac{\widehat{Y}}{\widehat{P}} = \underbrace{\widehat{A}}_{TFP} + \underbrace{\alpha \widehat{h}}_{Human \ capital} + \underbrace{\underbrace{\widehat{L}}_{P_A}}_{Employment \ rate} + \underbrace{\underbrace{\widehat{P}_A}_{P_{15-64}}}_{Activity \ rate} + \underbrace{\underbrace{\widehat{P}_{15-64}}_{P}}_{Pure \ demographic \ effect} + \underbrace{\underbrace{(1-\alpha)}_{\widehat{L}}^{\widehat{K}}}_{Capital \ stock \ per \ worker}$$
(7)

In this Section, we focus on the contribution from human capital, the employment rate, the activity rate and the pure demographic effect, not analysing the contribution from the other two components (TFP and capital stock per worker).

The α elasticity is approximated by the historical labour income share as a percentage of value added, which equals 0.64 (see Almeida and Félix (2006)).

As far as human capital is concerned, it is assumed that the average number of years of schooling of the labour force will continue to increase, converging to around 12 years in 2070.⁷ This results from the fact that the level of human capital in Portugal is quite low in comparison with other developed countries. In particular, in 2018 around 56% of the labour force had completed secondary education, against around 78% in the euro area (Eurostat – Labour Force Survey). The quality of human capital, although relevant, is not taken into account in the analysis because it is difficult to quantify, particularly in the context of a projection scenario.

⁷ The average number of years of schooling of the labour force in the period 2016-18 was computed using the Labour Force Survey of Statistics Portugal and it is approximately equal to 10. For a longer series, computed from the data of Barro and Lee (2013), see Banco de Portugal (2015).

For the employment rate, activity rate and pure demographic effect, the projections from Eurostat and European Commission (European Commission (2018)) were used.

There is high uncertainty surrounding the projections of net migration flows and projections for these flows take into account the number of persons, without considering their level of education. In addition to this limitation, there are endogeneity issues inherent to the exercise. As such, results should be interpreted with caution.

4. Impact on economic growth: results

Figure 8 shows the contribution of each component under analysis to GDP *per capita* growth, both for each year and in cumulative terms.

An immediate conclusion is that pure demographic developments – as measured by the ratio of population aged 15-64 to total population – have a very sharp negative contribution to GDP *per capita* growth up to 2050, more pronounced until the early 2040s. In cumulative terms, this contribution amounts to -19.7 p.p. in 2050 and -21.1 p.p. in 2070. The contribution from human capital is expected to partially offset the negative contribution from the pure demographic effect. Cumulatively, its contribution amounts to 10.4 p.p. in 2050 and 11.5 p.p. in 2070. The contribution from the employment rate is particularly strong up to 2019, reflecting the continued decline in the unemployment rate. Subsequently, this contribution becomes somewhat low, as that of the activity rate.

Therefore, the key conclusion drawn from the analysis is that in Portugal the adverse impact of demographic developments on growth will coexist with a favourable impact from a more skilled labour force.

5. Policies and issues for discussion

The economic impact of the population decline and ageing projected for Portugal should be mitigated by a series of suitable public policies. The necessary improvement of the institutional, legal and tax framework governing the activity of economic agents and the increase in quality of public expenditure require measures that in various cases may be more difficult to approve by an older electorate. This stresses the urgency of compromise and approval of the policy guidelines needed for a successful response to demographic challenges.



(b) Cumulative annual contributions - 2016=100

Sources: Statistics Portugal, projections from Eurostat and European Commission and authors' calculations.

This Section highlights the importance of education policies for mitigating demographic developments, and therefore these policies must be analysed (even more) carefully. In addition, policies that support a higher birth rate, policies to attract (and if necessary integrate) foreign workers, and the revision of employment policies, in particular in the higher age cohorts of the labour force, will also play a relevant role.

These policies should be credible and ongoing, for their success largely depends on agents' expectations. Furthermore, they should be designed in an integrated manner and combined with structural reforms that raise productivity, notably as regards factor mobility, innovation and competition in product markets. Ultimately, the effects of demographic trends should be accommodated via sustained total factor productivity growth.

Figure 8: Contributions to GDP per capita growth

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2 HUMAN CAPITAL

2.1. Is it still worth investing in education?

Maria Manuel Campos, Hugo Reis

1. Introduction

There is a wide strand of empirical literature shedding light on the magnitudes and explanatory factors of returns to schooling in both advanced and emerging economies. In the case of Portugal, returns to schooling rank high among European Union countries.⁸ Vieira (1999) and Sousa *et al.* (2015) present estimates for an additional year of school ranging from 7 to 11 per cent at the mean of the wage distribution, while Machado and Mata (1998), Hartog *et al.* (2001) and Martins and Pereira (2004) show that returns are higher at upper quantiles. Moreover, existing evidence points that the returns are especially high in the case of individuals with university education (Alves *et al.* (2010) and Portugal (2004)), among which unemployment rates are also consistently lower, especially when compared with that of high school graduates (Figure 9).

The returns to schooling in Portugal may however have changed over the last couple of decades, given the remarkable increase in the average educational attainment of the labour force. Higher educational levels are still generally associated with higher wages. Importantly, the differential between wages of individuals holding university degrees and those with only secondary education is large and it widens across the life-cycle (Figure 10). However, the average differential has recently been shrinking and the percentage of university-educated workers with below-median wages increased. These pieces of evidence motivate the discussion on whether it *still* pays-off to invest in university education. Such discussion provides valuable insight for individuals, informing their decisions on how much to invest in formal education. It is also relevant for policy makers by providing guidance for the design of programs and incentive schemes to promote individual investment in education.

This Section, based on Campos and Reis (2018), complements the existing evidence on returns to schooling in the Portuguese economy,

⁸ Refer to, for instance, Psacharopoulos (1994), Martins and Pereira (2004), Psacharopoulos and Patrinos (2004) and Montenegro and Patrinos (2014).



Figure 9: Unemployment rate by level of schooling Note: The Figure depicts the average annual unemployment rate among individuals aged between 15 and 64. Source: Labour Force Survey.

providing an overview of how they have changed since the late 1980s. We show that investing in tertiary education still yields significant individual returns.

2. Analytical framework

The analysis presented in this Section is based on data drawn from *Quadros de Pessoal* (QP) covering the 1986-2016 period (except 1990 and 2001 for which data are not available).⁹

A first grasp of the return to university education may be obtained by comparing the (present value of) costs and benefits of undertaking such investment accumulated over the lifecycle. In particular, assume that:

1. The costs of tertiary education correspond *only* to the average foregone earnings or the opportunity cost of spending four years in university instead of entering the labour market straight after finishing secondary education (the lighter shaded area in Figure 10); and

⁹ QP data cover every establishment paying wages in the Portuguese private sector: general government, military staff, self-employed and household employees are thus excluded.



Figure 10: Average wage over the life-cycle

Notes: The darker shaded area represents the lifetime additional earnings associated with holding a tertiary degree instead of completing only secondary education. The lighter region represents the opportunity cost of spending four year in university instead of entering the labour market after completing secondary education. Earnings are expressed in 1986 prices.

Source: 2016 Quadros de Pessoal.

2. The benefits are only the average additional earnings of individuals holding tertiary, compared to those which only hold secondary education, accumulated over the whole career (the darker area in Figure 10).

On the basis of a (standard) discount rate of 2%, these simplified assumptions imply a rate of return for the investment in tertiary education of approximately 5% in 2016. This provides only an approximation as it does not take into account the whole range of costs and benefits incurred. Moreover, this figure is based on the rough comparison of wages of individuals that may differ as regards many observable and unobservable endowments. A better gauging of the returns to schooling can be achieved on the basis of the analytical framework proposed by Mincer (1974) which illustrates the empirical relationship between education and earnings as:

$$\ln y_{i} = \alpha + \beta S_{i} + \lambda_{1} Exp_{i} + \lambda_{2} Exp_{i}^{2} + \epsilon_{i}$$
(8)

where $\ln y_i$ is the logarithm of earnings of individuals; S is a measure of educational attainment and Exp refers to individuals' experience in the labour market.

We run the regressions separately for each wave of QP, assuming a cross-sectional set-up and taking *age* (as a second order polynomial) as a proxy for labour market experience.¹⁰ We control for educational attainment by including a set of binary variables for each of the following levels: 1) less than the 9th grade; 2) 9th grade; 3) secondary education; and 4) tertiary education. The coefficients referring to these variables yield the wage premia relative to individuals holding less than the 9th grade, which is the category omitted in the regressions. As we are interested in the wage gain relative to the schooling level immediately before, we take the *difference in the coefficients* as a measure for the return associated with each level.

2.1. Results

Figure 11 plots the returns for each schooling level (vis-à-vis the level immediately before), at the mean of the wage distributions referring to male and female workers. It shows that women tend to benefit from larger returns to education than men. The premium associated with completing the 9th grade sharply declined since the 1980s. According to our results the magnitude estimated on the basis of 2016 data corresponds to approximately half the figures obtained for 1986. Regarding secondary education, there is evidence that the gain relative to completing only the 9th grade increased along 1986-2016, but it is still considerably below the one referring to tertiary education. Finally, the premium associated to tertiary education markedly increased along the 1990s against a background of an expansion in the pool of workers holding university degrees, suggesting that such increase was demand-driven.

Since the beginning of the 2000s, the returns to university education have been declining steadily, particularly in the case of women. Results obtained by Campos and Reis (2018) on the basis of Quantile Regressions (which yield estimates at different points of the wage distributions) show that such decline is particularly relevant for low-earning individuals, whose wages place them at the bottom of the wage distribution.

An analysis by age (Figure 12) focusing on the post-2005 period suggests that this evidence is driven by developments referring to younger workers: these not only benefit from lower returns to university education than their older counterparts, but they have also experienced sharper drops in returns in the most recent period. In

¹⁰ The regressions include a set of other covariates: the individual's tenure in the current firm (also as a second order polynomial), and the logarithm of the current firm's size.



Figure 11: Returns to schooling at the mean of the wage distribution by educational attainment

Note: The Figures depict the per cent wage premium associated with each educational level relative to the level immediately before.

this regard, it should be noted that this analysis does not differentiate between holders of a Bachelor's degree (*Licenciatura*) from those holding a Master's or a Doctorate. Existing evidence suggests that the decline in the premia for tertiary education in the last decade was driven by developments referring to workers with a *Licenciatura* only, whereas for those with post-graduate studies there was actually an increase (Figueiredo *et al.* (2017)). This evolution occurred in parallel with the implementation of the Bologna reform which, on the one hand, implied a reduction in the number of years of study required to obtain a *Licenciatura* and may have contributed to decrease the value given by employers to this degree. On the other hand, the reform has also contributed to increase demand for Master's degrees and an expansion in post-graduate programmes offered by universities, not only in terms of quantity but also in terms of the range of covered specialization fields - something that employers are likely to value.

3. Discussion and concluding remarks

This Section sheds light on the recent evolution of private returns to schooling in the Portuguese economy. These are found to be higher in the case of women and to increase with educational attainment.



Figure 12: Returns to tertiary education by age Note: The Figure depicts the relative wage increment from obtaining an university degree vis-à-vis completing only secondary education.

The returns to schooling increased in the late-1980s and the 1990s, especially as regards tertiary education. This occurred in parallel with an expansion of the pool of workers holding university degrees, suggesting it was surpassed by a rise in the demand for skilled labour. During the late-1990s and early-2000s, the wage premium for tertiary education remained relatively stable. In the most recent period the magnitude of the returns to tertiary education declined, an evolution that may have been driven by the drop in the number of years required to complete a *Licenciatura*, brought about by the Bologna reform. In any case, in Portugal, tertiary education remains a profitable investment for individual agents and policy makers must take this into account when designing policies and incentive schemes.

The current challenge for policy makers relies on ensuring the quality of the public school system while providing low-income households conditions to access university education, incluing at the post-graduate level. This cannot be done at the expense of low quality pre-school or elementary education, as investments in lower schooling levels increase the returns to subsequent ones. These tensions may require a reshuffling in terms of the funding sources, including an increase in the share of costs supported by the individuals in tertiary education. This may require not simply increasing tuition, but also the setting up of an effective loan scheme (such as the one recently implemented in the UK that is contingent on graduates' future earnings). Ensuring access to the increasingly more valued post-graduate programmes - whose tuition prices are considerably higher than those of *Licenciaturas* - is paramount.

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2.2. How has improvement in workers' educational attainment impacted educational mismatches?

Ana Catarina Pimenta, Manuel Coutinho Pereira

1. Motivation

A structural feature of the Portuguese workforce has been a low level of education by European standards. Over the last decades, however, there has been a considerable increase in workers' educational attainment. At the same time, occupations requiring more qualifications have gained importance, as economies modernize and the weight of technology intensive industries grows. Such developments have impacted on educational mismatches, that is, the lack or excess of education relatively to that required for workers to adequately perform their jobs. These phenomena are known, respectively, as undereducation and overeducation.

Educational mismatches entail costs for the economies. Overeducation prevents workers' qualifications to be fully put to use, while undereducated workers are likely to have a deficit of skills impacting negatively on their productivity. Furthermore, educational mismatches may indirectly impact firm productivity through their effects on wages and, more generally, job satisfaction.

This Section, based on Pimenta and Pereira (2019), deals with educational mismatches in Portugal over the last two decades. A first issue considered is the impact on undereducation of the catching up of the portuguese workforce to higher education levels. There has been a consistent reduction in undereducation, in line with the replacement of generations in the labour market. Higher undereducation in Portugal vis-à-vis European Union countries is currently mostly a problem of older employees. Additionally, the growing number of highly educated workers coming to the labour market, particularly college graduates, has given rise to overeducation only to a very limited extent. In particular, the figures for Portugal stand below those for the majority of the European countries.

2. Data and computation of educational mismatches

The evolution of educational mismatches is assessed on the basis of two micro datasets: Quadros de Pessoal, for Portugal, and the Survey on Income and Living Conditions (EU-SILC), for the European Union countries. The two key variables are employees' occupations and educational attainment. The evaluation of educational mismatches relies on the definition of a required education level for each occupation. In general, measured mismatches depend heavily on such a definition, while there is no single best methodology for determining the required education level. The results presented in this Section are based on a standard correspondence between the International Standard Classification of Occupations (ISCO-08) and the International Standard Classification of Education (ISCED-97), developed by the International Labour Organization (ILO, 2012). Pimenta and Pereira (2019) use a 6-occupation-breakdown, corresponding to a slightly aggregated version of eight ISCO-o8 major groups: Unskilled workers, Skilled manual workers, Services and Sales workers, Administrative staff, Technicians and Professionals.

3. Evolution of educational mismatches in the portuguese labour market

Figure 13 presents the evolution of overall educational mismatches and Figure 14 shows the breakdown by occupations and potential experience cohorts. The approximation of portuguese workforce education to European standards implied a consistent reduction of undereducation over time, from around two thirds of the employees in



Figure 13: Evolution of overall educational mismatches according to ISCO-ISCED indicator (in percentage).

Source: Authors' calculations based on Quadros de Pessoal (1995-2013).





(b) Cohort over 30 years of experience



Note: Numbers on the bars refer to the education required for each occupation in each year: o=None, 1=1st cycle of primary education, 2=2nd cycle of primary education, 3=3rd cycle of primary education, 4=Upper secondary and Post-secondary education and 5=Tertiary education.

Source: Authors' calculations based on Quadros de Pessoal (1995-2013).

1995 to approximately one third in 2013 (Figure 13). This trend is common to all four potential experience cohorts, although the level of undereducation varies substantially across such cohorts (Figure 14). It stood at around 80% for the cohort of employees with more than 30 years of experience, in the mid-90s, remaining at 60% at the end of the sample. In contrast, in the lowest experience cohort, undereducation came down from approximately 33% at the beginning of the sample to 7% at the end of it. The decreasing profile of undereducation over time within potential experience cohorts reflects the gradual replacement in the labour market of older generations by newer, more educated ones. Overeducation remains a rather unimportant phenomenon throughout, rising from negligible values at the beginning of the sample to around 5% at the end of it (Figure 13). Overeducation is higher for employees with up to 10 years of experience, increasing



Figure 15: Occupations and educational mismatches of college graduates according to ISCO-ISCED indicator.

Notes: Low-skilled occupations include Unskilled workers; Intermediate-skilled occupations include Skilled manual workers, Services and Sales workers and Administrative staff; Highly-skilled occupations include Technicians and Professionals. According to ISCO-ISCED correspondence, overeducated college graduates are those in low- and intermediate-skilled occupations.

Source: Authors' calculations based on Quadros de Pessoal (1995-2013).

from 4% in 1995 to 12% in 2013. For more experienced cohorts, the proportion of overeducated employees is still negligible at the end of the sample (Figure 14).

3.1. Overeducated college graduates

The increase in the proportion of college graduates in the Portuguese labour force has been a prominent development in the last two decades. Figure 15 shows that the proportion of college graduates in the total number of employees increased from about 3% to 16% between 1995 and 2013. These employees have been mainly hired by the service sector, whose weight in employment of college graduates has gone up, matching a decrease in the weight of manufacturing.

The share of overeducated college graduates in the total number of college graduates has gone up in the first decade of the sample (from 20% to 30%) and then approximately stabilized. Despite the increase in overeducation, the bulk of the incoming college graduates coming to the portuguese labour market were able to find highly-skilled occupations, in which the economy should profit most from their qualifications.



Figure 16: Evolution of educational mismatches by European Union country between 2007 and 2016 using ISCO-ISCED indicator (in percentage).

Notes: All results were weighted with sample weights, which allow an extrapolation to the entire population. The 26 countries represented are: Belgium (BE), Bulgaria (BG), Czech Republic (CZ), Denmark (DK), Germany (DE), Estonia (EE), Ireland (IE), Greece (EL), Spain (ES), France (FR), Italy (IT), Cyprus (CY), Latvia (LV), Lithuania (LT), Luxembourg (LU), Hungary (HU), Malta (MT), Netherlands (NL), Austria (AT), Poland (PL), Portugal (PT), Romania (RO), Slovenia (SI), Slovakia (SK), Finland (FI) and Sweden (SE).

Source: Authors' calculations based on EU-SILC.

3.2. Educational mismatches: Portugal vis-à-vis the European Union

Figure 16 presents an international comparison of educational mismatches for 2007 and 2016. Portugal is the country with the highest incidence of undereducation in both years, despite the reduction from 2007 to 2016. This disadvantage of Portugal vis-à-vis the European Union mainly reflects the low levels of education of more experienced employees in intermediate-skilled occupations. However, the aforementioned approximation of the level of education of the Portuguese workforce to international standards has contributed to mitigate such a disadvantage.

It is worth noting that the Portuguese workers employed in low-skilled occupations also had lower levels of education than their European peers, but this does not show up as undereducation because the ISCO-ISCED methodology considers as required education a very broad scope of attainment levels (as we can see in Figure 14). Moreover, some undereducation remains in highly-skilled occupations (specially for Technicians), but this is common to other European countries.

As regards overeducation, Portugal has an incidence below the European Union average and this holds throughout experience cohorts.

4. Final remarks

There has been a steady decline in the proportion of undereducated employees in the Portuguese labour market as younger and more educated generations replace the older ones. In turn, overeducation in Portugal has slightly increased but remains low, even in more recent years. An important caveat for the methodologies used is that required education is evaluated solely on the basis of formal education, while other skills coming from broad-based knowledge, on-the-job training and experience might be equally important for workers to adequately perform their jobs. Additionally, one is only looking at on-the-job mismatches and does not observe the workers who could not find a job (and perhaps were unemployed or emigrated), something that may have been particularly important around 2013, coinciding with the economic downturn.

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2.3. What is the relative advantage of vocational education in the Portuguese labour market?

Joop Hartog, Pedro Raposo, Hugo Reis

1. Introduction

Debates on the relative value of vocational versus general education have a long history among educators, politicians, lobbying employers, labour leaders and opinion leaders. It's a very broad issue, considering arguments such as intellectual and cultural preparation for adult life, citizenship and lifetime labour market prospects, too broad for analysis in a single sweep.

School systems usually differentiate among vocational and general (or academic) tracks. Vocational education will prepare rather directly for specific occupations and train the students in the skills needed in these occupations. General education teaches more broader, more basic abstract skills not directly related to tasks in particular occupations.

The relative benefits of vocational versus general education are often perceived to differ by career stage: (i) relative short-term benefits enhanced by vocational skills and (ii) relative long-term benefits enhanced by general skills. In other words, potential gains in youth by the vocational system facilitating the transition from school to work may be offset by less adaptability in the future. Empirical evidence is relatively limited. The main exceptions are the recent papers by Golsteyn and Stenberg (2017), Brunello and Rocco (2017), and Hanushek et al. (2017). In terms of earnings, Golsteyn and Stenberg (2017), show some evidence for Sweden supporting the trade-off result. For the UK, Brunello and Rocco (2017) find also evidence of a trade-off, but only for the group with secondary vocational education. In terms of employment, Hanushek et al. (2017) find evidence of the mentioned trade-off in countries with strong emphasis on apprenticeship programs. In a different context but also related, Malamud and Pop-Eleches (2010) examines the relative benefits of general education and vocational training during Romania's transition to a market economy. For Portugal, Pereira and Martins (2001) find that with a Mincer earnings function over the period 1982-1995, a

lower secondary technical degree pays always more than its academic counterpart and, over the years 1994 and 1995, that upper secondary vocational education paid better than general education. Oliveira (2014) finds that between 1993 and 2009, workers with vocational education initially have a wage advantage, but wages are higher for workers with general education after eight years of experience.

This Section follows up and complements the analysis on Hartog *et al.* (2018), providing evidence for the period 2011-2016 and for different levels of education in Portugal. More specifically, we compare the wage trajectories over the life course associated with high school vocational, high school general, higher education and less than secondary education, for a country where the vocational system is not so well developed and most likely still in a transition period. We also compare these groups in terms of risk measures defined as the coefficient of variation of wages, and unemployment rate. As expected, in terms of wages, high school vocational students are always worse off than higher education and always better off than less than secondary. Nevertheless, when comparing with the high school education we find evidence supporting the short-term advantage of the high school vocational and its long-term disadvantage. We find similar conclusions in terms of the risk measures.

2. Data and institutional setting

For the wage analysis, we use data from the Portuguese Quadros de Pessoal (QP), a longitudinal dataset that covers all workers in firms with at least one employee, irrespective of age. Our sample includes full-time wage earners in the private non-farm sector. Moreover, civil servants are not covered by QP and we dropped the self-employed as the data on this category is too noisy. We use data from 2011-2016, restricted to birth year cohorts 1968-1996 including only individuals that started school in the "modern system", i.e after the Law 46/86 that established the current system with 3 cycles of 9 years of basic school, and 3 of secondary school. At the same time, only the cohorts that were born in 1968 onwards are affected by the Law 194-A/93, which established the dual certification. For more details on the Portuguese education system please see Hartog et al. (2018). The selection analysis is performed using data from the Observatory of Student Pathways in Secondary Schools (OTES), in particular from the survey among students at the beginning of the secondary education. It is a representative survey, provided by the Ministry of Education, among students in tenth grade, i.e. the first year of our upper secondary level. Finally, the unemployment data is from the Portuguese Labour Force Survey, provided by Statistics Portugal(INE).

Since 1986, the Portuguese system has 3 years of differentiated secondary education, which is characterised by subject specialisation and is organised in different paths. More specifically, vocational education provision is concentrated mainly at the secondary level, while the vocational component at the basic and higher education levels represents a small share of the system. The vocational path follows the structure set in the legislation, comprising a general component and a training component. In Portugal the main vocational qualification is the "Professional Programmes" which accounts for around 70% of the enrollment in the vocational path.¹¹ This path lasts for three years with approximately 3200 hours. On the job learning is mandatory and lasts 600-840 hours, corresponding to 19-24% of the overall programme, and are offered by public and private schools.

3. Selection issues

We cannot take for granted that students choosing a vocational education or a general education are identical. For three recent school cohorts, we use data on students' performance in the period before entering upper secondary education. The data are from the Observatory of Student Pathways in Secondary Schools (OTES), in particular from the survey among students at the beginning of the secondary education. It is a representative survey, provided by the Ministry of Education, among students in tenth grade, i.e., the first year of our upper secondary level.

With this data, we can check the effect of ability and family background on actual track choice. Table 4 shows that mothers' education, whether measured in years or levels, has a significant effect on track choice: children from higher educated mothers choose the general track more often. This effect is much smaller for those who do not intend to continue education after secondary level than for those who do. In the latter case, reading score has a positive effect on the likelihood of choosing the general track, while math score has no significant effect. Since math scores are generally considered a good indicator of general intellectual ability (or IQ) and reading scores are taken as an indication of taste and talent for more scholastic engagement, this would indicate that students who choose the secondary education are not necessarily of lower ability, but have an interest in more practical, directly applicable education. However, this is a rather speculative interpretation which would require more evidence to substantiate. Therefore, we can document that in recent

¹¹ Other components: Apprenticeship programmes, Education and training programmes for young people, specialised art programmes, and other specific vocational programmes.

Variables	All General	General - with no intention
	and	to continue education after high
	All Vocational	school and All Vocational
	(1)	(2)
Mothers' years of schooling	0.0160***	0.00978***
	(0.00105)	(0.00218)
Reading Score (9th grade)	0.0703***	0.0265**
	(0.00469)	(0.0119)
Math score ((9th grade)	0.0498***	-0.00897
	(0.00433)	(0.00929)
At least one retention	-0.277***	-0.137***
	(0.0105)	(0.0142)
Age finishing 9th grade	-0.0579***	-0.0407***
	(0.00384)	(0.00661)
Gender	0.0650***	-0.00640
	(0.00828)	(0.0147)
Family structure (ommited: mother and father)		
Monoparental	-0.0153*	0.0269
	(0.00871)	(0.0183)
Couple but not father or mother	-0.0204	0.0288
	(0.0129)	(0.0246)
Other	0.0213	-0.0257
	(0.0175)	(0.0341)
Mother labour market status (ommited: employed)		
Unemployed	-0.0301**	-0.0108
	(0.0118)	(0.0193)
Domestic occupation	0.00680	0.0205
	(0.00979)	(0.0168)
Student	0.000722	0.0678
	(0.0353)	(0.0940)
Retired	-0.00816	0.0453
	(0.0175)	(0.0347)
Constant	1.041***	0.837***
	(0.0668)	(0.118)
Observations	35,023	6,840
R-squared	0.255	0.057

Table 4: Selection at secondary level

Note: Linear Probability Model estimates of the Likelihood of choosing the General track, for students at the 10th grade in the academic years of 2007/08, 2010/11, and 2013/14. The data are from the Ministry of Education, Observatory of Student Pathways in Secondary Schools (OTES). In Column (1) we use data from all students both in general and secondary education. In Column (2) the sample includes all vocational students but for the general track only students who have stated that they do not intend to continue education after graduating from upper secondary school. Both specifications include also year fixed effects. Robust standard errors in parentheses. * Significant at 10%; ** significant at 5%; *** significant at 1%.
years there is a large gap in school performance (*ability*) between vocational students and general students that go on to advanced education but only a modest negative gap with general students that refer no intention to continue.

4. Wage analysis

Next we turn to a simple analysis of the wage premium of the vocational graduate students on the basis of the well-known Mincerian wage equation that captures the empirical relationship between education and wages.

Table 5 shows vocational graduates wage premium (unconditional and conditional on age, gender, tenure, and firm size) relative to other education levels: Less than secondary, general secondary, and higher education. There is a positive premium compared to completing less than the secondary education, reaching on average almost 20% (almost 30% in the conditional specification). When compared to the higher education workers, the wage premium is clearly negative, reaching on average more than 50% in both specifications. Figure 17 shows that in both cases, the gaps increase with age. In particular, for individuals aged 45-49, the higher education premium is almost 70% and above 30% when compared to individuals with less than secondary education.

Graduates from vocational secondary education have about 8% lower wage than graduates with general education as their highest degree. Once we control for individual and firm characteristics, the gap shrinks to only 2%, on average (Table 5). By age, Figure 17 shows that there is a positive gap until age of 30 (around 2.5% for workers between 25 and 29), followed by a negative premium for older workers (almost 10% for individuals aged 45-49).

	Unconditional	Conditional
Less than Secondary Education	0,17	0,28
High School General Education	-0,08	-0,02
Higher Education	-0,55	-0,51

Table 5: High School Vocational graduate wage premium

Note: Conditional regression includes gender, age, age squared, tenure, tenure squared, log of firm size and year specific effects.



Figure 17: Log hourly wage - Life cycle profile by education level

5. Some "risk" measures

A trend to expand the curriculum of lower and extended vocational educations to include more general skills like math and languages has been observed in many countries, often to the dismay of students and employers. In Portugal, policy makers always motivated such expansion with the claim that vocational graduates will have a stronger position in a dynamic labour market, face less risk and have higher lifetime returns. In this setup, next we turn to the analysis of risk indicators by type of education: earnings variance, earnings coefficient of variation and unemployment rate.

Figure 18 shows that in terms of financial risk, higher education presents clearly a less riskier profile, while individuals with less than secondary education face a higher risk when compared to the vocational graduate individuals. As in the wage profile, we observe a short-term advantage of the vocational graduates but a long-term advantage of the general high school graduates.

In terms of unemployment, using data from the Portuguese Labour Force Survey, we observe a lower unemployment rate for the individuals with higher education levels (Figure 19). Nevertheless, in contrast to the other indicators, when compared to workers with less than secondary and with general high school graduates, we observe a higher unemployment rate for the vocational high school graduates between 2011-2014 but a lower one in the most recent period. These developments are likely to be related with the economic cycle, and potentially a result of the higher flexibility of the vocational type of



Figure 18: Earnings coefficient of variation, by education level



Figure 19: Unemployment rate, by education level

workers. By age, we do not observe a clear pattern by education groups.

6. Concluding remarks

Portuguese students tend to favor general education over vocational alternatives. However, it can be argued that vocational education is both under-developed and under-valued in Portugal and most likely

still in a transition period. Indeed, a non-trivial share of those entering higher education drop-out without obtaining any diploma and some public universities/courses tend to be over-crowded. Therefore, tracking those students ill-prepared for general education toward more applied education curricula may be an efficient way to reduce youth-unemployment. Nevertheless, the potential tradeoffs in the life-cycle should enter into policy debates on the degree of confidence on vocational programs. In this context, European Commission (2010) - the Bruges Communiqué - emphasized the need for enhanced vocational programs, largely to deal with high youth unemployment in Europe, but also recognizes that there must be a concomitant investment in "lifelong learning".¹² This is also highlighted by Hanushek et al. (2017), where they argue that vocational training should not substitute for providing strong basic skills because this and other analyses underscore the necessity in modern economies of developing general cognitive skills. Therefore, countries might want to contemplate programs that would ameliorate any later life disadvantages of vocational programs. This should be also a concern in Portugal.

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¹² The Bruges Communiqué is a package of objectives and actions to increase the quality of vocational training in Europe by making it more accessible and relevant to the needs of the labour market.

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2.4. What is the impact of human capital regional concentration on wages and capital returns?

Pedro Freitas

1. Motivation

Investment in education may generate two types of returns: private and social ones. Private returns are normally related to the wage gains associated to the individual level of education. The social returns on education arise from the positive impact on productivity explained by geographical concentration of educated workers, or as normally refered in the literature, human capital externalities. The estimation of these social returns is relevant to measure the return of the investment in education, return which justifies the public investment in education. This concept was originally presented by Marshall (1890) and then developed in a seminal work by Lucas (1988), which stated that such externalities could be large enough to explain economic growth variations across regions. Several empirical works tried to tackle this issue, particularly with data from the USA. These works find mixed results: Acemoglu and Angrist (2000) use variation in compulsory schooling laws to measure the magnitude of human capital externalities, concluding on its small size. Ciccone and Peri (2006) conclude that a one year increase of the average education, rises the wages at the state level by around 2%, while Moretti (2004) finds that a positive variation of one percentage point in the share of college graduates at the city level rises the productivity between 0.4% and 1.9%. Iranzo and Peri (2009) try to reconcile these results, developing a theoretical model with an empirical application, which shows no effect from the state concentration of high school graduates but a positive effect from the agglomeration of college graduates. Sousa et al. (2015), in a previous study for Portugal, find that an increase of one year in the average country education increases the labour returns by around 3%.

In this Section, we analyse how the concentration of high school and college graduates generate human capital externalities at the municipal level. Thus, we measure how the concentration of skilled workers affects the inputs within the firm, namely the productivity of workers with different education levels and the productivity of physical capital.

This question is particularly relevant in a country like Portugal, which made substantial investments in education during the last decades, in order to reduce the gap relatively to other western economies. Since the establishment of democracy in 1974, Portugal extended the mandatory schooling twice, first to 9 years (in 1986), and then for the present 12 years of schooling (in 2013). In order to accommodate the large number of new students, the number of state schools offering lower and upper secondary education increased from 277 in 1972 to 1,727 in 2017. During the same period the investment in education jumped from 1.3% to 3.7% of the GDP. This lead to a fall in the illiteracy rate from 25.7% in 1970 to 5.2% in 2011. Additionally, between 1998 and 2018, the share of population between 15 and 64 years old with high school graduation increased from 10.3% to 21.9% and the number of college graduates increased from 6.1% to 18.7%.

Despite this relevant evolution, Portugal presents quite an heterogeneous geographical distribution in what concerns the share of college and high school graduates. In the private sector, the average municipal share of high school graduates between 2005 and 2013 is 21.2% and the standard deviation is 5.4 p.p. In the same way, we observe a 14.3% average municipal share of college graduated workers and a standard deviation of 7.02 p.p.

Portugal still depicts an average schooling of its population below the benchmark of other European countries, however the Portuguese evolution across time raises the question about how all the investment in education was translated not just into private returns on education but how it was able to create regional skill spillovers, leveraging the growth and productivity of local firms.

2. The analytical framework

We use a matched employer-employee database (Quadros de Pessoal), merged with financial and accounting information (IES) on Portuguese firms between 2005 and 2013, observing around 490,000 different establishments across the 9 years. In Figure 20. we plot the quadratic relationship between the returns on labour and the return on capital versus the skills concentration of college and high school graduates at the municipal level. We observe a consistent positive relation between hourly wages and the municipal skill concentration, however regarding the return on capital, the figures are less sharp.



Figure 20: Quadratic relations between averages wages and return on capital and skill concentration

Note: Due to the large amount of data, the graphs depicts *binscatters*, meaning that each dot does not represent a single firm but a bin which aggregates a group of firms concentrated in that part of the graph.

Nevertheless, it is likely that this simple relation is biased by several confounding effects, such as variables related to the firm, its location or region specific time trends. Thus, we retrieve information about the number of hours worked by workers with different schooling levels as well as their respective wages, mean age of firm's workers, the proportion of women, the proportion of workers with tenure, firms sales and the value of its capital stock. Then, we use this set of information to estimate the following equation:

$$Y_{j,r,m,t} = \beta X_{j,r,m,t} + \gamma S_{m,t} + Trend_r + \eta_r + \alpha_j + \epsilon_{j,m,r,t}$$
(9)

This specification considers each firm j, in NUTS III region r, municipality m at time t. $Y_{j,r,m,t}$ is taken as: a) workers' log hourly wages without high school graduation; b) workers' log hourly wages with high school graduation; c) workers' log hourly with college graduation; d) The return on capital. $X_{j,r,m,t}$ is a set of firm controls; $S_{m,t}$ stands for the municipal skill concentration variable, Trend_R is a region (NUTSIII) specific time trend. η_r and α_j control for constant invariant effects at the level of the region, *r* and firm, *j*. $\epsilon_{j,m,r,i,t}$ is the error term. We consider two types of skill concentration, $S_{c,t}$: a) The share of college graduates at the municipal level; b) The share of high school graduated in the municipality. The impact of this skill concentration is given by the parameter γ in the equation above.

There are several issues regarding the identification of the unbiased effect of the concentration of skilled workers on firms' productivity. As a matter of example, if the most productive firms tend to be placed in urban regions, where the density of skilled workers is higher, then the impact on the productivity is not due to the spillover of high skilled workers interacting in the same geographical area, but due to firm's endogenous characteristics. In order to correctly filter the effect of the concentration of skilled workers, we exploit the exogenous impact created by the vast increase in the number of high schools in the country. Previous research, namely the work by Duflo (2001) looks at the long-run impacts of school construction programs. Combining information collected in the archives of the Portuguese Ministry of Education and directly from contacts with the schools we gathered the dates of construction of more than 400 state high schools in mainland Portugal. This information is summarized in Figure 21, which shows the number of high schools in 1970 and in 2018. It is clear that back in 1970, the highest concentration of high schools were in the city centers of Lisbon and Porto. From then on, the number of high schools increased not just around the main Portuguese cities, but in many municipalities in the inner land, the first high school was built.

Based on this source of variation we create an instrumental variable (IV) which measures the amount of schools, that on average, were available in the different municipalities during the workers' school age. This way we try to recover an exogenous shock in the variation of school supply, which allows us to isolate the true effect of the skill concentration on wages and return on capital. Using this approach, we report in Table 6. the results found. We find differences whether we consider the concentration of high school or college graduated graduated workers. A percentage point increase in the municipal share of high school graduates leads to an increase in wages between 0.2% and 0.9%. We can observe this impact in the wages of workers with different skill levels, but particularly for those ones with high school and college graduation. For the case of an increase in one percentage point in the municipal share of college graduated workers, the impact has a lower magnitude, being close to zero for the workers without high school graduation and between 0.2% and 0.3% for the remaining workers. Regarding the estimations on the return on capital



(a) Number of schools by municipality - 1970

(b) Number of schools by municipality - 2018

Figure 21: Municipal distribution of schools - 1970 and 2018.

a percentage point increase in the municipal share of high school or college graduated workers has a positive but non significant impact. However when we restrict the data, excluding the firms with the highest and lowest return on capital, we find a small impact of 0.01 Euros per unit of capital for each additional percentage point in the municipal con concentration of skilled workers.

Reforms of the education system are a commonly named structural reform for Portugal. Despite the lag still observed in relation to its main European partners, the evolution in the last decades in the amount of students graduated from high school and college is impressive. The investment made is expected to create knowledge concentration responsible for higher regional productivity dynamics. This is the question we tried to answer, using information on the performance of labour and capital in Portuguese firms, and building a variable which clear denotes the investment the country has been making in education: the increase in the number of high schools across the territory. We conclude that workers with different skills

	High school graduated	College graduated
Wages		
No high school	0.002***	0.000
	(0.000)	(0.000)
High school	0.007***	0.002***
	(0.000)	(0.000)
College	0.009***	0.003***
	(0.000)	(0.000)
Return on capital	0.017	0.006
	(0.062)	(0.022)

Table 6: IV results on the skill concentration (parameter γ)

Notes: Each individual estimation on wages is weighted for the amount of hours worked by the workers with the respective skill level and the estimation on the return on capital is weighted by the firm's physical capital level. Standard error in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

levels are positively affected on their wages due the municipal concentration of high school graduated workers. Regarding the municipal concentration of college graduates, it has a smaller impact and mainly on workers with high school and college graduation. The estimation of the impact on the return on capital showed, on average, not to be significant. The observed difference between the social returns due to the concentration of high school and college graduates means that the investment in studying after the upper secondary education shows a private return significantly higher than the social one.

Our results try to bring light on the reasons behind regional economic disparities, showing that skill concentration is responsible for increasing labour productivity within the firm. Such fact shows the need for an integrated regional policy, given the asymmetries in the skill distribution across the territory.

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3 LABOUR MARKET

3.1. How do firm dynamics and worker mobility influence real wage growth?

Sónia Félix, Pedro Portugal

1. Introduction

The modern approach to labour economics uncovered an unsuspected turbulence of job and worker flows underneath the surface of smooth employment aggregates (Blanchard and Diamond, 1992; Davis, Haltiwanger, and Schuh, 1998). Even in sclerotic labour markets, such as the Portuguese one in which job and worker flows are about one third of those of the United States, the intensity of these flows is well above what would have been guessed by simply observing the behaviour of aggregate employment (Blanchard and Portugal, 2001).

To better understand the dynamics behind aggregate real wage growth it will be useful to identify the contributions of job and worker flows. In this vein, the role of the entry and exit of firms and of the accessions and separation of workers can reveal the importance of job and worker restructuring in driving real wage growth. Furthermore, by decomposing aggregate real wage growth into a number of components, we will be able to disentangle the cyclical sensitivity of real wages associated with new firms and newly hired workers from that of incumbent firms and job stayers. It has been argued that the presence of implicit contracts inhibits the employers to fully accommodate product demand shocks and local labour market conditions when they set their wages. Such a constraint, however, is not present when they hire new workers, which makes the cyclicality of real wages stronger for newly hired workers in comparison with job stayers (Carneiro, Guimarães, and Portugal, 2012).

Worker churning, that is, the difference between worker flows and job flows, may well be excessive and inefficient in highly segmented labour markets, like the Portuguese one, due to the extensive use of fixed-term contracts. Fixed-term contracts may be employed for a number of reasons: to screen workers, to cushion against negative product demand shocks, or just to avoid firing costs (Portugal and Varejão, 2010). Be that as it may, if fixed-term contracts are pervasive, it means that entry wages are likely to be systematically below those of incumbent workers, accentuating the negative contribution of worker restructuring to real wage growth.

2. Empirical methodology

We follow Foster, Haltiwanger, and Syverson (2008) and present a decomposition that allows us to quantify the importance of job and worker restructuring on aggregate real wage changes. We study how changes in the composition of jobs and workers in the labour market affects aggregate real wage growth.

We proceed with the analysis in two steps. First we measure the relative contributions of within-firm variation, reallocation between incumbents, and entry and exit to real wage growth. We then decompose the aggregate real wage growth at the worker level for continuing jobs.

The basic idea underlying the decomposition is that aggregate real wage growth (ΔW_t) between year t and year s, t = s + 1, can be decomposed into within-firm wage growth (W_i) and job restructuring. The latter arises from changes in the labour shares between continuing firms (B_i) , the entry of firms (N_i) , and the exit of firms (X_i) .

Therefore, in the first step aggregate real wage growth can be written as:

$$\Delta W_{t} = W_{i} + B_{i} + C_{i} + N_{i} + X_{i} \tag{10}$$

where i represents a firm. In this decomposition, W_i measures the weighted average real wage growth within a firm and B_i is a between-firm effect that indicates changes in the labour shares between continuing firms, weighted by the growth rate of real wages.

The between effect is positive (negative) if the continuing firms that have a relatively high real wage level increased (decreased) their labour share amongst the continuing firms. The term N_i measures the contribution of entering firms to average real wage growth. This contribution is positive if the real wage level of the new firms is higher than the wage level of the continuing firms in the founding year.

The exit effect is measured by the term X_i and is positive if the real wage level of the exiting firms is lower than the real wage level of the firms that continue operating in the market. The magnitude of the entry and exit effects will depend on the labour shares of the new and exiting firms, respectively. The term C_i is a covariance term.

In the second step we further decompose the within-firm variation of the continuing firms at the worker level to gauge the contributions of hirings (N_j) , separations (X_j) , and continuing workers (W_j) to aggregate real wage changes.

The decomposition at the worker level is given by:

$$W_i = W_j + N_j + X_j \tag{11}$$

where j denotes a worker. In this step the sources of wage variation are the within component of job stayers, i.e., those who work in the firm in two consecutive years (W_j) , the newly hired workers (N_j) component, i.e., those who work in the firm at time t but not at time *s*, and the separation of workers (X_j) component, i.e., those who work in the firm at time *s* but not at time *t*, for each of the continuing firms.

The within component reflects the average real wage growth rate of job stayers in continuing firms, the entry component is positive if newly hired workers have on average a higher real wage level than job stayers in the firm that hired them, and the exit component is positive if separated workers have on average a lower real wage level than job stayers in the firm from which they have been separated.

3. Data

We use a very rich and comprehensive employer-employee dataset known as *Quadros de Pessoal* (QP). This dataset was created by the Portuguese Ministry of Employment and consists of an annual mandatory employment survey addressed to establishments employing at least one wage earner. Data are available from 1982 to 2017 for each wage earner, with the exception of workers of the Public Administration sector and domestic servants.

Detailed data are available on the establishment (location, economic activity, and employment), the firm (location, economic activity, employment, sales, year of formation, and legal framework), and for each and every of its workers (gender, age, education, occupation, earnings – including base wage, seniority related earnings, other regular and irregular benefits, overtime pay, normal, and overtime hours – and tenure).

4. Results

4.1. Worker flows

Figure 22 presents the worker flows in the Portuguese labour market in the period from 2005 to 2017. Worker flows are decomposed according to firm and worker dynamics. In particular, Figure 22 depicts the contribution of new firms, firm closures, job stayers, worker accessions, and worker separations to employment changes.

We document two main findings. First, job creation and job destruction are remarkably large during this period. Second, job creation and job destruction seem to co-move positively, that is, periods of more job creation are also periods of more job destruction.

4.2. *Micro-level sources of aggregate wage growth*

In this subsection we present the results of the aggregate wage growth decomposition at the firm and worker levels. Figures 23 and 24 show the role of job and worker restructuring on aggregate wage variation, respectively, in the period under study.

The decomposition of aggregate wage growth according to firm dynamics is presented in Figure 23 and suggests that, in general, aggregate real wage growth is lower than that of job stayers. Therefore, worker and job restructuring affect real wage growth negatively. Job restructuring has an important role in explaining changes in real



Figure 22: Worker flows (in thousands).



Figure 23: Decomposition of aggregate real wage variation at the firm level.

wages. New firms contribute negatively to real wage growth, implying that average real wages of new firms are lower than the average real wages of incumbents. Similarly, firm closures contribute positively to real wage growth, suggesting that on average real wages of exiting firms are lower than real wages of incumbents. These findings tally with a "cleansing effect" through which resources are reallocated toward more productive firms. The between component suggests that in the period from 2005 to 2008 the high-wage firms seem to have increased their labour shares while the opposite holds in the years from 2013 to 2016.

Figure 24 suggests that worker restructuring is important to explain within-firm wage growth. The results indicate that newly hired workers earn on average lower wages than job stayers, contributing negatively to aggregate wage variation. In contrast, the effect of worker separations is positive, which reflects the fact that separating workers earn less on average than job stayers. Overall, the net entry effect has a negative impact on aggregate real wage growth.

Importantly, the cyclicality of aggregate wage growth seems to be linked to the dynamics in the labour market. According to the decomposition at the firm level, the entry component is the most affected by the business cycle. In the aggregate, the correlation between the average real wage growth and the unemployment rate for continuing firms is -0.20. For continuing firms the correlation is -0.31, for those that exit it is -0.27 and for new firms equals -0.49. When the decomposition is performed at the worker level the cyclical sensitivity of the real wage growth of job stayers is the highest (the correlation is



Figure 24: Decomposition of aggregate real wage variation at the worker level for continuing firms.

-0.41), the one for newly hired workers is -0.29, and that of separating workers is the smallest (the correlation is -0.20).

The analysis of the role of worker restructuring on aggregate wage growth also suggests that the within component is substantially affected during the economic downturn, highlighting the links between the cyclicality in job and worker restructuring and aggregate real wage growth.

Overall, the results uncover the micro-level sources of aggregate wage growth and show that changes in the composition of jobs and workers in the labour market are important drivers of wage variation.

5. Concluding remarks

We have shown that, at an annual frequency, the main driver of real wage growth is the within wage variation amongst incumbent firms. The reallocation amongst continuing firms (the between variation) plays a muted role. Because the average wage of entering and exiting firms is below the average wage of the ongoing firms, the contribution of job restructuring is negative. Similarly, because the average wage of newly-hired workers and workers separating from their employers is below the average wage of job stayers, the contribution of worker restructuring is also negative. Aggregate real wages are pro-cyclical because all of the components are also pro-cyclical. The cyclical sensitivity of the real wages of workers employed by new firms is stronger than that of established firms.

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3.2. How did the downward wage rigidity shape unemployment during the crisis?

Fernando Martins, Pedro Portugal

"Thus, uniquely among the studies we survey, Portugal appears to be the canonical example of Keynes's premise that nominal wages cannot be cut."

Elsby and Solon, Journal of Economic Perspectives

1. A paradigm of downward nominal wage rigidity

Nominal wage cuts are illegal in the Portuguese labour market. The prohibition of wage decreases is inserted in the 129th article of the labour code. This legal framework, which is unique among developed countries, makes Portugal a conspicuous case of downward nominal wage rigidity (DNWR).

The notion of downward nominal wage rigidity, which is at the center stage of Keynesian (or structural) unemployment, was seen as immaterial during the periods when inflation rates were relatively high. In essence, in high inflation regimes, employers have room of maneuver to adjust real wages without the need to press for nominal cuts. More recently, however, with inflation rates systematically below 2 percent in most developed countries, the importance of DNWR and, relatedly, the Phillips curve, reemerged quite vividly in the academic debate (Devicienti et al. (2007), Galí (2011), Blanchard (2016), and Fallick et al. (2016)). At the center stage of the debate are the economic consequences that arise from the inability to adjust real wages whenever the occurrence of negative economic shocks would require a nominal wage decline. The resistance to accept or to propose nominal wage cuts may be based on a number of factors: fairness considerations, the moral of the workforce, psychological distress, or, simply, legal prohibitions. Be that as it may, in the presence of DNWR, the inward displacement of the labour demand curve does not engender a wage decrease, generating a new employment equilibrium given by the short side of the market (the demand side) and, thus, involuntary unemployment.

Whereas the empirical evidence on the importance of DNWR is abundant but ambiguous, (Elsby and Solon (2018)) the connection between DNWR and unemployment is much scarcer (Fehr and Goette (2005)). The "canonical" Portuguese case was first explored in Carneiro *et al.* (2014) where the it is shown that the high frequency of nominal wage freezes is associated with a dramatic job destruction. Nunes (2016) extends the statistical model of Fehr and Goette (2005) and uses a Portuguese matched employer-employee data set to show a strong relationship between the frequency of wage freezes and both the inflation rate and the unemployment rate. The author estimates that DNWR during the Portuguese economic crisis increased real labour costs by about 7 to 8 percent.

In the current exercise, we revisit the updated Portuguese data to characterize the evolution of the distribution of nominal wages and the corresponding distribution of nominal wage changes. We, then, discuss the connection between the incidence of wage freezes and the severity of unemployment and, by implication, the nature of the Phillips curve during the Portuguese economic crisis and recovery.

2. Wage setting

The Portuguese labour market is often regarded as an extreme case of downward wage rigidity (Elsby and Solon (2018), Behr and Pötter (2010), Holden and Wulfsberg (2008) and Dickens et al. (2007)). This rigidity stems above all from the fact that labour legislation forbids nominal wage cuts - a legal provision that was introduced in the 1950s and that was kept untouched until today. This restriction is idiosyncratic to the Portuguese labour market and it is one of its major singularities. Article 129 of the Labour Code states that "The employer is prohibited to decrease employees' compensation, except for particular cases provided in this code or in regulation of collective bargaining instruments". Article 258 clarifies that the concept of compensation includes not only base wages but also other monetary and non-monetary pay components that are paid on a regular basis. As a general rule, only travel and meal allowances as well as bonuses, commissions and benefits associated with workers' performance may legally be reduced, unless they are included in collective agreements (Article 260).

In addition to this feature of the wage formation, the Portuguese labour market is also strongly driven by collective bargained outcomes which are mostly determined at the industry level. Even though these agreements are negotiated by labour unions and employers' representatives with low representation their outcomes affect the whole sector. This stems from the fact that even though by law the collective wage agreements are binding only for workers complying with the so-called double affiliation principle (workers that are simultaneously members of the subscribing union(s) and that are employed by firms that are members of the subscribing employer associations) they have been traditionally extended by the Ministry of Employment to all firms in each sector. These agreements typically establish wage floors for the most important job types and levels for all firms in a given sector so that their extension is equivalent to the setting of fully-binding minimum wages. These extensions, which also explain the large gap between union density and union coverage, promotes the levelling of working conditions, as they require that all firms in a sector irrespective of their situation have to comply with the same set of minimum standards determined jointly by a small subset of firms and workers in that sector. Once an extension is in force, the affected workers and employers have to follow the terms and conditions of the underpinning collective agreement, including the payment of possibly higher wages.¹³

Finally, underlying the bargaining process there is a mandatory national minimum wage that sets the floor for wage negotiations for all workers in the economy.¹⁴ The national legal minimum wage and the pervasive setting of wage floors set by collective bargaining through the systematic extension of industry-wide agreements coupled with the legal prohibition of nominal wage cuts, which survives since the 1950s, creates a *de facto* situation of extreme downward nominal wage rigidity in Portugal.

3. Data

The empirical analysis uses a longitudinal matched employeremployee dataset known as Personnel Tables (*Quadros de Pessoal*) for the period between 2004 and 2017. It is constructed on the basis of a mandatory annual survey addressed to all Portuguese firms with wage earners. Being compulsory, the dataset does not suffer the typical non-response biases that are often associated with standard household and firm surveys.

One of the characteristics of the data that makes it so valuable is the richness of the information, including characteristics on the establishment (establishment identifier, location, industry and employment),

¹³ To make matters worse, when the agreements are extended, the corresponding wage clauses are often applied retrospectively, forcing employers affected to pay the resulting wages arrears.

¹⁴ The minimum for workers formally classified as apprentices is 80% of the full rate.

firm (firm identifier, location, industry, legal form, ownership, year of start-up, employment, sales and capital), and its workers (social security identifier, gender, age, education, occupation, employment status, education, professional level, seniority, earnings, normal and overtime hours, time elapsed since the last promotion and the type of classification in the collective wage agreement).

A number of restrictions were imposed before the major were the exclusion of individuals who were not working full time, who were aged less than 16 years and more than 65 years, who earned a nominal wage less than the legal minimum wage in each year. Wage changes are computed only for workers who remained employed at least in two consecutive years. Individuals employed in agriculture, hunting, forestry, and fishing industries were also excluded.

4. The wage distribution

Figure 25 illustrates the wage distribution in Portugal in 2017.¹⁵ We observe that the share of workers receiving wages close to the minimum wage is very significant. This is particularly noticeable since 2014. The national minimum wage was kept frozen between 2011 and 2014 but it has increased sharply ever since. Between 2014 and 2019, it increased by 24%. According to the Minimum Wage Report released by the Ministry of Employment (based on the Social Security registers) the share of workers earning the minimum wage in June 2018 stood at 22% (40% for the new hires) which compares to 13% four years before. The Figure also shows that the gap between the median and minimum wage is small. All in all, this suggests that the minimum wage has been gaining importance in the structure of wages in Portugal and its increases are becoming more and more binding for firms.

5. Wage freezes

The level of downward wage rigidity observed in Portugal can be particularly harmful at times of crisis with low inflation: if firms cannot adapt to the worsening conditions by lowering (real) wages, the only adjustment channel that is left is to reduce employment or simply shutting down.¹⁶ This is indeed what was observed during

¹⁵ Wage analysis uses base wages as the reference. Unlike total wages, base wages are less sensitive to quantity variations since it is not affected by changes in extra hours, shift payments or other payments that depend on the number of working days.

¹⁶ Dias *et al.* (2013) show that when Portuguese firms were asked how they cut labour costs in response to the negative shocks they faced during the Great Recession, 72%



Figure 25: Distribution of base wages in Portugal in 2017 Note: Private sector excluding agriculture, hunting, forestry and fishing.



Figure 26: Distribution of base wage growth in Portugal in 2012

the recent crisis: a large number of workers had their wages frozen, but low inflation meant that real wages moved little and large employment losses ensued (Carneiro *et al.* (2014)).

Figure 26 reveals that despite the severity of the crisis, the average nominal base of almost all workers who kept their job in consecutive

reported that they reduced their workforce, which was by far their most common strategy.

years did not fall.¹⁷ As we mentioned, such cuts are in fact forbidden. Given this constraint, firms still have the option to freeze base wages in the hope that inflation will bring real wages down. This was in fact a very common strategy used by employers in Portugal during the crisis. Figure 26 shows that 75% of workers had their base wage frozen in 2012. Despite the recent decline, the share of base freezes in Portugal is considerable larger than what is observed in countries like the United States and the United Kingdom (Elsby *et al.* (2016)).¹⁸ This indicates a substantial element of nominal wage rigidity in the Portuguese labour market.

6. Are wage freezes associated with real effects?

The frequency of wage freezes is often used as a close proxy for the relevance of DNWR. Whereas for low values of the incidence of wage freezes it can be argued that menu cost rather than wage rigidity may be at play, for the values that we exhibited above there is no doubt that proportion of wage freezes overwhelming reflects DNWR. Nevertheless, the wage rigidity per se may not have real impacts in the economy if employers adjust future wage increases to compensate for the hike in real labour costs associated with the inability to cut nominal wages. In this case, DNWR would not be associated with higher unemployment. Figure 27 distinctly suggests that this is not the case. Over the period under consideration, 2004 until 2017, the incidence of wage freezes and the unemployment rate are strongly co-move, suggesting that DNWR may generate higher unemployment. Firm level evidence reported by Carneiro et al. (2014) shows that the incidence of nominal wage freezes is associated with lower hiring rates and higher firm mortality rates. In sum, the striking evidence depicted in Figure 27 suggests that Keynesian unemployment may well be at play, at least during economic downturns that occur in low inflation regimes.

¹⁷ In 2012, the percentage of private sector workers whose base was reduced stood around 3%, a figure reflecting possible measurement errors but also the wage reduction agreed between the administration and the workers of a major financial institution. If we had considered a broader concept of pay, covering for example bonuses and other performance-related monetary payments, the share of wage cuts would have been 21%. It should be noted that these non-base wage are relatively small in Portugal, particularly in smaller firms.

¹⁸ The share of base wage freezes is somewhat blurred by the significant increases observed in the national minimum wage since 2014. If we exclude this effect the share of base wages freezes would be higher.



Figure 27: Share of base wage freezes and the unemployment rate in Portugal (2004-2017)

7. The resurrection of the Phillips curve

The indication of high values for the proportion of nominal wage freezes suggests that aggregate nominal wage changes are to a large extent determined the fraction of zero nominal wage changes. This is indeed the case, the linear correlation between the aggregate nominal wage changes (for workers that stay in the same firm during two consecutive years) and the incidence of wage freezes is -0.97. Not surprisingly, when we plot nominal wage changes against the unemployment rate we observe a sharp relationship (Figure 28). The Phillips curve exhibited corresponds faithfully to the stylized handbook version, where wage inflation (not the change in wage inflation) is contrasted with the unemployment rate. This result is in line with the indication that the US Phillips curve is alive and well (Blanchard (2016)) and suggests that reemergence of the trade-off between unemployment and inflation, namely the notion that inflation may "grease the wheels" of the labour market ((Schmitt-Grohé and Uribe, 2013)).

8. When DNWR bites

The drama of contemporary wage adjustment was graphically illustrated. At the heart of the slump, the wage change distribution nearly collapsed at zero percent nominal wage change. Because the inflation rate was very low, the margin to cut real wages without cutting minimal wages was highly limited. In these circumstances, an incredible large fraction of workers experienced nominal wage freezes, an



Figure 28: Base wage growth and the unemployment rate in Portugal (2004-2017)

outcome without parallel in other developed economies. Meantime, the unemployment rates increased to unprecedented levels raising the possibility that DNWR may have real effects. In this vein, we have shown that the severity of DNWR lends itself naturally to stylized old-fashioned Phillips curve. In short, the Portuguese economic crisis was a time in which the previous incipient downward nominal wage rigidity became truly binding, the full consequences of which could only be felt afterwards. These consequences included job destruction, severe unemployment, pent-up wage deflation, and, possibly, a crisis in industrial relations.

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3.3. What did the reform of severance pay bring?

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1. Motivation

The labour market reforms implemented in Portugal between 2011 and 2014 were unquestionably comprehensive and in-depth. These reforms were carried out as part of the overall Economic an Financial Assistance Programme agreed between Portugal and the Troika in May 2011. The Portuguese package of labour market reforms also ranks as one of the most comprehensive among the European Union countries in recent years. Even though a number of the initial reforms and measures have already been reversed, there is a general understanding that the Portuguese labour market is now considerably more flexible than it was prior to 2011.

Before the reforms, Portugal was an outlier among the OECD countries in terms of stringency of employment protection legislation for individual workers on open-ended contracts. This reflected *inter alia* the high level of severance pay and a very stringent definition of fair dismissal that made particularly difficult for employers to dismiss workers on open-ended contracts. In addition, the Portuguese labour market was also characterised by a large regulatory breach between open-ended and fixed-term contracts, contributing to the high degree of segmentation in the labour market. For workers, this segmentation reduces the incentive to invest in firm-specific skills and has a negative impact on motivation; from firms' standpoint, it increases worker turnover and recruitment costs and hampers productivity.

Employment protection legislation (EPL) concerns the set of legislation that governs the hiring and firing of workers. Typically, it tries to balance between, on the one hand, the need for flexibility that allows firms to adjust the level and composition of the workforce to changing technology and demand conditions and, on the other hand, the need to protect against the costs that are frequently associated to job displacement. These costs are both for workers (earning losses and the possible obsolescence of job-specific skills and experience) and for the society as a whole (unemployment benefits, costs on job-search assistance or on active labour market programmes). EPL



Figure 29: OECD EPL index for the strictness of employment protection to individual and collective dismissals

provides a mechanism that ensures that firms internalise at least part of these costs while avoiding excessive and inefficient worker turnover. However, EPL can be harmful for productivity by imposing excessive constraints on labour market flows with negative impact on the effectiveness of labour allocation to the most productive jobs.

2. Reforming EPL in Portugal

The reforms carried out in Portugal have taken employment protection on open-ended contracts to levels close to the OECD average. Between 2008 and 2013, Portugal observed the largest fall in the OECD's EPL index measuring the strictness of employment protection for individual and collective dismissals (Figure 29). Crucial among the changes in the Portuguese legislation was the reduction in severance payments, the introduction of a new reason for dismissal (inadaptability without change in the nature of the job post), and the new performance-related criteria for dismissing workers in the case of extinction of a work position, moving away from the seniority-based criteria. These reforms helped to reduce the protection of workers on open-ended contracts in Portugal and narrowed the regulatory gap with workers on fixed-term contracts.
Interestingly, the most emblematic and resilient reforms were taken in the domain of firing costs. Survey evidence shows that these are precisely the measures that firms' perceived as having the largest positive impact in the economy but also those where additional changes are considered urgent. In addition, preliminary indications suggest that the recent EPL reforms are encouraging on-the-job search – a lead indicator of job-to-job flows (Orsini and Núnez, 2014) – and having positive impact on firms' hiring rates. The impact on separations has been mitigated by the existence of grandfathering clauses.

Even though the number of changes in the Portuguese Labour Code was relatively extensive, the large cut in severance pay, in particular on open-ended contracts, is expected to have the largest impact at least in the short-run. From firms' perspective, lower severance pay is likely to contribute to increase hiring and firing rates; for workers, it is expected to lead to greater on-the-job search and to job-to-job flows. This Section discusses the possible implications of this particular reform and shares some preliminary evidence of its impact on the Portuguese labour market.

3. The reform of severance pay in Portugal

At the beginning of this decade, Portugal had one of the highest levels of severance pay for open-ended contracts among the OECD countries. Upon dismissal, every worker, irrespective of tenure, was entitled to receive a minimum of three months' severance pay with no upper limit. Severance pay was lower for fixed-term contracts than for open-ended contracts. This system acted as a disincentive for firms to hire workers on open-ended contracts and contributed to impair the efficient allocation of labour resources not only because of the large firing costs for firms but also because the right to receive high severance payments in case of dismissal acted as disincentive for workers to look for new jobs even if they involved better matches.

In this respect, it is interesting to see that, according to the results obtained from a firm-level survey conducted in 2014 by Banco de Portugal in the context of its participation in the Wage Dynamics Network (WDN),¹⁹ the size of firing costs was reported as the second most important reason for Portuguese firms to be reluctant to hire

¹⁹ The Eurosystem Wage Dynamics Network (WDN) was a research network created in 2006 and reactivated in 2013 with the main purpose of assessing labour market adjustments. In the third wave of the WDN the 25 participating national central banks launched a 'wage-setting survey' as an update to the two previous surveys carried out in 2007 and 2009. The motivation for the new survey was to understand how firms responded to the crisis, to what extent these responses depended on what happened between 2007 and 2009, and how the structural labour market reforms



Figure 30: Main obstacles for hiring workers on open-ended contracts (share of fims considering each option as relevant or very relevant)

workers on open-ended contracts (Figure 30). The answers took the period 2010-2013 as a reference.

Between 2011 and 2013, severance payments for open-ended contracts were reduced from 30 days of base wage plus tenure-based pay to 12 days for every year of tenure. In addition, the minimum of three months' pay was removed and it was introduced a ceiling on the maximum amount to be paid out.²⁰ Severance payments on fixed-term contracts were also reduced, though to a smaller extent.²¹ Nevertheless, severance payments on fixed-term contracts are still lower than on open-ended contracts.

One important characteristic of the new severance pay rules is that they are only valid for new contracts. This has an impact on the short-run as the rights for contracts signed before 2011 were

affected firm behaviour. The main results for Portugal as well as details on the survey can be found in Martins (2015).

²⁰ An upper limit of 20 times the national monthly minimum wage was set for the reference wage used to calculate the entitlement (base wage plus tenure-based increments) whereas it was also laid down that the total amount of severance pay could not exceed 12 times the reference wage – i.e. 240 times the national monthly minimum wage.

²¹ They were cut from three days per month of tenure on contracts lasting six months or less and two days per month of tenure for contracts lasting more than six months, to 18 days per year of tenure incremented by 12 days per year of tenure for contracts lasting more than three years.

kept virtually unchanged. There is evidence in the literature (see for instance von Below and Thoursie (2010)) that changes in employment protection can lead to a short-run contraction of employment as their immediate impact tends to be more concentrated on separations that on hirings. One way to avoid excessive job losses in the short-run is to impose grandfathering clauses. The drawback is that the potential positive effects of reforms take longer to become visible. Obviously, this only applies to open-ended contracts because in the case of fixed-term contracts, given their shorter tenure and higher turnover, the new rules are now entirely in place.

4. Some preliminary evidence on the impact of severance pay cuts

Evaluating the impact of each of the labour market reforms is far from being an easy task. Firstly, they were introduced over a 4-year period, which makes it difficult to identify a date that clearly draws the line between the period before and after the reforms. Secondly, they were combined with other reforms, which might have also affected the labour market. Thirdly, since not much time has elapsed since reforms were implemented, it may be too soon to make a conclusive assessment. Finally, the period after 2013 has been characterised by a gradual recovery of economic activity in Portugal and, most remarkably, by a considerable improvement in both employment and unemployment rates – even better than expected given the pace of recovery. Therefore, we should be cautious in establishing any type of causality between the reforms and the performance of the labour market, in particular because it is not straightforward to disentangle the impact of reforms from the effect of the economic cycle.

To get early indications on firms' perceptions about the impact of labour market reforms, the WDN survey asked Portuguese firms to report whether they considered being easier or more difficult to perform a set of actions in 2014 than before 2011. More specifically, firms were asked whether it was easier or more difficult to: i) dismiss employees, collectively, individually, temporarily or for disciplinary reasons; ii) adjust working hours; iii) recruit new employees; or iv) move employees to other positions or locations. Except for the case of geographical mobility and dismissal for disciplinary reasons, a non-negligible fraction responded that their ability to perform these actions had become easier or much easier (Figure 31). In particular, 32% of firms perceived individual dismissals as being easier or much easier than before the reforms. It is true that the figures are not overwhelming but in any case they are in most cases higher than those reported in other Southern European countries that also implemented wide-ranging labour market reforms (Izquierdo et al. (2017)).



Figure 31: Share of firms perceiving each action as easier or much easier in 2014 than in 2010

These results are broadly consistent with those obtained from a similar survey conducted by the IMF in 2015 (IMF (2016)). The survey covered not only the labour market but also the other three areas that were subject to reforms between 2011 and 2014 (product markets, public sector and financial sector). Respondents were asked to indicate their perception about the impact of a long list of reforms on their competitiveness and growth prospects as well as the perceived importance of additional measures in each reform area. In the case of labour market reforms, the list included increases in work time, increases in work-time flexibility, collective bargaining, hiring and firing costs, active labour market policies and effectiveness of employment agencies. In general, labour market reforms scored better than other reform areas, though the results in many cases were not significant. Nonetheless, the reforms that were perceived as having the largest positive impact on firms were the increase in work-time flexibility and changes in hiring and firing costs, which included the new rules for individual dismissals and cuts in severance pay. These were particularly important for exporting firms and SMEs.

However, the IMF and the WDN surveys do not disentangle the impact of cuts in severance pay from other changes in firing costs. In a tentative exercise, the OECD (OECD (2017)) estimates the impact of severance pay cuts on the probability of workers' on-the-job search

as well as on firms' probability of hiring and firing. The analysis is based on the information taken from the Labour Force Survey and the Portuguese *Quadros de Pessoal* (QP), a matched employer-employee administrative dataset. The (OECD (2017) results suggest that severance pay cuts increased on-the-job search and firms' hiring rates. In particular, based on quarterly data from the LFS the exercise estimates that reducing severance pay by 1 percentage point (p.p.) has increased on-the-job search by 0.075 p.p. and the hiring rate by 0.13 p.p.²² These impacts are estimated using individual-level regression models where the dependent variable - a dummy variable indicating if an individual is engaged in on-the-job search or firms'outcome (hirings or separations) - is regressed on the average percentage difference in severance pay between pre- and post-reform systems and a number of other worker and firm characteristics.

Results based on annual data from QP also reveal a positive impact from severance pay cuts on the separation rate, though considerably lower than the impact on the hiring rate. In particular, reducing severance pay by 1 pp has increased the separation rate by 0.04 pp and the hiring rate by 0.29 pp.²³ Even though these are relatively small coefficients, it is important to mention that the estimated difference between the old and the actual severance pay is 5.6%, while the difference between the old and the new severance pay (if the rules were applied fully, i.e. without grandfathering) would amount to 25.6%.

5. Final remarks

Despite the considerable progress in recent years, Portugal remains the OECD country with the most stringent regulations for individual dismissals of workers on open-ended contracts. While the reforms have narrowed the regulatory gap between open-ended and fixed-term contracts, the duality remains important and labour market segmentation is likely to continue a distinctive characteristic of the Portuguese labour market. This is because a number of incentives to keep hiring on fixed-term contracts were left untouched. Firing a worker on an open-ended contract involves more than just paying a compensation as it involves considerable procedural costs. According to Centeno and Álvaro Novo (2012), these costs represent the main difference *vis-à-vis* fixed-term contracts. These procedures can extend

²² The average share of workers engaged in on-the-job search per quarter is 6.6% whereas the average hiring rate per quarter is 3.8%.

²³ According to the information obtained from QP, on average 14.2% of workers separate from their employer every year whereas each year 16.2% of workers are new hires.

the dismissal process substantially, thus in many occasions firms are likely to keep their preference to hire workers on (lower-cost and more flexible) fixed-term contracts. In this respect, it is illustrative that despite the remarkable performance of the Portuguese labour market in recent years, the share of fixed-term contracts in total employment remains quite stable around 18%.

Further progress in lowering EPL on open-ended contracts in Portugal would probably require changes in labour market legislation. Clarifying the meaning of "just cause" would be very important, in particular the conditions under which firms can dismiss workers for economic reasons. France in 2017, under the so-called "Macron reform", and Spain in 2012 (OECD (2013)) have made important progresses in this domain.

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4 MANAGEMENTAND ORGANIZATIONOF FIRMS

4.1. What has the crisis shown about Portuguese top managers?

Sharmin Sazedj

1. Motivation

One of the most striking features of the economic developments in Portugal in the last decades has been the slow productivity growth, even in the midst of the recent recovery cycle (see Banco de Portugal, 2017). Many empirical and theoretical studies have tried to explain the astounding differences in productivity between countries, and even within countries, between firms. One remarkable study by Bloom *et al.* (2016) attributes approximately 30% of these productivity differences to different management practices. Theorists have long modelled heterogeneous managerial characteristics that are associated to different levels of firm performance. More recently, the increasing availability of data has confirmed many of these results empirically.

Different management practices can be associated to different managerial styles, which can in turn be mapped into Chief Executive Officer's (CEO) characteristics. Indeed, many authors find a strong link between different observable CEO characteristics, such as educational attainment, experience or tenure and firm performance, in particular firm productivity. Another set of characteristics that may play a role are the unobservable ones, such as risk preferences, flexibility or drive for change. While it is more demanding to analyse the impact of such characteristics given their unobservable nature, their value may also vary under different circumstances. Specifically in times of uncertainty and crisis, some attributes might become more valuable. In this context, this column aims to exploit a unique matched employer-employee dataset and: 1) characterise the top managers in Portugal, drawing a clear portrait of their observable characteristics; 2) take a deeper look into the recent economic crisis and analyse whether newcomer CEOs were able to deliver and whether their intrinsic characteristics became more valuable under such extreme circumstances.

2. Data

The analysis presented here draws on information from Quadros de Pessoal (QP) and Informação Empresarial Simplificada (IES). QP is a micro longitudinal dataset, collected by the Portuguese authorities, with matched employer-employee data that include all private firms and workers operating in Portugal between 1985 and 2016. The survey is mandatory for all establishments with wage-earners and contains information regarding the firm (including size, sales, capital) and the workers (including gender, age, schooling, hours worked and monthly earnings). Each worker is classified according to the National Classification of Occupations in QP, which allows us to identify those workers classified as chief executive officers. In addition, we draw on yearly data from IES for information regarding the firm's Gross Value Added (GVA). IES is the system through which corporations report mandatory information to the tax administration and the statistical authorities. Data is available from 2005 onwards, covering virtually the universe of Portuguese non-financial corporations.

3. Profile of a CEO in Portugal

The share of female top managers has been increasing slowly in Portugal during the last decades, remaining at a fairly low level (Figure 32a). In 2016, females represent around 30% of the CEOs in the Portuguese labour market. The incidence of female CEOs is relatively homogeneous across firm sizes, while relatively higher amongst the younger age groups and amongst managers in the services sector.

In terms of age brackets, around 60% of the CEOs are aged between 35 and 54 years. Figure 32b shows that, as expected, the share of younger CEOs has been decreasing over time. It is expectable that this tendency prevails in the coming years, given the ageing prospects of the Portuguese labour force and the increasing levels of education that postpone entry into the labour market, and thus, promotion to top management positions. In terms of distribution across firms, the most notable difference can be observed in large firms, where there are fewer very young and very old CEOs as compared to other firms.

There has been a general increase in the average number of years of schooling in Portugal, which is also visible amongst CEOs, though to a lower extent, given that CEOs are on average older than other employees. Figure 33a compares educational attainment of CEOs with non-CEO employees in 2016, suggesting that CEOs have on average more years of schooling, mainly due to the larger share of college graduates. As expected, average education levels are highest



(b) Age brackets

Figure 32: Breakdown of CEOs by gender and age brackets (percentage) Source: Quadros de Pessoal.

amongst the younger CEOs. With regard to the breakdown by firm size, there is a clear pattern that the larger the firms, and usually the responsibilities of the managers, the higher the average years of schooling of the CEO (Figure 33b). This is also true if we consider firms with some amount of foreign capital: more than 60% of the CEOs are college graduates and only around 5% have less than secondary education. Notwithstanding, it is worth mentioning that the vast majority of firms in Portugal are micro or small firms (with



(a) CEOs and other employees



(b) Breakdown by firm size

Figure 33: Breakdown of CEOs by educational attainment in 2016 (percentage) Source: Quadros de Pessoal.

no foreign capital), so the share of CEOs with lower than secondary education is still notably large. Education is often used as an indicator for human capital or an individual's ability (see Barro and Lee, 2013), which are drivers of production and growth. Authors, such as Bloom and Van Reenen (2010), associate higher levels of education to better management practices and thus better results for the firm. With respect to tenure, several scholars have argued that the impact of CEO tenure on firm performance can be described as an inverted U (see Hambrick and Fukutomi, 1991; Luo *et al.*, 2013). With time, as CEOs become myopic, risk-averse and overly wedded to early formulas, tenure starts to hurt firm performance (Henderson *et al.*, 2006). In Portugal, the average tenure at the firm in 2016 was around 11 years. However, in larger firms tenure tends to be much higher at the firm, and lower at the job. In other words, larger firms seem to have a higher CEO turnover rate, but a higher proportion of internal promotions - which explains the higher years of experience at the firm.

While traditionally ability was often associated to education or to acquired experience, more recently it has been linked to a diversified experience. According to Kevin Murphy (2004), Custódio *et al.* (2013) and Kaplan *et al.* (2012), who compare generalist and specialist CEOs, the former are associated with better firm performance. In this regard, we can consider previous experience from other sectors of activity. While around 50% of the CEOs in 2016 have worked previously in at least 2 different sectors of activity, only 10% have worked in more than 2 sectors. On average, CEOs with higher levels of education are also those that have a more generalist experience.

Finally, another defining feature of the Portuguese CEO market is the share of CEOs who are simultaneously owners of the firms. The share of owner CEOs has decreased over the last decades, reaching approximately 60% in 2016, of which close to 80% are in charge of micro-firms. It is noticeable that there seems to be two level shifts in the share of owner CEOs around the periods of economic crisis, namely in 2003 and during the more recent economic and financial crisis (Figure 34a). Figure 34b shows the breakdown of owner/non-owner CEOs by firm size and, as expectable, only 1% of the large firms are managed by their owners. Fabisik et al. (2018) find that firms with more managerial ownership are worth less. Bloom and Van Reenen (2010) find that family firms managed by a family member present usually a much lower performance than firms managed externally. Similarly, firms managed by their founder also present worse results.

4. CEOs and firm productivity in times of crisis

While the impact of certain characteristics on firm performance might be stable over time, other characteristics might change their value added depending on the circumstances. For instance under extreme circumstances, such as a major economic crisis, the framework under



(a) Owner CEOs across time



(b) Breakdown by firm size

Figure 34: Breakdown of CEOs by ownership, over time and by firm size (2016, percentage) Source: Quadros de Pessoal.

which firms operate changes drastically and the capacity to innovate and abandon old management practices becomes specially valuable. However, little research has been done to investigate these kind of changes.

In a recent paper (Sazedj *et al.*, 2018), we argue that, during normal times, there is a trade-off in the choice between a newcomer and an experienced insider. A newcomer – that is, a recent external hire –

may bring innovative and bold initiatives to the management of the firm, but will start with a knowledge deficit and will need time to reap the benefits of learning by doing. On the other hand, an experienced insider already masters business as usual, but might find it difficult to abandon settled management practices when challenging circumstances arise, and may fall prey to the so called experience trap. Firms choose their CEOs along the tenure-origin locus, so as to maximize the net value of their inter-temporal performance, for a given set of expectations about the future. However, when unexpected circumstances, such as a major crisis, do materialize, the ex-post optimal mix of CEO characteristics changes. Now, old management practices and strategies may be insufficient to innovate and generate growth, while taking risks and adopting creative solutions becomes more valuable.

In this study, we estimate the impact of newcomer CEOs on productivity during the economic and financial assistance program in Portugal. We focus on a period of serious economic downturn, unexpected and unprecedented in nature, reach and magnitude, and exogenous to firms, and make it the basis of the identification strategy. The depth and unexpected nature of the crisis precluded preemptive actions on the part of firms, including anticipatory CEO hires. The great majority of firms did not change CEO before the onset of the crisis. We consider having a newcomer in office when the crisis hit as an exogenous event, and use this to disentangle the impact on firm productivity from other, correlated, unobservable factors.

Using a difference-in-differences estimation summarized in Figure 35a, we are able to identify: i) the common productivity downturn for all firms, in terms of GVA per worker; ii) the ex-ante productivity gap between firms run by newcomer and non-newcomers; and iii) the additional gap specific to the crisis period. Our main finding is that firms run by newcomers outperform other firms during the crisis period, irrespective of whether we are analysing the sample of non-owner CEOs or owners. Additionally, we find no significant productivity gap in the period prior to the crisis, suggesting that unobservable differences between newcomers and other CEOs, such as risk preferences or different incentives, play a minor role during normal times, when conducting business as usual is sufficient and innovative management practices are not key.

As an additional robustness test, we use a nearest-neighbour matching estimator to address sample selection bias concerns. Ideally, we would compare a firm's productivity during the crisis if run by a newcomer with the same firm's productivity under the alternative that it had not appointed a newcomer CEO. The counter-factual is not observable though, and we thus construct a hypothetical counter-factual by estimating a first-stage probit regression of the likelihood that a firm appoints a newcomer using observable pre-crisis firm and CEO characteristics. We then obtain a propensity score based on the predicted probabilities. Finally, we use the outcome of the nearest neighbour to obtain the unobserved counter-factual.

We consider three indicators of productivity, namely: apparent labour productivity, measured as GVA and sales per worker, and GVA per unit sold. We then compare the performance of each firm run by a newcomer, during the crisis, with the previously constructed counter-factual based on the most similar firm. Overall, we document higher productivity levels in firms managed by newcomer CEOs during the crisis (see Figure 35b). Specifically, firms which are apparently equal ex-ante experience between 6 and 10% higher GVA per worker during the crisis if directed by a newcomer CEO. This figure rises to 8-13% when productivity is measured in terms of sales per worker. Finally, we also conclude that firms managed by newcomers generated more value per unit sold during the crisis, than otherwise similar firms in the control group, thus pointing towards significant efficiency gains. These figures are both statistically and economically significant.

5. Final remarks

CEOs play a key role in defining the strategies of a firm and therefore, impact significantly a firm's performance and productivity.

This Section suggests that CEOs in Portugal have still fairly low levels of education, so one promising avenue to increase firm productivity is through credible policies that improve the education system, turning it more adequate to the current market and technological changes in progress. Additionally, the high share of owner CEOs and the average high tenure also suggest that firms haven't been able to completely adapt to the changing market, implying that there is room for a more efficient reallocation of CEO skills to firms.

Aside from these key observable characteristics, there are a set of unobservable attributes that can make a difference in times of crisis, despite not playing a major role during normal times. More specifically, we argue that newcomer CEOs present a significant advantage in managing firms during difficult times, regardless of their relative knowledge deficit regarding the firm. Our results question traditional definitions of human capital based on seniority and tenure, suggesting that accumulated experience in the firm is not key in periods of economic distress, when compared to a newcomer CEO's flexibility, adaptability and willingness to take risks and innovate.



(a) Difference-in-differences estimation



(b) Propensity Score Match estimation

Figure 35: Newcomers and firm productivity (percentage)

Note: Dots and bars stand for the estimated coefficients and the lines represent the 95% confidence intervals. In the first figure the dots represent i) the common productivity downturn for all firms, in terms of GVA per worker (crisis); ii) the ex-ante productivity gap between firms run by newcomer and non-newcomers (newcomer); and iii) the additional gap specific to the crisis period (crisis*newcomer).

Source: Quadros de Pessoal

Future research should focus on understanding the management practices of newcomer CEOs and assess ways to facilitate transitions in top management positions as crises arise or, more generally, to design the appropriate incentives to make CEOs follow the best management practices at all times.

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4.2. Does a firm hiring an experienced manager improve its performance?

Giordano Mion, Luca David Opromolla, Alessandro Sforza

1. Motivation

"Managers are conductors of an input orchestra [...] Just as a poor conductor can lead to a cacophony rather than a symphony, one might expect poor management to lead to discordant production operations."

- Chad Syverson, What Determines Productivity (2011)

The majority of businessmen, practioners, and policy-makers—as well as football fans!—would probably agree with the above quote. What is instead definitely less consensual is the magnitude of the effect, i.e., how important managers are in determining the performance of a firm, and which characteristics of the managers are crucial in determining the performance of a firm. As an example, let's consider a firm that starts exporting right after having recruited a manager with established experience in the foreign market. Can we attribute the successful entry of the firm into the foreign market to the arrival of the manager? It seems natural to do so.

However, most of us would be less sure about this conclusion if we knew that the firm had, at the same time, obtained an ISO 9001 quality certification that both made its products more competitive—and therefore more desirable to the foreign market—and made the firm a more attractive workplace—and therefore more desirable to experienced managers.

How important was the manager then? And, if there was a positive contribution, was that related to the export experience that the manager had gained in the past or to some intrinsic capability of the manager, like her education, leadership, and communication skills? A precise answer to all these questions is important both for firms looking to operate in the foreign market, and for policy-makers that care about the solidity of the educational system and the efficiency of the labor market. This chapter, based on Mion and Opromolla (2014) and Mion *et al.* (2016), shows that firms where there is a manager with export experience are more likely to start (or continue) exporting, and are more likely to export more. The presence of a manager with export experience turns out to be as important as the productivity of the firm, especially for firms whose products are more difficult to evaluate, or heavily rely on external financing, or compete with Chinese products.

The literature studying how managers and managerial practices affect firm performance is fairly recent and fast-growing. Bloom and Van Reenen (2010), Bloom *et al.* (2013), Bloom *et al.* (2016) and Guiso and Rustichini (2017) among others, have established that better managers and managerial practices lead to better firm performance. Artopoulos *et al.* (2013) explain how the diffusion of business practices from export pioneers to followers can lead to sustained export growth.

2. The analytical framework

The analysis relies on a database that includes all manufacturing firms, as well as their workers, located in Portugal from 1995 to 2006. Besides some core characteristics of the firm, like size, age, and productivity, the dataset informs us if the firm is exporting, to which countries, and the amount of exports by destination. We also know if the firm employs a manager with experience in exporting to a specific country (e.g. France), or in exporting a specific product (e.g. shoes). This latter information comes from the fact that we can track workers, including managers, from one year to the other so that we know, for example, if the manager ever worked in a firm exporting to France or exporting shoes.

With the above data in hand, we follow a very simple—but nonetheless powerful— three-steps strategy to understand how the entry of a firm in a particular foreign market (e.g. France, shoes) depends on the presence of a manager that has experience in exporting toward that market. As an example, consider a firm in 2002. The first step is to check if the firm employs a manager with experience in exporting to any of the following markets: (1) Spain, (2) Other EU top five export destinations (Italy, France, Germany, U.K.), (3) Other EU destinations, (4) Other OECD destinations, (5) Community of Portuguese Language Countries (CPLP), (6) China, and (7) Rest of the World. Suppose this particular firm in 2002 has a manager with experience exporting to China, and a manager with experience exporting to CPLP countries. Figure 36 summarizes this situation:



Figure 36: Export entry and the presence of managers with export experience

the markets with the diagonal stripes are those for which the firm has a manager with export experience (China, and CPLP).

The second step is to check to which markets the firm starts to export in 2002. Suppose this particular firm in 2002 starts exporting to China, CPLP countries and Spain. Figure 36 again summarizes this situation: the markets with a dark grey component are those in which the firm enters in 2002.

The last and final step is to note that our firm is more likely to start exporting to the countries for which the firm has a manager with export experience: 2 out of 2 vs. 1 out of 5.

The power of this approach relies on the fact that, by exploiting the export destination variation for a given firm in a given year, it allows us to control for all those firm characteristic that can vary over time—both those observed like productivity, and size, and those that are unobservable to us, like the acquisition of an ISO 9001 certification that makes the firm more competitive in every market—that may affect the decision to export or not and confound our results.

While definitely powerful, this strategy may not always be enough, since it does not control for firm-time-destination factors. For example, it could be the case that the previous firm had in 2002 undertook some investments that made it more competitive specifically on the Chinese and CPLP markets, and attracted managers with experience to these specific markets. In order to overcome this potential issue, we return to our example above and check if the firm employed a manager with experience in exporting to China or CPLP countries in 1999, that is three years before the time we are interested in. If that was the case then this firm is likely to mantain those managers in 2002 as well. At the same time we can be sure enough that those managers were not hired in 1999 in anticipation of what would have happen three years later.

In more technical terms, we use the data described above to run an instrumental variable regression where the dependent variable is a dummy variable equal to one when a firm starts exporting to a given market in a given year; the main covariate of interest is another dummy variable equal to one if the firm employs a manager with experience in exporting to that market in a given year; the instrument is the third lag of the same main covariate; and where we control for firm-year and destination-year fixed effects.

The use of the third lag of the main covariate as instrument seems to be a good strategy. It relies on the large evidence regarding the fixed sunk costs (including market-specific ones) associated to export activity and therefore on the fact that the time frame corresponding to firms' decisions today affecting export performance tomorrow (like setting up or increasing investments in quality and/or productivity) is about 2 years.

The results, reported in detail in Mion *et al.* (2016), show that the presence of a manager with specific export experience increases the probability of starting to export by 2-4% which represent a very large number since only a few firms start to export in a given year.²⁴ Similarly, we find that the presence of a manager with specific export experience increases the probability to continue exporting, and increases the level of exports by about 57% for export to a specific destination conditional on continuation.

3. Final remarks

What determines the success of a firm in the foreign market? Knowledge of the specific foreign market, as embodied in a manager, seems to be an important factor. If that's the case, when a firm successfully enters into a foreign market it creates a body of knowledge that is absorbed by its managers and can benefit other firms when managers change jobs. In other words, the export knowledge and experience acquired in a firm seems to be fairly portable. To this extent, if the regulatory environment allows the most efficient firms to take

^{24 2-4%} roughly corresponds to half of the unconditional probability of starting exporting to a specific destination or a specific product.

advantage of the opportunites in the foreign markets, and it allows an healthy functioning of the labor market then this can lead to a better performance of firms, and potentially to higher growth.

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4.3. How important are organizational decisions in determining a firm's productivity?

Lorenzo Caliendo, Giordano Mion, Luca David Opromolla, Esteban Rossi-Hansberg

1. Motivation

Measuring and understanding differences and variations in firm, and therefore country, productivity is a difficult—and important—task. Economists throughout the world have documented large and persistent differences in measured productivity across firms: Syverson (2004), looking at the variation in revenue-based productivity across US plants within four-digit SIC industries, finds that the plant at the 90th percentile of the productivity distribution makes almost twice as much output, with the same measured inputs, as the 10th percentile plant.

The evolution of productivity is also at the center of the academic and policy debate, both in Portugal and abroad. How steeply productivity rises with firm age—the age-productivity profile—is quite heterogeneous across countries: older plants in the US are much larger and productive than younger plants, and this gap is (much) smaller in developing countries (Hsieh and Klenow, 2014). At the aggregate level, productivity growth seems to have slowed down in various advanced economies: labor productivity growth in the US has averaged 1.3 percent per year from 2005 to 2015, down from 2.8 percent in the previous decade (Syverson, 2017).

This Section, based on Caliendo *et al.* (2015a), tackles all these issues, and shows that a better understanding of the internal organization of a firm can go a long way towards understanding differences in productivity across Portuguese firms, as well as the evolution of firm-level and aggregate productivity.

The starting point is that a firm's productivity may depend on the way the firm organizes its production: the way different inputs and factors of production are combined with particular technologies, given demand for the firm product, determines the production efficiency of a firm. Some of these organizational decisions are taken as a reaction to shocks to demand (e.g. a change in fashion), to changes in the institutional environment in which the firm operates (e.g. sudden changes in regulations), or to productivity shocks (e.g. the shutdown of an important supplier). This creates a measurement challenge: in order to understand how changes to the organization of the firm affect its productivity, we need to acknowledge that these changes may have been triggered by external shocks that also affect productivity. How to disentagle the two channels? Let's start by looking, in the next section, at a real world example.

2. How a reorganization, triggered by increased competition, affected productivity?

The first step we need to take is to distinguish between quantity-based and revenue-based productivity. The distinction is crucial since the first measures how effective is a firm in transforming inputs and factors—like capital, intermediate goods and labor—*into output*, while the other measures how effective is a firm in transforming inputs and factors *into sales*, and therefore also measures any price variation, perhaps related to markups, that results from market power. Once we are able to distinguish between a firm's quantity-based and revenue-based productivity, we can begin to study how a change in the organization of the firm affects either of them. In both cases, we will focus on within-firm changes in productivity as a result of firm re-organization: this is extremely useful since it allows us to sidestep the difficulties in comparing quantity-based productivity—which is expressed in units of the particular goods produced by a firm—across firms.

Let's then consider the case of a Portuguese firm producing "Knitted and crocheted pullovers"—as well as other similar articles—that heavily downsized between 2002 and 2005, as a consequence of the increased competition following China's entry into the World Trade Organization. The quantity sold by the firm declined by 50 percent, with prices increasing by 30 percent. Since changes in the organization of a firm are inherently lumpy, the firm adapted to the new competitive situation by adopting an organizational structure that was a bit too small for the size of its new market: it streamlined its organizational structure by firing a number of managers and employees performing secondary tasks, and by focusing on its main experties by maintaining its "sewers and embroiderers". As a consequence of this significant change in the organization of the firm, quantity-based productivity declined by 53 percent, but revenue-based productivity—affected by prices—increased by 9.2 percent. The increased competition from China stimulated a specific change in the organization of this apparel firm—the span of control, i.e. the number of production workers per manager, increased—and had a large negative impact on its quantity-based productivity, and a more modest positive impact on its revenue-based productivity. In the rest of the chapter, we will show that this kind of adjustment is typical, and that reorganizations are important not only to understand how productivity changes for a given firm, but also to understand the evolution of aggregate productivity.

3. Data and econometric challenges

Three firm characteristics were crucial in the previous example: the organization of the firm, the firm revenue-based productivity, and the firm quantity-based productivity. Luckily, the rich set of data available for Portuguese firms allows us to measure all three of them.

Our measure of firm organization relies on the theory of knowledge-based hierarchies developed in Rosen (1982), Garicano (2000) and, in an equilibrium context with heterogeneous firms, in Garicano and Rossi-Hansberg (2006) and Caliendo and Rossi-Hansberg (2012). This theory emphasizes that knowledge, interpreted as the ability to solve problems, is a key input for production. Given that individuals have a limited time to work then, in order to relax this time constraint, individuals can work in teams and specialize in solving different kinds of problems: less knowledgeable workers deal with routine production tasks, thereby economizing on the time of experts who specialize in managing tasks.

In Portugal—just like in France (Caliendo *et al.*, 2015b)—we find that when firms re-organize, they manage the knowledge characteristics of their labor force to save on labor costs: when a firm expands substantially, it adds well-trained experts, and routinizes lower-level jobs for which the firm now hires less skilled/trained employees. The increase in the wage bill associated with the hiring of upper-level management is compensated by the decrease in the average wages associated to lower level jobs. The opposite happens when a firm shrinks substantially: the apparel firm that we considered above decided to downsize and focus on less managers and relatively more "sewers and embroiderers" because its market became much smaller. We were able to detect this change in the organization thanks to the Quadros de Pessoal, a matched employer-employee dataset covering the universe of firms located in Portugal, with information on all their workers. Specifically, for any given firm and year, we can assign each

of the workers in the firm to one of 4 layers, from production workers to top management.

The theory of knowledge-based hierarchies has clear-cut implications for the evolution of firm productivity that match what we observe in the data. Let's consider the evolution of revenue-based productivity for a growing firm. When a firm grows, but not enough to reorganize, revenue-based productivity increases, driven by the rise in the price charged. However, when the firm does change its organization by adding a layer of managers, revenue-based productivity drops, as prices reflect the lower marginal costs. Changes in the organization of the firm can be seen as lumpy investments (or disinvestments) that become worthwhile once the market of a firm is large enough to sustain the higher fixed cost associated to a more complex organization. In Caliendo *et al.* (2015a) we show, among other things, that the implications of the theory are consistent with the evolution of a simple measure of revenue-based productivity, value added per worker, within a broad spectrum of industries.

Once we acknowledge that a firm's organization is one of the inputs affecting production, we need to face two challenges. First, when estimating the productivity of a firm, we need to control for a measure of firm organization, as opposed to simply controlling for the number of workers or the wage bill. Second, we need to take into account that firm organization is endogeneous, and can depend on productivity shocks that are unobserved to the econometrician. In Caliendo *et al.* (2015a), we show how to solve both of these problems when computing several measures of firm revenue-based and quantity-based productivity.

Before jumping to the results, we need to address what is often the elephant in the room in many discussion in economics: causality. So far, we have discussed how to construct measures of productivity that incorporate the role of firm organization, based on a theory that associates increases in the number of layers of a firm to increases in quantity-based productivity and reductions in revenue-based productivity. To the extent that the organization of a firm, similar to what is usually assumed with capital, does not change much in the short run then we can interpret the relationship between a firm's number of layers and its productivity as causal.

However, we can also be more demanding. In Caliendo *et al.* (2015a) we employ two different strategies to instrument for a firm reorganization, and to make our results more robust. First, we resort to an instrumental variable strategy, and use a large set of instruments represented by demand and cost shocks, as well as real exchange rates and a firm's export and import patterns, that predict organiza-

tional changes but are uncorrelated with current productivity shocks. Second, we use the removal of quotas in sub-industries of the Textile and Apparel sector, that resulted from China's entry into the WTO, as an instrument for a firm's reorganization. In both cases, we get a consistent set of results that will be summarized in the next, final, subsection.

4. Organization is key

Our main results are based on the Wooldridge (2009) revenue-based productivity, and Forlani *et al.* (2016) quantity-based productivity approaches, extended to account for firm organization, and the instrumental variable strategy outlined above. We find that, as a result of an exogenous demand or productivity shock that makes the firm reorganize and add a management layer, quantity-based productivity increases by about 8 percent, while revenue-based productivity drops by around 7 percent. These effects are large in magnitude, and extremely significant and robust to alternative definitions of productivity, and empirical strategies.

The results are even more important once two additional facts are taken into account. First, reorganizations are fairly frequent in the data, and therefore are potentially an important driver of firm productivity: about 12 percent of firms in a layer reorganize by adding a layer, and about the same number downscale and drop one. This is not unique to the Portuguese market: Caliendo *et al.* (2015b), using data for France, find similar patterns.

Second, the effects of reorganization are important for understanding aggregate productivity dynamics: reorganization accounts for an increase in quantity-based productivity, when firms reorganize by adding layers, of about 8.3 percent, while the average increase in productivity for these firms was 6.5 percent. Similarly, when firms reduce the number of layers, reorganization accounts for more than 100 percent of the overall change in productivity of downsizing firms!

5. Final remarks

The results shown in this chapter underscore the importance of acknowleding that the organization of firms is a key input into the production process. This allows to better understand why some firms are much more productive than others, and to rationalize the change in productivity of expanding and downsizing firms. An implication of the analysis is that failure to reorganize in order to grow—possibly due to institutional impediments or management inadequacy—can result in an inability to exploit available productivity improvements. This can be crucial, especially since we find that reorganization is a first-order source of aggregate productivity gains in the economy.

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5 INVESTMENT AND FINANCING

5.1. How important is access to finance for firms' performance in a crisis?

Sudipto Karmakar

1. Motivation

How important is access to finance for Portuguese firms' performance? What determines bank's credit supply? Are all firms affected in an uniform way or are there important heterogeneities in the data? Such questions are of paramount importance for policymakers. They become even more relevant during crisis scenarios when credit availability is scarce and aggregate demand is low. Ideally, we would want the most productive firms to continue to have access to credit as these "good" firms are the engines of growth. In this Section, we address some of these issues by focussing on a specific crisis episode and try to derive some lessons from it. In particular, we will concentrate on the sovereign debt crisis that began in the spring of 2010.

Until early 2010 the sustainability of sovereign debt was not a concern for the markets. However, in the spring of 2010, when the Greek government requested an EU/IMF bailout package to cover its financial needs, markets started to doubt the sustainability of sovereign debt issued by other peripheral Eurozone countries like Italy, Portugal, and Ireland (Bottero *et al.*, 2015). The credit default swap spreads on Portuguese sovereign bonds increased dramatically and the Portuguese banks lost access to international debt markets which had been an important source of their funding. This sudden stop is attributed mainly to investor's concerns about contagion from the crisis in Greece. The sudden rise in Portuguese CDS spreads meant that the banks that were more exposed to the public sector saw the risk in their balance sheets going up and this relates to the much talked about sovereign-bank nexus (Brunnermeier *et al.* (2011)).²⁵

The sudden rise in the riskiness of the asset portfolio might affect the credit activities of the banks via two channels: the equity channel and the funding channel. In the case of Portugal, the funding channel seems to be predominant. It operates purely on the liabilities side

²⁵ For more details, refer to Reis (2013).



(b) Credit spreads

Figure 37: Bank funding and credit spreads Note: IIS in the bottom panel signifies Ireland, Italy and Spain.

where risky banks find it difficult to rollover their debt in capital markets. This increased funding costs of the banks are then passed onto borrowers, as is observed in Figure 37.²⁶

Figure 37a plots the market funding of Portuguese banks as a fraction of their liabilities while Figure 37b plots the interest rates charged on short-term loans (besides Portugal, we also plot some other euro area countries for the sake of comparison). In the rest of the Section we will explore how the banks that were differentially

²⁶ The equity channel is active if the assets are marked-to-market. A sudden rise in riskiness would lead to a depletion of bank equity (liabilities roughly remaining constant) and this would have an adverse impact on credit extension.

exposed to the capital markets behaved differently, in terms of credit extension. We will also document the real effects for the Portuguese firms who experienced a decline in credit, during the same period.

There is an emerging strand of literature that tries to study the real effects of financial shocks (Chodorow-Reich, 2014, Bofondi *et al.*, 2018, Bentolila *et al.*, 2018, Acharya *et al.*, 2014, and so on). In the context of Portugal, Buera and Karmakar (2018) analyze the credit supply and real effects in the immediate aftermath of the sovereign debt crisis. They are able to identify important dimensions of firm heterogeneity that determine their performance during a crisis episode. More precisely, they find that highly leveraged firms and firms that had a substantial amount of short-term debt on their balance sheets contracted significantly more during the crisis. These firms experienced a reduction in credit and were unable to tap into alternative sources of funding. Similar ideas are contained in some other recent papers (Giroud and Mueller, 2017 and Benmelech *et al.*, 2018).

2. Data and results

The main dataset used for this analysis is the Central Credit Register, maintained by Banco de Portugal. It contains very detailed information, at the loan level, on all commercial and industrial loans granted to non-financial corporations by all banks operating in Portugal. The dataset is comprehensive, as the reporting threshold for a loan is only 50 euros. We also use detailed, monthly, information on the bank's balance sheets. We will now proceed in two steps: first we look at the bank credit supply effects and next we turn to the firm side and discuss how certain groups of firms found it difficult to roll over their debt, thereby affecting their performance significantly. The discussion of the second part is purely based on the analysis conducted in Buera and Karmakar (2018).

2.1. Credit supply

The regression equation we estimate is given by:

The dependent variable, $\Delta L_{i,j,09:Q4-10:Q4}$, is the growth rate of total committed credit for each firm-bank (i-j) pair. The main explanatory variable is Security_ratio_{j,09:Q4} and it represents the ratio of market funding to total assets of bank 'j' prior to the crisis. B_{j,09:Q4} is

a vector of additional bank level controls while α_i is a vector of firm fixed effects to control for the demand side. The results are presented in Table 7. In column 1, we examine whether banks with a higher fraction of security funding cut back more on credit to firms between 2009:Q4 and 2010:Q4. As results in column 1 show, using the entire lending to firms, there is a significant drop in the growth rate of credit if the lending bank had a higher exposure to international capital markets. In column 2, we add an array of bank level controls. In columns 3 and 4, we restrict the sample to firms that were borrowing at least from two different banks as of December 2009. The coefficient on security funding ratio drops but still remains significant at the 1% level conveying the idea that the effect is much stronger if we include firms with single banking relationships.

One could be concerned that the results could be driven by some demand side conditions rather than supply side factors. Perhaps weaker firms with a lesser credit demand were borrowing more from banks with higher level of security funding. To address this concern, we include firm fixed effects, in columns 3 and 4, to control for heterogeneity both in observable and unobservable characteristics. The intuition is that we keep the firm constant and ask whether for two banks lending to the same firm in 2009:Q4, there is a higher reduction in credit from the banks with a greater security funding ratio. Hence, we are able to hold the observed and unobserved loan demand constant and isolate the loan supply effect. In terms of economic magnitudes, a one standard deviation increase in security funding ratio leads to a decline in credit growth by about 4%.

In columns 3 and 4, we also note that well capitalized banks and banks with higher liquidity ratios cut back lending by less and they were better able to absorb shocks. We also see that the effects were weaker for bigger banks hinting to the fact that they may have alternative sources of funding due to which their credit supply was less affected. Finally, in column 4, we control for the credit between the firm and the bank in 2009:Q4 and find similar results. The results point to the volatile nature of market funding and the consequent effect on borrowers. Banks with relatively higher exposures to the capital markets found it difficult to obtain financing and thereby had to cut back more on their operations. However, what is important to note, is that this was not a general phenomenon. The results are much weaker for bigger banks with alternative sources of funding and banks with stronger capital and liquidity ratios. We cluster standard errors at the bank level but the results are robust to their exclusion as well.
	Growth rate of credit (%AL)					
Variables	(1)	(2)	(3)	(4)		
Security ratio	-0.648***	-0.349**	-0.277**	-0.303**		
	(0.111)	(0.142)	(0.124)	(0.138)		
Liquidity ratio		-0.991	0.068***	0.077***		
		(1.942)	(0.020)	(0.0246)		
Capital ratio		-0.282	0.394***	0.453***		
		(0.174)	(0.131)	(0.133)		
Return on assets		1.027	1.056	0.914		
		(2.284)	(1.203)	(1.208)		
Central bank ratio		-1.599**	-0.215	-0.341		
		(0.760)	(0.752)	(0.812)		
Size			0.049***	0.060***		
			(0.010)	(0.011)		
Loan amount 09:Q4				-0.061***		
				(0.014)		
Observations	422,523	422,523	305,190	305,190		
R-squared	0.020	0.029	0.373	0.380		
Banking relationships >1	No	No	Yes	Yes		
Firm Fixed Effects	No	No	Yes	Yes		

Table 7: Banks' security funding and credit supply

Notes: The dependent variable is the growth rate of loans between firm 'i' and bank 'j' between 2009:Q4 and 2010:Q4. Security ratio is the ratio of market funding to total assets. Liquidity ratio is the ratio of cash, reserves and liquid assets as a fraction of total assets. Return on assets and Capital ratio are the profits before tax and core capital normalized by total assets, respectively. Central bank ratio is the fraction of liabilities financed by central bank funding. Size is the log of bank assets. Loan amount 09:Q4 measures the strength of the bank-firm relationship prior to the incidence of the shock. Columns 1 and 2 consider all firms while columns 3-4 consider only those firms that have at least two banking relationships. Standard errors, reported in parentheses and are clustered at the bank level. ***, **, and * indicate significance levels at 1%, 5%, and 10%, respectively.

2.2. Real effects

The credit market developments are important to the extent that they have real effects. If firms are easily able to substitute the loss in bank financing elsewhere, there will be no real decline in economic activity. Now that we have documented the credit supply effects, let us focus on the real side. The discussion in this section is based on Buera and Karmakar (2018) and the reader is advised to refer to the paper for extensive details. Here we will only discuss the main results and conclusions.

The effects of the sovereign debt crisis on firms were not uniform. The firms that were significantly higher leveraged and those that had been holding a significant amount of short-term debt on their balance sheets found it difficult to obtain fresh credit from banks, in the aftermath of the outbreak of the crisis.²⁷ On the other hand, there was no significant credit reduction to firms in the lower quartiles of leverage and maturity structure of debt, which definitely appears to be a positive development in the credit markets. To get a sense of the magnitudes, let us consider a highly leveraged firm that was simultaneously borrowing from two banks: one of which had a sovereign exposure in the top decile (highly exposed) while the other had a sovereign exposure in the bottom decile (less exposed). The highly exposed bank cut lending to the highly leveraged firm by 3.5 percentage points more than the less exposed bank. The number would stand at 4.7 percentage points for high short-term debt firms. The authors also document that these firms were not able to, instantaneously, seek funding elsewhere, e.g. trade credit. Should that have been the case, one would not find any effect on firms performance because they could continue with their operations unperturbed.

This was indeed not the case. The "fragile" firms were unable to obtain funding through other banks or other firms. As a result, they had to scale down the size of their operations and, therefore, report lower growth rates in terms of employment, fixed assets, and intermediate commodities. In order to have a sense of magnitudes, a highly leveraged firm contracted 1.7 percentage points more, in terms of employment, than its lower leveraged counterpart. The figure was 7.2 percentage points in case of assets and 3.9 percentage points in terms of intermediate commodities. These numbers are non-negligible and provide a sense of how financial shocks manifest themselves by interacting with firm characteristics. The effects are qualitatively similar for firms with a high degree of short-term debt on their balance sheets, albeit smaller quantitatively.

The above results point out to the fact that leverage and shorter maturity of debt seem to be two important dimensions of firm heterogeneity that influence their growth and performance. After documenting these results, the authors take a step back and ask the question: What drives the distribution of these variables? It is imperative

²⁷ Leverage was defined as the sum of all interest bearing liabilities divided by total assets while short-term debt consisted of the debt that was due to mature in the next one year. A highly leveraged firm was defined to be one that had a leverage ratio greater than 47% in 2009:Q4. A high short-term debt firm was defined to be as one that had more than 53% of the total debt maturing in a one year horizon.

to answer this question in order to be able to make sound policy recommendations.

The authors analyze this question theoretically by means of a simple model of firms' decision making. In the model, firms need to issue debt in order to finance an investment opportunity. They can choose an optimal mix of short-term and long-term debt. If the firm issues the optimal amount of long-term debt, then it is hedged against interest rate fluctuations in the interim periods (financial shock).²⁸ In that sense, long-term debt acts as an insurance tool to hedge against shocks. On the other hand, owing to a positive term premium, long-term debt is costly. This trade-off generates an interior solution for the amount of long-term debt issued. The authors document that the firms might be issuing more than the optimal amount of short-term debt owing to two reasons: they might be expecting higher cash flows in the future or the interest rate on long-term debt is too expensive for them. The implications of the two cases are extremely different. In the first case, the sub-optimal amount of long-term debt is exactly offset by the cash flows and in that case there are no real effects even if the adverse shock materializes. In the second scenario, this is not the case and should the adverse shock occur, the firm would have to refinance in the peak of the downturn (no cash flows and not sufficient long-term debt) and that would lead to severe real effects. Lastly, the authors revert back to the data and document that the Portuguese firms debt maturity structure is much more sensitive to firm specific interest rates than cash flows. This last exercise lends further support to the results obtained earlier, in the empirical exercise.

3. Concluding remarks

Access to finance is a key determinant of firms' performance and growth, even more so in crisis times when bank and alternative sources of funding are relatively scarce. We have just studied the veracity of this statement using the recent sovereign debt crisis as an example. We have observed that banks that saw the risk in their balance sheets rise by more, cut back lending more but this effect was muted for banks with sound capital and liquidity ratios. On the real side, the firms with significantly higher amounts of leverage and short-term debt were the ones that found it difficult to refinance in the peak of the crisis and hence reported poor growth performance. Therefore, the overall amount of debt (leverage) and

²⁸ If the status quo is maintained, it is the good state while if the interest rates turn out to be higher, it is equivalent to the bad state materializing.

the maturity structure turn out to be important dimensions of firm heterogeneity, in the data. In recent discussions within the Eurosystem, there has been a lot of attention dedicated to corporate leverage but the portfolio mix of short vs. long-term debt is an equally important indicator of firms' performance that should be monitored and discussed in greater detail.

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5.2. How important are borrowing constraints for Portuguese SMEs' exit and investment decisions?

Luísa Farinha, Sónia Félix

1. Motivation

[...], credit conditions remain very heterogeneous across countries and sectors. According to the latest ECB survey on credit access by small- and medium-sized enterprises (SMEs), supply constraints remain especially strong for SMEs in stressed countries. The percentage of financially constrained but viable SMEs – i.e. those with positive turnover in the last six months seeking a bank loan – varies from a minimum of 1% in Germany and Austria to a quarter of the total population in Spain and as much as a third in Portugal.

2014, by Mario Draghi, ECB Forum on Central Banking

The global financial crisis and the subsequent Portuguese sovereign debt crisis led to an economic adjustment process characterized by a substantial contraction of the economic activity and worse future prospects for economic agents. This economic adjustment comprised a bank lending channel with Portuguese banks being severely affected by international financing restrictions and stronger capital requirements. According to the Bank Lending Survey (BLS), the observed credit contraction during the economic and financial crisis was a result of increased restrictiveness in credit standards and conditions applied on loans as well as of decreased loan demand by firms.

Borrowing constraints have important implications for firm dynamics. Firms may be forced to operate at a smaller scale than desired, may forego investment opportunities, and may not be able to overcome temporary liquidity needs in the presence of negative shocks. While the heterogeneity underlying firm dynamics is not yet fully understood, it is well established that firm dynamics are an important determinant of aggregate outcomes (Hopenhayn and Rogerson, 1993; Melitz, 2003; Klette and Kortum, 2004).

The theoretical literature has emphasized the role of financing constraints in explaining firm dynamics, namely the firm's investment and exit decisions. Fazzari et al. (1988) explain the behaviour of aggregate investment based on financial constraints. Albuquerque and Hopenhayn (2004) develop a theory of endogenous borrowing constraints and find that these are an important determinant of firm growth and survival. Cabral and Mata (2003) find that the firm size distribution of Portuguese manufacturing firms is quite skewed to the right but evolving over time towards a more symmetric one. The explanation relies on the presence of financing constraints for young and smaller firms. Cooley and Quadrini (2001) introduce financial-market frictions in a model of industry dynamics with persistent shocks and show that the combination of these can explain the dependence of firm dynamics on size and age. Furthermore, the models of firm dynamics document that smaller firms may be more sensitive to the worsening of credit market conditions during recessions (Perez-Quiros and Timmermann, 2000) and a tightening of monetary policy (Gertler and Gilchrist, 1994).

Little empirical evidence can be found on the importance of the firm's capital structure for firm dynamics. Mata *et al.* (2010) document that firms with a higher share of long-term debt survive more. Farinha *et al.* (2018) establish this argument with respect to new firms. Farinha and Prego (2013) show that the firms' investment decisions are correlated with the firms' financial standing. Recently, Carreira and Teixeira (2016) use firm-level data for Portugal and show that credit market conditions in the period between 2004 and 2012 explain firm exit, especially in the case of large firms, and employment change.

Farinha and Félix (2015) consider a disequilibrium model to compute the probability of credit rationing and estimate that 15% of Portuguese small and medium-sized enterprises (SMEs) were partially credit rationed in the period between 2010 and 2012, i.e. were granted a loan but in a lower amount than they had applied for. The authors also estimate that in this period 32% of SMEs did not get a loan even though their latent credit demand was positive. Moreover, the authors estimate that the Portuguese SMEs searched for bank loans mainly to finance their operational activity and not for investment. The smaller firms and those with smaller amounts of internal resources are estimated to have higher demand for bank loans. In turn, firms with a higher capacity to generate cash-flows and pay their debt and with more assets to pledge as collateral are estimated to borrow more from banks. These results can have important implications on firm and market dynamics due to the relevance of bank loans as a source of financing for Portuguese SMEs.

This Section is presented in two parts. The first part of the analysis is based on Farinha and Félix (2015) and briefly describes the credit disequilibrium model estimated by the authors for the period between 2010 and 2012. The estimation of the credit disequilibrium model is restricted to SMEs because these are expected to rely more on bank loans and to have a limited access to other external sources of financing. Then, in the second part of the analysis, we assess the importance of credit constraints in explaining the firm's investment and exit decisions. This second part closely follows the work conducted in Félix (2018).

2. The demand and supply of credit

2.1. The disequilibrium model

The first part of the analysis relies on the estimation of a credit disequilibrium model, which assumes that the observed rate of interest does not ensure that credit demand equals credit supply. The disequilibrium model is comprised of three equations:

- An equation for the demand of new loans: $NL_d^* = f_d(X_db_d; u_d);$
- An equation for the supply of new loans: $NL_s^* = f_s(X_s b_s; u_s)$;
- And an equation that links the observed quantity of credit with the unobservable credit demand and supply: $NL = min(NL_d^*; NL_s^*)$.

Loan demand is assumed to depend on a set of variables X_d that measure the firm's economic activity, availability of substitute (internal and external) funds, and the cost of bank credit. Loan supply is assumed to be determined by a set of variables X_s that measure the firm-specific credit risk and the firm collateral. The terms u_d and u_s with zero mean and variance σ_d^2 and σ_s^2 , respectively, represent the unobservable factors that affect credit demand and credit supply, respectively, and it is assumed that they may be correlated with each other. This system of equations is estimated using the maximum likelihood estimator.

The variables included in the analysis were computed using the Portuguese database Simplified Corporate Information - IES - which consists of detailed balance sheet data and covers the population of virtually all Portuguese nonfinancial corporations. The formal details of the model and a description of the determinants of the demand and supply of new loans are presented in Farinha and Félix (2015).

	Partial rationing
	(in % of firms with loans)
SMEs	15
Very small firms	19
Small firms	13
Medium firms	9
Young SMEs	26
Manufacturing	12
Construction	21
Trade	16
Hotel and restaurant	9
Information and communication	11
Other services	14

Table 8: Credit rationing for Portuguese SMEs.

Notes: Partial rationing in percentage of firms with bank loans. The model was estimated for the period between 2010 and 2012.

We assume that a firm is affected by borrowing constraints, i.e. is partially credit rationed, whenever the probability that the latent credit demand is higher than the supply of credit exceeds 0.5. The model was estimated for SMEs in the period between 2010 and 2012.²⁹

2.2. Borrowing constraints

The estimates of the partial credit rationing model for Portuguese SMEs are presented in Table 8. According to the results, approximately 15% of SMEs with a bank loan were partially credit rationed. The most affected firms are the younger and the smaller, and the most affected sectors of economic activity are construction and trade.

²⁹ We consider a sample of Portuguese SMEs in the period between 2005 to 2012. The relevant period for the estimation starts in 2010 because we impose in the estimation of the disequilibrium model that firms stay at least for four consecutive years in the sample. Furthermore, we consider the Rivers and Vuong (1988) estimation strategy to deal with the endogeneity problems raised by some variables and consider the first differences of the explanatory variables lagged one and two periods as instruments of the endogenous variables.

3. Borrowing constraints and firm dynamics

3.1. Empirical framework

In the second part of this Section, we closely follow the work conducted in Félix (2018). The author presents a very simple model to investigate the importance of borrowing constraints for firms' investment and exit decisions. The analysis proceeds in two steps: first, the author picks the estimates of the credit disequilibrium model estimated in Farinha and Félix (2015) to identify which firms were affected by borrowing constraints. Second, the author analyses the importance of partial credit rationing in two outcomes: firm exit from the market and the firm's investment rate.

To assess the importance of borrowing constraints on firm's investment and likelihood of survival the author considers the following baseline equation:

$$y_{it} = \beta_0 + \alpha_i + \delta_s + \lambda_t + \beta_1 BorrowingContraints_{it} + \beta_2 Size_{it} + u_{it},$$
(13)

where yit assumes two outcomes: exit and investment rate of firm i in year t. A firm exit in year t is defined by its absence from the IES in that year, provided that this absence does not constitute a reporting gap. The firm's investment rate is calculated as the ratio between the change from year *t*-1 to year *t* in net fixed assets, i.e. adjusted for depreciations, and total assets. The variable Borrowing Constraints assumes two possibilities: first, the probability of partial credit rationing as estimated in Farinha and Félix (2015), and second, a dummy variable that equals one whenever the probability that the latent credit demand is higher than the supply of credit exceeds 0.5, and zero otherwise. Size is a categorical variable for firm size with categories very small, small, and medium-sized firms.³⁰ The terms δ_s and λ_t denote a set of sector of economic activity and time fixed effects, respectively. The term α_i denotes a vector of firm fixed effects that account for firm (observed and unobserved) time-invariant heterogeneity.³¹ The formal details of the estimation procedure are presented in Félix (2018).

³⁰ The classification of firms according to size follows the European classification of SMEs.

³¹ Firm fixed effects are only included in the investment specification because of the single failure per firm data that would lead to the inconsistency of the fixed effects in the exit model.

3.2. Propensity to exit and investment

Félix (2018) estimates that firms that were affected by borrowing constraints have a higher propensity to exit from the market. In particular, the estimated average marginal effect after fitting a complementary log-log model equals 0.034, which implies that the higher the probability of being affected by borrowing constraints the higher the likelihood of firm exit. Moreover, the author also finds that firms that were estimated to have been partially credit constrained in the period between 2010 and 2012 are on average 1.61 percentage points less likely to survive, *ceteris paribus*. The average exit rate for the firms in the sample in this period is approximately 2.5% and therefore this estimate implies that credit constrained firms are on average 64% less likely to survive than their counterparts.

The estimates also suggest that borrowing constraints played a role in explaining investment dynamics in the period between 2010 and 2012. The results suggest that a one standard deviation increase in the probability of being credit constrained contributes to decrease the investment rate by 1.6 percentage points. Furthermore, the results suggest that the investment rate of SMEs that were estimated to have been partially credit constrained is on average 2.7 percentage points lower than that of their counterparts, *ceteris paribus*.

All in all, the results tally with the theoretical and empirical literature on firm dynamics and financing constraints, and suggest that borrowing constraints are important to explain the firms' investment rate and the likelihood of firm exit from the market in the period between 2010 and 2012.

4. Final remarks

This Section contributes to the empirical literature on credit constraints and firm dynamics by analyzing the investment behaviour and exit decisions of Portuguese SMEs that were estimated to have been partially credit rationed in the period between 2010 and 2012. The results suggest that partially credit constrained firms are significantly less likely to survive than their counterparts. Moreover, it is estimated that in this period the firm's investment rate is negatively correlated with the presence of financing frictions in the credit market. These findings tally with the theoretical underpinnings that financing constraints play a crucial role in explaining firm dynamics and emphasize the importance of sources of funding other than bank credit for SMEs.

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5.3. Do bank credit shocks matter for firms' investment decisions?

João Amador, Arne Nagengast

1. Motivation

Assessing the impact of bank shocks on firms' investment is an important aspect when it comes to discussing economic growth. In particular, persistently weak investment against a backdrop of low bank lending might be an impediment to growth. Although the rate of return on investments carried out by firms and their indebtedness levels are very relevant concerns, the ability to support firms' investment efforts is a basic task for any banking system. These considerations naturally apply to the Portuguese economy, especially in view of weak investment and low levels of capital per worker. Nevertheless, identifying the origin of variations in credit is hard, since the total loan volume in an economy is a function of both credit demand and credit supply.

This Section, based on Amador and Nagengast (2016), adopts the methodology suggested by Amiti and Weinstein (2018) and shows that credit supply shocks have a sizeable impact on firm-level as well as on aggregate investment in Portugal. Adverse bank shocks are found to impair firm-level investment as a function of the capital structure and size of firms. For the economy as a whole, granular shocks in the banking system account for a sizeable share of aggregate investment dynamics.

2. The analytical framework

While initial contributions to identifying credit supply shocks were based on aggregate data, more recent studies have made use of the increasing availability of matched bank-firm loan datasets, exploiting the across-bank variation of an exogenous event affecting bank lending, as well as the fact that firms obtain their loans from different credit institutions (e.g. Amiti and Weinstein, 2011; Chava and Purnanandam, 2011; Jimenez *et al.*, 2012; Schnabl, 2012; Chodorow-Reich, 2014; Iyer *et al.*, 2014; Miyakawa *et al.*, 2015; Dwenger *et al.*, 2015; Kaoru *et al.*, 2015; Paravisini *et al.*, 2015). The main obstacle in applying the previous approaches to other countries is the difficulty of finding suitable instruments to identify credit supply shocks. Even if these instruments are available, the analysis is usually limited to studying one particular episode. Another shortcoming is that, while these studies convincingly address the identification problem at the firm level, they remain silent on the aggregate effect of credit supply shocks.

In Amador and Nagengast (2016) bank shocks are identified by applying the decomposition framework proposed by Amiti and Weinstein (2018) to a rich dataset of matched bank-firm loans. The methodology decomposes the growth rate of individual credit relationships along bank, firm, industry and common shocks, adding up to the growth rate of bank credit in the economy as a whole. Figure 38 plots a stylised set of bank-firm relationships and aims at providing the basic intuition underlying the identification strategy. The argument builds on the fact that each bank serves a subsample of firms and each firm works with a subset of banks. Therefore, if a shock is observed in a bank-firm relationship, the source can be attributed to the firm if the bank is behaving normally with all its other clients, whereas if the firm is obtaining credit from other banks under normal circumstances, this means that the shock should be attributed to the bank. Overall, the methodology exploits the variation of firm borrowing across different banks.

In comparison to a simple fixed-effects approach, the introduction of an adding-up constraint in this methodology has the advantage of being much more efficient and providing macro-level estimates of bank shocks that are consistent with the micro-level shock decomposition.

The methodology used to disentangle loan supply shocks from loan demand shocks requires a dataset mainly consisting of firms with multiple bank relationships, i.e. the availability of matched bank-firm loan information. In addition, in order to assess the effect of bank shocks on firms' investment decisions, while controlling for their characteristics, balance sheet and income statement information is required. Therefore, another data requirement is linking the lender-borrower information with other characteristics of the firm. The Portuguese credit registry and balance sheet databases together with the existence of a common firm identifier allow us to construct a very rich micro-level dataset for Portugal for the period 2005-2013.



Figure 38: Stylised credit relationships between banks and firms

Notes: This diagram presents a stylised set of credit relationships between banks and firms. Each bank serves a subset of firms and each firm works with a subset of banks. This variation (along with adding-up constraints) allows for the identification of bank and firm shocks. If a shock is observed in one edge (a single bank-firm relationship), the source is attributed to the firm if the bank is behaving normally with other clients, whereas if the firm is obtaining credit under normal circumstances from other institutions, the shock is attributed to the bank.

3. Results

3.1. Bank shocks and firm-level investment

In order to quantify the effect of bank shocks on firm investment, we use a standard investment regression framework with cash flow and lagged sales growth, which is a commonly used proxy for Tobin's Q of unlisted firms (Whited, 2006; Bloom *et al.*, 2007; Kaoru *et al.*, 2015). In addition, we always include firm and year fixed effects to control for unobserved firm-level characteristics as well as common time-varying factors affecting investment in all firms. Table 9 presents our baseline results along with a number of robustness tests and alternative specifications. In line with the literature, we find a positive association between a firm's investment and its cash flow and investment opportunities. In Column 2 we add the bank shock, firm shock and industry shock from the decomposition of firm borrowing.³²

Since not all firms borrow from banks to the same extent, the effect that bank shocks have on investment is likely to differ as a function of firms' dependence on bank loans. For example, a given bank shock will affect firms that borrow very little from banks relative to their size

³² We cannot include the common shock separately since it does not vary across firms and therefore is already absorbed in the year fixed effect.

Dependent Variable: Investment _{f,t} / Capital _{f,t-1}	(1) Full Sample	(2) Full Sample	(3) Largest firms
Cash Flow _{f,t} / Capital _{f,t-1}	0.0260***	0.0257***	0.00385***
	(0.000403)	(0.000404)	(0.00102)
Sales $Growth_{f,t-1}$	0.0388***	0.0295***	0.00104
	(0.00190)	(0.00186)	(0.00487)
Bank Shock _{f,t}		0.146***	0.0396
		(0.00835)	(0.0628)
(Bank Shock _{f,t})×		0.147***	0.301**
\times (Mean Bank-Loan-to-Asset Ratio _f)		(0.0259)	(0.143)
Firm Shock _{f,t}		0.133***	0.137***
		(0.00277)	(0.0156)
(Firm Shock _{f,t})×		0.142***	0.0451
\times (Mean Bank-Loan-to-Asset Ratio _f)		(0.0142)	(0.0419)
Industry shock _{f,t}		0.498***	0.141***
		(0.0293)	(0.0545)
Fixed Effects			
Year	Yes	Yes	Yes
Firm	Yes	Yes	Yes
Observations	656246	656246	21415
R ²	0.356	0.388	0.418

Table 9: Determinants of firm-level investment

Notes: Robust standard errors in parentheses. ***p<0.01, **p<0.05 *p<0.1. We drop the top and bottom two and a half percentiles of each variable. The mean bank-loan-to-asset ratio is defined for each firm as its average ratio of bank loans to assets over the sample period. Largest firms correspond to the top three percentile of loan volume in each year.

much less than firms that depend almost entirely on bank financing. In order to account for these differences in bank dependence, we include interaction terms with the mean ratio of bank loans to total assets.³³

Column 2 of Table 9 shows that the coefficient on bank shocks interacted with the mean loan-to-asset ratio is positive, indicating that a stronger exposure to bank loans is associated with a more pronounced effect of bank shocks. We also find a positive coefficient on bank shocks entering alone, which means that even firms with

³³ Since the mean bank-loan-to-asset ratio is time invariant, we cannot include it separately in the regression since it is already absorbed in the firm fixed effect.

few bank loans would have financed more investment projects in the absence of negative shocks to their banks' credit supply. As expected, both the firm borrowing shock and its interaction with the mean bank-loan-to-asset ratio show a positive coefficient. This implies that the firm-borrowing channel, for example capturing changes in the marginal product of capital or changes in the credit worthiness of the firm, has a strong impact on investment which is more pronounced for firms that are highly dependent on the supply of bank credit. Similarly, we find a positive coefficient for the industry shock, suggesting that investment opportunities often arise at the level of particular industries. For example, these might be related to the price of industry-specific investment goods, or demand and productivity shocks that are shared by all firms within the same industry.

We repeat the decomposition exercise including only the largest firms in our dataset, and in Column 3 we present the results for this additional analysis. In this case, we find that the coefficient on bank shocks is statistically indistinguishable from zero. Very large firms may be more likely to benefit relative to other firms when credit conditions tighten, while small firms lack alternative financing sources and may generally struggle in the presence of adverse financing conditions even if their exposure to bank loans is relatively low. The coefficients of the remaining variables do not change sign. Bank shocks interacted with the mean bank-loan-to-asset ratio become more important, while firm shocks become less important. Similarly, the coefficient on industry shocks is lower, indicating that industry dynamics seem to be slightly less important than for smaller firms.

The broad coverage of firms in the micro-dataset supports the findings by Amiti and Weinstein (2018) and makes it possible to consider how the effect of credit supply shocks varies across firms with different characteristics. Small firms are found to be much more vulnerable to the adverse impact of bank shocks on investment mainly for two reasons. First, their bank lending contracts much more than for large firms since they are less able to substitute their borrowing from other banks. Moreover, they have a larger share of short-term maturities and they may be considered more risky by their banks than larger firms. Second, while we find that alternative financing sources mitigate the adverse impact of bank shocks on investment, small firms are almost entirely bank-dependent and hence feel the full brunt of disruptions to their banks' credit supply.



Figure 39: Aggregate Bank and Firm Shock

3.2. Bank shocks and aggregate investment dynamics

One important feature of the methodology proposed by Amiti and Weinstein (2018) is that it also provides a complete decomposition of loan growth rates into bank, firm, industry and common shocks at the aggregate level. Figure 39 presents the aggregate decomposition results for a quarterly dataset between 2005 and 2014. The aggregate bank shock series is characterised by two pronounced contractions with values falling below zero, thus indicating that larger banks in Portugal were particularly hard hit by idiosyncratic shocks in the last decade.

In order to assess the relative importance of the shocks, we correlate them with the growth rate of investment excluding housing. The aggregate bank shock accounts for 37 to 38 percent of investment dynamics, while the common shock and the aggregate firm shock are much less important (accounting for about 1 to 3 and 10 to 12 percent, respectively). Therefore, on the whole, our analysis provides strong evidence for the importance of granular bank shocks in explaining aggregate investment fluctuations.

4. Final remarks

Overall, bank supply shocks have a strong and robust negative effect on firm-level investment for the average firm in Portugal. In addition, small firms are found to be much more vulnerable to the adverse impact of bank shocks on investment. Moreover, the banking system in Portugal – as in most other countries – is very concentrated. The ten largest banks account for more than three-quarters of the total loan volume in our dataset. This implies that idiosyncratic shocks to these institutions do not average out in the aggregate, but can have a considerable effect on total lending and hence investment.

The ongoing efforts to reduce the level of non-performing loans in the Portuguese economy and the recapitalisation of banks are likely to reduce the prevalence of bank shocks, thus having a positive impact on investment. Moreover, the diversification of firms' funding sources, with a larger role to be played by capital markets, is likely to be beneficial to them as a shield from adverse bank shocks.

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5.4. Is bank credit going to the most productive firms?

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1. Motivation

Long-term economic growth largely depends on the ability to channel resources to high-productivity firms, enabling them to invest and expand. Banks play a prominent role in resource allocation, especially in economies, such as those in the European Union, which are heavily reliant on bank lending. The degree of efficiency in the allocation of bank credit will thus have major consequences for a country's prosperity.

Resource misallocation, especially as regards credit, is all the more worrying as it can be self-reinforcing. A proliferation of low-productivity firms tends to congest markets, hampering the entry or growth of more efficient competitors (Caballero *et al.*, 2008; Adalet McGowan *et al.*, 2017). Bank support to those firms through successive loans, itself a cause of that proliferation, also implies long-lasting credit misallocation and may decrease credit availability for more productive companies.

This Section, based on Azevedo *et al.* (2018), tries to shed light on two related questions. First, how the stock of outstanding credit granted by banks operating in Portugal to non-financial corporations is allocated across firms of different levels of productivity. Second, whether changes in that stock respond positively to firm productivity, thus inducing credit reallocation towards more productive firms, and how that response is affected by the existing allocation.

The linkages between credit allocation and productivity have particular relevance in Portugal. Recent years have seen positive developments, such as a growing allocation of new bank loans to lower risk firms (which tend to be more productive), and, since 2016, a substantial reduction in the stock of non-performing loans (Banco de Portugal, 2017, Banco de Portugal, 2018a). However, important challenges remain. The relative importance of non-performing loans

³⁴ Álvaro Pina was working at Banco de Portugal when this Section was written.

in banks' balance sheets is still among the highest in the euro area (Banco de Portugal, 2018a).³⁵ Furthermore, several studies have documented worsening resource misallocation in the Portuguese economy in the first decade of this century (Dias *et al.*, 2016; Gopinath *et al.*, 2017; Reis, 2013), with moderate subsequent improvement in some sectors (Dias and Marques, 2018). However, these studies, unlike ours, have not put together firms' accounting data and data on credit granted by banks.

2. Data

Our sample has largely come from matching two Banco de Portugal datasets of virtually universal coverage for Portugal in 2006-2016, Central de Balanços and the Central Credit Register. The former is based on the Simplified Corporate Information (IES) annual reporting of firms balance sheet and income statement variables. We use this data inter alia to classify firms into sectors (64 altogether) and to estimate each firms' productivity. More technically, we compute total factor productivity (TFP) based on a production function where gross value added (GVA) depends on employment (L) and the capital stock (K, measured as the book value of tangible and intangible assets, net of depreciation). From the credit register we get end-year outstanding loans (performing or not) granted to firms by credit institutions operating in Portugal. We aggregate individual credit institutions into the eight largest banking groups plus a ninth, residual group comprising the rest of the banking system (these groups are henceforth referred to simply as banks).

To maximize credit coverage, our sample also includes firms with outstanding loans which do not report accounting data (IES). The ensuing dataset covers about 95% of total outstanding credit to non-financial corporations recorded in the credit register (the gap to full coverage is mainly explained by the exclusion of a few sectors for technical difficulties in productivity estimation).

3. Credit allocation to firms of different productivity

It is not possible to compute productivity for all companies, notably (but not exclusively) for those that do not report IES. Our strategy to characterize credit allocation is then to classify firms into seven

³⁵ International comparisons of non-performing loans (NPLs) should be regarded with caution, as the implementation of the NPL definition involves judgement and is therefore not fully harmonised across countries.

		Zombies	Non-zombies	
Firms with IES reporting	GVA, K, L >0	9903	185584	
	GVA, K>o, L=o or missing	745	14597	
	$\text{GVA} \leqslant o \text{ or } K \leqslant o$	19763	128716	
Firms without IES reporting		48166		
but with outstanding loans				

 Table 10: Number of firms in each of the 7 categories | 2016

Note: Shading is applied to categories deemed unproductive (see text for details).



Figure 40: Share of unproductive firms in total bank credit to firms | Per cent

different categories, and assess which of these have, or are likely to have, very low productivity. Firms in these categories will be labelled as unproductive firms.

Categories are defined on the basis of (i) whether firms report IES, (ii) the values of the three key variables for productivity estimation (gross value added, employment and the capital stock) and (iii) whether firms are zombie. The latter are old, financially fragile firms often kept alive by banks, which successively grant them credit to delay the eventual recognition of losses ("new loans to repay old loans"). Based on Adalet McGowan *et al.* (2017) and similarly to what is done in Section 6.2, we consider that a firm is a zombie if it is at least 10 years old and has operating income below interest payments for three consecutive years.

Table 10 summarises the seven categories, shades those unproductive, and shows how many firms each category comprised in 2016. Productivity (TFP) can be computed for firms with positive value added, employment and capital stock. It may be higher or lower, but

	Obs	Average	St. dev.	P10	P25	P50	P75	P90
By 2-digit sector (S)	512	25.2	15.2	8.8	14.9	22.8	31.8	46.3
By bank (B)	72	36.5	8.5	26.2	30.3	36.2	43.4	48.1

Table 11: Share (%) of bank credit allocated to unproductive firms | Descriptive statistics, 2008-2015

there is no reason to regard these firms as a whole as unproductive, except for those which meet the zombie criteria (which actually display much lower productivity). In contrast, productivity cannot be computed for firms with positive value added, positive capital stock and zero employment, but the absence of personnel could be due to technology rather than to low productivity (e.g. a wind farm). However, when firms display zero or negative value added or capital stock, their productivity inspires concerns: their ability to create value is probably very small, and fully depreciated machinery (zero capital stock) does not bode well for the efficiency of operations. A final category is that of firms without IES reporting, an absence which often persists for several years. These firms may be facing difficulties, linger in semi-informal activity, or have already closed down (leaving unpaid loans). They are therefore deemed unproductive.

There is evidence of substantial misallocation of bank loans, in the sense that a large share of outstanding credit is owed by firms of very low productivity (Figure 40). This share increased from 2008 to 2013, as the recession got worse, and declined afterwards.³⁶ Less than half of this credit lies with zombie firms, which underlines the relevance of the broader concept of unproductive firms. Furthermore, the share of unproductive firms in bank credit is larger than their share in the capital stock or in employment (Azevedo *et al.*, 2018).

Credit misallocation is especially large in construction and real estate, but also a concern in many other sectors (Figure 41). Variation in the share of credit allocated to unproductive firms is larger across sectors than across banks, where it is nonetheless substantial (Table 11). The next section studies how this variation matters for changes in credit.

³⁶ In the final year considered (2016), the share of credit allocated to firms without IES reporting is somewhat overstated, since (i) some firms have likely not complied with the deadline for IES reporting but will have reported later and (ii) some other firms have a later deadline due to non-coincidence of their fiscal year with the calendar year. In both cases, later reporting has not been taken into account.



Figure 41: Share of unproductive firms in total bank credit to firms by 2-digit sector | 2016, per cent

Note: Construction and real estate sectors are marked in dark grey.

4. Credit reallocation to firms of higher productivity

To study credit reallocation, we estimate an econometric model measuring the response of credit growth to firm productivity, and how that response is affected by the share of credit allocated to unproductive firms. "Credit growth" is (approx.) the percentage change in outstanding credit to firm i by bank b from year t - 1 to t. "Firm productivity" is (approx.) the percentage deviation of firm i's TFP from its sector average in t - 1 (using productivity in t would cause circularity problems, as it might depend on credit growth). The share of credit allocated to unproductive firms (also in t - 1) is defined both by sectors and by banks and denoted respectively by S and B (recall Table 11).

The econometric model also takes account of firm age and size, unobserved time-varying sector-specific shocks (e.g. stemming from the business cycle) and unobserved time-varying bank characteristics.

The response of credit to productivity will depend on the estimated coefficients and on the shares S and B. Credit growth will not depend on productivity alone, but also on the variables mentioned in the previous paragraph. However, if for a pair of firms all these variables are identical, the expected *difference in credit growth* between one firm and the other will only depend on (i) the response of credit to productivity (which will be sector- and bank-dependent) and (ii) the difference in productivity between the two firms. To summarise econometric results, we focus below on this difference in credit growth.



Figure 42: Difference in credit growth between a more productive and a less productive firm | Percentage points

Notes: B denotes the credit share of each banking group granted to unproductive firms. S stands for the share of bank credit to sector s allocated to unproductive firms.

Take then two firms of the same age and size classes, operating in the same sector and borrowing from the same bank. One is more productive (being at the 75th percentile – P75 – of the statistical distribution of firm productivity) and the other is less (at P25). Their difference in credit growth will depend on whether the firms' sector has high or low S, and the lending bank high or low B. If S is high (i.e. if firms operate in a sector where a lot of credit lies with unproductive firms), say 46%, at P90 of the cross-sector distribution (Table 11), the difference in credit growth will be 3.3 percentage points (p.p.; Figure 42, left panel). This is compatible with credit growth of 7% for the more productive firm and 3.7% for the less productive firm, or with credit growth of 1% and -2.3% respectively. In contrast, if S is low, say 9% (at P10), the difference in credit growth between the more and the less productive firms increases to 6.0 p.p.. A similar exercise can be performed for B (Figure 42, middle panel), showing that a higher share of loans to unproductive firms in the credit portfolio of the lending bank also reduces the difference in credit growth between the two firms. Unsurprisingly, taking high versus low values of both S and B yields a sharper contrast (Figure 42, right panel), and the gap in the difference in credit growth between the more and the less productive firms reaches about 4 p.p. (6.7 minus 2.6 p.p.). This gap decreases to about 2.5 p.p. if the econometric model is re-estimated without firms operating in construction and real estate.

Therefore, we conclude that existing credit misallocation (i.e., high values of S and B) can substantially hamper credit reallocation by muting the response of credit growth to firm productivity.

5. Interpreting the results

The allocation of credit depends on both credit supply and credit demand. Supply decisions, taken by banks, may first come to mind, but demand decisions, taken by firms, should not be forgotten. For example, some Portuguese companies have in recent years increasingly obtained funding in international capital markets (Banco de Portugal, 2018b), which likely decreased their demand for loans granted by banks operating in Portugal. An increase in own funds through retained earnings, as has been the case with Portuguese SMEs in recent years, may also weigh on credit demand.

Multiple supply and demand decisions taken in different moments of time, when outstanding loans were granted, are behind the credit allocation observed in a given period. A high share of credit sunk in unproductive firms may reflect bad decisions at the time of loan origination, but also the impact of subsequent events. For instance, a deep economic crisis, following a long accumulation of imbalances by the Portuguese economy, helps explain the sharp increase in the credit share of unproductive firms in 2008-2013 (Figure 40). In turn, poor credit demand and credit supply decisions have likely contributed to the almost 30% share of unproductive firms in total credit to firms in 2008 (Figure 40), when the worst of the crisis was still to come.

Credit reallocation also reflects the joint forces of supply and demand, which our econometric model does not attempt to disentangle. This forces us to be tentative when interpreting the negative impact of credit misallocation on the responsiveness of credit to productivity. Nonetheless, some possible explanations emerge. At bank level, a poor credit portfolio may lead banks, in order to delay loss recognition, to keep lending to the same unviable firms or to postpone write-offs of loans unlikely to be ever repaid, though stepped up supervisory action, especially since 2016, has curbed this behaviour.³⁷ At sectoral level, congestion effects (stemming from a proliferation of low-productivity firms) may help explain hampered reallocation: healthy firms find it harder to grow (e.g. since surviving inefficient firms take some market share) and hence demand less funding (from banks or from other sources), while banks, aware of low profitability in the sector, may also restrict credit supply.

³⁷ For example, some of the main banks have become bound to comply with NPL reduction plans submitted to supervisory authorities (Banco de Portugal, 2018a).

6. Final remarks

Despite welcome developments, such as a shift in new loans from higher to lower risk firms since 2013, there is still substantial credit misallocation in the Portuguese economy: a large share of outstanding credit granted by resident banks to non-financial corporations lies with categories of firms which have, or are likely to have, very low productivity. In addition, the credit share held by these unproductive firms has been found to hamper credit reallocation: the positive response of credit growth to firm productivity becomes smaller, and the flow of credit to efficient firms (relative to inefficient ones) is thus slowed down. Among other constraints, many of which are discussed in different Sections of this book, this slower reallocation may make it harder for the best firms to invest and upscale.

Credit reallocation to productive companies should go hand in hand with further rebalancing of the financing structure of firms as a whole towards own funds and away from debt. Despite significant progress on this front since 2012, especially for SMEs, Portuguese firms are still highly indebted (and, concomitantly, poorly capitalized) by European standards. This may deter investment and leaves the economy more vulnerable to adverse shocks (Banco de Portugal, 2017). Therefore, better credit allocation and higher firm capitalization are twin levers not only for a more resilient banking system but also for stronger economic growth.

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6 PRODUCT MARKET

6.1. What do price-cost margins and worker's bargaining power tell us about Portuguese markets?

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1. Motivation

Sustained economic growth and higher aggregate welfare require the efficient allocation of resources in the economy, which is enhanced by competition across markets. Therefore, from a policy perspective, it is crucial to identify the markets where the degree of competition is insufficient.

Assessing competition is especially relevant for the Portuguese economy. Firstly, before the latest crisis, a weak competitive setup may have favored an over allocation of resources in the non-tradable sector, thus negatively affecting productivity and welfare. More resources were drawn out of export-oriented activities, thereby contributing to the accumulation of external imbalances. Secondly, in the economic and financial assistance program, Portugal committed to a series of structural reforms, many of them with the aim of increasing competition in the product market. Therefore, it is interesting to assess the latest developments in competition indicators.

The markup is a commonly used indicator for the degree of competition in a given market. By measuring the difference between the selling price and the production cost of a good or service, we can evaluate firms' ability to increase profits by sustaining prices above their marginal costs. A positive markup implies the rejection of the paradigm of perfectly competitive markets, signaling that firms hold market power.

However, perfect product market competition also requires the existence of perfect competition in the labour market, meaning that workers are paid exactly in accordance with their productivity. There is significant evidence that this assumption does not hold and, more importantly, if this feature is not disregarded, it leads to a consistent underestimation of market power in product markets. This column assesses the evolution of product market competition in Portugal between 2010 and 2016 through the estimation of markups, both in product and labour markets. Results highlight the need to address labour and product market imperfections in an integrated way. Additionally, we confirm that there is significant room for improving competition in the Portuguese economy. Furthermore, during the period of analysis, estimated price-cost margins exhibit a stable pattern whereas workers' bargaining power follow a downward trend, meaning that workers' capacity to extract some of their employers' profits decreased significantly.

2. The analytical framework

The methodology used to estimate markups is based on the work of Hall (1988) and Roeger (1995). They were inspired by the seminal contribution of Solow (1957), which introduced growth accounting to determine the role of technological progress, and also relaxed the assumption of perfect competition in product markets, thus making it possible to estimate markups.

By assuming a standard neoclassical production function and following the same assumptions as in Solow (1957), it is possible to derive the Solow residual, which is the difference between total output growth and the part that is explained by the accumulation of capital, labour and intermediate inputs. Under certain assumptions, the Solow residual would be exactly equal to technological progress but by relaxing the assumption of perfect competition on the output market this equivalence does not exist. Nevertheless, in an imperfect competition setting the Solow residual can be decomposed into a technological component and a markup. Given that the technological component is unobservable, Roeger (1995) proposed considering the difference between the (primal) Solow residual and its dual, which is derived from the the firms' cost minimization problem, so that it is possible to eliminate this unobserved parameter and, consequently, consistently estimate markups.

However, both Roeger (1995) and Hall (1988) assumed perfectly competitive labour markets and, consequently, workers' bargaining power was absent. Since there is empirical evidence that markups are significantly underestimated, their approach was modified to account also for imperfect competition in the labour market (Crépon *et al.*, 2005; Abraham *et al.*, 2009).

Within an imperfect labour market setup, it can be assumed that wages and the number of workers are simultaneously chosen according to a standard efficient bargaining problem, which involves sharing the surplus between profit-maximizing firms and workers whose utility comes from employment and wages.

In this Section we obtain consistent markups' estimates by simultaneously considering product and labour market imperfections (through the joint estimation of price-cost margins and the workers' bargaining power, respectively) in the Portuguese economy for the period 2010-2016. Therefore, we closely follow Amador and Soares (2017), which performed a similar exercise for a previous period.

Under imperfect competition in the labour market and computing the difference between the primal (SR) and the dual Solow Residual (SR^d), we can obtain equation (14), which enables us to jointly estimate the markup (μ) and the workers' bargaining power (ϕ). In this setup, ϕ should assume values between 0 and 1, where a competitive labour market corresponds to $\phi = 0$, while $\phi = 1$ implies that firms' surplus is fully transferred to the workers. As a result, markets with bargaining power estimates outside the [0,1] interval were disregarded.

$$SR - SR^{d} = \left(1 - \frac{1}{\mu}\right) \left[(\Delta p + \Delta q) - (\Delta r + \Delta k)\right] + \frac{\Phi}{1 - \Phi} \left(\alpha^{L} - 1\right) \left[(\Delta l + \Delta w) - (\Delta r + \Delta k)\right]$$
(14)

By including the last term accounting for an imperfect labour market we are able to improve the consistency of our estimates. The exclusion of this last term would have caused a downwards bias which would be higher the higher the bargaining power (ϕ), the share of labour costs in output (α^{L}) and the larger the difference between the growth rate of nominal labour and nominal capital costs [($\Delta l + \Delta w$) – ($\Delta r + \Delta k$)].

Estimating equation 14 enables us to test the assumption of perfect competition in product markets of the Portuguese economy for the 2010-2016 period. The benchmark specification of this study corresponds to OLS estimations with clustered errors at the firm level since observations of the same firm are expected to be correlated over time. Furthermore, fixed and random effects regressions for each market were estimated to ensure the robustness of results. The fixed effects model was estimated to control for measurement errors related to the firm, for instance, associated to the assumption for the cost of capital. The random effects model was estimated to ascertain that our results remain unchanged to estimation assumptions. Lastly, two-step Heckman regressions were run to account for the potential sample selection bias associated to the exclusion of firms reporting negative operational profits.

Data was drawn from the annual accounts of Portuguese firms reported under *Informação Empresarial Simplificada* (IES) for the period 2010-2016. In line with Amador and Soares (2017), some observations were eliminated from the database to ensure robust estimates. Firms reporting negative operational results in four or more consecutive years were disregarded in order to be consistent with the assumption of profit maximization in the long run. Additionally, sectors "Agriculture and Mining", "Education" and "Health" were withdrawn given their small share in total gross value added (GVA) or the sizeable relevance of public entities for their regular functioning.

3. Results

The results show that the hypothesis of perfect competition is broadly rejected in Portuguese product markets, confirming Amador and Soares (2017) and Folque (2017). Considering a 5 per cent significance level, estimated markups are statistically significant for around 92 per cent of the markets.

For our benchmark specification, price-cost margins range between a minimum of 4 per cent and a maximum of 65 per cent, approximately. Even though our estimates show a high level of heterogeneity across markets, as expected, it is noteworthy that the rank of markets obtained across the different model specifications is virtually unchanged meaning that the identification of less competitive markets is robust across the different models. The robustness of our results across the different specifications is especially relevant from a policy perspective.

The results also confirm previous empirical evidence about price-cost margin estimates becoming higher once labour markets are assumed to be imperfectly competitive, that is, when workers hold some bargaining power. In that case, our markup estimate captures the overall surplus extracted by the firm from the consumer through its market power, including the part that is transferred to workers through their bargaining power. In our results the average coefficient is around 14 percentage points (p.p.) which is in line with the results of Amador and Soares (2017) and Bassanetti *et al.* (2010) that found an underestimation of 11 p.p. and 10 p.p., respectively. Yet the correlation between markups estimated under perfect competition and markups estimated for the imperfect competition case is very high (around 82 per cent).


Figure 43: Product and labour market imperfection, percent

Similarly to price-cost margins estimates, the workers' bargaining power estimates are generally consistent across estimation strategies, even though for some markets the fixed effects estimates differ from the benchmark.

Moreover, Figure 43 shows a positive correlation between product market imperfection and the degree of imperfection in the labour market (around 80 per cent), which is consistent with previous empirical literature.

According to Dobbelaere (2004), the positive correlation between price-cost margins and workers' bargaining power can be explained in two different ways. One explanation is that a high bargaining power leads to increased wages and a reduction of the rents left to the firm. As a result, some firms exit the market and there is a decrease in the degree of competition in the product market (and consequently an increase in markups). Conversely, workers' bargaining power tends to be higher when there are rents to be extracted from the firms, that is, if there is strong competition in the product market (meaning that markups are low) and thus no surplus to be extracted, workers tend to exert less bargaining pressure.

Figure 44 presents the evolution of the two variables under analysis during the 2012-2016 period, using both GVA and employment as weighting variables. Despite a slight difference on the levels, we can see that price-cost margins are in both cases roughly stable during the period considered.

On the contrary, when analyzing the evolution of workers' bargaining power, our estimates show a clear decrease during the period under analysis (which is more pronounced when using employment



(a) Markets weighted with GVA



(b) Markets weighted by employment



as weight). This significant decrease of the workers' bargaining power took place in all the sectors and, thus, on the overall economy and it may be associated with labour market reforms. This result implies that workers' ability to capture part of the surplus extracted by firms from consumers is now lower. In fact, this decrease can be partially explained by the slight decrease in markups.

Table 12 presents price-cost margins and workers' bargaining power estimates for several industries from the aggregation of individual markets, using GVA and employment as weights for the years of 2012 and 2016.

At the sectoral level, it can still be observed that price-cost margin estimates become higher once labour markets are assumed to be imperfectly competitive. However, and contrary to what happened

	t Margi	n	Bargaining Power					
	2012		2016		2012		2016	
	GVA	Employment	GVA	Employment	GVA	Employment	GVA	Employment
Overall economy	30.29	27.48	29.11	26.57	20.43	21.48	18.63	19.71
Tradable	29.42	29.27	28.58	28.24	22.13	22.67	20.31	21.10
Non-Tradable	31.08	25.87	29.65	24.97	18.90	20.42	13.36	17.85
Manufacturing	28.73	28.75	28.42	27.80	22.10	22.66	21.47	21.30
Non-Manufacturing	30.89	26.88	29.42	25.94	19.79	20.93	17.37	18.89
of which								
Electricity, Gas & Water	54.26	39.34	49.91	38.66	16.54	13.66	5.97	9.51
Construction	30.93	30.89	28.62	28.25	25.72	25.62	24.01	23.69
Trade	15.51	15.75	15.30	15.68	12.21	12.61	11.89	12.30
Transports & Communications	32.60	32.65	31.76	31.10	22.35	24.06	20.98	22.24
Other Services	36.05	33.57	25.60	26.48	25.60	26.48	22.45	22.18

 Table 12: Price-cost margins and workers' bargaining power per sector

 (2012-2016) (per cent)

Note: Industrial markets weighted by GVA or by employment.

at the individual market level, for some industries there is no positive correlation between price-cost margins and workers' bargaining power.

The industries with the highest price-cost margins in 2012 are "Electricity, Gas and Water", "Transports and Communications" and "Other Services". The first two are capital intensive network sectors where scale economies are expected to play an important role and thus profits to be above the average of the economy. "Other Services" include several sorts of activities and a varied set of services, and registers a significant decrease in markups from 2012 to 2016, possibly associated with the implemented product market reforms.

Conversely, for the whole period the lowest price-cost margin is by far observed in the "Trade" sector (about 16 per cent), an atomized industry composed of many small units and just a few large ones that aggressively compete on prices. "Trade" also has the lowest bargaining power because is the sector where the higher proportion of workers earns the minimum wage or values near that.

Both manufacturing and non-manufacturing sectors present a decreasing trend in markups between 2012 and 2016. One would expect markups to be lower on manufacturing due to the higher exposure to international competition. However, this only happens when GVA is the basis for aggregation. The decrease was more significant in the Non-Manufacturing sector, in particular, in the "Electricity" industry.

Regarding the comparison between tradable and non-tradable sectors, in 2016 results depend on the variable used to weigh the estimates. When considering the GVA as the weighting variable, the non-tradable sector has a higher price-cost margin than the one of the tradable sector. When employment is the variable used to weigh our estimates, the relation is the opposite. However, as the estimates are very close, there is not enough evidence of a significant difference between price-cost margins in each sector. Nevertheless, it is noteworthy that price-cost margins in the non-tradable sector is decreasing in this period, which is positive in the perspective of avoiding the over-allocation of resources in such markets, with potentially negative effects on efficiency and thus on Portuguese economic growth.

4. Final remarks

This column shows that the Portuguese labour and product markets are far from the perfect competition paradigm. Therefore, our findings suggest that reforms aiming at strengthening competition in both labour and product markets should be implemented. Furthermore, those reforms should tackle labour and product markets imperfection in an integrated way.

Nevertheless, results should be interpreted with caution. One should focus more on the evolution and on relative comparisons of estimates across sectors than on its levels. Moreover, the levels of the estimated coefficients can change significantly with updates in the database.

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6.2. Are zombie firms curbing the growth of viable firms?

Ana Fontoura Gouveia, Christian Osterhold

1. Motivation

Productivity is slowing down: the average annual growth rate of GDP per hour worked declined from above 2% in the early 1990s to below 1% in the past decade (Figure 45). Given the key contribution of productivity to living standards, it is important to understand the drivers of these developments, which are not exclusive to Portugal. Despite the progress in information and communication technologies, the increased participation of firms in global value chains and a better than ever educated workforce, a similar pattern can be observed in other OECD countries.

One driver of what is known as the "productivity paradox" relates to a breakdown of technological diffusion mechanisms, translating into the emergence of "winner takes it all" dynamics - where one or few firms dominate the market. Firms below the technological frontier are no longer able to learn from top-performers and therefore cannot catch-up and grow. Relying on Portuguese firm-level data, one sees that the productivity growth slowdown is, in fact, not broad-based (Figure 46): while the most productive within each sector continue to grow, the others are stagnating.

Another driver relates to a depressed creative destruction process, where firm dynamics are curtailed, leading to lower entry in the market, lower exit and fewer opportunities for the best firms to grow. An increasing body of research corroborates this channel, uncovering a rising capital and labor misallocation. This trend is also visible for Portugal, both across sectors (Reis, 2013; Benigno and Fornaro, 2014) - in particular towards non-tradables - and within sectors (Dias et al., 2014; Gopinath et al., 2017), with within industry misallocation almost doubling between 1996 and 2011. Institutional bottlenecks create the conditions for non-viable firms to remain in the market. The seminal work carried out for Japan's macroeconomic stagnation in the 1990s (Caballero et al., 2008; Hoshi and Kashyap, 2004) stresses the negative effects of these unviable firms - the so-called "zombies"-



Figure 45: Average annual productivity growth in % (GDP per hour worked)

Source: OECD.



Figure 46: Firm level productivity - frontier v. laggards Notes: Gross value added per hour worked. Frontier firms are the 10% most productive within each sector; laggard firms are all others. Source: Authors' computations based on IES.

on the economy. They not only drag down aggregate productivity directly (by being less productive), but also hamper the growth of healthy firms by crowding out financing and human capital and by congesting markets. Recent studies revived the analysis of zombie firms for OECD countries (e.g. Adalet McGowan et al., 2017a/b), corroborating earlier findings.

To take action, it is essential to understand the institutional drivers of zombie prevalence. The literature points to the role of banks, which under some circumstances may promote the misallocation of resources (e.g. Storz et al., 2017 and Acharya et al., 2017). Financial frictions harm the most vulnerable firms, not necessarily the least productive (Duval et al., 2017), and foster - at the expense of healthy firms - the survival of firms that should otherwise leave the market, as weaker firms are associated with weaker banks (Schivardi et al., 2017). While promoting bank health is certainly part of the answer on how to address zombie prevalence, lower exit and restructuring barriers constitute another important element, by reducing zombie congestion (Adalet McGowan et al., 2017b) and increasing the incentives for banks to initiate restructuring (Andrews and Petroulakis, 2017).

This Section, based on Gouveia and Osterhold (2018), aims at assessing the impact of zombie firms in the Portuguese economy and the role of public policy to reduce their prevalence. We document three main results: (i) in some sectors, there is a high prevalence of zombies among Portuguese firms; (ii) the zombie prevalence has been curbing the growth of viable firms, in particular the most productive; and (iii) the reduction in exit and restructuring barriers is promoting a more effective exit channel and the restructuring of the most productive firms, allowing for a reduction of zombie prevalence and thereby potentiating productivity growth.

2. Method and results

2.1. Data

The main data source in this Section is *Informação Empresarial Simplificada* (IES) provided by *Banco de Portugal*. IES consists of annual firm-level accounting data for firms operating in Portugal. We consider the period 2006-2015 and the firms operating in the sectors corresponding to the NACE codes 10-83, excluding 64-66. Agriculture, mining, the financial sector and non-market activities (such as health or education) are excluded. Observations with negative or nil values for turnover, assets, tangible assets, total workers, paid workers, worked hours or labor costs are dropped. Values are deflated using information from Statistics Portugal.

2.2. Zombie prevalence

To assess zombie prevalence, it is crucial to quantitatively define a zombie. In economic terms, a zombie is a non-viable company that, when competitive forces are at play, should be compelled to exit the market or, where feasible, restructure. The literature offers different possibilities to operationalize this concept (see Adalet McGowan et al., 2017a). We follow the OECD definition, whereby a firm is clas-

sified as a zombie if (i) the operating income is lower than interest expenses for at least three consecutive years and (ii) the firm operates for more than 10 years. The first condition identifies firms that do not generate enough cash-flow to service the debt and the second avoids erroneously classifying firms such as start-ups as zombies (a zombie is, by definition, a company that remains in the market for a prolonged period, despite not being viable).

By applying this definition, we find that, in Portugal, zombie firms account for 6.5% of the firms operating in 2008, increasing steadily to 8.5% in 2013. Since then, the weight decreased, reaching close to 6% in 2015.³⁸ These figures are, however, poor measures of zombie prevalence. In our dataset, zombie firms are not only less productive than their healthier counterparts in the same sector, but they are also larger. Their economic weight is thus better ascertained by measures of zombie congestion that consider their relative size.

We thus build two measures of zombie congestion of production factors at sectorial level: the weight of zombie firms' tangible assets in relation to total tangible assets in the sector; and the share of workers employed by zombies in relation to all workers in the sector (Figures 47 and 48). We show that (i) zombie prevalence, measured by the resources they capture, is high, reaching in some industries more than 20% of tangible capital and of total workers employed in the sector; (ii) there are important differences across sectors: for instance, while in consultancy and scientific activities only 5% of labor and 9% of capital is taken by zombies, the shares rise to 23% and 27%, respectively, for the case of accommodation and food services; and, finally, (iii) in most sectors (but not in all), there is a reduction of zombie congestion from the peak of 2013.³⁹

Overall, these results are consistent with OECD findings, pointing to cross-country regularities. Zombie firms are, on average, larger companies and significantly less productive than their healthy counterparts, pushing labor productivity down. Furthermore, there is

39 For presentational purposes, we aggregate data at the branch of activity CAE letter code, whereas in the analytical part that follows we use the more detailed 2-digits breakdown. Industries, with weights in 2015 turnover: C - Manufacturing (27%); D - Electricity, gas, steam and air conditioning supply (4%); E - Water supply, sewerage, waste management and remediation activities (1%); F - Construction (5%); G - Wholesale and retail trade, repair of motor vehicles and motorcycles (43%); H - Transportation and storage (5%); I - Accommodation and food service activities (3%); J - ICT (5%); L - Real estate activities (1%); M - Professional, scientific and technical activities (3%); N - administrative and support service activities (3%).

³⁸ This pattern is similar to that of other countries, such as Spain, Belgium and Italy (Adalet McGowan et al., 2017a). It should be noted that a direct comparison with the figures obtained for other countries is not meaningful as the levels obtained in different studies depend on the definition of zombies and on the sample of sectors and firms taken (e.g. some studies rely only on firms with 10 or more employees).



Figure 47: Capital sunk - industry level

Note: For each branch of activity the Figure displays the share of tangible assets held by zombie firms.

Source: Authors' own computations based on IES.



Figure 48: Labor sunk - industry level

Note: For each branch of activity the Figure displays the share of workers employed in zombie firms.

Source: Authors' own computations based on IES.

evidence of distortions at the exit margin, as zombies remain in the market and absorb a significant part of production factors, with high heterogeneity at sectorial level.

2.3. The impact on healthy firms

We estimate a reduced-form equation on the impact of zombie congestion on investment and employment growth of the average non-zombie firm:

$$\delta Y_{i,s,t} = \beta_0 + \beta_1 \text{nonzombie}_{i,s,t} + \beta_2 \text{nonzombie}_{i,s,t} \times \text{RS}_{s,t} + \beta_3 \text{Firmcontrols}_{i,s,t-1} + \text{FE}_{s,t} + \varepsilon_{i,s,t}$$
(15)

where δY denotes tangible capital or employment growth of firm i in a 2-digit sector s in year t. The dummy nonzombie signals non-zombie firms. RS is the share of sectorial resources sunk in zombies, which, depending on the specification, is measured either as capital sunk or labor sunk.⁴⁰

By estimating this equation, we find a negative β_2 , which signals that the investment of the typical Portuguese healthy firm (in relation to that of zombies within the same sector) is negatively affected by the resources - capital or labor - sunk in zombies. As an illustration, the capital growth differential between a non-zombie and a zombie is 0.9 pp lower in the textile sector vis-à-vis the consulting sector (capital sunk in textiles is close to 20% while it is around 10% in consulting). There is, however, no effect on relative employment growth for the average non-zombie, which may reflect the relative flexibility of capital in comparison to labor.

While assessing if the impact on the average firm is informative, it is important to understand the consequences of zombie congestion across the productivity distribution. In the absence of distortions, one expects the most productive firms to grow faster than the less productive. In an alternative specification that takes into account labor productivity differentials, we show that capital sunk in zombies limits this reallocation towards the most productive, both in terms of capital and employment growth. The results are likely driven by reduced access to finance, which hampers investment and firm growth and thereby also limits employment growth. Indeed, we do not find evidence of effects from labor congestion.

⁴⁰ Firm controls include age, number of workers (as a measure of firm size) and turnover growth (as a proxy of growth opportunities). We include two-digit industry-year fixed effects FE to control for sectorial aggregate shocks and robust standard errors clustered by industry-year. The fixed effects structure implies that the absolute effect of resources sunk cannot be estimated, as it is absorbed by the dummy structure. Therefore, β_2 captures the effect on the average non-zombie *in deviation* from the effect on zombies (and this it is not an absolute effect).

2.4. The role of public policy

To assess the impact of the reduction of exit and restructuring barriers on the dynamics of Portuguese firms, we complement the firm-level data with a novel country-level OECD composite insolvency indicator. It is available for 2010 and 2016, ranging from 0 to 1 and increasing in exit and restructuring barriers (see Adalet McGowan et al., 2017b). Based on the timing of the most relevant policy changes - namely in 2012 and 2014-2015 - we are able to annualize the OECD indicator. Portugal registered, according to this indicator, one of the largest improvements among OECD countries.

As the barriers are more relevant for sectors with higher natural turnover rates (entry plus exit rates), we build a sectorial exposure variable using data for the US and the UK (SDBS Business Demography Indicators), two countries which are relatively less regulated and in which the observed turnover rate is likely to approach the natural one. Our identification strategy relies on the assumption that industries more exposed to exit and restructuring barriers (the treatment group) are more affected by changes in those policies in comparison with less exposed industries (control group):

$$Exit_{i,s,t} = \beta_0 + \beta_1 zombie_{i,s,t-1} + \beta_2 zombie_{i,s,t-1} \times Insolvency_{t-1} \times Exposure_s + \beta_3 Firmcontrols_{i,s,t-1} + FE_{s,t} + \varepsilon_{i,s,t}$$
(16)

where Exit indicates whether firm i in sector s exits the market in year t. Insolvency denotes the level of barriers to exit, Exposure is the natural sectorial turnover rate, as described above and zombie identifies zombies.⁴¹ By estimating this specification, we do find a negative β_2 , concluding that zombie firms in sectors more exposed to exit barriers are more likely to exit after the reforms that reduced those barriers.

Effective insolvency regimes should not only potentiate the exit of non-viable firms but also the restructuring of the most productive zombies, where it is feasible. With an alternative specification focusing solely on zombie firms and taking into account their productivity levels, we provide evidence that this second channel is also present.

⁴¹ Firm controls include age, number of workers, firm turnover growth and relative labor productivity vis-à-vis the sectorial-year average. Two digits sectorial-year fixed effects are included and robust standard errors are clustered at the sectorial-year level.

3. Final remarks

Zombie prevalence has been curbing the growth of viable firms in Portugal. Accordingly, fostering the exit of the least productive firms is certainly appealing, but one needs to carefully consider the broad implications. In Portugal, zombies are responsible for a significant part of employment: in some sectors, more than 1 out of 5 workers are employed in a zombie firm; and, in some regions, the figure increases to 1 out of 3. Thus, looking ahead, the policy mix must be carefully designed to address the important social costs that may arise. The same concern holds for capital: in some industries, more than 25% of tangible capital is allocated to zombies. As they exit the market, part of this capital will be lost, as it is firm-specific.

On improving the allocation of capital, there are important complementarities between bank health and good insolvency regimes. The latter reduce incentives for evergreening and bank forbearance, by encouraging a timely start of insolvency processes and promoting effective firm resolution. It should be emphasized that zombies are, on average, larger than non-zombies, with more assets to pledge as collateral. If banks' financing criteria focus on the existence of collateral, rather than on the quality of the project or of the firm, zombie lending lasts even without evergreening motives. This calls for further policy action, in particular as the intangibles - non-collateralizable - gain importance in the economy. Public policy may be key in correcting information asymmetries in the bank financing market, for instance via well-designed public guarantees systems, and in fostering the development of alternative financing options - in particular in the context of supranational initiatives, such as the Capital Markets Union in the European Union.

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6.3. How important is resource reallocation for productivity growth?

Carlos Robalo Marques

1. Introduction

Aggregate productivity dynamics depends not only on technical progress at the firm-level, but also on the efficient use of inputs. For this reason, the contribution of input reallocation for productivity growth has been recognised as an important issue in the literature. Some recent papers even suggest that the decline in the reallocation of inputs is important for explaining the slowdown in global productivity since the start of this century (Decker et al., 2017; Decker et al., 2018).

This Section uses firm-level data to assess the importance of resource reallocation for total factor productivity (TFP) growth in Portugal, over the decade 2006-2015. To quantify this reallocation effect, productivity is decomposed into the contributions made by the various groups of firms operating in the economy. In each year, these firms may be classified into three types: firms that began activity in that year (entrants or entering firms), firms that ceased activity in that year (exiters or exiting firms) and firms which are active and survive to the next year (incumbents, survivors or surviving firms). Productivity growth in a given sector may be seen as the result of efficiency gains within the surviving firms (within-firm effect), efficiency gains from the reallocation of resources between these firms (between-firm effect) and efficiency gains from the reallocation of resources through the exit and entry of firms.

Overall, we find that total reallocation of resources, involving the between effect of surviving firms and the contribution of entering and exiting firms, had a clearly positive impact on productivity growth in the tradable sector (manufacturing and tradable services), but a negative impact in the nontradable sector (nontradable services). The negative performance of total reallocation in the nontradable sector alone fully accounts for the negative productivity growth in this sector, as well as the negative contribution of total input reallocation for the economy as a whole. This finding, which highlights the contrast between the tradable and nontradable sectors, suggest that the implementation of competition-enhancing policies in the nontradable sector could bring about larger productivity gains, stemming from a larger contribution of resource reallocation.

2. The dataset

The data source for the analysis is *Informação Empresarial Simplificada* (IES). IES data exist from 2006 onwards and covers virtually the universe of Portuguese non-financial firms. The data provide very detailed information on firm's balance sheets and income statements. After cleaning the original dataset by dropping firms that do not report strictly positive figures for the relevant variables, and excluding industries with fewer than 10 firms (to avoid estimation problems), we are left with 202 industries (defined at 3-digit NACE code). In order to obtain variables at constant prices (real gross output, real intermediate consumption), we use industry-level price deflators, as firm-level prices are not available.

It is important bo bear in mind that the use of industry-level price deflators may have important implications for the interpretation of our productivity measure, below. If firms operate in an environment of differentiated products, there should be an inverse relationship between productivity and the price set by the firm. This means that our productivity measure, because it is computed using an industry-level price, tends to underestimate productivity for high productivity firms and to overestimate productivity for low productivity firms. A similar phenomenon may occur in the case of new firms. The evidence in the literature (Foster et al., 2008) suggests that these firms tend to set lower prices than older firms. In this situation, the use of industry-level price deflators understates new firms' real output relative to that of incumbent firms and thereby may affect the measured contribution of these firms to total productivity growth.

3. Firm-level and aggregate total factor productivity

In this exercise, we look at total factor productivity (TFP) defined on gross output. In line with most literature, we assume that the output of firm i in year t is given by a three-input Cobb-Douglas production function. From the estimated production function, we compute firm-level TFP_{it} as:

$$lnTFP_{it} = lnQ_{it} - \alpha lnK_{it} - \beta lnL_{it} - \gamma lnM_{it}$$
⁽¹⁷⁾

where Q_{it}, K_{it}, L_{it} and M_{it} stand for real gross output, real capital stock, employment and real intermediate consumption, respectively. Sectoral or economy-wide aggregate productivity is computed as a weighted average of firm-level productivities:

$$P_{t} = \sum_{i} \theta_{it} p_{it}$$
(18)

where $p_{it} = ln(TFP_{it})$ and the weights θ_{it} sum to 1. As p_{it} is defined in logs, $\Delta P_t = P_t - P_{t-1}$, our variable of interest, represents a rate of change.

One important point here refers to the choice of weights θ_{it} to be used in equation (18). To compute aggregate TFP measures, the literature has used essentially two types of weights: gross output (or gross value added) and the composite input from the production function (Foster et al., 2001; Bartelsman and Dhrymes, 1998). For this exercise, we define the weights θ_{it} using the log of the composite input, $K^{\alpha}_{it}L^{\beta}_{it}M^{\gamma}_{it}$. Logs are used to account for outliers in the data and prevent a small number of very big firms from dominating the results. The log transformation compresses the distribution of the weights around the mean, decreasing the relative weight of the larger firms and increasing the relative weight of the smaller firms. Thus, our aggregate productivity measure, which is robust to the presence of outliers, can be seen as representing the productivity of a "typical" firm.

4. Productivity decomposition

To assess the importance of resource reallocation for productivity growth, we resort to the well-known dynamic Olley-Pakes Decomposition (Melitz and Polanec, 2015). Let S_t , E_t and X_t represent the three groups of firms operating in the economy in period t: survivors, entrants and exiters, respectively. If we use θ_{Rt} and P_{Rt} to denote the aggregate weight and average productivity of firms in group R (R=S_t, E_t, X_t), the dynamic Olley-Pakes decomposition of productivity growth may be written as follows:

$$\Delta P_{t} = \Delta \overline{P}_{S} + \Delta Cov_{S} + \theta_{E,t}(P_{E,t} - P_{S,t}) + \theta_{X,t-1}(P_{S,t-1} - P_{X,t-1})$$
(19)

where $Cov_S = \sum_{i \in S} (\theta_{it} - \overline{\theta}_S)(p_{it} - \overline{P}_S)$ with $\overline{P}_S = (\sum_{i \in S} p_{it})/N_s$, $\overline{\theta}_S = 1/N_S$ with N_S denoting the number of surviving firms. \overline{P}_S represents the unweighted mean productivity of surviving firms and $\overline{\theta}_S$ the mean weight of these same firms.

In this decomposition, the first two terms represent the contribution of surviving firms to productivity growth. The changes in productivity over time of this group of firms are decomposed into the sum of two components: one that captures shifts in the productivity distribution (changes in the unweighted mean, \overline{P}_S), usually called the within-firm effect, and another that captures the reallocation of inputs between surviving firms (changes in the "covariance" term, Cov_S), usually labelled the between-firm effect. The within-firm effect may be seen as originating in innovation or creation of better and more efficient technologies, as well as in the adoption of new management practices by firms. The between-firm effect in turn reflects the result of the reallocation of resources, namely capital and labour, from less to more productive firms in the industry.

The third and fourth terms of the decomposition represent the contributions to productivity growth made by entering and exiting firms, respectively. Note that the new firms make a positive contribution to productivity growth if and only if they have higher average productivity than that of the surviving firms, in period t. In turn, exiting firms make a positive contribution to productivity growth if and only if they have lower average productivity than that of the surviving firms in period t-1.

5. Empirical results

5.1. Contributions of the different types of firms

The cumulative values for 2006-2015 of the contributions to TFP growth made by the three groups of firms identified by the dynamic Olley-Pakes decomposition are in Table 13 (columns (2) to (6)). An important finding relates to the contribution of entering and exiting firms (entry and exit in Table 13). Productivity for the total economy over the 2006-2015 period was very negatively affected by the contribution of entrants and very positively affected by the contribution of exiters. The fact that entering firms make a negative contribution and exiting firms a positive contribution to productivity growth means that entering and exiting firms are, on average, less productive than surviving firms.

The finding for exiting firms is in line with expectations: firms that leave the market are, on average, less productive than those that survive. However, there are situations in which the opposite may occur. Due to the existence of credit restrictions, many high productivity firms may have to close, especially in situations of financial crisis (Hallward-Driemeier and Rijkers, 2013; Eslava et al., 2015). The finding that new firms are, on average, less productive than the incumbent firms, while seemingly unexpected, is relatively

	Survivors					Net	Total	Total
Sectors	Within	Between	Total	Entry	Exit	entry	reallocation	change
(1)	(2)	(3)	(4)=(2)+(3)	(5)	(6)	(7)=(5)+(6)	(8)=(3)+(7)	(9)=(4)+(7)
Manufacturing	1.0	3.8	4.7	8.9	-6.6	2.4	6.2	7.2
Tradable services	-8.1	-1.7	-9.7	14.3	4.3	18.7	17.0	8.9
Nontradable services	3.8	-0.8	3.0	-26.8	18.6	-8.3	-9.1	-5.3
Total economy	0.5	-1.0	-0.5	-11.4	7.6	-3.8	-4.8	-4.3

Table 13: Productivity decomposition (accumulated contributions 2006-2015)

Note: Total economy also includes agriculture and construction, but excludes electricity, gas and water services. The distinction between tradable and nontradable services was made according to the criterion established in Amador and Soares (2012). Aside from manufacturing, the authors classified as tradable the industries for which the export-to-sales ratio was above 15%.

common in the empirical literature (Foster et al., 2016). However, the analysis by sector of activity shows significant differences in regard to the contribution of entrants and exiters. In manufacturing and tradable services, entering firms are found to be more productive than incumbent firms, contributing positively to sectoral TFP growth. In contrast, new firms are found to be less productive than surviving firms in nontradable services, contributing negatively to productivity growth in this sector.

Overall, the similarity of the role played by entrants in manufacturing and tradable services must be stressed. These firms are found to be more productive than incumbents in these two sectors (which together represent almost all of the economy's tradable sector), but less productive than the incumbents in the nontradable sector (nontradable services). Also, the contribution to TFP growth of exiting firms is clearly lower in the tradable sector (positive, but clearly lower in tradable services than in nontradable services and even negative in manufacturing). The larger contribution of entering firms together with the lower contribution of exiting firms in the tradable sector may be associated with the greater international competition faced by this sector, thus requiring relatively higher levels of TFP to enter and survive in the sector (note that in the tradable sector survival depends on the productivity of firms that compete in international markets, and not so much on productivity of domestic firms operating in the same sector).

5.2. *Resource reallocation*

The total contribution to productivity growth resulting from the reallocation of inputs is generally understood as the sum of the contributions arising from the reallocation of inputs between surviving firms (between effect) and the contributions arising from the entering and exiting firms. Thus, in terms of the dynamic Olley-Pakes decomposition, we define total reallocation as:

Total reallocation = between effect + entry + exit

= between effect + net entry effect

An important point to note in Table 13 (column 3) is that the cumulative contribution resulting from the reallocation of inputs between surviving firms (between effect) is positive in manufacturing, but negative in the (tradable and nontradable) service sector, with the result that its cumulative effect over the period is slightly negative for the total economy (-1.0%). In other words, this suggests that in manufacturing the most productive firms increased their market share (measured in terms of inputs), with a corresponding increase in aggregate TFP, but that this did not happen in services. Regarding the net-entry contribution to TFP growth – sum of the contributions of entering and exiting firms – it is positive in the tradable sector (2.4 p.p. in manufacturing and 18.7 p.p. in tradable services), but negative in the nontradable sector (-8.3 p.p.), in the latter case due to the strong negative contribution of entering firms.

Figure 49 shows the evolution over time of the between effect, the net-entry contribution and their sum (total reallocation). Table 13 (column 8) and Figure 49 show that the total reallocation of resources had a clearly positive impact on productivity growth in the tradable sector (manufacturing and tradable services), but negative in nontradable services. The negative evolution of total reallocation in nontradable services was responsible not only for the negative performance of productivity recorded in the sector itself (column (9) of Table 13), but also for the negative developments in total reallocation recorded for the economy as a whole (column (8) of Table 13).

6. Final remarks

The exercise conducted in this Section uses total factor productivity defined on gross output. Other measures of productivity, used in the literature, involve labour productivity and TFP defined on gross value added. It is well known that labour productivity may significantly differ from TFP, depending on the evolution of the capital stock, and that TPF defined on gross output may also differ from



Figure 49: Cumulated aggregate productivity - resource reallocation Note: Total economy also includes agriculture and construction, but excludes electricity, gas and water services.

TFP defined on gross value added, depending on the evolution of intermediate inputs.

Furthermore, the analysis of productivity growth was conducted using the dynamic Olley-Pakes decomposition. This decomposition has an attractive feature relative to other decompositions: it can be more directly connected to theoretical models, that have been developed to analyse the pattern of market share reallocations across firms and its consequences for aggregate productivity (Bartelsman et al., 2013). However, there are other decompositions in the literature that differ from the dynamic Olley-Pakes decomposition in the way they quantify the contributions of entry, exit, within or between effects (Foster et al., 2001). Thus, it is important to bear in mind that the conclusions in this Section, regarding the contribution of resource reallocation for productivity growth, may be sensitive to the use of alternative productivity measures or alternative productivity-growth decompositions.

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6.4. Do firms' export status influence the likelihood of survival?

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1. Motivation

The relation between borrowing constraints and firm dynamics, in particular survival, is an important topic in the context of the Portuguese economic growth. In general, the impact of financial variables on survival has been found to be significant and consistent across different empirical studies. In parallel, theoretical frameworks that incorporate financial variables have also been considered to explain the mechanisms through which borrowing constraints influence survival. Revenues, financial structure and the collateral of firms are variables frequently used in such models (see e.g. Albuquerque and Hopenhayn, 2004, Cabral and Mata, 2003, Farinha and Santos, 2006, Mata et al., 2010 and Mata and Freitas, 2012).

In addition to financial constraints also firm characteristics play a significant role in firm survival (Mata and Portugal, 1994, and Farinha and Santos, 2006). Companies that export are often seen as more resilient than firms that depend solely on the domestic demand, particularly during recessions. A number of papers have studied whether the likelihood of survival is differed between exporters and non-exporters (see Wagner, 2011, for a survey of the literature). A consistent conclusion across all studies is that exporters are more likely to survive than firms that do not export. However, only a very small number of papers have analyzed whether the likelihood of survival differs between exporters and non-exporters controlling for financial constraints. It is important to separate the two effects as in the literature, evidence has been found that financial constraints may be important when deciding whether to export (Bridges and Guariglia, 2008, and Görg and Spaliara 2014). Until present, none of the studies on the impact of export status on survival used Portuguese firms' data.

This Section is based on Simões (2017), and aims to study the impact of financial constraints on firm survival and to determine if the likelihood of survival differs between exporters and non-exporters, or across exporting status - starters/switchers, continuous exporters, continuous non-exporters, and exiters from export markets - in Portugal. It also analyzes the impact of financial variables on survival for the different groups.

Empirical evidence shows that variables such as leverage, profitability and availability of assets that could be presented as collateral are relevant to the likelihood of exit of a firm. Firms with higher leverage, lower returns on assets and lower shares of assets that can be used as collateral have on average a higher probability of exit. However, relative to the main research question whether exporters were more likely to survive relative to firms that were only exposed to the domestic market, results show that, after controlling for financial variables, exporting firms have on average a higher probability of survival. Moreover, exporting firms also present healthier values for the financial indicators, which decreases even more the likelihood of exit. Exiters from export markets, which are firms that stopped exporting in the current period, constitute the group that has the lowest likelihood of survival. These firms present worst values for the financial variables when compared to continuous exporters and non-exporters and they are the most likely to exit when financial factors are controlled for. Exiters from export markets are also more reactive to variations in the financial variables relative to other firms. Nevertheless, firms that do not exit and become continuous exporters are expected to have lower hazard rates than firms that never decided to export, with and without the financial effects.

2. Data

The analysis uses the database *Informação Empresarial Simplificada* (IES) compiled by Banco de Portugal. The IES database includes balance sheet and firm information (such as starting year, district and sector of the economy) which is reported by each firm on a mandatory basis. However, for some firms there may be no data in a specific year (e.g. due to reporting delays). Hence, if a firm reported in period t-1 and in period t+1, but no information for period t exists, the firm was considered to be alive and the simple average of the values of the variables in t-1 and in t+1 was used to compute the missing information for period t. If instead, a firm failed to report in period t and in period t+1, it was classified as "dead" in period t-1. Finally, a firm was classified as dead in period t if it had reported its intention to close business in period t. Consequently, only information for the period 2008-2012 is used, as the last two years are required to construct the variable "dead/exit".

Moreover, firms that had incomplete or inconsistent information for the variables of interest were excluded, as well as firms that reported values for the financial variables that were above the 99th percentile (as such extreme values were considered to be a result of reporting errors or extreme shocks). Additionally, only firms with positive values of business turnover and assets were used.

In 2010, a new set of accounting rules was implemented in Portugal, the new guidelines were designed to be consistent with international standards and a break in financial variables was observed. As a consequence, the definition of some of the variables varies before and after 2010. In order to accomplish a rigorous analysis, the sample was split into two subsamples: subsample I considers firms that reported before 2010 and subsample II includes information for the period between 2011 and 2012.

To create the final database, financial ratios were calculated for each firm for every year. The ratio of debt to total assets was taken as a measure of leverage. Profits were defined as return on assets, i.e. the ratio between earnings before interests and taxes over total assets. IES does not have a direct measure of collateral, therefore fixed assets were used as a proxy and for each firm in each year, the ratio between fixed assets to total assets was computed.

Export indicator variables were also calculated for each of the firms. *Exporter* is an indicator variable which is equal to 1 if exports are positive, and zero otherwise. After 2010, the number of firms with missing information on exports was similar to the number recorded before 2010. Therefore, missing values were considered to be zero for this particular variable. An additional variable, measuring the link between survival and export behavior, was computed for each firm. The *Export* status is a categorical variable with four possible classifications: continuous exporter, continuous non-exporter, exiter from export markets and starter/switcher. A firm was classified as continuous exporter if it exported in period *t*, *t*-1 and in period *t*-2. If a firm did not have positive exports for period *t*, *t*-1 and *t*-2 the firm was classified as continuous non-exporter. Moreover, in the case a firm exported in period *t*-1 but had no positive exports in period *t*, it was considered an exiter from export markets. Finally, if a firm had no positive exports in period *t*-1 but had positive exports in period *t* the firm was classified as a starter/ switcher.

The control variables for individual characteristics of the firms, age and size, were computed as the logarithm of age and the logarithm of real sales to account for non-linearities. In the cases where this specification was considered not sufficient, the logarithm squared was used as well. In the literature, different measures for size are used

	2008	2009	2010	2011	2012
Non-exporter	8.5	6.8	6.6	7.4	7.6
Exporter	4.8	4.1	3.5	4.1	3.9
Exiter from export markets	9.6	10.3	8.8	8.1	9.0
Continuous exporter	4.6	4.0	3.3	3.9	3.8
Continuous non-exporter	8.4	6.7	6.5	7.3	7.5
Starter/switcher	5.4	4.6	4.0	4.5	4.3

Table 14: Evolution of death rates of firms by export status Sources: IES and author's calculations.

(e.g. number of employees, real sales or assets). In this analysis, sales were used to approximate the classification used by the European Commission for firm dimension. Control variables for the market (the industry dummies) were also used (see Simões, 2017 for details).

To reduce endogeneity, all financial and size variables were used with one lag. Moreover, in order to measure the impact of the financial variables on survival, only firms that had positive values for the financial variables for at least one of the sample years were included in the analysis. Additionally, sectors that did not have at least one firm with positive values of exports in each year were excluded.

Table 14 shows the evolution of death rates across the years for exporting and non-exporting firms. There is clear evidence that the rate is higher in the case of non-exporters. Relative to export status, exiters from export markets have the highest death rate and continuous exporters have the lowest.

Table 15 presents the sample means of the firm's variables by exporting status. On average, exporting firms are larger and older, have larger profits and have lower collateral and leverage. Finally, on average, profits are the highest for continuously exporting firms and continuous non-exporters have the largest value of debt.

3. Empirical model

To achieve our purpose it is essential to estimate the exit probability of firms. Several important features condition the analysis and should be taken into consideration before choosing a suitable model. First, looking at the information available for firms in 2012, it is impossible to know when most of the firms in the sample will die, i.e., the data is right censored. Second, in 2008 all firms were included regardless

	Non-		Exiter	Continous	Continous	Starter/
	-Exporters	Exporter	Export	Exporter	Non-	switcher
			Market		-Exporter	
Age (S1)	2.409 (0.774)	2.629 (0.759)	$\underset{(0.695)}{2.533}$	2.687 (0.740)	2.397 (0.780)	$\underset{(0.790)}{2.431}$
Age (S2)	2.431 (0.761)	2.600 (0.756)	$\underset{\left(0.705\right)}{2.518}$	$\underset{(0.744)}{2.650}$	$\underset{(0.765)}{2.423}$	$\underset{(0.771)}{2.432}$
Size (S1)	12.27 (1.690)	$\underset{(1.675)}{13.76}$	$\underset{(1.428)}{12.90}$	14.01 (1.577)	12.22 (1.701)	12.89 (1.709)
Size (S2)	11.97 (1.657)	$\underset{(1.760)}{13.43}$	$\underset{\left(1.476\right)}{12.55}$	13.70 (1.658)	11.91 (1.663)	$\underset{(1.804)}{12.55}$
Collateral (S1)	65.69 (50.61)	$63.32 \\ (46.23)$	$\underset{\left(46.28\right)}{61.33}$	$\underset{(46.69)}{64.41}$	66.12 (50.99)	$\underset{(44.44)}{59.62}$
Collateral (S2)	31.16 (28.39)	$\underset{(21.91)}{25.26}$	$\underset{(23.98)}{25.66}$	$\underset{(21.32)}{24.94}$	31.70 (28.73)	$\underset{(23.75)}{26.32}$
Profits (S1)	0.805 (14.54)	$\underset{(10.53)}{3.112}$	$\underset{(12.75)}{1.463}$	3.451 (9.906)	0.741 (14.70)	1.960 (12.35)
Profits (S2)	-1.786 (19.92)	1.659 (14.10)	-1.127 (17.60)	2.213 (13.07)	-1.850 (20.13)	-0.199 (16.98)
Leverage (S1)	$\underset{(22.16)}{23.17}$	21.14 (17.07)	$\underset{\left(18.59\right)}{21.38}$	21.30 (16.70)	$\underset{(22.47)}{23.34}$	$\underset{(18.25)}{20.63}$
Leverage (S2)	39.60 (34.48)	30.99 (24.44)	$\underset{(29.26)}{34.16}$	30.18 (23.20)	40.13 (34.90)	$\underset{\left(28.03\right)}{33.71}$
Observations	213627	58588	18781	45272	194846	13316

Table 15: Sample means of the firms' variables by exporting status Note: (S1) - sample from 2008-2010; (S2) - sample from 2011 -2012; Standard errors are reported in parenthesis; Variables are expressed in logs. Sources: IES and author's calculations.

of their age, which means that the data is left truncated. Third, the data used is of annual periodicity, and therefore it is not possible to determine the exact time of death of the firm. It is only possible to acknowledge that the firm died after the beginning of the period and before it ended, thus interval censoring is also present. Finally, it is also important to incorporate firm heterogeneity in the models as it is relevant to explain survival. For instance, the discrete survival model used to analyse the relationship between survival and exporter status was:

$$log h_i(t, \Pi | v) = \delta(t) + \beta Y_{it} + \alpha X_{it} + \eta W_{it} + \gamma + X_{it} * W_{it} + \omega Z_{it} + \theta_i$$
(20)

where the hazard depends on the baseline hazard that characterises each firm, $\nu(\theta_i = f(\nu))$, (t) and Y_{it} correspond to a firms age and size, X_{it} is a vector of financial variables, W_{it} are export status indicators, Z_{it} are market indicators, and β , α , η and ω are vectors of regression coefficients.⁴²

⁴² Note that the interaction term is $\gamma X_{it} * W_{it} = \gamma_1 \text{Levarage}_{it}$ Export status_{it} + γ_2 Profits_{it} Export status_{it} + γ_3 Collateral_{it} Export status_{it}. Π includes Y_{it} , X_{it} , W_{it} and Z_{it} .

4. Results

The impact of financial variables - leverage, profits and collateral - is relevant (statistically significant) for the exit decision of firms. The results show that firms with more leverage have on average a higher likelihood of exit, which is consistent with the results found in the literature (e.g. Fotopolis and Louri, 2000, Bridges and Guariglia, 2008, Görg and Spaliara, 2014), including previous results that used Portuguese data (Farinha and Santos, 2006, Mata et al., 2010, and Mata and Freitas, 2012).

The results also indicate that firms with higher ROA (profits) have on average a lower probability of exit. This is in line with previous studies on survival (Mata and Freitas, 2012, Fotopolis and Louri, 2000, Bridges and Guariglia, 2008). Moreover, collateral is also an important factor of survival. The higher its value, the lower is, on average, the probability of exit. In the literature, several variables have been used as proxy for collateral, e.g. fixed assets (Fotopolis and Louri, 2000); and tangibles assets, which include not only fixed assets but also inventories (Farinha and Santos, 2006, and Bridges and Guariglia, 2008). The empirical results show that the probability of survival depends on the financial strength of firms, as companies with less leverage and more profits and collateral have a lower probability of exit, which is also consistent with the existent empirical literature.

The empirical results also show that exporting firms have, on average, a lower probability of exit than non-exporting firms, controlling for the financial factors that also influence the business. There are several empirical studies that analyze the link between firm survival and exports, and found that (on average) exporting firms have a lower likelihood to exit or the link is insignificant. However, only Bridges and Guariglia (2008) analyzed this effect controlling for the financial health of the firm. Their conclusion was that exporting firms had a higher probability of survival.

A more detailed analysis of the effect of exporting was done considering exiters of export markets, continuous exporters, continuous non-exporters and starters. After controlling for financial factors (on average) exiters from export markets have the highest probability of closing their business. Starters/switchers have the lowest probability of exit, which suggests that the decision to start exporting and exit are not taken in the same year. Continuous exporters show a lower probability of exit when compared to continuous non-exporters, this difference is particularly relevant in the last period (2011-2012). However, Table 15 shows that firms with different exporting status present different sample means for the financial variables. This fact suggests



Figure 50: Hazard rates

that the impact of export status on survival happens through two channels - the financial and the non-financial.

Figure 50 shows the hazard rate (probability of death at each age) using the coefficients that were estimated in the regression, the mean of the financial variables for each status, and the effect of the status. The graphs confirm the previous conclusions that exiters from export markets have higher hazard rates, and starters/switcher have the lowest rates. Continuous exporters have a lower likelihood of exit relative to continuous non-exporters.

The exporting status of a firm seems relevant to explain survival even when the financial effect is controlled for in the model. The results also show that the decision to export comes with risks as exiters from export markets had the highest values for the hazard rate. A possible explanation is that a large investment is required prior to the start of the exporting activity, with a large share being a sunk cost. Not succeeding may therefore compromise the firm's ability to honor their commitments with the financial institutions or reduce the internal resources of the firm to unsustainable levels.

The results on the individual characteristics of the firms are also consistent with the literature, as older and larger firms have a lower probability to exit. In addition, the results show that the interactions between the financial variables and export status are particularly relevant when the estimation uses all industries, with most of the coefficients being statistically significant. The empirical results suggest that the increase in the probability of exit after a decrease of collateral or profits will be higher for exiters from export markets relative to starters and continuous non-exporters, however the impact on survival after an increase in leverage is expected to be lower for exiters. It should be noted that even in the presence of interactions, the indicators of export status remain statistically significant, with the same sign and ordering.

5. Concluding remarks

As expected, the results indicate that firms with less leverage, higher profits and higher collateral are more likely to survive than their counterparts. The empirical analysis also shows that after controlling for financial effects, firms' characteristics such as age and size, sector characteristics, macro and random firm effects, exporters were more likely to survive than non-exporting firms. In addition, after exiting the export market firms had a lower probability of surviving when compared to continuous and non-continuous exporters, and starters/switchers.

Firms that export are more robust, they have lower death rates, lower leverage and higher returns. This may be relevant for policy decisions. Therefore, removing barriers to internationalization is important to strengthen the economy. However, the decision to export has risks. Firms that stop exporting have the highest hazard rates.

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7 INTERNATIONALIZATION
7.1. How different are demand and supply factors in export-based internationalization strategies?

Paulo Júlio, José R. Maria

1. Motivation

Internationalization is a strategic goal for most countries, Portugal included. Instead of being restricted by demand constraints imposed by domestic conditions, firms can benefit *inter alia* from worldwide demand and market diversification. The effects are expected to feedback on the domestic economy, boosting employment, income, consumption and ultimately welfare.

Export-based internationalization strategies depend on firms' ability to find new markets and, if needed, to scale up their production in an highly competitive environment. Such goals require firms to adopt best practices and to embrace innovation, in the benefit of their survival. Investing in high-quality products that are less vulnerable to price changes is a necessary condition to achieve better positions in international markets.

Augmenting total factor productivity (TFP, henceforth) is another development that is by and large desirable. The conditions under which the economy operates and the quality of institutions are among the main driving forces behind the evolution of TFP. The aim is, naturally, to promote a transition from relatively low-skilled, labour-intensive, low productivity, and thus low-wage sectors, to relatively high value-added sectors on the technology frontier, as a means to achieve better living standards.

We use in this Section a general equilibrium model to discuss demand-pull and supply-push factors leading to an increase in Portuguese exports. The analytical work is carried out with the *Portuguese Economy Structural Small Open Analytical* model (henceforth PESSOA model), a Dynamic Stochastic General Equilibrium (DSGE) model specially designed to fit the operating environment of the Portuguese economy. The model, estimated by Júlio and Maria (2017a) with Portuguese and euro area data, features a multi-sectoral production structure, non-Ricardian characteristics, imperfect market competition, and a number of nominal, real and financial frictions. By allowing permanent changes in deep parameters, DSGE models provide a privileged environment to evaluate a wide range of structural changes (which give rise to a new steady state), including a higher degree of competition in product and labour markets (Almeida *et al.*, 2010), fiscal consolidation strategies (Almeida *et al.*, 2013), or aging effects (Castro *et al.*, 2017).⁴³ Our estimates have both a "qualitative flavour," given that they are model dependent and conditional on the selected simulations, and a "reality-based quantitative nature," given that they are computed with an estimated model.

The ratio of Portuguese exports to euro area Gross Domestic Product (GDP) (the latter assumed to remain unchanged, reflecting the small-economy framework), oscillates in PESSOA due to an exogenous demand component or due to endogenous movements in the real exchange rate. This Section compares the main effects of an increase in this exogenous component to those of an exogenous rise in TFP, *i.e.*, a demand and a supply shock. The former mimics, for instance, a strategy that successful introduces domestic products abroad and thereby creates a permanently higher external demand level. The latter captures an indirect effect on exports *via* more efficient firms. Selected simulations assume a gradual increase in both shocks, and a stabilization around 2.9 and 0.9 percent above initial steady-state levels, respectively. These figures represent the 75th percentile of all estimated temporary shocks over 1999-2017, which allow us to investigate what would happen if such increases were to take a permanent nature.

The chosen demand and supply-driven processes bear some similarities. Exports increase in both cases and, as expected, GDP, capital and labour expand in the short, medium and long term. The trade balance improves under both simulations in the long run. Another identical result is that macroeconomic responses surpass the period when the shocks' rate of change tends to zero, *i.e.*, the economy continues expanding after demand and supply shocks stabilize at their new steady-state values.

The shocks differ, however, along key dimensions. The demand shock is more expansionary over the short run, boosted by higher investment rates, reflecting the capital-intensive requirements of higher exports (employment augments almost the same). At shorter time

⁴³ DSGE models are currently standard instruments in the suite of models used by policy-making institutions, such as the *Riksbank* (Adolfson *et al.*, 2008), the *Bundesbank* (Gadatsch *et al.*, 2015), the *Bank of Finland* (Kilponen *et al.*, 2016), the *European Central Bank* (Christoffel *et al.*, 2008), the *Banco Central do Brasil* (de Castro *et al.*, 2011), or the *European Commission* (Ratto *et al.*, 2009)

spans, the TFP shock presents limited effects on GDP due to its disinflationary nature, which increases real interest outlays of debt holders and hence hinders private consumption. Over longer horizons, in turn, impacts build up and the multiplicative effects become noteworthy. In the long run, model estimates suggest an increase in GDP of around 1.3 percent *vis-à-vis* the initial steady-state level for both shocks. However, the elasticity of the TFP shock is much higher than that of the demand-side shock (1.61 *versus* 0.47).⁴⁴

Finally, whereas higher demand brings about a permanent increase in domestic price levels and an appreciation of the real exchange rate, the opposite applies to the supply shock. Impacts on international trade follow as expected: the positive effect of the former reduces exports and increases imports whereas the positive technology shock has the opposite effect. In the long run, imports increase under the demand shock, given the import content of exports, but decrease under the supply shock, given the price-effect dominance.

2. The PESSOA model: key features

The Portuguese economy is modelled as a stylised system of equations that can be solved to find equilibrium outcomes in labour, product and financial markets.⁴⁵ Key interactions between all agents are clarified in Figure 51. Labour unions are assumed to hire labour services from households and rent them to intermediate good producers (termed "manufacturers").

Final good producers ("distributors") combine domestic intermediate goods with imported goods to produce four types of final goods. Consumption goods are acquired by households, government consumption goods by the government, investment goods by capital goods producers, and export goods by foreign distributors. The interactions between capital goods producers, entrepreneurs and banks are assumed to capture key elements of the financial intermediation sector.

International trade and financial flows take place solely with euro area agents, who are immune to domestic shocks, real or nominal. Interest rates are set by the Central Bank.

The *PESSOA* model is estimated by Bayesian techniques using Portuguese and euro area data between 1999Q1 and 2015Q4. The database comprises twenty four observable time series, including

⁴⁴ The demand shock elasticity surpasses the ratio of exports to Portuguese GDP due to the presence of positive general equilibrium effects.

⁴⁵ For details see Júlio and Maria (2017a,b)

The Portuguese economy



Figure 51: An overview of PESSOA

Notes: Identifier C stands for consumption goods, \mathfrak{I} for investment goods, \mathfrak{G} for government consumption goods, \mathfrak{X} for export goods, and \mathfrak{M} for import goods. The financial accelerator mechanism comprises capital goods producers, entrepreneurs, and banks. The simulation exercises evaluated in this Section consider an increase in TFP, directly affecting manufacturers, and in the non-price competitiveness of exports, directly affecting the final good producer \mathfrak{X} -Distributor.

real and nominal developments in gross domestic product, private consumption, public consumption and investment, private investment, exports, imports, wages and hours worked. The external sector is represented by a VAR model encompassing foreign output, the interest rate, and inflation.

The stochastic behavior of the model is driven by twenty four structural shocks, among them temporary TFP and non-price competitiveness disturbances. The supply capabilities of manufacturers are directly affected by the TFP disturbance $A_t^{\alpha^{u}}$, whose impact in intermediate output Z_t is implemented with a Cobb-Douglas production function featuring labour services U_t and capital K_t , namely

$$Z_{t} = A_{t}^{\alpha^{\mathcal{U}}} \left[K_{t}^{1-\alpha^{\mathcal{U}}} \left(T_{t} U_{t} \right)^{\alpha^{\mathcal{U}}} \right], \tag{21}$$

where T_t represents the worldwide level of technology, and $\alpha^{U} = 0.54$. The TFP shock shifts the supply schedule outwards. In other words, for the same utilization of capital and labour, manufacturers now produce more. Successful innovation strategies or improved institutional arrangements can justify this kind of shock.

The ratio of Portuguese exports Y_t^{χ} to foreign GDP Y_t^* is directly affected by the non-price competitiveness disturbance α_t^* , as well as by endogenous movements in the real exchange rate $\vartheta_t^{\xi^*}$. In short,

$$\frac{Y_t^{\chi}}{Y_t^*} = \alpha_t^* \cdot \vartheta_t^{\xi^*}, \tag{22}$$

where $\xi^* = 1.62$ is an estimated parameter. The non-price effect shifts upward the demand schedule faced by exporting firms. In other words, for the same price, foreign agents are willing to buy additional domestic goods. A marketing strategy that successful introduces domestic products worldwide provides one rationale for this type of shock.

Figure 52 reports the evolution of both shocks over 1999–2017. The estimated results show that the supply shock is less persistent than the demand shock, depicting lower amplitudes, in part due to developments in the ratio of actual Portuguese exports to foreign GDP. The 75th percentile imply an increase of 0.9 and 2.9 percent in supply and demand shock, respectively, *vis-à-vis* initial steady-state values. Figure 52 also reports the 90th percentile, which imply increases of 2.2 and 5.8 percent, respectively.⁴⁶

The contributions to GDP growth, reported in the last column of Figure 52, attach a larger relevance to export shocks.

3. Higher exports to the euro area and better technology

3.1. The simulations

To calibrate the simulations of this Section we take the 75th percentile of all temporary disturbances reported in Figure 52 and investigate what would happen if those shocks were to take a permanent nature. We assume a gradual increase in both shocks, close to 60 percent of the total increase over the first five years. The level of each shock largely stabilizes after forty quarters (ten years). It is important to clarify that these working hypothesis are arbitrary and serve merely as a benchmarking exercise. However, the selected simulations allow us to investigate structural changes in the Portuguese economy brought about by permanent higher levels of supply or demand.

The transition path to the new steady state is known and fully anticipated once the shock is observed.

⁴⁶ The standard deviation of temporary TFP shocks stand at 2 percent and of export shocks at 5 percent.



Figure 52: Selected demand and supply factors in *PESSOA* Notes: Estimated TFP and export shocks are reported in quarterly terms. The contributions to GDP growth are in annual terms (in percentage points).

3.2. Impacts on GDP, labour, and capital

Figure 53 reports general equilibrium outcomes of the model, namely the impact on real GDP, labour, and capital. Results support two main conclusions. First, the dynamic macroeconomic responses clearly outlive both disturbances. Both the demand and supply shocks reach the new steady-state level soon after ten years, however, at that date, all main macroeconomic variables are still far away from their new long-run values. For instance, after ten years GDP has increased by less than 50% of its full long-run impact.

Second, higher exogenous exports are more expansionary in the short and medium run than the TFP shock. The significant increase in exports' demand directly requires more capital and labour to support the new production level of export goods. Since future income and hence wealth are indirectly boosted, households increase consumption in the very short run, benefiting from better future prospects. In the case of the TFP shock, the short- and medium-run responses are severely contained since private consumption is negatively impacted by disinflation (see the next subsection). Nevertheless, consumption gains are supported from higher real wages in both cases. When compared with the export shock, firms take advantage of the higher technology level to accumulate more modest capital levels and yet achieve the same level of output.

In short, both shocks have beneficial and long-lived effects on output, wealth and employment, providing a general equilibrium rationale on why policy makers should lay ground for favourable condi-



--- TFP increase

Figure 53: GDP, capital stock and labour developments

Notes: All shocks are permanent, deterministic and anticipated. Each figure refers to deviations from initial steady-state values. Identifier Y_i refers to the average value over the previous five years ending on year i.

tions that encourage technological progress and export-based internationalization strategies.

3.3. Other impacts

Qualitatively similar effects on GDP, capital or labour hide important differences in other variables.

While both shocks deliver basically the same long-run impact on GDP, the long-run elasticities are quite different. They stand at 0.47 percent in the case of the demand shock, and at 1.61 percent in the case of the supply shock, *i.e.* the amplification properties of the TFP shock are more than threefold, given that intermediate goods are used as inputs in the production function of all final goods, including exports. If simulations took into account the 90th percentile reported in Figure 52—a more optimist scenario—GDP would reach higher levels under both shocks but the long run impact of the TFP shock would in this case be larger than that of the demand shock. Long-run elasticities would remain unchanged however, given that the model is linear.

Another key difference is the impact on prices. The demand shock is inflationary, whereas the supply shock is disinflationary. This brings along opposite effects on real interest rates and thus on consumption. Higher expected inflation lowers real interest rates and boosts consumption goods' demand, largely reflecting the improved financial position of households, who are net debtors. The external finance premium of firms is reduced, with positive effects on capital demand and hence investment. The opposite applies to the technology shock, which increases real interest rates in the short run and thus depresses wealth and private consumption.

Real interest rate developments have, however, a temporary nature. Given that the macroeconomic response of the Portuguese economy has no influence on the Monetary Union's nominal anchor, nominal interest rates remain unchanged. It follows that the relative law of one price holds in the long run, implying that any domestic inflationary process *vis-à-vis* the euro area must be fully cancelled out, at some point in time, through a disinflationary process and *vice-versa*. Inflation and thus the real interest rate must therefore converge to its initial value (identical to the euro area). However, permanent shocks like those implemented herein violate the absolute version of the law of one price, *i.e.* inflation returns to its pre-shock figure but the price level does not.

Permanent changes in price levels have permanent effects on the real exchange rate and thus competitiveness. A higher export level directly increases the trade balance but leads to a permanent real exchange rate appreciation that reduces the initial impact. In contrast, higher TFP does not directly affect the trade balance but triggers a permanent depreciation with favourable effects on international trade. Results also suggest that higher production, supported by better technology, does not require additional imports in the long run, only more capital and employment.

4. Some caveats

Current simulations are conditional on several working assumptions that justify some discussion. First, results depend on the hypothesis that all agents benefit from perfect foresight. This implies that short-term results should be seen as optimistic outcomes, as expected future production translates into greater wealth and thus into an expansion in current aggregate demand, which in turn justifies higher capital and labour.

Second, the banking system is acknowledgedly very simple, as we abstract from possible credit supply restrictions or banking frictions that may limit the ability of firms to expand their balance sheet.

Third, capital utilization remains unchanged throughout the entire simulation period. This assumption avoids entrepreneurs to set abnormal levels of capital utilization associated with permanent shocks. In the standard set up, however, entrepreneurs can optimally choose the level that maximizes the net (of taxes) return per unit of capital.

Finally, exports depend, in the model, on euro area GDP and not on a weighted average world demand, where the weights could be set by the importance of each country in Portuguese trade.

5. Final remarks

This Section claims that Portugal should benefit either from upward shifts in foreign customers' demand or better domestic firms' technology. Both demand-pull and supply-push factors boosts production, capital, employment, and promote an improvement in international trade.

There are however some noticeable differences. Demand shocks are more expansionary in the short and medium run, which can be the preferred internationalization strategy. Supply shocks, however, have higher multiplicative effects in the long run, which should not be ignored. Rather significantly, the former leads to a real exchange rate appreciation, while an increase in total factor productivity leads to real depreciation.

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7.2. How did Portuguese exporters get through the crisis?

Paulo Soares Esteves, Miguel Portela, António Rua

1. Motivation

Portuguese exports of both goods and services registered an outstanding behavior during the last decade, in particular during the latest economic and financial crisis, thus promoting Portuguese economic growth. Such a performance was not observed in other countries and understanding it is crucial to assess the (lack of) success of the recent economic adjustment of some European economies.⁴⁷

The noteworthy behavior of the Portuguese exports can be succinctly highlighted through exports share on GDP (Figure 54a). After remaining stable between 25 to 30 per cent since the second half of the eighties, it increased substantially during the last ten years, attaining a level close to 45 per cent in 2017 (see Banco de Portugal (2017) for a more thorough view on the recent evolution of the trade openness of the Portuguese economy).

Naturally, one may argue that this sort of indicator suffers from a denominator effect, as GDP recorded a strong decline during the crisis. However, other indicators point to the same direction. The exports market share increased 25 per cent since 2007 (Figure 54b). With the exception of Ireland, this evolution was clearly more favorable when compared with the European countries most severely hit by the latest crisis. However, such an evolution cannot be explained by changes in the relative prices, as real exchange rate developments are not able to explain both the behavior of Portuguese exports or the differences between countries' exports performance (with the exception of Ireland).

⁴⁷ The importance of exports reaction was already clearly present in 2010, in a IMF memo about Greece on 4th May from IMF's chief economist Olivier Blanchard to Poul Thomsen, the director of the Fund's European Department, quoted in Blustein (2016): "...In the absence of a strong export rebound, there is nothing that can support growth against the negative contribution of public sector...with a recession deeper and longer than projected, followed by a period of sluggish growth...".



Figure 54: Exports/GDP ratio and exports market shares Source: AMECO, INE and Pinheiro (1999).

In this Section, we argue that the observed behavior of Portuguese exports was partly related to the strong negative domestic demand shock. To put it simply, when facing adverse domestic market conditions, Portuguese firms were able to reorient their sales to external markets. In other words, the crisis was a trigger for deeper internationalization.

Such a view is supported by recent applied research. From a macro stance, it has been documented that this effect is strong and that the relationship between exports and domestic demand is asymmetric, being more significant when domestic demand declines, suggesting that market share gains will not be reverted when domestic economy recovers. From a micro perspective, the negative link is supported by the results drawing on firm level data. It has also been found that the activity sector and size of the firm also play a role concerning the magnitude of the link.

2. From a macro perspective to firm level insights

Based on macroeconomic data, the empirical research strongly supports a negative relationship between domestic demand and exports. In this respect, Esteves and Rua (2015) present evidence of such a link for the Portuguese economy, using quarterly data from 1980 up to 2012. Moreover, Bobeica *et al.* (2016) extend the findings to a panel of eleven Euro area countries, using quarterly data from 1995 up to 2013.⁴⁸ Esteves and Prades (2018) confirm the previous evidence using an annual panel data from 1997 up to 2014, arguing however

⁴⁸ Greece is excluded given the lack of quarterly data.

that the exporting behavior may differ across countries, depending negatively on product concentration and thus explaining the less successful adjustment of the Greek economy.⁴⁹

Furthermore, the above mentioned studies point to an asymmetric effect of domestic demand on exports, being larger and more significant when domestic demand declines. Such a result would suggest that a rebound of the domestic market may not have *per se* a negative impact on exports. A possible rationale for this asymmetry is the existence of uncertainty and sunk costs that firms face when entering into the external market which may deter the firm of leaving it when domestic demand recovers.

In addition to the above discussed macro evidence, Esteves *et al.* (2018) explore firm level data for the Portuguese economy during the latest economic and financial crisis period. The remainder of the article draws on Esteves *et al.* (2018) and focuses on the main firm level insights.

3. Model and data

Based on a monopolistic competition model of a firm selling to domestic and foreign markets, profit maximization conditions allow to define a function where exports revenues of firm i at period t (X_{it}) depend on its relevant foreign demand (FD_{it}) and, in a nonlinear way, on the ratio between the corresponding domestic (DD_{it}) and foreign demands, i.e.

$$X_{it} = \alpha_{i0} FD_{it}^{\alpha_1} \left(1 + \frac{DD_{it}}{FD_{it}}\right)^{\alpha_2}$$
(23)

The elasticity of exports to domestic demand converges to α_2 while the elasticity of exports to foreign demand converges asymptotically to $\alpha_1 - \alpha_2$.

The main estimation results are obtained using a sample covering the period from 2009 up to 2016. Firms' exports are collected from the external trade database of the Statistics Portugal (INE), where a product disaggregation at 8- digit level is considered.

Foreign demand is computed using information on imports for 213 countries, obtained from the BACI database at 6-digit product level of

⁴⁹ One very intuitive and illustrative example concerns an oil exporting country. In this case, oil exports will not depend on the domestic consumption of oil, as domestic consumption of oil is typically insignificant when compared to exports.



Figure 55: Estimated exports elasticities Source: Esteves *et al.* (2018)

the Harmonized System classification. Such information is thereafter aggregated according to the relative importance of each market on firm exports. In this way, a specific foreign demand is computed for each firm, taking into account its product and destination specialization.

Domestic sales are used as a measure of domestic demand, which are obtained from the Simplified Business Information (IES), that also includes many other variables, such as the sector of activity. The sample encompasses 3655 firms in a total of 19381 observations.

4. Results

Overall, the results confirm a negative link between domestic demand and exports, as found in previous literature using macro level data. During the most recent years, firms reacted to adverse domestic demand conditions through an increase of sales to external markets. The results are robust to alternative samples and estimation methods. Furthermore, the use of firm-level data unveils some new insights about this relationship.

Firstly, the elasticity of exports is not constant, neither over time nor between firms (Figure 55). In particular, it depends on the ratio between domestic and foreign sales. Naturally, firms' exports should



(a) Estimates by sector





Figure 56: Parameter estimates underlying the elasticity of exports to domestic demand

Notes: Industry codes: 10, Food Products; 11, Beverages; 13, Textiles; 14, Wearing Apparel and Dressing; 15, Footwear, Articles of Fur; 16, Wood and Cork; 17, Paper and Paper Products; 18, Publishing, Printing and Reproduction; 19 & 20, Fuel and Chemicals; 21, Pharmaceuticals; 22, Rubber and Plastic; 23, Other Non-Metallic Mineral Products; 24 & 25, Basic Metals and Fabricated Metal Products (exc. Machinery and Equipment); 26 & 27, Computing, Communication and Electrical Machinery; 28, Machinery and Equipment; 29 & 30, Motor Vehicles; 31, Furniture; 32, Other Manufactures.

Source: Esteves *et al.* (2018)

not react to domestic market conditions if the firm does not sell in the home country. This finding is also consistent with the above discussed effect of exports concentration. Likewise in the case of a country, if exports are fully concentrated in a commodity, the importance of domestic sales can be close to zero and therefore the effect of this reallocation will be irrelevant. The reaction is expected to be larger if the scope for shifting is also larger. Secondly, one should highlight that sales reallocation seems to depend on the activity sector. Figure 56a presents the estimated value of the parameter underlying the elasticity of exports to domestic demand (α_2) as well the respective confidence interval with a 95 per cent confidence level, covering 18 manufacturing sectors. The results point to a generalized negative relationship between exports and domestic demand. Nevertheless, among those industries where the effect is statistically significant, the magnitude of the coefficient varies quite substantially. Such heterogeneity highlights the importance of considering industry level data when analysing the evolution of total exports.

Finally, the importance of firm size is also evaluated within each sector. By considering firms classified in each sector by terciles of the size distribution (small, medium and large), the negative relationship between domestic and external sales seems to be larger and statistically more significant when considering larger firms (Figure 56b).

5. Final remarks

Portugal recorded a severe crisis during the latest economic and financial crisis. The economic and financial assistance program deepened the effects of 2008-2009 recession on economic activity. Domestic demand declined in an unprecedented way. In parallel, exports grew well above foreign demand, which cannot be explained by real exchange rate developments.

The empirical results of applied research with macro data and, more recently, with firm level data during the crisis period suggest a noticeable reaction of Portuguese firms. Facing an impressive negative shock, there was a reallocation of sales from domestic to foreign markets. The results also suggest that this reallocation will not be reverted, since firms will not leave the external market when domestic demand rebounds due to the presence of uncertainty and sunk costs. Moreover, as shown in Banco de Portugal (2017), despite the remarkable evolution during the most recent period, the Portuguese economy continues to be less open than others with similar characteristics (area, size, geographical location, among others).

The reaction of Portuguese firms to a strikingly adverse economic episode unveils a remarkable ability to adjust to new conditions. In particular, the occurrence of a pronounced deterioration of the domestic market resulted in a set of firms more oriented towards the foreign market leading to an important structural change of the Portuguese economy. Such a change should be supported and promoted to assure improved economic prospects.

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7.3. How important is the role of entry and exit in international markets?

João Amador, Luca David Opromolla

1. Motivation

Economies present strong firm dynamics when analyzed at the micro level. Such dynamics also translates into entry and exit of firms in the international markets, expansion or contraction of export and import scopes, as well as in terms of the portfolio of markets supplied and sourced. Beyond adding or dropping of firms, markets and goods - the designated extensive margin - the change in the scale of operations by continuing firms in continuing markets with continuing goods - the designated intensive margin - is very relevant. Nevertheless, new-born firms, upon survival in their first year, become continuing firms and they may be quite different from older ones. Therefore, following the individual cohorts of international traders is another way of studying the dynamics of trade and, ultimately, Portuguese economic growth. This Section bases on Amador and Opromolla (2017) and assesses the contribution of the intensive and extensive margins in the firm, destination and product dimensions both in exports and imports of goods in the period 1995-2014. Moreover, we describe the behaviour of cohorts of international traders born in the last 20 years, with an emphasis on the impact of events like the great trade collapse and the Portuguse economic and financial assistance program. The literature on the margins of international trade is too large to be listed here. The seminal contributions are those of Eaton et al. (2004), Schott (2004) and Bernard et al. (2007). As for the analysis of cohorts of international traders, there is little literature because it requires databases that track traders along a relatively large sequence of years. One exception is Wagner (2012), which studies the cohorts of exporters in Germany that started to export between 1998 and 2002.

2. The analytical framework

The analysis of product and destination mix is made possible by the use of a database that includes all export and import transactions by



Figure 57: The margins of trade

firms that are located in Portugal, on a monthly basis, from 1995 to 2015, aggregating to total Portuguese exports and imports of goods, as reported by the Statistics Portugal (Instituto Nacional de Estatística). We take account of the existence of reporting thresholds for exports and imports. In order to have a comparable set of firms and to avoid attributing entrance and exit of traders to changes in the reporting threshold, we take the highest report limit in the entire period and apply it to all years, after adjusting for inflation with the consumer price index. We define products at four-digit level according to the HS. This allows us to avoid classification problems related to revisions of the Combined Nomenclature and still allows for a set of more than 1000 potential products.

Portuguese total export and import growth rates are broken down into the contribution of three distinct decisions: the decision to entry/stay/exit in export/import markets, the decision of where to export/import and the decision of what to export/import. Consistently with what was done in Amador and Opromolla (2013), we first decompose total export growth in the contribution of "entering", "exiting" and "continuing" traders, that is, in the extensive and intensive margin at the aggregate level along the firm dimension. Next, we consider the product that firms choose to export in "continuing" and "added" destinations. We distinguish among "added", "dropped" and "continuing" products exported by firms in "continuing destinations", that is, the extensive and intensive margin at the firm level along the product dimension. Finally, we split the export change associated to new destinations into products already sold by the firm somewhere, i.e. old products, and products that were not sold by the firm anywhere, i.e. new products. The diagram in Figure 57 summarizes the decomposition.

3. Results

3.1. Trade margins

The panels of Figure 58 plot the contribution of intensive and extensive margins to the yearly export and import growth rates over the period 1996-2014. The intensive margin includes the growth of exports (imports) of continuing products in continuing destinations (origins) by continuing firms. The sum of the bars corresponding to the entry and exit parts of the extensive margin define the growth of exports (imports) due to net firm, product and destination (origin) entry. The most important insight is that the intensive margin is the main driver of the growth rates in both trade flows. The contributions from gross entry and exit of firms, destinations and products are large but their net effect is small at the yearly level.

The panels of Figure 59 plot the contribution of the intensive and extensive margins to the accumulated export and import growth over the period 1996-2014. As for the export side, it is clear that, after 18 years, the overall intensive margin represents a sizeable share of cumulative export growth. Nominal exports of goods increased by 89 per cent in the period 1996-2014, while the cumulative extensive and intensive margins increased by 23 and 55 per cent, respectively. A somewhat similar picture is visible for imports of goods. Nominal imports of goods grew by 80 per cent in the referred period, while the overall extensive and intensive margins grew by 27 and 45 per cent, respectively. Therefore, although the extensive margin is relatively small on an yearly basis, it is important in cumulative terms.

Panel a of Figure 59 shows a very strong impact of the great trade collapse in the intensive margin but not in the extensive margin. This is compatible with the well-established fact that exports to foreign markets involve important entry and re-entry costs. For example, firms must allocate resources to adapt to local legislation, establish retail channels and sometimes adjust to local preferences.

A similar analysis conducted for the import side leads to somewhat different results. The total effect of the great trade collapse is smaller than in exports. Conversely, the negative impact on imports of the sovereign debt crisis in the euro area and of the Portuguese economic and financial assistance program in 2010-2012 is visible in the extensive and, mostly, in intensive margins.

It should be mentioned that the conclusions based on the cumulative impact of the extensive margins convey a conservative message in terms of its role to trade flows. By definition, a new trader, a new



Figure 58: Yearly intensive and extensive margins

destination (origin) or a new product by continuing traders are only accounted for in the extensive margin in the initial period. After the initial period they become part of the intensive margin. Therefore, the decisions of international traders with different ages feed the intensive margin exactly in the same way. To better understand the differential contribution of old and new international traders to export and import developments, cohorts need to be followed separately.



Figure 59: Cumulative intensive and extensive margins

3.2. Cohorts of exporters and importers

An important part of the analysis of the growth rate of exports and imports is the contribution of the cohorts of traders. It is interesting to assess the pattern for their survival and growth and it is relevant to evaluate whether events like the great trade collapse or the Portuguese economic and financial assistance programme have lasting effects on the cohorts of traders that entered on those years.

The exit rate of new exporters is particularly high in the first year of life, as almost one out of three exits foreign markets. This exit rate drops to about 15 per cent in the second year and slowly decreases afterwords. In our sample, three fourths of new exporters exit in the



(a) Number of exporters



Figure 60: Number of exporters and value of goods exports per cohort in each year

first five years of activity. The ratio of exports per firm increases on average about 70 per cent in the first year of the cohort, meaning that those that survive strongly increase exports. This growth rate decreases to an average of 10 per cent in the second year, stabilizing afterwards on a range between 4 and 9 per cent.

The yearly number of firms and the value of their exports for each cohort is difficult to represent in a meaningful way. The panels of Figure 60 suggest a representation that plots cohorts as stacked layers. Therefore, on an horizontal perspective, the thickness of each layer defines the evolution in the cohort's number of firms (panel a) and their exports (panel b), while a vertical reading gives the breakdown of the total number of exporters starting activity after 1997 and their exports by cohort.







Figure 61: Number of importers and value of goods imports per cohort in each year

Panel A of Figure 60 shows that the size of each cohort in terms of number of firms virtually stabilizes after around eight years. The cohorts born in 2008 and 2011, which correspond to the beginning of the great trade collapse and the first year of the Portuguese economic and financial assistance program, follow a normal pattern in terms of number of exporters and a comparatively good performance in terms of total exports, especially the 2011 cohort. This suggests that firms that start to export in crisis years, and manage to survive, are not handicapped. In the Portuguese case, the 2008 and 2011 crisis took place against a background of strong export growth that had been initiated several years before. Indeed, Portuguese firms were adjusting for some time to a new pattern of comparative advantages, which followed the shocks of Asian competition and EU enlargement.

As for the cohorts of importers of goods in the Portuguese economy (Figure 61), we observe that the initial number of firms in each cohort has been decreasing, notably after 2008, but those that survive seem to increase in number. In 2014, the share of importers born in post-1996 cohorts is relatively close, despite the difference in terms of age. Nevertheless, the value of imports per cohort evolves in somewhat different ways. For example, the post-2008 and, mostly, post-2010 cohorts show lower import levels.

4. Final remarks

Portugal presents a healthy demography of international traders with high gross entry and exit rates and a significant role for the extensive margin in accumulated terms. Indeed, churning is an important feature in markets in order to select the best ideas and the most efficient firms. Nevertheless, despite high mortality rates in the first year of life, the cohorts of exporters in the last two decades have shown a steady path. Therefore, the temptation of blindly supporting newborn firms should be avoided, because it is expensive and does not necessarily improve the overal export performance.

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7.4. How heterogeneous are Portuguese international traders of non-tourism services?

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1. Motivation

In recent decades, international trade in services has been growing strongly, leading to higher shares of this sector in total gross output, employment and trade. As new technological developments reduce the need for face-to-face interactions and facilitate remote connections, in the near future, more workers should start providing services abroad, even in those tasks that today require a physical presence (Baldwin, 2016).

Portugal has been experiencing a progressive increase in its trade openness and there has been also a growing importance of trade in services. Even if tourism remains the largest sector in Portuguese trade in services, accounting for around 45 percent of exports and 28 percent of imports, non-tourism services have been gaining importance in the last decade (Figure 62). In 2015, total Portuguese trade in non-tourism services represented around 13 percent of GDP, which compares to around 9.5 percent in the world economy. In addition, since the beginning of the 2000's, Portugal has been recording surpluses in the non-tourism services account, which contrasts with the systematic deficits registered previously. In 2015, the Portuguese services account, excluding tourism, showed a surplus of 2.5 percent of GDP, with exports and imports representing 7.7 and 5.2 percent of GDP, respectively.

This Section is based on Amador *et al.* (2018) that provide a portrait of Portuguese international trade in non-tourism services at the firm-level. The analysis relies on firm-year-service-country data on Portuguese international trade in non-tourism services at a disaggregated breakdown level, as collected by the Statistics Department of Banco de Portugal, merged with firms' balance-sheet information for 2014 and 2015. We classify international traders of services in three groups in line with their trading status: only export (one-way exporters), only import (one-way importers) or engaging in both activities (two-way traders). The general term importers (exporters)



(a) International trade in non-tourism services



(b) Portuguese exports and imports of non-tourism services

Figure 62: International trade of non-tourism services as a percentage of GDP

Notes: Nominal Balance of Payments transactions and nominal GDP are denominated in current US dollars. Exports and imports of services exclude transactions of the travel account.

Source: CEPII-Chelem database.

refers to firms importing (exporting) services irrespective of the export (import) dimension. For simplicity, non-tourism services are referred to as services in the remaining of this section.

We find that a substantial share of Portuguese service traders is active in both flows (45 percent). Furthermore, there is a high concentration of both exports and imports of services in these firms: two-way traders account for 90 percent of total Portuguese international trade in services. Compared with firms that only export and that only import, two-way traders of services tend to be more productive and more profitable. Moreover, as found for international trade in goods, we show that multi-service and multi-country firms are crucial in explaining the level of Portuguese international trade in services. In sum, these facts confirm a high degree of firm-level heterogeneity in Portuguese services trade.

2. Aggregate descriptive statistics

Table 16 shows the representation of firms and trade flows according to 10 broad categories of services at the 2-digit level of EBOPS classification, based on the 29 types of services considered in the database. In terms of number of firms, "Other business services" is the largest category for both exporters and importers, followed by "Transport" on the export side and "Telecommunications, computer and information" on the import side. The two latter service categories are third in the ranking of number of importers and exporters. In terms of values traded, "Transports" accounts for almost half of the value exported (48.2 percent), followed by "Other business services" (30.6 percent). On the import side, "Other business services" rank first (35.7 percent) and "Transports" second (27.5 percent). "Telecommunications, computer and information" accounts for the third highest share in exports and imports (10.6 and 15.6 percent, respectively). Hence, Portuguese international trade in non-tourism services is dominated by three main categories of "Other business services", "Transports" services: and "Telecommunications, computer and information". Within these broad categories, the most important types of services are "Air transport", "Telecommunications", "Computer services", "Scientific and other technical services", "Trade-related services" and "Other business services n.i.e", both on the export and import sides.

To examine the geographical composition of Portuguese international trade in services, Table 17 reports the ten largest export and import partner countries in terms of their percentage share in the respective trade flows and number of firms. The main trade partners are almost identical on the export and import side, where countries of the European Union (EU) and Portuguese speaking countries dominate. UK, Spain and France are the top export destinations, while Spain, UK and Germany are the top import origins. Interestingly, Spain represents a larger share of Portugal's imports than exports (17.7 versus 11.1 percent). In addition, Spain is also the country that accounts for the largest number of both exporters and importers. Regarding non-European countries, Angola and Brazil are more relevant in terms of exports than imports, while USA has a higher importance in imports than exports.

porters
7.9
11.6
2.8
4.6
5.3
2.9
17.9
41.0
5.8
0.16
100.0

Table 16: Shares in total trade and in total number of firms by broad service categories, 2014-2015

Notes: The 29 types of services are aggregated in 10 broad categories at the 2-digit level of EBOPS 2010 for presentation purposes. Firms are counted each time they export/import a specific service type at the disaggregated breakdown level of 29 service types in the current year, implying that a firm-year can appear more than once across the broad categories of services listed. The share of each aggregate service category represents its percentage fraction in total exports or imports in both years.

Countries	Exports	Exporters	Countries	Imports	Importers	
UK	12.1	5.9	Spain	17.7	14.2	
Spain	11.1	10.5	UK	13.4	8.8	
France	10.3	7.6	Germany	rmany 10.2		
Germany	7.9	6.8	USA	9.0	5.0	
Angola	7.2	2.9	France	8.4	8.0	
Brazil	5.7	1.6	Netherlands	6.2	5.3	
USA	5.5	3.2	Switzerland	4.1	2.9	
Switzerland	4.8	3.2	Belgium	3.9	3.8	
Netherlands	3.7	4.7	Ireland	3.3	3.6	
Italy	3.3	3.4	Brazil	3.3	1.7	
Other	28.4	50.1	Other	20.6	39.1	
Total	100.0	100.0	Total	100.0	100.0	

Table 17: Main partner countries - shares in total trade and in total number of firms, 2014-2015

Notes: Firms are counted each time they export or import with a different partner country in the current year, implying that a firm-year can appear more than once across the listed countries. The share of each country represents its percentage fraction in total exports or imports in both years.

		Exports	Exporters						
					By firm type			m type	
Firm size	Only Exp	Exp & Imp	Total	Only Exp	Exp & Imp	Total	Only Exp	Exp & Imp	
Micro	1.7	2.5	4.1	19.2	14.4	33.6	49.7	23.4	
Small	3.1	10.2	13.2	14.2	24.1	38.2	36.7	39.2	
Medium	2.3	17.4	19.6	4.5	16.0	20.5	11.7	26.0	
Large	3.9	59.1	63.0	0.7	7.0	7.7	1.9	11.4	
Total	10.9	89.1	100.0	38.6	61.4	100.0	100.0	100.0	
	Imports			Importers					
				By firm type			m type		
Firm size	Only Imp	Exp & Imp	Total	Only Imp	Exp & Imp	Total	Only Imp	Exp & Imp	
Micro	0.3	2.3	2.6	8.9	14.5	23.4	23.4	23.4	
Small	1.4	8.3	9.8	16.6	24.2	40.8	43.5	39.2	
Medium	1.8	18.6	20.4	10.2	16.1	26.2	26.6	26.0	
Large	2.8	64.4	67.2	2.5	7.0	9.5	6.5	11.4	
Total	6.4	93.6	100.0	38.2	61.8	100.0	100.0	100.0	

Table 18: Joint distribution of trade values and traders by firm type and size category

Notes: Each cell represents the percentage of total exporters (importers) or exports (imports) associated with firms-year belonging to a certain size class (row category) and firm type (column category) in 2014-2015. The four size classes are defined according to the EU official classification.

3. Characteristics of Portuguese international traders of services

Table 18 presents the joint distribution of traded values and traders by their type and size categories. The four size categories are defined according to the EU official classification, which combines number of employees, turnover and balance-sheet total. Large firms account for the majority of international trade flows of services in Portugal, representing 63 percent of exports and 67 percent of imports. However, most international traders of services are micro and small firms. In particular, around half of one-way exporters are micro firms, while more than 40 percent of one-way importers are small firms. The proportion of large firms is higher in two-way traders, representing more than 11 percent of the total. The distribution of firms and international trade flows of services along size classes is in line with that identified for Portuguese international trade in goods (Amador and Opromolla, 2013).

Figure 63 depicts the marginal distributions of service traders and trade values along the service and geographical dimensions. Most Portuguese firms trade only one service type abroad: around three-quarters of total Portuguese exporters sell only one service type and around half of importers buy only one service. However,



(a) Number of services traded



(b) Number of partner countries

Figure 63: Distribution of trade values and traders by number of services and partner countries, 2014-2015

Notes: For the number of services, the values represent the percentage of total exporters (importers) and exports (imports) associated with firms-year exporting (importing) a certain number of service types in 2014-2015. For the number of partner countries, the values represent the percentage of total exporters (importers) and exports (imports) associated with firms-year exporting (importing) to (from) a certain number of partner countries in 2014-2015.

these firms are responsible for much smaller proportions of total trade, 39.8 percent for exports and 16.5 percent for imports. The diversification is higher in terms of partner countries than in terms of service types traded. Firms that have only one destination country represent 38.0 percent of total exporters and 5.9 percent of total exports of services. The proportions are similar on the import side, with traders with only one source country accounting for 37.6 percent of total importers and 8.3 percent of total imports. Considering both dimensions together, firms that only export one



(a) Labour productivity



(b) Profitability

upper 95th percentiles are excluded.

Figure 64: Distribution of labour productivity and profitability, 2014-2015 Notes: Labour productivity is in thousand euros and it is defined as a firm's gross value added divided by the number of employees. Profitability is defined as the percentage share of a firm's earnings before interest, taxes, depreciation and amortization (EBITDA) in total assets. Firms-year with values in the lower 5th and

service to one country represent 34.5 percent of total exporters but only 4.2 percent of total exports. On the import side, firms with a single service and source country represent 30.8 percent of importers and account for 5.1 percent of total imports.

Conversely, firms that trade multiple services are responsible for disproportionate large shares of total values traded. Firms that export more than 3 service types represent 3.8 percent of exporters and 37.6 percent of exports (16.7 percent and 66.8 percent for importers and imports, respectively). This feature is particularly evident on the geographical dimension: firms that export to more than 50 countries represent only 0.9 percent of exporters but 40.3 percent of exports, while firms that import from more than 50 source countries represent 0.4 percent of total importers and 31.5 percent of total imports. When the service and geographical dimensions are taken together, firms that export more than 3 services to more than 50 countries represent just 0.3 percent of total exporters but account for 27.9 percent of total exports. Values are similar for imports as firms that buy more than 3 services from more than 50 source countries represent 0.1 percent of total exports as firms that buy more than 3 services from more than 50 source countries represent 0.2 percent of importers and 31.1 percent of imports.

The two panels of Figure 64 depict the distributions of labour productivity and profitability of the three types of Portuguese international traders of services. Labour productivity is defined as gross value added per worker. Profitability is defined as the ratio of earnings before interest, taxes, depreciation and amortization (EBITDA) over total assets, which is an approximate measure of operating cash flow based on income statement data. This is an indicator commonly used for profitability assessment and usable for small and large firms. We tested alternative measures like earnings before taxes over total assets or simple price-cost margins and the results are similar. All distributions of labour productivity are markedly right-skewed, but two-way traders tend to have higher productivity levels. In addition, firms that only import services appear to be somewhat more productive than those that just export. The profitability distributions are closer to a normal distribution, but that for two-way traders presents less density at lower profit rates. Therefore, this set of firms tends to be not only more productive but also more profitable than one-way traders of services.

4. Final remarks

The increase in the share of exports in Portuguese GDP has been one positive development of the latest years. This path signals a reorientation of resources towards the tradables sector, thus consolidating the correction of Portuguese external imbalances. In addition, non-tourism services are becoming increasingly tradable and this contributes to the structural transformation of the Portuguese economy. The structure of service traders resembles the one observed for international traders of goods, with multi-service and multi-country firms playing a major role. Moreover, around 45 percent of Portuguese service traders engage simultaneously in exports and imports, representing around 90 percent of total trade value. Compared with one-way traders, these two-way traders of services tend to be more productive and more profitable.

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7.5. How does tourism-related firm dynamics differ from other sectors?

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1. Introduction

The dependence of countries on the tourism sector has several implications on their overall economic performance (see, *inter alia*, Eugenio-Martin, Morales and Scarpa, 2004 and Andraz, Gouveia and Rodrigues, 2009). According to the World Travel and Tourism Council (WTTC) (2018) the direct contribution of Travel and Tourism to the world GDP in 2017 was USD 2,570.1bn (3.2% of total GDP). However, the contribution is significantly higher when indirect and induced effects are also taken into account. The total contribution in 2017 was in effect USD 8,272.3bn (10.4% of GDP), with a share in employment (including wider effects from investment, the supply chain and induced income impacts) of 9.9%, i.e., 313,221,000 jobs (WTTC, 2018).

In Portugal, tourism also plays a central role on the country's economic performance. According to the WTTC (2018), the total contribution of tourism to GDP in 2017 was USD 38.0 billion (EUR 33.5 billion), corresponding to 17.3% of GDP, and it is expected to grow by 2.4% per annum to 20.5% of GDP by 2028. The total contribution to employment was 967,500 jobs in 2017, around 20.5% of total employment and it is expected to grow 1.3% per annum to 1,151,000 jobs (24.9% of total employment) by 2028. About a quarter of foreign investment is motivated by the tourism trade.

The importance of the tourism sector for Portugal was also emphasized and highlighted in a recent issue of Banco de Portugal Economic Bulletin (December 2018). According to the Tourism Satellite Account (TSA) released by Statistics Portugal, tourism spending in Portugal increased 3 percentage points of GDP from 2008 to 2015, reaching about 12% in the end of this period. In addition, the gross value added generated by tourism grew faster than the rest of the economy, which led to an increase in its relative importance over this period. In terms of the labour market, there was also an increase in the importance of tourism-related activities. Moreover, available indicators suggest that the relevance of this sector in the various macroeconomic aggregates increased further between 2015 and 2017.

Given the importance of tourism as one of Portugal's main economic activities and its important role in relation to other economic sectors, this Section provides a comprehensive characterization of tourism-related firm dynamics.

2. Data and tourism definitions

This Section uses firm level data covering the period from 2006 to 2017. The data was obtained from *Informação Empresarial Simplificada* (IES), which includes balance sheet and income statement information annually reported to the Ministry of Justice, Ministry of Finance, Banco de Portugal and Instituto Nacional de Estatística, virtually covering the universe of non-financial Portuguese firms. The data on overnight stays by tourists was collected from the Eurostat.

In order to identify the sectors with larger exposure to touristic activities, we follow the definitions proposed by the Eurostat. A broader group of activities which offer services to both tourists and non-tourists was labeled *Total Tourism* and includes activities of three main groups: Transportation, such as trains and taxi operations; Accommodation, Food and Beverage Services such as hotels, restaurants and bars; and Logistics, such as car rentals and travel agencies.

In order to isolate as far as possible the tourism specific effect, a second group labeled *Mainly Tourism* was considered, which includes only the activities which offer services mostly to tourists. In addition to passenger air transport and travel agencies, this group also includes three accommodation categories: Hotels and similar accommodation; Holiday and other short-stay accommodation, which include house rentals for holidays, short-term rentals of digital platforms and tourism in the rural areas; and Camping grounds and trailer parks. A comprehensive list of the activities included in both groups is presented in Table 19.

NACE	Description	Total	Mainly
Code		Tourism	Tourism
H491	Passenger rail transport, interurban	x	
H4932	Taxi operation	x	
H4939	Other passenger land transport	x	
H501	Sea and coastal passenger water transport	x	
H5110	Passenger air transport	x	x
I5510	Hotels and similar accommodation	x	x
I5520	Holiday and other short-stay accommodation	x	x
I5530	Camping grounds, recreational vehicle parks and trailer parks	x	x
I5610	Restaurants and mobile food service activities	x	
I5630	Beverage serving activities	x	
N771	Renting and leasing of motor vehicles	x	
N7721	Renting and leasing of recreational and sports goods	x	
N79	Travel agency, tour operator reservation service and related activities	x	x

Table 19: Tourism definitions

Note: Sector code according to NACE Rev.2 and CAE Rev.3. Source: "Tourism Industries - economic analysis" - Eurostat.

3. Firm characterization

Portugal's tourism boom over the last decade has emphasized the importance of this economic activity. In particular, between 2012 and 2017 there was a significant growth in the number of overnight stays in Portugal (of around 40%), reaching more than 70 million in 2017. The strong growth in demand is visible across all sub-sectors, and particularly in the main category - hotels and similar accommodation. Nevertheless, the increased weight of other short-stay accommodation, such as, e.g. Airbnb, has turned this category into a non-negligible part of the tourism structure. In fact, over the last decade, the number of overnight stays in other short-stay accommodation in Portugal has increased more than 5 times, reaching almost 6 million stays, which corresponds to around 8% of total touristic accommodation in 2017.



Figure 65: Number of firms - year-on year growth rate Source: IES.

3.1. Tourism

Figure 65 shows a considerable increase in the number of firms in the *Mainly Tourism* sector, over the last decade. This number has more than doubled between 2005 and 2017. It is important to highlight the strong contribution that is observed over the last five years to the overall evolution and dynamism of the tourism sector. Moreover, in 2017, the number of firms is over 10000, reaching almost 7% of the total services sector. This positive evolution is much stronger than the one observed in the services sector and is in contrast to the modest evolution observed in the manufacturing sector.

In terms of the number of employees, the positive evolution observed in the tourism sector is similar to that observed in the services sector. Between 2005 and 2017, the number of employees increased around 30%, corresponding to more than 80 thousand individuals and to around 8 percent of total services. Regarding the number of firms and number of employees, the main driver in *Mainly Tourism* is related to short-stay accommodation.

3.2. Short-stay Accommodation

Figures 66 and 67 show the number of firms and the number of employees within the holiday and other short-stay accommodation, respectively. From 2008 on, and with particular intensity in the period 2014-2017, developments in this category have a significant contribution to *Mainly Tourism* as a whole. In particular, in the *Furnished*



Figure 66: Number of firms - holiday and other short-stay accommodation categories Source: IES.



Figure 67: Number of employees - holiday and other short-stay accommodation categories

Source: IES.

accommodation for tourists category the number of firms in 2017 is more than 4 times the number in 2014. In the same period, the number of employees increased by more than 40%. This sector includes short-stay accommodation activities associated with short-term rental platforms (such as Airbnb), suggesting a significant impact of the development of this market on the Portuguese economy.⁵⁰

⁵⁰ These figures are likely to be under estimated as we are not considering the self-employed, which contribute also to the recent developments of the short-stay accommodation activity.

The proliferation of this type of accommodation has motivated the development of a distinct legal framing for this activity,⁵¹ which has defined it as an autonomous category and further clarified the rules and requirements for the establishment and operations of this type of accommodation.⁵²

While the increase in the number of firms providing these services is without doubt the result of market dynamics, the implementation of the aforementioned legal and fiscal framing may have influenced the increase in the number of firms registered in this activity, either by raising awareness of the business opportunity, creating incentives for individuals/organizations who already had operations to move out of the parallel economy and the transformation of other touristic enterprises who in light of the new legal framework decided to move to short-stay accommodation activities.

Airbnb started in 2008 as a simple concept that combined economic benefits for travelers and for residents of tourist areas. However, nowadays it has an expressive presence in tourism destinations, with positive and negative impacts. In the social and cultural impact of tourism we distinguish increased availability of facilities – infrastructure, retail, entertainment – on the positive side, and increased competition for the use of these and previously existing facilities – e.g. parking space – on the negative side (Quijones, 2015; Croft, 2015).

4. Firm survival

Establishments at large tourism destinations have a higher survival chance than those at smaller destinations because the degree of product differentiation, as well as the rate of innovation and productivity, typically increases with size (Ritchie and Crouch, 2005). A large supply of hotels in the same region means that multi-unit businesses are less exposed to idiosyncratic demand shocks, as a sudden rise or drop of customers in one business operation is more likely to be compensated by the opposite shock in another operation, resulting in a better overall occupancy rate. In other words, a large supply of hotels helps to offset firm-specific fluctuations in demand. In the tourism sector, characterized as it is by many small businesses and a highly fragmented supply, destinations with a few market leaders in combination with many small businesses are likely to enjoy relatively stable market conditions. Hence, we expect survival rates of incumbents to be higher in more concentrated markets.

⁵¹ Decree-Law nº128/2014, of August 29

⁵² Although it is not compulsory to create a firm to provide short-stay accommodation services, individuals may opt to do so for fiscal or logistic reasons.

Tourism firm's long-term survival may rely more on overall strategic-level innovativeness that produces dynamic capabilities, which in turn enhances the development of innovations, and less on actual innovations (Abernathy and Utterback, 1978; Trott, 1998). Relatively little reported empirical research details how firms can achieve firm-level innovativeness (Markides, 1998), remaining a central dilemma for most small firms.

In the context of the Portuguese economy, between 2008 and 2016 the survival rates of firms in the *Mainly Tourism* category were the largest (displaying survival rates between 93.8% and 95.3% over this period), followed by *Manufacturing*, *Total Tourism* and *Services* (the latter displaying survival rates between 93.4% and 92.0%).⁵³

Interestingly, according to Table 20 *Mainly Tourism* displays the highest birth rates between 2011 and 2017 (18.95% in 2017), which are significantly higher than the birth rates of the other three categories considered. *Manufacturing* presents a relatively stable rate of growth between 2008 and 2017 (between 5.4% and 7.3%). The death rates across the four categories considered are not very different, although *Mainly Tourism* seems to display the lowest rates (5.9% in 2015) and *Total Tourism* the highest between 2011 and 2015 (between 7.4% and 7.8%).

Table 21 shows that the average age of firms has been increasing in the *Services* and *Manufacturing* categories, whereas since 2013, it seems to be decreasing for *Total Tourism* and since 2011 for *Mainly Tourism*. The decrease observed may be related to the high birth rates observed in these categories since 2011. Using the median, which is robust to more extreme observations, Table 21 shows that *Services* is generally the category with the lowest median age over the sample considered and that *Manufacturing* displays the highest.

Similarly to average and median age, we also observe from Table 22 that *Manufacturing* firms display the highest average and median age upon death and again Services in general the lowest. Note that *Mainly Tourism* is the second category with highest average and median age upon death.

Studies on firm survival in the manufacturing and service industries have revealed several 'stylized facts'. An entrant's initial size seems to have a positive effect on its duration. The probability of exit declines with size and age. There may be several reasons why young and small firms are exposed to a higher risk of exit. Older and larger firms often have more resources (capital and human) and more

⁵³ Survival rate is defined as the share of firms operating in year t-1 that also operate in year t, conditional on them having the same main activity in both periods (NACE REV.2 2-digit code).

Birth rates	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Services	10,90%	9,09%	10,25%	10,04%	8,92%	9,66%	9,39%	10,45%	10,28%	11,05%
Manufacturing	6%	5,43%	5,56%	6,66%	6,40%	7,16%	6,81%	7,31%	6,62%	6,17%
Total Tourism	7,97%	7,55%	7,69%	8,61%	8,60%	9,80%	9,34%	10,68%	10,60%	11,63%
Mainly Tourism	7,49%	8,13%	8,29%	10,56%	11,36%	11,75%	12,13%	15,98%	15,82%	18,95%
Death rates	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Services	5,72%	6,36%	7,69%	7,76%	6,88%	7,63%	7,81%	7,24%	7,18%	7,02%
Manufacturing	5,43%	5,98%	7,42%	7,57%	6,29%	7,56%	7,14%	5,95%	5,94%	6,03%
Total Tourism	4,98%	6,12%	7,05%	6,96%	6,18%	7,63%	7,70%	7,37%	7,37%	7,79%
Mainly Tourism	3,78%	4,51%	5,29%	5,68%	4,84%	5,78%	5,62%	5,16%	5,37%	5,91%

Table 20: Birth and death rates

Notes: A firm is considered to be "born" in year t if it has not operated before or has not operated in the previous two consecutive years. Additionally, a firm is considered to be born in a given group if it changes its main activity into that group (NACE REV.2 2-digit code). A firm is considered to "die" in year t if it does not operate in year t+1 nor t+2. Additionally, it is considered to die if it changes its main activity (NACE REV.2 2-digit code). The results for the service sector exclude total tourism.

Average age	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Services	10,51	10,58	10,71	11,03	11,34	11,51	11,83	11,98	12,09	12,10
Manufacturing	14,16	14,48	14,81	15,26	15,67	15,86	16,13	16,19	16,31	16,37
Total Tourism	14,38	14,55	14,77	15,08	15,38	15,48	15,68	15,61	15,50	15,28
Mainly Tourism	13,88	14	14,18	14,22	14,43	14,29	14	13,68	13,16	12,37
Median Age	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Services	6	7	7	8	8	8	9	9	9	8
Manufacturing	10	11	11	11	12	12	12	12	13	14
Total Tourism	8	8	9	9	10	10	11	12	12	11
Mainly Tourism	10	10	10	10	11	10	10	10	9	7

Table 21: Average and median age

Note: Firm's average and median age in years.

managerial experience. Such firms are better in withstanding external shocks. Furthermore, older and larger firms will typically have more market power and endurance. Older and larger firms are also more likely to be diversified and therefore less susceptible to fluctuations in demand. Furthermore, sunk costs such as fixed investments in tangible and intangible assets lower entry and exit barriers and therefore improve the survival chances for tourism businesses already in the market (Bull, 1997).

Average age	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Services	7,79	7,79	7,86	8,17	8,04	8,34	8,55	9,03	9,19	9,65
Manufacturing	12	11,92	12,18	12,91	13,37	13,6	13,68	13,26	13,88	13,86
Total Tourism	9,17	9,36	9,06	9,73	9,38	9,92	10,48	10,98	10,67	10,91
Mainly Tourism	12,77	10,29	12,6	10,84	10,69	11,3	10,74	13,5	10,97	10,2
Median age	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Services	5	5	5	5	5	5	5	6	6	6
Manufacturing	8	8	8	8	9	10	10	10	10	9
Total Tourism	5	6	6	6	5	5	6	6	6	6
Mainly Tourism	8	7	8	8	7	6	7	8	7	6

Table 22: Average and median age upon death

Notes: Age in years. A firm is considered to "die" in year t if it does not operate in year t+1 nor t+2. Additionally, it is considered to die if it changes its main activity (NACE REV.2 2-digit code).

5. Final remarks

This Section describes the recent firm dynamics in tourism related sectors in the Portuguese economy. We show that the tourism related sector is increasing and growing its importance in the Portuguese economy. Moreover, within the tourism activities we provide evidence on the increasing importance of the "new" short-stay accommodation activities.

Therefore, one of the current challenges for policy makers relies on the significant growth of the sharing economy in the tourism sector. Shared accommodation arrangements are the most well-established, with platforms such as Airbnb leading these developments. In fact, these digital platforms are challenging traditional operators, through significant competition to traditional tourism service providers. This is clearly highlighted by an OECD report about Tourism Trends and Policies published in 2016. In this context it is important to keep in mind that different actors are affected in different ways. More specifically, it is critical for tourism policy makers to understand how they should approach the sharing economy in areas such as regulation, taxation, and economic growth.

Finally, the demography of tourism firms does not seem to be strongly different from that of other main economic sectors. This conveys the message of tourism being a mature activity, not necessary riskier or more hazardous than other businesses. Therefore, there is room for gains in terms of productivity, and a further potential positive contribution to the Portuguese potential output.

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8 REGULATORY COSTS

8.1. Which regulatory costs are associated with Portuguese firms' productivity?

João Amador, Sónia Cabral, Birgitte Ringstad

1. Motivation

The institutional setting of an economy, defined as existing legislation and its inherent costs, strongly impacts on the operation of firms in the different sectors of activity and on overall economic performance. Lloyd and Lee (2016) provide a survey of the recent literature on the importance of institutions for explaining cross-country differences in growth rates. Nevertheless, regulatory costs are often neglected or misinterpreted in micro-level analysis. One reason is the relatively scarce firm-level information on the evaluation of regulatory costs. Another reason is the lack of a clear and consistent definition, as well as a practical and exhaustive typology of regulatory costs and their impacts.

Figure 68 presents the main categories of regulatory costs, as suggested by the OECD (1997), and highlights that regulations affect virtually all agents in the economy, including the public sector and households. However, firms tend to concentrate most of the attention of the economic analysis of regulatory costs, due to their crucial role on the creation of employment and value added. The areas shaded in grey in Figure 68 correspond to different types of regulatory impacts on firms. Although specific types of regulations are not detailed in the diagram, it is straightforward to conclude that regulatory costs imposed on firms are quite diverse in nature, ranging from licensing procedures to the functioning of the judicial system, as well as labour market rules and ease of access to finance. The terminology used in the literature for the identification of such regulatory costs is diverse, including terms like "institutional costs", "red tape costs", "business environment" or "costs of doing business".

In this section, we discuss the relation between several regulatory costs and labour productivity of Portuguese firms, as developed in Amador *et al.* (2019). We use detailed data from the Business Costs of Context Survey (*Inquérito aos Custos de Contexto*, Portuguese acronym: IaCC) for 2014, a survey conducted by Statistics Portugal (INE). The



Figure 68: Main categories of regulatory costs Source: OECD (1997), The OECD Report on Regulatory Reform.

survey covers nine domains of regulatory costs ("starting activity", "licensing", "network industries", "financing", "judicial system", "tax system", "administrative burden", "barriers to internationalisation", "human resources") and comprises several questions on the level of different obstacles within each domain. The questions on the level of obstacles have a qualitative nature, expressed in a scale of response with 5 levels: 1 - not an obstacle; 2 - very reduced obstacle; 3 - reduced obstacle; 4 - high obstacle; 5 - very high obstacle. There is also a complementary question on the importance of each of the nine domains to firms' activity.

INE (2015) provides an analysis of the main aggregate results and a detailed description of the methodology used in the survey. In 2018, INE published a second edition of the same survey (INE, 2018) and the results of both vintages are very similar. In both editions of the IaCC, around five thousand non-financial firms were asked about their perceptions on the level of different regulatory obstacles. The IaCC is based on a stratified random sample by size-class (defined in terms of employment and turnover) and main sector of activity. Hence, the sample is representative of the structure of Portuguese non-financial firms. For each individual question in the survey, an aggregate indicator (the obstacle indicator) is computed as the weighted average of all firms' responses along the 5 levels considered, thus ranging between 1 and 5.

Figure 69 presents the composite indicators for each of the nine domains of regulatory costs in 2014 and 2017 (computed as a simple average of the respective obstacle indicators), as well as the global indicator (computed taking into account the additional question that assesses the importance that firms assign to each of the nine areas of



Figure 69: Composite indicators of the nine domains of regulatory costs in Portugal

Notes: The composite indicator for each of the nine domains of regulatory costs is computed as a simple average of the respective obstacle indicators. For more details, see INE (2015) and INE (2018).

Source: Statistics Portugal (INE).

regulatory costs to their activity, as well as their weight in the corresponding stratum in terms of turnover). The global indicator scored a value of 3.04 and 3.05 in 2014 and 2017, respectively, thus signalling an overall intermediate assessment of regulatory costs by Portuguese firms. In 2014, as for the domains of regulatory costs, the "judicial system" scores the highest obstacle index (3.7), followed by "licensing" and "tax system" (3.5 and 3.3, respectively).

2. Analytical framework

We use an Item Response Theory (IRT) procedure with a graded response model for ordered items to obtain the latent obstacle that is associated with each domain of regulatory costs for each firm (see Rasch (1980) and Birnbaum (1968) for seminal contributions on IRT methods). The distribution of the latent obstacle was standardised with mean zero and standard deviation equal to one. We implement also a partition of firms that corresponds to what they responded in the complementary question on the importance of each domain of regulatory costs to their activity. We grouped firms' responses to this question for each domain into two categories: "important", which corresponds to the two highest levels in the scale of answers (4 - important and 5 - very important); and "not important", corresponding to the remaining three levels (1 - not important, 2 - little importance and 3 - indifferent). This information was merged with the Integrated Enterprise Accounts System (*Sistema de Contas Integradas das Empresas*, Portuguese acronym: SCIE) to obtain information on firms' characteristics.

We run a set of descriptive regressions relating the regulatory obstacles with firms' performance. The regression for each of the nine domains of regulatory costs is:

$$\log Y_{it} = \alpha + \beta_0 d_i + \beta_1 X_i + \beta_2 X_i \times d_i + \gamma_j + \gamma_t + \varepsilon_{it}, \quad (24)$$

where Y_{it} is labour productivity, in logs, of firm i in year t from 2010 to 2016. Labour productivity is defined as gross value added per worker. d_i is a dummy variable that takes the value one for firms responding that the domain of regulatory costs is important or very important to their activity in 2014 and zero otherwise, i.e., firms in the "important" category. X_i is the IRT latent obstacle that is associated with the respective regulatory cost for firm i in 2014. The interaction term in the regression allows for the link of the latent obstacle with the performance variable to differ between firms that consider the domain as important to their activity and those that don't. Sector and time fixed-effects are included in γ_j and γ_t , respectively. The control for the main sector of activity of the firm is defined at the *Classificação Portuguesa das Actividades Económicas* (CAE) 2-digit level, comprising 77 different sectors. ϵ_{it} is an error term robust to heteroscedasticity using the Huber-White variance estimator.

3. Regulatory costs and labour productivity

Figure 70 reports the results for weighted least squares regressions of Equation 24 using sampling weights, with labour productivity as the dependent variable.

The coefficients of the importance dummy variable, β_0 , measure the gap in average productivity levels between firms that consider the regulatory cost as important to their activity and those that don't, for a level of zero of the latent obstacle. For instance, the productivity gap between similar firms that differ only in their assessment of the importance of the regulatory cost to their activity is -18.78 per cent (= 100 * (exp(-0.208) - 1)) in the case of "administrative burden" and -13.76 per cent for "barriers to internationalisation". For "starting activity" and "human resources", the estimated coefficient is also negative, while the opposite happens for "network industries" and "tax system".



(a) Importance dummy







Figure 70: Labour productivity (2010-2016), regulatory costs and their importance (2014)

Note: Only statistically significant estimates are presented. Horizontal lines correspond to 90 per cent confidence intervals.

The coefficient of the latent obstacle, β_1 , is significant for all domains of regulatory costs except "licensing" and "barriers to internationalisation". In all significant cases with the exception of "starting activity" and "administrative burden", the coefficient is negative. This means that a higher level of the latent obstacle associates with lower average productivity for firms that do not consider the obstacle as important ($d_i = 0$). For example, a unitary increase in the latent obstacle of "tax system" is associated with a decline of 15.63 per cent of the average productivity of firms that do not see this regulatory cost as important.

The coefficient of the interaction term, β_2 , captures the difference in the link of the level of the latent obstacle with productivity between firms that perceive the regulatory cost as important and those that don't. This coefficient is significant in four out of nine domains of regulatory costs. As for "starting activity" and "network industries" the coefficient is positive, while for "financing" and "administrative burden" it is negative. For example, in the case of "financing", a unitary increase in the latent obstacle is associated with an decline in average productivity of 7.92 per cent for firms that don't asses this domain as important and 13.83 per cent (= 100 * (exp(-0.0825 - 0.0663) - 1)) for similar firms that consider it important.

Only obstacles related to "human resources" are identified as having a significant and negative relation in terms of both the importance to firms' activity and the level of the latent obstacle. As acknowledged in the literature, regulation on hirings and firings, security and health in the workplace and firms' access to specific competences and skills of workers seem to have a bearing on productivity. This result does not mean that barriers like, for example, judicial costs are not important, simply they are present irrespectively of firms' performance.

4. Final remarks

Regulatory costs exist in all economies and they are perceived as a blockage to firms' performance. As regulatory costs impact on firms' decisions, policy makers should design legislation so that negative effects are minimised, while public objectives are achieved. Implementing the best international practices can be a good approach but only if they are adapted to the domestic reality. In addition, frequent changes in the institutional framework impose a burden on firms as they consume resources in the adjustment process. In this section, we show that there is a significant negative association between most types of regulatory costs and firms' productivity. Therefore, while maintaining the basic purpose of regulation, there is a case for reducing these obstacles as a way to promote Portuguese economic growth.

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8.2. What drives demand and productivity in economic justice?

Manuel Coutinho Pereira, Lara Wemans⁵⁴

1. Motivation

The impact of the judicial system on economic growth has been widely explored in the literature. A particularly important link between effectiveness of the judicial system and potential growth operates through its effect on the overall regulatory costs faced by firms when doing business in a particular country. The fact that Portuguese firms identify the judicial system as one of the top obstacles to their activity (Instituto Nacional de Estatística, 2018) makes it an issue when discussing Portuguese economic growth. Moreover, although the large heterogeneity of judicial systems hampers a direct comparison of efficiency, the data regularly published by Council of Europe (CEPEJ) shows that the efficiency of Portuguese justice still lags behind top performers in Europe as regards congestion, despite some recent catching up (CEPEJ, 2018).

There has been a historical mismatch between incoming and resolved cases in civil justice, in particular as regards economic cases. This helps explaining how the delays in the judicial system rose to the top of business obstacles, as perceived by firms. Figure 71 plots these flows in the past decades considering separately cases aiming at the definition of a particular right (declarative) and those intended to demand the fulfilment of an obligation that was previously established (enforcement).

There has been a considerable decline of incoming declarative cases, driven by the generalisation of the injunction (a simplified procedure which allows the creditor to obtain an enforceable order, so as to require the recovery of a debt), which acted as a substitute for most debt-related cases. This allowed the net flow of declarative cases (i.e. incoming less resolved cases) to become negative since 2000, leading to a slow but steady reduction in congestion for this type of cases. As regards enforcement, however, it has been only since 2013 that the number of resolved cases has surpassed incoming

⁵⁴ Lara Wemans was working at Banco de Portugal when this Section was written.



(a) Declarative cases



(b) Enforcement cases

Figure 71: Demand and supply in civil justice from 1993 to 2017

ones (for more details, see Section 8.3) leading to a reduction in congestion. The closer match between supply and demand was, however, not enough to reduce congestion to more reasonable levels, due to the legacy of the past. In fact, the number of pending civil cases at the end of 2017 was still two times the number of cases resolved in that year, which inevitably translates into large delays.

This Section looks at the determinants of demand and productivity in civil justice in Portugal, focusing on the period just before the most recent change in the judicial map, implemented in 2014. As to demand, there is evidence of rationing-by-queuing and important spillover effects from socioeconomic characteristics of surrounding *comarcas*. Regarding productivity, it is worth highlighting a positive impact associated with the number of incoming cases per judge (i.e. demand), judicial staff per judge and specialization. The evidence presented here is based on Pereira and Wemans (2015, 2017).

2. Territorial distribution of demand and human resources

The average number of incoming civil cases in a certain region (*comarca*) can be seen as a measure of demand for civil justice directed to courts with jurisdiction there. Figure 72 shows the relation between this indicator and the number of judges in small and large *comarcas*. The restriction created by the allocation of at least one judge to each *comarca* is very binding in the group of small *comarcas*, with most of them having on average one judge, despite the wide variation in the number of incoming cases (from less than 100 to more than 500 a year). In contrast, for large *comarcas* there is a positive relationship between demand and the number of judges.

Having on average a lighter caseload, small *comarcas* could have better performance indicators, but there is no such an evidence, as congestion measures are somehow independent from the size. Consequently, a more flexible human resource management, in the spirit of the Judicial Map implemented in 2014 will tend to increase productivity, while allowing a more balanced distribution of the caseload within the system.

3. Data and analytical framework

The evidence presented in this Section is based on a panel dataset by *comarca*, covering the period from 1993 to 2013, with information about case flows, human resources and the duration of resolved cases in first instance judicial courts, as well as socioeconomic indicators. There is also data on expenditure on judges' wages, from 2007 onwards, and information on the number of lawyers, although only for a higher territorial level (*círculo judicial* instead of *comarca*).

To study the determinants of litigation we follow a two-step approach. Firstly, we take advantage of the panel dataset to investigate how the civil litigation rate (number of cases filed *per capita*) is affected by time-varying characteristics, such as the duration of cases in the previous year. Secondly, we use the results of this first regression in order to understand the more structural determinants of the litigation rate, including as explanatory variables, not only the



(b) Large comarcas

Figure 72: Incoming cases vs the number of judges

Note: Lisbon and Porto *comarcas* were excluded from figure B, as the average number of incoming cases in these areas is very high. Averages for each *comarca* between 1993 and 2013.

characteristics of the *comarca* itself, but also those of the neighbouring ones (weighting by the distance between *comarcas*).

As regards productivity, we use a strictly quantitative indicator: the ratio between the outcome - number of resolved civil cases - and the number of judges. A clear limitation of this measure is to ignore both the quality of decisions and the complexity of cases. While the first issue could not be addressed due to data limitations, the second one has been dealt with by considering both the heterogeneity across different *comarcas* and the caseload from other litigation areas.

The regression covering the structural determinants of litigation is based on a spatial econometric model, which takes into account spillover effects (for more information on this issue, see Anselin *et al.* (2004)). The other regressions follow a dynamic panel specification (Arellano and Bond, 1991), justified by the relatively long time horizon covered and allowing to deal with variables not strictly exogenous. These regressions include fixed-effects for *comarcas*, in order to capture their specific characteristics, and year fixed-effects, in order to capture the specificities of a given year with a cross-*comarca* impact.

4. Results

4.1. Determinants of demand

The results show that the duration of proceedings has a negative effect on the litigation rate, which may indicate the existence of a congestion effect. This is consistent with the evidence of rationing-by-queuing, possibly mediated by lawyers that use their knowledge about recent resolved cases to inform potential litigants about the expected duration of their particular case. In addition, non-civil litigation has a positive effect on the number of civil cases filed, meaning that reforms in other areas of litigation can have significant spillovers to civil justice.

As to the structural determinants of litigation, Figure 73a depicts the percentage impact on the civil litigation rate of regional differences in socioeconomic regressors. The results are directly comparable and independent from the measurement unit of each indicator because they reflect the impact of a one standard-deviation change on each variable. This allows to take into account the different degrees of dispersion around the mean. One conclusion is that there are significant spatial spillovers in the generation of litigation. Indeed, some socioeconomic factors, such as the density of small and medium enterprises and purchasing power, appear to play a more important role for litigation when stemming from the surrounding *comarcas* than from the *comarca* itself, despite the uncertainty of the estimates. This importance of spatial spillovers probably reflects the small size of the basic territorial units underlying the organization of justice in the previous Judicial Map vis-à-vis the geographical extent of the transactions between economic agents. Such an evidence highlights the need to take a broad territorial perspective in the definition of justice policies. The 2014 Judicial Map reform proceeded along these lines,



(b) Productivity

Figure 73: Determinants of litigation and productivity

Notes: Point estimates and 95% confidence intervals. One standard-deviation change of each explanatory variable considered in order to ensure direct comparability. In panel B, the results for the seniority of judges were obtained with data from 2007 to 2013.

by entailing considerable territorial aggregation and some flexibility in resource management.

Moreover, we find a positive relationship between economic development and litigation, particularly visible for the illiteracy rate and purchasing power. This can be associated with a higher degree of formality in economic transactions in more developed regions. Finally, the location of companies is a strong attractor of litigation, and differences between neighbouring *comarcas* with regard to the concentration of small and medium enterprises divert litigation from each other.

The estimation of the effects of the concentration of lawyers on litigation has the major limitation of being also positively driven by the volume of litigation in the *comarca*. When a standard econometric procedure to take this into account is implemented, using information on the distance of a given *comarca* to the *comarca* where the nearest law college is located as an instrument, there is some evidence of demand inducement by lawyers. This result must be interpreted with caution, however, as uncertainty remains about the effectiveness of such correction.

4.2. Determinants of productivity

The impact of the most relevant variables on judges' productivity is illustrated in Figure 73b. There is evidence of a positive response of productivity to the number of incoming cases per judge, meaning that productivity of judges responds to the pressure put by demand on the judicial system. This response of productivity to demand can be related to an attempt by judges to prevent an increase in congestion in the jurisdictions for which they are responsible. However, this capacity to respond to demand is lower as the number of incoming cases per judge increases, with the impact estimated for the quadratic term being negative. This is expectable given the more intense use of resources, as incoming cases grow. For example, the combination of these two effects, computed at the average of incoming cases per judge, indicates that 100 additional cases filed lead to an increase by about 50 in resolved ones. Regarding other human resources allocated to the *comarca*, productivity is also positively impacted by the number of judicial staff per judge.

An indicator of specialization, constructed using case flow information, has a positive effect on productivity. This indicator reflects, in each *comarca* the percentage of civil cases completed in judgeships (the organizational unit below the *comarca*) in which, in a given year, more than 80 percent of resolved cases were civil. An alternative indicator of specialization, reflecting *de jure* instead of *de facto* specialization was not significant.

Finally, benefiting from a strong association between salary and experience documented for Portuguese judges, a variable that intends to approximate their experience through the average salary was included in a second estimation with data from 2007 onwards. There is evidence of a negative impact of experience on productivity, possibly reflecting factors such as incentives to the resolution of cases or the balance between quantity and quality of judicial decisions.

The explanatory factors of the judicial sector performance are highly complex and it is important to stress that, although we cover some relevant ones, there are several others, such as legislation, procedural rules or the behaviour of different players in the system that should also play a significant role.

5. Final remarks

This Section discusses the determinants of the litigation rate and productivity, contributing to a better understanding of both demand and supply of civil justice in Portugal. In order to contribute to more informed public policies in this area, we believe that quantitative analyses using case level data are of paramount importance. Obviously, the findings of these studies should be seen as complementary to those achieved by other scientific approaches. In this regard, a multidisciplinary analysis of justice policy issues is clearly beneficial.

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8.3. What has changed in the duration of debt enforcement in Portugal?

Manuel Coutinho Pereira, Lara Wemans⁵⁵

1. Motivation

Efficiency of debt enforcement through the judicial system is crucial for the functioning of important markets in the economy, impacting in particular on investment by corporations and consumption smoothing by households. According to the published figures for duration of closed cases, Portugal has compared poorly with other countries, notwithstanding some improvement in recent years (CEPEJ, 2018). At the same time, surveys to firms document that judicial system delays feature prominently among regulatory costs. This situation may also contribute to Portuguese firms being particularly exposed to the risk of late payments by customers (European Payment Report 2017).

Recent decades saw profound changes in the enforcement procedure that impacted the role of the different players involved (Pimenta, 2012 and Pinto, 2013). This process began with the 2003 reform of the Civil Procedure Code that promoted de-jurisdictionalisation of debt enforcement. This reform established enforcement officers, giving them the role to conduct this type of cases even if the judge maintained the controlling power (Gomes, 2007). Reform implementation generated blockages, as the clarification of the intervention of different players and the establishment of instruments for its proper functioning were only gradually accomplished (Lourenço, 2017). Such blockages and the difficulties in striking the right balance between the interests of the parties to the case led to several legislative and procedural changes over the years and the enactment of a new Civil Procedure Code in 2013.

Changes to the law have been accompanied by the creation of instruments to support the activity of enforcement officers, notably electronic platforms where information about the assets held by the debtor can be gathered, and the establishment of PEPEX (*Procedimento Extrajudicial Pré-Executivo*) in 2014. This allowed the holder of

⁵⁵ Lara Wemans was working at Banco de Portugal when this Section was written.

an enforceable title to obtain more easily information regarding the feasibility of an enforcement case before presenting it.

The frequent legislative changes and considerable investment in the streamlining of procedures regarding debt collection show the high priority given by the Portuguese legislator to its effectiveness. Therefore, it is appropriate to analyse where we are heading as far as duration of cases is concerned - the most important variable from economic agents' viewpoint. This question is, however, difficult to answer on the basis of the duration statistics regularly published referring to cases ended each year. Indeed, given the size of the backlog, this indicator captures the situation of the system over a period extending much before the year it refers to.

The availability of a database with case level information makes it possible to shed new light on this question and, at the same time, study the impact on duration of cases' characteristics. Pereira and Wemans (2018) carry out such an analysis, concluding for a considerable reduction of duration of enforcement cases in the recent years. This Section summarises the main results presented in that paper.

2. Data and analytical framework

The data underlying the results in this Section comprise all enforcement cases of civil and commercial debts dealt with in first instance judicial courts in Portugal between 2007 and 2016 (excluded are chiefly cases for recovering debts from judicial fees, fines, penalties and insurance premia). This rich dataset includes, in particular, the cases that started before 2007 and remained unresolved at the beginning of the period under analysis, as well as those pending at the end of 2016. Several characteristics of enforcement cases are available in the database, beyond the dates when these were filed and resolved. Such characteristics include information about the plaintiff (companies vs. individuals and mass litigant status), comarca and type of judgeship (whether specialised in enforcement - juízos de execução or not) in which the case was resolved or pending. Moreover, there is information about the claim value and enforceable title. The different titles were aggregated into homogeneous categories with a similar treatment by the judicial system: court sentences, injunctions, authenticated documents, private documents, contracts and other titles.

The database has also information about procedural aspects attached to the enforcement case (*apensos*), such as oppositions by the defendant and other creditors (*oposições e embargos de terceiro*) and creditors' claims (*reclamações de créditos*). Finally, there is information about the grounds for case closure, which was aggregated into four categories, namely, fulfilment of the obligation (including debt payment in instalments), lack of assets, inactivity (or withdrawal) of plaintiff and other types of closure. On the basis of information at the case level, measures of complexity of litigation and congestion were drawn for the *comarca* as a whole.

As far as methodology is concerned, we apply different instruments of duration analysis to the data. At the descriptive level, the results presented in the Section are based on the survival function that depicts the evolution of resolution probability over time since case filing. Additional results are based on the hazard function, which is an alternative way to characterize the duration distribution along with the survival function. The hazard function measures the instantaneous rate of resolution of a pending case, in probabilistic terms, at a given moment after start.

The impact of the different explanatory variables on duration is studied on the basis of the Cox semi-parametric model. The Cox model assumes that the explanatory variables do not change the shape of the hazard function, just shift it multiplicatively by proportional factors - the hazard ratios. This hazard proportionality hypothesis can, however, be partially lifted by estimating hazard functions specific to the cohorts defined by one or more categorical variables. In the results reported below such procedure has been applied by judicial year of filing and *comarca* in which the case was resolved or pending (taking the current territorial configuration of the judicial system as a reference). This allows not to impose proportional hazards in relation to such variables, while ensuring that the coefficients of the other explanatory variables are not affected by their correlation with the characteristics of *comarcas*, nor with common determinants shared by cases starting in a given year.

3. Results

3.1. Duration of enforcement cases

Figure 74a shows the median case duration (time period during which half of cases are expected to be resolved), as well as the first and third quartiles, computed from the survival function on an yearly basis. The median duration increased over the initial years, presenting thereafter a decreasing trend, with particularly significant reductions in 2011, 2013 and 2016. There was a particularly steep decline in 2013, in the longer durations, that is likely to reflect several measures taken at that time. These measures include the establishment of special units to reduce case backlog in some courts

and simplification of closure of cases due to inactivity of the plaintiff and lack of seizable assets (the latter, for cases filed before September 2003). In the shorter durations - time needed to resolve 25% of the cases - there has been a constant decrease since 2010, from 25 to only 9 months. This reduction in the length of cases is consistent with the evolution of the number of cases filed net of cases resolved documented in Chapter 8.2. Figure 74a also shows, for comparison, the median of duration of cases resolved each year. In contrast to the evolution described, this indicator has remained stable, around 40 months.

In order to take out from results the impact of the abovementioned changes to the rules governing case closure due to inactivity of the plaintiff, figure 74b repeats the foregoing analysis but considering as resolved only the cases ending with the fulfilment of the obligation or recognition of a lack of sufficient assets. Cases ending by reasons attributable to the plaintiff are treated as censored observations, as the court did not effectively resolved them. This alternative approach confirms a strong decline in average duration after 2010.

3.2. Probabilistic profile of resolution of enforcement cases

Figures 75a and 75b show the case resolution's probabilistic intensity (hazard function), respectively, for the periods before and after the beginning of 2014 judicial year (the latter approximately corresponding to the current situation).

Prior to the 2014 judicial year, the hazard function shows positive duration dependence (Figure 75a), i.e. the instantaneous rate of resolution of pending cases increases over time, except for very long durations, when a very small number of unresolved cases remains. In the subsequent judicial years (Figure 75b), the resolution intensity does not have a marked trend, varying within a much more limited range. In addition, such intensity is higher in this second period, over a span that extends from the start of cases up to about 5 years of duration, the median of resolved cases being reached much earlier.

In the pre-2003 reform regime, the intervention of judges in all enforcement cases would be a reason for an increasing profile of the hazard rate, under the assumption of a prioritization of older cases. Although our analysis starts already in 2007, at the time the system still had a significant number of pending cases, both pre-reform and entered in the changeover to the new regime. It is also to be expected that the profile estimated in figure 75a reflects the adjustment of the system to the new rules, notably with respect to the formation of a body of enforcement officers capable of responding to the volume of



(a) All types of closure



(b) Type of closure: effective resolution



incoming cases. In the more recent period, the greater intensity of resolution in the first years of the case and the absence of an upward trend will also reflect the swifter procedures for identification and seizure of debtor's assets, including the impact of the effectiveness of these mechanisms in promoting voluntary compliance at an early stage.



(a) Before the 2014 judicial year



(b) 2014 judicial year and following

Figure 75: Instantaneous rate (probabilistic) of case resolution Note: Hazard functions and confidence bands at 95%, for durations up to 15 years that cover the time span of the vast majority of cases. The dashed line is the median of case duration and the dashed/dotted line the 90th percentile.

3.3. Determinants of duration of enforcement cases

Figure 76 presents the impact of the above mentioned explanatory variables on duration in terms of shifts in the hazard function: for instance, a 0.10 shift to the left (right) from 1 entails a decrease (increase) by 10% in the rate of case resolution. Lawsuits initiated by



Figure 76: Impacts of explanatory variables on duration

Notes: Multiplicative shift in the intensity of case resolution brought about by a change in regressors, for binary variables vis-à-vis the omitted group (in brackets), for the log of claim value equal to one standard-error at the median (corresponding, in the case of an increase, approximately to a change for 2 500 to 12 500 euros in the claim value). Point estimates and 95% confidence intervals of hazard ratios estimated by the Cox regression.

mass-litigants within those filed by companies tend to proceed more rapidly, and the same holds for cases brought by individuals relative to firms, but with a less marked difference. The first result may stem from mass litigants' benefiting from experience and scale effects. The second result is difficult to explain, as firms can be expected to be generally more familiar with debt enforcement. This may reflect differences in the characteristics of cases filed by individuals vis-a-vis firms omitted in the model.

A higher claim value tends to lengthen enforcement cases, reflecting the specificities of the litigation associated with higher debts, such as an enhanced complexity and a greater opposition on the debtor side. Regarding the impact of the different enforceable titles on duration, measured vis-a-vis injunctions, cases based on private documents and contracts tend to be more time-consuming. Such a result could reflect the less swift enforcement procedure applicable to some of these titles relative to injunctions, in particular where the former assume a value above a certain threshold. However, an alternative specification interacting the title with an indicator for a claim value above the threshold that determined the application of different procedural rules does not back this hypothesis. *Apensos* attached to the case have a negative impact on the speed of enforcement proceedings, particularly when they are initiated by other creditors with secured claims over the seized asset (creditors' claims). Additional estimates considering separately the periods before and after the 2014 judicial year indicate an impact comparatively larger in the second period. In this second period, there is a greater share of cases entered under the post-2003 regime that, in general, does not require an intervention of the judge. Whenever the case has *apensos* attached to it, such an intervention must occur and brings about an increased duration. In contrast, in the pre-2003 regime the judge had always to intervene.

Another estimated specification included proxies for congestion and complexity of litigation by *comarca* (now imposing the same hazard function throughout all *comarcas*). The coefficients have the expected signs, with a positive change in each of these covariates bringing about a longer duration of cases. The impacts are substantial, in general even higher than those of case characteristics, confirming that duration also depends heavily on the overall litigation directed to the *comarca*. Another interesting aspect is that the impacts of these variables on duration greatly decreased when the estimation was confined to the 2014 judicial year and thereafter.

There is still evidence of a shorter case duration in the more recent period, holding constant changes in the observable characteristics of enforcement cases through a regression analysis.

4. Final remarks

The documented decrease of duration of enforcement cases in the recent years has certainly been influenced by the very significant set of reforms in this area implemented over time, although it cannot be ascribed to a specific policy measure. In addition, it has reflected the impact of other factors, notably changes to the unobservable characteristics of cases and factors outside the judicial system, such as changes in the cyclical position of the economy. Identifying the contribution of each of these factors is beyond the scope of this Section. The production of empirical evidence about the reforms to judicial debt collection may contribute to pave the way for reforms in other areas of the judicial system.
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zombie (firms), 165, 166, 185–192 "If the institutions responsible for analysing the economies remain exclusively focused on accompanying short-term dynamics, they will lose sight of structural dynamics that condition individual well-being and the wealth and equity of the society, and will consequently be unable to signal the need for measures that anticipate and mitigate their effects. Therefore, Banco de Portugal assumes its mission of assessing the structural reality of the Portuguese economy, identifying corresponding challenges and opportunities. In this book, the Bank gives continuity to the fulfilment of this mission."

Carlos da Silva Costa, Governor From the Preface

