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Labour Market Concentration, Wages and Job Security in Europe[*]

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Abstract

We investigate the impact of labour market concentration on two dimensions of job quality, namely wages and job security. We leverage rich administrative linked employer-employee data from Denmark, France, Germany, Italy, Portugal and Spain in the 2010s to provide the first comparable cross-country evidence in the literature. Controlling for productivity and local product market concentration, we show that the elasticities of wages with respect to labour market concentration are strikingly similar across countries: increasing labour market concentration by 10% reduces wages by 0.19% in Germany, 0.22% in France, 0.25% in Portugal and 0.29% in Denmark. Regarding job security, we find that an increase in labour market concentration by 10% reduces the probability of being hired on a permanent contract by 0.46% in France, 0.51% in Germany and 2.34% in Portugal. While not affecting this probability in Italy and Spain, labour market concentration significantly reduces the probability of being converted to a permanent contract once hired on a temporary one. Our results suggest that considering only the effect of labour market concentration on wages underestimates its overall impact on job quality and hence the resulting welfare loss for workers.

Keywords: labour market concentration, monopsony, wages, job security, fixed term contracts

JEL Codes: J31, J41, J42

Introduction

Recent years have seen a renewed interest in the issue of monopsonistic competition in the labour market, both among academics (see e.g. Manning, 2003, 2021, and the special issues of the *Journal of Labor Economics*, 2010, and the *Journal of Human Resources*, 2022)[2] and among policy-makers.[3] An important source of monopsony power is, of course, labour market concentration since when there are fewer employers in a market, it is more difficult for workers to find suitable outside options.[4]

A recent literature has estimated the impact of local labour market competition on wages, both in the United States (Arnold, 2021; Schubert et al., 2021; Azar et al., 2022; Rinz, 2022; Benmelech et al., 2022) and in other countries (Martins, 2018; Abel et al., 2018; Dodini et al., 2020; Marinescu et al., 2021; Bassanini et al., 2021; OECD, 2021; Popp, 2021). However, due to heterogeneity in the definition of local labour markets and in the resulting measures of concentration, and to differences in specifications, the estimated elasticities are hardly comparable across studies.

Moreover, this strand of research only considers the impact of labour market concentration on wages.[5] However, there is broad evidence in the literature that workers also value non-wage job attributes and that they may be willing to trade off wages for other dimensions of job quality (Mas and Pallais, 2017; Taber and Vejlin, 2020 and Kesternich et al., 2021). If offering high-quality jobs is costly, employers enjoying monopsony power are likely to offer poorer non-wage attributes – see e.g. Manning (2003). Hence, considering only the wage effects of labour market concentration is likely to underestimate its true cost for workers.

This paper addresses these two limitations by providing comparable evidence of the effects of labour market concentration in six European countries and by considering how such concentration affects not only wages, but also one key dimension of job quality, namely job security. To do so, we leverage rich, administrative linked employer-employee data from

[2] *Journal of Labor Economics*, 28(2), April 2010 and *Journal of Human Resources*, 57(S), April 2022.

[3] See the US Horizontal Merger Guidelines, 2010 (https://www.justice.gov/atr/horizontal-merger-guidelines-08192010), and its revised version in preparation (https://www.justice.gov/opa/press-release/file/1463566/download), the US Antitrust Guidance for Human Resource Professionals, 2016 (https://www.justice.gov/atr/file/903511/download), and M. Vestager's speech on *A new era of cartel enforcement* in October 2021 (https://ec.europa.eu/commission/commissioners/2019-2024/vestager/announcements/speech-evp-m-vestager-italian-antitrust-association-annual-conference-new-era-cartel-enforcement_en).

[4] Jarosch et al. (2019) show that concentration affects wages by changing workers' outside options in a search and matching model with granular search. Concentration is also positively associated to monopsony power in a static Cournot model of the labour market (see e.g. Boal and Ransom, 1997) as well as in models with idiosyncratic preferences and cross-firm heterogeneity concerning job amenities (Manning and Petrongolo, 2022).

[5] Two notable exceptions are Qiu and Sojourner (2019) and Meiselbach et al. (2022) – see below.

Denmark, France, Germany, Italy, Portugal and Spain in the 2010s. We build comparable measures of concentration, by computing Herfindahl-Hirschman indexes for new hires in local labour markets, defined as a combination of 4-digit occupations and functional areas. The latter are characterised as the union of all Eurostat functional urban areas (FUAs) – corresponding to a city and its catchment area – and all NUTS-3 regions[6] in which at least 70% of municipalities are not part of a FUA. As a robustness check, we also use FUAs only and, alternatively, NUTS-3 regions to build two other measures of local labour market concentration.

We have information on wages in Denmark, France, Germany and Portugal. We first investigate the impact of labour market concentration on daily wages of full-time workers. Our specification includes individual fixed effects along with time-varying individual characteristics. Since it is crucial to properly control for product market concentration and establishment-level productivity, we follow Bassanini et al. (2021) and include firm-by-municipality-by-year fixed effects in our regressions. These capture productivity at a very disaggregate level, as well as concentration in local product markets, two key confounders of labour market concentration. To address the endogeneity of concentration, we use the standard leave-one-out instrument employed, among others, by Azar et al. (2022), Rinz (2022) and Marinescu et al. (2021). We discuss the identifying assumptions, highlight their limitations and show that our results are robust to large violations of these assumptions. Despite the heterogeneity of labour market institutions across the countries we study, the elasticities we estimate are strikingly similar, ranging from -0.019 in Germany to -0.022 in France, -0.025 in Portugal and -0.029 in Denmark. They imply that increasing labour market concentration by one standard deviation from the mean reduces daily wages by 3% in Denmark, 2.4% in France, 2.1% in Germany and 2.5% in Portugal. Using hourly wages of either full-timers or all employees, in countries where they are available, yields very similar results. Interestingly, when considering separately new hires and incumbent workers, we find a negative effect of labour market concentration on daily wages of full-timers for both groups. This indicates that reduced outside options not only affect the bargaining power of workers at the time of hiring, but also that of incumbents (or their representatives, e.g. trade unions) when negotiating pay raises and/or promotions.

[6] The NUTS classification (Nomenclature of territorial units for statistics) is a hierarchical system for dividing up the economic territory of the EU and the UK for the purpose of collection, development and harmonisation of European regional statistics. NUTS-3 is the most disaggregate level of this classification.

As a second step, we consider the impact of labour market concentration on job security, as proxied by employment contract type (permanent vs. temporary).[7] Information on the type of contract at the time of hiring is available – or can be reconstructed – in all our countries except Denmark. We therefore estimate the effect of the Herfindahl-Hirschman index in a local labour market on the probability of being hired on a permanent rather than a temporary contract. In Italy and Spain, we also know whether individuals hired on a temporary contract at year *t* have been converted to a permanent contract by the end of the following calendar year. This allows us to estimate how labour market concentration affects conversions from temporary to permanent contracts. We find that higher labour market concentration reduces the probability of being hired on a permanent contract in France, Germany and Portugal. The corresponding elasticities are as large as -0.046, -0.051 and -0.234,[8] respectively, i.e. more than twice as large as those estimated for wages. This implies that increasing the HHI by one standard deviation from the mean reduces the probability of being hired on a permanent contract by 5% in France, 6% in Germany and 24% in Portugal. We do not find the same effect in Italy and Spain where the impact of labour market concentration on the type of contract of new hires is not significant at conventional levels. However, in both countries, labour market concentration strongly affects the probability of being converted from a temporary to a permanent contract in the first year following hiring: the elasticity of conversions with respect to labour market concentration is as large as -0.241 in Italy and -0.068 in Spain. Increasing labour market concentration by one standard deviation from the mean therefore reduces the probability of conversion by 28% in Italy and 8% in Spain. This suggests that when firms have some monopsony power, the cost for workers materialises in various dimensions of job quality: not only in the form of lower wages, but also in terms of poorer job security.

Finally, we investigate the differential effect of labour market concentration on wages and job security, by age and gender. We do not find any systematic difference across groups: the effect of labour market concentration on wages and on the probability of being hired on – or converted to – a permanent contract is stronger for youth in some countries, but the opposite holds in others. The same goes for women with respect to men. Moreover, in most countries, confidence intervals of the estimates for the two age and gender groups overlap, thus preventing us from detecting any systematic pattern in the results.

[7] This measure of job security is consistent with evidence provided by OECD (2014) suggesting that, in European countries, people employed on temporary contracts perceive a much higher risk of losing their job within the next six months than people employed on permanent contracts.
[8] Elasticities are computed at sample average, unless otherwise indicated.

Our paper contributes to the literature on labour market concentration and wages by providing estimates for four European countries. To the best of our knowledge, this paper is the first providing comparable estimates across countries.[9] We do so by controlling for productivity and product market concentration at a very disaggregate level. The closest papers to ours are Benmelech et al. (2022), who control for establishment-level productivity and concentration in the national product market of the firm, and Marinescu et al. (2021), who control for local product market competition and firm-level productivity using observables. By including firm-by-municipality-by-year fixed effects, we control both for establishment-level productivity and concentration in local product markets, which are both likely to be correlated with local labour market concentration and wages.

We also contribute to the surprisingly small literature focusing on the impact of labour market concentration on non-wage job attributes. To our knowledge, the only two papers doing so are Qiu and Sojourner (2019) and Meiselbach et al. (2022) who find a negative effect of concentration on employer-provided health insurance in the United States. We consider another dimension of job quality, namely job security, and show that higher labour market concentration reduces the probability of being hired on a permanent contract or converted to such a contract in the course of the first year of employment. This finding holds in the five countries of our sample for which the analysis can be conducted. It suggests that considering only the effect of labour market concentration on wages underestimates its overall impact on job quality and hence the resulting welfare loss for workers.

The remainder of the paper is organised as follows. Section 1 presents the data and some descriptive statistics. Section 2 lays out our empirical specification. Section 3 presents the results and Section 4 concludes.

1. The Data

Data sources

We use near-universe national administrative data for Denmark, France, Germany, Italy, Portugal and Spain – see Appendix F for a detailed description of each dataset. We drop agriculture and industries where the public administration is dominant.[10] We exclude self-

[9] OECD (2021) estimates wage elasticities for six countries. However, as acknowledged in the study itself, the confidence intervals are so large that they do not allow country-by-country comparisons. Country-specific estimates are therefore only used to derive an average cross-country elasticity.
[10] In practice, we keep NACE Rev.2 industries ranging from 05 to 82 as well as 90 and 92 to 96.

employed and household employees and only keep workers with at least 1 month of tenure with their current employer.

The structure of the data varies across countries. In Germany and France, we observe all job matches (i.e. an employee matched with an employer) during the year, but not contract changes within a job match.[11] In Denmark and Portugal, we only observe job matches at one month of the year, namely October for Portugal and November for Denmark. In Italy and Spain, our observations are contracts rather than job matches. In Italy, we have information on the start and end dates of each contract during the year, while in Spain we only have information on the start date. Sample periods are also slightly different across countries: 2010-2018 for Denmark, 2009-2017 for France, 2012-2018 for Germany and Italy, 2010-2019 for Portugal and 2010-2017 for Spain.

Labour Market Concentration

A local labour market $l = (o, z)$ is defined as the intersection between an occupation o and a geographical area z. Denoting with E the total number of employers hiring in each market, we measure concentration by a Herfindahl-Hirschman index (HHI):

$$HHI_{l,t} = \sum_{e=1}^{E} s_{e,l,t}^2$$

where $s_{e,l,t}$ is the share of employer e in the total number of hirings (H) in local labour market l at time t:

$$s_{e,l,t} = \frac{H_{e,l,t}}{\sum_{m=1}^{E} H_{m,l,t}}$$

In Italy and Germany, all establishments of a given firm located in a given municipality are reported in the data as a single establishment. Moreover, in Germany, the data do not allow identifying firms, but only establishments, i.e. firm*municipality couples. In order to harmonise our units of observation across countries, we define an employer as being composed of all the establishments belonging to a given firm and located in a given municipality. Using this firm*municipality concept, by definition we only have single-establishment employers in Italy and Germany, while in other countries employers may be composed of several establishments, all located in the same municipality. We show in Appendix Figure B.1 that, in countries where

[11] In particular, we do not observe conversions from temporary to permanent contracts.

we can also use a more standard definition of employers based on firm rather than firm*municipality, the resulting HHIs are strongly correlated with one another.[12] Moreover, in each country, regressing one HHI on the other yields point estimates close to 1, which suggests that they can be used interchangeably and that the estimation error we make by using a firm*municipality concept is small.[13] As an additional proof of this point, in countries where this is feasible, we run a robustness check using the firm – rather than firm*municipality – concept to construct the HHI. In the remainder of the paper, f will index a firm*municipality.[14]

New hires are defined as individuals who are in a firm*municipality at time t and were not there at $t-1$. Since the precise definition varies slightly across countries,[15] we show in Appendix Figure B.2 that, in countries where more than one definition of new hires can be used, the resulting HHIs are, here again, strongly correlated with one another[16] and that regressing

[12] When an employer is defined as the firm instead of the firm*municipality couple, the hiring shares are defined as the ratio of the number of new hires of the firm in the local labour market to the total number of new hires in that market. However, all transfers are excluded when computing the number of new hires, including those coming from other establishments of the same firm located in other geographical areas. Correlation coefficients between $log(HHI)$ based on firm*municipality and $log(HHI)$ based on firm identifiers are 0.87 for Denmark, 0.95 for France, 0.98 for Italy, 0.96 for Portugal and 0.95 for Spain.

[13] The point estimates of the regressions of $log(HHI)$ based on firm*municipality on $log(HHI)$ based on firm identifiers are 0.880 for Denmark, 1.003 for France, 1.017 for Italy, 1.008 for Portugal and 0.981 for Spain.

[14] Municipalities are of different sizes across countries. France has the smallest ones (with an average population of 1,751 individuals per municipality) while Denmark and Portugal have the largest ones (59,402 and 32,968 individuals per municipality, respectively). One could therefore worry that HHIs computed based on firm*municipality identifiers will not be comparable. In French data, we also know in which *cantons* and in which *intercommunalités* firms are located. *Cantons* and *intercommunalités* are geographical units larger than French municipalities but of comparable size to Portuguese and Danish municipalities (with an average population of 33,579 individuals in *cantons* and 53,497 individuals in *intercommunalités*). We show in Appendix Figure A.1 that HHIs based on firm*municipality and on firm**canton* or firm**intercommunalité* identifiers are approximatively superposed. Moreover, we run robustness checks using firm**canton* and firm**intercommunalité* (rather than firm*municipality) identifiers and show that our results are unchanged.

[15] In France, Germany and Italy a new hire is defined as an individual who is employed in a firm*municipality (with at least 1 month of tenure) at year t and was not employed in the same firm*municipality at $t-1$. In Denmark, new hires are defined as employees who are employed in a firm*municipality in November of year t (with at least 1 month of tenure by the end of the month) and were hired between December of year $t-1$ and October of year t. In Portugal, new hires are defined as employees who are employed in a firm*municipality in October of year t and were hired between November of year $t-1$ and August of year t. In Spain, new hires are employees who started a contract (whose expected duration was at least 1 month) at year t and did not start a contract in the previous 12 months with the same employer.

[16] In France, Germany and Italy, in the main specification new hires are defined as workers who are employed for at least 1 month at the firm*municipality in year t and were not employed there in year $t-1$. As a robustness check, in these countries we can alternatively define new hires using a month*year concept, i.e. as workers who are employed at the firm*municipality in month m of year t (with tenure being at least 1 month) and were not employed by the same employer in the same month of year $t-1$. The reference month m chosen for this exercise is December in Germany and November in France and Italy. Correlation coefficients between $log(HHI)$ computed for new hires defined on the basis of a month*year concept and $log(HHI)$ computed for new hires defined on the basis of a year concept are 0.99 for France and Germany and 0.97 for Italy.

one on the other yields point estimates close to 1.[17]

We build three alternative HHIs, based on three types of geographical areas z. The first one is the Functional Urban Areas (FUAs) defined by Eurostat. A FUA consists of a city and its catchment area, i.e. a commuting zone whose labour market is highly integrated with the city (OECD, 2012; Dijkstra et al., 2019). FUAs are constructed using the same algorithm in all countries and hence provide a harmonised definition of cities and their areas of influence in international perspective.[18] The second type of geographical areas we consider are NUTS-3 regions.[19] Their main advantage over FUAs is that they cover the entire territory of each country and not only urban areas. In contrast, an important drawback of this concept is that it does not take into account the fact that catchment areas of cities often go beyond the borders of NUTS-3 regions. To overcome this limitation but still include rural areas in our analysis, we consider a third type of geographical area, based on a mix of FUAs and rural NUTS-3 – to which we refer as Functional Areas (FAs), hereafter. More specifically, we consider the inclusion of all FUAs and all NUTS-3 regions (excluding the municipalities that are part of a FUA) in which at least 70% of municipalities are not part of a FUA. Using these three types of geographical areas z, we build three different HHIs for each local labour market $l = (o, z)$ where occupations o are 4-digit categories. Our preferred results are obtained using measures of labour market concentration based on FAs, but we also run robustness tests using measures based alternatively on FUAs and NUTS-3 regions.

Table 1 provides the distribution of country-specific HHIs based on FAs and weighted by the number of new hires. The level and distribution of labour market concentration appear to be rather similar across the six countries we consider despite their different industrial structures and labour market institutions. More than 75% of the new hires are employed in local labour markets with an HHI below 0.15, the threshold for moderate concentration defined by the US Antitrust Authorities. Moreover, the 90th percentile of the HHI distribution is higher than 0.25 – the threshold for high concentration – in only one country, i.e. Portugal. These measures of concentration could be affected by our definition of employers which relies on a firm-by-

[17] The point estimates obtained when regressing $log(HHI)$ computed for new hires defined on the basis of a month*year concept on $log(HHI)$ computed for new hires defined on the basis of a year concept are 1.005 for France, 0.992 for Germany and 0.945 for Italy.

[18] FUAs have been used by Ascheri et al. (2021) to characterise labour market concentration in European urban areas.

[19] In Portugal, we use districts (*distritos*) instead of NUTS-3 regions since the latter are smaller than in other countries while the former are of comparable size. In Germany, a few NUTS-3 regions are composed of single urban municipalities which are enclaves of other NUTS-3 regions. When this is the case, we merge the enclave with the surrounding region to increase cross-country comparability.

municipality concept. As mentioned above, in all countries except Germany, we can recompute the HHI distribution based on the classic firm concept which aggregates all establishments of the same firm, whatever the municipality they are located in. When doing so, labour market concentration does not increase substantially: it is still the case that in all countries less than 25% of the new hires are employed in a local labour market with an HHI higher than 0.15, and that the 90th percentile of the HHI distribution is below 0.25 everywhere except in Portugal.[20]

Dependent and control variables

We have information on wages for Denmark, France, Germany and Portugal. Monthly wages are available for Denmark and Portugal, while annual wages are available for France and Germany. In Denmark and France, we have information on the number of days of employment with each employer and the number of hours worked. German data only report the number of days of employment and Portuguese data only have the number of hours worked. So, we construct monthly wages for Portugal, daily wages for Denmark, France and Germany, and hourly wages for Denmark, France and Portugal. To ensure that our results on monthly and daily wages are not affected by the incidence of short part-time employment, we restrict our sample to full-time workers. For the sake of comparability, we also do so when using hourly wages, although in this case we also run additional estimates on the whole population of full- and part-timers. Whatever our measure of wages (either monthly, daily or hourly) we trim the top and bottom 1% of the distribution.

Information on the type of contract upon hiring (permanent vs temporary) is available in all countries except Denmark and Portugal. In Portugal, however, we observe the type of contract of workers employed in October of each year and we know the month in which they were hired. We therefore approximate the contract type at the time of hiring by the contract type observed in October of each year, for the subsample of employees hired in June, July and August of that year. These indeed have at least 1 month of tenure – see above – and have been hired sufficiently recently to have a high probability of being still employed on the type of contract on which they were hired.[21] For France, Germany, Italy, Spain and Portugal, we then define a dummy variable equal to 1 if the individual is hired on a permanent contract and 0 if hired on a temporary contract. In Italy and Spain, the nature of the data also allows identifying conversions from

[20] In this case, the 75th (resp. 90th) percentiles of the HHI distribution are 0.0718 (resp. 0.1667) in Denmark, 0.0750 (resp. 0.2088) in France, 0.0597 (resp. 0.1822) in Italy, 0.1024 (resp. 0.2802) in Portugal and 0.0795 (resp. 0.2222) in Spain.

[21] See Cahuc et al. (2022) for a recent analysis of temporary contracts in Portugal using the same dataset.

temporary to permanent contracts. We define a dummy variable for conversion that is equal to 1 if the individual was hired on a temporary contract at year *t* and started a permanent employment spell with the same employer by the end of the following calendar year, and 0 otherwise.

Our data also contain information on individuals' age, gender and education – grouped in four categories: less than upper secondary education, upper secondary, more than upper secondary education and a category for missing values since in some countries the information on education is missing for a substantial number of employees.[22] We also know whether individuals work part time or full time and in which industry they are employed. For new hires, we also know whether they were in employment the year before.[23]

Although our measures of labour market concentration are constructed using the entire population, the regressions are conducted on random subsamples of the population in three out of six countries.[24] Descriptive statistics of our data are provided in Appendix Table C.1. Unsurprisingly, (monthly, daily and hourly) wages of full-timers are lower for new hires than in the whole working population, in all countries. Women represent about 40% of new hires and this share is quite homogeneous across countries – 40% in Denmark, 42% in France, 44% in Germany, 38% in Italy, 45% in Portugal, and 41% in Spain. Workers in our full samples are about 40 years old on average. New hires are somewhat younger with a mean age ranging from 33 in Denmark and France, to 34 in Spain and 36 in Germany, Italy and Portugal. Full-timers represent a vast majority of the workforce, ranging from 93% in Portugal to 79% in Denmark, 72% in France and 64% in Germany. The distribution of educational levels (computed excluding missing values) varies substantially across countries. In Germany, 70% of the workers have upper secondary education while only 16% have attended higher education. In contrast, in France (resp. Denmark) 45% (resp. 36%) of the working population has not attained upper secondary education while 33% (resp. 40%) has some higher education. In Portugal, the educational level of the workforce is overall lower with 53% of the workers having less than upper secondary education and 28% having no more than high-school education. Finally, the

[22] The number of missing values is particularly large in France since the administrative data on which we run our estimates (DADS) do not contain information on education. To retrieve it, we match these data with a reduced random sample of individuals (*Echantillon Démographique Permanent*). The resulting missing variables are therefore independent from any individual characteristic.

[23] In the case of Spain, we do not know whether the year before the worker was employed but we know whether the worker started a contract. Hence, for Spain, this variable will replace the dummy "employed in the year before" in all the specifications in which the latter is used as a control variable.

[24] The full population is used in Denmark, Italy and Portugal. To save computational time, random subsamples of the population are used in Germany (10% of the population) and Spain (15%). In France, panel data are available only for a random subsample covering one twelfth of the population (see Appendix F.2).

proportion of new hires on permanent contracts also varies a lot across countries from 67% in Germany to 44% in France, 41% in Portugal, 32% in Italy and 16% in Spain. The dual nature of the Spanish labour market is confirmed by the small rate of conversion from temporary to permanent contracts: only 5.7% in the course of the first year following hiring, as compared to 16% in Italy.

2. Empirical specification

We first estimate the impact of labour market concentration on wages using the following specification:

$$\log(w_{i,j,f,l,s,t}) = \beta \log(HHI_{l,t}) + \gamma X_{i,j,f,l,s,t} + \mu_i + \mu_{ft} + \mu_l + \varepsilon_{i,j,f,l,s,t} \qquad (1)$$

where i indexes the worker, j the establishment, f the firm*municipality, l the local labour market, s the industry and t is the year. w alternatively denotes the daily or hourly wage. HHI is the concentration index computed using firm*municipality identifiers. X is a vector of individual controls including yearly dummies for the worker's age, whether or not the individual is a new hire in the firm and if so, whether or not he/she was in employment the year before. X also includes establishment and/or industry fixed effects when different from firm*municipalities', as well as a dummy variable for working part time vs full time, whenever our regression sample is not restricted to full-timers. Our specification also includes individual and local-labour-market fixed effects (μ_i and μ_l, respectively). Finally firm-by-municipality-by-year fixed effects (μ_{ft}) allow controlling for firm productivity at a very disaggregate level.[25] They also control for both national and local product market competition. The latter is a likely confounder of labour market concentration if firms sell their products mainly on the local market rather than on national or international markets.

We also estimate the impact of labour market concentration on job security. To do so, we restrict our sample to new hires and estimate the following specification:

$$S_{i,j,f,l,s,t} = \beta \log(HHI_{l,t}) + \gamma X_{i,j,f,l,s,t} + \mu_{ft} + \mu_l + \varepsilon_{i,j,f,l,s,t} \qquad (2)$$

where S alternatively denotes a dummy variable equal to 1 when the individual is hired on a permanent contract – 0 otherwise –, or a dummy variable equal to one when the individual was

[25] As, in the countries of our sample, establishments are not accounting centres, no linked employer-employee dataset could be used to measure productivity at a more disaggregate level.

hired on a temporary contract and is converted to a permanent one in the following year – 0 otherwise. In the latter case, the regression sample is restricted to those initially hired on a temporary contract. We do not include individual fixed effects in equation (2) to avoid confining the analysis to individuals who changed job several times over the period under study. Individual heterogeneity is accounted for by augmenting the vector of individual controls X with invariant or quasi-invariant characteristics (gender and education), in addition to the individual's age and a dummy variable for whether or not he/she was in employment the year before. Standard errors are clustered at the local-labour-market-by-year level for all estimates.

In this set-up, identification may be under threat if an omitted time-varying variable is correlated with both the HHI and our dependent variables. This may happen if positive or negative shocks to local labour supply affect both the wage (and/or the contract type) workers are willing to accept, and the number of firms that find it attractive to operate in the local labour market. Similarly, shocks to local infrastructures may affect labour demand – hence concentration – and wages (and/or contract type through e.g. a compensating wage differential mechanism). As standard in the literature – see e.g. Marinescu et al. (2021), Azar et al. (2022), and Rinz (2022) – we tackle this issue by using a leave-one-out instrumental variable strategy. We instrument $\log(HHI)$ in local labor market $l = (o, z)$ at time t with the average of $\log(1/N_{o,z',t})$, where $N_{o,z',t}$ is the number of firms with a positive number of hires in all other geographical areas z' for the same occupation o and time period t.[26] Following this standard instrumental variable strategy enhances the comparability of our estimates with the rest of the literature. We discuss the identifying assumptions and tackle the limitations of the instrument in the next section.

3. Results

Labour market concentration and wages

We first estimate the impact of labour market concentration on daily wages of full-timers in Denmark, France, Germany and Portugal. IV estimates are presented in Table 2.[27] As shown by the values of the F-statistics, the instrument is strongly correlated with labour market

[26] Instrumenting a variable in one zone using the average of this variable in other zones (i.e. a Hausman or leave-one-out instrument) is standard in international economics and industrial organisation – see e.g. Hausman et al. (1994), Autor et al. (2013), Bai et al. (2017) and Azar et al. (2019).

[27] The OLS estimates are provided in Appendix Table C.2. The point estimates are negative, but much smaller than those obtained when instrumenting labour market concentration. This suggests that they are possibly upward biased.

concentration in all countries. The F-statistic is lower in Portugal and Denmark than in Germany and France[28] but remains higher than the critical threshold of 10 in all countries. The point estimates of the coefficient on labour market concentration are strikingly similar across the four countries, ranging from -0.019 in Germany to -0.022 in France, -0.025 in Portugal and -0.029 in Denmark, all significant at the 1% level. Since we found similar HHI distributions across countries – see Table 1 –, this implies that the effective range of wage variation induced by labour market concentration is also very similar across the countries we cover. In fact, increasing labour market concentration by one standard deviation from the mean reduces daily wages by 3% in Denmark, 2.4% in France, 2.1% in Germany and 2.5% in Portugal.

Our findings are consistent with what has been found in the existing literature for the countries considered here. For France, Marinescu et al. (2021) and Bassanini et al. (2021) find an elasticity of -0.020 and -0.024, respectively, using a similar specification but a different definition of local labour markets (based on commuting zones rather than functional areas).[29] For Portugal, Martins (2018) reports a point estimate of -0.028 using districts instead of functional areas, considering an earlier period, and controlling for firm instead of firm-by-municipality-by-year fixed effects. For Germany, Popp (2021) finds a larger elasticity (-0.043) using however a very different specification from ours. His data are at the establishment rather than individual level, local labour markets are defined based on industries-by-commuting zones rather than on occupations-by-functional areas, and he uses a different set of fixed effects. As regards estimates for the United States, our elasticities are lower than those reported by Qiu and Sojourner (2019) and Azar et al. (2022) but they are in the ballpark of those reported by Schubert et al. (2021), Rinz (2022) and Benmelech et al. (2022), the latter being the only US study fully controlling for productivity and product market competition as we do.

Our instrument for $\log(HHI_{l,t})$ being the average of $\log(1/N_{o,z',t})$ in all other geographical areas z' for the same occupation o and time period t, it provides a source of variation in labour market concentration based on national rather than local changes in the occupation we consider. If changes in an occupation result, for example, from mergers and divestitures of large national companies, they will likely affect concentration in the local labour markets where these companies are present, without being correlated to idiosyncratic shocks in these markets. This would make our instrument valid. However, one could worry that variations in the instrument

[28] This is likely due to the smaller country size of Denmark and Portugal which implies a smaller number of functional areas in these countries.
[29] Marinescu et al. (2021) restrict their sample to new hires only.

may also capture national trends in supply and demand which could also affect our dependent variables. To alleviate this concern, we proceed in the following way. First, we augment equations (1) and (2) by including the share of each 4-digit occupation in new hires at the national level to capture occupation-specific national trends in labour supply and demand. One caveat is that the potential endogeneity of this variable could bias the estimates of the effect of $\log(HHI_{l,t})$, even in the IV specification. However, if our instrument were strongly affected by national trends in supply and demand, we would expect that the introduction of the share of each 4-digit occupation in new hires should substantially modify our estimates. As shown in Table D.1, this is not the case in France, Germany and Portugal where the wage elasticities are very similar to those presented in Table 1, ranging from -0.021 in France to -0.022 in Portugal and -0.025 in Germany. In Denmark, controlling for 4-digit occupational shares in new hires at the national level lowers the magnitude of the point estimate from -0.029 to -0.013, although the coefficient remains statistically significant. This suggests that, in this country, the instrument may partly capture national trends in labour supply and demand. In contrast, in France, Germany and Portugal, the violation of exogeneity of the instrument, if any, is likely to be small.

As a second step, we quantify the exogeneity violation that our models may tolerate using the plausibly exogenous instrument regression method proposed by Conley et al. (2012). We consider the following model, in which the instrument (*Z*) is not fully exogenous and therefore may have a direct effect on the dependent variable:

$$Y_{i,j,f,l,s,t} = \beta \log(HHI_{l,t}) + \gamma Z_{l,t} + \delta C_{i,j,f,l,s,t} + \varepsilon_{i,j,f,l,s,t} \quad (3)$$

where *Y* is the outcome variable and *C* is the vector of controls including fixed effects.

If the true value of γ – denoted by γ^* – were known, *Z* would be a valid instrument in the following equation (i.e. it would no longer be correlated with the error term):

$$Y_{i,j,f,l,s,t} - \gamma^* Z_{l,t} = \beta \log(HHI_{l,t}) + \delta C_{i,j,f,l,s,t} + \varepsilon_{i,j,f,l,s,t} \quad (4)$$

In practice, the direct effect of *Z* is unknown, but we can still determine how large it should be to make the coefficient of interest, β, insignificant. This is done in two steps. First, we estimate the following reduced form equation by OLS:

$$Y_{i,j,f,l,s,t} = \alpha Z_{l,t} + \delta C_{i,j,f,l,s,t} + u_{i,j,f,l,s,t} \quad (5)$$

where u is a standard disturbance term. Second, we take 0 as the upper bound of the support of γ. We then consider decreasing potential values of γ^* one-by-one, take them as given and

estimate equation (4) by 2SLS, instrumenting $\log(HHI)$ with Z and storing confidence intervals for β at every step. This allows us to determine the lowest value of γ^* that would still make β significant at the 10% level. We can then express it in percentage of the reduced-form effect α, as estimated in equation (5). This ratio provides an order of magnitude of the violation of instrument exogeneity that would be required to make β insignificant.

As evidenced in Table E.1, our IV estimates are robust to large violations of exogeneity of the instrument: β would still be significant at the 10% level if the direct effect of the instrument on wages were as large as 87% of the reduced-form estimate in France, 80% in Germany and 57% in Portugal. We consider such large violations as unlikely given the stability of our estimates when controlling for the 4-digit national occupational shares in new hires. In Denmark, our estimate is robust to violations of exogeneity as large as 74% of the effect obtained with the reduced form, which still allows us to draw conclusions – although cautiously – from our findings.

For the sake of cross-country comparability, we measure labour market concentration using a firm*municipality concept, i.e. considering that an employer is composed of all its establishments located in a given municipality – see Section 1 above.[30] Since this definition is not quite standard in the literature, for countries in which we can identify establishments and aggregate them nationwide into firms, we re-run our estimates using this more standard definition of employers. The results are presented in Appendix Table C.3. The elasticity of wages with respect to labour market concentration is similar to that estimated in Table 1 for France (-0.024) and Portugal (-0.021). It is even larger for Denmark (-0.051), although less precisely estimated. This suggests that our main results are not driven by the specificity of the employer concept that we use.

Our estimates could also be sensitive to the definition of local labour markets based on functional areas. Appendix Tables C.4 and C.5 provide robustness checks using alternatively FUAs and NUTS-3 regions to define local labour markets. The results are stable, thus suggesting that the choice of functional areas does not affect our findings in a major way.[31]

[30] We show in Appendix Table A.1 that, for the only country where we can do so, i.e. France, our results are unchanged when measuring labour market concentration using an HHI based on firm*_canton_ or firm*_intercommunalité_ (i.e. larger administrative areas) rather than on firm*municipality identifiers.

[31] When using _districts_ instead of functional areas in Portugal – Table C.5 –, the first stage becomes relatively weak and the point estimate is lower and noisier. It still remains within one standard deviation off the estimate presented in Table 2 but it is no longer significant at conventional levels.

For a subset of countries, we can compute hourly wages, in addition to daily wages. Estimating the impact of labour market concentration on the former yields similar results to those obtained with daily wages. When the sample is restricted to full-timers only – see Table 3 - Panel A – point estimates range from -0.016 in France to -0.023 in Portugal and -0.033 in Denmark. Using hourly wages also allows considering the entire population of salaried workers and not only full-timers, since the results are immune from any bias due to short part-time work. The corresponding results are shown in Panel B of Table 3. The elasticities we find are extremely close to those estimated for full-timers – -0.014 for France, -0.024 for Portugal and -0.026 for Denmark – thereby suggesting that restricting our sample to full-timers when considering daily wages does not substantially affect our results.

The impact of labour market concentration on wages that we have estimated so far is the aggregation of the impact on two different groups of employees: those who have been hired over the past year (the new hires) and those who were already employed in the firm the year before (the incumbents). The literature conjectures that the depressing effect of labour market concentration on wages could be larger for new hires since they are more sensitive to market conditions – Haefke et al. (2013); Kudlyak (2014); Marinescu et al. (2021). To investigate this potential source of heterogeneity in the effect of labour market concentration, we re-run our regressions interacting $log(HHI)$ with two dummy variables, for new hires and incumbents, separately. Results are reported in Table 4. In all countries, we do find that labour market concentration negatively affects daily wages of newly hired full-timers. But we also find a negative effect on incumbents' wages with elasticities ranging from -0.020 in Germany to -0.022 in France, -0.025 in Portugal and -0.028 in Denmark – all significant at the 1% level.[32] This is consistent with results from Arnold (2021), Thoresson (2021) and Bassanini et al. (2021), which suggest that labour market concentration generates downward pressure on incumbents' earnings, too. The estimates reported in Table 4 suggest that the negative effect of labour market concentration on wages is stronger for new hires than for incumbents in Denmark and France, but not in Germany and Portugal, pointing to the absence of a universally applicable pattern. This finding is also consistent with a recent literature showing that the wages of new hires are actually no more flexible than those of job stayers (see Grigsby et al., 2021).

[32] One could worry that the effect we find on incumbents could actually be due to the downward pressure exerted by labour market concentration on wages at the time of hiring which would persist over time. Yet, using a specification very similar to ours, Bassanini et al. (2021) show that the effect they estimate on French incumbents remains remarkably stable when controlling for a spell fixed effect, thereby netting out the effect of labour market concentration at the time of hiring.

Labour market concentration and job security

As a second step, we investigate the impact of labour market concentration on a second job attribute, i.e. job security. First, we capture it with the probability of an individual to be hired on a permanent rather than temporary contract. To do so, we restrict our samples to new hires.[33] To avoid identifying the effect only on individuals who changed job several times over our relatively short time period, we do not include individual fixed effects. We control for individual heterogeneity in the best way we can, by adding gender and education to our vector of covariates. As shown in Table 5, our IV estimates[34] suggest that a higher level of concentration in the local labour market significantly reduces the probability of new workers to be hired on a permanent rather than a temporary contract, both in France and Germany.[35] When computed at sample average, the corresponding elasticities[36] are large: -0.046 (resp. -0.051) for France (resp. Germany). In Portugal, the effect of labour market concentration is significant only at the 11% level.[37] However, the elasticity of the probability of being hired on a permanent contract is very large: -0.234, at sample average. Taking into account the distributions of HHIs, these estimates imply that increasing the HHI by one standard deviation from the mean reduces the probability of being hired on a permanent contract by 5% in France, 6% in Germany and 24% in Portugal.

In contrast, labour market concentration does not seem to affect the probability of being hired on a permanent contract in a noticeable way either in Italy or in Spain. This is likely due to the fact that, in these countries, most workers are anyway hired on temporary contracts. Therefore, there is not much room for increasing the probability of being hired on a temporary contract

[33] We do not investigate the effect of labour market concentration on the probability of being *employed* on a permanent contract separately for new hires and incumbents. The reason for not doing so is that, for incumbents, being on a permanent contract is generally an absorbing state, so that our model – see equation (2) – would be mis-specified.

[34] The corresponding OLS estimates are provided in Appendix Table C.6.

[35] We show in Appendix Table A.2 that, for the only country where we can do so, i.e. France, our results are unchanged when measuring labour market concentration using an HHI based on firm**canton* or firm**intercommunalité* (i.e. larger administrative areas) rather than on firm*municipality identifiers.

[36] Elasticities are computed by dividing the point estimate by the average incidence of permanent contracts among new hires – see Table C.1.

[37] Robustness checks on the instrument are provided in Appendix Tables D.2 and E.2 for the countries where the point estimates on $\log(HHI)$ are statistically significant in Table 5. When controlling for the share of 4-digit occupations in new hires at the national level, the point estimates are of smaller magnitude in France and Portugal, but they are still within the confidence intervals of the baseline estimates. Moreover, as shown in Table E.2, in France – and Germany – the results are robust to large violations of exogeneity. This test would not be meaningful for Portugal since the baseline results are significant only at the 11% level. Appendix Tables C.7, C.8 and C.9 provide robustness checks conducted using firm (instead of firm*municipality) identifiers and FUAs and NUTS-3 respectively (instead of functional areas) when computing HHIs. The robustness checks confirm the negative estimates for France and Germany, but yield somewhat noisy results for Portugal.

even when local labour markets become more concentrated.[38] This does not mean, however, that concentration in the labour market does not affect job security. In Table 6, we provide IV estimates of the effect of $\log(HHI)$ on the probability that an employee hired on a temporary contract at year t be converted to a permanent contract by the end of the following calendar year.[39] Our findings suggest that in local labour markets where concentration is higher, the probability of conversion to a permanent contract is indeed significantly lower with an elasticity of -0.068 in Spain and -0.241 in Italy, when computed at sample average.[40] Increasing labour market concentration by one standard deviation from the mean therefore reduces the probability of conversion by 28% in Italy and 8% in Spain. The estimate for Italy looks large. However, it should be considered with some caution since it is sensitive to the specification we use. When we control for 4-digit occupational shares in new hires at the national level, the point estimate on $\log(HHI)$ is three times lower, narrowing the estimated effect to that of Spain – see Appendix Table D.3. This suggests that the instrument could be partly endogenous. Yet, as shown in Table E.3, our estimate is robust to large violations of exogeneity (66% of the effect estimated in the reduced form), which makes it possible to draw clear, albeit cautious, conclusions from our findings. In Spain, the instrument does not seem to capture national trends in labour supply and demand since the results in Appendix Table D.3 are similar to those presented in Table 6. They are also robust to violations of exogeneity of the instrument as large as 50% of the effect estimated in the reduced form – see Appendix Table E.3. Taken together, the above findings suggest that when most workers are anyway hired on temporary contracts (as in Italy and Spain), the negative effect of labour market concentration on job security materialises through a lower chance of subsequent conversion to a permanent contract, rather than through more precarious conditions at the time of hiring.

Overall, our results provide evidence of a negative effect of labour market concentration on both wages and job security in all the countries we study.

[38] In Italy (resp. Spain), 68.4% (resp. 83.9%) of new hires are on a temporary contract. To the extent that Portugal also has a large proportion of new hires on temporary contracts (78.4%) it is particularly remarkable that we do find a large and borderline significant effect of labour market concentration on the probability for a new hire to be on a permanent rather than temporary contract in this country.

[39] OLS estimates are provided in Appendix Table C.10.

[40] Appendix Tables C.11, C.12 and C.13 provide robustness checks conducted using firm (instead of firm*municipality) identifiers and FUAs and NUTS-3 respectively (instead of functional areas) when computing HHI. These robustness checks confirm our results.

Heterogeneity by gender and age

The evidence presented so far suggests a strong effect of labour market concentration on job quality. This is consistent with the idea that employers who have market power take advantage of it to reduce labour demand in order to lower the cost associated with wages and non-wage attributes. Employers depressing their labour demand may also be expected to become more selective in hiring in a context of asymmetric information on the labour market. In particular, they may prefer job candidates with long work experience since their resume provides a more accurate signal of their productivity. If this is the case, we may expect labour market concentration to be particularly harmful to wages and job security of workers with shorter work experience and, in particular, youth and women.

To test this hypothesis, we interact $\log(HHI)$ separately with dummies for being a man or a woman on the one hand, and with dummies for being younger or older than 25 on the other hand, in equations (1) and (2). The results are presented in Figures 1 and 2.

As evidenced on Figure 1 - Panel A, the effect of labour market concentration on wages appears to be very similar for men and women in Denmark. It is slightly larger for women in France and Portugal, but slightly smaller in Germany, and in both cases confidence intervals at the 90% level largely overlap. The same holds when considering the probability of being hired on a permanent contract: the point estimate on labour market concentration is slightly more negative for women in France, Germany and Italy, but this is not the case in Portugal and Spain, and here again confidence intervals overlap – see Panel B of Figure 1. Finally, in the case of conversions too, no systematic gender difference is uncovered by our analysis – see Figure 1 - Panel C.

Regarding youth, results are very similar. Panel A of Figure 2 points to a more negative effect of labour market concentration on youth's wages in Denmark and France and, to a lower extent in Portugal, but the opposite holds in Germany, and confidence intervals largely overlap in most countries. The same goes for the probability of being hired on a permanent contract – see Panel B: the point estimates on labour market concentration tend to be more negative for youth in France, Germany, Italy and Spain, but this is not the case in Portugal and confidence intervals overlap in all countries. For conversions, differences in the effect by age are small and go in opposite directions for Spain and Italy – see Panel C.

Overall, our findings suggest that there is no systematic difference in the effect of labour market concentration on wages and job security across gender or age. However, this does not mean that

women and youth are exposed to the same degree of monopsony power as men and older adults. It has been shown that women tend to search for jobs closer to their home and are ready to accept a significant wage penalty for a closer job (Le Barbanchon et al., 2020; Jacob et al., 2019). For the same reason, they may also be willing to accept lower job security. Youth may also search closer to their home if they live with their parents and plan to continue doing so. Thus, a given level of concentration will imply fewer acceptable outside options for women and young workers, and therefore lower wages and possibly lower job security.[41] Despite this difference, an increase in labour market concentration by, say, 10% may still have a similar percentage effect on the rarefaction of available alternatives for both men and women on the one hand, and older workers and youth on the other hand, consistent with the pattern of results shown in Figures 1 and 2.

4. Conclusion

This paper contributes to the debate on the effects of labour market concentration on job quality. We leverage rich administrative linked employer-employee data from Denmark, France, Germany, Italy, Portugal and Spain in the 2010s to provide the first comparable cross-country evidence in the literature. First, we show that the distribution of labour market concentration is similar across countries. Second, controlling for productivity and local product market concentration, we show that, despite different labour market institutions, the elasticities of wages with respect to labour market concentration are very similar across countries, ranging from -0.019 in Germany to -0.029 in Denmark. We then consider a second dimension of job quality, i.e. job security. Our results suggest that higher labour market concentration reduces the probability of being hired on a permanent contract in France, Germany and Portugal, with elasticities as large as -0.046, -0.051 and -0.234, respectively, i.e. more than twice as large as the elasticities of wages with respect to labour market concentration. In Italy and Spain, where most workers are anyway hired on temporary contracts, we detect no significant effect of labour market concentration on the probability of being hired on a permanent contract. In contrast, we

[41] In fact, the literature on own-firm-labour-supply elasticity systematically finds lower elasticities for women than for men, thereby suggesting that the former are more exposed to monopsony power than the latter – see Manning (2021).

find that higher concentration significantly reduces the probability of being converted to a permanent contract once hired on a temporary one.

These results suggest that firm monopsony power not only negatively affects wages but also degrades other dimensions of job quality and, in particular, job security. Policy interventions limiting employer concentration and/or its effects are therefore likely to improve labour market outcomes along such dimensions for incumbent workers and new hires. Potential interventions may include enforcement actions by antitrust authorities, such as taking systematically into account labour market outcomes in merger reviews and cracking down on labour market collusion, including on no-poaching and wage-fixing agreements – see e.g. Hovenkamp and Marinescu (2019). On the one hand, evidence suggests that mergers increasing concentration do not need to create dominant employers to have a strong negative effect in the labour market – see e.g. Arnold (2021); Prager and Schmitt (2021). On the other hand, collusion is more likely to occur in concentrated markets, since coordination among few actors is typically easier to sustain – see e.g. Asker and Nocke (2021). Other interventions to compensate the effect of labour market concentration are rather in the realm of labour policy. These include, e.g. direct interventions to facilitate collective bargaining, raising the minimum wage, and policies to improve geographical mobility and training. Labour unions and collective bargaining have indeed been shown to help counterbalance the effect of firm market power in case of monopsonistic competition – see e.g. MaCurdy and Pencavel (1986), Ashenfelter et al. (2010), as well as Dodini et al. (2021) and Benmelech et al. (2022) for recent empirical evidence. Similarly, under monopsonistic competition, the minimum wage may shift down the firm marginal labour cost curve and make it flatter, thereby potentially increasing both wages and labour demand – see e.g. Manning (2003). Finally, enhanced geographical mobility and training would make it easier for workers to look for jobs in different, possibly more competitive, local labour markets – see e.g. OECD (2022). Although all these policies are well on the radar of policy-makers, there is still much scope for improvement along these lines in most European countries.

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Tables

Table 1 – Labour Market Concentration

HHI	Mean	Std Deviation	P25	P50	P75	P90
Denmark	.0587	.1093	.0096	.0216	.0544	.1437
France	.0657	.1297	.0055	.0194	.0604	.1710
Germany	.0591	.1213	.0057	.0171	.0511	.1508
Italy	.0635	.1370	.0046	.0144	.0528	.1642
Portugal	.0957	.1686	.0108	.0311	.0921	.2654
Spain	.0693	.1477	.0051	.0167	.0591	.1776

Note: Herfindahl-Hirschman index based on hiring, computed using firm*municipality identifiers. Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). FAs are defined as FUAs and NUTS-3 regions (excluding the municipalities that are part of a FUA) for which at least 70% of the municipalities are not part of a FUA. Districts instead of NUTS-3 regions are used for Portugal. Statistics are weighted by the number of new hires. Labour market concentration is computed over the following time periods: 2011-2018 for Denmark, 2010-2017 for France, 2013-2018 for Germany and Italy, 2011-2019 for Portugal and 2011-2017 for Spain.

Table 2 – Labour Market Concentration and Daily Wages of Full-Timers – IV estimates.

Dep. Var Daily Wages	Denmark	France	Germany	Portugal
Log HHI	-.029***	-.022***	-.019***	-.025***
	(.007)	(.002)	(.002)	(.009)
KP F Test	32.1	708.9	271.4	14.6
Observations	5,486,000	8,269,375	11,050,435	15,086,998

Note: 2SLS estimates. The dependent variable is log(wage). Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Control variables include yearly dummies for workers' age, whether the individual is a new hire, whether the individual was employed the year before if new hire, as well as individual fixed effects, firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other FAs for the same occupation. Monthly wages instead of daily wages are used for Portugal. Standard errors are clustered at the labour-market-by-year level. KP F Test: Kleibergen-Paap Wald F Test. *** p<0.01, ** p<0.05, * p<0.1.

Table 3 – Labour Market Concentration and Hourly Wages – IV estimates.

Dep. Var Hourly Wages	Denmark	France	Portugal
	Panel A. Full-Timers		
Log HHI	-.033***	-.016***	-.023***
	(.008)	(.002)	(.008)
KP F Test	29.1	721.3	13.9
Observations	5,989,967	8,233,169	14,678,273
	Panel B. All employees		
Log HHI	-.026***	-.014***	-.024***
	(.005)	(.002)	(.008)
KP F Test	46.7	891.5	15.3
Observations	8,552,216	11,435,329	16,227,766

Note: 2SLS estimates. The dependent variable is log(wage). Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Control variables include yearly dummies for workers' age, whether the individual is a new hire, whether the individual was employed the year before if new hire, as well as individual fixed effects, firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. In Panel B, controls also include a dummy variable for whether the individual works full time or not. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other FAs for the same occupation. Standard errors are clustered at the labour-market-by-year level. KP F Test: Kleibergen-Paap Wald F Test. *** p<0.01, ** p<0.05, * p<0.1.

Table 4 – Labour Market Concentration and Daily Wages of Full-Timers – New Hires vs Incumbents – IV estimates.

Dep. Var Daily Wages	Denmark	France	Germany	Portugal
Log HHI*New hire	-.037***	-.024***	-.016***	-.024***
	(.007)	(.002)	(.002)	(.009)
Log HHI*Incumbent	-.028***	-.022***	-.020***	-.025***
	(.007)	(.002)	(.002)	(.008)
KP F Test	16.1	354.5	135.5	7.3
Observations	5,486,000	8,269,375	11,050,435	15,086,998

Note: 2SLS estimates. The dependent variable is log(wage). Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Control variables include yearly dummies for workers' age, whether the individual is a new hire, whether the individual was employed the year before if new hire, as well as individual fixed effects, firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other FAs for the same occupation. Interactions between $log(HHI)$ and another variable are instrumented by this variable interacted with the instrument for $log(HHI)$. Monthly wages instead of daily wages are used for Portugal. Standard errors are clustered at the labour-market-by-year level. KP F Test: Kleibergen-Paap Wald F Test. *** p<0.01, ** p<0.05, * p<0.1.

Table 5 – Labour Market Concentration and Probability of being hired on a Permanent Contract – IV estimates – New hires only.

Dep. Var Perm. contract	France	Germany	Italy	Portugal	Spain
Log HHI	-.0206***	-.0344***	-.0037	-.0504^{+}	.0022
	(.0046)	(.0119)	(.0066)	(.0313)	(.0020)
KP F Test	592.6	255.4	99.3	13.4	1126.1
Observations	3,530,660	4,167,918	16,645,917	1,039,792	4,875,973

Note: 2SLS estimates. The dependent variable is a dummy variable equal to 1 if the individual is hired on a permanent contract and 0 if hired on a temporary contract. Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Control variables include gender, education (4 categories), yearly dummies for workers' age, whether the individual was employed the year before, whether he/she works full time or not, as well as firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other FAs for the same occupation. Standard errors are clustered at the labour-market-by-year level. KP F Test: Kleibergen-Paap Wald F Test. *** p<0.01, ** p<0.05, * p<0.1, $^{+}$ p<0.11.

Table 6 – Labour Market Concentration and Conversions from Temporary to Permanent Contracts – IV estimates – New hires on temporary contracts only.

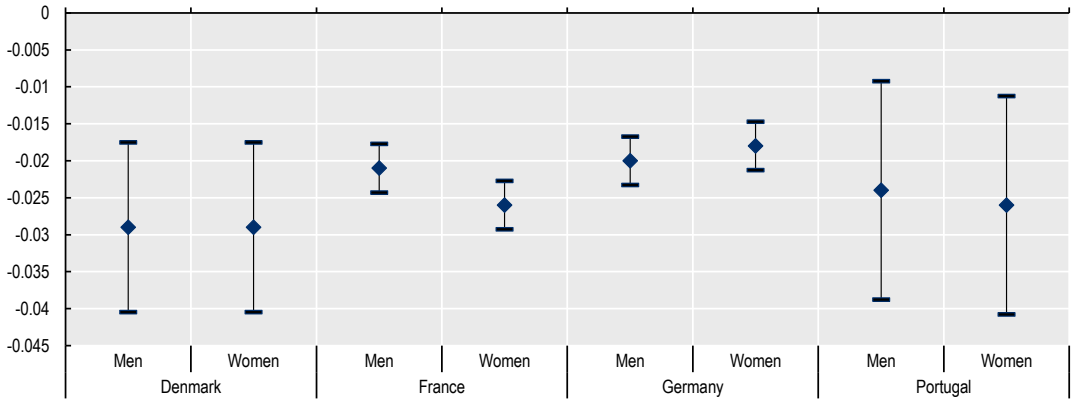
Dep. Var Conversion	Italy	Spain
Log HHI	-.0384***	-.0039***
	(.0091)	(.0011)
KP F Test	59.1	993.3
Observations	8,927,725	4,089,355

Note: 2SLS estimates. The dependent variable is a dummy variable equal to one when the individual was hired on a temporary contract at year *t* and started a permanent employment spell with the same employer by the end of the following calendar year; it is equal to 0 otherwise. Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Control variables include gender, education (4 categories), yearly dummies for workers' age, whether the individual was employed the year before hiring, whether he/she works full time or not, as well as firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other FAs for the same occupation. Standard errors are clustered at the labour-market-by-year level. KP F Test: Kleibergen-Paap Wald F Test. *** p<0.01, ** p<0.05, * p<0.1.

Figures

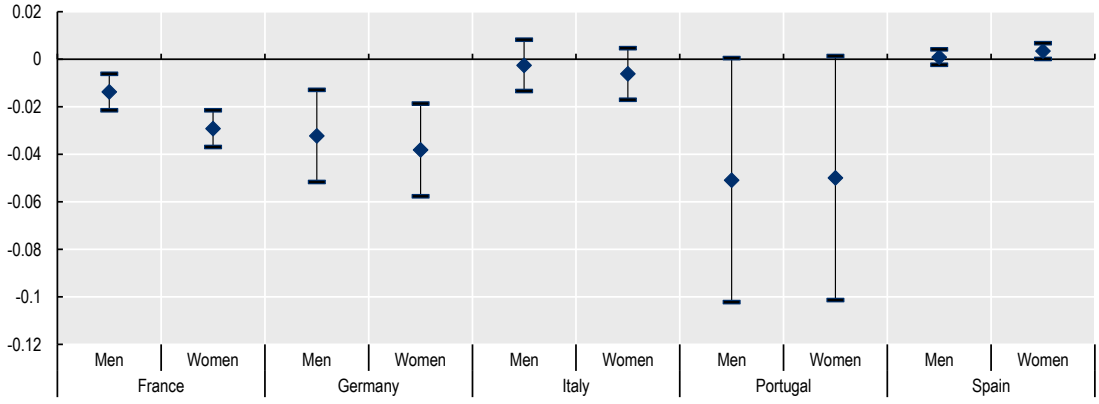
Figure 1. Effect of labour market concentration by gender

Panel A: Log of daily wages of full-timers



Note: 2SLS estimates. The figure reports point estimates and 90% confidence intervals of the interactions of $log(HHI)$ with gender dummies. The dependent variable is log(wage). Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Control variables include yearly dummies for workers' age, whether the individual is a new hire, whether the individual was employed the year before if new hire, as well as individual fixed effects, firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other FAs for the same occupation. The interaction between $log(HHI)$ and gender is instrumented by gender interacted with the instrument for $log(HHI)$. Monthly wages instead of daily wages are used for Portugal. Standard errors are clustered at the labour-market-by-year level.

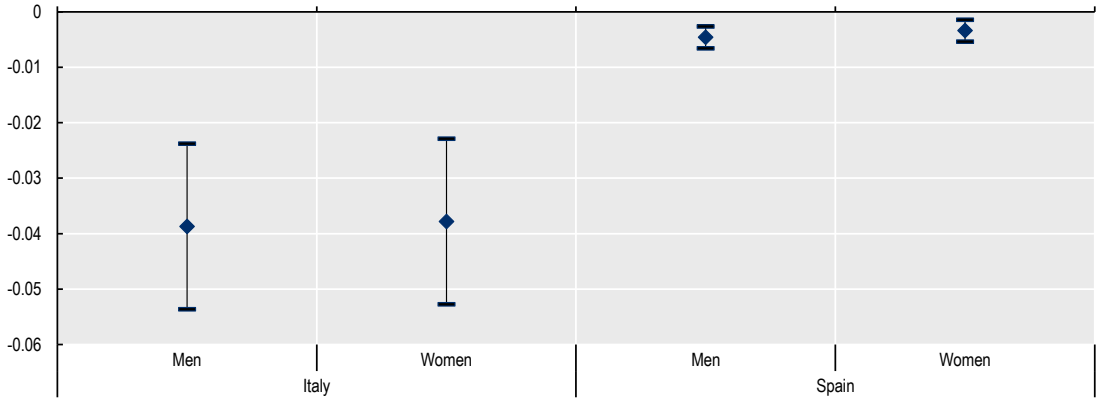
Panel B: Probability of being hired on a permanent contract (new hires only)



Note: 2SLS estimates. The figure reports point estimates and 90% confidence intervals of the interactions of $log(HHI)$ with gender dummies. The dependent variable is a dummy variable equal to 1 if the individual is hired on a permanent contract and 0 if hired on a temporary contract. Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Control variables include gender, education (4 categories), yearly dummies for workers' age, whether the individual was employed the year before, whether he/she works full time or not, as well as firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other FAs for the same occupation. The interaction between $log(HHI)$ and gender is instrumented by gender interacted with the instrument for $log(HHI)$. Standard errors are clustered at the labour-market-by-year level.

Figure 1. Effect of labour market concentration by gender (*cont.*)

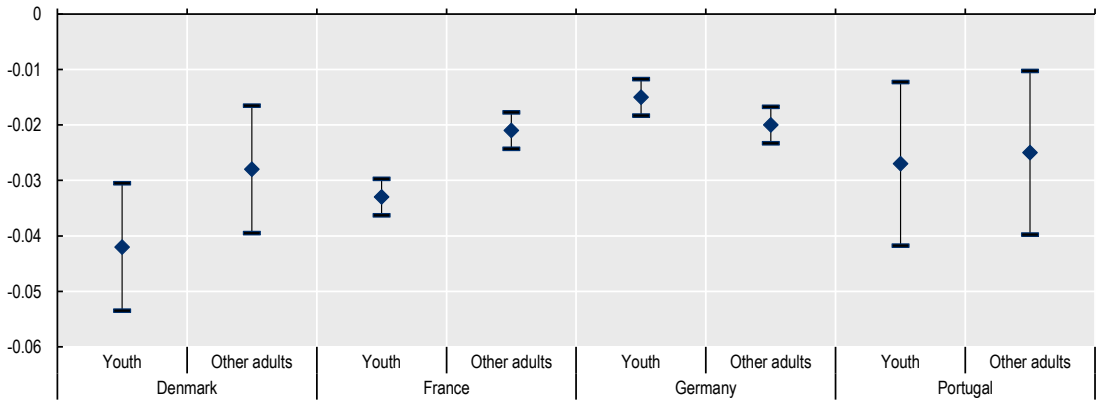
Panel C: Probability of being converted to a permanent contract (new hires on temporary contracts only)



Note: 2SLS estimates. The figure reports point estimates and 90% confidence intervals of the interactions of $log(HHI)$ with gender dummies. The dependent variable is a dummy variable equal to one when the individual was hired on a temporary contract at year *t* and started a permanent employment spell with the same employer by the end of the following calendar year. Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Control variables include gender, education (4 categories), yearly dummies for workers' age, whether the individual was employed the year before hiring, whether he/she works full time or not, as well as firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other FAs for the same occupation. The interaction between $log(HHI)$ and gender is instrumented by gender interacted with the instrument for $log(HHI)$. Standard errors are clustered at the labour-market-by-year level.

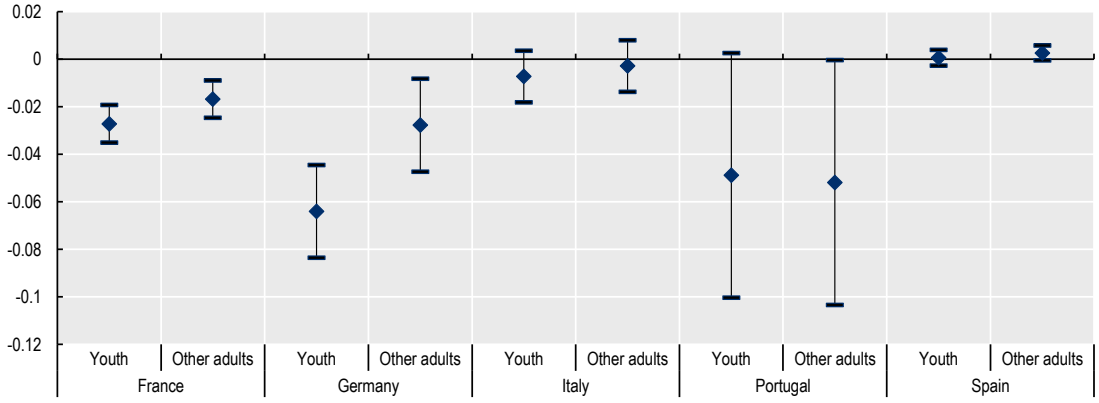
Figure 2. Effect of labour market concentration by age group

Panel A: Log of daily wages of full-timers



Note: 2SLS estimates. The figure reports point estimates and 90% confidence intervals of the interactions of $log(HHI)$ with dummy variables for being younger (resp. older) than 25. The dependent variable is log(wage). Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Control variables include yearly dummies for workers' age, whether the individual is a new hire, whether the individual was employed the year before if new hire, as well as individual fixed effects, firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other FAs for the same occupation. The interaction between $log(HHI)$ and age is instrumented by age interacted with the instrument for $log(HHI)$. Monthly wages instead of daily wages are used for Portugal. Standard errors are clustered at the labour-market-by-year level.

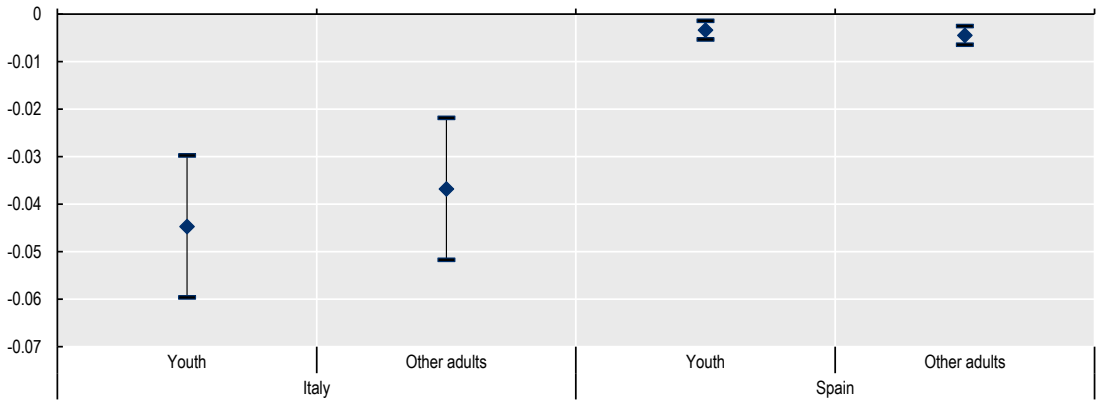
Panel B: Probability of being hired on a permanent contract (new hires only)



Note: 2SLS estimates. The figure reports point estimates and 90% confidence intervals of the interactions of $log(HHI)$ with dummy variables for being younger (resp. older) than 25. The dependent variable is a dummy variable equal to 1 if the individual is hired on a permanent contract and 0 if hired on a temporary contract. Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Control variables include gender, education (4 categories), yearly dummies for workers' age, whether the individual was employed the year before, whether he/she works full time or not, as well as firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other FAs for the same occupation. The interaction between $log(HHI)$ and age is instrumented by age interacted with the instrument for $log(HHI)$. Standard errors are clustered at the labour-market-by-year level.

Figure 2. Effect of labour market concentration by age group (*cont.*)

Panel C: Probability of being converted to a permanent contract (new hires on temporary contracts only)



Note: 2SLS estimates. The figure reports point estimates and 90% confidence intervals of the interactions of $log(HHI)$ with dummy variables for being younger (resp. older) than 25. The dependent variable is a dummy variable equal to one when the individual was hired on a temporary contract at year *t* and started a permanent employment spell with the same employer by the end of the following calendar year. Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Control variables include gender, education (4 categories), yearly dummies for workers' age, whether the individual was employed the year before hiring, whether he/she works full time or not, as well as firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other FAs for the same occupation. The interaction between $log(HHI)$ and age is instrumented by age interacted with the instrument for $log(HHI)$. Standard errors are clustered at the labour-market-by-year level.

Appendices

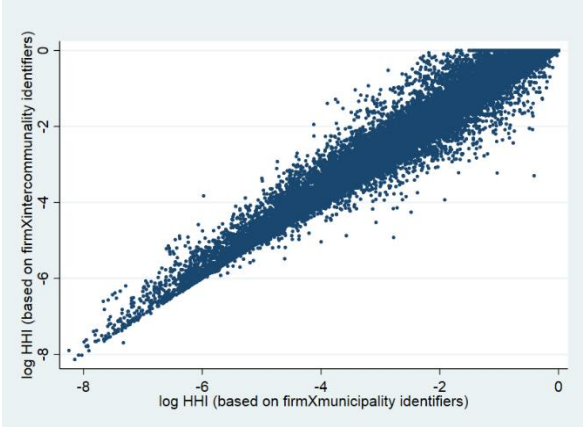
For online publication only

Appendix A – HHI based on firm*municipality vs HHI based on firm**intercommunalité* and firm**canton* identifiers in France.

Cantons and *intercommunalités* are geographical units larger than French municipalities but of comparable size to Portuguese and Danish municipalities, respectively.

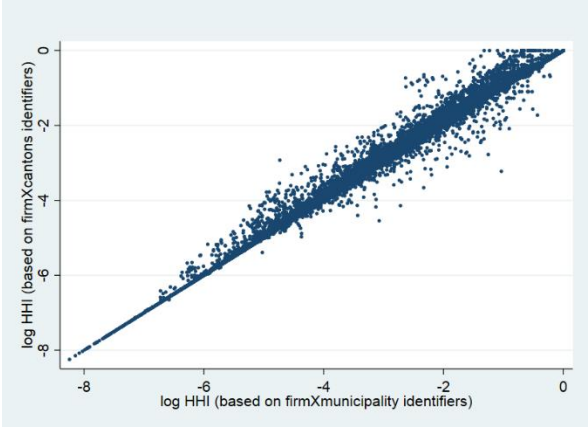
Appendix Figure A.1. Correlations between $log\,(HHI)$ constructed using identifiers based on firm*municipality and firm*larger geographical area (France only).

Panel A: Firm**Intercommunalité* identifiers



Regression coefficient: 0.9303887; R-squared: 0.9702

Panel B: Firm**Canton* identifiers



Regression coefficient: 0.9970262; R-squared: 0.9970

Note: Local labour markets are defined based on Functional Areas (FAs).

Table A.1 – Labour Market Concentration and Daily Wages of Full-Timers in France – IV estimates – other identifiers.

Dep. Var Daily Wages	Firm**intercommunalité* identifiers	Firm**canton* identifiers
Log HHI	-.0236*** (.0020)	-.0227*** (.0019)
KP F Test	599.8	696.2
Observations	8,269,106	8,269,343

Note: The dependent variable is log(wage). Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Employers are defined as the aggregation of all their establishments in an *intercommunalité* (resp. *canton*). Control variables include yearly dummies for workers' age, whether the individual is a new hire, whether the individual was employed the year before if new hire, as well as individual fixed effects, firm-by-*intercommunalité*-by-year (resp. firm-by-*canton*-by-year) fixed effects and establishment fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other FAs for the same occupation. Standard errors are clustered at the labour-market-by-year level. KP F Test: Kleibergen-Paap Wald F Test. *** p<0.01, ** p<0.05, * p<0.1.

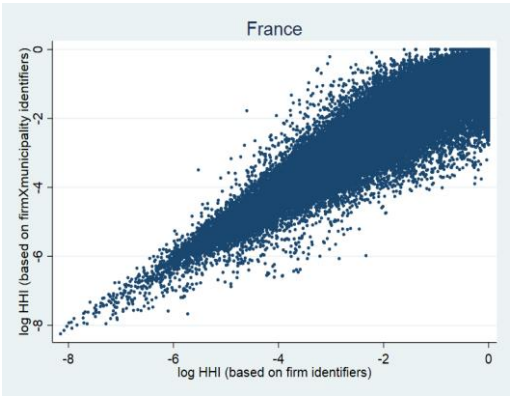
Table A.2 – Labour Market Concentration and Probability of being hired on a Permanent Contract in France – IV estimates – New hires only – other identifiers.

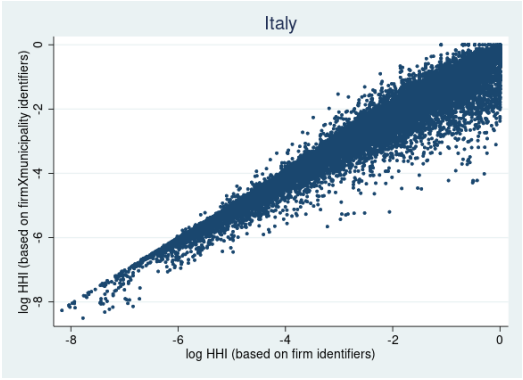
Dep. Var Perm contract	Firm**intercommunalité* identifiers	Firm**canton* identifiers
Log HHI	-.0199*** (.0048)	-.0204*** (.0047)
KP F Test	637.9	580.7
Observations	3,376,061	3,503,243

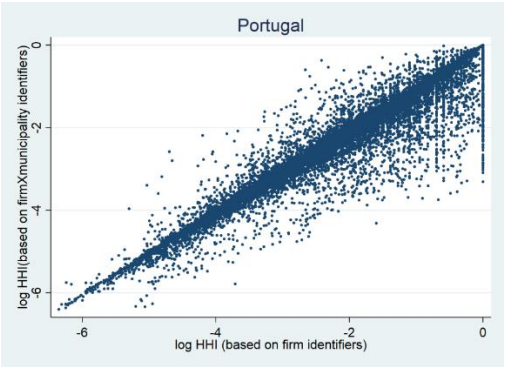
Note: 2SLS estimates. The dependent variable is a dummy variable equal to 1 if the individual is hired on a permanent contract and 0 if hired on a temporary contract. Employers are defined as the aggregation of all their establishments in an *intercommunalité* (resp. *canton*). Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Control variables include gender, education (4 categories), yearly dummies for workers' age, whether the individual was employed the year before, whether he/she works full time or not, as well as firm-by-*intercommunalité*-by-year (resp. firm-by-*canton*-by-year) fixed effects and establishment fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other FAs for the same occupation. Standard errors are clustered at the labour-market-by-year level. KP F Test: Kleibergen-Paap Wald F Test. *** p<0.01, ** p<0.05, * p<0.1.

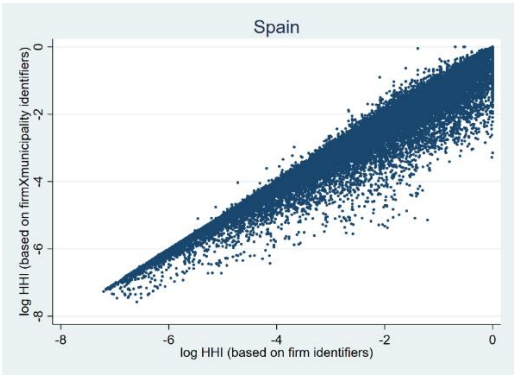
Appendix B – Appendix Figures

Appendix Figure B.1 - Correlations between $log\,(HHI)$ constructed using firm*municipality and firm identifiers

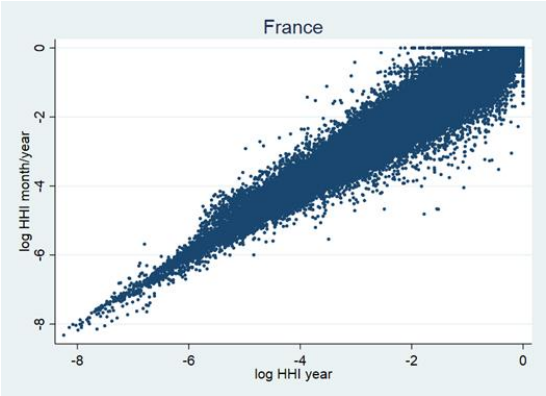


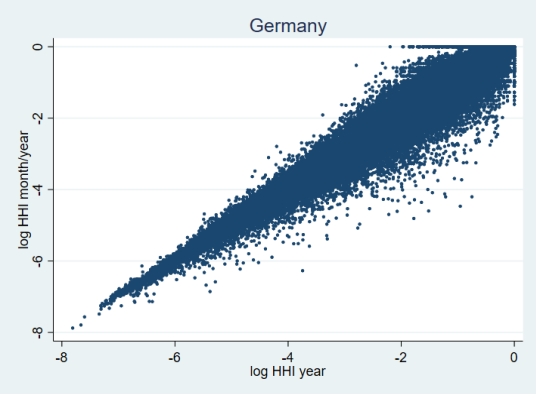


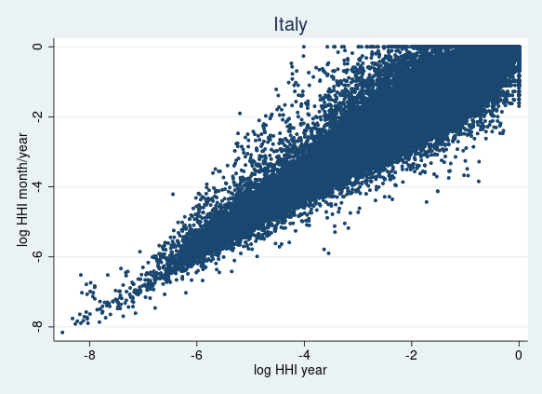




Appendix Figure B.2 – Correlations between $log\ (HHI)$ computed with new hires defined based on a month*year concept and $log\ (HHI)$ computed with new hires defined based on a year concept







Appendix C – Appendix Tables

Table C.1 – Descriptive Statistics

Variable	Denmark		France		Germany		Italy		Portugal			Spain	
	Full sample	New hires	Full sample	New hires	Full sample	New hires	Full sample	New hires	Full sample	New hires	New hires (June to Sept)	Full sample	New hires
HHI													
Mean	.0682	.0594	.0691	.0640	.0630	.0599	-	.0635	.0957	.0956	.0950	-	.0543
Standard deviation	.1174	.1086	.1298	.1270	.1236	.1229	-	.1370	.1649	.1685	.1689	-	.1277
Daily wage (full-timers)													
Mean	157.16	139.96	68.51	57.48	116.3	95.17	-	-	-	-	-	-	-
Standard deviation	62.78	58.63	36.58	30.69	60.46	53.63	-	-	-	-	-	-	-
Monthly wage (full-timers)													
Mean	-	-	-	-	-	-	-	-	1059.5	914.7	818.2	-	-
Standard deviation	-	-	-	-	-	-	-	-	680.1	565.3	448.2	-	-
Hourly wage (full-timers)													
Mean	30.35	27.0	13.30	11.32	-	-	-	-	6.44	5.60	5.02	-	-
Standard deviation	12.06	11.28	6.41	5.24	-	-	-	-	4.18	3.46	2.68	-	-
Hourly wage (all)													
Mean	28.58	24.39	12.78	10.97	-	-	-	-	6.20	5.34	4.82	-	-
Standard deviation	12.09	10.89	6.20	4.98	-	-	-	-	4.06	3.29	2.53	-	-
Women													
Mean	.3720	.3988	.4079	.4209	.4162	.4399	-	.3760	.4301	.4532	.4346	-	.4118
Standard deviation	.4833	.4896	.4914	.4937	.4929	.4964	-	.4844	.4951	.4978	.4957	-	.4921
Age													
Mean	39.71	32.96	38.00	32.93	42.64	36.05	-	35.65	40.23	36.33	33.93	-	34.36
Standard deviation	13.46	13.04	12.30	11.70	13.52	13.44	-	11.50	11.05	11.36	11.17	-	10.52
Full-time work													
Mean	.7923	.6464	.7233	.6424	.6354	.5357	-	.5787	.9345	.8807	.8543	-	.5358
Standard deviation	.4056	.4781	.4474	.4793	.4813	.4987	-	.4938	.2475	.3241	.3528	-	.4987

Notes: Wages are in nominal euros.

Table C.1 – Descriptive Statistics (cont.)

Variable	Denmark		France		Germany		Italy		Portugal			Spain	
	Full sample	New hires	Full sample	New hires	Full sample	New hires	Full sample	New hires	Full sample	New hires	New hires (June to Sept)	Full sample	New hires
Education													
Below upper secondary													
Mean	.2210	.2856	.1888	.1778	.1307	.2119	-	.3747	.5322	.4871	.4904	-	.6536
Standard deviation	.4149	.4517	.3913	.3824	.3371	.4086	-	.4841	.4990	.4998	.4999	-	.4758
Upper secondary													
Mean	.1504	.1728	.0934	0906	.6714	.5495	-	.3314	.2841	.3186	.3400	-	.2543
Standard deviation	.3575	.3781	.2909	.2870	.4697	.4975	-	.4707	.4510	.4659	.4737	-	.4355
Above upper secondary													
Mean	.2453	.2073	.1367	.1128	.1505	.1419	-	.0838	.1816	.1906	.1648	-	.0919
Standard deviation	.4303	.4054	.3435	.3164	.3537	.3490	-	.2771	.3855	.3928	.3710	-	.2889
Missing													
Mean	.3832	.3343	.5812	.6188	.0474	.0967	-	.2101	.0022	.0038	.0048	-	0
Standard deviation	.4862	.4717	.4934	.4860	.2124	.2956	-	.4074	.0463	.0614	.0691	-	0
New hires													
Mean	.2682	-	.3038	-	.2145	-	-	-	.2330	-	-	-	-
Standard deviation	.4430	-	.4599	-	.4105	-	-	-	.4227	-	-	-	-
Employed year before if new hire													
Mean	-	.6789	-	.7273	-	.7171	-	.6405	-	.4035	.3819	-	.2809
Standard deviation	-	.4669	-	.4453	-	.4504	-	.4799	-	.4906	.4859	-	.4494
New hires on perm. contract													
Mean	-	-	-	.4444	-	.6693	-	.3161	-	.4062	.2157	-	.1614
Standard deviation	-	-	-	.4969	-	.4705	-	.4650	-	.4911	.4113	-	.3679
Conversion to permanent contract													
Mean	-	-	-	-	-	-	-	.1596	-	-	-	-	.0570
Standard deviation	-	-	-	-	-	-	-	.3662	-	-	-	-	.2318

Notes: Conversions are computed on the samples of new hires on temporary contracts. For Spain, “Employed year before if new hire” means “Started a contract the year before if new hire”.

Table C.2 – Labour Market Concentration and Daily Wages of Full-Timers – OLS estimates.

Dep. Var Daily Wages	Denmark	France	Germany	Portugal
Log HHI	-.0020	-.0007**	-.0003	-.0007***
	(.0006)	(.0003)	(.0002)	(.0002)
Observations	6,740,546	8,269,430	11,050,435	15,087,543

Note: The dependent variable is log(wage). Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Control variables include yearly dummies for workers' age, whether the individual is a new hire, whether the individual was employed the year before if new hire, as well as individual fixed effects, firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. Monthly wages instead of daily wages are used for Portugal. Standard errors are clustered at the labour-market-by-year level. *** p<0.01, ** p<0.05, * p<0.1.

Table C.3 – Labour Market Concentration and Daily Wages of Full-Timers – IV estimates – Nationwide firms.

Dep. Var Daily Wages	Denmark	France	Portugal
Log HHI	-.051**	-.024***	-.021***
	(.020)	(.002)	(.008)
KP F Test	8.0	558.7	15.6
Observations	5,483,456	8,266,589	15,074,086

Note: 2SLS estimates. The dependent variable is log(wage). Employers are defined as the aggregation of all their establishments nationwide, rather than the aggregation of their establishments at the municipality level, as done in our baseline regressions. Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Control variables include yearly dummies for workers' age, whether the individual is a new hire, whether the individual was employed the year before if new hire, as well as individual fixed effects, firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other FAs for the same occupation. Monthly wages instead of daily wages are used for Portugal. Standard errors are clustered at the labour-market-by-year level. KP F Test: Kleibergen-Paap Wald F Test. *** p<0.01, ** p<0.05, * p<0.1.

Table C.4 – Labour Market Concentration and Daily Wages of Full-Timers – IV estimates – Local Labour Markets based on FUAs.

Dep. Var Daily Wages	Denmark	France	Germany	Portugal
Log HHI	-.034***	-.022***	-.017***	-.028***
	(.008)	(.002)	(.003)	(.009)
KP F Test	35.5	540.9	214.9	17.5
Observations	3,640,305	6,973,615	8,472,227	9,902,973

Note: 2SLS estimates. The dependent variable is log(wage). Local labour markets are defined based on 4-digit occupations and Functional Urban Areas (FUAs), rather than Functional Areas, as in our baseline regressions. Control variables include yearly dummies for workers' age, whether the individual is a new hire, whether the individual was employed the year before if new hire, as well as individual fixed effects, firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other FUAs for the same occupation. Monthly wages instead of daily wages are used for Portugal. Standard errors are clustered at the labour-market-by-year level. KP F Test: Kleibergen-Paap Wald F Test. *** p<0.01, ** p<0.05, * p<0.1.

Table C.5 – Labour Market Concentration and Daily Wages of Full-Timers – IV estimates – Local Labour Markets based on NUTS-3 regions.

Dep. Var Daily Wages	Denmark	France	Germany	Portugal
Log HHI	-.030***	-.023***	-.021***	-.017
	(.004)	(.001)	(.002)	(.011)
KP F Test	86.3	2695.1	547.5	6.5
Observations	7,279,543	9,564,667	11,037,434	17,362,165

Note: 2SLS estimates. The dependent variable is log(wage). Local labour markets are defined based on 4-digit occupations and NUTS-3 regions (districts in Portugal), rather than Functional Areas, as in our baseline regressions. Control variables include yearly dummies for workers' age, whether the individual is a new hire, whether the individual was employed the year before if new hire, as well as individual fixed effects, firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other NUTS-3 regions for the same occupation. Monthly wages instead of daily wages are used for Portugal. Standard errors are clustered at the labour-market-by-year level. KP F Test: Kleibergen-Paap Wald F Test. *** p<0.01, ** p<0.05, * p<0.1.

Table C.6 – Labour Market Concentration and Probability of being hired on a Permanent Contract – OLS estimates – New hires only.

Dep. Var Perm contract	France	Germany	Italy	Portugal	Spain
Log HHI	.0012 (.0010)	-.0024** (.0012)	.0006 (.0007)	-.0022* (.0012)	-.0055*** (.0008)
Observations	3,530,688	4,167,918	16,645,917	1,039,822	4,895,950

Note: The dependent variable is a dummy variable equal to 1 if the individual is hired on a permanent contract and 0 if hired on a temporary contract. Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Control variables include gender, education (4 categories), yearly dummies for workers' age, whether the individual was employed the year before, whether he/she works full time or not, as well as firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. *** p<0.01, ** p<0.05, * p<0.1.

Table C.7 – Labour Market Concentration and Probability of being hired on a Permanent Contract – IV estimates – New hires only – Nationwide firms.

Dep. Var Perm contract	France	Italy	Portugal	Spain
Log HHI	-.0222*** (.0050)	.0013 (.0094)	-.0569* (.0329)	.0024 (.0022)
KP F Test	596.5	61.05	13.7	357.76
Observations	3,195,832	16,281,601	1,035,808	4,895,897

Note: 2SLS estimates. The dependent variable is a dummy variable equal to 1 if the individual is hired on a permanent contract and 0 if hired on a temporary contract. Employers are defined as the aggregation of all their establishments nationwide, rather than the aggregation of their establishments at the municipality level, as done in our baseline regressions. Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Control variables include gender, education (4 categories), yearly dummies for workers' age, whether the individual was employed the year before, whether he/she works full time or not, as well as firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other FAs for the same occupation. Standard errors are clustered at the labour-market-by-year level. KP F Test: Kleibergen-Paap Wald F Test. *** p<0.01, ** p<0.05, * p<0.1.

Table C.8 – Labour Market Concentration and Probability of being hired on a Permanent Contract – IV estimates – New hires only – Local Labour Markets based on FUAs.

Dep. Var Perm contract	France	Germany	Italy	Portugal	Spain
Log HHI	-.0225*** (.0051)	-.0332*** (.0116)	-.0005 (.0105)	-.0129 (.0324)	.0013 (.0022)
KP F Test	473.7	256.1	33.61	12.7	913.6
Observations	3,031,859	3,274,302	11,027,960	712,828	3,947,159

Note: 2SLS estimates. The dependent variable is a dummy variable equal to 1 if the individual is hired on a permanent contract and 0 if hired on a temporary contract. Local labour markets are defined based on 4-digit occupations and Functional Urban Areas (FUAs), rather than Functional Areas, as in our baseline regressions. Control variables include gender, education (4 categories), yearly dummies for workers' age, whether the individual was employed the year before, whether he/she works full time or not, as well as firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other FUAs for the same occupation. Standard errors are clustered at the labour-market-by-year level. KP F Test: Kleibergen-Paap Wald F Test. *** p<0.01, ** p<0.05, * p<0.1.

Table C.9 – Labour Market Concentration and Probability of being hired on a Permanent Contract – IV estimates – New hires only – Local Labour Markets based on NUTS-3.

Dep. Var Perm contract	France	Germany	Italy	Portugal	Spain
Log HHI	-.0180*** (.0032)	-.0391*** (.0116)	-.0061 (.0061)	-.0938 (.0668)	.0018 (.0017)
KP F Test	1569.6	444.3	146.2	4.3	1578.2
Observations	4,021,376	4,167,909	18,198,802	1,159,438	5,230,111

Note: 2SLS estimates. The dependent variable is a dummy variable equal to 1 if the individual is hired on a permanent contract and 0 if hired on a temporary contract. Local labour markets are defined based on 4-digit occupations and NUTS-3 regions (districts in Portugal), rather than Functional Areas, as in our baseline regressions. Control variables include gender, education (4 categories), yearly dummies for workers' age, whether the individual was employed the year before, whether he/she works full time or not, as well as firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other NUTS-3 regions for the same occupation. Standard errors are clustered at the labour-market-by-year level. KP F Test: Kleibergen-Paap Wald F Test. *** p<0.01, ** p<0.05, * p<0.1.

Table C.10 – Labour Market Concentration and Conversions from Temporary to Permanent Contracts – OLS estimates – New hires on temporary contracts only.

Dep. Var Conversion	Italy	Spain
Log HHI	-.0002	-.0025***
	(.0006)	(.0005)
Observations	8,927,725	4,105,318

Note: The dependent variable is a dummy variable equal to one when the individual was hired on a temporary contract at year *t* and started a permanent employment spell with the same employer by the end of the following calendar year. Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Control variables include gender, education (4 categories), yearly dummies for workers' age, whether the individual was employed the year before hiring, whether he/she works full time or not, as well as firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. *** p<0.01, ** p<0.05, * p<0.1.

Table C.11 – Labour Market Concentration and Conversions from Temporary to Permanent Contracts – IV estimates – New hires on temporary contracts only – Nationwide firms.

Dep. Var Conversion	Italy	Spain
Log HHI	-.0768***	-.0042***
	(0.0218)	(.0012)
KP F Test	20.4	317.5
Observations	8,714,750	4,089,334

Note: 2SLS estimates. The dependent variable is a dummy variable equal to one when the individual was hired on a temporary contract at year *t* and started a permanent employment spell with the same employer by the end of the following calendar year. Employers are defined as the aggregation of all their establishments nationwide, rather than the aggregation of their establishments at the municipality level, as done in our baseline regressions. Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Control variables include gender, education (4 categories), yearly dummies for workers' age, whether the individual was employed the year before hiring, whether he/she works full time or not, as well as firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other FAs for the same occupation. Standard errors are clustered at the labour-market-by-year level. KP F Test: Kleibergen-Paap Wald F Test. *** p<0.01, ** p<0.05, * p<0.1.

Table C.12 – Labour Market Concentration and Conversions from Temporary to Permanent Contracts – IV estimates – New hires on temporary contracts only – Local Labour markets based on FUAs.

Dep. Var Conversion	Italy	Spain
Log HHI	-.0404***	-.0037***
	(.0143)	(.0013)
KP F Test	22.4	799.6
Observations	5,686,754	3,256,943

Note: 2SLS estimates. The dependent variable is a dummy variable equal to one when the individual was hired on a temporary contract at year *t* and started a permanent employment spell with the same employer by the end of the following calendar year. Local labour markets are defined based on 4-digit occupations and Functional Urban Areas (FUAs), rather than Functional Areas, as in our baseline regressions. Control variables include gender, education (4 categories), yearly dummies for workers' age, whether the individual was employed the year before hiring, whether he/she works full time or not, as well as firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other FUAs for the same occupation. Standard errors are clustered at the labour-market-by-year level. KP F Test: Kleibergen-Paap Wald F Test. *** p<0.01, ** p<0.05, * p<0.1.

Table C.13 – Labour Market Concentration and Conversions from Temporary to Permanent Contracts – IV estimates – New hires on temporary contracts only – Local Labour markets based on NUTS-3 regions.

Dep. Var Conversion	Italy	Spain
Log HHI	-.0401***	-.0040***
	(.0079)	(.0010)
KP F Test	87.4	1344.9
Observations	9,819,974	4,403,598

Note: 2SLS estimates. The dependent variable is a dummy variable equal to one when the individual was hired on a temporary contract at year *t* and started a permanent employment spell with the same employer by the end of the following calendar year. Local labour markets are defined based on 4-digit occupations and NUTS-3 regions (districts in Portugal), rather than Functional Areas, as in our baseline regressions. Control variables include gender, education (4 categories), yearly dummies for workers' age, whether the individual was employed the year before hiring, whether he/she works full time or not, as well as firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other NUTS-3 regions for the same occupation. Standard errors are clustered at the labour-market-by-year level. KP F Test: Kleibergen-Paap Wald F Test. *** p<0.01, ** p<0.05, * p<0.1.

Appendix D – Controlling for the share of 4-digit occupations in new hires at the national level

Table D.1 – Labour Market Concentration and Daily Wages of Full-Timers – IV estimates – controlling for the share of 4-digit occupations in new hires at the national level .

Dep. Var Daily Wages	Denmark	France	Germany	Portugal
Log HHI	-.013*** (.003)	-.021*** (.002)	-.025*** (.002)	-.022*** (.007)
Share of occupation *o* in hiring at the national level	yes	yes	yes	yes
KP F Test	85.5	921.9	338.3	24.0
Observations	5,486,000	8,269,375	11,050,435	15,086,998

Note: 2SLS estimates. The dependent variable is log(wage). Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Control variables include yearly dummies for workers' age, whether the individual is a new hire, whether the individual was employed the year before if new hire, as well as individual fixed effects, firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other FAs for the same occupation. Monthly wages instead of daily wages are used for Portugal. Standard errors are clustered at the labour-market-by-year level. KP F Test: Kleibergen-Paap Wald F Test. *** p<0.01, ** p<0.05, * p<0.1.

Table D.2 – Labour Market Concentration and Probability of being hired on a Permanent Contract – IV estimates – New hires only – controlling for the share of 4-digit occupations in new hires at the national level.

Dep. Var Permanent contract	France	Germany	Portugal
Log HHI	-.0139*** (.0040)	-.0331*** (.0109)	-.0342* (.0190)
Share of occupation *o* in hiring at the national level	yes	yes	yes
KP F Test	876.2	317.1	34.3
Observations	3,530,660	4,167,918	1,039,792

Note: 2SLS estimates. The dependent variable is a dummy variable equal to 1 if the individual is hired on a permanent contract and 0 if hired on a temporary contract. Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Control variables include gender, education (4 categories), yearly dummies for workers' age, whether the individual was employed the year before, whether he/she works full time or not, as well as firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other FAs for the same occupation. Standard errors are clustered at the labour-market-by-year level. KP F Test: Kleibergen-Paap Wald F Test. *** p<0.01, ** p<0.05, * p<0.1.

Table D.3 – Labour Market Concentration and Conversions from Temporary to Permanent Contracts – IV estimates – New hires on temporary contracts only – controlling for the share of 4-digit occupations in new hires at the national level.

Dep. Var Conversion	Italy	Spain
Log HHI	-.0116* (.0063)	-.0028** (0.0010)
Share of occupation *o* in hiring at the national level	yes	yes
KP F Test	117.2	2247.0
Observations	8,927,725	4,089,355

Note: 2SLS estimates. The dependent variable is a dummy variable equal to one when the individual was hired on a temporary contract at year *t* and started a permanent employment spell with the same employer by the end of the following calendar year. Local labour markets are defined on the basis 4-digit occupations and Functional Areas (FAs). Control variables include gender, education (4 categories), yearly dummies for workers' age, whether the individual was employed the year before hiring, whether he/she works full time or not, as well as firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. $Log(HHI)$ is instrumented by the average of the log inverse number of firms in other FAs for the same occupation. Standard errors are clustered at the labour-market-by-year level. KP F Test: Kleibergen-Paap Wald F Test. *** p<0.01, ** p<0.05, * p<0.1.

Appendix E – Plausibly exogenous instrument regressions

Table E.1 – Labour Market Concentration and Daily Wages of Full-Timers – Plausibly exogenous instrument regressions.

Dep. Var Daily Wages	Denmark	France	Germany	Portugal
(1) Reduced-form estimate of α from eq. (5)	-.0073*** (.0012)	-.0171*** (.0013)	-.0141*** (.0015)	-.0041*** (.0009)
(2) Minimum γ for which β is significant at the 10% level in eq. (4) using 2SLS	-.0054	-.0148	-.0113	-.0023
(2)/(1)	.74	.87	.80	.57

Note: The dependent variable is log(wage). Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Control variables include yearly dummies for workers' age, whether the individual is a new hire, whether the individual was employed the year before if new hire, as well as individual fixed effects, firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. Monthly wages instead of daily wages are used for Portugal. Standard errors are clustered at the labour-market-by-year level. *** p<0.01, ** p<0.05, * p<0.1.

Table E.2 – Labour Market Concentration and Probability of being hired on a Permanent Contract – New hires only – Plausibly exogenous instrument regressions.

Dep. Var Permanent contract	France	Germany
(1) Reduced-form estimate of α from eq. (5)	-.0158*** (.0034)	-.0271*** (.0092)
(2) Minimum γ for which β is significant at the 10% level in eq. (4) using 2SLS	-.0101	-.0118
(2)/(1)	.6333	.4333

Note: The dependent variable is a dummy variable equal to 1 if the individual is hired on a permanent contract and 0 if hired on a temporary contract. Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Control variables include gender, education (4 categories), yearly dummies for workers' age, whether the individual was employed the year before, whether he/she works full time or not, as well as firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. Standard errors are clustered at the labour-market-by-year level. *** p<0.01, ** p<0.05, * p<0.1.

Table E.3 – Labour Market Concentration and Conversions from Temporary to Permanent Contracts – New hires on temporary contracts only – Plausibly exogenous instrument regressions.

Dep. Var Conversion	Italy	Spain
(1) Reduced-form estimate of α from eq. (5)	-.0168*** (.0033)	-.0026*** (.0007)
(2) Minimum γ for which β is significant at the 10% level in eq. (4) using 2SLS	-.0112	-.0013
(2)/(1)	.66	.50

Note: The dependent variable is a dummy variable equal to one when the individual was hired on a temporary contract at year t and started a permanent employment spell with the same employer by the end of the following calendar year. Local labour markets are defined based on 4-digit occupations and Functional Areas (FAs). Control variables include gender, education (4 categories), yearly dummies for workers' age, whether the individual was employed the year before hiring, whether he/she works full time or not, as well as firm-by-municipality-by-year fixed effects, sector and establishment fixed effects (where different from firm*municipality's), and local labour market fixed effects. Standard errors are clustered at the labour-market-by-year level. *** p<0.01, ** p<0.05, * p<0.1.

Appendix F – Data Description

Appendix F.1 – Denmark

The best-suited dataset to study labour market concentration in Denmark is the Danish Integrated Database for Labor Market Research (in Danish, *Den Integrerede Database for Arbejdsmarkedsforskning*, IDA). The database covers the universe of Danish workers, establishments, and firms in all sectors of the economy.

Each worker is observed at a yearly frequency (in November), when information is recorded on his/her employment status, main occupation, and on one secondary activity. A host of information is available for each job, including the occupational category (ISCO-08 plus one additional level of disaggregation), the number of hours worked per week, and the hourly wage.

Worker-level data can be linked to data on both the establishment and the firm in which the worker is employed. Workers, establishments, and firms have unique time-invariant identifiers, which allow for the construction of a panel.

To facilitate the creation of employment histories, the dataset also includes a retrospective and a prospective employment variable. For each worker, the retrospective variable identifies the employment status of the individual in the previous year and provides some additional explanation for changes in status.[42] Similarly, the prospective variable identifies the employment status of the individual in the following year.[43]

At the individual level, the database also includes a host of personal worker characteristics, including age, gender, and education.

For this project, we use data from 2010 to 2018.

Appendix F.2 – France

The analysis for France builds upon the *Déclarations Annuelles de Données Sociales* (DADS), which are social security records drawn from firm tax declarations. The DADS are available under different formats. The *DADS-Postes* cover the universe of workers and establishments in all industries since 2009 (before that date the DADS did not include agriculture, part of the food-processing industry, so-called rural financial institutions – including Crédit Agricole, which is one of the largest French banks) and the public administration. We have access to these data until 2017, which effectively limits our sample to 2009-2017. The data contain information on each establishment's industry (at the 4-digit NACE level), location (municipality) and the firm to which the establishment belongs. They also contain information on each wage and salary employee who has worked for at least one hour in the establishment over the year. In particular, we know his/her 4-digit occupation according to the PCS-ESE classification, which contains about the same number of categories as the 4-digit breakdown of the ISCO-08 classification.[44] Self-employed are not covered by the dataset, while household employees and interns are dropped even if included in the data.

[42] If the worker was not in the same establishment in the previous year, the variable records whether he/she moved to his/her current post from another establishment of the same firm, a different firm, unemployment, outside the labour force, abroad, or a period of leave.

[43] If the individual is not present in the same establishment in the following year, the variable records whether he/she moved to another establishment within the same firm, another firm, unemployment, outside the labour force, abroad, a period of leave, or died.

[44] 412 categories in the PCS-ESE classification as compared to 436 categories in the ISCO-08 classification.

Each line in this dataset is a job match (establishment*employee*year). Establishments have a unique identifier which is invariant over time, except when the establishment changes location (or simply changes mail address), in which case it is assigned a new identifier. By contrast, for the sake of anonymity, workers' identifiers are changed every year (but they are unique in a given year, even if they change establishment). However, for any given wave (corresponding to a given year), the previous year's record corresponding to the same job match (if any) is also reported (with a random noise on quantitative variables, so that these couples of observations for different waves cannot be chained and used to reconstruct a long panel).[45] Information concerning dissolved matches that existed in the previous year is also reported. Using these pieces of information, we can identify whether a worker is a new hire under the different definitions of firm used in the paper.

For the subset of workers in the *DADS-Postes* who are born in October of each year, there exists a panel which maintains the same identifier over time for each worker and hence allows following workers across various employers and years. This panel (*Panel tous salariés*) reports the day when the worker was hired and when the employment spell terminates. It also reports, for each match, the annual gross wage, a full-time/part-time indicator and annual hours worked. The data also report workers' age, gender, municipality of residence, type of contract, and 4-digit occupation.

The *Echantillon Démographique Permanent* (EDP) is used to retrieve information on education. It contains a random sample of individuals updated with Census data (which are updated on a rotating basis for 1/10 of the population each year). However, as this information is updated every ten years, it only allows defining a rough, time-invariant variable based on the highest diploma, as the precise dates of change in educational status cannot be identified. Moreover, since not all workers in the *Panel tous salariés* are part of the EDP, information on educational attainment can be retrieved only for a minority of the workers in our sample.

Appendix F.3 – Germany

The analysis for Germany builds on the Employment History (BeH V10.05.01-201912) of the Institute for Employment Research (IAB), which is equivalent to the employment information in the IAB Integrated Employment Biographies – IEB, described in Müller and Wolter (2020). The BeH contains employer declarations about the universe of workers who are subject to social security contributions. Thus, the data give full account of private sector employment for regular workers, marginal workers, and apprentices in the German labour market.[46] The BeH is available from 1975 onwards for West Germany and 1993 onwards for East Germany. In this project, we use the universe of employment spells in the years 2012–2018.

Information on employment spells is available at the daily level. Wages are averaged over the spells' duration and reported by calendar year for spells that cover several calendar years. When establishments report multiple spells for the same worker in the same year, we select the spell with the highest wage.[47] The information is thus organised in worker-by-establishment-by-year triplets (i.e., job-year combinations). An establishment typically comprises all establishments

[45] For example, for a given establishment A and worker B, the 2010 wave reports both the variables corresponding to 2010 and 2009, with a small random noise added to the 2009 values. If all variables for the previous year (2009 in the example) are missing, this means that worker B was not in establishment A in that year (therefore it would be unambiguously a new hire in the current year – 2010 in the example). If no record involving worker B can be found in the previous year, this means that he/she was not working as a salaried employee the year before.

[46] Being exempt from social security records, civil servants, self-employed persons and family workers do not enter the IEB.

[47] If there is a tie, we choose the spell with the longest duration.

of a firm within a municipality, but we do not observe whether establishments in different municipalities belong to the same firm.

As regards workers, the data include the daily wage (up to the social security contribution ceiling), job duration, social security status, gender, age, occupation, the employer's location and an indicator for full-time and part-time employment, but not the precise number of working hours. Furthermore, the data contain information on whether a worker was hired on a fixed-term or a permanent contract, though we cannot observe later conversions.

Occupations are recorded using the German Classification of Occupations (KldB 2010) with 1,286 distinct occupations, which we map onto 4-digit ISCO-08 occupations via a standard crosswalk (German Federal Employment Agency, 2011). Moreover, we follow standard practice and impute top-coded wages using a two-step procedure (see Card et al., 2013).[48]

Appendix F.4 – Italy

The analysis for Italy builds on *Comunicazioni Obbligatorie* (CO), a contract-level dataset maintained for administrative purposes by the Ministry of Labour and Social Policies and made available thanks to a research agreement with ANPAL (*Agenzia Nazionale Politiche Attive Lavoro*). The dataset contains all employers' declarations about activations, terminations and conversions of contracts that took place in Italy since 2010.

For each contract, it reports rich information about its characteristics: the (anonymised) identity of the employer and that of the employee; the start date; the conversion date (i.e. the date when a non-permanent contract is converted into a permanent one), the termination date, if applicable; and the number of contract extensions (for non-permanent contracts only). Furthermore, the dataset contains the following information: the type of contract (permanent, temporary, or apprenticeship), the business sector (6-digit NACE Rev.2 classification); the working hour arrangements (i.e. full-time or part-time); the occupation (5-digit CP-2011 classification which we map onto 4-digit ISCO-08 using a hand-created crosswalk); and the municipality where the employer is located.

Alongside information about the contract, the following socio-demographic characteristics of the employee are available: gender, age, and education.

Against these unique advantages, the dataset has the drawback that it does not record information about the hiring wage and the size of the firm.

Appendix F.5 – Portugal

The data for Portugal come from the *Quadros de Pessoal* (QP), an administrative panel with matched firm, establishment, and worker data for all firms operating in the private sector. Since 2010, the QP is part of a broader compulsory survey on firms, the *Relatório Único*. All firms employing at least one worker in a given year have to deliver the *Relatório Único* to the Ministry

[48] First, we use fitted wages from a Tobit regression at the worker level to calculate average daily wages for each establishment-year combination (excluding the top-coded observation at hand). In a second step, we repeat the Tobit regression with this leave-one-out variable as an additional regressor which delivers the final imputations. Specifically, we adopt Schmucker et al.'s (2018) implementation and regress log daily wages on age, a quadratic of log establishment size, the share of low-skilled and high-skilled workers within the establishment, the share of censored observations excluding the observation at hand, as well as dummy variables for German nationality, workplace in East Germany, one-person establishments and establishments with more than ten full-time employees. Separate Tobit models are estimated for 56 cells defined according to the year (7 groups), gender (2 groups) and individual qualification (4 groups).

of Employment by April of the following year. When filling the QP part of the *Relatório Único* for a given year, firms must report detailed information on their activity and on every worker who was employed in the firm at some point in October of that year. Workers hired after October of year *t* and who leave before October of year *t+1* will not be included in this record. The QP is therefore a snapshot of the Portuguese labour market as of October of each year.

Importantly for us, the QP provides us with the location of firms and all their establishments at the municipality-level, as well as their economic activity, following the 5-digit Portuguese Classification of Economic Activities (CAE Rev.3), which is harmonised and directly comparable with NACE-Rev.2 until the fourth digit.

At the worker level, the QP includes information on gender, date of birth, education, the month and year of admission in the firm, gross monthly wages (base, bonuses, and overtime components separately), base and overtime hours worked in October, whether or not the individual works full-time or part-time, his/her type of contract (permanent vs temporary), and occupation at the 4 digit-level of the 2010 Portuguese Classification of Occupations (CPP/2010), which is harmonised and directly comparable with ISCO-08.

Firms, establishments and workers all have identifiers that enable us following them longitudinally. This allows us to define a new hire both according to the firm and to the firm-by-municipality concept.

Since the QP does not provide the number of days worked in the firm, in order to ensure that new hires have at least one month of tenure, we exclude all new hires whose admission in the firm dates back to September of each year.[49]

While the QP is available since 1985, we focus on 2010-2019 for three reasons. First, to work on a time period that is contemporaneous to the ones used in other countries. Second, because the introduction of *Relatório Único* in 2010 led to some changes in the data compared to 2009. Third, in 2010, occupations were recoded according to the CPP/2010, in replacement of the National Classification of Occupations dating back to 1994. Hence, focusing on 2010 onward ensures that we are consistently defining local labour markets.

Appendix F.6 – Spain

The analysis for Spain uses confidential information on the universe of contracts recorded by the National Public Employment Service (*Servicio Público de Empleo Estatal* or SEPE), an independent agency ascribed to the Ministry of Labour and Social Economy. Our monthly dataset contains anonymised records for the universe of regular private sector employment contracts including apprenticeship. The data are available starting in 2007, but for this project we use the universe of contracts signed between 2010 and 2017.

The administrative record for each contract contains information about the worker, including gender, age, an anonymised ID and his/her level of education. It also includes a unique firm and an establishment-level ID, the 4-digit sector (according to the 2009 National Classification of Economic Activities) in which the firm is active and the location of the establishment. As regards the labour contract itself, it provides information on the 4-digit occupation, regular working hours, as well as the starting date and type of the contract. In contrast, our dataset does

[49] We are not able to assess the number of days of tenure of two workers who would be hired in September and would leave the firm during the month of October, even though it is possible that one of them completed 1 month of tenure while the other one did not.

not contain information on wages and only provides information on the expected end dates for fixed-term contracts.

Occupations are recorded using the 4-digit Spanish Classification of Occupations (CNO 2011). We map this data onto the 4-digit ISCO-08 classification using a crosswalk provided by the Spanish National Statistical Institute (INE).

Formally, our dataset is a matched employer-employee panel with information on the universe of contracts. As such, we can distinguish between initial contracts, new contracts and the conversion of temporary or fixed-term contracts into permanent contracts.

Appendix References

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