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Wage inequality, entrepreneurship and creative people in regional labour markets

António Sérgio Ribeiro^a , Rui Baptista^b  and Francisco Lima^c 

ABSTRACT

We examine the impact of entrepreneurship and creative occupations on wage inequality in regional labour markets. We apply dynamic models to longitudinal linked employer–employee data for Portugal. Our results indicate that regional labour markets where job creation by new firms is stronger and creative occupations represent a greater proportion of total employment are associated with greater inequality. The wage structures of new firms are less compressed than those of incumbents. New firms pay lower average wages but offer a greater share of high-paying jobs. Opportunity-based entrepreneurship and creative occupations are linked to a higher share of top earners.

KEYWORDS

wage inequality; entrepreneurship; creative occupations; regional labour markets

JEL J31, L26, O15

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INTRODUCTION

Entrepreneurship has been recognized as an important driver of innovation and economic growth (Audretsch & Thurik, 2001; Baumol, 2002). Increasing attention has also been paid to people engaged in ‘creative’ professions or occupations, defined as those who create or use new knowledge or transform existing knowledge, using it in innovative ways (Florida, 2004). Florida (2005) argues that the accumulation of creative people in certain regions or metropolitan areas is closely related to entrepreneurial dynamics and innovative activities, contributing to superior performance in terms of productivity and economic growth.

The recognition of knowledge-intensive entrepreneurship as a driver of innovation and economic growth and the perception that a subset of the workforce – creative individuals – play a leading role in promoting innovative and entrepreneurial activities has impacted public policy significantly. Chatterji et al. (2014) report that increasing the supply of entrepreneurs and highly skilled people while supporting and developing industries where creative occupations are prominent have become key objectives for regional and industrial policymakers.

Concurrently, income inequality has become a major political point of contention in developed societies. As the proportion of highly paid, creative occupations increases in regional labour markets, so does the proportion of low-skill jobs (Florida & Mellander, 2016). As the proportion of occupations earning incomes close to the median withers, so does the middle class, leading to greater income inequality in cities and regions. While the absence of inequality likely reduces economic incentives to investment, productivity and, possibly, entrepreneurship (Mirrlees, 1971; Okun, 1975), excessive inequality could have undesirable effects such as political and social unrest, poor health outcomes and excessive taxation (Lippmann et al., 2005; Persson & Tabellini, 1994; Rözer & Volker, 2016; Wilkinson & Pickett, 2009).

The last few decades have witnessed a growing ‘polarization’ of wages, that is, an increasing proportion of workers employed in occupations at the poles of the wage distribution at the expense of the middle occupations. Researchers have found that this polarization occurs because labour markets have increasingly split into high- and low-skill jobs (Autor et al., 2006; Card & DiNardo, 2002). Glaeser et al. (2009) provide evidence of a connection between inequality and the clustering of

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both high- and low-skill people in large metropolitan areas. Wage inequality among workers in urban areas is a rising concern due to the difficulties faced by the younger generation and poorer workers to establish themselves in large cities. This phenomenon is well documented for the United States and the UK (Florida & Mellander, 2016; Glaeser et al., 2009; Lee et al., 2015).

Recent empirical work has identified a link between entrepreneurship and inequality (Atems & Shand, 2018; Halvarsson et al., 2018; Ragoubi & El Harbi, 2018). The present paper contributes to the literature by looking at how entrepreneurship and the incidence of creative occupations influence wage inequality in regional labour markets. The impacts of entrepreneurship and the incidence of creative people have not thus far been examined simultaneously.

The present study also contributes by examining whether opportunity- and necessity-based entrepreneurship (Baptista et al., 2014; Caliendo & Kritikos, 2019; Reynolds et al., 2001) play a role in the relationship between entrepreneurship and inequality. Opportunity-based entrepreneurial ventures are likely to be knowledge intensive and growth oriented, hiring skilled workers and paying wages at the top levels of the labour income distribution. Necessity-based entrepreneurial initiatives are likely to hire lower skill workers and pay wages at the bottom levels of the distribution.

The remainder of the paper is structured as follows. In the next section we look at the background literature regarding the relationship between entrepreneurship, creative professions and inequality, and formulate hypotheses to be tested. Next, we introduce the data, variables and econometric methodology. The following two sections present and discuss the results. The last section addresses the limitations of the study and looks forward to future research avenues.

BACKGROUND: WAGE INEQUALITY AND THE ROLE OF ENTREPRENEURSHIP AND CREATIVE OCCUPATIONS

While most studies of inequality look at national patterns of inequality over time or across nations, the present paper focuses on differences in inequality across regional labour markets. We therefore focus our attention primarily on the role played by factors impacting on wage inequality that are more specific to regional labour markets.

Regions differ persistently in the incidence of small, entrepreneurial firms, and these differences are strongly correlated with differences in economic growth (Glaeser et al., 2010). Regions differ in the supply of entrepreneurs (Chatterji et al., 2014; Chinitz, 1961; Glaeser et al., 2010). Empirical studies find that entrepreneurs are more likely to be from their region of birth than wage workers, and that local entrepreneurs operate stronger businesses (e.g., Figueiredo et al., 2002; Michelacci & Silva, 2007). Other research finds that regions differ in their attractiveness of nonlocal entrepreneurs (e.g., Colombelli et al., 2021) and that, while experiencing greater failure rates, new

businesses with nonlocal roots have a greater impact on regional diversification and structural change (Colombelli et al., 2020; Elekes et al., 2019; Neffke et al., 2017). If persistent regional differences in entrepreneurship are associated with differences in economic growth, they should also translate into differences in inequality.

Wage inequality and entrepreneurship

There are reasons to believe that entrepreneurial activity and inequality are linked. Economic and institutional factors that affect inequality, such as industry structure, capital markets and labour market policies are also recognized as determinants of entrepreneurship. Previous empirical and theoretical work suggests that there is likely to be reverse causality between entrepreneurship and wage inequality. This relationship is analogous to the one found for entrepreneurship and economic growth (Thurik et al., 2008). If variations in inequality are likely to cause variations entrepreneurship while changes in entrepreneurship are likely to lead to changes in inequality levels, it is important to disentangle these effects.

Let us first consider the effect of entrepreneurship on inequality. At the macroeconomic level, researchers have studied the role played by occupational choice and imperfect credit markets in driving economic growth and inequality. Galor and Zeira (1993) and Banerjee and Newman (1993) propose that, in the presence of credit market imperfections, the current distribution of wealth will determine the proportion of credit-constrained individuals in the economy, which in turn may affect equilibrium returns to different occupations, including entrepreneurship. In particular, would-be entrepreneurs from the lower levels of the wealth distribution are likely to face liquidity constraints when seeking funds to start and grow a firm (Evans & Jovanovic, 1989). The existence of credit constraints due to imperfect information (Stiglitz & Weiss, 1981) means that those at the lower levels in the income distribution will likely undertake too few entrepreneurial ventures, so entrepreneurs will likely be disproportionately drawn from the higher levels of the wealth distribution. Ghatak and Jiang (2002) suggest that, depending on the initial wealth distribution, future levels of inequality may be intensified through intergenerational transfers because incomes from successful entrepreneurial ventures will likely accrue to those in the higher levels of the income distribution.

Subsequent work in the same vein has suggested additional mechanisms through which entrepreneurship may increase aggregate income and wealth inequality. Imperfect credit markets again play a key role in these mechanisms. Credit rationing leads to borrowing constraints on entrepreneurial investment, providing incentives for entrepreneurs to accumulate wealth, leading to a higher concentration of wealth among entrepreneurs than among paid employees. Quadrini (2000) shows that more wealth inequality is generated in a general equilibrium model that incorporates entrepreneurship than in an analogous one that does not consider entrepreneurial activities. Cagetti and De Nardi (2006) find that models

without entrepreneurship consistently generate inequality levels lower than observed in the US economy.¹

While these theoretical models focus on inequality in wealth rather than wages, it is possible to extend some results to labour incomes. Indeed, while wealth inequality is greater than inequality in labour income, the two are generally linked and positively correlated (Kuhn et al., 2020; Saez, 2017). Atems and Shand (2018) argue that borrowing and other financial constraints may cause individuals with entrepreneurial goals to increase work effort, leading to higher levels of labour income growth and capital accumulation for (potential) entrepreneurs (Jones & Kim, 2018), which in turn increases aggregate wage inequality.

Empirical work by Frid et al. (2016) finds that liquidity constraints seem to have a greater impact on entrepreneurial disengagement (i.e., exit) than entrepreneurial entry. Low-wealth entrepreneurs are less able to grow their firms and more likely to exit. If liquidity constraints are barriers to growth and survival rather than entry, entrepreneurial ventures will generate unequal earnings. Thus, increased entrepreneurship may lead to increased inequality simply because entrepreneurial incomes tend to be more unequal than labour incomes. Evans and Leighton (1989) find that small-scale entrepreneurs' earnings are lower than average labour incomes. Hamilton (2000) reports that a majority of entrepreneurs enter and remain in business even though their earnings are lower than earnings of individuals in paid employment. A possible explanation for this apparent paradox rests in the existence of non-pecuniary benefits to entrepreneurship (Ástebro et al., 2014; Wasserman, 2008). Entrepreneurs may forgo pecuniary rewards in return for greater independence and flexibility.

Focusing specifically on wage incomes, entrepreneurship should lead to greater inequality if the wages paid by new firms are more unequal than those paid by incumbents and exiting firms. Under such circumstances, wage inequality may arise from industry dynamics brought about by entrepreneurship. More firm entry is likely to drive out older firms (Baptista & Karaöz, 2011). Most firms start small (Mata, 1996). Small firms pay lower average wages than established incumbents (Evans & Leighton, 1989; Gibson & Stillman, 2009). Brixy et al. (2007) and Nyström and Elvung (2014, 2015) find evidence of a wage penalty associated with employment in new firms.

Inequality in both entrepreneurial and labour incomes may increase if, upon starting their firms, highly skilled entrepreneurs are more likely to hire highly skilled employees, as those firms would perform better and likely pay higher wages. Studying young firms, Baptista et al. (2013) find evidence that more skilled entrepreneurs run larger businesses and hire more skilled workers. Crucially, the higher the levels of human capital of the entrepreneur, the higher the wage premium paid for workers' skills. Thus, high-skill entrepreneurs hire high-skill workers and pay them higher wages relative to what they would be paid by low-skill entrepreneurs. This matching between

high-skill entrepreneurs and high-skill workers (at a wage premium) and between low-skill entrepreneurs and low-skill workers occurring in new firms would imply that more entrepreneurship is likely to lead to wage inequality.

Based on the prior discussion, the following hypothesis can be proposed:

Hypothesis 1: Increases in the regional rate of entrepreneurship will lead to increases in regional wage inequality.

Now we consider the effect of inequality on entrepreneurship. Greater wage inequality can also cause more entrepreneurship. Wage dispersion within organizations leads low-earning employees to pursue entrepreneurial ventures. Sørensen and Sharkey (2014) find that employees in organizations with high wage inequality are more likely to make the transition to entrepreneurship. Carnahan et al. (2012) report that high-performance employees are likely to transition to entrepreneurship in organizations with low compensation dispersion/inequality. Glaeser et al. (2014) propose that as older employers are replaced and wages decline at the bottom of the earnings distribution, entrepreneurship becomes relatively more attractive and more new businesses will be started. Xavier-Oliveira et al. (2015) find that, as inequality increases, human and financial capital deficiencies become weaker deterrents of entry.

Using Global Entrepreneurship Monitor (GEM) data, Lippmann et al. (2005) find that entrepreneurship rates are higher in countries with significant income inequality. It seems reasonable to assume that causality runs from entrepreneurship to inequality as well as from inequality to entrepreneurship. This reverse causality needs to be accounted for when examining the impact of entrepreneurship on wage inequality.

The entrepreneurship literature makes a distinction between necessity-based entrepreneurs that are 'pushed' into business ownership owing to dissatisfaction with their current situation (Amit & Muller, 1995), usually related to unemployment, and opportunity-based entrepreneurs that are 'pulled' into business ownership to exploit created or discovered business opportunities (Baptista et al., 2014; Reynolds et al., 2001).

Necessity-based entrepreneurs generally report a fear of failure and lower expectations (Van Stel et al., 2007). In contrast, opportunity-based entrepreneurs voluntarily establish new firms (Fairlie & Fossen, 2019; Hechavarria & Reynolds, 2009). Opportunity-based entrepreneurs are generally more likely to plan and accumulate financial resources and business networks required to ensure firm success (Colombo et al., 2004). Also, opportunity-based entrepreneurs are more likely to pursue complex strategies in knowledge-based businesses (Block et al., 2015).

Opportunity-based start-ups are likely to be larger and better funded than necessity-based ones (Baptista et al., 2013, 2014). Burton et al. (2018) report that, after adjusting for differences in the characteristics of employees, larger firms pay more than smaller ones for observationally equivalent individuals, but younger firms pay more than

older firms. The size effect, however, dominates the age effect. Thus, although the typical start-up – being both young and small – might pay less than a more established employer, the largest start-ups (likely to be opportunity-based) pay a wage premium.

The general and specific human capital resource profiles of necessity- and opportunity-based entrepreneurs, as well as those of their hires, often differ significantly (Amit & Muller, 1995; Fossen & Büttner, 2013; Van der Zwan et al., 2016). Necessity-based entrepreneurs generally accumulate smaller and narrower resource pools of financial, technical and knowledge resources, hire less skilled employees and pay below average wages, while opportunity-based entrepreneurs will be willing to pay a premium to attract employees with key technical and/or market knowledge (Baptista et al., 2013). This premium would be required to work in a start-up as employees with higher qualifications often have greater requirements with regard to their workplace – for example, regarding job safety and prerequisites – which are harder to fulfil by young small firms (Koch et al., 2013).

It seems therefore reasonable to expect that necessity-based entrepreneurial ventures are more likely to pay wages at the bottom levels of the labour income distribution while opportunity-based ones are more likely to pay wages at the top of the distribution. We then propose the following:

Hypothesis 2A: Increases in the regional rate of necessity-based entrepreneurship will lead to increases in regional wage inequality by increasing the proportion of earners at the bottom levels of the labour income distribution.

Hypothesis 2B: Increases in the regional rate of opportunity-based entrepreneurship will lead to increases in regional wage inequality by increasing the proportion of earners at the top levels of the labour income distribution.

Wage inequality and creative occupations

Florida (2004) argues that more creative people mean more innovative businesses, and more innovative businesses attract more creative people, leading to more growth. The creative class is not evenly distributed across cities and regions, so asymmetries in the regional distribution of creative people and occupations are associated with differences in regional growth (Boschma & Fritsch, 2009).

Asymmetries in the distribution of creative people across regions are also likely to influence entrepreneurship. As pointed out above, empirical work finds that local entrepreneurs operate stronger businesses (Figueiredo et al., 2002; Michelacci & Silva, 2007). Immobile workers may possess traits that lend them to entrepreneurship, such as high human capital. If creative people are more likely to remain in their local environment over time, there will be persistent differences in the regional incidence of creative people. Since creative people are likely to earn wages at the top of the labour income distribution

(Florida, 2017; Florida & Mellander, 2016), these differences will translate into persistent differences in wage inequality. Public policy may contribute to reinforce these differences. Chatterji et al. (2014) point out that, since a disproportionate percentage of high-growth start-ups are in technical, knowledge-intensive fields, policy-makers have sought to increase the supply of technically skilled individuals.

Manning (2004), Goos and Manning (2007) and Goos et al. (2009) find that as more high-skill, high-paying jobs concentrate in the same area, so does the demand for low skill, low-wage jobs in areas of personal services, such as retail trade, cosmetology, food preparation and service, and hospitality which are relatively place-bound and thus harder to move outside the location where they are performed. Such occupations require spatial proximity to the populations and markets they serve and thus cluster around highly affluent populations and areas.

Revisiting the theme of creative classes and regional economic growth, Florida (2017) points out that that the accumulation of creative classes in large cities and regions has led to higher levels of income and wage inequality, suggesting that most of the gains in economic growth have been appropriated by those in creative occupations. Lee et al. (2015) and Florida and Mellander (2016) find that regional variation in wage inequality is associated with within-region disparities in educational levels and the co-location of high- and low-skill individuals in more affluent regions/cities, leading to increasing proportions of high- and low-wage jobs. We therefore formulate the following hypothesis:

Hypothesis 3: Regions with a greater incidence of creative occupations will have greater wage inequality.

Wage inequality in regional labour markets

Entrepreneurship and the incidence of creative professions are not the only determinants of regional wage inequality. Indeed, several characteristics of local labour markets are likely to influence wage inequality. These characteristics represent the control variables in the present study.

Examining differences in income inequality across US cities, Glaeser (1999) claims that there is a negative link between population density and income inequality because productivity might be unevenly distributed among workers as a result of differences in learning. Local learning and productivity are enhanced by the amount of personal contacts. Low-skill workers are assumed to benefit more by this person-to-person learning than high-skill workers. By increasing productivity (and, therefore, wages) of low-skill workers, this phenomenon is expected to have the effect of compressing the labour income distribution.

However, it seems clear that in a dynamic setting, inequality changes with changes in the size and educational composition of the local population and the local business structure. Human capital theory (Becker, 1964) regards income differences among individuals as a consequence of individual differences in the market rate

of return to investments in education and training. If the more highly educated are relatively more productive and this is reflected in their wages, we would expect inequality to vary with the local distribution of education. Since a more highly educated labour force is usually feature of larger labour markets (Glaeser & Resseger, 2010), inequality should be positively correlated with labour market size.

Industrial composition affects productivity and the demand for specialized labour, which also influences wages. Central place theory (Christaller, 1966; Losch, 1954) and the 'new economic geography' (Fujita et al., 1999; Fujita & Thisse, 2002) posit that the main rationale for the geographic spread of industry branches is the varying level of fixed set-up costs relative to the local demand needed to cover these fixed costs. Businesses that need a large local population to cover these fixed costs locate in central places (i.e., in relatively larger cities or regions) whereas establishments that require lower levels of fixed costs relative to local demand can be set up in every city, regardless of size. Hence, there should be a positive correlation between urban scale and the degree of specialization of the local business and occupational structures. The larger the local labour market, the more diversified the local business structure.

Sørensen and Sorenson (2007) find that increasing horizontal differentiation (i.e., variation in the kinds of organizations) reduces wage inequality as individuals can more easily find firms interested in their distinctive attributes and talents. Korpi (2008) argues that, as technological progress increases the demand for skilled labour, the greater variety of skills and occupations offered by larger, more specialized local labour markets allows for better matching between individuals' skills and available jobs and, thus, higher productivity and wages at the top of the earnings distribution. It is therefore expected that greater diversity in the regional industry structure is associated with greater inequality in wage incomes.

DATA AND METHODOLOGY

Data

We focus on Portugal, a small, open economy where the tax structure is the same across regions and racial composition and unionization rates are fairly homogeneous across the whole territory. Migrations towards the largest metropolitan areas have a bearing on inequality rates that is likely to be picked up by differences in regional human capital composition (Berry & Glaeser, 2005). This study uses data from *Quadros de Pessoal* (QP), a longitudinal matched employer–employee database that contains information on workers, companies, and establishments for the Portuguese economy. The database is assembled from yearly surveys conducted by the Ministry of Social Security and Employment covering all private firms with at least one wage earner. Response is mandatory. Data on companies and establishments include sector, age, number of employees, turnover, and geographical location (municipality). Data on workers

include age, tenure, level of education, job assignment, occupation, hours worked and wages.

The Portuguese continental territory is divided in 21 intermunicipal communities and two metropolitan areas, corresponding to NUTS-III in the European system of territorial divisions. We take these geographic areas as the regional unit of observation in our study as they aggregate several municipalities (i.e., counties) into more coherent spatial labour markets (workers may live in one municipality and work in an adjacent one).

We use labour income data to measure inequality covering the period 2002–12. Monthly wage income is calculated as the sum of base wage and regular benefit payments, deflated using the consumer price index (CPI). Income data relate to wages and regular benefits and exclude other sources of income not covered by the survey as well as irregular benefits. Regular benefits include, for instance, allowances for food, occupation, accommodation or transport, seniority and productivity premia, and allowances for shift work or night work. In order to assess more accurately the significance of entrepreneurship (i.e., new firm entry) in local labour markets, our measure of entrepreneurship is the ratio between total employment in new firms and total employment for each year and region.

The period of analysis partially covers the effects of the great recession. Portuguese gross domestic product (GDP) declined in real terms in the period 2011–13. While the recession had an impact on inequality and new firm creation (both declined), the effects on Portuguese regional labour markets were quite homogeneous, as expected in a small open economy. Portuguese authorities enacted policies to aid recovery, but their effects occurred mostly after the period of analysis. Also, we have found no evidence of any changes in taxation and labour market regulations targeting specific regions (e.g., International Labour Organization (ILO), 2018). We therefore do not expect our results to be affected significantly.

Figure 1 displays maps comparing inequality (Gini index) across Portuguese regions in the beginning (2002), middle (2007) and end (2012) of our period of analysis. Figure 2 displays maps comparing entrepreneurial activity (job creation by new firms) across Portuguese regions, also in the beginning (2002), middle (2007) and end (2012) of our period of analysis. Inequality rises for most of the period of analysis, declining at the end, likely as a result of the recession. Job creation by new firms declines slightly during the period of analysis, and strongly at the end, as the recession hit.

Using data on individual workers from the years before entry we are able to track the backgrounds of founders, allowing us to identify a proxy for necessity- and opportunity-based entry. A significant amount of works in the literature link the distinction between opportunity- and necessity-based entrepreneurship to the employment status of the entrepreneur prior to founding a new business (e.g., Baptista et al., 2014; Block & Wagner, 2010; Caliendo & Kritikos, 2019; Rocha et al., 2018). For the purposes of the present analysis, new firm founders who

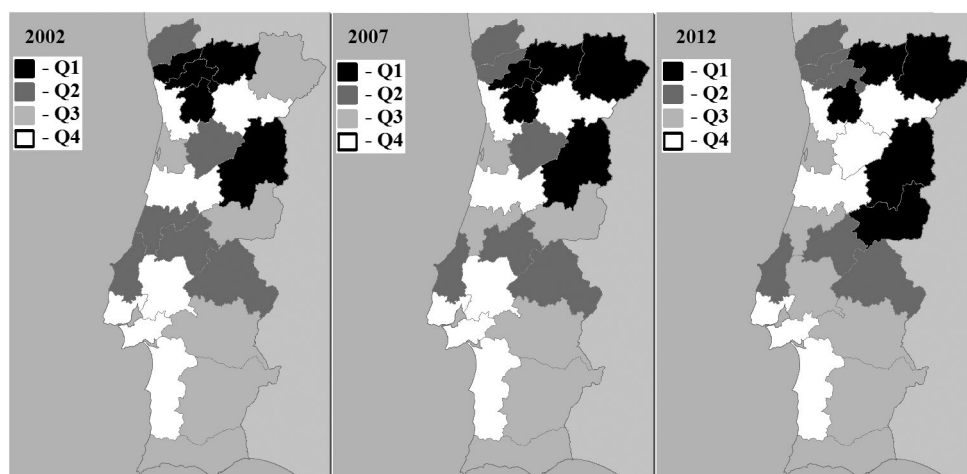


Figure 1. Gini index for wage inequality in Portuguese regional labour markets, 2002, 2007 and 2012.

had been unemployed (or absent from the workforce) for at least three years prior to start-up are deemed ‘necessity-based’ entrepreneurs, while others are defined as ‘opportunity-based’ entrepreneurs. The basic rationale for this distinction is that individuals who give up paid employment to establish a new business are likely incurring an opportunity cost and, therefore, are more likely to be doing it because they identified what they believe is a profitable business opportunity. Although it is difficult to cleanly dichotomize these two types of entrepreneurship, the distinction closely matches the theoretical concepts of necessity- and opportunity-based entrepreneurship (Fairlie & Fossen, 2019).

The average number of workers in the database in the years covered by the study is 2.9 million, varying from 2.64 million in 2002 to 3.23 million in 2008. We have almost 32 million observations. Table 1 presents measures of wage inequality and dispersion for new workers hired by incumbent companies and for workers hired by new entrants, offering some insight on the effect of entrepreneurship and new firm entry. The data show that workers

entering new companies earn lower average wages and experience greater inequality than workers hired by incumbents. The ratio between the 90th (higher) percentile and the 10th (lower) percentile of the distribution of labour incomes shows that top wage earners earn over nine times more than bottom wage earners in new firms, while the ratio is about six times more in incumbents.

Florida (2004) defines the creative class as comprising those people who are engaged in creative and innovative jobs. Hence, members of the creative class may be found in every industry and empirical research needs to identify those workers who are engaged in creative professions, rather than those who have specific advanced degrees and qualifications, or work in specific industries. The QP database classifies occupations according to the International Standard Classification of Occupations (ISCO) of the International Labor Union (Elias, 1997).² Each employed worker in the QP database is assigned an occupation in each year using this classification.

In order to identify creative occupations in the QP database we employ the methodology proposed by

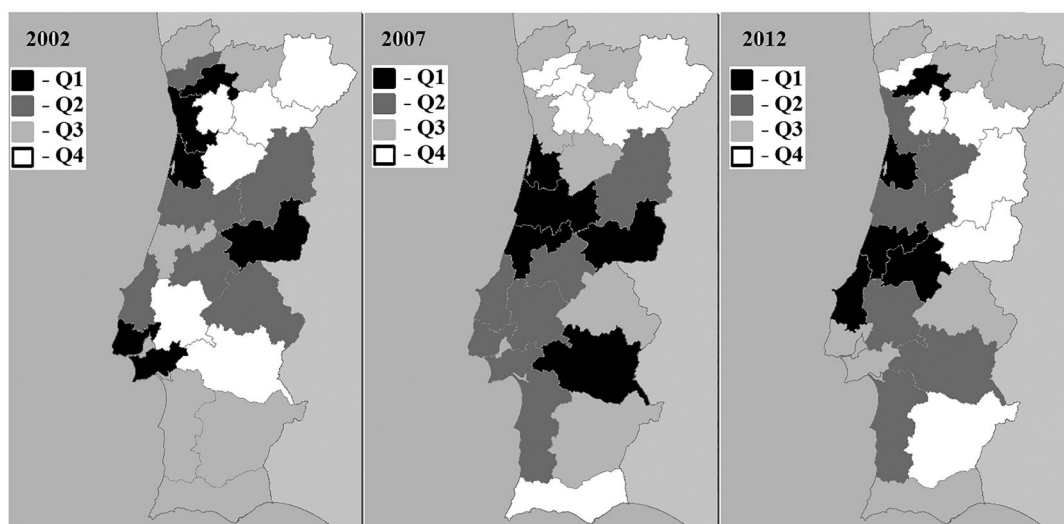


Figure 2. Job creation by new firms (as a proportion of total jobs) in Portuguese regional labour markets, 2002, 2007 and 2012.

Table 1. Wage inequality in new jobs in incumbents and new entrants.

Index	Incumbent companies	New entrants
p90/p10	6.127	9.175
p90/p50	2.109	2.958
P50/p10	2.907	3.106
Gini	0.387	0.493
Average (€)	614.0	593.9

Boschma and Fritsch (2009) and updated by Fritsch and Stuetzler (2013). These authors adopt Florida's (2004) definitions of creative occupations, distinguishing among the creative core, creative professionals, and bohemians. Members of the creative core are those whose function is to create new ideas, new technology and/or new creative content. These individuals are chiefly found in science and engineering, architecture and design, education, arts, music, and entertainment (Florida, 2004). Creative professionals engage in complex problem solving that involves a great deal of independent judgment and requires high levels of education. These individuals mainly work in business and finance, law, healthcare and related fields (Florida, 2004). Bohemians are engaged in cultural and artistic occupations. Bohemians have two roles: they are part of the creative class and are a sign of an urban culture of tolerance; thus, they play a key role in attracting the two other categories of the creative class.³

Following Boschma and Fritsch (2009), the present study considers creative occupations as including those in the creative core (science and engineering, architecture and the arts, music and entertainment) and the creative professionals (business and finance, law, healthcare and related fields). The majority of workers employed in creative occupations earn wages above the median, with about 40% in the top quartile and over 75% above the median wage. The distribution is similarly skewed for incumbents and new entrants.

Variables

The present study aims to investigate the impact of entrepreneurship and creative occupations on regional differences in wage inequality. Table 2 presents the variables used in the empirical analysis and their descriptive statistics.⁴

Our dependent variables measure wage inequality using the Gini index and the generalized entropy (Theil) index GE1 (Dagum, 1997).⁵ We also use wage dispersion as a dependent variable, measured by the ratios between the wages at the 90th and 50th, 90th and 10th, and 50th and 10th percentiles. For both the Gini and Theil indexes, a value of zero represents perfect equality and higher values denote increasing levels of inequality.

In order to test Hypotheses 1, 2A and 2B, our explanatory variables include total entrepreneurship as well as necessity- and opportunity-based entrepreneurship. We assess entrepreneurship by the ratio between jobs created by new firms and total employment, for each year and

region. Necessity-based entrepreneurship refers to new firms started by at least one necessity-based (i.e., previously unemployed) founder, while opportunity-based entrepreneurship concerns new firms started exclusively by opportunity-based founders (i.e., previously employed). During the period covered by our study, necessity-based start-ups represented about 20% of new firm entry. This proportion shows little variation across regional units (16% to 24%). In order to test Hypothesis 3, we include an explanatory variable measuring the incidence of creative people in each region, which corresponds to the proportion of workers in creative occupations in each region's total employment in each year.

Based on the discussion in the second section above, our models include several region-specific control variables. The size of the labour market (total employment) is likely to influence wage inequality. Larger labour markets are associated with more highly educated workforces and greater industry diversity, corresponding to greater wage inequality. However, greater density increases local learning and productivity of low-skill workers which should lead to less inequality, so the expected net effect is unclear. Previous empirical studies (e.g., Lee et al., 2015) show that richer cities tend to be more unequal. In order to make sure that variables reflecting employment created by new entrants are not simply functioning as a proxy for large, rich and diverse cities where entrepreneurial activities are more likely to occur (Bosma & Sternberg, 2014), we include the median wage in regional labour markets as an additional control variable.

Greater industry variety means more specialized local labour markets. With a greater diversity of occupations available workers' specific skills are more highly valued, leading to higher wages at the top of the earnings distribution and, therefore, greater inequality.

Human capital and creative occupations are not equally distributed across regions. More highly educated workers and those in creative occupations gain more from increases in regional productivity when compared with low-skill workers. Regions that collect more high-skill workers and creative people also register greater proportions of low skill, low-wage jobs.

We consider the proportion of large firms in each region. Large firms pay higher wages for similar occupations than small firms (Burton et al., 2018; Gibson & Stillman, 2009). Thus, we expect that regions with different proportions of large firms to have different wage structures. We also expect average workforce age in a region to influence wage distribution. Older workers are more likely to have accumulated more experience and have longer job tenure, leading to higher wages for the same education levels and occupations. Finally, we consider the proportion of knowledge-intensive service (KIS) firms in each region and the proportion of KIS jobs.⁶ Regions where KIS represent a significant part of the industrial structure are generally richer, more innovative and more productive (Capello et al., 2012). KIS companies employ a greater proportion of high-skill workers and pay substantially higher wages than the private-sector average (Hill,

Table 2. Variable definitions and descriptive statistics.

Variable	Description	Mean	SD
Gini	Gini coefficient measuring the yearly dispersion of wages in each intermunicipal community; 0 means perfect equality and 1 means maximum inequality in each intermunicipal community	0.308	0.034
p90p10	Ratio between percentile 90 and percentile 10; percentile 90 and 50; and	3.265	0.715
p90p50	percentile 50 and 10 for yearly wage incomes per year and region/	2.142	0.264
p50p10	intermunicipal community	1.515	0.191
GE1	Generalized entropy index GE1 (Theil index)	0.192	0.041
Creative people (%)	Percentage of workers in creative occupations in each region/intermunicipal community's total employment in each year	0.198	0.030
Entrepreneurship (%)	Ratio between total employment created by new entrants and total employment for each year and region/intermunicipal community	0.02	0.010
Necessity entrepreneurship (%)	Ratio between total employment created by new entrants in which at least one founder was unemployed or inactive in the three previous years before start-up and total employment in each region/intermunicipal community	0.003	0.002
Opportunity entrepreneurship (%)	Ratio between total employment created by new entrants in which all founders were employed in the three previous years before start-up and total employment in each region/intermunicipal community	0.017	0.009
Large companies (%)	Percentage of companies with more than 250 employees out of the total number of companies in each region/intermunicipal community in each year	0.054	0.048
Industry diversity (%)	Ratio between the number of industry sectors (two-digit NACE code) existing in each region/intermunicipal community in each year and the total number of industry sectors existing in the country	0.61	0.135
Human capital/tertiary education (%)	Percentage of workers who completed a university degree or equivalent (tertiary education) in each region/intermunicipal community's workforce in each year	0.095	0.029
Average age	Average age of the workforce in each region/intermunicipal community in each year	38.779	1.333
Number of workers (log)	Logarithm of the number of workers in each region/intermunicipal community each year	11.050	1.030
KIS (%) (knowledge-intensive services)	Percentage of KIS companies out of the total number of companies in each region/intermunicipal community in each year	0.211	0.075
Median	Median wage salary, 2012 adjusted, in each region/intermunicipal community in each year	658.560	65.086
Jobs in KIS (%)	Percentage of KIS jobs out of the total number of jobs in each region/intermunicipal community in each year	0.215	0.077

2014), so regional differences in the incidence of KIS firms are likely to influence wage inequality.

Methodology

We seek to explain wage inequality and dispersion. Assuming a linear functional form, the set of explanatory variables (described in Table 2) capture the dynamics and heterogeneity of each region in terms of entrepreneurship, job creation, industry structure, human capital and creative occupations. Assessing the relationship between wage inequality and entrepreneurship in regional labour markets raises several estimation issues.

As pointed out in the second section above, causality between inequality and entrepreneurship is likely to run in both directions. The functional form has also to consider that the current realization of the inequality measure in each region will most likely be influenced by past realizations. Therefore, we must define a dynamic specification with the lag realization of inequality in the set of regressors. In addition, each region will possess some constant specific attributes that are not captured by the explanatory variables which requires a panel data setup introducing regional fixed effects in the regression. Yearly dummies are also needed to account for wide time-specific economic shocks.

The dynamic specification of the model, the endogeneity issues, and the need to account for regional fixed effects all point to the use of difference generalized method of moments (GMM) (Arellano & Bond, 1991; Hansen, 1982; Holtz-Eakin et al., 1988). The difference GMM model takes first-differences of the variables and uses the lags of the regressors as instruments. Difference GMM instruments typically include one instrument for each time period, with zero replacing missing variables (Holtz-Eakin et al., 1988). We rearrange the instruments matrix to reduce its size in order to reduce instrument proliferation (Roodman, 2009a). We also limit the variables' lags to be used as instrument (to six lags) as an additional technique to reduce the instrument count.⁷ Apart from the lag variable for each measure of wage inequality, we have also instrumented the entrepreneurship variables and the size of the labour market (log workers in the region), as well as the percentage of KIS and the percentage of jobs in KIS.

Our empirical setting is similar to Atems and Shand (2018), but we discard the use of system GMM (Arellano & Bover, 1995; Blundell & Bond, 1998) given that it imposes the additional assumption that regional fixed-effects are not correlated with the first-difference of the instrumenting variables. This assumption is too strong due to the regional nature of our data (and the relatively small number of regional units observed).

RESULTS

Table 3 presents the estimation results for the Gini inequality index. Table 4 presents estimation results for the Theil (GE1) index as well as for wage dispersion, as measured by the wage percentile ratio p90p10. Table 5 displays the estimation results for the remaining wage percentile ratios, p90p50 and p50p10. We specify several combinations of variables and include fixed effects for regions and dummy variables for each year. We introduce a LAG variable that represents the dependent variable in period $t - 1$, therefore assuming that the inequality level in a given region in a given year is lag dependent. We report the Hansen test for overidentifying restrictions, as well as the Arellano and Bond (1991) tests for first- and second second-order serial correlation (AR(1) and AR(2)) for all regressions. The tests provide no evidence of model misspecification.⁸

Estimation of the models involved testing several specifications, changing the set of variables used. The significance and order of magnitude of the variables' coefficients and significance levels are similar across different specifications, suggesting the results are robust. We therefore present results for the regressions including all the control variables simultaneously. Our objective is to estimate the impact of entrepreneurship and creative people on measures of regional wage inequality. The main variables of interest refer to our measures of the pervasiveness of entrepreneurship and of creative occupations in regional labour markets.

Results show that entrepreneurship, measured as the proportion of jobs created by new firms on total employment, has a significant positive effect on wage inequality as measured by both the Gini index and the GE1 (Theil) index. We can therefore say that the results support Hypothesis 1. Job creation by both necessity and opportunity start-ups also have a positive effect on wage inequality, but the coefficients are only weakly significant, and this significance disappears when models are estimated including also total job creation by start-ups. These results do not seem to lend support to Hypotheses 2A and 2B.

The proportion of workers in creative professions has a positive effect on wage inequality as measured by both the Gini and GE1 (Theil) indexes. This effect is significant and the coefficients change little with the inclusion of our measures of entrepreneurship in the model. This suggests that employment in creative professions impacts wage inequality regardless of the entrepreneurial activity in the region. We can therefore say that Hypothesis 3 is supported by the results. The coefficients for the Theil index (GE1) are in line with results for the Gini index in terms of direction, significance, and magnitude.

Estimation results for the wage percentile ratios show that job creation by new firms has a generally positive, weakly significant effect on all the ratios. This suggests that job creation by new firms leads to greater dispersion by both depressing the wages at the bottom of the distribution and boosting the wages at the top. The coefficients for job creation by necessity-based entrepreneurs are generally not significant. This result indicates that necessity-based entrepreneurs are not more likely to pay wages at the bottom of the labour income distribution, so Hypothesis 2A is definitely not supported. The coefficients for job creation by opportunity-based entrepreneurs are positive and weakly significant for the ratios involving wages at the top of the distribution (p90p50 and p50p10), but significance vanishes when the model is estimated including also total employment creation by new firms. This result lends only weak support to Hypothesis 2B by suggesting that opportunity-based entrepreneurs are more likely to pay wages at the top of the labour income distribution. In general, both wage inequality and wage dispersion seem to be driven primarily by total entrepreneurship rather than by necessity- and opportunity-based entrepreneurship independently.

The effects of the proportion of creative occupations on the dispersion ratios involving wages at the top of the distribution (p90p50 and p90p10) are positive and significant, while the coefficients for p50p10 are not significant. These results suggest that a greater percentage of workers in creative occupations leads to greater inequality by increasing wages at the top of the distribution but does not significantly impact wage dispersion in the lower half of the labour income distribution. The results for wage dispersion therefore support Hypothesis 3.

Control variables accounting for characteristics of regional labour markets have the expected effects. Regional industry diversity has a positive effect on

Table 3. Inequality indexes Gini: Arellano–Bond (AB) difference generalized method of moments (GMM).

	Gini	Gini	Gini	Gini	Gini	Gini	Gini	Gini	Gini	Gini
Entrepreneurship (%)		0.570** (2.41)				0.796*** (2.89)			0.869*** (2.89)	0.209 (0.19)
Necessity entrepreneurship (%)			0.969* (1.77)				0.466 (0.62)		−0.660 (0.60)	
Opportunity entrepreneurship (%)				0.544* (1.90)				0.875*** (2.82)		0.660 (0.60)
Creative people (%)					0.242*** (3.07)	0.297*** (2.93)	0.235** (2.78)	0.317*** (3.16)	0.313*** (2.92)	0.313*** (2.92)
Large companies (%)	0.258*** (2.85)	0.405*** (3.80)	0.297*** (3.15)	0.376*** (3.27)	0.354*** (3.83)	0.580*** (5.55)	0.369*** (4.26)	0.573*** (5.10)	0.578*** (5.47)	0.578*** (5.47)
Industry diversity (%)	0.201** (2.77)	0.258** (2.79)	0.171** (2.51)	0.272** (2.56)	0.238*** (3.76)	0.327*** (3.59)	0.223*** (3.89)	0.365*** (3.29)	0.357*** (3.47)	0.357*** (3.47)
Human capital/tertiary education (%)	0.163 (0.97)	−0.096 (0.45)	0.180 (1.19)	−0.094 (0.41)	0.373*** (3.26)	0.059 (0.30)	0.375*** (3.12)	0.025 (0.13)	0.028 (0.15)	0.028 (0.15)
Average age	0.005 (1.22)	0.010* (2.06)	0.007* (1.76)	0.008* (1.92)	0.001 (0.33)	0.008 (1.27)	0.002 (0.53)	0.006 (1.12)	0.007 (0.98)	0.007 (0.98)
Number of workers (log)	−0.018 (0.57)	−0.018 (0.57)	−0.006 (0.17)	−0.025 (0.76)	−0.030 (1.08)	−0.034 (1.10)	−0.024 (0.82)	−0.046 (1.45)	−0.043 (1.35)	−0.043 (1.35)
Median wage	0.122 (0.79)	0.174 (1.16)	0.082 (0.52)	0.194 (1.29)	0.097 (0.79)	0.165 (1.40)	0.079 (0.61)	0.205 (1.58)	0.197 (1.28)	0.197 (1.28)
KIS (%)	−0.060** (2.25)	−0.062** (2.11)	−0.066** (2.40)	−0.058* (2.03)	−0.063** (2.28)	−0.066** (2.35)	−0.066** (2.29)	−0.061* (2.07)	−0.063* (1.85)	−0.063* (1.85)
Jobs in KIS (%)	0.153*** (3.08)	0.172*** (3.95)	0.160*** (3.63)	0.167*** (3.57)	0.098** (2.20)	0.112** (2.16)	0.103** (2.24)	0.103* (1.90)	0.106* (1.80)	0.106* (1.80)
LAG	0.503*** (3.24)	0.439** (2.65)	0.451** (2.65)	0.471*** (2.89)	0.466** (2.40)	0.368* (1.81)	0.442** (2.11)	0.403* (1.97)	0.393 (1.70)	0.393 (1.70)
AR(1) test	−3.73 [0.000]	−3.37 [0.001]	−3.79 [0.000]	−3.42 [0.001]	−3.48 [0.000]	−3.13 [0.002]	−3.50 [0.000]	−3.08 [0.002]	−3.06 [0.002]	−3.06 [0.002]

(Continued)

Table 3. Continued.

	Gini	Gini	Gini	Gini	Gini	Gini	Gini	Gini	Gini	Gini	Gini
AR(2) test	1.66 [0.097]	0.61 [0.542]	1.74 [0.082]	0.70 [0.482]	1.63 [0.104]	-0.05 [0.961]	1.62 [0.105]	-0.10 [0.923]	-0.10 [0.918]	-0.10 [0.918]	-0.10 [0.918]
Hansen test	6.12 [1.000]	4.42 [1.000]	6.07 [1.000]	4.56 [1.000]	3.00 [1.000]	2.75 [1.000]	2.77 [1.000]	2.29 [1.000]	2.12 [1.000]	2.12 [1.000]	2.12 [1.000]
Observations	207	207	207	207	207	207	207	207	207	207	207
F-statistic	121.94	220.96	1,531.00	159.84	51.05	179.52	928.31	110.61	117.74	117.74	117.74

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; regressions include dummies for years. Data are for 2002–12. t -Statistics are shown in parentheses.

inequality by increasing specialization, as predicted by Korpi (2008). Diversity facilitates the matching between firms and workers with specific skills, thus increasing wages at the top of the distribution. Human capital (formal education) of the regional workforce has a positive significant effect on Gini coefficients. This effect on wage inequality likely occurs by increasing wages for more highly educated individuals in the top half of the labour income distribution.

The size of the labour market, as captured by the total number of workers, has a negative impact on the Gini coefficient for wage inequality, as well as on the p90p50 ratio. Once we control for other regional factors that increase inequality which are positively correlated with labour market size – that is, industry diversity, the proportion of large firms and KIS firms, and human capital – the remaining effect of market size on inequality and dispersion in the top half of the wage distribution is significantly negative.

The regional median wage has no significant impact on inequality for all models estimated. This outcome differs from the results reported by Lee et al. (2015) for Great Britain, specifically that regions with higher median pay experience greater wage inequality. However, these authors do not include variables accounting for regional human capital and the presence of large companies. These variables are also strong indicators of regional wealth and are strongly correlated with both regional inequality and median wages.

Finally, the coefficients for the lagged dependent variable fall in the range 0.35–0.55, depending on the specification considered. This result points to the existence of persistent differences in inequality across regions over time.

DISCUSSION

This study finds that higher levels of both the total entrepreneurship rate and the prevalence of creative people are associated with higher levels of wage inequality and dispersion in Portuguese regional labour markets. These effects are captured after controlling for region-specific variables and fixed effects, as well as serial correlation in both wage inequality and dispersion. Specifically, increases in the proportion of new jobs created by start-ups are associated with higher levels of wage inequality and greater wage dispersion, driven by increases in the shares of wages both at the top and at the bottom of the labour income distribution. The latter result intimates that wages in start-ups tend to be less compressed (i.e., more unequal) than in incumbents and firms that recently dropped out of the market. Wage inequality and dispersion are driven primarily by total entrepreneurship rather than specifically by necessity- or opportunity-based start-ups.

The share of creative workers in total employment is also positively associated with wage inequality and dispersion. In particular, greater shares of workers in creative occupations are associated with greater shares of wages at the top of the distribution. Regions that generate more

Table 4. GE1 (Theil) and inequality indexes p90p50 ratio: Arellano–Bond (AB) difference generalized method of moments (GMM).

	GE1	GE1	GE1	GE1	GE1	p90p50	p90p50	p90p50	p90p50	p90p50
Entrepreneurship (%)	0.904** (2.37)			0.978** (2.32)	0.319 (0.24)	6.120** (2.09)			6.139** (2.26)	5.975 (0.58)
Necessity entrepreneurship (%)		0.740 (0.80)		−0.658 (0.46)			7.431 (0.84)		−0.165 (0.02)	
Opportunity entrepreneurship (%)			0.990** (2.30)		0.658 (0.46)			6.294** (2.33)		0.165 (0.02)
Creative people (%)	0.372** (2.76)	0.299** (2.72)	0.392*** (2.97)	0.387** (2.74)	0.387** (2.74)	3.799*** (3.44)	3.163*** (3.07)	3.894*** (3.59)	3.803*** (3.38)	3.803*** (3.38)
Large companies (%)	0.728*** (5.21)	0.498*** (4.33)	0.715*** (4.78)	0.724*** (5.19)	0.724*** (5.19)	4.883*** (4.37)	3.340*** (3.02)	4.719*** (4.47)	4.883*** (4.36)	4.883*** (4.36)
Industry diversity (%)	0.417*** (3.58)	0.291*** (4.14)	0.459*** (3.31)	0.446*** (3.52)	0.446*** (3.52)	2.140*** (2.91)	1.242* (1.97)	2.379*** (2.83)	2.148*** (2.94)	2.148*** (2.94)
Human capital/tertiary education (%)	0.004 (0.01)	0.368** (2.19)	−0.030 (0.12)	−0.025 (0.10)	−0.025 (0.10)	4.261* (1.81)	6.588*** (3.39)	4.148* (1.74)	4.253* (1.79)	4.253* (1.79)
Average age	0.011 (1.22)	0.005 (0.87)	0.009 (1.13)	0.010 (1.02)	0.010 (1.02)	0.055 (0.70)	0.017 (0.24)	0.041 (0.59)	0.054 (0.62)	0.054 (0.62)
Number of workers (log)	−0.050 (1.40)	−0.037 (1.13)	−0.063* (1.72)	−0.058 (1.65)	−0.058 (1.65)	−0.398 (1.25)	−0.261 (0.72)	−0.487 (1.55)	−0.400 (1.03)	−0.400 (1.03)
Median wage	0.096 (0.53)	−0.003 (0.02)	0.144 (0.74)	0.129 (0.56)	0.129 (0.56)	2.324 (1.40)	1.526 (0.78)	2.608 (1.52)	2.332 (1.17)	2.332 (1.17)
KIS (%)	−0.088** (2.50)	−0.090** (2.60)	−0.081** (2.26)	−0.083* (2.00)	−0.083* (2.00)	−0.632* (1.86)	−0.606* (1.82)	−0.588 (1.71)	−0.631 (1.68)	−0.631 (1.68)
Jobs in KIS (%)	0.132* (1.96)	0.124** (2.25)	0.123* (1.79)	0.126* (1.78)	0.126* (1.78)	1.124** (2.35)	1.094** (2.13)	1.052** (2.13)	1.122** (2.08)	1.122** (2.08)
LAG	0.303* (1.79)	0.331* (1.74)	0.344* (1.97)	0.329 (1.59)	0.329 (1.59)	0.337 (1.59)	0.423* (1.91)	0.364* (1.76)	0.337 (1.50)	0.337 (1.50)

(Continued)

Table 4. Continued.

	GE1	GE1	GE1	GE1	GE1	p90p50	p90p50	p90p50	p90p50	p90p50	p90p50
AR(1) test	-3.28 [0.001]	-3.56 [0.000]	-3.21 [0.001]	-3.22 [0.001]	-3.22 [0.001]	-2.52 [0.012]	-2.85 [0.004]	-2.60 [0.009]	-2.52 [0.012]	-2.52 [0.012]	-2.52 [0.012]
AR(2) test	-0.49 [0.621]	0.97 [0.330]	-0.48 [0.631]	-0.46 [0.647]	-0.46 [0.647]	0.75 [0.455]	1.22 [0.221]	0.74 [0.457]	0.74 [0.459]	0.74 [0.459]	0.74 [0.459]
Hansen test	7.49 [1.000]	8.46 [1.000]	4.65 [1.000]	2.41 [1.000]	2.41 [1.000]	0.64 [1.000]	1.69 [1.000]	3.31 [1.000]	0.43 [1.000]	0.43 [1.000]	0.43 [1.000]
Observations	207	207	207	207	207	207	207	207	207	207	207
F-statistic	125.75	194.38	95.23	126.37	126.37	118.30	119.77	69.41	110.55	110.55	110.55

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; regressions include dummies for years. Data are for 2002–12. *t*-Statistics are shown in parentheses.

creative jobs will experience greater wage inequality resulting driven by high wages. The results are robust to estimations using the Gini index or the GE1 (Theil) index and are supported by estimations for wage dispersion ratios.

We expected job creation in necessity and opportunity-based start-ups to have a significant impact on wage inequality by increasing the proportion of wages at the bottom and top of the labour income distribution, respectively. Specifically, we anticipated that necessity-based entrepreneurs would be more likely to hire low-skill workers and pay them relatively lower wages, while opportunity-based entrepreneurs would be more likely to hire high-skill workers and pay them relatively higher wages, thus increasing wage dispersion and inequality. However, while opportunity-based entrepreneurs are somewhat more likely to pay wages at the top of the distribution, the individual impacts of necessity- and opportunity-based employment creation on wage inequality and dispersion are generally weak or not significant. It is possible that the weakly significant positive impacts of opportunity-based entrepreneurship on dispersion associated with increases at the top of the distribution is associated with larger start-ups, as suggested by Burton et al. (2018).

In general, the results indicate that it is total entrepreneurship (meaning total job creation by start-ups) that is positively and significantly associated with wage inequality and dispersion. Also, the impact of new firm creation on dispersion occurs primarily by increasing the share of wages at the top of the distribution. It is possible that while low-skill, necessity-based entrepreneurs pay wages at the bottom of the distribution, high-skill, opportunity-based entrepreneurs pay wages at the top. Wage dispersion is greater within new firms perhaps because opportunity-based entrepreneurs pay a premium to hire high-skill workers, while paying low-skill workers lower wages than do incumbents.

Regional labour market characteristics including industry diversity, the proportion of large firms and KIS firms, and workforce human capital are all associated with higher levels of wage inequality and dispersion. These results confirm previous findings in the literature (e.g., Florida & Mellander, 2016; Korpi, 2008; Lee et al., 2015).

Once the effects of regional factors that are positively correlated with both inequality and labour market size are controlled for, larger regional labour markets are associated with lower levels of wage inequality, possibly because greater density enhances local learning and productivity of workers close to the median levels of the wage distribution. Thus, our results provide support for Glaeser's (1999) learning argument but suggest that learning is more likely to occur for workers in the middle of the wage distribution, as it is the wage structure in the top half of the distribution that is more compressed in larger regional labour markets.

The present analysis has several limitations. First, we follow previous works in linking the incidence of creative individuals to the presence of occupations classified as

Table 5. Inequality indexes p90p10 and p50p10 ratios: Arellano–Bond (AB) difference generalized method of moments (GMM).

	p90p10	p90p10	p90p10	p90p10	p90p10	p50p10	p50p10	p50p10	p50p10	p50p10
Entrepreneurship (%)	23.333*			25.098**	10.879	6.566*			7.571	−0.214
	(2.07)			(2.16)	(0.32)	(1.72)			(1.71)	(0.02)
Necessity entrepreneurship (%)		19.901		−14.219			3.035		−7.785	
		(0.83)		(0.41)			(0.44)		(0.67)	
Opportunity entrepreneurship (%)			25.522**		14.219			7.561*		7.785
			(2.17)		(0.41)			(1.73)		(0.67)
Creative people (%)	6.468**	4.496*	7.056***	6.834**	6.834**	0.020	−0.438	0.227	0.232	0.232
	(2.59)	(1.97)	(2.83)	(2.36)	(2.36)	(0.02)	(0.53)	(0.26)	(0.23)	(0.23)
Large companies (%)	15.291***	9.323***	15.104***	15.341***	15.341***	3.390**	1.688*	3.442**	3.438**	3.438**
	(4.47)	(3.99)	(4.28)	(4.45)	(4.45)	(2.45)	(1.72)	(2.35)	(2.38)	(2.38)
Industry diversity (%)	4.874***	1.673	5.982***	5.550***	5.550***	0.925	0.093	1.288*	1.296*	1.296*
	(2.99)	(0.92)	(3.24)	(3.15)	(3.15)	(1.56)	(0.14)	(1.94)	(1.75)	(1.75)
Human capital/tertiary education (%)	−2.763	6.866	−3.585	−3.448	−3.448	−4.291	−1.610	−4.684	−4.688	−4.688
	(0.44)	(1.65)	(0.61)	(0.58)	(0.58)	(1.36)	(0.64)	(1.49)	(1.48)	(1.48)
Average age	0.209	0.074	0.173	0.193	0.193	0.065	0.023	0.057	0.057	0.057
	(0.86)	(0.44)	(0.78)	(0.74)	(0.74)	(0.92)	(0.55)	(0.83)	(0.77)	(0.77)
Number of workers (log)	1.060	1.373	0.672	0.844	0.844	0.790	0.831	0.674	0.670	0.670
	(0.78)	(0.91)	(0.52)	(0.62)	(0.62)	(1.51)	(1.45)	(1.37)	(1.42)	(1.42)
Median	5.999	3.051	7.202	6.720	6.720	0.889	0.248	1.292	1.302	1.302
	(1.39)	(0.61)	(1.50)	(1.17)	(1.17)	(0.77)	(0.21)	(0.98)	(0.83)	(0.83)
KIS (%)	−0.343	−0.407	−0.232	−0.282	−0.282	0.299	0.274	0.329	0.330	0.330
	(0.30)	(0.38)	(0.20)	(0.23)	(0.23)	(0.84)	(0.78)	(0.88)	(0.84)	(0.84)
Jobs in KIS (%)	2.829	2.628	2.570	2.695	2.695	0.586	0.490	0.514	0.511	0.511
	(1.40)	(1.40)	(1.25)	(1.22)	(1.22)	(0.72)	(0.64)	(0.63)	(0.60)	(0.60)
LAG	0.221	0.306*	0.241	0.230	0.230	0.277*	0.296*	0.280*	0.280*	0.280*
	(1.34)	(1.78)	(1.50)	(1.33)	(1.33)	(1.72)	(1.72)	(1.75)	(1.72)	(1.72)

(Continued)

Table 5. Continued.

	p90p10	p90p10	p90p10	p90p10	p90p10	p50p10	p50p10	p50p10	p50p10	p50p10	p50p10
AR(1) test	-2.17 [0.030]	-2.16 [0.031]	-2.10 [0.036]	-2.09 [0.036]	-2.09 [0.036]	-1.97 [0.049]	-1.86 [0.063]	-1.92 [0.055]	-1.91 [0.056]	-1.91 [0.056]	-1.91 [0.056]
AR(2) test	-0.69 [0.489]	1.41 [0.159]	-0.60 [0.546]	-0.64 [0.519]	-0.64 [0.519]	-1.04 [0.299]	0.03 [0.975]	-1.03 [0.301]	-0.98 [0.327]	-0.98 [0.327]	-0.98 [0.327]
Hansen test	1.41 [1.000]	1.17 [1.000]	2.52 [1.000]	0.03 [1.000]	0.03 [1.000]	1.37 [1.000]	1.31 [1.000]	2.93 [1.000]	1.08 [1.000]	1.08 [1.000]	1.08 [1.000]
Observations	207	207	207	207	207	207	207	207	207	207	207
F-statistic	15.27	203.08	20.30	15.43	15.43	58.19	33.47	19.82	32.18	32.18	32.18

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; regressions include dummies for years. Data are for 2002–12. t -Statistics are shown in parentheses.

creative. Many of the occupations regarded as creative require a relatively high level of qualification so there is a highly positive correlation between highly positive correlation between the share of people in creative occupations and the share of people with a higher level of education (Markusen, 2006). While this methodology has been established by previous research (Boschma & Fritsch, 2009; Fritsch & Stuetzer, 2013), better indicators for measuring creativity, in line with the studies by Florida et al. (2012) and Florida and Mellander (2016) are a prerequisite for further work aimed at recognizing the impact of creative classes and occupations on innovation, growth and inequality.

Second, the analysis is affected by endogeneity. A small sample limits the methodologies that may be used to lessen its impact. It is likely that entrepreneurship and inequality are influenced by the same variables, thus leading to reverse causality. For analogous reasons, endogeneity may also affect the relationship between inequality and the prevalence of creative occupations.

CONCLUSIONS

The analysis in the present paper was motivated by the concurrence of two major trends in labour markets. First, the recognition of entrepreneurship and creative professions as drivers of innovation, employment, and economic growth has led regional authorities to pursue policies promoting entrepreneurship and innovation. Second, concerns about economic inequality have expanded rapidly in recent years both in developed and emerging economies.

This study seeks to address the concerns raised by Goos et al. (2009), Lee et al. (2015) and Florida and Mellander (2016) regarding increased inequality in regional and urban labour markets by examining the impacts of new firm creation and creative professions on regional wage inequality within a developed economy. Our results confirm that more entrepreneurship (i.e., greater job creation by new firms) does contribute to wage inequality and dispersion, as the wage structure of new firms tends to be less compressed than that of incumbents and exiting firms. However, we find that increased inequality is not driven primarily by an increase in the proportion of wages at the bottom of the income distribution.

This result is potentially encouraging for policymakers seeking to promote entrepreneurship in regional labour markets. New firm creation in Portuguese regions has been shown to have positive subsequent effects on employment growth (Baptista et al., 2008). Greater proportions of jobs created in new firms are likely to lead to increased wage inequality, so there will be tensions between job creation and inequality. Still, while the jobs created in new firms pay lower average wages than jobs in incumbents, necessity-based start-ups do not seem more likely to pay wages at the bottom of the distribution than other firms. In particular, the share of high-paying jobs in new firms is at least as high as in incumbents, so start-ups provide

opportunity for upward mobility in the labour income distribution.

It should also be considered that incomes may not tell the whole story about individual well-being. Åstebro et al. (2014) and Parker (2018) stress the importance of non-pecuniary benefits from entrepreneurship. Such benefits include independence, flexibility of schedule, and a sense of achievement. It is conceivable that key employees in new firms also extract some non-pecuniary benefits from taking part in the establishment and growth of a new business.

It is therefore recommendable that policymakers should consider the potential of entrepreneurship to drive job creation together with its potential connection with greater wage inequality. Entrepreneurship is unlikely to be a major determinant of increasing inequality. Researchers have identified a multitude of contributing factors, including skill-biased technological change (Card & DiNardo, 2002), trade and globalization (Feenstra & Hanson, 1996), and differences in educational attainment (Gregorio & Lee, 2002).

We also find that the accumulation of creative professions in regional labour markets is significantly associated with increasing wage inequality and dispersion. Increasing employment in creative professions increases the share of wages at the top levels of the labour income distribution. Job polarization occurs when the employment shares of highly skilled professionals as well as low skill, low-wage personal service workers increase significantly at the expense of the employment shares of middle-income workers. Our results suggest that creative professions play a role in job polarization. This raises a potential challenge for policymakers seeking to increase the supply of creative professionals in their regions. Increases in the share of wages at the top of the distribution likely lead to rising property prices, driving the middle class away from those regional labour markets that are expected to experience higher economic growth (due to having more creative people). This mechanism likely leads to a concentration of the benefits of greater regional productivity and economic growth on the top wage earners (Lee et al., 2015).

Future research should explore further differences between different types of entrepreneurs that go beyond the necessity- and opportunity-based dichotomy. Differences in general and specific human capital may enable researchers to further explore the impacts of matching between high-skill entrepreneurs and high-skill workers on inequality.

Further work should also seek to explore data including differences in institutions across regions. Recent works have highlighted that the potential for entrepreneurship to drive sustainable development is strongly linked to the existence of inclusive institutions (Apetrei et al., 2019). Entrepreneurship may increase or decrease economic inequality depending on its effect on institutions, making them more inclusive or more exclusive (Bruton et al., 2021).

A final word regarding the implications of the current pandemic is warranted. By generating a recession that is

fundamentally asymmetrical in its effects across industries and regions (industries such as hardware and e-commerce have thrived while others such as travel and hospitality have been ravaged, with significant impacts on regional development), the current pandemic has wide-ranging effects on inequality that have not yet been fully determined. The relationship between entrepreneurship and inequality will likely increasingly depend on the specific sector and region and be mediated by institutional factors and public policy initiatives. New questions arise that will require new data in order to be addressed empirically.

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NOTES

1. See also Quadrini (2009) for a review of studies that look at the aggregate and distributional implications of entrepreneurship.
2. See also <https://www.ilo.org/public/english/bureau/stat/isco/>.
3. Appendix A in the supplemental data online presents the list of ISCO occupations deemed creative based on the methodology proposed by Boschma and Fritsch (2009) and updated by Fritsch and Stuetzer (2013).
4. Table B1 in Appendix B in the supplemental data online displays the correlation matrix for dependent and explanatory variables.
5. Estimations for the job polarization index proposed by Jones and Green (2009) were also conducted, but provided few meaningful results. In particular, it is not possible to

capture significant effects of entrepreneurship on job polarization. The fact that Portugal is a small open economy with a reasonably homogeneous industry structure across regions is the most likely reason for this limitation. The estimations for polarization are presented in Appendix B in Table B2 in the supplemental data online. In general, the explanatory variables display lower levels of correlation with the polarization index than with other measures of inequality. It is likely that aggregating occupations according to average wage generates less variability across regions than the other measures of inequality. Hence, while the polarization measure is appealing, since it looks at the dispersion between occupations rather than wages, the numbers of regions and occupations are too low to yield significant results.

6. To classify a sector as an KIS we follow Eurostat's glossary and aggregation of NACE sectors (two digit). See [https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Knowledge-intensive_services_\(KIS\)](https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Knowledge-intensive_services_(KIS)) and https://ec.europa.eu/eurostat/cache/metadata/Annexes/htec_esms_an3.pdf.

7. We apply the `xtabond2` command in Stata (Roodman, 2009b).

8. It is acknowledged that the results of the Hansen tests point to possible issues with implausibly perfect p -values of 1.000. The tests are likely weakened by a low ratio between observations available and number of instruments. The complexity in the estimation associated with possible endogeneity and a relatively small sample leads us to stretch the model to its limits.

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