Product market and labor market imperfections and heterogeneity in panel data estimates of the production function*

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November 16, 2006

Abstract

Embedding the efficient bargaining model into the original R. Hall (1988) approach for estimating price-cost margins shows that both imperfections in the product and labor markets generate a wedge between factor elasticities in the production function and their corresponding shares in revenue. This article investigates these two sources of discrepancies both at the sector level and the firm level using an unbalanced panel of 10646 French firms in 38 manufacturing sectors over the period 1978-2001. By estimating standard production functions and comparing the estimated factor elasticities for labor and materials and their shares in revenue, we are able to derive estimates of average price-cost mark-up and extent of rent sharing parameters. For manufacturing as a whole, our preferred estimates of these parameters are of an order of magnitude of 1.3 and 0.5 respectively. Our sector-level results indicate that sector differences in these parameters and in the underlying estimated factor elasticities and shares are quite sizeable. Since firm production function, behavior and market environment are very likely to vary even within sectors, we also investigate firm-level heterogeneity in estimated mark-up and rent-sharing parameters. To determine the degree of true heterogeneity in these parameters, we adopt the P.A. Swamy (1970) methodology allowing to correct the observed variance in the firm-level estimates from their sampling variance. The median of the firm estimates of the price-cost mark-up ignoring labor market imperfections is of 1.10, while as expected it is higher of 1.20 when taking them into account and the median of the corresponding firm estimates of the extent of rent sharing is of 0.62. The

*We are grateful to Benoit Mulkay (Université Montpellier 1), Mark Rogers (Oxford University) and participants at the ZEW Conference on the Economics of Innovation and Patenting (Mannheim, 2005) and the International Industrial Organization Conference (Boston, 2006) for helpful comments and suggestions. All remaining errors are ours.

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Swamy corresponding robust estimates of true dispersion are of about 0.18, 0.37 and 0.35, giving indeed very sizeable within-sector firm heterogeneity. We find that firm size, capital intensity, distance to the sector technology frontier and investing in R&D seem to account for a significant part of this heterogeneity.

JEL classification : C23, D21, J51, L13.
Keywords : Rent sharing, price-cost mark-ups, production function, panel data.

1 Introduction

In a world of perfect competition, the output contribution of individual production factors equals their respective revenue shares. In numerous markets, however, market imperfections and distortions are prevalent. The most common sources for market power in product as well as labor markets are product differentiation, barriers to entry and imperfect information. Focusing on the labor side, market power generally originates from coalitions between employers and employees. The labor economics literature is dominated by the standard rent sharing models where, for example, costs of hiring, firing and training can be exploited by employees to gain market power. Those models generate wage differentials that are unrelated to productivity differentials and hinder the competitive market mechanism.[1]

Since the 1970s, models of imperfect competition have *separately* permeated many fields of economics ranging from industrial organization (see Bresnahan, 1989; Schmalensee, 1989 for surveys) to international trade (Brander and Spencer, 1985; Krugman, 1979) to labor economics (see Booth, 1995; Manning, 2003 for surveys). Recently, an empirical literature that examines *simultaneously* imperfections in both the product and the labor market has emerged (Bughin, 1996; Crépon-Desplatz-Mairesse, 1999, 2002; Neven-Röller-Zhang, 2002; Dobbelaere, 2004). These articles aim at bridging the gap between the econometric literature on estimating product market imperfections and the one on estimating labor market imperfections. Two methods dominate the most recent approaches to simultaneously estimate product market and labor market imperfections. One is the production function approach which entails estimating a structural model including the full set of explicitly specified factor share equations and the production function (see Bughin, 1996 and Neven et al., 2002). The other approach is an extension of a microeconomic version of R. Hall's (1988) framework and boils down to estimating a reduced form equation (see Crépon et al., 1999, 2002 and Dobbelaere, 2004). Following Marschak and Andrews' 1944 *Econometrica* article, many studies have applied the simultaneous equations methodology to production function estimation (see Griliches and Mairesse, 1998 and Ackerberg-Benkard-Berry-Pakes, 2006 for surveys). The

[1] Recently, the monopsony model (Manning, 2003) has received attention in the labor economics literature. Contrary to the classical rent sharing models, search frictions generate upward sloping labor supply curves to individual firms, giving *employers* some market power.

core of this paper is to provide an in-depth analysis of imperfections in the product and the labor markets as two sources of discrepancies between the marginal products of input factors and the apparent factor prices. By doing so, we contribute to the classical literature on estimating microeconomic production functions and to the recent empirical literature on simultaneously estimating imperfections in product and factor markets.

This article differs from the existing literature in the following ways. Consistent with the standard models of imperfect competition in the labor market pointed out above, we reflect on an extension of a microeconomic version of R. Hall's (1988) framework. Following Crépon et al. (1999, 2002), we presume that employees possess a degree of market power when negotiating with the firm over wages and employment (efficient bargaining model, McDonald and Solow, 1981). Assuming constant returns to scale, it can be shown that product and labor market imperfections generate a wedge between factor elasticities in the production function and their corresponding shares in revenue. By estimating standard production functions and comparing the estimated factor elasticities for labor and materials and their shares in revenue, we are able to derive estimates of average price-cost mark-up and extent of rent sharing parameters. Taking advantage of a rich panel of French manufacturing firms covering the period 1978-2001 (INSEE, SESSI, DEP), we analyze between- as well as within-sector heterogeneity in the estimated output elasticities and the retrieved parameters of interest. For manufacturing as a whole, the average output elasticities with respect to employment, materials and capital are estimated at 0.30, 0.67 and 0.03 respectively. The derived average price-cost mark-up is found to be 1.3 and the corresponding extent of rent sharing 0.5, showing that product markets and labor markets are overall far from being competitive. Ignoring the occurrence of rent sharing reduces the average price-cost mark-up to 1.2. Our sector-level results indicate that sector differences in these parameters and in the underlying estimated factor elasticities and shares are quite sizeable, as could be expected. The estimated price-cost mark-up is lower than 1.04 for the first quartile of sectors and exceeds 1.19 for the top quartile. There is no evidence of rent sharing for the first quartile of sectors but we estimate it to be higher than 0.33 for the top quartile. The median price-cost mark-up and extent of rent sharing are estimated at 1.15 and 0.12 respectively. Focusing on the 24 sector estimates for which the estimated price-cost mark-up equals or exceeds 1 and the corresponding estimated extent of rent sharing lies in the $[0, 1]$-interval, the corresponding median values are estimated at 1.18 and 0.27 respectively. To investigate different dimensions between those sectors, we classify them according to profitability, technology intensity and unionization. The estimated price-cost mark-up of highly profitable sectors exceeds the median value. Low-technology sectors, likely to be typified as less competitive sectors, display a price-cost mark-up and extent of rent sharing above the respective median values. Weakly unionized sectors are characterized by a price-cost mark-up below the respective median value. The estimated extent of rent sharing of half of those sectors is lower than the respective median value. Since firm production function, behavior and market environment are very likely to vary even within sectors, we also investigate firm-level heterogeneity in estimated mark-up and rent-sharing parameters (and the estimated factor elasticities and their shares). We analyze whether the observed cross-sectional dispersion in the estimated output elasticities of input factors, the price-cost mark-up and the extent of rent sharing is true or whether it is merely a reflection of sampling variability. To determine the degree of true heterogeneity in the production function coefficients and parameters of interest, we adopt the P.A. Swamy (1970) methodology as a variance decomposition approach. This method allows us to estimate the variance components of heterogeneity, i.e., the pure sampling variance and the true heterogeneity or dispersion (see also Mairesse-Griliches, 1990 for a related analysis). The logic behind this methodology is that due to noisy firm-level estimates, much of the variation is not caused by "real" parameter variability but purely by sampling error. Swamy (1970) suggests to correct the observed variability for this sampling variability by subtracting it off. Among the different estimators of coefficient heterogeneity, the Swamy estimates are the most straightforward to obtain and are robust to the possibility of correlated effects since they are based on individual firm regression estimates (see Mairesse-Griliches, 1990). The median of the firm estimates of the price-cost mark-up ignoring labor market imperfections is of 1.10, while as expected it is higher of 1.20 when taking them into account and the median of the corresponding firm estimates of the extent of rent sharing is of 0.62. The Swamy corresponding robust estimates of true dispersion are of about 0.18, 0.37 and 0.35, giving evidence of indeed very sizeable within-sector firm heterogeneity. Restricting ourselves to the economically meaningful parameter estimates of the firm price-cost mark-up and the corresponding extent of rent sharing, the median of the firm estimates of the price-cost mark-up is of 1.44 and the median of the corresponding firm estimates of the extent of rent sharing is of 0.58. The Swamy corresponding robust estimates of true dispersion are of about 0.28 and 0.20. Firm size, capital intensity, distance to the sector technology frontier and investing in R&D seem to account for a significant part of this heterogeneity.

We proceed as follows. Section 2 briefly presents our theoretical framework and provides estimates of output elasticities, price-cost mark-ups and the extent of rent sharing at the manufacturing level. In Section 3, we focus on between-sector heterogeneity and investigate different dimensions between sectors. Section 4 provides different estimators and indicators of heterogeneity in the firm price-cost mark-up and the extent of rent sharing and looks at within-sector heterogeneity. In addition, it concentrates on the role of specific firm-level variables in explaining part of the observed heterogeneity. Section 5 concludes.

2 Methodology

Consistent with two models of imperfect competition in the labor market that are currently commonplace in the literature, the efficient bargaining model and the monopsony model, we originally reflect on two extensions of Hall's (1988) framework. First, following Crépon et al. (1999, 2002), we presume that, for example, costs of firing, hiring and training can be exploited by employees to gain market power when negotiating with the firm over wages and employment (efficient bargaining). In this framework, the firm price-cost mark-up and the extent of rent sharing generate a wedge between output elasticities and factor shares. Second, we abstain from the assumption that the labor supply curve facing an individual employer is perfectly elastic (monopsony model). In this setting, the firm price-cost mark-up and the firm wage elasticity of the labor supply curve elicit deviations between marginal products of input factors and input prices.

Both extensions entail estimating a reduced-form equation which allows us to identify the structural parameters -measures of product and labor market imperfections- derived from theory. Our strategy of comparing both extensions is aimed at selecting the appropriate labor market model characterizing French manufacturing firms. Having a priori a prediction about the magnitude of economically meaningful parameter estimates, we can convincingly reject the extension anchoring the monopsony model on the basis of the data. This underlying theoretical model is briefly presented in Appendix. Based on the estimates, we did not follow that route in the remaining of the paper.

This section explains the theoretical framework encompassing the efficient bargaining model, derives the reduced-forms and discusses the manufacturing level results.

2.1 Efficient bargaining model

Following Crépon et al. (1999, 2002),[2] we start from a production function $Q_{it} = \Theta_{it} F(N_{it}, M_{it}, K_{it})$, where i is a firm index, t a time index, N is labor, M is material input, K is capital and $\Theta_{it} = Ae^{\eta_i + u_t + v_{it}}$ is an index of technical change or "true" total factor productivity. The logarithmic specification of the production function gives:

$$q_{it} = \varepsilon^{Q}_{N_{it}} n_{it} + \varepsilon^{Q}_{M_{it}} m_{it} + \varepsilon^{Q}_{K_{it}} k_{it} + \theta_{it} \tag{1}$$

We first assume that firms operate under imperfect competition in the product market and act as price takers in the input markets. Assuming that labor and material input are variable factors, short run profit maximization implies the following two first-order conditions:

$$\varepsilon^{Q}_{N_{it}} = \mu_{it} \alpha_{N_{it}} \tag{2}$$

[2] For technical details, see Crépon et al. (1999, 2002).

$$\varepsilon^Q_{M_{it}} = \mu_{it}\alpha_{M_{it}} \tag{3}$$

where $\alpha_{J_{it}} = \frac{P_{J_{it}}J_{it}}{P_{it}Q_{it}}\,(J = N, M)$ is the share of inputs in total revenue. $\mu_{it} = \frac{P_{it}}{C_{Q,it}}$ refers to the mark-up of price over marginal cost. Assuming constant returns to scale $\left(\varepsilon^Q_{N_{it}} + \varepsilon^Q_{M_{it}} + \varepsilon^Q_{K_{it}} = 1\right)$,[3] the capital elasticity can be expressed as:

$$\varepsilon^Q_{K_{it}} = 1 - \mu_{it}\alpha_{N_{it}} - \mu_{it}\alpha_{M_{it}} \tag{4}$$

Inserting (2), (3) and (4) in (1) and rearranging terms gives the following expression:

$$q_{it} - k_{it} = \mu_{it}\left[\alpha_{N_{it}}(n_{it} - k_{it}) + \alpha_{M_{it}}(m_{it} - k_{it})\right] + \theta_{it} \tag{5}$$

Let us now abstain from the assumption that labor is priced competitively. We assume that the union and the firm are involved in an efficient bargaining procedure, with both wages (w) and labor (N) being the subject of agreement. The union objective is to maximize $U(w_{it}, N_{it}) = N_{it}w_{it} + (\overline{N}_{it} - N_{it})\overline{w}_{it}$, where $\overline{N}_{it}$ is union membership $(0 < N_{it} \leq \overline{N}_{it})$ and $\overline{w}_{it} \leq w_{it}$ is the alternative wage. The firm objective is to maximize its short-run profit function: $\pi(w_{it}, N_{it}, M_{it}) = R_{it} - w_{it}N_{it} - j_{it}M_{it}$. The outcome of the bargaining is the asymmetric generalized Nash solution to:

$$\max_{w_{it},\, N_{it},\, M_{it}} \left\{N_{it}w_{it} + \left(\overline{N}_{it} - N_{it}\right)\overline{w}_{it} - \overline{N}_{it}\overline{w}_{it}\right\}^{\phi_{it}} \left\{R_{it} - w_{it}N_{it} - j_{it}M_{it}\right\}^{1-\phi_{it}} \tag{6}$$

where $\phi_{it} \in [0, 1]$ represents the bargaining power of the union.
The first-order condition with respect to material input is $R_{M,it} = j_{it}$, which directly leads to the corresponding equation (3). Maximization with respect to the wage rate and labor respectively gives the following first-order conditions:

$$w_{it} = \overline{w}_{it} + \frac{\phi_{it}}{1-\phi_{it}}\left[\frac{R_{it} - w_{it}N_{it} - j_{it}M_{it}}{N_{it}}\right] \tag{7}$$

$$w_{it} = R_{N,it} + \phi_{it}\left[\frac{R_{it} - R_{N,it}N_{it} - j_{it}M_{it}}{N_{it}}\right] \tag{8}$$

Solving simultaneously (7) and (8), leads to an expression for the contract curve: $R_{N,it} = \overline{w}_{it}$, or a modified equation (2):

$$\varepsilon^Q_{N_{it}} = \mu_{it}\left(\frac{\overline{w}_{it}N_{it}}{P_{it}Q_{it}}\right) \tag{9}$$

[3] The assumption of constant returns to scale is motivated by the large problem of identification that arises when price-cost mark-up and scale elasticity parameters are estimated simultaneously (Crépon et al., 2002).

Defining μ_{it} as $\left[\varepsilon^{R}_{Q_{it}}\right]^{-1} = \left[\frac{R_{Q,it}Q_{it}}{R_{it}}\right]^{-1}$, the marginal revenue of labor can be expressed as $R_{N,it} = R_{Q,it}Q_{N,it} = \frac{P_{it}Q_{N,it}}{\mu_{it}}$. Using this expression of $R_{N,it}$, Eq. (8) can be rewritten as $\varepsilon^{Q}_{N_{it}} = \mu_{it}\alpha_{N_{it}} + \mu_{it}\frac{\phi_{it}}{1-\phi_{it}}\left(\alpha_{N_{it}} + \alpha_{M_{it}} - 1\right)$.

Estimating the following equation:

$$q_{it} - k_{it} = \varepsilon^{Q}_{N_{it}}(n_{it} - k_{it}) + \varepsilon^{Q}_{M_{it}}(m_{it} - k_{it}) + \theta_{it} \tag{10}$$

allows the identification of (1) the mark-up of price over marginal cost and (2) the extent of rent sharing:

$$\mu_{it} = \frac{\varepsilon^{Q}_{M_{it}}}{\alpha_{M_{it}}} \tag{11}$$

$$\gamma_{it} = \frac{\phi_{it}}{1-\phi_{it}} = \frac{\varepsilon^{Q}_{N_{it}} - \left(\varepsilon^{Q}_{M_{it}}\frac{\alpha_{N_{it}}}{\alpha_{M_{it}}}\right)}{\frac{\varepsilon^{Q}_{M_{it}}}{\alpha_{M_{it}}}\left(\alpha_{N_{it}} + \alpha_{M_{it}} - 1\right)} \tag{12}$$

$$\phi_{it} = \frac{\gamma_{it}}{1+\gamma_{it}} \tag{13}$$

By embedding the efficient bargaining model into a microeconomic version of Hall's (1988) framework, it follows that the firm price-cost mark-up and the extent of rent sharing generate a wedge between output elasticities and factor shares.[4] The advantages of this extended approach are twofold: it avoids the problematic computation of the user cost of capital to assess the magnitude of the price-cost mark-up and it avoids the measurement of the alternative wage to estimate the extent of rent sharing.

2.2 A first look at general results

2.2.1 Data description

We use an unbalanced panel of French firms over the period 1978-2001. This sample has been constructed by merging accounting information of firms from EAE ("Enquête Annuelle d'Entreprise", "Service des Etudes et Statistiques Industrielles" (SESSI)) with data of Research & Development collected by DEP ("Ministère de l'Education et de la Recherche"). We only keep firms for which we have at least 12 years of observations, ending up with an unbalanced panel

[4]Note that to accommodate two imperfectly competitive markets, we need at least two variable input factors to identify the model. Going beyond Hall (1988) is hence not possible when starting from a value added specification.

of 10646 firms with the number of observations for each firm varying between 12 and 24.[5] The R&D surveys (DEP) provide two R&D variables: a dichotomous R&D indicator and total R&D expenditure. We assume that the sample is exhaustive, i.e., a firm which does not report any R&D expenditure is considered to be a non-R&D firm. Based on this criterion, we construct three subsamples: the pure non-R&D firms (8818 firms), the mixed R&D firms for which we have data on R&D expenditure for less than 12 years (1299 firms) and the pure R&D firms for which we have data on R&D expenditure for at least 12 years (529 firms). We use real current production deflated by the two-digit producer price index of the French industrial classification as a proxy for output (Q). Labor (N) refers to the average number of employees in each firm for each year and material input (M) refers to intermediate consumption deflated by the two-digit intermediate consumption price index. The capital stock (K) is measured by the gross bookvalue of fixed assets. The shares of labor (α_N) and material input (α_M) are constructed by dividing respectively the firm total labor cost and undeflated intermediate consumption by the firm undeflated production and by taking the average of these ratios over adjacent years. Table 1 reports the means, standard deviations and first and third quartiles of our main variables.

<Insert Table 1 about here>

2.2.2 Manufacturing-level results

Being interested in average output elasticities and derived reduced-form parameters, we estimate the following specification for the manufacturing industry as a whole over the period 1978-2001:

$$q_{it} - k_{it} = \varepsilon_N^Q (n_{it} - k_{it}) + \varepsilon_M^Q (m_{it} - k_{it}) + \zeta_{it} \tag{14}$$

Table 2 presents the results of the basic production function (14) for a range of estimators. Columns 1 and 2 report the levels OLS and the first-differenced OLS estimates respectively. From column 3 onwards, we take into account endogeneity problems. Columns 3 and 5 show the results of estimating the model in first differences to eliminate unobserved firm-specific effects and using appropriate lags of the variables in levels (n, m and k) as instruments for the differenced regressors to correct for simultaneity (standard panel first-differenced GMM). As argued by, for example, Blundell and Bond (2000), the first-differenced GMM estimator might be subject to large finite sample biases due to the time series persistence properties of some of the variables. In columns 4 and 6, we therefore adopt a more efficient GMM estimator which includes level moments (system GMM).[6] The last two columns show the results of estimating a dynamic specification of Eq.(14), allowing for an autoregressive component in the productivity

[5] Putting the number of firms between brackets and the number of observations between square brackets, the structure of the data is given by: (1398) [12], (1369) [13], (1403) [14], (1315) [15], (3414) [16], (226) [17], (215) [18], (200) [19], (164) [20], (153) [21], (180) [22], (136) [23], (473) [24].

[6] The GMM estimation is carried out in Stata 9.2 (Roodman, 2005). We report results for the *one*-step estimator, for which inference based on the asymptotic variance matrix is shown

shocks. The productivity term is modelled as:

$$\begin{array}{rcl}\zeta_{it} & = & \eta_i + u_t + \upsilon_{it} \\ \upsilon_{it} & = & \rho\upsilon_{it-1} + e_{it} \qquad |\rho| < 1 \\ e_{it} & \sim & MA(0)\end{array} \tag{15}$$

where η_i is an unobserved firm-specific effect, u_t a year-specific intercept and υ_{it} is an $AR(1)$ error term.

The first part of the table gives the estimated output elasticities. Part 2 provides specification tests. We report the results of first- and second-order residual serial correlation tests (m_1 and m_2) and, when appropriate, the Sargan test of overidentifying restrictions (p-values) and the Difference Sargan test (p-values) of validity of the additional moment conditions used in the system GMM estimator relative to the corresponding first-differenced GMM estimator. In the last row of the table, test statistics of common factor restrictions ($Comfac$) in the dynamic specification are shown.[7] The third part of Table 2 presents our parameters of interest which are derived from the production function coefficients: the price-cost mark-up assuming perfect competition in the labor market ($\widehat{\mu}$ *only*), and both the price-cost mark-up ($\widehat{\mu}$) and the extent of rent sharing ($\widehat{\phi}$). The standard errors (σ) of $\widehat{\mu}$ and $\widehat{\phi}$ are computed using the Delta Method (Woolridge, 2002): $\sigma^2_{\widehat{\mu}} = \frac{1}{\alpha^2_M}\sigma^2_{\widehat{\varepsilon}^Q_M}$, $\sigma^2_{\widehat{\gamma}} = \left(\frac{\alpha_M}{\alpha_N+\alpha_{M-1}}\right)^2 \frac{\left(\widehat{\varepsilon}^Q_M\right)^2\sigma^2_{\widehat{\varepsilon}^Q_N} - 2\,\widehat{\varepsilon}^Q_N\widehat{\varepsilon}^Q_M\,\sigma_{\widehat{\varepsilon}^Q_N,\widehat{\varepsilon}^Q_M} + \left(\widehat{\varepsilon}^Q_N\right)^2\sigma^2_{\widehat{\varepsilon}^Q_M}}{\left(\widehat{\varepsilon}^Q_M\right)^4}$ and $\sigma^2_{\widehat{\phi}} = \frac{\sigma^2_{\widehat{\gamma}}}{(1+\widehat{\gamma})^4}$.

Focusing on our preferred estimator, the system GMM estimator, ε^Q_N, ε^Q_M and -the complement- ε^Q_K are estimated at 0.298, 0.675 and 0.027 respectively. The derived price-cost mark-up is found to be 1.3 and the corresponding extent of rent sharing 0.5. Consistent with previous findings (f.e. Dobbelaere, 2004 for the Belgian manufacturing industry), estimating price-cost mark-ups relying on the original Hall (1988) approach, assuming allocative wages, generates a downward bias. For France, ignoring imperfect competition in the labor market brings the price-cost mark-up estimate down to 1.2. Intuitively, this underestimation corresponds to the omission of the part of product rents captured by the workers. Note that the validity of the instruments in the first-differenced equations is rejected by the Sargan test of overidentifying restrictions. The Difference Sargan test does however not reject the validity of the additional instruments in differences in the levels equations. In the dynamic specification results, the test of common factor restrictions is never passed.

to be more reliable than for the asymptotically more efficient two-step estimator (Blundell and Bond, 2000).

[7] Using (15), we can transform (14) through substitution to obtain $q_{it} - k_{it} = \pi_1(q_{it-1} - k_{it-1}) + \pi_2(n_{it} - k_{it}) + \pi_3(n_{it-1} - k_{it-1}) + \pi_4(m_{it} - k_{it}) + \pi_5(m_{it-1} - k_{it-1}) + \eta_i^* + u_t^* + e_{it}$, where $\pi_1 = \rho$, $\pi_2 = \varepsilon^Q_N$, $\pi_3 = -\rho\,\varepsilon^Q_N$, $\pi_4 = \varepsilon^Q_M$, $\pi_5 = -\rho\,\varepsilon^Q_M$, $\eta_i^* = (1-\rho)\,\eta_i$ and $u_t^* = u_t - \rho\,u_{t-1}$. Given consistent estimates of the unrestricted parameter vector $\boldsymbol{\pi} = (\pi_1, \pi_2, \pi_3, \pi_4, \pi_5)$, the two non-linear common factor restrictions $\pi_3 = -\pi_1\,\pi_2$ and $\pi_5 = -\pi_1\,\pi_4$ can be tested using minimum distance to get the restricted parameter vector $\left(\varepsilon^Q_N, \varepsilon^Q_M, \rho\right)$.

<*Insert Table 2 about here*>

By way of sensitivity test, we restrict the total sample to those firms for which we have 24 years of observations. The results are reported in Table A.1. in Appendix. The system GMM estimates of the static specification are similar to those of the total sample (μ *only* and μ are estimated at 1.2 and 1.3 respectively), although the implied extent of rent sharing is slightly lower (0.4 compared to 0.5 for the total sample). In contrast to the total sample results, the Sargan test does not reject the joint validity of the lagged levels of n, m and k dated $(t-2)$ (and earlier) as instruments in the first-differenced equations but the validity of the additional first-differenced variables as instruments in the levels equations is rejected by the Difference Sargan test.

3 Between-sector heterogeneity in $\hat{\mu}$ and $\widehat{\phi}$

3.1 Between-sector estimates

In this section, we do not take into account potential firm-level heterogeneity and estimate the production function (Eq.(14)) for each sector j. The average sector-level price-cost mark-ups ($\hat{\mu}_j$), relative bargaining power ($\widehat{\gamma}_j$) and extent of rent sharing ($\widehat{\phi}_j$) parameters are derived from the estimated output elasticities:

$$\hat{\mu}_j = \frac{\widehat{\varepsilon}^Q_{M_j}}{\alpha_{M_j}}$$

$$\widehat{\gamma}_j = \frac{\widehat{\varepsilon}^Q_{N_j} - \left(\widehat{\varepsilon}^Q_{M_j} \frac{\alpha_{N_j}}{\alpha_{M_j}}\right)}{\frac{\widehat{\varepsilon}^Q_{M_j}}{\alpha_{M_j}} \left(\alpha_{N_j} + \alpha_{M_j} - 1\right)} \tag{16}$$

$$\widehat{\phi}_j = \frac{\widehat{\gamma}_j}{1 + \widehat{\gamma}_j}$$

We decompose the total sample into 38 manufacturing sectors according to the French industrial classification ("Nomenclature économique de synthèse - Niveau 3" [NES 114]). Table A.2 in Appendix shows the sector repartition of the sample. Table 3 summarizes the first-differenced OLS and the system GMM results of the sector analysis. For each estimator, we consider two subsamples. The first subsample contains the estimates for which the price-cost mark-up equals or exceeds 1 and the corresponding extent of rent sharing lies in the $[0, 1]$-interval. The second subsample includes the estimates showing no evidence of rent sharing and a price-cost mark-up ignoring labor market imperfections that equals or exceeds 1. Both estimators have 21 sectors in common in the first subsample and 8 in the second subsample. Detailed information on the first-differenced OLS and the system GMM estimates is presented in Table A.3.a in Appendix. In the left part of Table A.3.a [Part 1-2], we compute the average shares of labor, material input and capital for each sector. The middle part reports the first-differenced OLS and the system GMM estimates of the output elasticities. The right part presents the derived parameters of interest: the price-cost mark-up assuming that labor is priced competitively ($\widehat{\mu}_j$ *only*), the price-cost mark-up taking into account labor market imperfections ($\widehat{\mu}_j$), the relative bargaining power ($\widehat{\gamma}_j$) and the extent of rent sharing ($\widehat{\phi}_j$). For each estimator, we first report the estimates of the first subsample [24 sectors for OLS DIF and 26 for system GMM], followed by those of the second subsample [14 for OLS DIF and 11 for system GMM[8]]. Within each subsample, the table is drawn up in increasing order of $\widehat{\mu}_j$ *only*. Economically meaningful estimates are blackened.[9]

From Table 3, it follows that sector differences in the parameters and in the underlying estimated factor elasticities and shares are quite sizable, as could be expected. Concentrating on the economically meaningful first-differenced OLS estimates of the price-cost mark-up and the corresponding extent of rent sharing [24 sectors], the price-cost mark-up ($\widehat{\mu}_j$) is estimated to be lower than 1.15 for the first quartile of sectors and higher than 1.22 for the top quartile. The corresponding estimate of the extent of rent sharing is found to be lower than 0.13 for the first quartile of sectors and higher than 0.39 for the top quartile. The median values are estimated at 1.18 and 0.27 respectively. As to the first-differenced OLS results of the full sample, the estimated price-cost mark-up ($\widehat{\mu}_j$) is lower than 1.04 for the first quartile of sectors and exceeds 1.19 for the top quartile. There is no evidence of rent sharing for the first quartile of sectors but we estimate it to be higher than 0.33 for the top quartile. Focusing on the median, the price-cost mark-up and the extent of rent sharing are estimated at 1.15 and 0.12 respectively. Ignoring the occurrence of rent sharing reduces the estimated median price-cost mark-up to 1.09.

When taking into account endogeneity problems, the estimates of the price-cost mark-up appear to be higher than the first-differenced OLS results (see system GMM results in Table 3). For the full sample, the median price-cost mark-up and the median extent of rent sharing are estimated at 1.25 and 0.11 respectively. For 26 out of 38 sectors, we find evidence of price-cost mark-ups being underestimated when imperfection in the labor market is ignored, hence validating the findings of Bughin (1996) and Dobbelaere (2004). Consistent with the first-differenced OLS results, the median of the sector estimates of the price-cost mark-up (value of 1.28) and -in particular- the median of the corresponding

[8] In Table A.3.a [Part 4], we also report the estimates of sector 1, for which $\widehat{\phi}_j = 1$ and $\widehat{\mu}_j$ *only* > 1. The estimate of the extent of rent sharing is however not significant.

[9] If $\widehat{\mu}_j \geq 1$ and $\widehat{\phi}_j \in [0,1]$, $\boldsymbol{\widehat{\mu}_j}$, $\boldsymbol{\widehat{\gamma}_j}$ and $\boldsymbol{\widehat{\phi}_j}$ are blackened (see f.e. sector 6, OLS DIF). If $\widehat{\phi}_j = 0$ and $\widehat{\mu}_j$ *only* ≥ 1, $\boldsymbol{\widehat{\mu}_j}$ **only** is blackened (see f.e. sector 3, OLS DIF).

sector estimates of the extent of rent sharing (value of 0.29) are considerably higher when considering only the economically meaningful parameter estimates [26 sectors].

<Insert Table 3 about here>

Table A.3.b in Appendix summarizes all the sector estimates. The upper part displays the correlation between our parameters of interest for a range of estimators (first-differenced OLS, first-differenced GMM and system GMM). The lower part of the table shows the correlation of the parameters across the different estimators. The left part of the table considers the full sample while the right part restricts the sample to those sectors for which the estimated extent of rent sharing lies in the $[0, 1]$-interval. The correlation between the estimated price-cost mark-up ignoring the occurrence of rent sharing ($\widehat{\mu}_j$ *only*) and the estimate taking into account labor market imperfections ($\widehat{\mu}_j$) amounts to 0.6 for each estimator (see upper part of Table A.3.b). The correlation between the price-cost mark-up estimate ($\widehat{\mu}_j$) and the estimated relative extent of rent sharing ($\widehat{\gamma}_j$) is found to be 0.8 for the whole sample and 0.5 for the restricted sample. From the lower part of Table A.3.b, it follows that particularly the first-differenced OLS and the system GMM estimates are highly correlated.

3.2 Different dimensions between sectors

To investigate different dimensions between sectors, we classify the sectors according to profitability, technology intensity and unionization. For each dimension, we consider four types (low, medium low, medium high and high). As to the profitability dimension, we calculate the sector-level price-cost margin (PCM)[10] and determine the different types based on the quartile values. The identification of the technology types relies on the OECD classification. This methodology uses two indicators of technology intensity, R&D expenditures divided by value added and R&D expenditures divided by production (OECD, 2005). To construct our measure of the degree of unionization, we merge our original dataset consisting of firms from EAE (SESSI) with the REPONSE 1998 ("Relations Professionnelles et Négociations d' Entreprises") database collected by the French Ministry of Labor. Having 911 firms left, we compute the average sector-level union density.[11] Similar to the profitability dimension, the quartile values define the four types. For each dimension, columns 4-6 in Table A.2 in Appendix indicate the type to which each sector belongs.

Graphs 1-3 aim at discerning a pattern in the economically meaningful sector estimates of $\widehat{\mu}_j$ and $\widehat{\phi}_j$.[12] Each graph corresponds to one of the three dimensions (profitability, technology intensity and unionization). Within each dimension,

[10] The price-cost margin is defined as the difference between revenue and variable cost over revenue (see Schmalensee, 1989 p. 960).

[11] Since we use a small non-representative subsample (only 911 firms) to define the degree of sector-level unionization, the resulting classification has to be interpreted with caution.

[12] The corresponding sectors are blackened in Table A.2 in Appendix.

different symbols refer to each of the four types (low, medium low, medium high and high). The dashed lines denote the median values ($\widehat{\mu}_{j,med} = 1.18$, $\widehat{\phi}_{j,med} = 0.27$). Given the positive correlation between $\widehat{\mu}_j$ and $\widehat{\phi}_j$ of 0.48, most sectors are situated either in the upper right part or the lower left part of the graphs. Focusing on Graph 1, the price-cost mark-up of two thirds of the highly profitable sectors is higher than the median price-cost mark-up. As to $\widehat{\phi}_j$, no clear pattern can be detected. From Graph 2, it follows that nearly two thirds of the low-technology sectors are characterized by a relatively high $\widehat{\mu}_j$ and $\widehat{\phi}_j$ (see upper right part of the graph).[13] Concentrating on Graph 3, nearly two thirds of the sectors with a high degree of unionization have a price-cost mark-up exceeding the median value. All weakly unionized sectors are situated in the lower part of the graph, being characterized by an estimated price-cost mark-up below the respective median values. The estimated extent of rent sharing of half of those sectors is lower than the median value.[14]

<Insert Graphs 1-3 about here>

4 Within-sector heterogeneity in $\hat{\mu}$ and $\widehat{\phi}$

Production behavior is very likely to vary even within sectors, because input combinations differ, labor markets are not homogeneous and demand might be more elastic or inelastic in one firm than another. In this section, we allow for heterogeneous production behavior across firms and address the question whether there is real firm-level heterogeneity in the estimated factor elasticities and shares, and the estimated mark-up and rent sharing parameters.

Since production is primarily affected by input factors and only secondarily by -for example- demand conditions, we assume that the relationships among variables are proper but the production function coefficients differ across firms. Therefore, we estimate the production function for each firm i and retrieve the firm price-cost mark-up $\widehat{\mu}_i$ and the extent of rent sharing $\widehat{\phi}_i$ from the estimated firm output elasticities ($\widehat{\varepsilon}^Q_{J_i}$, $J = N, M, K$).[15]

4.1 Swamy (1970) methodology

To determine the degree of true heterogeneity in the coefficients and parameters of interest, we adopt the Swamy (1970) methodology as a variance decomposition approach. This method allows us to estimate the variance components of heterogeneity in the estimated firm output elasticities ($\widehat{\varepsilon}^Q_{J_i}$, $J = N, M, K$)

[13] Note that in contrast to Graphs 1 and 3, **12** sectors belong to the low-technology category.

[14] Graphs 1-3 display the first-differenced OLS estimates of $\widehat{\mu}_j$ and $\widehat{\phi}_j$ (see blackened sector estimates in Table A.3.a, Part 1). Plotting the system GMM estimates of $\widehat{\mu}_j$ against $\widehat{\phi}_j$ (see blackened sector estimates in Table A.3.a, Part 3) leads largely to the same .conclusions.

[15] Besides allowing for the possible heterogeneity across firms, we could also focus on the stability of the structural parameters over time. However, relaxing the constancy of μ_i and ϕ_i in the time dimension would strain our already overextended computational framework.

and the derived structural parameters ($\hat{\mu}_i$ *only*, $\hat{\mu}_i$, $\widehat{\gamma}_i$ and $\hat{\phi}_i$), i.e., the pure sampling variance and the true heterogeneity.
Considering random production function coefficients that vary across firms and letting $x_{1it} \equiv 1$, we can rewrite the production function as follows:[16]

$$q_{it} = \sum_{k=1}^{K} \varepsilon_{kit} x_{kit} + \xi_{it} \tag{17}$$

$\boldsymbol{\varepsilon}_i$ is assumed to be randomly distributed with $\boldsymbol{\varepsilon}_i = \widetilde{\boldsymbol{\varepsilon}} + \boldsymbol{\eta}_i$. $\widetilde{\boldsymbol{\varepsilon}} = \left(\widetilde{\varepsilon}_1, ..., \widetilde{\varepsilon}_K\right)'$ represents the common-mean coefficient vector and $\boldsymbol{\eta}_i = \left(\eta_{1i}, ..., \eta_{Ki}\right)'$ the individual deviation from the common mean $\widetilde{\boldsymbol{\varepsilon}}$. Following Swamy (1970), we assume that the errors for firm i are uncorrelated across firms and allow for heteroskedasticity across firms, $\boldsymbol{\xi}_i \sim N\left(\mathbf{0}, \sigma_i^2 I\right)$. $E\left(\boldsymbol{\eta}_i\right) = \mathbf{0}$, $E\left(\boldsymbol{\eta}_i \boldsymbol{\eta}_j'\right) = \Delta$, if $i = j$, $E\left(\boldsymbol{\eta}_i \boldsymbol{\eta}_j'\right) = \mathbf{0}$**,** otherwise. Swamy suggests first estimating Eq. (17) for each firm i by OLS giving:

$$\begin{aligned} \widehat{\boldsymbol{\varepsilon}}_i &= \left(X_i' X_i\right)^{-1} X_i' \mathbf{q}_i \quad \text{with} && (18) \\ \widehat{\boldsymbol{\xi}}_i &= \mathbf{q}_i - X_i \widehat{\boldsymbol{\varepsilon}}_i && (19) \end{aligned}$$

Using (18) and (19), we obtain unbiased estimators of σ_i^2 and Δ, given by Eq. (20) and (21) respectively.

$$\widehat{\sigma}_i^2 = \frac{\widehat{\boldsymbol{\xi}}_i' \widehat{\boldsymbol{\xi}}_i}{T - K} \tag{20}$$

with the estimated variance-covariance matrix $Var\left(\widehat{\boldsymbol{\varepsilon}}_i\right) = \widehat{\sigma}_i^2 \left(X_i' X_i\right)^{-1}$. Defining the mean of $\widehat{\boldsymbol{\varepsilon}}_i$ as $\overline{\boldsymbol{\varepsilon}} = \frac{1}{N} \sum_{i=1}^{N} \widehat{\boldsymbol{\varepsilon}}_i$, their variance can be estimated as:

$$\begin{aligned} \widehat{\Delta} &= \frac{1}{N-1} \sum_{i=1}^{N} \left(\widehat{\boldsymbol{\varepsilon}}_i - \overline{\boldsymbol{\varepsilon}}\right) \left(\widehat{\boldsymbol{\varepsilon}}_i - \overline{\boldsymbol{\varepsilon}}\right)' - \frac{1}{N} \sum_{i=1}^{N} Var\left(\widehat{\boldsymbol{\varepsilon}}_i\right) \\ &= \underbrace{\frac{1}{N-1} \sum_{i=1}^{N} \left(\widehat{\boldsymbol{\varepsilon}}_i - \overline{\boldsymbol{\varepsilon}}\right) \left(\widehat{\boldsymbol{\varepsilon}}_i - \overline{\boldsymbol{\varepsilon}}\right)'}_{(1)} - \underbrace{\frac{1}{N} \sum_{i=1}^{N} \sigma_i^2 \left(X_i' X_i\right)^{-1}}_{(2)} \qquad (21) \end{aligned}$$

The logic behind the definition of $\widehat{\Delta}$, the Swamy estimate of true variance of the coefficients, is that due to noisy estimates $(\widehat{\boldsymbol{\varepsilon}}_i)$, much of the variation in $\widehat{\boldsymbol{\varepsilon}}_i$ is not caused by "real" parameter variability but purely by sampling error. Swamy

[16]For the sake of parsimony, we denote the explanatory variables by x_{kit} $(k = 1,..,K)$ and the firm output elasticities by ε_{kit} (dropping the superscript (Q) and the subscript $(J = N, M)$).

(1970) thus suggests to correct for this sampling variability by subtracting it off.
Two major advantages of the Swamy methodology are that these estimates are the most straightforward to obtain among the different estimators of coefficient heterogeneity and that they are robust to the possibility of correlated effects between the firm intercept and slope parameters and the other variables in the equation since they are based on individual regression estimates (see Mairesse-Griliches, 1990).[17]

4.2 General overview

Table 4 summarizes the first-differenced OLS results of estimating Eq.(17) for each firm i in a comprehendible fashion. Consistent with the between-sector estimates, we consider two subsamples of estimates. The first part of Table 4 shows the results of the first subsample keeping only the firm estimates of which $\hat{\mu}_i \geq 1$ and $\hat{\phi}_i \in [0,1]$ [5906 firms]. The second part of Table 4 presents the results of the second subsample restricting the firm estimates to those of which $\hat{\phi}_i = 0$ and $\hat{\mu}_i$ *only* ≥ 1 [1239 firms]. The last part of Table 4 summarizes the results of all the firm estimates [10646 firms]. Each part is split into three sections, focusing on the simple mean, the weighted mean and the median respectively. Table A.4 in Appendix, which is structured in the same way as Table 4, reports detailed information on the results of applying the Swamy (1970) methodology. For comparison purposes, we list also similar statistics for the firm input shares (α_{J_i}, $J = N, M, K$). Within each part, the last row of each section reports the F-statistic for the hypothesis of equality of the estimates (or the computed variables) across firms.

The first section of each part of Table A.4 gives the original Swamy estimates of true variance [$\widehat{\sigma}^2_{true}$, corresponding to $\widehat{\Delta}$ in Eq. (21)], which are computed as the difference between the observed variance of the individually estimated firm coefficients [$\widehat{\sigma}^2_o$, corresponding to term (1) in Eq. (21)] and the mean of the corresponding sampling variance [$\widehat{\sigma}^2_s$, corresponding to term (2) in Eq. (21)].[18] The

[17] Besides the Swamy method, the random coefficient model literature suggests another approach to estimate the variance components of heterogeneity, using the maximum likelihood (ML) estimator and the more flexible approach of regressing the squares and the cross-products of residuals on comparable squares and cross-products of the independent variables (Hildreth and Houck, 1968; Amemiya, 1977; MaCurdy, 1985). Contrary to the Swamy estimates, the ML estimates and those based on the regression of the squares and cross-products of the residuals assume either the independence of the firm slope parameteres or the independence between both the firm intercept and slope parameters and the other variables in the equation, i.e., the absence of correlated effects (see Mairesse-Griliches, 1990 for a comparison of the three different approaches).

[18] Taking into account the unbalanced nature of the sample, the equivalent for the input shares α_J can be expressed as: $\widetilde{\sigma}^2_{true} = \frac{1}{N-1}\sum_{i=1}^{N}\left(\overline{\alpha}_{J_i} - \overline{\alpha}_J\right)^2 - \frac{1}{\overline{T}}\widetilde{\sigma}^2_s$, where n_t denotes the number of years within firm i and N_{n_t} the number of firms having n_t years of observations. $\overline{T} = \sum_{n_t=12}^{24}\left(\frac{N_{n_t}}{N}n_t\right)$, $\overline{\alpha}_{J_i} = \frac{1}{T}\sum_{t=1}^{n_t}\alpha_{J_{it}}$, $\overline{\alpha}_J = \frac{1}{N}\sum_{i=1}^{N}\overline{\alpha}_{J_i}$ and $\widetilde{\sigma}^2_s =$

observed variance $\left(\widehat{\sigma}_o^2\right)$ illustrates the sizeable dispersion in the estimated firm output elasticities and the derived parameters and shows that the heterogeneity at the firm level is largely magnified by large sampling errors arising from the rather short time series available. Due to the large sampling variance $\left(\widehat{\sigma}_s^2\right)$, we even find zero estimates of true variance in the individually estimated extent of rent sharing $\hat{\phi}_i$ in the first subsample [5906 firms] and the total sample [10646 firms]. All the observed variability is either common to all firms, transitory or attributable to sampling variability. Given the large number of degrees of freedom, all the F-statistics are significant at conventional significance levels (the critical value barely exceeds 1 for our sample size), except for $\hat{\phi}_i$.[19] Except for $\hat{\mu}_i$ *only*, the large sampling variance drives the true variance in all the derived parameters towards zero in the second subsample [1239 firms].

To investigate whether the true heterogeneity is not just an artefact of outliers and large sampling errors, we look at the Swamy estimates of the weighted true variance and the Swamy estimates of the robust true variance. The Swamy estimate of the *weighted* true variance, which is calculated as the weighted observed variance minus the weighted sampling variances, is reported in the second section of each part of Table A.4.[20] The weight is defined as the inverse of the sampling variance. As to the estimated firm output elasticities ($\widehat{\varepsilon}_{J_i}^Q$, $J = N, M, K$), the weighted observed and -even more so- the weighted sampling variance are considerably smaller than the corresponding simple observed and simple sampling variance. As such, the Swamy estimate of the weighted true variance exceeds the corresponding Swamy estimate of the simple true variance in both subsamples. As to the total sample, the Swamy estimate of the weighted true variance is very similar to the corresponding Swamy estimate of the simple true variance. Focusing on the derived structural parameters ($\hat{\mu}_i$ *only*, $\hat{\mu}_i$, $\widehat{\gamma}_i$ and $\hat{\phi}_i$), the difference between the weighted observed (sampling) variance and the simple observed (sampling) variance is even more pronounced. As a result, the Swamy estimates of the weighted true variance are significantly different from zero in the first subsample and the total sample. Hence, contrary to the results in the first section, the hypothesis of homogeneity is clearly rejected everywhere, even for $\hat{\phi}_i$. Given our focus on $\hat{\mu}_i$ *only* in the second subsample, we only find true variance in that parameter in this subsample.

In section 3 of each part of Table A.4, we report the Swamy estimates of the *robust* true variance,[21] which are computed by subtracting the median of the

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$\frac{1}{N(T-1)} \sum_{i=1}^{N} \sum_{t=1}^{n_t} \left(\alpha_{J_{it}} - \overline{\alpha}_{J_i}\right)^2$.

[19] One can question, however, the validity of these F-statistics in such large samples. A more symmetric treatment of the inference problem, advocated by Leamer (1978), would necessitate using a critical value which increases with the number of degrees of freedom. This would lead to less certainty in rejecting the hypothesis of homogeneity (Mairesse-Griliches, 1990).

[20] In practice, the weighted sampling variance is calculated as $N \sum_{i=1}^{N} \widehat{\sigma}_i^2$.

[21] When focusing on *robust* indicators and estimates, we assume that the individually estimated parameters are normally distributed and the sampling variance is distributed as χ^2.

individually estimated sampling variances from the interquartile observed variance.[22] Consistent with the Swamy estimates of the weighted true variance, we find persistent individual firm differences in both the firm input shares, the firm estimated elasticities and the derived parameters in the first subsample and the total sample . Compared to the weighted results, both the interquartile observed variance, the robust sampling variance and the Swamy estimate of robust true variance of the derived parameters are larger than their weighted counterparts.

Having explained the computations of Table 4, we discuss now briefly that table. The first row of each section lists respectively the simple averages, the weighted averages and the median values of the firm input shares, the individually estimated firm output elasticities and the derived structural parameters. The corresponding observed dispersion $(\widehat{\sigma}_o)$ is put between brackets while the corresponding Swamy estimates of true dispersion $(\widehat{\sigma}_{true})$ are given between square brackets. As to the estimated firm output elasticities and the price-cost mark-ups, the simple mean, the weighted mean and the median do not differ considerably. For the sample of 5906 firms, the elasticities of labor, material input and capital are estimated at about 0.13, 0.73 and 0.11, respectively. The estimates of the price-cost mark-up ignoring the occurrence of rent sharing and the one taking into account labor market imperfections amount to 1.14 and 1.46 respectively.[23] The simple average of the estimated extent of rent sharing $\left(\hat{\phi}_i\right)$ is close to the median value (0.58). The weighted mean points to a higher extent of rent sharing (0.81). Concentrating on the median, the Swamy robust estimates of true dispersion of 0.14 for $\hat{\mu}_i$ *only*, 0.28 for $\hat{\mu}_i$ and 0.20 for $\hat{\phi}_i$ are good indicators of a credible amount of heterogeneity. For the sample of 1239 firms, the median of the firm estimates of the elasticities of labor, material input and capital is of 0.40, 0.59 and 0.01, respectively. The median of the estimated price-cost mark-ups ignoring labor market imperfections is of 1.22 with a Swamy corresponding robust estimate of true dispersion of 0.17. As to the total sample [10646 firms], the median of the estimated elasticities of labor, material input and capital is of 0.26, 0.61 and 0.09. The median of the firm estimates of the price-cost mark-up assuming that labor is priced competitively is of 1.1, while it is higher of 1.2 when taking labor market imperfections into account and the median of the corresponding firm estimates of the extent of rent sharing is of 0.62.[24] The Swamy corresponding robust estimates of true dispersion of 0.18, 0.37 and 0.35 give evidence of a very sizeable within-sector firm heterogeneity.

<Insert Table 4 about here>

[22] The term *interquartile observed variance* indicates that the observed variance is computed from the interquartile range of the firm input shares and firm estimates.

[23] At the individual level, the correlation between the derived price-cost mark-up ignoring the occurrence of rent sharing and the estimate taking into account labor market imperfections amounts to 0.31 for the subsample consisting of 5906 firm estimates. Except for 13 firms, the lack of explicit consideration of labor market imperfections results in an underestimation of the firm-level price-cost mark-up.

[24] For the total sample, the correlation between $\hat{\mu}_i$ *only* and $\hat{\mu}_i$ amounts to 0.44. For 61% of the firms, the firm price-cost mark-up is underestimated when labor market imperfections are ignored.

4.3 Within-sector heterogeneity

Starting from the 10646 firm estimates, we group the individually estimated firm elasticities and the derived structural parameters into 38 sectors, according to the sector classification in Section 3. Being interested in within-sector heterogeneity, we report the weighted mean and the corresponding Swamy estimate of weighted *true* standard deviation of the firm estimates in Table A.5 in Appendix. The ranking of sectors equals the one of Table A.3.a [Part1-2]. Table 5 summarizes the within-sector estimates. Focusing on the subsample of 24 sectors, one-fourth of the sectors exhibit a price-cost mark-up ($\widehat{\mu}_{ij}$) which is lower than 1.16. Looking at the top quartile of sectors, the estimated price-cost mark-up exceeds 1.23. The estimated extent of rent sharing ($\widehat{\phi}_{ij}$) appears to be lower than 0.76 for the first quartile of sectors and higher than 0.85 for the top quartile. As to the subsample of 14 sectors, the estimates of the price-cost mark-up ignoring labor market imperfections ($\widehat{\mu}_{ij}$ *only*) are less dispersed. This estimated price-cost mark-up is found to be lower than 1.09 for the first quartile of sectors and higher than 1.11 for the top quartile. As to the total sample, one-fourth of the sectors display a price-cost mark-up ($\widehat{\mu}_{ij}$) which is higher than 1.09. At the top quartile, the estimated price-cost mark-up exceeds 1.22. The estimated extent of rent sharing appears to be lower than 0.76 for the first quartile of sectors and higher than 0.84 for the top quartile. The correlation between the estimated price-cost mark-up assuming that labor is priced competitively ($\widehat{\mu}_{ij}$ *only*) and the estimate taking into account labor market imperfections ($\widehat{\mu}_{ij}$) is found to be 0.34. The correlation between the price-cost mark-up estimate ($\widehat{\mu}_{ij}$) and the estimated relative extent of rent sharing ($\widehat{\gamma}_{ij}$) amounts to 0.45. Comparing the uppert part of Table 3 with Table 5, it follows that the match between the sector and the firm estimates is quite good for $\widehat{\mu}$ *only* and $\widehat{\mu}$, but far less so for $\widehat{\gamma}$ and $\hat{\phi}$.

<Insert Table 5 about here>

4.4 Determinants of observed heterogeneity

In this section, we investigate whether firm-level variables, like size, capital intensity, being a mixed or pure R&D firm and distance to the sector technology frontier, explain part of the observed heterogeneity in the estimated price-cost mark-ups and relative extent of rent sharing. First, we discuss the data. Then, we analyze whether the firm-level variables influence $\hat{\mu}$ and $\widehat{\gamma}$ at the firm level.

Data description

As before, we merge the R&D information (DEP) with accounting information of firms from EAE (SESSI). We only consider the economically meaningful firm estimates as dependent variables. More specifically, the dependent variable is either the vector of $\ln(\widehat{\mu}_i \text{ } only - 1)$ $(i = 1, ..., 1239)$, the vector of $\ln(\widehat{\mu}_i - 1)$ $(i = 1, ..., 5906)$ or the vector of $\ln(\widehat{\gamma}_i)$ $(i = 1, ..., 5906)$.[25] For each of

[25]Consistent with Section 4.2, we consider two subsamples. The first subsample consists of

these dependent variables, we have four different matrices of regressors. Each set consists of a firm-level variable (size, capital intensity, the R&D identifier, distance to the sector technology frontier) and sector dummies. All variables are centered around the sector mean. Size (n_i) is measured by the logarithm of the average number of employees in each firm and capital intensity ($capint_i$) by the logarithm of the gross book-value of fixed assets divided by sales. We identify R&D firms through the dichotomous R&D indicator. As mentioned above, we consider pure non-R&D firms, mixed R&D firms ($mixentr_i$) and pure R&D firms ($rdentr_i$). Our measure of the distance of a firm to its sector technology frontier takes the following form $dist_i = p^{95} \ln\left(\frac{VA}{N}\right)_j - \ln\left(\frac{VA}{N}\right)_{ij}$, where i is a firm index, j a sector index and $\frac{VA}{N}$ value added per employee. We use the 95^{th} percentile, instead of the maximum, to drop outliers.

Results

The OLS, WLS, where the weight is defined as the inverse of the sampling variance, and the median regression coefficients of the set of regressors explaining the vector of $\ln(\widehat{\mu}_i \ only - 1)$, the vector of $\ln(\widehat{\mu}_i - 1)$ or the vector of $\ln(\widehat{\gamma}_i)$ are reported in Table 6. The 0.50 quantile regression can be interpreted as a robust equivalent of OLS. Large firms experience a negative effect on the estimated price-cost mark-up taking into account labor market imperfections, and on the corresponding relative extent of rent sharing while capital-intensive firms experience a positive impact on the estimated price-cost mark-up but a negative impact on the corresponding relative extent of rent sharing. Being a R&D firm exerts a negative effect on the relative extent of rent sharing. This effect is strongest for the pure R&D firms. Firms which are nearer to the sector technology frontier experience a positive effect on the estimated price-cost mark-up. This impact becomes negative when labor market imperfections are taken into consideration. Consistent with the between-sector results, low-technology firms experience a positive effect on the price-cost mark-up and the corresponding relative extent of rent sharing.

<Insert Table 6 about here>

5 Conclusion

This article thoroughly investigates product and labor market imperfections as two sources of discrepancies between the output contribution of individual production factors and their respective revenue shares. By doing so, we contribute to the classical literature on estimating microeconomic production functions and to the recent empirical literature on simultaneously estimating imperfections in product and factor markets. Embedding the efficient bargaining model into the original Hall (1988) approach shows that the firm price-cost mark-up and the

$\widehat{\mu}_i \geq 1$ and $\widehat{\phi}_i \in [0, 1]$ (5906 estimates) and the second subsample consists of $\widehat{\phi}_i = 0$ and $\widehat{\mu}_i$ *only* ≥ 1 (1239 estimates).

extent of rent sharing generate a wedge between marginal products of input factors and the apparent factor prices. To econometrically explore these particular sources of discrepancies, we start by estimating a standard production function using a panel of 10646 French manufacturing firms covering the period 1978-2001. From the production function coefficients, i.e., the output elasticities, we derive our parameters of interest. At the manufacturing level, the system GMM estimates point to an average price-cost mark-up of 1.3 and an average extent of rent sharing of 0.5. The next step into our empirical strategy is to examine between-sector heterogeneity in the production function coefficients and the retrieved parameters. Splitting the sample into 38 sectors, we find a considerable degree of between-sector heterogeneity. The median price-cost mark-up and the median extent of rent sharing are estimated at 1.15 and 0.12 respectively. The median values of the economically meaningful sector estimates are of an order of magnitude of 1.18 and 0.27 respectively. Highly profitable sectors display a price-cost mark-up that is higher than the median value. Low-technology sectors, likely to be typified as less competitive sectors, display a price-cost mark-up and extent of rent sharing above the respective median values. Weakly unionized sectors are characterized by a price-cost mark-up below the respective median value. The estimated extent of rent sharing of half of those sectors is lower than the respective median value. Since production behavior is likely to vary across firms, we finally take into account firm-level heterogeneity and look at within-sector heterogeneity. To determine the degree of heterogeneity in the production function coefficients and parameters of interest, we adopt the Swamy (1970) methodology as a variance decomposition approach. This method allows us to estimate the variance components of heterogeneity, i.e., the pure sampling variance and the true heterogeneity or dispersion. The median of the firm estimates of the price-cost mark-up ignoring the occurrence of rent sharing is of 1.10, while it is higher of 1.20 when taking them into account and the median of the corresponding firm estimates of the extent of rent sharing is of 0.62. The Swamy corresponding robust estimates of true dispersion of 0.18, 0.37 and 0.35 are good indicators of a credible amount of heterogeneity. Besides focusing on coefficient heterogeneity, we try to identify factors explaining the observed heterogeneity in firm-level price-cost mark-ups and the extent of rent sharing. Firm size, capital intensity, distance to the sector technology frontier and being a R&D firm seem to account for part of this heterogeneity.

Appendix : Extension embedding the monopsony model

The original Hall (1988) model is based on the assumption that there is a potentially infinite supply of employees wanting a job in the firm. Limited mobility on the part of the employees and entry costs on the part of competing firms might however create rents to jobs. This gives employers some power over their workers as a small wage cut will no longer induce them to leave the firm.
Consider a firm facing a labor supply $N_{it}(w_{it})$, which is an increasing function of the wage w_{it}. The monopsonist firm objective is to maximize its short-run profit function, taking the labor supply curve as a given:

$$\max_{w_{it},\, M_{it}} \pi(w_{it},\, N_{it},\, M_{it}) = R_{it}(N_{it}(w_{it}),\, M_{it}) - w_{it}N_{it}(w_{it}) - j_{it}M_{it} \tag{A.1}$$

Maximization with respect to material input gives $R_{M,it} = j_{it}$, which directly leads to the corresponding equation (3). Maximization with respect to the wage rate gives the following first-order condition:

$$w_{it} = \left(\frac{\varepsilon^N_{w_{it}}}{1+\varepsilon^N_{w_{it}}}\right) R_{N,it} \tag{A.2}$$

where $\varepsilon^N_{w_{it}} \in \Re_+$ represents the elasticity of the labor supply. From (A.2), it follows that the degree of monopsony power, measured by $\left(\frac{R_{N,it}}{w_{it}}\right)$, depends negatively on $\varepsilon^N_{w_{it}}$. Rewriting (A.2) results in a modified equation (2):

$$\varepsilon^Q_{N_{it}} = \mu_{it}\alpha_{N_{it}}\left(1+\frac{1}{\varepsilon^N_{w_{it}}}\right) \tag{A.3}$$

Assuming constant returns to scale, estimation of the reduced-form equation $q_{it} - k_{it} = \varepsilon^Q_{N_{it}}(n_{it} - k_{it}) + \varepsilon^Q_{M_{it}}(m_{it} - k_{it}) + \theta_{it}$, allows the identification of (1) the mark-up of price over marginal cost and (2) the elasticity of the supply of labor of the firm with respect to the wage rate:

$$\mu_{it} = \frac{\varepsilon^Q_{M_{it}}}{\alpha_{M_{it}}} \tag{A.4}$$

$$\beta_{it} = \frac{\varepsilon^N_{w_{it}}}{1+\varepsilon^N_{w_{it}}} = \frac{\alpha_{N_{it}}}{\alpha_{M_{it}}}\frac{\varepsilon^Q_{M_{it}}}{\varepsilon^Q_{N_{it}}} \tag{A.5}$$

$$\varepsilon^N_{w_{it}} = \frac{\beta_{it}}{1-\beta_{it}} \tag{A.6}$$

Table A.1
Estimates of output elasticities $\widehat{\varepsilon}_J^Q$ $(J = N, M, K)$, mark-up $\hat{\mu}$ $(only)$ and extent of rent sharing $\hat{\phi}$:
Balanced sample: 473 firms, each firm 24 years of observations - Period 1978-2001

	STATIC SPECIFICATION				**DYNAMIC SPECIFICATION**	
	OLS LEVELS	**OLS DIF**	**GMM DIF** $(t-2)$	**GMM SYS** $(t-2)$	**GMM DIF** $(t-2)$	**GMM SYS** $(t-2)$
ε_N^Q	0.257	0.320	0.134	0.241	0.302	0.262
	(0.016)	(0.011)	(0.067)	(0.022)	(0.032)	(0.028)
ε_M^Q	0.646	0.586	0.664	0.666	0.602	0.628
	(0.015)	(0.011)	(0.051)	(0.022)	(0.023)	(0.023)
$\widehat{\varepsilon}_K^Q$	0.097	0.094	0.202	0.093	0.096	0.110
$m1$	13.25	-6.53	-6.39	-7.26	-14.85	-11.13
$m1$	12.71	-0.90	-1.27	-1.10	1.22	0.38
$Sargan$			1.000	1.000	1.000	1.000
$Dif\ Sargan$				0.000		0.000
$\mu\ only$	1.208	1.190	1.121	1.213	1.204	1.159
	(0.014)	(0.011)	(0.042)	(0.023)	(0.026)	(0.028)
μ	1.319	1.197	1.357	1.359	1.230	1.282
	(0.031)	(0.023)	(0.105)	(0.045)	(0.048)	(0.048)
ϕ	0.345	0.182	0.481	0.374	0.230	0.328
	(0.024)	(0.033)	(0.053)	(0.029)	(0.068)	(0.044)
ρ					0.712	0.390
					(0.022)	(0.035)
$Comfac$					0.010	0.0007

Robust standard errors and first-step robust standard errors in columns 1-2 and columns 3-5 respectively.
Time dummies are included but not reported.
Note: see notes of Table 2, except for:
(2') Input shares: $\alpha_N = 0.270$, $\alpha_M = 0.490$, $\alpha_K = 0.240$.
(3') $GMM\ DIF$: the set of instruments includes lagged levels of n, m and k dated $(t-2)$ and earlier.
(4') $GMM\ SYS$: the set of instruments includes the lagged levels of n, m and k dated $(t-2)$ and earlier in the first-differenced equations and the lagged first-differences of n, m and k dated $(t-1)$ in the levels equations.

Table A.2
Sector repartition

Sector	Code	Name	Profit.[a] type	Tech.[b] type	Union.[c] type	# Obs. (# Firms)
Sec 1	B01	Meat preparations	L	L	ML	4881 (324)
Sec 2	B02	Milk products	L	L	MH	1981 (122)
Sec 3	B03	Beverages	H	L	H	1705 (106)
Sec 4	B04	Food production for animals	MH	L	L	1942 (126)
Sec 5	B05-B06	Other food products	MH	L	MH	7835 (518)
Sec 6	C11	Clothing and skin goods	MH	L	L	6938 (453)
Sec 7	C12	Leather goods and footwear	H	L	ML	3400 (213)
Sec 8	C20	Publishing, (re)printing	ML	L	H	10919 (724)
Sec 9	C31	Pharmaceutical products	H	H	L	2153 (130)
Sec 10	C32	Soap, perfume and maintenance products	ML	MH	L	1877 (114)
Sec 11	C41	Furniture	ML	L	MH	5043 (322)
Sec 12	C42, C44-C46	Accommodation equipment	MH	MH	ML	2871 (179)
Sec 13	C43	Sport articles, games and other products	MH	ML	L	2390 (156)
Sec 14	D01	Motor vehicles	MH	MH	MH	2064 (133)
Sec 15	D02	Transport equipment	H	ML	H	2177 (129)
Sec 16	E11-E14	Ship building, aircraft and railway construction	L	ML	ML	1834 (110)
Sec 17	E21	Metal products for construction	L	ML	L	2590 (171)
Sec 18	E22	Ferruginous and steam boilers	L	ML	L	4461 (294)
Sec 19	E23	Mechanical equipment	MH	MH	ML	3020 (182)
Sec 20	E24	Machinery for general usage	L	ML	MH	4151 (268)
Sec 21	E25-E26	Agriculture machinery	ML	ML	ML	2391 (154)
Sec 22	E27-E28	Other machinery for specific usage	L	ML	H	4355 (286)
Sec 23	E31-E35	Electric and electronic machinery	H	H	ML	2934 (203)
Sec 24	F11-F12	Mineral products	H	L	H	3099 (205)
Sec 25	F13	Glass products	H	ML	H	1681 (104)
Sec 26	F14	Earthenware products and construction material	H	ML	ML	6109 (391)
Sec 27	F21	Textile art	L	L	MH	4338 (270)
Sec 28	F22-F23	Textile products and clothing	ML	L	H	4858 (310)
Sec 29	F31	Wooden products	ML	L	L	7170 (475)
Sec 30	F32-F33	Paper and printing products	MH	L	H	5312 (330)
Sec 31	F41-F42	Mineral and organic chemical products	ML	MH	MH	3026 (192)
Sec 32	F43-F45	Parachemical and rubber products	MH	MH	H	2759 (171)
Sec 33	F46	Transformation of plastic products	L	ML	ML	9037 (600)
Sec 34	F51-F52	Steel products, non-ferrous metals	ML	ML	MH	2024 (125)
Sec 35	F53	Ironware	ML	L	H	2247 (138)
Sec 36	F54	Industrial service to metal products	L	L	ML	14930 (1000)
Sec 37	F55-F56	Metal products, recuperation	H	L	MH	9314 (599)
Sec 38	F61-F62	Electrical goods and components	MH	H	L	5193 (319)

L: low-type, **ML**: medium low-type, **MH**: medium high-type, **H**: high-type.
[a] **L**: PCM $<$ 19% (10 sectors), **ML**: 19% $\leq$ PCM $<$ 22% (9 sectors), **MH**: 22% $\leq$ PCM $<$ 24% (10 sectors), **H**: PCM $\geq$ 24% (9 sectors).
[b] **L** (17 sectors), **ML** (6 sectors), **MH** (12 sectors), **H** (3 sectors).
[c] **L**: union density $<$ 6.7% (9 sectors), **ML**: 6.7% $\leq$ union density $<$ 10.2% (10 sectors), **MH**: 10.2% $\leq$ union density $<$ 12.9% (9 sectors), **H**: union density $\geq$ 12.9% (10 sectors).

Table A.3.a

Sector analysis: Estimated sector-level output elasticities $\widehat{\varepsilon}^{Q}_{J_j}$ $(J = N, M, K)$, mark-up $\hat{\mu}_j$ (*only*) and extent of rent sharing $\hat{\phi}_j$

Part 1: OLS DIF: $\widehat{\mu}_j \geq 1 \quad \vee \quad \widehat{\phi}_j \in [0, 1]$ [24 sectors]

					OLS DIF						
Sector	# Firms	α_{N_j}	α_{M_j}	α_{K_j}	$\widehat{\varepsilon}^{Q}_{N_j}$	$\widehat{\varepsilon}^{Q}_{M_j}$	$\widehat{\varepsilon}^{Q}_{K_j}$	$\hat{\mu}_j$ *only*	$\hat{\mu}_j$	$\widehat{\gamma}_j$	$\hat{\phi}_j$
Sec 6	453	0.424	0.398	0.178	0.370 (0.011)	0.457 (0.008)	0.173 (0.009)	1.037 (0.011)	**1.150 (0.020)**	**0.573 (0.073)**	**0.364 (0.029)**
Sec 18	294	0.406	0.482	0.112	0.341 (0.011)	0.556 (0.008)	0.103 (0.010)	1.053 (0.011)	**1.153 (0.017)**	**0.992 (0.114)**	**0.498 (0.029)**
Sec 17	171	0.286	0.594	0.120	0.265 (0.016)	0.645 (0.013)	0.090 (0.014)	1.054 (0.015)	**1.085 (0.022)**	**0.352 (0.153)**	**0.261 (0.084)**
Sec 20	268	0.313	0.535	0.152	0.322 (0.015)	0.574 (0.012)	0.103 (0.012)	1.063 (0.013)	**1.073 (0.021)**	**0.083 (0.124)**	**0.077 (0.106)**
Sec 16	110	0.345	0.496	0.159	0.352 (0.021)	0.536 (0.015)	0.112 (0.018)	1.066 (0.019)	**1.081 (0.030)**	**0.122 (0.163)**	**0.109 (0.129)**
Sec 22	286	0.379	0.482	0.139	0.313 (0.015)	0.566 (0.011)	0.121 (0.013)	1.073 (0.014)	**1.174 (0.022)**	**0.808 (0.115)**	**0.477 (0.035)**
Sec 28	310	0.334	0.483	0.183	0.289 (0.012)	0.566 (0.011)	0.145 (0.010)	1.078 (0.012)	**1.173 (0.023)**	**0.478 (0.075)**	**0.324 (0.035)**
Sec 5	518	0.285	0.528	0.187	0.207 (0.009)	0.646 (0.011)	0.148 (0.008)	1.079 (0.011)	**1.223 (0.020)**	**0.621 (0.049)**	**0.383 (0.018)**
Sec 13	156	0.322	0.465	0.213	0.323 (0.018)	0.519 (0.017)	0.158 (0.017)	1.081 (0.021)	**1.115 (0.037)**	**0.151 (0.106)**	**0.131 (0.080)**
Sec 23	203	0.385	0.450	0.165	0.375 (0.018)	0.518 (0.014)	0.107 (0.016)	1.090 (0.018)	**1.150 (0.032)**	**0.360 (0.132)**	**0.264 (0.072)**
Sec 11	322	0.317	0.518	0.165	0.254 (0.011)	0.628 (0.011)	0.118 (0.010)	1.095 (0.012)	**1.211 (0.022)**	**0.645 (0.073)**	**0.392 (0.027)**
Sec 33	600	0.282	0.552	0.166	0.256 (0.008)	0.641 (0.008)	0.103 (0.007)	1.099 (0.008)	**1.162 (0.014)**	**0.370 (0.054)**	**0.270 (0.029)**
Sec 8	724	0.341	0.478	0.181	0.286 (0.008)	0.615 (0.008)	0.099 (0.005)	1.126 (0.007)	**1.288 (0.016)**	**0.661 (0.017)**	**0.398 (0.017)**
Sec 36	1000	0.385	0.443	0.172	0.317 (0.007)	0.577 (0.005	0.106 (0.005)	1.129 (0.006)	**1.303 (0.012)**	**0.825 (0.017)**	**0.452 (0.012)**
Sec 12	179	0.331	0.480	0.188	0.351 (0.016)	0.559 (0.014)	0.091 (0.012)	1.131 (0.015)	**1.163 (0.029)**	**0.158 (0.017)**	**0.136 (0.080)**
Sec 24	205	0.265	0.497	0.238	0.261 (0.016)	0.585 (0.012)	0.154 (0.014)	1.135 (0.016	**1.177 (0.024)**	**0.180 (0.068)**	**0.153 (0.049)**
Sec 7	213	0.334	0.470	0.197	0.281 (0.015)	0.596 (0.013)	0.123 (0.012)	1.138 (0.015)	**1.269 (0.027)**	**0.569 (0.076)**	**0.363 (0.031)**
Sec 27	270	0.309	0.514	0.178	0.274 (0.013)	0.634 (0.011)	0.091 (0.011)	1.143 (0.011)	**1.235 (0.022)**	**0.489 (0.078**	**0.328 (0.035)**
Sec 37	599	0.322	0.442	0.236	0.337 (0.010)	0.526 (0.009)	0.137 (0.008)	1.144 (0.012)	**1.188 (0.019)**	**0.162 (0.049)**	**0.140 (0.037)**
Sec 14	133	0.258	0.558	0.185	0.296 (0.020)	0.646 (0.017)	0.059 (0.014)	1.155 (0.017)	**1.157 (0.031)**	**0.013 (0.122)**	**0.013 (0.119)**
Sec 35	138	0.333	0.491	0.177	0.276 (0.017)	0.640 (0.016)	0.083 (0.015)	1.161 (0.018	**1.306 (0.033)**	**0.685 (0.093)**	**0.406 (0.017)**
Sec 15	129	0.259	0.533	0.208	0.287 (0.017)	0.630 (0.014)	0.083 (0.014)	1.167 (0.016)	**1.182 (0.026)**	**0.078 (0.088)**	**0.072 (0.075)**
Sec 26	391	0.294	0.471	0.236	0.309 (0.012)	0.571 (0.011)	0.120 (0.010)	1.168 (0.013)	**1.214 (0.024)**	**0.166 (0.060)**	**0.143 (0.044)**
Sec 30	330	0.237	0.529	0.234	0.275 (0.012)	0.642 (0.012)	0.084 (0.008)	1.200 (0.011)	**1.212 (0.022)**	**0.044 (0.058)**	**0.042 (0.053)**

Table A.3.a (ctd)

Sector analysis: Estimated sector-level output elasticities $\widehat{\varepsilon}^Q_{J_j}$ $(J = N, M, K)$, mark-up $\hat{\mu}_j$ (*only*) and extent of rent sharing $\hat{\phi}_j$

Part 2: OLS DIF: $\widehat{\phi}_j = 0 \;\vee\; \widehat{\mu}_j \; only \geq 1$ [14 sectors]

					OLS DIF						
Sector	# Firms	α_{N_j}	α_{M_j}	α_{K_j}	$\widehat{\varepsilon}^Q_{N_j}$	$\widehat{\varepsilon}^Q_{M_j}$	$\widehat{\varepsilon}^Q_{K_j}$	$\hat{\mu}_j$ *only*	$\hat{\mu}_j$	$\widehat{\gamma}_j$	$\hat{\phi}_j$
Sec 3	106	0.183	0.579	0.238	0.288 (0.022)	0.549 (0.021)	0.163 (0.021)	**1.027 (0.027)**	0.949 (0.036)	-0.503 (0.127)	-1.013 (0.514)
Sec 21	154	0.300	0.553	0.147	0.344 (0.021)	0.556 (0.016)	0.099 (0.016)	**1.037 (0.018)**	1.006 (0.030)	-0.284 (0.195)	-0.396 (0.380)
Sec 2	122	0.137	0.693	0.170	0.234 (0.022)	0.675 (0.026)	0.092 (0.016)	**1.049 (0.024)**	0.974 (0.037)	-0.605 (0.178)	-1.534 (1.145)
Sec 32	171	0.230	0.565	0.205	0.337 (0.021)	0.541 (0.019)	0.123 (0.015)	**1.058 (0.020)**	0.957 (0.034)	-0.594 (0.155)	-1.464 (0.942)
Sec 4	126	0.116	0.681	0.202	0.240 (0.022)	0.656 (0.027)	0.104 (0.017)	**1.061 (0.027)**	0.963 (0.039)	-0.656 (0.157)	-1.908 (1.331)
Sec 19	182	0.326	0.486	0.188	0.381 (0.019)	0.502 (0.015)	0.117 (0.014)	**1.070 (0.017)**	1.032 (0.031)	-0.230 (0.144)	-0.299 (0.242)
Sec 10	114	0.250	0.531	0.219	0.339 (0.021)	0.532 (0.019)	0.129 (0.015)	**1.080 (0.021)**	1.002 (0.036)	-0.405 (0.138)	-0.679 (0.389)
Sec 1	324	0.201	0.607	0.192	0.255 (0.012)	0.639 (0.014)	0.107 (0.009)	**1.090 (0.011)**	1.053 (0.022)	-0.212 (0.084)	-0.270 (0.135)
Sec 29	475	0.257	0.538	0.205	0.292 (0.010)	0.579 (0.010)	0.128 (0.008)	**1.090 (0.011)**	1.076 (0.019)	-0.073 (0.063)	-0.079 (0.073)
Sec 31	192	0.260	0.544	0.196	0.339 (0.016)	0.566 (0.015)	0.094 (0.013)	**1.100 (0.016)**	1.041 (0.028)	-0.336 (0.115)	-0.506 (0.262)
Sec 38	319	0.330	0.500	0.170	0.365 (0.013)	0.550 (0.010)	0.085 (0.010)	**1.102 (0.011)**	1.100 (0.021)	-0.012 (0.098)	-0.012 (0.100)
Sec 9	130	0.232	0.530	0.238	0.385 (0.024)	0.527 (0.022)	0.088 (0.018)	**1.122 (0.025)**	0.994 (0.041)	-0.653 (0.155)	-1.882 (1.291)
Sec 25	104	0.312	0.459	0.229	0.423 (0.026)	0.472 (0.022)	0.105 (0.019	**1.126 (0.025)**	1.028 (0.048)	-0.434 (0.179)	-0.767 (0.560)
Sec 34	125	0.218	0.569	0.213	0.279 (0.024)	0.643 (0.019)	0.078 (0.017)	**1.153 (0.020)**	1.131 (0.033)	-0.135 (0.125)	-0.156 (0.168)

Robust standard errors in parentheses. Time dummies are included but not reported.

Table A.3.a (ctd)

Sector analysis: Estimated sector-level output elasticities $\widehat{\varepsilon}^{Q}_{J_j}$ $(J = N, M, K)$, mark-up $\hat{\mu}_j$ (*only*) and extent of rent sharing $\hat{\phi}_j$

Part 3: GMM SYS: $\widehat{\mu}_j \geq 1 \ \vee \ \widehat{\phi}_j \in [0,1]$ [26 sectors]

		GMM SYS $(t-2)(t-3)$									
Sector	# Firms	$\widehat{\varepsilon}^{Q}_{N_j}$	$\widehat{\varepsilon}^{Q}_{M_j}$	$\widehat{\varepsilon}^{Q}_{K_j}$	$\hat{\mu}_j$ *only*	$\hat{\mu}_j$	$\widehat{\gamma}_j$	$\hat{\phi}_j$	*Sargan*	$m1$	$m2$
Sec 6	453	0.399 (0.030)	0.526 (0.017)	0.075 (0.029)	1.213 (0.033)	**1.323 (0.043)**	**0.685 (0.157)**	**0.407 (0.055)**	0.004	-9.91	-2.40
Sec 2	122	0.152 (0.035)	0.797 (0.024)	0.051 (0.027)	1.147 (0.025)	**1.151 (0.035)**	**0.027 (0.192)**	**0.026 (0.182)**	1.000	-4.03	-0.68
Sec 18	294	0.373 (0.030)	0.606 (0.030)	0.021 (0.016)	1.104 (0.018)	**1.258 (0.061)**	**0.982 (0.33)**	**0.495 (0.084)**	0.998	-8.24	0.59
Sec 16	110	0.342 (0.042)	0.632 (0.030)	0.026 (0.034)	1.174 (0.037)	**1.276 (0.061)**	**0.486 (0.262)**	**0.327 (0.119)**	1.000	-5.89	-1.79
Sec 22	286	0.261 (0.035)	0.636 (0.025)	0.103 (0.026)	1.100 (0.027)	**1.320 (0.052)**	**1.306 (0.230)**	**0.566 (0.043)**	0.995	-9.91	2.41
Sec 28	310	0.359 (0.042)	0.626 (0.034)	0.015 (0.027)	1.227 (0.031)	**1.296 (0.070)**	**0.311 (0.244)**	**0.237 (0.142)**	0.435	-8.87	-2.96
Sec 5	518	0.239 (0.016)	0.677 (0.023)	0.084 (0.022)	1.117 (0.028)	**1.281 (0.043)**	**0.527 (0.086)**	**0.345 (0.037)**	0.006	-9.15	-2.24
Sec 13	156	0.406 (0.041)	0.600 (0.040)	-0.006 (0.035)	1.281 (0.046)	**1.290 (0.086)**	**0.034 (0.222)**	**0.033 (0.208)**	1.000	-7.38	0.90
Sec 23	203	0.409 (0.040)	0.563 (0.041)	0.028 (0.041)	1.162 (0.050)	**1.249 (0.092)**	**0.348 (0.292)**	**0.258 (0.161)**	1.000	-8.18	-2.72
Sec 29	475	0.301 (0.023)	0.665 (0.027)	0.034 (0.020)	1.220 (0.027)	**1.236 (0.050)**	**0.064 (0.130)**	**0.060 (0.114)**	0.619	-11.45	-2.05
Sec 11	322	0.314 (0.042)	0.698 (0.034)	-0.012 (0.030)	1.247 (0.033)	**1.348 (0.065)**	**0.503 (0.239)**	**0.335 (0.106)**	0.676	-9.46	-2.81
Sec 33	600	0.298 (0.034)	0.654 (0.027)	0.047 (0.019)	1.147 (0.021)	**1.185 (0.048)**	**0.180 (0.229)**	**0.152 (0.164)**	0.000	-12.15	-2.98
Sec 31	192	0.298 (0.043)	0.625 (0.053)	0.077 (0.028)	1.149 (0.036)	**1.149 (0.097)**	**0.002 (0.291)**	**0.002 (0.289)**	1.000	-5.53	-0.83
Sec 38	319	0.356 (0.035)	0.558 (0.058)	0.086 (0.025)	1.102 (0.031)	**1.116 (0.075)**	**0.065 (0.294)**	**0.061 (0.259)**	0.172	-8.07	-1.86
Sec 8	724	0.295 (0.024)	0.682 (0.021)	0.023 (0.014)	1.219 (0.018)	**1.429 (0.045)**	**0.746 (0.121)**	**0.427 (0.040)**	1.000	-10.59	-0.33
Sec 36	1000	0.372 (0.020)	0.563 (0.017)	0.065 (0.013)	1.142 (0.016)	**1.272 (0.038)**	**0.537 (0.132)**	**0.349 (0.056)**	0.000	-16.96	-3.45
Sec 12	179	0.337 (0.033)	0.688 (0.025)	-0.025 (0.027)	1.285 (0.032)	**1.431 (0.052)**	**0.508 (0.153)**	**0.337 (0.067)**	1.000	-7.58	-2.44
Sec 24	205	0.264 (0.038)	0.623 (0.030)	0.113 (0.020)	1.174 (0.024)	**1.253 (0.061)**	**0.227 (0.167)**	**0.185 (0.111)**	1.000	-6.16	0.52
Sec 7	213	0.359 (0.039)	0.566 (0.035)	0.075 (0.037)	1.164 (0.045)	**1.206 (0.075)**	**0.183 (0.228)**	**0.155 (0.163)**	0.999	-6.25	0.30
Sec 27	270	0.280 (0.039)	0.674 (0.030)	0.046 (0.023)	1.193 (0.024)	**1.312 (0.058)**	**0.536 (0.214)**	**0.349 (0.091)**	0.692	-7.98	-1.73
Sec 37	599	0.238 (0.040)	0.692 (0.032)	0.070 (0.024)	1.243 (0.029)	**1.564 (0.072)**	**0.719 (0.132)**	**0.418 (0.045)**	0.000	-11.94	-2.24
Sec 34	125	0.267 (0.034)	0.714 (0.045)	0.019 (0.037)	1.249 (0.049)	**1255 (0.080)**	**0.022 (0.174)**	**0.021 (0.167)**	1.000	-6.16	0.52
Sec 35	138	0.335 (0.028)	0.668 (0.021)	-0.003 (0.022)	1.244 (0.025)	**1.362 (0.044)**	**0.490 (0.147)**	**0.329 (0.066)**	1.000	-7.18	-0.58
Sec 15	129	0.307 (0.043)	0.674 (0.029)	0.019 (0.033)	1.245 (0.034)	**1.265 (0.054)**	**0.078 (0.201)**	**0.072 (0.173)**	1.000	-5.42	-1.98
Sec 26	391	0.252 (0.032)	0.659 (0.030)	0.088 (0.028)	1.189 (0.038)	**1.401 (0.064)**	**0.482 (0.120)**	**0.325 (0.055)**	0.015	-9.16	-2.00
Sec 30	330	0.295 (0.024)	0.703 (0.028)	0.002 (0.025)	1.295 (0.035)	**1.328 (0.053)**	**0.063 (0.103)**	**0.060 (0.091)**	0.100	-8.52	-3.32

Table A.3.a (ctd)

Sector analysis: Estimated sector-level output elasticities $\widehat{\varepsilon}^{Q}_{J_j}$ $(J = N, M, K)$, mark-up $\hat{\mu}_j$ $(only)$ and extent of rent sharing $\hat{\phi}_j$

Part 4: GMM SYS: $\widehat{\phi}_j = 0 \vee \widehat{\mu}_j$ *only* ≥ 1 [11 sectors] - $\widehat{\phi}_j = 1 \vee \widehat{\mu}_j$ *only* ≥ 1 [1 sector]

		GMM SYS $(t-2)(t-3)$									
Sector	# Firms	$\widehat{\varepsilon}^{Q}_{N_j}$	$\widehat{\varepsilon}^{Q}_{M_j}$	$\widehat{\varepsilon}^{Q}_{K_j}$	$\hat{\mu}_j$ *only*	$\hat{\mu}_j$	$\widehat{\gamma}_j$	$\hat{\phi}_j$	*Sargan*	$m1$	$m2$
Sec 3	106	0.331 (0.044)	0.640 (0.038)	0.028 (0.052)	**1.228 (0.058)**	1.107 (0.066)	-0.489 (0.198)	-0.955 (0.756)	1.000	-4.39	-1.42
Sec 21	154	0.357 (0.047)	0.647 (0.042)	-0.003 (0.030)	**1.175 (0.035)**	1.170 (0.076)	-0.029 (0.386)	-0.030 (0.409)	1.000	-6.88	-0.28
Sec 17	171	0.331 (0.049)	0.626 (0.036)	0.043 (0.029)	**1.081 (0.026)**	1.053 (0.060)	-0.238 (0.520)	-0.312 (0.894)	1.000	-6.24	0.27
Sec 32	171	0.311 (0.033)	0.611 (0.033)	0.078 (0.028)	**1.162 (0.037)**	1.084 (0.069)	-0.281 (0.207)	-0.390 (0.399)	1.000	-5.28	-1.67
Sec 4	126	0.217 (0.029)	0.754 (0.046)	0.028 (0.049)	**1.186 (0.064)**	1.107 (0.067)	-0.396 (0.153)	-0.655 (0.419)	1.000	-2.07	-2.45
Sec 20	268	0.447 (0.039)	0.606 (0.040)	-0.053 (0.027)	**1.222 (0.033)**	1.133 (0.074)	-0.536 (0.375)	-1.155 (1.741)	0.983	-8.95	-1.79
Sec 19	182	0.431 (0.062)	0.559 (0.042)	0.010 (0.037)	**1.211 (0.039)**	1.149 (0.087)	-0.263 (0.419)	-0.356 (0.770)	1.000	-7.77	-0.34
Sec 10	114	0.341 (0.039)	0.652 (0.037)	0.006 (0.030)	**1.266 (0.036)**	1.228 (0.069)	-0.130 (0.203)	-0.149 (0.267)	1.000	-5.30	0.43
Sec 1	324	0.415 (0.046)	0.576 (0.041)	0.009 (0.040)	**1.014 (0.054)**	0.949 (0.067)	-1.228 (0.368)	5.393 (7.108)	0.252	-6.86	-1.21
Sec 9	130	0.329 (0.046)	0.677 (0.027)	-0.005 (0.037)	**1.309 (0.040)**	1.276 (0.051)	-0.109 (0.180)	-0.122 (0.227)	1.000	-4.37	-1.24
Sec 25	104	0.357 (0.043	0.512 (0.039)	0.131 (0.048)	**1.128 (0.062)**	1.115 (0.086)	-0.037 (0.226)	-0.039 (0.244)	1.000	-3.74	-1.36
Sec 14	133	0.364 (0.042)	0.581 (0.037)	0.055 (0.026)	**1.157 (0.030)**	1.042 (0.066)	-0.496 (0.321)	-0.983 (1.264)	1.000	-6.57	-0.34

Time dummies are included but not reported. First-step robust standard errors in parentheses.

(1) Input shares: see Part 1-2 of this table.

(2) Instruments used: the lagged levels of n, m and k dated $(t-2)$ and $(t-3)$ in the first-differenced equations and the lagged first-differences of n, m and k dated $(t-1)$ in the levels equations.

(3) $Sargan$: test of overidentifying restrictions, asymptotically distributed as χ^2_{df}. p-values are reported.

(4) $m1$ and $m2$: tests for first-order and second-order serial correlation in the first-differenced residuals, asymptotically distributed as $N(0,1)$.

Table A.3.b
Sector analysis: Correlation of $\hat{\mu}_j$ (*only*), $\widehat{\gamma}_j$ and $\hat{\phi}_j$ within and across different estimators

Correlation	Full sample			$\widehat{\phi}_j \in [0,1]$		
	OLS DIF	**GMM DIF** $(t-2)(t-3)$	**GMM SYS** $(t-2)(t-3)$	**OLS DIF**	**GMM DIF** $(t-2)(t-3)$	**GMM SYS** $(t-2)(t-3)$
$\hat{\mu}_j$ *only* $-\ \hat{\mu}_j$	0.608	0.588	0.557	0.581	0.689	0.539
$\hat{\mu}_j - \widehat{\gamma}_j$	0.857	0.789	0.787	0.482	0.438	0.538
$\hat{\mu}_j - \hat{\phi}_j$	0.820	0.223	-0.065	0.484	0.331	0.604
# $\widehat{\phi}_j = 0$ (# *sign.*)[a]	14 (3)	18 (0)	11 (0)			
# $\widehat{\phi}_j = 1$ (# *sign.*)	0	2 (1)	1 (0)			

[a] Significant at -at least- 10%.

Correlation	Full sample (38 sectors)		$\widehat{\phi}_j \in [0,1]$	
	GMM DIF $(t-2)(t-3)$	**GMM SYS** $(t-2)(t-3)$	**GMM DIF** $(t-2)(t-3)$	**GMM SYS** $(t-2)(t-3)$
OLS DIF	$\hat{\mu}_j$ *only*: 0.266 $\hat{\mu}_j$: 0.453 $\widehat{\gamma}_j$: 0.157 $\hat{\phi}_j$: 0.034	$\hat{\mu}_j$ *only*: 0.313 $\hat{\mu}_j$: 0.615 $\widehat{\gamma}_j$: 0.714 $\hat{\phi}_j$: 0.187	$\hat{\mu}_j$ *only*: 0.149 $\hat{\mu}_j$: 0.182 $\widehat{\gamma}_j$: 0.370 $\hat{\phi}_j$: 0.324 14 sectors	$\hat{\mu}_j$ *only*: 0.453 $\hat{\mu}_j$: 0.165 $\widehat{\gamma}_j$: 0.639 $\hat{\phi}_j$: 0.619 21 sectors
GMM DIF $(t-2)(t-3)$		$\hat{\mu}_j$ *only*: -0.083 $\hat{\mu}_j$: 0.285 $\widehat{\gamma}_j$: 0.153 $\hat{\phi}_j$: 0.003		$\hat{\mu}_j$ *only*: -0.113 $\hat{\mu}_j$: -0.253 $\widehat{\gamma}_j$: 0.477 $\hat{\phi}_j$: 0.375 15 sectors

(1) *GMM DIF*: the set of instruments includes lagged levels of n, m and k dated $(t-2)$ and $(t-3)$.
(2) *GMM SYS*: the set of instruments includes the lagged levels of n, m and k dated $(t-2)$ and $(t-3)$ in the first-differenced equations and correspondingly the lagged first-differences of n, m and k dated $(t-1)$ in the levels equations.

Table A.4

Heterogeneity of firm output elasticities $\widehat{\varepsilon}_{J_i}^{Q}$ $(J = N, M, K)$, mark-up $\hat{\mu}_i$ (*only*) and extent of rent sharing $\hat{\phi}_i$:
Different indicators and first-differenced OLS estimates
Part 1: $\widehat{\mu}_i \geq 1$ $\vee$ $\widehat{\phi}_i \in [0,1]$ [5906 firms] - $\widehat{\phi}_i = 0$ $\vee$ $\widehat{\mu}_i$ *only* ≥ 1 [1239 firms]

	α_{N_i}	α_{M_i}	α_{K_i}	$\widehat{\varepsilon}_{N_i}^{Q}$	$\widehat{\varepsilon}_{M_i}^{Q}$	$\widehat{\varepsilon}_{K_i}^{Q}$	$\hat{\mu}_i$ *only*	$\widehat{\mu}_i$	$\widehat{\gamma}_i$	$\hat{\phi}_i$
$\widehat{\mu}_i \geq 1$ $\vee$ $\widehat{\phi}_i \in [0,1]$ **[5906 firms]**										
SIMPLE										
Observed variance $\widehat{\sigma}_o^2$	0.017	0.019	0.008	0.050	0.039	0.042	0.076	**0.284**	**3.093**	**0.046**
Sampling variance $\widehat{\sigma}_s^2$	0.0002	0.0006	0.001	0.046	0.026	0.035	0.046	**0.185**	**1.825**	**0.172**
True variance $\widehat{\sigma}_{true}^{2\ a}$	0.017	0.018	0.007	0.004	0.013	0.007	0.030	**0.099**	**1.268**	**0**
F-test^b	85	31.667	8	1.087	1.500	1.200	1.652	**1.535**	**1.695**	**0.267**
WEIGHTED										
Observed variance $\widehat{\sigma}_o^2$	0.019	0.020	0.019	0.028	0.034	0.020	0.029	**0.087**	**1.380**	**0.013**
Sampling variance $\widehat{\sigma}_s^2$	0.00004	0.00003	0.0004	0.013	0.009	0.008	0.011	**0.031**	**0.161**	**0.001**
True variance $\widehat{\sigma}_{true}^{2\ a}$	0.019	0.020	0.019	0.015	0.025	0.012	0.018	**0.056**	**1.219**	**0.012**
F-test^b	475	667	47.5	2.154	3.778	2.500	2.636	**2.806**	**8.571**	**13**
MEDIAN										
Interquartile observed variance $\widehat{\sigma}_o^2$	0.019	0.025	0.011	0.037	0.038	0.030	0.045	**0.150**	**1.935**	**0.056**
Robust sampling variance $\widehat{\sigma}_s^2$	0.0002	0.0008	0.0012	0.025	0.016	0.018	0.025	**0.072**	**0.594**	**0.015**
Robust true variance $\widehat{\sigma}_{true}^{2\ a}$	0.019	0.024	0.010	0.012	0.022	0.012	0.020	**0.078**	**1.341**	**0.041**
F-test^b	95	31.25	9.167	1.480	2.375	1.667	1.800	**2.083**	**3.257**	**3.733**
$\widehat{\phi}_i = 0$ $\vee$ $\widehat{\mu}_i$ *only* ≥ 1 **[1239 firms]**										
SIMPLE										
Observed variance $\widehat{\sigma}_o^2$	0.010	0.018	0.014	0.025	0.027	0.028	**0.077**	0.057	0.082	686
Sampling variance $\widehat{\sigma}_s^2$	0.0002	0.0007	0.001	0.050	0.027	0.036	**0.049**	0.153	2.660	$2.40\ 10^{8}$
True variance $\widehat{\sigma}_{true}^{2\ a}$	0.010	0.017	0.013	0	0	0	**0.028**	0	0	0
F-test^b	50	25.714	14	0.500	1	0.778	**1.571**	0.372	0.031	$2.858\ 10^{-6}$
WEIGHTED										
Observed variance $\widehat{\sigma}_o^2$	0.012	0.020	0.025	0.022	0.026	0.013	**0.029**	0.024	0.066	0.037
Sampling variance $\widehat{\sigma}_s^2$	0.00004	0.00003	0.0002	0.017	0.009	0.009	**0.009**	0.031	0.362	0.830
True variance $\widehat{\sigma}_{true}^{2\ a}$	0.012	0.020	0.025	0.005	0.017	0.004	**0.020**	0	0	0
F-test^b	300	667	125	1.294	2.889	1.444	**3.222**	0.774	0.182	0.044
MEDIAN										
Interquartile observed variance $\widehat{\sigma}_o^2$	0.012	0.029	0.023	0.023	0.028	0.018	**0.050**	0.037	0.134	1.795
Robust sampling variance $\widehat{\sigma}_s^2$	0.0002	0.0008	0.001	0.030	0.017	0.019	**0.022**	0.070	1.028	10.305
Robust true variance $\widehat{\sigma}_{true}^{2\ a}$	0.012	0.028	0.022	0	0.011	0	**0.028**	0	0	0
F-test^b	60	36.25	23	0.767	1.647	0.947	**2.273**	0.528	0.130	0.174

Table A.4 (ctd)
Heterogeneity of firm output elasticities $\widehat{\varepsilon}^{Q}_{J_i}$ $(J = N, M, K)$, mark-up $\hat{\mu}_i$ (*only*) and extent of rent sharing $\hat{\phi}_i$:
Different indicators and first-differenced OLS estimates
Part 2: Full sample [10646 firms]

	α_{N_i}	α_{M_i}	α_{K_i}	$\widehat{\varepsilon}^{Q}_{N_i}$	$\widehat{\varepsilon}^{Q}_{M_i}$	$\widehat{\varepsilon}^{Q}_{K_i}$	$\hat{\mu}_i$ *only*	$\hat{\mu}_i$	$\widehat{\gamma}_i$	$\hat{\phi}_i$
Full sample [10646 firms]										
SIMPLE										
Observed variance $\widehat{\sigma}^2_o$	0.016	0.019	0.010	0.093	0.066	0.058	0.096	0.372	3146	327
Sampling variance $\widehat{\sigma}^2_s$	0.0002	0.0006	0.0009	0.055	0.028	0.041	0.051	0.176	$8.45\ 10^8$	$1.55\ 10^9$
True variance $\widehat{\sigma}^2_{true}$ [a]	0.016	0.018	0.009	0.038	0.038	0.017	0.045	0.196	0	0
F-test[b]	80	31.667	11.111	1.690	2.357	1.415	1.822	2.114	$3.72\ 10^{-6}$	$2.11\ 10^{-7}$
WEIGHTED										
Observed variance $\widehat{\sigma}^2_o$	0.019	0.020	0.022	0.054	0.055	0.026	0.038	0.139	1.619	0.015
Sampling variance $\widehat{\sigma}^2_s$	0.00004	0.00003	0.0003	0.015	0.010	0.010	0.012	0.032	0.257	0.002
True variance $\widehat{\sigma}^2_{true}$ [a]	0.019	0.020	0.022	0.039	0.045	0.016	0.026	0.107	1.362	0.013
F-test[b]	475	667	73.33	3.600	5.500	2.600	3.167	4.343	6.300	7.500
MEDIAN										
Interquartile observed variance $\widehat{\sigma}^2_o$	0.018	0.026	0.013	0.077	0.068	0.039	0.060	0.209	3.803	0.189
Robust sampling variance $\widehat{\sigma}^2_s$	0.0002	0.0006	0.0011	0.030	0.017	0.020	0.026	0.074	1.312	0.068
Robust true variance $\widehat{\sigma}^2_{true}$ [a]	0.018	0.025	0.012	0.047	0.051	0.019	0.034	0.135	2.491	0.121
F-test[b]	90	43.333	11.818	2.567	4	1.950	2.308	2.824	2.899	2.779

[a] The estimated true variance is computed by adjusting the observed variance for the sampling variability: $\widehat{\sigma}^2_{true} = \widehat{\sigma}^2_o - \widehat{\sigma}^2_s$.
[b] F-test $= \frac{\widehat{\sigma}^2_o}{\widehat{\sigma}^2_s}$.

Table A.5
Within-sector dispersion: Weighted mean and Swamy estimate of weighted true standard deviation ($\widehat{\boldsymbol{\sigma}}_{true}$) of $\widehat{\varepsilon}^{Q}_{J_{ij}}$, mark-up $\hat{\mu}_{ij}(only)$ and extent of rent sharing $\hat{\phi}_{ij}$

	OLS DIF						
Sector	$\widehat{\varepsilon}^{Q}_{N_{ij}}$	$\widehat{\varepsilon}^{Q}_{M_{ij}}$	$\widehat{\varepsilon}^{Q}_{K_{ij}}$	$\hat{\mu}_{ij}$ *only*	$\hat{\mu}_{ij}$	$\widehat{\gamma}_{ij}$	$\hat{\phi}_{ij}$
Sec 6	0.276 [0.010]	0.490 [0.012]	0.082 [0.009]	1.109 [0.009]	**1.207 [0.015]**	**1.782 [0.082]**	**0.857 [0.004]**
Sec 18	0.318 [0.010]	0.607 [0.007]	0.078 [0.009]	1.107 [0.007]	**1.184 [0.011]**	**1.275 [0.098]**	**0.881 [0.004]**
Sec 17	0.212 [0.011]	0.719 [0.011]	0.050 [0.009]	1.077 [0.009]	**1.170 [0.015]**	**1.311 [0.102]**	**0.855 [0.008]**
Sec 20	0.274 [0.013]	0.632 [0.011]	0.062 [0.010]	1.099 [0.007]	**1.134 [0.015]**	**1.051 [0.065]**	**0.867 [0.008]**
Sec 16	0.260 [0.024]	0.577 [0.018]	0.067 [0.016]	1.080 [0.016]	**1.163 [0.030]**	**1.008 [0.120]**	**0.774 [0.009]**
Sec 22	0.263 [0.013]	0.569 [0.011]	0.083 [0.012]	1.062 [0.010]	**1.159 [0.021]**	**2.006 [0.105]**	**0.859 [0.005]**
Sec 28	0.199 [0.011]	0.609 [0.011]	0.131 [0.010]	1.078 [0.010]	**1.196 [0.017]**	**1.242 [0.064]**	**0.834 [0.007]**
Sec 5	0.118 [0.007]	0.721 [0.010]	0.070 [0.006]	1.083 [0.008]	**1.271 [0.020]**	**1.567 [0.056]**	**0.794 [0.004]**
Sec 13	0.218 [0.014]	0.566 [0.018]	0.125 [0.017]	1.026 [0.020]	**1.167 [0.037]**	**1.013 [0.116]**	**0.852 [0.007]**
Sec 23	0.351 [0.019]	0.501 [0.019]	0.068 [0.013]	1.055 [0.015]	**1.080 [0.036]**	**1.338 [0.155]**	**0.922 [0.004]**
Sec 11	0.192 [0.008]	0.685 [0.010]	0.070 [0.008]	1.107 [0.009]	**1.249 [0.016]**	**1.235 [0.055]**	**0.757 [0.006]**
Sec 33	0.207 [0.007]	0.660 [0.007]	0.077 [0.007]	1.097 [0.006]	**1.144 [0.012]**	**1.025 [0.043]**	**0.781 [0.005]**
Sec 38	0.227 [0.007]	0.650 [0.007]	0.052 [0.008]	1.114 [0.005]	**1.248 [0.011]**	**1.250 [0.038]**	**0.733 [0.004]**
Sec 36	0.249 [0.006]	0.583 [0.006]	0.105 [0.006]	1.111 [0.005]	**1.268 [0.011]**	**1.452 [0.033]**	**0.771 [0.003]**
Sec 12	0.269 [0.016]	0.621 [0.014]	0.051 [0.010]	1.158 [0.010]	**1.228 [0.019]**	**1.185 [0.079]**	**0.778 [0.009]**
Sec 24	0.225 [0.010]	0.634 [0.011]	0.123 [0.010]	1.143 [0.011]	**1.210 [0.018]**	**0.521 [0.043]**	**0.640 [0.010]**
Sec 7	0.208 [0.012]	0.668 [0.014]	0.038 [0.012]	1.148 [0.015]	**1.335 [0.021]**	**0.812 [0.074]**	**0.814 [0.018]**
Sec 27	0.223 [0.012]	0.627 [0.012]	0.051 [0.010]	1.111 [0.008]	**1.152 [0.018]**	**1.045 [0.063]**	**0.820 [0.007]**
Sec 37	0.195 [0.008]	0.593 [0.009]	0.106 [0.008]	1.117 [0.008]	**1.233 [0.015]**	**1.076 [0.032]**	**0.694 [0.004]**
Sec 14	0.253 [0.014]	0.763 [0.012]	0.027 [0.011]	1.173 [0.012]	**1.222 [0.017]**	**0.508 [0.070]**	**0.761 [0.012]**
Sec 35	0.204 [0.014]	0.636 [0.012]	0.081 [0.016]	1.109 [0.016]	**1.193 [0.029]**	**1.272 [0.083]**	**0.751 [0.009]**
Sec 15	0.215 [0.015]	0.694 [0.017]	0.069 [0.011]	1.160 [0.012]	**1.184 [0.019]**	**0.724 [0.075]**	**0.708 [0.010]**
Sec 26	0.253 [0.010]	0.630 [0.011]	0.080 [0.008]	1.117 [0.009]	**1.222 [0.016]**	**0.752 [0.041]**	**0.764 [0.008]**
Sec 30	0.289 [0.016]	0.562 [0.015]	0.091 [0.011]	1.101 [0.012]	**1.033 [0.030]**	**0.950 [0.046]**	**0.757 [0.008]**
Sec 3	0.165 [0.019]	0.633 [0.027]	0.051 [0.022]	**1.101 [0.027]**	1.016 [0.038]	0.334 [0.051]	0.877 [0.023]
Sec 21	0.249 [0.013]	0.630 [0.015]	0.058 [0.013]	**1.073 [0.011]**	1.100 [0.028]	0.769 [0.048]	0.837 [0.015]
Sec 2	0.084 [0.012]	0.796 [0.018]	0.045 [0.011]	**1.102 [0.011]**	1.096 [0.021]	0.686 [0.049]	0.655 [0.016]
Sec 32	0.197 [0.018]	0.631 [0.017]	0.085 [0.016]	**1.109 [0.018]**	1.085 [0.026]	0.736 [0.080]	0.761 [0.009]
Sec 4	0.132 [0.013]	0.800 [0.020]	0.047 [0.009]	**1.106 [0.012]**	1.097 [0.020]	0.216 [0.044]	0.662 [0.023]
Sec 19	0.328 [0.016]	0.522 [0.015]	0.090 [0.011]	**1.107 [0.012]**	1.066 [0.023]	0.638 [0.079]	0.851 [0.009]
Sec 10	0.273 [0.019]	0.535 [0.023]	0.074 [0.015]	**1.102 [0.017]**	1.034 [0.032]	0.534 [0.077]	0.703 [0.015]
Sec 1	0.156 [0.009]	0.680 [0.014]	0.060 [0.007]	**1.080 [0.006]**	1.055 [0.015]	0.650 [0.044]	0.817 [0.009]
Sec 29	0.180 [0.009]	0.680 [0.011]	0.054 [0.009]	**1.153 [0.008]**	1.243 [0.016]	1.002 [0.033]	0.718 [0.005]
Sec 31	0.295 [0.015]	0.574 [0.017]	0.062 [0.013]	**1.088 [0.014]**	1.018 [0.026]	0.866 [0.075]	0.813 [0.011]
Sec 38	0.289 [0.012]	0.559 [0.012]	0.074 [0.010]	**1.091 [0.008]**	1.085 [0.020]	1.142 [0.066]	0.820 [0.006]
Sec 9	0.330 [0.022]	0.593 [0.020]	0.039 [0.015]	**1.162 [0.014]**	1.087 [0.029]	0.496 [0.066]	0.774 [0.016]
Sec 25	0.277 [0.009]	0.592 [0.024]	0.039 [0.012]	**1.130 [0.011]**	1.120 [0.023]	0.814 [0.112]	0.797 [0.010]
Sec 34	0.219 [0.019]	0.669 [0.018]	0.094 [0.021]	**1.086 [0.013]**	1.084 [0.021]	0.669 [0.100]	0.779 [0.009]

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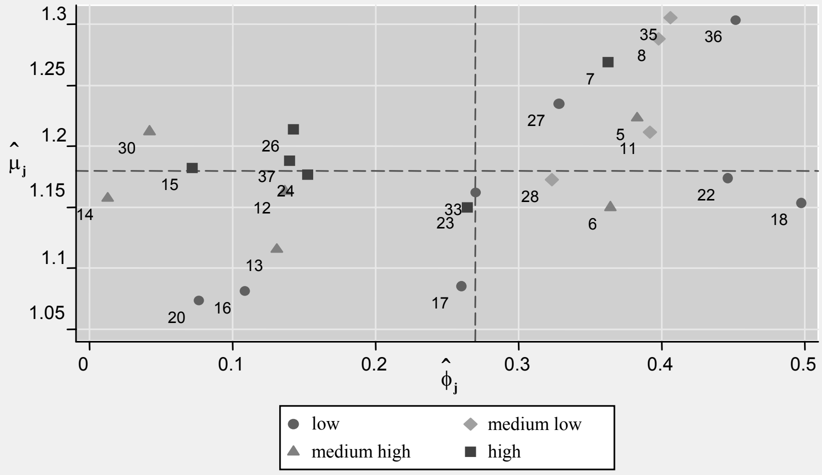
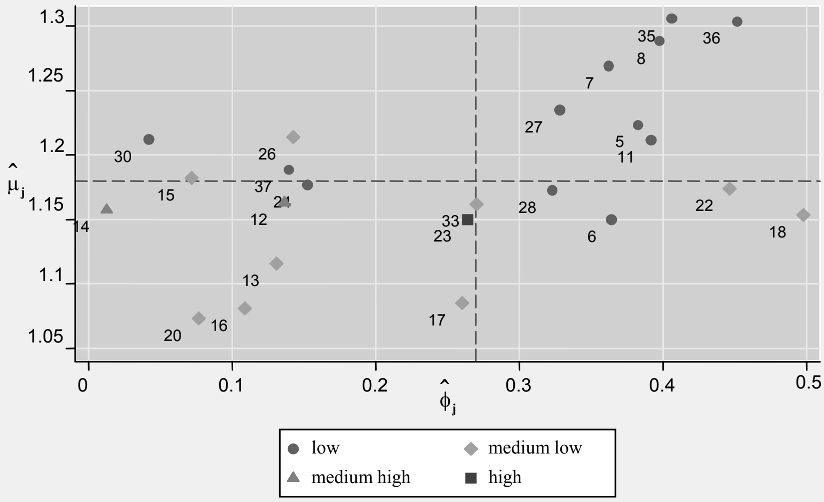
Graph 1 Profitability differences between sectors



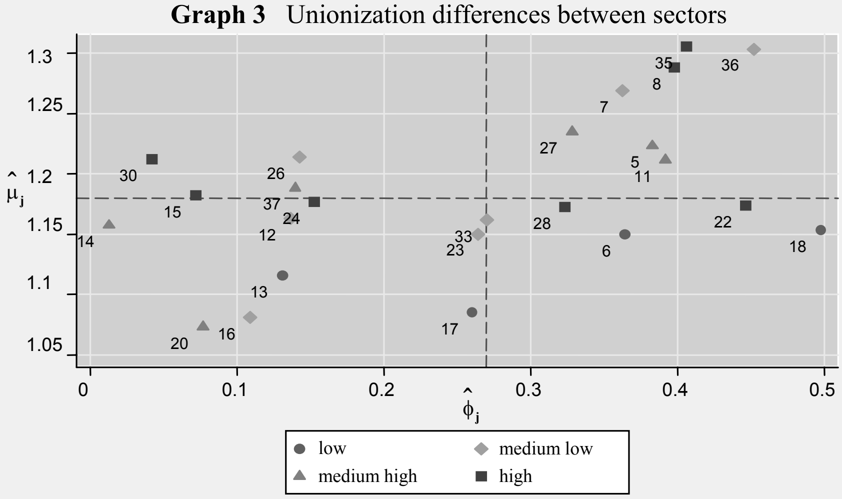
Source: Table 3 estimates

Graph 2 Technology differences between sectors



Source: Table 3 estimates

Graph 3 Unionization differences between sectors



Source: Table 3 estimates

Table 1
Summary statistics

Variables	1978-2001				
	Mean	Sd.	Q_1	Q_3	N
Real firm output growth rate Δq	0.021	0.152	-0.061	0.103	154363
Labor growth rate Δn	0.006	0.123	-0.043	0.054	154363
Capital growth rate Δk	-0.001	0.151	-0.072	0.060	154363
Materials growth rate Δm	0.040	0.192	-0.060	0.139	154363
Labor share in nominal output α_N	0.307	0.136	0.208	0.387	165009
Materials share in nominal output α_M	0.503	0.159	0.399	0.614	165009
$\Delta q - \Delta k$	0.022	0.188	-0.081	0.126	154363
$\Delta n - \Delta k$	0.007	0.166	-0.073	0.088	154363
$\Delta m - \Delta k$	0.041	0.220	-0.079	0.160	154363

Table 2
Estimates of output elasticities $\widehat{\varepsilon}_J^Q$ $(J = N, M, K)$, mark-up $\hat{\mu}$ $(only)$ and extent of rent sharing $\hat{\phi}$:
Full sample: 10646 firms, each firm between 12 and 24 years of observations - Period 1978-2001

	STATIC SPECIFICATION				DYNAMIC SPECIFICATION	
	OLS LEVELS	**OLS DIF**	**GMM DIF** $(t-2)(t-3)$	**GMM SYS** $(t-2)(t-3)$	**GMM DIF** $(t-2)(t-3)$	**GMM SYS** $(t-2)(t-3)$
$\widehat{\varepsilon}_N^Q$	0.331	0.298	0.138	0.298	0.134	0.201
	(0.003)	(0.002)	(0.020)	(0.007)	(0.032)	(0.015)
$\widehat{\varepsilon}_M^Q$	0.592	0.587	0.725	0.675	0.595	0.541
	(0.003)	(0.002)	(0.016)	(0.007)	(0.022)	(0.019)
$\widehat{\varepsilon}_K^Q$	0.077	0.115	0.137	0.027	0.271	0.258
$m1$	46.72	-39.80	-37.10	-40.46	-31.71	-35.22
$m2$	44.81	-6.72	-5.26	-5.51	7.98	6.03
$Sargan$			0.000	0.000	0.000	0.000
$Dif\ Sargan$				1.000		1.000
$\widehat{\mu}\ only$	1.144	1.112	1.129	1.211	1.041	0.934
	(0.003)	(0.002)	(0.013)	(0.007)	(0.032)	(0.020)
$\widehat{\mu}$	1.177	1.167	1.443	1.341	1.184	1.076
	(0.007)	(0.005)	(0.033)	(0.014)	(0.043)	(0.039)
$\widehat{\phi}$	0.393	0.493	0.691	0.490	0.605	0.534
	(0.006)	(0.004)	(0.009)	(0.007)	(0.018)	(0.015)
ρ					0.713	0.619
					(0.023)	(0.018)
$Comfac$					0.000	0.000

Robust standard errors and first-step robust standard errors in columns 1-2 and columns 3-5 respectively.
Time dummies are included but not reported.
(1) $\varepsilon_K^Q = 1 - \varepsilon_N^Q - \varepsilon_N^Q$.
(2) Input shares: $\alpha_N = 0.315$, $\alpha_M = 0.503$, $\alpha_K = 0.182$.
(3) $GMM\ DIF$: the set of instruments includes lagged levels of n, m and k dated $(t-2)$ and $(t-3)$.
(4) $GMM\ SYS$: the set of instruments includes the lagged levels of n, m and k dated $(t-2)$ and $(t-3)$ in the first-differenced equations and correspondingly the lagged first-differences of n, m and k dated $(t-1)$ in the levels equations.
(5) $m1$ and $m2$: tests for first-order and second-order serial correlation in the levels residuals for OLS levels and in the first-differenced residuals for the other estimators, asymptotically distributed as $N(0,1)$.
(6) $Sargan$: test of overidentifying restrictions for the GMM estimators, asymptotically distributed as χ^2_{df}. p-values are reported.
(7) $Dif\ Sargan$: test of the additional moment conditions used in the system GMM estimators relative to the corresponding first-differenced GMM estimators, asymptotically distributed as χ^2_{df}. p-values are reported.
(8) $Comfac$: test of the non-linear common factor restrictions, distributed as χ^2_{df}. p-values are reported.

Table 3

Summary sector analysis: Estimated sector-level output elasticities $\widehat{\varepsilon}^{Q}_{J_j}$ $(J = N, M, K)$, mark-up $\hat{\mu}_j$ (*only*) and extent of rent sharing $\hat{\phi}_j$ [a]

	α_{N_j}	α_{M_j}	α_{K_j}	**OLS DIF** $\widehat{\varepsilon}^{Q}_{N_j}$	$\widehat{\varepsilon}^{Q}_{M_j}$	$\widehat{\varepsilon}^{Q}_{K_j}$	$\hat{\mu}_j$ *only*	$\hat{\mu}_j$	$\widehat{\gamma}_j$	$\hat{\phi}_j$
$\widehat{\mu}_j \geq 1 \;\vee\; \widehat{\phi}_j \in [0,1]$ **[24 sectors]**[b]										
Sector mean	0.323	0.495	0.182	0.300 (0.014)	0.586 (0.012)	0.113 (0.011)	1.111 (0.013)	**1.188 (0.023)**	**0.399 (0.088)**	**0.257 (0.052)**
Sector Q_1	0.285	0.470	0.165	0.274 (0.011)	0.557 (0.009)	0.091 (0.009)	1.075 (0.011)	**1.152 (0.020)**	**0.154 (0.059)**	**0.134 (0.029)**
Sector median	0.322	0.487	0.180	0.292 (0.014)	0.581 (0.011)	0.107 (0.011)	1.113 (0.013)	**1.175 (0.022)**	**0.365 (0.077)**	**0.267 (0.036)**
Sector Q_3	0.343	0.529	0.202	0.330 (0.016)	0.637 (0.014)	0.130 (0.014)	1.143 (0.016)	**1.219 (0.028)**	**0.633 (0.114)**	**0.388 (0.077)**
$\widehat{\phi}_j = 0 \;\vee\; \widehat{\mu}_j$ *only* ≥ 1 **[14 sectors]**[c]										
Sector mean	0.239	0.560	0.201	0.321 (0.019)	0.570 (0.018)	0.108 (0.015)	**1.083 (0.020)**	1.022 (0.032)	-0.367 (0.137)	-0.783 (0.538)
Sector Q_1	0.201	0.530	0.188	0.279 (0.016)	0.532 (0.015)	0.091 (0.013)	**1.058 (0.016)**	0.974 (0.028)	-0.594 (0.115)	-1.464 (0.168)
Sector median	0.240	0.548	0.203	0.338 (0.021)	0.553 (0.019)	0.104 (0.016)	**1.085 (0.020)**	1.017 (0.033)	-0.370 (0.141)	-0.593 (0.385)
Sector Q_3	0.300	0.579	0.219	0.365 (0.022)	0.638 (0.021)	0.123 (0.017)	**1.102 (0.025)**	1.053 (0.037)	-0.212 (0.157)	-0.270 (0.942)
Full sample [38 sectors]										
Sector mean	0.292	0.519	0.189	0.308 (0.016)	0.580 (0.014)	0.111 (0.013)	1.101 (0.016)	1.125 (0.027)	0.117 (0.106)	-0.126 (0.231)
Sector Q_1	0.257	0.480	0.170	0.275 (0.012)	0.541 (0.010)	0.091 (0.010)	1.066 (0.011)	1.041 (0.021)	-0.230 (0.073)	-0.299 (0.034)
Sector median	0.305	0.516	0.187	0.302 (0.016)	0.573 (0.013)	0.106 (0.013)	1.092 (0.015)	1.150 (0.025)	0.136 (0.106)	0.120 (0.077)
Sector Q_3	0.333	0.552	0.213	0.340 (0.020)	0.638 (0.017)	0.123 (0.016)	1.135 (0.019)	1.188 (0.033)	0.489 (0.138)	0.328 (0.242)

	α_{N_j}	α_{M_j}	α_{K_j}	**GMM SYS** $(t-2)(t-3)$ $\widehat{\varepsilon}^{Q}_{N_j}$	$\widehat{\varepsilon}^{Q}_{M_j}$	$\widehat{\varepsilon}^{Q}_{K_j}$	$\hat{\mu}_j$ *only*	$\hat{\mu}_j$	$\widehat{\gamma}_j$	$\hat{\phi}_j$
$\widehat{\mu}_j \geq 1 \;\vee\; \widehat{\phi}_j \in [0,1]$ **[26 sectors]**[b]										
Sector mean	0.311	0.502	0.187	0.312 (0.034)	0.645 (0.030)	0.043 (0.026)	1.193 (0.031)	**1.291 (0.060)**	**0.389 (0.196)**	**0.243 (0.119)**
Sector Q_1	0.265	0.470	0.170	0.267 (0.030)	0.606 (0.025)	0.018 (0.022)	1.147 (0.025)	**1.249 (0.048)**	**0.065 (0.132)**	**0.061 (0.056)**
Sector median	0.322	0.493	0.182	0.304 (0.035)	0.657 (0.030)	0.040 (0.026)	1.191 (0.031)	**1.278 (0.059)**	**0.415 (0.196)**	**0.292 (0.108)**
Sector Q_3	0.341	0.529	0.208	0.359 (0.039)	0.682 (0.034)	0.075 (0.030)	1.244 (0.036)	**1.328 (0.072)**	**0.536 (0.239)**	**0.349 (0.164)**
$\widehat{\phi}_j = 0 \;\vee\; \widehat{\mu}_j$ *only* ≥ 1 **[11 sectors]**[c]										
Sector mean	0.255	0.552	0.193	0.347 (0.043)	0.624 (0.038)	0.029 (0.035)	**1.193 (0.042)**	1.133 (0.069)	-0.273 (0.290)	-0.468 (0.672)
Sector Q_1	0.230	0.530	0.152	0.328 (0.039)	0.581 (0.035)	-0.003 (0.027)	**1.157 (0.033)**	1.081 (0.060)	-0.488 (0.198)	-0.955 (0.267)
Sector median	0.258	0.553	0.202	0.341 (0.042)	0.626 (0.038)	0.028 (0.030)	**1.186 (0.037)**	1.115 (0.067)	-0.262 (0.226)	-0.356 (0.419)
Sector Q_3	0.312	0.579	0.229	0.364 (0.047)	0.652 (0.042)	0.055 (0.048)	**1.228 (0.058)**	1.170 (0.076)	-0.109 (0.386)	-0.122 (0.894)
Full sample [38 sectors][d]										
Sector mean	0.292	0.519	0.189	0.325 (0.037)	0.637 (0.033)	0.038 (0.029)	1.189 (0.035)	1.236 (0.063)	0.154 (0.227)	0.173 (0.463)
Sector Q_1	0.257	0.480	0.170	0.295 (0.032)	0.600 (0.027)	0.009 (0.024)	1.147 (0.026)	1.149 (0.052)	-0.109 (0.153)	-0.039 (0.084)
Sector median	0.305	0.516	0.187	0.331 (0.039)	0.638 (0.032)	0.028 (0.028)	1.187 (0.033)	1.254 (0.063)	0.071 (0.210)	0.112 (0.164)
Sector Q_3	0.333	0.552	0.213	0.359 (0.042)	0.676 (0.039)	0.075 (0.035)	1.243 (0.039)	1.312 (0.074)	0.503 (0.290)	0.337 (0.289)

Robust standard errors in parentheses.

[a] Detailed information on the sector-level estimates is presented in Table A.3.a in Appendix.

[b] These subsamples have 21 sectors in common.

[c] The intersection between the two subsamples contains 8 sectors.

[d] For sector 1, $\widehat{\phi}_j > 1$, but insignificantly so.

Table 4
Heterogeneity of firm output elasticities $\widehat{\varepsilon}^{Q}_{J_i}$ $(J = N, M, K)$, mark-up $\hat{\mu}_i$ *(only)* and extent of rent sharing $\hat{\phi}_i$:
Different indicators and first-differenced OLS estimates[a]

	α_{N_i}	α_{M_i}	α_{K_i}	$\widehat{\varepsilon}^{Q}_{N_i}$	$\widehat{\varepsilon}^{Q}_{M_i}$	$\widehat{\varepsilon}^{Q}_{K_i}$	$\hat{\mu}_i$ *only*	$\widehat{\mu}_i$	$\widehat{\gamma}_i$	$\widehat{\phi}_i$
$\widehat{\mu}_i \geq 1 \;\vee\; \widehat{\phi}_i \in [0,1]$ **[5906 firms]**										
Simple mean	0.335	0.489	0.175	0.132	0.736	0.131	1.148	**1.580**	**1.859**	**0.544**
Observed dispersion $\widehat{\sigma}_o$	(0.130)	(0.138)	(0.089)	(0.224)	(0.197)	(0.205)	(0.276)	**(0.533)**	**(1.759)**	**(0.214)**
True dispersion $\widehat{\sigma}_{true}$	[0.130]	[0.134]	[0.084]	[0.063]	[0.114]	[0.084]	[0.173]	**[0.315]**	**[1.126]**	**[0]**
Weighted mean	0.368	0.559	0.251	0.132	0.730	0.080	1.137	**1.367**	**1.328**	**0.813**
Weighted observed dispersion $\widehat{\sigma}_o$	(0.138)	(0.141)	(0.138)	(0.167)	(0.184)	(0.141)	(0.170)	**(0.295)**	**(1.175)**	**(0.114)**
Weighted true dispersion $\widehat{\sigma}_{true}$	[0.138]	[0.141]	[0.138]	[0.122]	[0.158]	[0.109]	[0.134]	**[0.237]**	**[1.104]**	**[0.109]**
Median	0.322	0.495	0.150	0.137	0.737	0.111	1.134	**1.442**	**1.384**	**0.580**
Interquartile observed dispersion $\widehat{\sigma}_o$	(0.138)	(0.158)	(0.105)	(0.192)	(0.195)	(0.173)	(0.212)	**(0.387)**	**(1.391)**	**(0.237)**
Robust true dispersion $\widehat{\sigma}_{true}$	[0.138]	[0.155]	[0.100]	[0.109]	[0.148]	[0.109]	[0.141]	**[0.279]**	**[1.158]**	**[0.202]**
$\widehat{\phi}_i = 0 \;\vee\; \widehat{\mu}_i$ *only* ≥ 1 **[1239 firms]**										
Simple mean	0.252	0.508	0.239	0.417	0.594	-0.012	**1.298**	1.186	-0.437	-4.687
Observed dispersion $\widehat{\sigma}_o$	(0.100)	(0.134)	(0.118)	(0.158)	(0.164)	(0.167)	**(0.277)**	(0.239)	(0.286)	(26.192)
True dispersion $\widehat{\sigma}_{true}$	[0.100]	[0.130]	[0.114]	[0]	[0]	[0]	**[0.167]**	[0]	[0]	[0]
Weighted mean	0.275	0.590	0.352	0.366	0.621	0.007	**1.187**	1.137	-0.282	-0.139
Weighted observed dispersion $\widehat{\sigma}_o$	(0.109)	(0.141)	(0.158)	(0.148)	(0.161)	(0.114)	**(0.170)**	(0.155)	(0.257)	(0.192)
Weighted true dispersion $\widehat{\sigma}_{true}$	[0.109]	[0.141]	[0.158]	[0.071]	[0.130]	[0.063]	**[0.141]**	[0]	[0]	[0]
Median	0.241	0.520	0.201	0.402	0.593	0.008	**1.222**	1.134	-0.416	-0.712
Interquartile observed dispersion $\widehat{\sigma}_o$	(0.109)	(0.170)	(0.152)	(0.152)	(0.167)	(0.134)	**(0.224)**	(0.192)	(0.366)	(1.340)
Robust true dispersion $\widehat{\sigma}_{true}$	[0.109]	[0.167]	[0.148]	[0]	[0.105]	[0]	**[0.167]**	[0]	[0]	[0]
Full sample [10646 firms]										
Simple mean	0.307	0.503	0.190	0.288	0.599	0.112	1.097	1.238	-0.880	0.583
Observed dispersion $\widehat{\sigma}_o$	(0.126)	(0.138)	(0.100)	(0.305)	(0.257)	(0.241)	(0.310)	(0.610)	(56)	(18)
True dispersion $\widehat{\sigma}_{true}$	[0.126]	[0.134]	[0.095]	[0.195]	[0.195]	[0.130]	[0.212]	[0.443]	[0]	[0]
Weighted mean	0.339	0.570	0.278	0.222	0.627	0.071	1.107	1.172	1.129	0.822
Weighted observed dispersion $\widehat{\sigma}_o$	(0.138)	(0.141)	(0.148)	(0.232)	(0.234)	(0.161)	(0.195)	(0.373)	(1.272)	(0.122)
Weighted true dispersion $\widehat{\sigma}_{true}$	[0.138]	[0.141]	[0.148]	[0.197]	[0.212]	[0.126]	[0.161]	[0.327]	[1.167]	[0.114]
Median	0.291	0.510	0.160	0.262	0.613	0.094	1.096	1.200	0.528	0.617
Interquartile observed dispersion $\widehat{\sigma}_o$	(0.134)	(0.161)	(0.114)	(0.277)	(0.261)	(0.197)	(0.245)	(0.457)	(1.950)	(0.435)
Robust true dispersion $\widehat{\sigma}_{true}$	[0.134]	[0.158]	[0.109]	[0.217]	[0.226]	[0.138]	[0.184]	[0.367]	[1.578]	[0.348]

[a] Detailed information on the firm-level estimates is presented in Table A.4 in Appendix.

Table 5

Within-sector dispersion: Weighted mean and Swamy estimate of weighted true standard deviation ($\widehat{\boldsymbol{\sigma}}_{true}$) of $\widehat{\varepsilon}^{Q}_{J_{ij}}$, mark-up $\hat{\mu}_{ij}(only)$ and extent of rent sharing $\hat{\phi}_{ij}$ [a]

	OLS DIF						
	$\widehat{\varepsilon}^{Q}_{N_{ij}}$	$\widehat{\varepsilon}^{Q}_{M_{ij}}$	$\widehat{\varepsilon}^{Q}_{K_{ij}}$	$\hat{\mu}_{ij}$ *only*	$\hat{\mu}_{ij}$	$\widehat{\gamma}_{ij}$	$\hat{\phi}_{ij}$
24 sectors							
Sector mean	0.236 [0.012]	0.625 [0.012]	0.076 [0.010]	1.106 [0.010]	**1.194 [0.020]**	**1.146 [0.072]**	**0.792 [0.007]**
Sector Q_1	0.207 [0.009]	0.580 [0.010]	0.057 [0.008]	1.082 [0.008]	**1.161 [0.015]**	**0.979 [0.045]**	**0.757 [0.004]**
Sector median	0.224 [0.011]	0.628 [0.011]	0.073 [0.010]	1.108 [0.009]	**1.194 [0.017]**	**1.130 [0.067]**	**0.779 [0.007]**
Sector Q_3	0.266 [0.014]	0.664 [0.014]	0.087 [0.012]	1.117 [0.012]	**1.231 [0.021]**	**1.293 [0.090]**	**0.853 [0.008]**
Correlation with sector estimates[b]	0.750 [0.845]	0.791 [0.785]	0.626 [0.884]	0.565 [0.897]	0.455 [0.798]	0.670 [0.823]	0.316 [0.653]
14 sectors							
Sector mean	0.227 [0.015]	0.635 [0.018]	0.062 [0.013]	**1.106 [0.013]**	1.085 [0.024]	0.682 [0.066]	0.776 [0.013]
Sector Q_1	0.165 [0.012]	0.574 [0.014]	0.047 [0.010]	**1.088 [0.011]**	1.055 [0.020]	0.534 [0.047]	0.718 [0.009]
Sector median	0.234 [0.015]	0.630 [0.017]	0.059 [0.012]	**1.102 [0.012]**	1.085 [0.023]	0.678 [0.066]	0.788 [0.010]
Sector Q_3	0.289 [0.019]	0.680 [0.020]	0.074 [0.015]	**1.109 [0.014]**	1.097 [0.028]	0.813 [0.078]	0.820 [0.016]
Correlation with sector estimates[b]	0.889 [0.753]	0.841 [0.694]	-0.046 [0.657]	0.266 [0617]	0.273 [0.438]	0.689 [0.293]	0.484 [0.621]
38 sectors							
Sector mean	0.232 [0.013]	0.629 [0.014]	0.071 [0.011]	1.106 [0.011]	1.154 [0.021]	0.975 [0.070]	0.786 [0.009]
Sector Q_1	0.199 [0.010]	0.577 [0.011]	0.051 [0.009]	1.086 [0.008]	1.085 [0.016]	0.686 [0.046]	0.757 [0.005]
Sector median	0.224 [0.013]	0.630 [0.013]	0.069 [0.010]	1.106 [0.011]	1.161 [0.019]	1.005 [0.066]	0.780 [0.008]
Sector Q_3	0.273 [0.016]	0.669 [0.017]	0.083 [0.013]	1.117 [0.014]	1.221 [0.026]	1.242 [0.081]	0.837 [0.010]
Correlation with sector estimates[b]	0.789 [0.828]	0.793 [0.830]	0.470 [0.812]	0.460 [0.761]	0.712 [0.680]	0.795 [0.471]	0.318 [0.732]

[a] Detailed information on the within-sector estimates is presented in Table A.5 in Appendix.
[b] Estimates reported in Table A.3.a, Part 1-2.

Table 6
Determinants of firm-level $\ln(\hat{\mu}_i\ only - 1)$, $\ln(\hat{\mu}_i - 1)$ and $\ln(\widehat{\gamma}_i)$:
OLS, WLS and median regression coefficients

Variables[a]	n_i	$capint_i$	$mixentr_i$	$rdentr_i$	$dist_i$
$\hat{\boldsymbol{\beta}}_{OLS}$					
$\ln(\hat{\mu}_i\ only - 1)$	0.040	-0.023	0.083	-0.087	-0.512***
	(0.031)	(0.053)	(0.085)	(0.157)	(0.111)
$\ln(\hat{\mu}_i - 1)$	-0.048***	0.066***	-0.143***	-0.101	0.158***
	(0.014)	(0.021)	(0.047)	(0.080)	(0.047)
$\ln(\widehat{\gamma}_i)$	-0.210***	-0.088***	-0.226***	-0.419***	0.949***
	(0.015)	(0.023)	(0.049)	(0.084)	(0.051)
$\hat{\boldsymbol{\beta}}_{WLS}$					
$\ln(\hat{\mu}_i\ only - 1)$	-0.058	-0.031	-0.019	-0.159*	-0.066
	(0.049)	(0.053)	(0.074)	(0.084)	(0.128)
$\ln(\hat{\mu}_i - 1)$	-0.048***	0.140***	-0.097*	-0.179***	0.251***
	(0.016)	(0.025)	(0.055)	(0.070)	(0.058)
$\ln(\widehat{\gamma}_i)$	-0.191***	-0.127***	-0.299***	-0.508***	0.750***
	(0.029)	(0.047)	(0.095)	(0.087)	(0.115)
$\hat{\boldsymbol{\beta}}(\mathbf{0.50})$					
$\ln(\hat{\mu}_i\ only - 1)$	0.081	0.024	0.110	0.247*	-0.513***
	(0.025)	(0.070)	(0.100)	(0.146)	(0.115)
$\ln(\hat{\mu}_i - 1)$	-0.032**	0.105***	-0.069	-0.047	0.182***
	(0.015)	(0.018)	(0.052)	(0.090)	(0.054)
$\ln(\widehat{\gamma}_i)$	-0.222***	-0.096***	-0.234***	-0.418***	0.942***
	(0.014)	(0.023)	(0.055)	(0.094)	(0.050)

*** Significant at 1%; ** Significant at 5%; * Significant at 10%.
Robust standard errors in parentheses. All regressions include sectoral dummies.
[a] The dependent and the explanatory variables are centered around the sector mean.