Rising Concentration and Wage Inequality*

Guido Matias Cortes† Jeanne Tschopp‡
York University University of Bern

This Draft: August 22, 2019

Abstract

Wage inequality has risen in many countries over recent decades. At the same time, production has become increasingly concentrated in “superstar” firms. In this paper, we show that these two phenomena are linked. Theoretically, we show that shocks that increase concentration, such as an increase in consumers’ price sensitivity, will also lead to an increase in wage dispersion between firms. Empirically, we use industry-level data from 14 European countries over the period 1999–2016 and show robust evidence of a positive and statistically significant correlation between concentration and the dispersion of firm-level wages.

*We thank the Social Sciences and Humanities Research Council of Canada for support. Dennis Ko provided valuable research assistance.
†Department of Economics, York University, 4700 Keele Street, Toronto, ON, M3J 1P3, Canada; gncortes@yorku.ca; +1 (416) 736-2100 (ext 33987).
‡Department of Economics, University of Bern, Schanzeneckstrasse 1, 3001 Bern, Switzerland; jeanne.tschopp@vwi.unibe.ch; +41 31 631 45 05.
1 Introduction

In recent years, two important economic phenomena have received a large amount of attention from academics and policymakers. On the one hand, there has been a strong increase in wage inequality since the 1980s (Juhn et al., 1993; Katz and Autor, 1999; Acemoglu and Autor, 2011). A recent literature has shown that a large fraction of this increase in inequality is driven by increased wage dispersion between firms, rather than within firms (Card et al., 2013; Song et al., 2018; Barth et al., 2016). On the other hand, a separate literature has shown that product markets have become increasingly concentrated, with a smaller number of firms becoming increasingly dominant in many industries (De Loecker and Eeckhout, 2017; Autor et al., 2017a,b; Grullon et al., 2019). So far, the rise in inequality and the rise in concentration have been studied in isolation. In this paper, we show that the two phenomena are related.

From a theoretical perspective, we show that a shock that increases concentration, such as an increase in consumer price sensitivity (which in turn may be driven by factors such as greater economic integration and the availability of new web technologies) will also lead to increased wage dispersion between firms. Empirically, we use industry-level data from 14 European countries over the period 1999–2016 to show that there is a significant positive correlation between inequality and concentration, which is robust to controlling for unobservable factors in a variety of ways.

We motivate our analysis using the fair wage setting of Egger and Kreickemeier (2012); a framework that features heterogeneous firms and heterogeneous wages. We analyze the implications of an increase in consumer price sensitivity – modeled as an increase in the elasticity of substitution between varieties in consumption, as in Autor et al. (2017b). The model predicts that this type of shock will lead to increased concentration of production in the most productive firms within industries, while at the same time increasing wage inequality between firms within industries.

Intuitively, an increase in price sensitivity shifts consumer demand towards the most productive firms, who are able to produce goods at a lower price. Low productivity firms are no longer able to operate profitably and must exit the market, while high productivity firms are able to increase their market share. Hence, production within the industry will become increasingly concentrated in the most productive firms. Through the rent-sharing mechanism embedded in the fair-wage framework, the increase in rev-

---

1The conceptual framework considered by Autor et al. (2017b) features a competitive labor market, which does not allow for any type of wage inequality.
enues in the most productive firms translates into increasing relative wages in these firms and hence increasing between-firm wage inequality.

Although we show the existence of the relationship between concentration and wage inequality formally within the fair wage framework, the intuition would extend to a wide range of models that feature a mechanism through which increases in firm revenues translate into increases in worker wages.

We test the predictions of the model using data from the Competitiveness Research Network (CompNet). The dataset provides information on concentration and wage inequality at the 2-digit industry level for 14 European countries over the period 1999-2016. Concentration can be measured in terms of the turnover or employment shares of the top firms within an industry-country-year cell. Wage inequality captures differences in average labor costs per worker across firms.

Our empirical strategy consists of regressing inequality on concentration as well as various combinations of industry, country, and year fixed effects. This strategy allows us to exploit different sources of variation for identification in order to determine the robustness of the results. Our key finding is that there is a positive and statistically significant correlation between concentration and inequality, suggesting that, as predicted by the model, the two phenomena are indeed linked to each other. This result is robust to restricting identification to variation within industry-country cells over time. A rough estimate of the economic importance of this correlation suggests that changes in concentration can account for approximately 10–30% of the variation in inequality within industry-country cells.

When we explore changes at different parts of the firm wage distribution, we find that concentration is correlated with a widening across a range of percentile gaps, including the 90-10, the 90-50, and the 50-10 gap. The correlation appears to be particularly strong when considering the 99-10 gap, suggesting that it is indeed the very top firms that are important in driving the increase in between-firm wage inequality.

Our paper provides an important contribution to the literature by providing evidence of the link between the growth of concentration and the growth of wage inequality. Our results highlight the importance of considering common driving forces that can account for both of these patterns. We contribute to the literature that studies changes in wage inequality by proposing a mechanism which gives a relevant role to firms in driving the widening of the wage distribution. While several papers have documented the increase in wage dispersion between firms, little is known about the underlying driving mechanisms. The literature on wage inequality has mostly focused on the role of
changing demand for skills and tasks, without allowing for heterogeneous firms to play a relevant mediating role (see e.g. Acemoglu and Autor, 2011, for a review of this literature). Studying the specific nature of the shocks that favor the most productive firms in an industry, such as an increase in consumer price sensitivity, remains a promising avenue for future research.

2 Theoretical Motivation

In order to motivate our analysis of the relationship between concentration and inequality, we illustrate the theoretical link between these two variables within the closed economy fair wage setting of Egger and Kreickemeier (2012). We consider the same type of shock as in Autor et al. (2017b): an increase in consumer price sensitivity, modeled as an increase in the price elasticity of demand. Below we discuss how the intuition for the link between concentration and inequality would generalize to other types of shocks that disproportionately favor the most productive firms in an industry, and to other types of frameworks featuring heterogeneous firms and some mechanism for rent-sharing.


The Egger and Kreickemeier (2012) framework features a sector with a continuum of monopolistically competitive firms, each producing a unique variety. The production function is \( q = \varphi \ell \), where \( \varphi \) is the firm’s idiosyncratic productivity draw, and \( \ell \) is employment in the firm. The productivity distribution, \( G(\varphi) \), is assumed to be Pareto with shape parameter \( k \).

The key feature of the model for the purposes of studying wage differences between firms is that the labor market is characterized by a variant of the fair-wage effort mechanism first discussed by Akerlof and Yellen (1990). Workers are able to adjust their effort according to the extent to which they consider the wage that they receive to be fair.\(^2\) In equilibrium, it is in the firms’ best interest to pay workers the fair wage in order to elicit the optimal amount of effort.

Egger and Kreickemeier (2012) specify the fair wage as depending on a firm-external point of reference (workers should consider their wage to be fair relative to the wage

\(^2\)See Mas (2006) for empirical evidence on the relationship between fairness considerations and workplace effort in the context of New Jersey police officers.
of employees at other firms), and a firm-internal point of reference (workers should consider their wage to be fair given their own firm’s performance). The firm-external point of reference is specified as \((1 - U)\overline{w}\), where \(1 - U\) is the employment rate and \(\overline{w}\) is the average wage of employed workers in the sector. The firm-internal point of reference is given by the firm’s operating profits, which are \(\frac{r(\varphi)}{\sigma}\), where \(r(\varphi)\) are the revenues of the firm with productivity \(\varphi\), and \(\sigma\) is the elasticity of substitution between varieties. The fair wage is therefore specified as:

\[
\hat{w}(\varphi) = \left(\frac{r(\varphi)}{\sigma}\right)^{\theta} \left[(1 - U)\overline{w}\right]^{1-\theta}
\]

where \(\theta \in (0, 1)\) is the rent-sharing parameter. Given that firms find it optimal to pay the fair wage, the relative wage across two operating firms will be a function of their relative revenues, which in turn are a function of their relative productivity. In equilibrium, for two firms with productivity draws \(\varphi_1\) and \(\varphi_2\), we will have:

\[
\frac{w(\varphi_1)}{w(\varphi_2)} = \left(\frac{\varphi_1}{\varphi_2}\right)^{\eta} \quad \text{where} \quad \eta \equiv \frac{\sigma - 1}{1 + \theta(\sigma - 1)} \quad (1)
\]

Relative employment across the two firms will also be proportional to their relative productivity:

\[
\frac{\ell(\varphi_1)}{\ell(\varphi_2)} = \left(\frac{\varphi_1}{\varphi_2}\right)^{(1-\theta)\eta} \quad (2)
\]

As is standard in heterogeneous firm frameworks (such as Melitz, 2003), the equilibrium is characterized by a productivity threshold, \(\varphi^*\), such that only firms with idiosyncratic productivity draws above the threshold will choose to remain in operation. In the Egger and Kreickemeier (2012) framework, the threshold is given by:

\[
\varphi^* = \left(\frac{k\sigma - \eta}{k - \eta}\right)^{1/k} \quad (3)
\]

where \(k > \eta\) is assumed to ensure that the threshold is positive.

For our purposes we are interested in the model implications for concentration and inequality outcomes. In terms of concentration, consider a set of top firms with productivity above a certain threshold \(\overline{\varphi}\). In the model, these will be the largest and most

---

3See Egger and Kreickemeier (2012) for full details on the derivation of this result.
profitable firms, which also pay the highest wages in the sector. The share of aggregate sectoral profits accruing to these firms, and the share of aggregate employment concentrated in these firms is given, respectively, by:

\[
C_\pi = \left( \frac{\varphi}{\varphi^*} \right)^{\eta-k} \quad C_\ell = \left( \frac{\varphi}{\varphi^*} \right)^{(1-\theta)\eta-k} \tag{4}
\]

In terms of inequality, one can derive the Gini coefficient for firm-level wages. This can be computed in terms of the distribution of wages across firms (not employment weighted), or in terms of the distribution across workers (i.e., an employment-weighted measure of inequality in firm-level wages). These are given, respectively, by:

\[
G_f = \frac{\eta}{2k-\eta} \quad G_w = \frac{\theta\eta}{2[k-(1-\theta)\eta]-\theta\eta} \tag{5}
\]

### 2.2 Effects of an Increase in Consumer Price Sensitivity

As mentioned, we consider the impact of an increase in consumer price sensitivity, modeled as an increase in the elasticity of substitution between varieties, \( \sigma \). Our two key predictions are the following:

**Prediction 1:** An increase in consumer price sensitivity increases concentration.

**Proof:** Note that from the definition of \( \eta \) in Equation (1), we have that \( \frac{\partial \eta}{\partial \sigma} > 0 \). Given this, from Equation (3) we can obtain that \( \frac{\partial \varphi^*}{\partial \sigma} > 0 \), and using this result we can obtain the sign for the impacts on the change in concentration using Equation (4):

\[
\frac{\partial C_\pi}{\partial \sigma} > 0 \quad \frac{\partial C_\ell}{\partial \sigma} > 0
\]

**Prediction 2:** An increase in consumer price sensitivity increases inequality in firm-level wages.

**Proof:** Given \( \frac{\partial \eta}{\partial \sigma} > 0 \), we can obtain the sign for the impacts on the change in inequality using Equation (5):

\[
\frac{\partial G_f}{\partial \sigma} > 0 \quad \frac{\partial G_w}{\partial \sigma} > 0
\]
2.3 Intuition and Generalizability

Intuitively, a shock that increases consumers’ price-sensitivity will shift consumer demand towards the lower cost varieties produced by higher-productivity firms. As demand for the higher cost varieties produced by low productivity firms falls, they are no longer able to operate profitably and must exit. This is reflected in the increase in the productivity threshold $\phi^*$. It is worth noting that, although the increase in the threshold reduces the range of firm types that operate, under the assumption that productivity is Pareto-distributed, this will actually increase the variance of productivity among operating firms.\(^4\) Since employment and wages are proportional to productivity, the exit of unproductive firms will increase the measured dispersion in employment and wage outcomes across firms, even if there are no changes in the level of employment and wages among continuing firms.

This increased dispersion due to the selection margin is compounded by the changes in employment and wage choices among continuing firms. The increased demand experienced by the most productive firms will lead to an increase in their relative size in terms of employment, revenues and profits, hence increasing sectoral concentration. Due to fair-wage considerations, the increase in the relative profits of these high-productivity firms also leads to an increase in the relative wage of workers in these firms, thus increasing wage inequality.

The intuition that we have developed for the fair wage framework would carry over to other heterogeneous firm settings that incorporate a mechanism that allows for firm rents and worker wages to be linked, such as the Helpman et al. (2010) model. Moreover, the underlying shock need not be an increase in consumer price sensitivity. Any shock that favors the most productive firms in a sector will tend to increase concentration and wage inequality. In what follows, we empirically study the link between concentration and wage inequality using sector-level data for a range of European countries.

---

\(^4\)Note that the productivity distribution among operating firms is a truncated version of $G(\varphi)$. This truncated Pareto has the same shape parameter $k$, but has a scale parameter $\phi^*$. The variance of a variable with a Pareto distribution is increasing in the scale parameter and decreasing in the shape parameter, so as $\phi^*$ increases, the variance of $\varphi$ among operating firms increases as well. Intuitively, the increased selection due to the increase in the threshold $\phi^*$ increases heterogeneity across firms as measured by the variance of productivity, due to the exit of a mass of firms with relatively homogenous firm types, which implies a relative increase in the mass of firms towards the tail.
3 Data

We use data from the Competitiveness Research Network (CompNet). This dataset draws on various administrative and public sources, and compiles information for non-financial corporations with at least one employee in various European countries. The latest edition of the data (6th vintage) provides information for 18 countries over the period 1999–2016, though not all years are available for all countries. We focus on the 14 countries which have representative data for the full universe of firms. Public-use data is provided at various levels of aggregation. We work with the finest level of aggregation available, which is the industry-country-year level, where industries are coded at the 2-digit NACE Revision 2 level.

A number of concentration measures can be constructed from the CompNet data. We focus on three measures of concentration in terms of sectoral turnover: the share of turnover in the top 1% of firms in each industry-country-year cell, the share of turnover in the top 10 firms, and the Herfindahl-Hirschman index of market concentration. We also consider a measure of employment concentration based on the relative size of the largest 1% of firms within an industry-country-year cell.

Our measures of sectoral wage inequality are also constructed from the CompNet data. Information is available on the distribution of labor costs per employee across firms. This allows us to measure dispersion in average firm-level wages. It is worth noting that these dispersion measures will capture pure firm wage premia (i.e. wage differences for otherwise identical workers), as well as sorting of workers to firms based on observable or unobservable characteristics.

Figure 1 displays the overall evolution of concentration and wage inequality across the European countries in our sample. The solid line in the top panel displays the evolution of between-firm wage inequality, measured as the weighted average of the

---

5The 14 countries are Belgium, Croatia, Denmark, Finland, France, Hungary, Italy, Lithuania, Netherlands, Portugal, Romania, Slovenia, Spain and Sweden. Due to missing data on some variables, Denmark, Netherlands and Romania are not included in all specifications. Representativeness is achieved through a reweighting procedure as detailed in the CompNet User Guide available at https://www.comp-net.org/fileadmin/_compnet/user_upload/Documents/User_Guide_6th_Vintage.pdf. Although data for the Czech Republic is available, its use is not recommended due to the very low coverage rate of small firms.

6Our data do not allow us to distinguish between these two components. The findings in the literature suggest that both components are important in driving between-firm wage inequality, with a particularly important role for sorting (Card et al., 2013; Song et al., 2018).

7Due to missing data, Denmark and Netherlands are excluded from these graphs, but they are included in regressions that use alternative measures of inequality and/or concentration.
Figure 1: Rising Concentration and Rising Between-Firm Wage Inequality in Europe

Note: Inequality measures are based on the 90-10 ratio of firm-level wages at the industry-country level. Concentration measures are based on the share of turnover within the top 1% of firms in an industry-country cell. The top panel presents averages across up to 12 European countries based on the raw data, though the composition of countries varies over time given that not all countries are observed in all years (see Table 1). The bottom panel accounts for these changes in composition by presenting average residuals obtained from regressions of inequality and concentration on a full set of industry-country fixed effects, hence capturing only variation over time within industry-country cells.
90-10 ratio of firm-level wages in each country-industry cell (where each cell is weighted based on its share of national value added). The dashed line displays the evolution of concentration, measured as the average share of revenues concentrated in the top 1% of firms within each country-industry cell. Both series display an upwards trend over our sample period, confirming that both between-firm inequality and concentration have been on the rise in Europe since the early 2000s.

In order to rule out the possibility that these patterns are driven by changing sample composition over time (given that not all countries are observed in all periods, as we show below in Table 1), we run separate regressions of inequality and concentration on a full set of country-industry dummies, and compute the average residuals from these regressions in each year. These average residuals will only vary due to changes in concentration and wage inequality within country-industry cells over time. These are plotted in the bottom panel of Figure 1, and confirm that the increases in inequality and concentration observed in the raw data are not driven by changes in the composition of countries or industries in our sample.

Table 1 presents descriptive statistics on the evolution of concentration and wage inequality for each of the countries in our sample. Columns (1) and (2) indicate the earliest and latest year in which each country is observed, while the remaining columns display the levels and the changes in inequality and concentration observed in each country. As before, inequality is measured as the 90-10 ratio of firm-level wages in each country-industry cell, while concentration is based on the share of revenues concentrated in the top 1% of firms in a country-industry cell. National averages are constructed based on each industry’s share of national value added in the respective year. Column (5) shows that the increase in between-firm wage inequality has been widespread across European countries. All countries except Finland, Romania and Slovenia experience an increase in the 90-10 ratio of firm-level wages. Meanwhile, Column (8) indicates that concentration has also been on the rise in most countries. The share of turnover captured by the top 1% of firms in each industry increases over our sample period in all countries except Belgium, France and Romania. In what follows, we confirm whether these coinciding trends observed at the national level are also observed when focusing on variation within country-industry cells, while accounting for various types of potential shocks through the use of different combinations of fixed effects.
Table 1: Change in inequality and concentration

<table>
<thead>
<tr>
<th>Country</th>
<th>Country Year (t)</th>
<th>Inequality (t=0)</th>
<th>Inequality (t=T)</th>
<th>Inequality (t=T) - Inequality (t=0)</th>
<th>Concentration (t=0)</th>
<th>Concentration (t=T)</th>
<th>Concentration (t=T) - Concentration (t=0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>2004, 2015</td>
<td>1.03</td>
<td>1.14</td>
<td>0.11</td>
<td>12.60</td>
<td>12.25</td>
<td>-0.35</td>
</tr>
<tr>
<td>Croatia</td>
<td>2002, 2016</td>
<td>1.37</td>
<td>1.58</td>
<td>0.21</td>
<td>15.45</td>
<td>16.40</td>
<td>0.96</td>
</tr>
<tr>
<td>Finland</td>
<td>1999, 2015</td>
<td>1.11</td>
<td>1.03</td>
<td>-0.08</td>
<td>13.88</td>
<td>15.59</td>
<td>1.70</td>
</tr>
<tr>
<td>France</td>
<td>2004, 2014</td>
<td>1.51</td>
<td>1.53</td>
<td>0.02</td>
<td>15.50</td>
<td>14.03</td>
<td>-1.47</td>
</tr>
<tr>
<td>Hungary</td>
<td>1999, 2015</td>
<td>1.67</td>
<td>2.31</td>
<td>0.65</td>
<td>14.44</td>
<td>15.99</td>
<td>1.55</td>
</tr>
<tr>
<td>Italy</td>
<td>2001, 2014</td>
<td>1.38</td>
<td>1.48</td>
<td>0.10</td>
<td>9.60</td>
<td>10.85</td>
<td>1.25</td>
</tr>
<tr>
<td>Lithuania</td>
<td>2000, 2015</td>
<td>1.70</td>
<td>2.61</td>
<td>0.91</td>
<td>14.09</td>
<td>17.58</td>
<td>3.48</td>
</tr>
<tr>
<td>Portugal</td>
<td>2006, 2015</td>
<td>1.21</td>
<td>1.53</td>
<td>0.32</td>
<td>14.44</td>
<td>14.84</td>
<td>0.40</td>
</tr>
<tr>
<td>Romania</td>
<td>2005, 2015</td>
<td>2.27</td>
<td>2.06</td>
<td>-0.21</td>
<td>16.35</td>
<td>15.94</td>
<td>-0.41</td>
</tr>
<tr>
<td>Slovenia</td>
<td>2005, 2016</td>
<td>0.98</td>
<td>0.91</td>
<td>-0.07</td>
<td>15.87</td>
<td>18.18</td>
<td>2.32</td>
</tr>
<tr>
<td>Spain</td>
<td>2009, 2015</td>
<td>1.30</td>
<td>1.37</td>
<td>0.07</td>
<td>12.07</td>
<td>12.82</td>
<td>0.75</td>
</tr>
<tr>
<td>Sweden</td>
<td>2003, 2015</td>
<td>1.59</td>
<td>2.10</td>
<td>0.51</td>
<td>12.32</td>
<td>13.84</td>
<td>1.53</td>
</tr>
</tbody>
</table>

Note: *t = 0 (t = T) denotes the first (last) appearance of both inequality and concentration measures in the data. Inequality is the log of the 90-10 ratio of the wage bill per worker. Concentration is the share of turnover at the top 1% of firms. ∆ denotes the change between the first and last year of appearance. Columns (6) and (7) show percentages. The last column shows percentage point changes in concentration. Due to missing data, Denmark and Netherlands are excluded from this table, but they are included in regressions that use alternative measures of inequality and/or concentration.

4 Findings

In order to explore the empirical link between concentration and between-firm wage inequality, we exploit variation across industry-country-year cells in the CompNet data. Our equation of interest is:

$$INEQ_{ict} = \alpha CONC_{ict} + \gamma_i + \delta_c + \tau_t + u_{ict}$$ (6)

The dependent variable is a measure of inequality in firm-level wages in industry *i* in country *c* at time *t*. The key independent variable is a measure of concentration in industry *i* in country *c* at time *t*. In order to exploit different sources of variation for identification, we experiment with different combinations of industry, country and time fixed effects, as discussed below.\(^8\)

\(^8\)The inclusion of these different sets of fixed effects also alleviates potential concerns about the cross-country comparability of the data sources underlying CompNet.
Table 2 presents our main set of results. Our benchmark measure of inequality is the log of the 90-10 ratio of the wage bill per worker across firms at the industry-country-year level. Concentration is measured based on the distribution of firm turnover in the first three panels, and based on the distribution of employment in the bottom panel. Each panel uses a different measure of concentration, and each column considers a specification with a different set of fixed effects, as detailed in the bottom panel of the table. All regressions are weighted using each industry’s share of total value added in the country (so all country-year cells receive equal weight in the regression).

In the top panel of Table 2, our concentration measure is based on the 99th percentile of the turnover distribution across firms. Column (1) presents a specification which includes industry, country and year fixed effects. We find that there is a positive and statistically significant correlation between concentration and between-firm wage inequality. The remaining columns of Table 2 consider different combinations of fixed effects in order to exploit different sources of identification. Column (2) includes country-year and industry fixed effects, thus achieving identification from differential variation across industries within country-year cells. Column (3) includes industry-country and year fixed effects. Here, identification is achieved from differential changes over time for a given industry within a given country. Columns (4) through (6) include different combinations of two-way fixed effects. Regardless of the source of variation used for identification, the positive correlation between concentration and inequality remains. Even in the most restrictive specifications in Columns (4) through (6), the coefficients remains statistically significant at the 1% level.

The second and third panels of Table 2 verify the robustness of our main result using alternative measures of turnover concentration. In the second panel, concentration is measured as the share of turnover of the top 10 firms in an industry-sector-year cell. In all specifications, the estimated coefficient is positive, and in all specifications except the one in Column (5), the coefficient is statistically significant at the 10% level or higher.

The third panel of Table 2 uses the Herfindahl-Hirschman index of market concentration. Once again, we find that the estimated correlations are generally positive and statistically significant. The estimates obtained when industry-country fixed effects are

---

9Specifically, if we assumed that all firms in the top 1% of the turnover distribution had the same market share as the firm at the 99th percentile, we can compute the market share of the top 1% of firms by dividing the turnover at the 99th percentile by the average turnover in the industry, and multiplying this by 1%.
Table 2: Concentration and Wage Inequality

<table>
<thead>
<tr>
<th>Dep var: log 90-10 ratio of wage bill per worker</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concentration (top 1%)</td>
<td>0.478</td>
<td>0.387</td>
<td>0.650</td>
<td>0.258</td>
<td>0.630</td>
<td>0.544</td>
</tr>
<tr>
<td></td>
<td>(0.082)***</td>
<td>(0.074)***</td>
<td>(0.083)***</td>
<td>(0.082)***</td>
<td>(0.097)***</td>
<td>(0.06)***</td>
</tr>
<tr>
<td>Obs.</td>
<td>6814</td>
<td>6809</td>
<td>6799</td>
<td>6754</td>
<td>6743</td>
<td>6793</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.836</td>
<td>0.873</td>
<td>0.933</td>
<td>0.886</td>
<td>0.944</td>
<td>0.967</td>
</tr>
<tr>
<td>Concentration (top 10)</td>
<td>0.251</td>
<td>0.171</td>
<td>0.168</td>
<td>0.135</td>
<td>0.111</td>
<td>0.087</td>
</tr>
<tr>
<td></td>
<td>(0.038)***</td>
<td>(0.029)***</td>
<td>(0.073)**</td>
<td>(0.032)**</td>
<td>(0.083)</td>
<td>(0.046)*</td>
</tr>
<tr>
<td>Obs.</td>
<td>7865</td>
<td>7854</td>
<td>7859</td>
<td>7827</td>
<td>7832</td>
<td>7848</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.704</td>
<td>0.833</td>
<td>0.828</td>
<td>0.859</td>
<td>0.855</td>
<td>0.940</td>
</tr>
<tr>
<td>Concentration (HHI)</td>
<td>0.333</td>
<td>0.441</td>
<td>0.113</td>
<td>0.956</td>
<td>-0.115</td>
<td>0.423</td>
</tr>
<tr>
<td></td>
<td>(0.092)***</td>
<td>(0.074)***</td>
<td>(0.130)</td>
<td>(0.092)***</td>
<td>(0.175)</td>
<td>(0.081)***</td>
</tr>
<tr>
<td>Obs.</td>
<td>8242</td>
<td>8231</td>
<td>8225</td>
<td>8196</td>
<td>8191</td>
<td>8214</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.702</td>
<td>0.826</td>
<td>0.836</td>
<td>0.861</td>
<td>0.862</td>
<td>0.943</td>
</tr>
<tr>
<td>Concentration (Employment)</td>
<td>0.222</td>
<td>0.101</td>
<td>0.555</td>
<td>-0.036</td>
<td>0.714</td>
<td>0.231</td>
</tr>
<tr>
<td></td>
<td>(0.088)**</td>
<td>(0.079)</td>
<td>(0.092)***</td>
<td>(0.088)</td>
<td>(0.105)***</td>
<td>(0.067)***</td>
</tr>
<tr>
<td>Obs.</td>
<td>6906</td>
<td>6901</td>
<td>6891</td>
<td>6851</td>
<td>6841</td>
<td>6885</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.834</td>
<td>0.872</td>
<td>0.933</td>
<td>0.885</td>
<td>0.944</td>
<td>0.967</td>
</tr>
<tr>
<td>Industry FE</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Country FE</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year FE</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Country x Year FE</td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industry x Country FE</td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industry x Year FE</td>
<td>Yes</td>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: All regressions are weighted using each industry’s share of total value added in the country.
included in Columns (3) and (5), however, are imprecise and not statistically significant.

In the final panel of Table 2, we replace our turnover-based measures of concentration with a measure of employment concentration. This is analogous to the turnover concentration measure based on the top 1% of firms, but now using the relative size (in terms of number of workers) for the firm at the 99th percentile of the size distribution within an industry-country-year cell. The results once again generally suggest a positive correlation between concentration and inequality.

In terms of the magnitude of the estimated correlations, consider the coefficients in the top panel of Table 2. These range between 0.26 and 0.65. Between 2005 and 2015, 10% of sector-country cells experience increases in concentration of 4.4 percentage points or more. Given the estimated coefficients, this would be associated with increases in inequality of roughly 1–3 log points. For the median sector-country cell, inequality increases by nearly 9 log points over this time period. Hence, the change in concentration can account for approximately 10–30% of the variation in inequality within sector-country cells.

Table 3 further explores the relationship between concentration and inequality using different measures of between-firm wage inequality. The top panel uses the standard deviation across firms of the wage bill per worker, instead of the 90-10 ratio, as our measure of between-firm wage inequality.\footnote{We exclude the top 1% of observations in terms of the standard deviation of the wage bill as they are extreme outliers.} The middle panels explore inequality in the top half and the bottom half of the distribution, by focusing on the log 90-50, and the log 50-10 ratio of firm-level wages. The bottom panel considers wage inequality between the very top of the distribution (99th percentile) and the 10th percentile. The results show that the relationship between concentration and wage inequality is generally observed throughout the entire distribution, with the estimated coefficients being positive and statistically significant in most cases. The magnitude of the estimated correlation tends to be larger when we focus on the very top of the distribution in the bottom panel of the table.

Finally, we explore the extent to which our results hold within each of the countries in our sample. To do so, we run a series of separate regressions of inequality on concentration for each country, including industry and time fixed effects. Figure 2 plots the estimated coefficient on concentration for each country, along with the corresponding 95% confidence interval. The correlation between concentration and inequality (conditional on industry and time fixed effects) is positive in 10 out of the 12 countries in
Table 3: Alternative Measures of Wage Inequality

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dep var:</strong></td>
<td>Standard Deviation of wage bill per worker</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concentration (top 1%)</td>
<td>12.555 (3.161)***</td>
<td>15.425 (3.010)***</td>
<td>0.310 (4.299)***</td>
<td>14.677 (3.281)***</td>
<td>-5.648 (5.028)***</td>
<td>4.559 (4.018)***</td>
</tr>
<tr>
<td>Obs.</td>
<td>7557</td>
<td>7557</td>
<td>7542</td>
<td>7506</td>
<td>7489</td>
<td>7542</td>
</tr>
<tr>
<td><strong>R^2</strong></td>
<td>0.543</td>
<td>0.606</td>
<td>0.671</td>
<td>0.658</td>
<td>0.721</td>
<td>0.732</td>
</tr>
</tbody>
</table>

|               | log 90-50 ratio of wage bill per worker |           |           |           |           |           |
| Concentration (top 1%) | 0.479 (0.057)*** | 0.511 (0.057)*** | 0.136 (0.041)*** | 0.462 (0.064)*** | 0.069 (0.047)*** | 0.234 (0.036)*** |
| Obs.          | 7412      | 7412      | 7395      | 7365      | 7346      | 7395      |
| **R^2**       | 0.549     | 0.576     | 0.905     | 0.604     | 0.924     | 0.931     |

|               | log 50-10 ratio of wage bill per worker |           |           |           |           |           |
| Concentration (top 1%) | 0.365 (0.065)*** | 0.240 (0.055)*** | 0.496 (0.074)*** | 0.169 (0.06)*** | 0.599 (0.088)*** | 0.280 (0.051)*** |
| Obs.          | 6814      | 6809      | 6799      | 6754      | 6743      | 6793      |
| **R^2**       | 0.809     | 0.869     | 0.900     | 0.885     | 0.914     | 0.956     |

|               | log 99-10 ratio of wage bill per worker |           |           |           |           |           |
| Concentration (top 1%) | 0.448 (0.106)*** | 0.371 (0.098)*** | 0.951 (0.113)*** | 0.161 (0.107)*** | 0.925 (0.13)*** | 0.847 (0.094)*** |
| Obs.          | 6731      | 6726      | 6716      | 6668      | 6657      | 6710      |
| **R^2**       | 0.824     | 0.855     | 0.919     | 0.875     | 0.936     | 0.948     |

Industry FE    | Yes       | Yes       |           |           |           |           |
Country FE     | Yes       |           |           |           |           |           |
Year FE        | Yes       |           |           |           |           |           |
Country x Year FE | Yes       |           | Yes       |           | Yes       |           |
Industry x Country FE | Yes       |           | Yes       |           | Yes       |           |
Industry x Year FE | Yes       |           | Yes       |           |           |           |

Note: All regressions are weighted using each industry’s share of total value added in the country.
Figure 2: Results by Country

Note: The figure plots the estimated coefficients and 95% confidence intervals obtained from country-specific regressions of inequality on concentration, industry and time fixed effects.

our sample, and is statistically significant at the 5% level or above for 7 of these 10 countries. This confirms that the results are widespread across European countries.

5 Conclusions

We document a theoretical and an empirical link between rising concentration and rising between-firm wage inequality. Conceptually, a shock that favors the most productive firms (e.g. an increase in consumer price sensitivity, as in Autor et al. (2017b)), will increase the concentration of employment and revenues in those firms. In a setting where worker wages are linked to the profitability of the firm that they are employed in (e.g. the fair wage framework of Egger and Kreickemeier (2012)), the increased dispersion of revenues across firms will also lead to an increase in between-firm wage inequality.

We confirm the empirical relevance of this conceptual link using data on concentration and between-firm wage inequality for 14 European countries over the period
1999-2016. We indeed find evidence of a statistically significant positive correlation between concentration and inequality at the industry-country-year level, which is robust to allowing for a variety of different combinations of industry, country and year fixed effects. The magnitude of the estimated correlation suggests that this link is economically relevant.

Further understanding the driving forces behind the rise in concentration and between-firm wage inequality, as well as the underlying micro-level adjustments occurring at the firm level using detailed micro-data would be promising avenues for future research.
References


