A characterization of product and labor market imperfections and their dispersion*

Sabien DOBBELAERE† Jacques MAIRESSE‡

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Abstract

Consistent with two models of imperfect competition in the labor market, the efficient bargaining model and the monopsony model, we provide two extensions of a microeconomic version of Hall's framework for estimating price-cost margins. We show that both product and labor market imperfections generate a wedge between factor elasticities in the production function and their corresponding shares in revenue. Using an unbalanced panel of 10646 French firms in 38 manufacturing industries over the period 1978-2001, we classify industries into 6 regimes depending on the type of competition in the product and the labor market. Within the predominant regimes, we assess both across-industry and within-industry firm differences in the estimated average joint market imperfections parameter, capturing (im)perfect competition in both the product and the labor market, and in the corresponding estimated average price-cost mark-up and rent-sharing or labor supply elasticity parameters. To determine the degree of true firm dispersion, we adopt the Swamy methodology as a variance decomposition approach. We do not only quantify the estimated across-industry and within-industry firm differences in the parameters of interest, we also tie the industry and firm estimates to industry and firm observables respectively within the dominant regime.

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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

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†VU University Amsterdam, Tinbergen Institute, IZA Bonn, visiting CREST. Corresponding author: sdobbelaere@feweb.vu.nl

‡CREST, Institut National de la Statistique et des Etudes Economiques (INSEE), MERIT-Maastricht University, NBER.

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. Recently, the monopsony model has regained considerable attention in the labor economics literature. Contrary to the standard rent-sharing models, search frictions or heterogeneous worker preferences for job characteristics generate upward sloping labor supply curves to individual firms, giving *employers* some market power.

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 (e.g. Krugman, 1979; Brander and Spencer, 1985) to labor economics (see Booth, 1995; Manning, 2003 for surveys). Recently, there has been a number of attempts to examine *simultaneously* imperfections in both the product and the labor market (Bughin, 1996; Crépon et al., 1999, 2002; Dobbelaere, 2004; Dumont et al., 2006; Neven et al., 2006; Abraham et al., 2009; Boulhol et al., 2010).[1] By estimating simultaneously price-cost mark-ups in the product market and the extent of rent sharing in the labor market, these articles aim at bridging the gap between the econometric literature on estimating product market imperfections and the one on estimating labor market imperfections. The existing articles rely on two different approaches. 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; Dumont et al. 2006 and Neven et al., 2006). The other approach is an extension of a microeconomic version of Hall's (1988) framework and boils down to estimating a reduced form equation (see Crépon et al., 1999, 2002; Dobbelaere, 2004; Abraham et al., 2009 and Boulhol et al., 2010). 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 et al., 2006 for surveys). The 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 econometric productivity literature on estimating microeconomic production functions and to the recent econometric literature on simultaneously estimating imperfections in product and factor markets.

Consistent with a standard labor bargaining model in one case and the monopsony model in the other case, we reflect on two extensions of a microeconomic version of Hall's (1988) framework. The first extension follows Crépon et al. (1999, 2002) and presumes that employees possess a degree of market power when negotiating with the firm over wages and employment (efficient bargaining model; McDonald and Solow, 1981). The second extension abstains from the assumption that the labor supply curve facing an individual employer is perfectly elastic (monopsony model; Manning, 2003). By estimating standard production functions and comparing the estimated factor elasticities for labor and materials with their shares in revenue, we obtain an estimate of joint market imperfections, capturing (im)perfect competition in both the product and the labor market. From this joint market imperfections parameter estimate, we derive estimates of product and labor market imperfections, i.e. price-cost mark-up and extent of rent-sharing parameters if the first extension fits the data, or price-cost mark-up and labor supply elasticity parameters if the second extension is not rejected by the data.

Using an unbalanced panel of 10646 French firms in 38 manufacturing industries over the period 1978-2001, we estimate a standard production for each industry. From the estimated industry-specific output elasticities, we derive an industry-specific joint market imperfections parameter. Depending on the sign and the significance of this joint market imperfections parameter, we

[1]For *theoretical* contributions on this issue, we refer to Nickell (1999) and Blanchard and Giavazzi (2003).

classify industries in distinct regimes which differ in terms of the type of competition prevailing in both markets. We consider 6 regimes:

(1) Perfect competition in the product market and perfect competition or right-to-manage bargaining in the labor market (*PC-PR*)

(2) Imperfect competition in the product market and perfect competition or right-to-manage bargaining in the labor market (*IC-PR*)

(3) Perfect competition in the product market and efficient bargaining in the labor market (*PC-EB*)

(4) Perfect competition in the product market and monopsony in the labor market (*PC-MO*)

(5) Imperfect competition in the product market and efficient bargaining in the labor market (*IC-EB*)

(6) Imperfect competition in the product market and monopsony in the labor market (*IC-MO*)

The predominant regimes are *IC-EB*, *IC-PR* and *PC-MO*. Within each of these regimes, we investigate across-industry differences in the product and labor market imperfection parameters. In addition, we provide an extensive analysis of firm differences in the estimated output elasticities of the production function and the estimated imperfection parameters within the three predominant regimes. Following Mairesse and Griliches (1990), we adopt the Swamy (1970) methodology as a variance decomposition approach to determine the degree of true firm dispersion. We do not only quantify the estimated across-industry and within-industry firm differences in the parameters of interest, we also tie the industry and firm estimates to industry and firm observables respectively within the dominant regime (*IC-EB*).

Our analysis is most closely related to Mairesse and Griliches (1990), Crépon et al. (1999, 2002) and Dobbelaere (2004). Using a sample of about 450 manufacturing firms in France, 450 manufacturing firms in the US and 850 manufacturing firms in Japan over the period 1967-1979, Mairesse and Griliches (1990) estimate the degree of true dispersion in the output-capital coefficient of a production function in the three countries. Using a sample of 1000 French manufacturing firms over the period 1986-1992, Crépon et al. (1999, 2002) estimate a Solow residual equation that gives estimates of average price-cost mark-up and average rent-sharing parameters at the manufacturing level. Using a sample of 7086 Belgian firms in 18 manufacturing industries over the period 1988-1995, Dobbelaere (2004) also uses the Solow residual normalization to analyze across-industry differences in estimated average price-cost mark-up and rent-sharing parameters. However, we believe that our article contributes to the current state of research in distinct respects. Our analysis goes one step further than Mairesse and Griliches (1990). From the estimated output-labor and output-materials coefficients of a production function, we derive estimates of product and labor market imperfection parameters and determine the degree of true dispersion in these parameters. Three important aspects distinguish our work from Crépon et al. (1999, 2002) and Dobbelaere (2004). First, instead of using the Solow residual normalization, we follow the productivity literature and estimate a production function to derive product and labor market imperfection parameters. Second, we do not impose *a priori* the efficient bargaining framework upon the data but we classify industries based on the type of competition prevailing in the product and the labor market. Third, we quantify across-industry as well as within-industry firm differences in our imperfection parameters and investigate how the industry and firm estimates correlate with industry-specific and firm-specific variables respectively.

We proceed as follows. Section 2 presents the theoretical framework and elucidates the identification strategy. Section 3 discusses the data and –for illustrative purposes– provides estimates of average output elasticities and average imperfection parameters at the manufacturing level. Section 4 classifies industries in distinct regimes which differ in terms of the type of competition that is prevalent in the product and the labor market, investigates across-industry differences in the estimated parameters of interest within the three dominant regimes and explores industry-specific patterns in the estimated imperfection parameters within the dominant regime. Section 5 analyzes within-industry firm differences in the imperfection parameters within the three predominant regimes and ties the firm-specific market imperfection parameter estimates to firm-specific observables within the dominant regime.

2 Theoretical and econometric framework

Hall's (1988) approach for evaluating price-cost mark-ups hinges on one crucial assumption, that is, firms consider input prices as given prior to deciding their level of inputs. In other words, there is no imperfect competition in the labor market. Consistent with two models of imperfect competition in the labor market that are widespread in the literature, the efficient bargaining model and the monopsony model, we reflect on two extensions of Hall's 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. One point should be clarified from the outset. We do not envisage a labor market where there is monopsony *sensu stricto*, i.e. where the employer is the sole employer in the labor market. Instead, the labor market that we have in mind is more accurately described in terms of oligopsony or monopsonistic competition. The former refers to a situation where employer market power persists despite competition with other employers. The latter is equivalent to oligopsony with free entry, driving employer's profits to zero. Both extensions of Hall's framework entail estimating a reduced-form equation that allows us to identify the key parameters –measures of product and labor market imperfections– derived from theory.

2.1 Perfect competition in the product and the labor market

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. $\Theta_{it} = Ae^{\eta_i+u_t+\upsilon_{it}}$, with η_i an unobserved firm-specific effect, u_t a year-specific intercept and υ_{it} a random component, is an index of technical change or "true" total factor productivity. Denoting the logarithm of Q_{it}, N_{it}, M_{it}, K_{it} and Θ_{it} by q_{it}, n_{it}, m_{it}, k_{it} and θ_{it} respectively, the logarithmic specification of the production function gives:

$$q_{it} = (\varepsilon_N^Q)_{it}n_{it} + (\varepsilon_M^Q)_{it}m_{it} + (\varepsilon_K^Q)_{it}k_{it} + \theta_{it} \qquad (1)$$

where $(\varepsilon_J^Q)_{it}$ ($J = N, M, K$) is the elasticity of output with respect to input factor J.

Following Solow (1957), firms act as price takers in product and input markets. In a competitive environment, the firm prices at marginal cost $(C_Q)_{it}$ such that $\frac{P_{it}}{(C_Q)_{it}} = 1$. Assuming that labor and material are variable input factors, short run profit maximization implies the following two first-order conditions:

$$(\varepsilon_N^Q)_{it} = (\alpha_N)_{it} \tag{2}$$

$$(\varepsilon_M^Q)_{it} = (\alpha_M)_{it} \tag{3}$$

where $(\alpha_N)_{it} = \frac{w_{it}N_{it}}{P_{it}Q_{it}}$ and $(\alpha_M)_{it} = \frac{j_{it}M_{it}}{P_{it}Q_{it}}$ are the share of labor costs and material costs in total revenue respectively.

Assuming that the elasticity of scale, $\lambda_{it} = (\varepsilon_N^Q)_{it} + (\varepsilon_M^Q)_{it} + (\varepsilon_K^Q)_{it}$, is known, the capital elasticity can be expressed as:

$$(\varepsilon_K^Q)_{it} = \lambda_{it} - (\alpha_N)_{it} - (\alpha_M)_{it} \tag{4}$$

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

$$q_{it} - k_{it} = (\alpha_N)_{it}\,[n_{it} - k_{it}] + (\alpha_M)_{it}\,[m_{it} - k_{it}] + [\lambda_{it} - 1]\,k_{it} + \theta_{it} \tag{5}$$

2.2 Imperfect competition in the product market

2.2.1 Perfectly competitive labor market / Right-to-manage bargaining

Perfectly competitive labor market

As in the original Hall approach, firms operate under imperfect competition in the product market and act as price takers in the input markets. Short-run profit maximization implies the following two first-order conditions:

$$(\varepsilon_N^Q)_{it} = \mu_{it}\,(\alpha_N)_{it} \tag{6}$$

$$(\varepsilon_M^Q)_{it} = \mu_{it}\,(\alpha_M)_{it} \tag{7}$$

where $\mu_{it} = \frac{P_{it}}{(C_Q)_{it}}$ refers to the mark-up of output price P_{it} over marginal cost $(C_Q)_{it}$.[2]

Assuming that the elasticity of scale (λ_{it}) is known, the capital elasticity can be expressed as:

$$(\varepsilon_K^Q)_{it} = \lambda_{it} - \mu_{it}\,(\alpha_N)_{it} - \mu_{it}\,(\alpha_M)_{it} \tag{8}$$

Inserting Eqs. (6), (7) and (8) in Eq. (1) and rearranging terms gives the following expression:

$$q_{it} - k_{it} = \mu_{it}\,\left[(\alpha_N)_{it}\,[n_{it} - k_{it}] + (\alpha_M)_{it}\,[m_{it} - k_{it}]\right] + [\lambda_{it} - 1]\,k_{it} + \theta_{it} \tag{9}$$

Estimating Eq. (9) allows the identification of the mark-up of price over marginal cost.

Right-to-manage bargaining

Let us abstain from the assumption that labor is priced competitively. We assume that the workers and the firm bargain over wages (w) but that the firm retains the right to set employment

[2] The short-run profit function of an imperfectly competitive firm i at time t is given by: $\pi_{it} = p_{it}Q_{it} - w_{it}N_{it} - j_{it}M_{it}$. Profit maximization with respect to labor and materials implies: $(\varepsilon_N^Q)_{it} = \left[1 + \frac{s_{it}\kappa_{it}}{\omega_{it}}\right]^{-1}(\alpha_N)_{it}$ and $(\varepsilon_M^Q)_{it} = \left[1 + \frac{s_{it}\kappa_{it}}{\omega_{it}}\right]^{-1}(\alpha_M)_{it}$ respectively, with s_{it} market share, κ_{it} the conjectural variations parameter ($= 1$ if firms play Nash in quantities and $= 0$ if they play Nash in prices) and ω_{it} the price elasticity of demand. Profit maximization with respect to output levels implies: $\left[1 + \frac{s_{it}\kappa_{it}}{\omega_{it}}\right]^{-1} = \frac{P_{it}}{(C_Q)_{it}} = \mu_{it}$ with P_{it} the output price and $(C_Q)_{it}$ the marginal cost (see Levinsohn, 1993 for details). Substitution leads to Eqs. (6) and (7).

(N) unilaterally (right-to-manage bargaining; Nickell and Andrews, 1983). Since, as in the perfectly competitive labor market case, labor and material input are unilaterally determined by the firm from profit maximization [see Eqs. (6) and (7) respectively], the mark-up of price over marginal cost that follows from Eq. (9) is not only consistent with the assumption that the labor market is perfectly competitive but also with the less restrictive right-to-manage bargaining assumption.

2.2.2 Efficient bargaining

Each firm operates under imperfect competition in the product market. Following Crépon et al. (1999, 2002), we assume that the workers and the firm are involved in an efficient bargaining procedure with both wages (w) and labor (N) being the subject of an agreement (McDonald and Solow, 1981). It is the objective of the workers to maximize $U(w_{it}, N_{it}) = N_{it}w_{it} + (\overline{N}_{it} - N_{it})\overline{w}_{it}$, where $\overline{N}_{it}$ is the competitive employment level ($0 < N_{it} \leq \overline{N}_{it}$) and $\overline{w}_{it} \leq w_{it}$ is the reservation wage. Consistent with capital quasi-fixity, it is the firm's objective to maximize its short-run profit function: $\pi_{it} = R_{it} - w_{it}N_{it} - j_{it}M_{it}$, where $R_{it} = P_{it}Q_{it}$ stands for total revenue. The outcome of the bargaining is the asymmetric generalized Nash solution to:

$$\max_{w_{it},\, N_{it},\, M_{it}} \left\{N_{it}w_{it} + \left(\overline{N}_{it} - N_{it}\right)\overline{w}_{it} - \overline{N}_{it}\overline{w}_{it}\right\}^{\phi_{it}} \left\{R_{it} - w_{it}N_{it} - j_{it}M_{it}\right\}^{1-\phi_{it}} \tag{10}$$

where $\phi_{it} \in [0, 1]$ represents the bargaining power of the workers.

Material input is unilaterally determined by the firm from profit maximization: $(R_M)_{it} = j_{it}$ with $(R_M)_{it}$ the marginal revenue of material input, which directly leads to Eq. (7).

Maximization with respect to the wage rate and labor respectively gives the following first-order conditions:

$$w_{it} = \overline{w}_{it} + \frac{\phi_{it}}{1-\phi_{it}}\left[\frac{R_{it} - w_{it}N_{it} - j_{it}M_{it}}{N_{it}}\right] \tag{11}$$

$$w_{it} = (R_N)_{it} + \phi_{it}\left[\frac{R_{it} - (R_N)_{it}N_{it} - j_{it}M_{it}}{N_{it}}\right] \tag{12}$$

with $(R_N)_{it}$ the marginal revenue of labor.

Solving simultaneously Eqs. (11) and (12) leads to the following expression for the contract curve:

$$(R_N)_{it} = \overline{w}_{it} \tag{13}$$

Eq. (13) shows that under risk neutrality, the firm's decision about employment equals the one of a (non-bargaining) neoclassical firm that maximizes its short-run profit at the reservation wage.

We denote the marginal revenue by $(R_Q)_{it}$ and the marginal product of labor by $(Q_N)_{it}$. Given that $\mu_{it} = \frac{P_{it}}{(R_Q)_{it}}$ in equilibrium, we can express the marginal revenue of labor as $(R_N)_{it} = (R_Q)_{it}\,(Q_N)_{it} = (R_Q)_{it}\,(\varepsilon_N^Q)_{it}\,\frac{Q_{it}}{N_{it}} = \frac{P_{it}\,(Q_N)_{it}}{\mu_{it}}$. Using this expression together with Eq. (13), the elasticity of output with respect to labor can be written as:

$$(\varepsilon_N^Q)_{it} = \mu_{it}\left(\frac{\overline{w}_{it}N_{it}}{P_{it}Q_{it}}\right) = \mu_{it}\,(\overline{\alpha}_N)_{it} \tag{14}$$

Given that we can rewrite Eq. (11) as $(\alpha_N)_{it} = (\overline{\alpha}_N)_{it} + \frac{\phi_{it}}{1-\phi_{it}} [1 - (\alpha_N)_{it} - (\alpha_M)_{it}]$, Eq. (14) is equivalent to:

$$(\varepsilon_N^Q)_{it} = \mu_{it}\,(\alpha_N)_{it} - \mu_{it}\frac{\phi_{it}}{1-\phi_{it}}\,[1 - (\alpha_N)_{it} - (\alpha_M)_{it}] \tag{15}$$

In the remainder of the article, we denote $\frac{\phi_{it}}{1-\phi_{it}}$ by γ_{it}. Note that Eq. (15) discriminates between the right-to-manage bargaining setting and the efficient bargaining setting. In the right-to-manage model, employment is highly endogenous with respect to wages. As in the perfectly competitive labor market case, the marginal revenue of labor is equal to the wage whereas in the efficient bargaining model, employment does not directly depend on the bargained wage. Hence, as discussed in Section 2.1, the null hypothesis of $\gamma_{it} = 0$ in Eq. (15) does not only correspond to the assumption that the labor market is competitive but also to the less restrictive right-to-manage bargaining assumption.

Assuming that the elasticity of scale, $\lambda_{it} = (\varepsilon_N^Q)_{it} + (\varepsilon_M^Q)_{it} + (\varepsilon_K^Q)_{it}$, is known, the capital elasticity can be expressed as:

$$(\varepsilon_K^Q)_{it} = \lambda_{it} - \mu_{it}\,(\alpha_N)_{it} + \mu_{it}\frac{\phi_{it}}{1-\phi_{it}}\,[1 - (\alpha_N)_{it} - (\alpha_M)_{it}] - \mu_{it}\,(\alpha_M)_{it} \tag{16}$$

Estimating the production function:

$$q_{it} - k_{it} = (\varepsilon_N^Q)_{it}\,[n_{it} - k_{it}] + (\varepsilon_M^Q)_{it}\,[m_{it} - k_{it}] + [\lambda_{it} - 1]\,k_{it} + \theta_{it} \tag{17}$$

allows us to obtain estimates of (1) the mark-up of price over marginal cost and (2) the extent of rent sharing. Indeed, from Eq. (17) it follows that:

$$\frac{(\varepsilon_M^Q)_{it}}{(\alpha_M)_{it}} - \frac{(\varepsilon_N^Q)_{it}}{(\alpha_N)_{it}} = \mu_{it}\frac{\phi_{it}}{1-\phi_{it}}\left[\frac{1 - (\alpha_N)_{it} - (\alpha_M)_{it}}{(\alpha_N)_{it}}\right] \tag{18}$$

to which we refer as the parameter of joint market imperfections and which we denote by ψ_{it} in the remainder of the article.[3]

2.2.3 Monopsony

The model of Hall (1988) is based on the assumption that there is a potentially infinite supply of employees having a free and costless choice of a large number of employers for whom they might work. Competition among these employers then results in a single market wage. A small wage cut by the employer will result in the immediate resignation of all existing workers. In contrast, the wage elasticity of the labor supply curve facing an individual employer is not infinite when the labor market is characterized by monopsony. There are a number of reasons why labor supply might be less than perfectly elastic, creating rents to jobs. Paramount among these are the absence of perfect information on alternative possible jobs (Burdett and Mortensen, 1998), moving costs (Boal and Ransom, 1997) and heterogeneous worker preferences for job characteristics (Bhaskar and To, 1999; Bhaskar et al., 2002) on the supply side, and efficiency wages with diseconomies of scale in monitoring (Boal and Ransom, 1997) and entry costs on the part of competing firms on the demand side. All these factors give employers nonnegligible market power over their workers.

[3] From Eq. (18), it is clear 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.

Consider a firm that operates under imperfect competition in the product market and faces a labor supply $N_{it}(w_{it})$, which is an increasing function of the wage w_{it}. Both $N_{it}(w_{it})$ and the inverse of this relationship $w_{it}(N_{it})$ are referred to as the labor supply curve of the individual firm. The monopsonist firm's objective is to maximize its short-run profit function, taking the labor supply curve as given:

$$\max_{N_{it},\, M_{it}} \pi(w_{it},\, N_{it},\, M_{it}) = R_{it}(N_{it},\, M_{it}) - w_{it}(N_{it})\, N_{it} - j_{it} M_{it} \tag{19}$$

Maximization with respect to material input gives $(R_M)_{it} = j_{it}$, which is equivalent to Eq. (7).

Maximization with respect to labor gives the following first-order condition:

$$w_{it} = \frac{(\varepsilon_w^N)_{it}}{1 + (\varepsilon_w^N)_{it}}\, (R_N)_{it} \tag{20}$$

where $(\varepsilon_w^N)_{it} \in \Re_+$ represents the wage elasticity of the labor supply. In the remainder of the article, we denote $\frac{(\varepsilon_w^N)_{it}}{1+(\varepsilon_w^N)_{it}}$ by β_{it}. From Eq. (20), it follows that the degree of monopsony power, measured by $\frac{(R_N)_{it}}{w_{it}}$, depends negatively on $(\varepsilon_w^N)_{it}$. The more inelastic the labor supply curve to the individual firm, the wider the gap between the marginal revenue of labor and the wage. In the tradition of Pigou (1924) and Hicks (1932), this wedge $\left(\frac{(R_N)_{it} - w_{it}}{w_{it}} = \frac{1}{(\varepsilon_w^N)_{it}}\right)$ is referred to in the literature as the rate of exploitation. Rewriting Eq. (20) gives the following expression for the elasticity of output with respect to labor:

$$(\varepsilon_N^Q)_{it} = \mu_{it}\, (\alpha_N)_{it} \left(1 + \frac{1}{(\varepsilon_w^N)_{it}}\right) \tag{21}$$

Assuming again that the elasticity of scale, $\lambda_{it} = (\varepsilon_N^Q)_{it} + (\varepsilon_M^Q)_{it} + (\varepsilon_K^Q)_{it}$, is known, estimation of the production function $\left[q_{it} - k_{it} = (\varepsilon_N^Q)_{it}\,[n_{it} - k_{it}] + (\varepsilon_M^Q)_{it}\,[m_{it} - k_{it}] + [\lambda_{it} - 1]\, k_{it} + \theta_{it}\right]$ allows the identification of (1) the mark-up of price over marginal cost and (2) the labor supply elasticity of the firm. Indeed, in a monopsony labor market, the parameter of joint market imperfections (ψ_{it}) is expressed as:

$$\psi_{it} = \frac{(\varepsilon_M^Q)_{it}}{(\alpha_M)_{it}} - \frac{(\varepsilon_N^Q)_{it}}{(\alpha_N)_{it}} = -\mu_{it} \frac{1}{(\varepsilon_w^N)_{it}} \tag{22}$$

2.3 Identification strategy

The data features that are key to empirical identification of the product and labor market imperfection parameters are the differences between the estimated output elasticities of labor and materials and the shares of labor and materials in revenue. Depending on the labor market setting, it follows from the parameter of joint market imperfections that these differences can be mapped into either the firm price-cost mark-up and the extent of rent sharing [Eq. (18)] or the firm price-cost mark-up and the firm labor supply elasticity [Eq. (22)].

Since our study aims at assessing across-industry and within-industry firm differences in product and labor market imperfection parameters, we estimate *average* parameters. There are many sources of variation in input shares. Some might be related to variation in hours of work, machinery, capacity utilization (variation in the business cycle). When deriving our parameters of interest, we want to abstract from this possible source of bias. Therefore, we assume *constant* input shares. Hence, we derive *average* product and labor market imperfection parameters by comparing the estimated *average* production function coefficients, i.e. the estimated average output elasticities of labor and materials, with the *average* shares of labor and materials in revenue. The empirical specification that acts as the bedrock for the regressions in this article is hence given by:

$$q_{it} - k_{it} = \varepsilon_N^Q \left[n_{it} - k_{it}\right] + \varepsilon_M^Q \left[m_{it} - k_{it}\right] + \left[\lambda - 1\right] k_{it} + \zeta_{it} \tag{23}$$

The estimated joint market imperfections parameter $\left(\widehat{\psi}\right)$ determines the regime characterizing the type of competition prevailing in the product and the labor market. *A priori*, 6 distinct regimes are possible: (1) perfect competition in the product market and perfect competition or right-to-manage bargaining in the labor market, (2) imperfect competition in the product market and perfect competition or right-to-manage bargaining in the labor market, (3) perfect competition in the product market and efficient bargaining in the labor market, (4) perfect competition in the product market and monopsony in the labor market, (5) imperfect competition in the product market and efficient bargaining in the labor market and (6) imperfect competition in the product market and monopsony in the labor market. In the remaining of the article, we denote the 6 possible regimes by $R \in \Re = \{PC\text{-}PR, IC\text{-}PR, PC\text{-}EB, PC\text{-}MO, IC\text{-}EB, IC\text{-}MO\}$, where the first part reflects the type of competition in the product market and the second part reflects the type of competition in the labor market. Once the regime is determined, we derive the product and labor market imperfection parameters from the estimated joint market imperfections parameter.

When interpreting the (differences in) market imperfections, we should be aware of other forces –that are not included in our modeling framework– impacting the estimated elasticity-revenue share ratios. Possibilities range from economic factors like distortions in the intermediate materials market, variable factor utilization and factor adjustment costs to measurement issues.

3 Data description and manufacturing-level results

In this section, we discuss the data. For illustrative purposes, we also present the results of estimating the production function at the manufacturing level.

3.1 Data description

We use an unbalanced panel of French manufacturing firms over the period 1978-2001, based mainly on firm accounting information from EAE ("Enquête Annuelle d' Entreprise", "Service des Etudes et Statistiques Industrielles" (SESSI)). We only keep firms for which we have at least 12 years of observations, ending up with an unbalanced panel of 10646 firms with the number of observations for each firm varying between 12 and 24.[4] 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.[5] 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

[4] 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]. The average number of observations per firm is 15.5 and the total number of observations is 165009.

[5] The capital stock measure used in this article is the gross book value of tangible assets as reported in the firm balance sheets at the beginning of the year (or the end of the previous year), adjusted for inflation.

production and by taking the average of these ratios over adjacent years. Table 1 reports the means, standard deviations and quartile values of our main variables. The average growth rate of real firm output for the overall sample is 2.1% per year over the period 1978-2001. Capital has decreased at an average annual growth rate of 0.1%, while materials and labor have increased at an average annual growth rate of 4% and 0.6% respectively. The Solow residual or the conventional measure of total factor productivity (TFP) is stable over the period. As expected for firm-level data, the dispersion of all these variables is considerably large. For example, TFP growth is lower than -5.6% for the first quartile of firms and higher than 5.4% for the upper quartile.

<Insert Table 1 about here>

3.2 Manufacturing-level results

For illustrative purposes, we estimate the standard production function (Eq. (23)) at the manufacturing level over the period 1978-2001 with and without imposing constant returns to scale.

Part 1 of Table 2 shows the results of estimating Eq. (23) under the assumption of constant returns to scale ($\lambda = 1$), while Part 2 allows for non constant returns to scale. We present both set of results for a range of estimators. Columns 1 and 2 report the levels OLS results and the first-differenced OLS estimates, respectively. From column 3 onwards, we take into account endogeneity problems. Columns 3 and 5 display the results of estimating the model in first differences to eliminate unobserved firm-specific effects and using appropriate lags of internal 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 report the results of estimating a dynamic specification of Eq. (23), allowing for an autoregressive component in the productivity shock.[7]

The first section of each part of Table 2 gives the estimated output elasticities. The second section presents our key parameters which are derived from the average production function coefficient estimates: the estimated joint market imperfections parameter $\left(\widehat{\psi}\right)$ from which we infer that the IC-EB-regime applies at the manufacturing level, and the corresponding estimates of the average price-cost mark-up $(\widehat{\mu})$ and the average extent of rent sharing $\left(\widehat{\phi}\right)$. The standard errors ($\sigma$) of $\widehat{\mu}$ and $\widehat{\phi}$ are computed using the Delta method (Woolridge, 2002).[8] We also report the profit ratio parameter, which can be expressed as the estimated price-cost mark-up divided

This is a standard measure in microeconometric studies of the production function based on firm accounting information. It has the advantage of relying on direct information provided by the firm and does not make the strong assumptions underlying the capital stock measures obtained by the perpetual inventory method, mainly a constant rate of depreciation or a fixed service life. In practice, however, panel data estimates of capital elasticities appear to be very robust to the use of the two types of measures. See for example Atkinson and Mairesse (1978) and Mairesse and Pescheux (1980).

[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 to be more reliable than for the asymptotically more efficient two-step estimator (Arellano and Bond, 1991).

[7] The productivity term is modeled as: $\zeta_{it} = \eta_i + u_t + \upsilon_{it}$, with $\upsilon_{it} = \rho\upsilon_{it-1} + e_{it}$ where $|\rho| < 1$, and $e_{it} \sim MA(0)$. η_i is an unobserved firm-specific effect, u_t a year-specific intercept and υ_{it} is an $AR(1)$ error term.

[8] More specifically, $\widehat{\mu}$ and $\widehat{\phi}$ are derived as follows: $\widehat{\mu} = \frac{\widehat{\varepsilon}_M^Q}{\alpha_M}$, $\frac{\widehat{\phi}}{1-\widehat{\phi}} = \widehat{\gamma} = \frac{\widehat{\varepsilon}_N^Q - \left(\widehat{\varepsilon}_M^Q \frac{\alpha_N}{\alpha_M}\right)}{\frac{\widehat{\varepsilon}_M^Q}{\alpha_M}(\alpha_N + \alpha_M - 1)}$

by the estimated scale elasticity $\left(\frac{\widehat{\mu}}{\widehat{\lambda}}\right)$. This ratio shows that the source of profit lies either in imperfect competition or decreasing returns to scale. As a benchmark, we present the average price-cost mark-up that would apply if firms were to consider input prices as given prior to deciding their level of inputs as in the original Hall (1988) setting ($\widehat{\mu}$ *only*).

Focusing on our preferred estimator, the first-differenced OLS estimator under the assumption of constant returns to scale, ε_N^Q, ε_M^Q and ε_K^Q are estimated at 0.298, 0.587 and 0.115 respectively under the assumption of constant returns to scale.[9] The joint market imperfections parameter estimate is 0.186. The derived price-cost mark-up is found to be 1.167 and the corresponding extent of rent sharing 0.440. Ignoring efficient bargaining in the labor market brings the price-cost mark-up estimate down to 1.112. Intuitively, this underestimation corresponds to the omission of the part of product rents captured by the workers. Note that for all the GMM results, none of the specification tests is passed.[10] Since, contrary to this finding, the specification tests are passed nearly everywhere in the estimates at the industry level (see infra), we conclude that the rejection of the tests at the manufacturing level is due to imposing common slopes for the industries. Apart from being interested in across-industry differences *per se*, this finding motivates our analysis at the industry level. Note that in the dynamic specification results, the test of common factor restrictions is never passed.[11]

Comparing the results allowing for non constant returns to scale (Part 2 of Table 2) with those imposing constant returns to scale (Part 1 of Table 2) leads to the following insights. The returns to scale assumption evidently affects the estimated output elasticities of factor inputs. In general, the production function coefficients are estimated to be lower when allowing for non constant returns to scale. However, our product and labor market imperfection parameter estimates $\left(\widehat{\mu} \text{ and } \widehat{\phi}\right)$ appear to be relatively stable when allowing for non constant returns to scale.[12] Due to the finding of decreasing returns to scale, the average profit ratio parameter is estimated to be higher when allowing for non constant returns to scale. Besides our objective to compare consistently estimates of product and labor market imperfections at the manufacturing, the industry and the firm level, we put forward a twofold motivation to maintain the constant returns to scale assumption in the remaining of the paper. *First*, since the first-order conditions

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and $\widehat{\phi} = \frac{\widehat{\gamma}}{1+\widehat{\gamma}}$. Their respective standard errors are computed as: $\left(\sigma_{\widehat{\mu}}\right)^2 = \frac{1}{(\alpha_M)^2}\left(\sigma_{\widehat{\varepsilon}_M^Q}\right)^2$, $\left(\sigma_{\widehat{\gamma}}\right)^2 = \left(\frac{\alpha_M}{\alpha_N+\alpha_M-1}\right)^2 \frac{\left(\widehat{\varepsilon}_M^Q\right)^2\left(\sigma_{\widehat{\varepsilon}_N^Q}\right)^2 - 2\,\widehat{\varepsilon}_N^Q\,\widehat{\varepsilon}_M^Q\left(\sigma_{\widehat{\varepsilon}_N^Q,\widehat{\varepsilon}_M^Q}\right) + \left(\widehat{\varepsilon}_N^Q\right)^2\left(\sigma_{\widehat{\varepsilon}_M^Q}\right)^2}{\left(\widehat{\varepsilon}_M^Q\right)^4}$ and $\left(\sigma_{\widehat{\phi}}\right)^2 = \frac{(\sigma_{\widehat{\gamma}})^2}{(1+\widehat{\gamma})^4}$.

[9] We prefer the first-differenced OLS estimator under the assumption of constant returns to scale as this estimator allows a consistent comparison of our results at the manufacturing, the industry and the firm level. Since the number of observations for each firm varies between 12 and 24, taking into account endogeneity problems in the firm estimations would lead to too much imprecision.

[10] Results not reported but available upon request. The validity of the instruments in the first-differenced equations is rejected by the Sargan test of overidentifying restrictions but the Difference Sargan test does not reject the validity of the additional instruments in differences in the levels equations.

[11] Using $\zeta_{it} = \eta_i + u_t + \upsilon_{it}$, with $\upsilon_{it} = \rho\upsilon_{it-1} + e_{it}$ and $e_{it} \sim MA(0)$, and assuming constant returns to scale ($\lambda = 1$), we can transform Eq. (23) 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 $\pi_1 = \rho$, $\pi_2 = \varepsilon_N^Q$, $\pi_3 = -\rho\,\varepsilon_N^Q$, $\pi_4 = \varepsilon_M^Q$, $\pi_5 = -\rho\,\varepsilon_M^Q$, $\eta_i^* = (1-\rho)\,\eta_i$ 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 $\left(\varepsilon_N^Q, \varepsilon_M^Q, \rho\right)$.

[12] Except for the estimated price-cost mark-up ($\widehat{\mu}$) using the first-differenced GMM estimator, which is estimated to be much lower when allowing for non constant returns to scale (see Part 2 of Table 2). This result is due to the considerable decrease in the estimated output elasticity of materials $\left(\widehat{\varepsilon}_M^Q\right)$ when abstaining from the constant returns to scale assumption.

with respect to the variable input factors –Eq. (15) for labor and Eq. (7) for materials– do not depend on the returns to scale assumption, our key parameters are robust to this assumption. *Second*, there is a problem in estimating simultaneously and precisely the price-cost mark-up and the elasticity of scale parameters (see Crépon et al., 2002).

<Insert Table 2 about here>

By way of sensitivity test, we restricted the total sample to those firms for which we have 24 years of observations and estimated Eq. (23) imposing constant returns to scale. On average, the price-cost mark-up parameters are estimated to be higher and the corresponding extent of rent-sharing parameters are estimated to be lower than those of the total (unbalanced) sample across the different estimators.[13]

4 Industry analysis

From Section 2, it follows that the joint market imperfections parameter captures (im)perfect competition in both the product and the labor market and as such determines the prevalent regime. In this section, we first classify our 38 manufacturing industries in distinct product and labor market regimes. Once the regime is determined, we derive the average industry-specific product and labor market imperfection parameters from the estimated average industry-specific joint market imperfections parameter. Within the predominant regimes, we then provide a detailed analysis of across-industry differences in the estimated average parameters of interest, i.e. the output elasticities of the production function, the joint market imperfections parameter, and –depending on the regime– the price-cost mark-up and the extent of rent sharing or the labor supply elasticity parameters. To verify whether the estimated industry-specific product and labor market imperfection parameters are externally sensible, we tie these estimates to industry-specific observables (profitability, unionization, import penetration and technology intensity) within the dominant regime.

4.1 Classification of industries

We consider 38 manufacturing industries, which are based on the French industrial classification ("Nomenclature économique de synthèse - Niveau 3" [NES 114]), making up our sample. This decomposition is detailed enough for our purposes and ensures that each industry contains a sufficient number of firms (minimum: 104 firms, maximum: 1000 firms). Table 3 presents the industry repartition of the sample and the number of firms and the number of observations for each industry $j \in \{1, \ldots, 38\}$.

<Insert Table 3 about here>

We apply the following classification procedure on which we comment below.

[13] More specifically, the price-cost mark-up is estimated at 1.319 (OLS LEV), 1.197 (OLS DIF), 1.357 (GMM DIF) and 1.359 (GMM SYS). The extent of rent sharing is estimated at 0.345 (OLS LEV), 0.182 (OLS DIF), 0.481 (GMM DIF) and 0.374 (GMM SYS). 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. However, the validity of the additional first-differenced variables as instruments in the levels equations is rejected by the Difference Sargan test. Results not reported but available upon request.

Classification procedure: Hypothesis test	Statistical significance level	Null hypothesis not rejected
PART 1: F-test of the joint hypothesis (explicit joint test): H_0: $\left(\mu_j - 1 = \frac{(\varepsilon_M^Q)_j}{(\alpha_M)_j} - 1\right) = \left(\psi_j = \frac{(\varepsilon_M^Q)_j}{(\alpha_M)_j} - \frac{(\varepsilon_N^Q)_j}{(\alpha_N)_j}\right) = 0$	10%	$R = PC\text{-}PR$
PART 2: Two separate t-tests (implicit joint test): H_{10}: $\left(\mu_j - 1 = \frac{(\varepsilon_M^Q)_j}{(\alpha_M)_j} - 1\right) > 0$ and H_{20}: $\left(\psi_j = \frac{(\varepsilon_M^Q)_j}{(\alpha_M)_j} - \frac{(\varepsilon_N^Q)_j}{(\alpha_N)_j}\right) = 0$	10% 10%	$R = IC\text{-}PR$
H_{10}: $\left(\mu_j - 1 = \frac{(\varepsilon_M^Q)_j}{(\alpha_M)_j} - 1\right) = 0$ and H_{20}: $\left(\psi_j = \frac{(\varepsilon_M^Q)_j}{(\alpha_M)_j} - \frac{(\varepsilon_N^Q)_j}{(\alpha_N)_j}\right) > 0$	10% 10%	$R = PC\text{-}EB$
H_{10}: $\left(\mu_j - 1 = \frac{(\varepsilon_M^Q)_j}{(\alpha_M)_j} - 1\right) = 0$ and H_{20}: $\left(\psi_j = \frac{(\varepsilon_M^Q)_j}{(\alpha_M)_j} - \frac{(\varepsilon_N^Q)_j}{(\alpha_N)_j}\right) < 0$	10% 10%	$R = PC\text{-}MO$
H_{10}: $\left(\mu_j - 1 = \frac{(\varepsilon_M^Q)_j}{(\alpha_M)_j} - 1\right) > 0$ and H_{20}: $\left(\psi_j = \frac{(\varepsilon_M^Q)_j}{(\alpha_M)_j} - \frac{(\varepsilon_N^Q)_j}{(\alpha_N)_j}\right) < 0$	10% 10%	$R = IC\text{-}MO$
H_{10}: $\left(\mu_j - 1 = \frac{(\varepsilon_M^Q)_j}{(\alpha_M)_j} - 1\right) > 0$ and H_{20}: $\left(\psi_j = \frac{(\varepsilon_M^Q)_j}{(\alpha_M)_j} - \frac{(\varepsilon_N^Q)_j}{(\alpha_N)_j}\right) > 0$	10% 10%	$R = IC\text{-}EB$

For each industry j, we estimate the production function assuming constant returns to scale [Eq. (23) with $\lambda = 1$] using the first-differenced OLS estimator. In the *first part* of the classification procedure, we perform an F-test (explicit joint test) of the joint hypothesis $H_0 : \left(\mu_j - 1\right) = \psi_j = 0$, where the alternative is that at least one of the parameters (the industry-specific price-cost mark-up μ_j minus 1 or the industry-specific joint market imperfections parameter ψ_j) does not equal zero. In other words, if H_0 is not rejected, that particular industry is characterized by perfect competition in the product market and perfect competition or right-to-manage bargaining in the labor market. If H_0 is rejected, the prevalent regime $R \in \Re \backslash \{PC\text{-}PR\}$.

Having selected the industries typified by the $PC\text{-}PR$-regime, we test a 2-dimensional hypothesis by conducting two separate t-tests to classify the remaining industries in one of the 5 other regimes in the *second part* of the classification procedure. For example, if our null hypothesis is that imperfect competition in the product market and efficient bargaining in the labor market feature the industry, we perform the following implicit joint test (or induced test) (Savin, 1984): $H_{10} : \left(\mu_j - 1\right) > 0$ and $H_{20} : \psi_j > 0$. The separate t-tests reject that the $IC\text{-}EB$-regime applies if either H_{10} or H_{20} is rejected.

Since we believe that it is more likely that an industry is characterized by imperfections in either the product market or the labor market, we put *a priori* less weight on the $PC\text{-}PR$-regime by using the 10% statistical significance level instead of the conventional 5% level. More specifically, when testing $H_0 : \left(\mu_j - 1\right) = \psi_j = 0$ in the first part of the classification procedure, we reject H_0 at the 10% level if the two-tailed p-value is less than 0.10. When testing $H_{10} : \left(\mu_j - 1\right) = 0$ against $H_{1a} : \left(\mu_j - 1\right) > 0$ in the second part of the classification procedure, we reject H_{10} at the 10% level if $\left(\mu_j - 1\right) > 0$ and the two-tailed p-value is less than 0.20. Likewise, for the two-tailed test of ψ_j, we reject $H_{20} : \psi_j = 0$ at the 10% level if the two-tailed p-value is less than 0.10. We conducted two robustness checks which we discuss below.

In such classification procedure, there might be a potential for a conflict between the explicit joint test in the first part of the classification procedure and the implicit joint test in the second part since the rejection regions for both tests differ. W do not find any inconsistencies, except for 1 industry (see infra).

We performed two robustness checks. *First*, we investigated how robust the industry classification is to imposing the constraint $\left(\mu_j = \frac{\left(\epsilon_M^Q\right)_j}{\left(\alpha_M\right)_j}\right) \geq 1$. As discussed in Section 2.4, this article focuses on differences in product and labor market imperfection parameters and hence estimates average parameters. One could argue, however, that it is not reasonable to assume that –on average– prices fall below marginal costs over a period of 24 years. Therefore, we estimated the following non-linear specification for each industry $j \in \{1, \ldots, 38\}$ using the first-differenced OLS estimator:

$$\begin{aligned} SR_{it} &= q_{it} - \alpha_N n_{it} - \alpha_M m_{it} - \left[1 - \alpha_N - \alpha_M\right] k_{it} \\ &= \left[\frac{\varepsilon_M^Q}{\alpha_M} - 1\right]^2 \left[\alpha_N \left[n_{it} - k_{it}\right] + \alpha_M \left[m_{it} - k_{it}\right]\right] - \left[\frac{\varepsilon_M^Q}{\alpha_M} - \frac{\varepsilon_N^Q}{\alpha_N}\right] \left[\alpha_N \left[n_{it} - k_{it}\right]\right] + \zeta_{it} \end{aligned} \tag{24}$$

Second, we tested the sensitivity of the industry classification by increasing the rejection regions in both parts of the classification procedure. In the first part of the procedure, $H_0 : \left(\mu_j - 1\right) = \psi_j = 0$ is rejected if $\left(\mu_j - 1, \psi_j\right)$ falls outside an elliptical probability contour. To check robustness, we rejected H_0 at the 40% level instead of at the 10% level. Likewise, we increased the rejection region in the second part of the procedure by decreasing the critical values of the two separate test statistics, corresponding to the 40% statistical significance level.

Table 4 summarizes the industry classification. For details on the specific industries belonging to each regime, we refer to column 5 of Table 3. Focusing on the main classification, it follows that the dominant regime is *IC-EB*, 17 out of the 38 industries (45%) belong to this regime. This is consistent with the finding that manufacturing as a whole is characterized by *IC-EB*. The second predominant regime is *IC-PR*, 10 out of the 38 industries (26%) belong to this regime. The third predominant regime is *PC-MO*, 8 out of the 38 industries (21%) belong to this regime. The *IC-MO*-regime only holds for 2 out of the 38 industries (5%). Only 1 industry (3%) belongs to the *PC-PR*-regime. Note that initially, we rejected the *PC-PR*-regime for that particular industry (industry $j = 21$) due to a type I error in the first part of the classification procedure. Based on the two separate t-tests, however, we decided to classify this industry in the *PC-PR*-regime.[14] As expected, none of the industries is characterized by perfect competition in the product market and efficient bargaining in the labor market (*PC-EB*). On the product market side, 76% of the industries are typified by imperfect competition. On the labor market side, 45% of the industries are characterized by efficient bargaining, 26% of the industries by monopsony and perfect competition or right-to-manage bargaining features 29% of the industries.

Focusing on the first robustness check, six industries switch from *PC-MO* to *IC-MO*. These industries are indicated by $(^*)$ in column 5 of Table 3. As a result, the proportion of industries characterized by imperfect competition in the product market increases from 76% to 92%. Evidently, the classification of industries in one of the three labor market settings is not affected.

[14] Note that $H_{20} : \psi_j = 0$ is not rejected at the borderline (p-value of 0.13).

Focusing on the second robustness check, eight industries switch from one regime to another. These industries are indicated by ($^{\triangledown}$) in column 5 of Table 3. Consequently, 82% of the industries are typified by imperfect competition on the product market side. On the labor market side, 53% of the industries are characterized by efficient bargaining, 34% of the industries by monopsony and perfect competition or right-to-manage bargaining features 13% of the industries.

<Insert Table 4 about here>

4.2 Industry-level estimates of product and labor market imperfections

The predominant regimes are *IC-EB* (17 industries), *IC-PR* (10 industries) and *PC-MO* (8 industries). Within each of these regimes, we investigate across-industry differences in the computed industry-specific factor shares $(\alpha_J)_j$ $(J = N, M, K)$, the estimated industry-specific output elasticities $\left(\widehat{\varepsilon}_J^Q\right)_j$ $(J = N, M, K)$, joint market imperfections parameter $\widehat{\psi}_j$, and corresponding price-cost mark-up $\widehat{\mu}_j$ (*only*) and extent of rent sharing $\widehat{\phi}_j$ or labor supply elasticity $\left(\widehat{\varepsilon}_w^N\right)_j$.

Table 5 presents the industry mean and the industry quartile values of the first-differenced OLS results within the predominant regimes. The system GMM results are reported in Table A.1 in Appendix. For reasons of comparability, we use the same classification of industries within regimes (see Table 4) for both estimators. All the industry-specific estimates (OLS DIF and GMM SYS) are presented in Table A.2 in Appendix.[15] Tables 5, A.1 and A.2 have the same format: the left part reports the computed factor shares, the middle part reports the output elasticity estimates and the right part reports the estimated price-cost mark-up that would apply if firms were to consider input prices as given prior to deciding their level of inputs, the estimated joint market imperfections parameter and the derived product and labor market imperfections parameters, i.e. the price-cost mark-up taking into account labor market imperfections and the extent of rent sharing for industries within *IC-EB*, and the price-cost mark-up taking into account labor market imperfections and the labor supply elasticity for industries within *PC-MO* and *IC-MO*.[16]. In Table A.2, the industries within the *IC-EB*-regime are ranked according to $\widehat{\phi}_j$. Within the *IC-PR*-regime, the table is drawn up in increasing order of $\widehat{\mu}_j$. Within the *PC-MO*-regime and the *IC-MO*-regime, we rank industries in order of increasing $\widehat{\beta}_j = \frac{\left(\widehat{\varepsilon}_w^N\right)_j}{1+\left(\widehat{\varepsilon}_w^N\right)_j}$.

From Table 5, it follows that industry differences in the parameters and in the underlying estimated factor elasticities and shares are quite sizable, as could be expected. Let us focus the discussion on the primary parameters within the predominant regimes.

[15] For reasons of completeness, Table A.2 also provides detailed information on the first-differenced OLS and the system GMM estimates of the industries which are classified in the *IC-MO*-regime (2 industries) and the *PC-PR*-regime (1 industry).

[16] Dropping subscript j, $\widehat{\beta}$ and $\widehat{\varepsilon}_w^N$ are derived as follows: $\widehat{\beta} = \frac{\widehat{\varepsilon}_w^N}{1+\widehat{\varepsilon}_w^N} = \frac{\alpha_N}{\alpha_M}\frac{\widehat{\varepsilon}_M^Q}{\widehat{\varepsilon}_N^Q}$ and $\widehat{\varepsilon}_w^N = \frac{\widehat{\beta}}{1-\widehat{\beta}}$. Their respective standard errors are computed using the Delta method as follows: $\left(\sigma_{\widehat{\beta}}\right)^2 = \left(\frac{\alpha_N}{\alpha_M}\right)^2 \frac{\left(\widehat{\varepsilon}_M^Q\right)^2\left(\sigma_{\widehat{\varepsilon}_N^Q}\right)^2 - 2\,\widehat{\varepsilon}_N^Q\,\widehat{\varepsilon}_M^Q\left(\sigma_{\widehat{\varepsilon}_N^Q,\widehat{\varepsilon}_M^Q}\right) + \left(\widehat{\varepsilon}_N^Q\right)^2\left(\sigma_{\widehat{\varepsilon}_M^Q}\right)^2}{\left(\widehat{\varepsilon}_N^Q\right)^4}$ and $\left(\sigma_{\widehat{\varepsilon}_w^N}\right)^2 = \frac{\left(\sigma_{\widehat{\beta}}\right)^2}{(1-\widehat{\beta})^4}$. For the derivation of the market imperfection parameters $\widehat{\mu}$, $\widehat{\gamma}$ and $\widehat{\phi}$, and their respective standard errors, we refer to footnote 8.

- Within regime $R = IC\text{-}EB$, $\widehat{\psi}_j$ is lower than 0.191 for industries in the first quartile and higher than 0.426 for industries in the third quartile. The corresponding $\widehat{\mu}_j$ is lower than 1.162 for the first quartile of industries and higher than 1.235 for the top quartile. The corresponding $\widehat{\phi}_j$ is lower than 0.264 for the first quartile of industries and higher than 0.398 for the top quartile. The median values of $\widehat{\mu}_j$ and $\widehat{\phi}_j$ are estimated at 1.188 and 0.363 respectively. Ignoring the occurrence of rent sharing reduces the estimated median price-cost mark-up to 1.099 $(\widehat{\mu}_j \textit{ only})$.
- Within regime $R = IC\text{-}PR$, $\widehat{\mu}$ is lower than 1.081 for industries in the first quartile and higher than 1.163 for industries in the upper quartile. The median value is estimated at 1.123.
- Within $R = PC\text{-}MO$, we observe the highest dispersion in $\widehat{\psi}_j$ compared to the two other regimes. This parameter is estimated to be lower than -0.701 for industries in the first quartile and higher than -0.342 for industries in the third quartile. Consequently, industry differences in $\left(\widehat{\varepsilon}_w^N\right)_j$ are also large. This elasticity is estimated to be lower than 1.408 for industries in the first quartile and higher than 2.973 for industries in the upper quartile. The median value of $\left(\widehat{\varepsilon}_w^N\right)_j$ is estimated at 1.711.

<Insert Table 5 about here>

Taking into account endogeneity problems reveals the following patterns in the estimates (see Table A.1 in Appendix). Compared to the first-differenced OLS results, we observe a comparable degree of dispersion in the estimated joint market imperfections parameter across the three regimes. However, across the three regimes we clearly discern an increase in this parameter estimate. Resolving the simultaneity bias, this increase translates into a considerably higher price-cost mark-up estimate across the three regimes, as expected.

- Within $IC\text{-}EB$, the estimate of the extent of rent sharing remains unchanged. The median values of $\widehat{\mu}_j$ and $\widehat{\phi}_j$ are estimated at 1.296 and 0.335 respectively (compared to 1.188 and 0.363 using the first-differenced OLS estimator).
- Within $IC\text{-}PR$, the median value of $\widehat{\mu}_j$ increases from 1.123 (OLS DIF) to 1.260.
- Within $PC\text{-}MO$, the increase in $\widehat{\psi}_j$ translates into a higher estimate of $\widehat{\beta}_j = \frac{\left(\widehat{\varepsilon}_w^N\right)_j}{1+\left(\widehat{\varepsilon}_w^N\right)_j}$ as well. The median value of $\widehat{\mu}_j$ increases from 0.984 to 1.132 and the median value of $\widehat{\beta}_j$ increases from 0.629 to 0.883. Besides an increase in both market imperfection parameters, we also observe a higher degree of dispersion in both parameters. The value of the interquartile range of $\widehat{\mu}_j$ increases from 0.055 to 0.082. For $\widehat{\beta}_j$, we identify an increase from 0.164 to 0.230.

How do our estimates of product and labor market imperfections match up with other studies? Imposing $IC\text{-}EB$ on the data, Dobbelaere (2004) and Boulhol et al. (2010) examine across-industry differences in price-cost mark-ups and extent of rent sharing. Using a panel of 7086 Belgian firms in 18 manufacturing industries over the period 1988-1995, Dobbelaere (2004) finds that the price-cost mark-up is lower than 1.354 for the first quartile of industries and higher than 1.500 for the upper quartile. The corresponding extent of rent sharing is lower than 0.161 for the first quartile of industries and higher than 0.263 for the third quartile. Using a panel of 11799 British firms in 20 manufacturing industries, Boulhol et al. (2010) estimate the price-cost mark-up to be lower than 1.212 for the bottom quartile of industries and higher than 1.292 for the top quartile. The corresponding extent of rent sharing is estimated to be lower than 0.189 for the first quartile of industries and higher than 0.544 for the upper quartile. Whereas there is an abundant literature on estimating the extent of product market power (see Bresnahan, 1989 for a survey), there is little direct evidence of employer market power over its workers. For studies estimating the wage elasticity of the labor supply curve facing an individual employer, we refer to Reynolds (1946), Nelson (1973), Sullivan (1989), Boal (1995), Staiger et al. (1999), Falch (2001) and Manning (2003). These studies point to an elasticity in the [1-5]-range.[17]

4.3 Different dimensions across industries within the IC-EB-regime

Having quantified across-industry differences in product and labor market imperfection parameters in the previous section, this section aims at verifying whether the industry estimates within the dominant regime (IC-EB) are externally sensible. To this end, we tie these estimates to industry observables. We classify the 17 industries according to profitability, unionization, import penetration and technology intensity. For the first three dimensions, we consider three types (low, medium and high). For the technology dimension, we consider two types (low and medium). Columns 4-7 in Table A.4 in Appendix indicate for each dimension the type to which each industry belongs.

Graphs 1-4 aim at discerning a pattern in the first-differenced OLS estimates of $\widehat{\mu}_j$ and $\widehat{\phi}_j$ within IC-EB. Each graph corresponds to one of the four dimensions (profitability, unionization, import penetration and technology intensity). Within each dimension, different symbols refer to different types (low, medium and high). The dashed lines denote the median values ($\widehat{\mu}_{j,med} = 1.188$, $\widehat{\phi}_{j,med} = 0.363$). Observing a positive correlation between $\widehat{\mu}_j$ and $\widehat{\phi}_j$ of 0.332, most industries are situated either in the upper right part or the lower left part of the graphs.

As to the profitability dimension, we calculate the average industry-specific price-cost margin (PCM) and determine the different types based on the percentile values (low = [1-33]-percentiles, medium = [34-66]-percentiles and high = [67-100]-percentiles).[18] Following Bain (1941), many analytical and empirical studies have provided evidence of a positive relationship between market structure and performance (profitability) (see Martin, 1993 for a survey). Therefore, we expect a positive correlation between PCMs and price-cost mark-ups.

- Considering the low- and high-type industries (11 out of the 17 industries), the rank correlation coefficient is 0.47 (p-value of 0.14) for $\widehat{\mu}_j$ and -0.27 (p-value of 0.43) for $\widehat{\phi}_j$.
- Graph 1 shows that for 4 out of the 6 most profitable industries, $\widehat{\mu}_j > \widehat{\mu}_{j,med}$. Fort 4 out of the 5 least profitable industries, $\widehat{\mu}_j < \widehat{\mu}_{j,med}$. As to $\widehat{\phi}_j$, no clear pattern can be detected.

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,

[17] For example, employing regional data, Nelson (1973) uses a population density measure to identify labor supply and reports large elasticities for most US states. Sullivan (1989) estimates the supply elasticity of nurses directed toward individual hospitals to be in the [1.3-3.8]-range. Using data from US coal mining, Boal (1995) finds the labor supply elasticity to be in the [1.9-6.8]-range in the short run and infinite in the long run. Staiger et al. (1999) point to an elasticity estimate of around 0.10, implying considerable monopsonistic wage-setting power.

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

we compute the average industry-specific union density.[19] Similar to the profitability dimension, the percentile values define the three types. According to the standard rent-sharing literature, unions are most likely created in firms where rents can be extracted. Since this is most likely to happen if there is imperfect competition in the product market, we expect a positive correlation between union density and price-cost mark-ups. Union density is expected to be positively related to the extent of rent sharing, as shown by Karier (1985) and Conyon and Machin (1991).

- Considering the low- and the high-type industries (11 out of the 17 industries), the rank correlation coefficient is 0.26 (p-value of 0.43) for $\widehat{\mu}_j$ and 0.10 (p-value of 0.76) for $\widehat{\phi}_j$.
- Graph 2 shows that for 3 out of the 5 industries with a high degree of unionization, $\widehat{\phi}_j > \widehat{\phi}_{j,med}$. For 5 out of the 6 weakly unionized industries, $\widehat{\mu}_j < \widehat{\mu}_{j,med}$. Fort 3 out of the 6 weakly unionized industries, $\widehat{\phi}_j < \widehat{\phi}_{j,med}$.

As to the openness dimension, we compute the average industry-specific import penetration ratio as the ratio of industry product imports to the sum of these imports plus the value of domestic production in the industry using the input-output tables defined at the three-digit level (National Institute for Statistics and Economic Studies (INSEE)). The different types are also identified through the percentile values. Firms under intensifying pressure from foreign competition are induced to reduce their price-cost margins because of the increase in the perceived elasticity of the demand they are facing. Following Levinsohn (1993), many studies have shown evidence of the imports-as-market-discipline hypothesis (see Boulhol et al., 2010 for references). Following Rodrik's (1997) argument that the closer substitutes domestic and foreign workers are –due to e.g. international trade– the lower the enterprise surplus ending up with workers, we expect a negative correlation between import penetration and the extent of rent sharing (see also Brock and Dobbelaere, 2006 and Dumont et al., 2006). Using Belgian and UK firm-level data respectively, Abraham et al. (2009) and Boulhol et al. (2010) provide support for the imports-as-product-and-labor-market discipline hypothesis, i.e. they provide evidence of international competition curtailing domestic market power in the product market as well as in the labor market.

- Considering the low- and the high-type industries (10 out of the 17 industries), the rank correlation coefficient is -0.41 (p-value of 0.24) for $\widehat{\mu}_j$ and -0.22 (p-value of 0.54) for $\widehat{\phi}_j$.
- Graph 3 shows that for 4 out of the 5 industries with high import penetration rates, $\widehat{\mu}_j < \widehat{\mu}_{j,med}$ while for 3 out of the 5 industries shielded from import competition, $\widehat{\phi}_j > \widehat{\phi}_{j,med}$.

The identification of the two 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). When competition intensifies, firms' reaction is not limited to pricing behavior. Sutton (1991, 1998) insists on the endogeneity of market structure. An increase in the competitive environment may trigger an endogenous reaction of firms through an increase in R&D spending for instance. This might force out firms that are unable to keep the pace. R&D expenditures could hence be positively related to mark-ups. The correlation between technology intensity and rent sharing is *a priori* unclear. As discussed in Betcherman (1991), it depends on the importance of labor costs in the firm's total costs and on the workers' essentiality in the production process. Horn and Wolinsky (1988) follow the same argument.

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

- The rank correlation coefficient is -0.06 (p-value of 0.83) for $\widehat{\mu}_j$ and -0.29 (p-value of 0.25) for $\widehat{\phi}_j$.
- Graph 4 shows that for 6 out of the 9 low-technology industries, $\widehat{\phi}_j > \widehat{\phi}_{j,med}$ whereas for 5 out of the 8 medium-technology industries, $\widehat{\phi}_j > \widehat{\phi}_{j,med}$.

<Insert Graphs 1-4 about here>

5 Firm analysis

Our firm analysis essentially aims at gaining insight into the production behavior of firms within industries. Indeed, production behavior is likely to vary even within industries, because input combinations differ, labor markets are not homogeneous and demand might be more elastic or inelastic in one firm compared to another. 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 that the production function coefficients differ across firms. Therefore, we estimate the production function assuming constant returns to scale [Eq. (23) with $\lambda = 1$] for each firm i using the first-differenced OLS estimator and retrieve our market imperfection parameters from the estimated firm output elasticities $\left(\left(\widehat{\varepsilon}_J^Q\right)_i (J = N, M, K)\right)$.[20] We only consider firms for which $\left(\widehat{\varepsilon}_N^Q\right)_i$ and $\left(\widehat{\varepsilon}_M^Q\right)_i$ are estimated to be positive, ending up with 9032 firms.[21] To guarantee consistency between the industry analysis and the firm analysis, we investigate firm differences in product and labor market imperfections conditional on the industry classification.

We start with a brief discussion of the Swamy (1970) methodology. We then apply this methodology to analyze whether there is real firm-specific dispersion in the estimated average factor elasticities and average shares, and the derived imperfection parameters within the three predominant regimes to which the industries belong (IC-EB, IC-PR and PC-MO). To verify whether the estimated firm-specific product and labor market imperfection parameters are externally sensible, we tie these firm-specific estimates to firm-specific observables within the dominant regime (IC-EB).

5.1 Swamy (1970) methodology

To determine the degree of true dispersion in the production function coefficients and market imperfection parameters, we adopt the Swamy (1970) methodology as a variance decomposition approach. This method allows us to estimate the variance components in the estimated firm output elasticities $\left(\widehat{\varepsilon}_J^Q\right)_i (J = N, M, K)$, the joint market imperfections parameter $\widehat{\psi}_i$, and the corresponding price-cost mark-up $\widehat{\mu}_i$ and extent of rent sharing $\widehat{\phi}_i$ or labor supply elasticity

[20] Besides allowing for heterogeneity across firms, we could also focus on the stability of the parameters over time. However, relaxing the constancy of the joint market imperfections parameter $\widehat{\psi}_i$, and the corresponding price-cost mark-up $\widehat{\mu}_i$ and extent of rent sharing $\widehat{\phi}_i$ or labor supply elasticity $\left(\widehat{\varepsilon}_w^N\right)_i$ in the time dimension would overload our already overextended computational framework.

[21] Starting from the 10646 firm estimates, we find that $\left(\widehat{\varepsilon}_N^Q\right)_i$ is estimated to be negative in 1481 firms and $\left(\widehat{\varepsilon}_M^Q\right)_i$ is estimated to be negative in 136 firms. Only 32% of the negatively estimated $\left(\widehat{\varepsilon}_N^Q\right)_i$ is statistically significant at the 20% level. Only 21% of the negatively estimated $\left(\widehat{\varepsilon}_M^Q\right)_i$ is statistically significant at the 20% level.

$\left(\widehat{\varepsilon}_w^N\right)_i$. In particular, the Swamy methodology enables to disentangle the pure sampling variance from the true variance.

Considering random production function coefficients that vary across firms and assuming constant returns to scale, we rewrite the production function as follows:[22]

$$\mathbf{q}_i = X_i \boldsymbol{\varepsilon}_i + \boldsymbol{\xi}_i \tag{25}$$

$\boldsymbol{\varepsilon}_i$ is assumed to be randomly distributed with $\boldsymbol{\varepsilon}_i = \widetilde{\boldsymbol{\varepsilon}} + \boldsymbol{\eta}_i$. $\widetilde{\boldsymbol{\varepsilon}} = (\widetilde{\varepsilon}_1, ..., \widetilde{\varepsilon}_K)'$ represents the common-mean coefficient vector and $\boldsymbol{\eta}_i = (\eta_{1i}, ..., \eta_{Ki})'$ 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, $\boldsymbol{\xi}_i \sim N\left(\mathbf{0}, \sigma_i^2 I\right)$. $E\left(\boldsymbol{\eta}_i\right) = \mathbf{0}$, $E\left(\boldsymbol{\eta}_i \boldsymbol{\eta}_j'\right) = \boldsymbol{\Delta}$ if $i = j$, $E\left(\boldsymbol{\eta}_i \boldsymbol{\eta}_j'\right) = \mathbf{0}$ otherwise. Swamy suggests first estimating Eq. (25) for each firm i by OLS giving:

$$\widehat{\boldsymbol{\varepsilon}}_i = \left(X_i' X_i\right)^{-1} X_i' \mathbf{q}_i \quad \text{with} \tag{26}$$

$$\widehat{\boldsymbol{\xi}}_i = \mathbf{q}_i - X_i \widehat{\boldsymbol{\varepsilon}}_i \tag{27}$$

Using Eqs. (26) and (27), we obtain unbiased estimators of σ_i^2 ($\widehat{\sigma}_i^2 = \frac{\widehat{\boldsymbol{\xi}}_i' \widehat{\boldsymbol{\xi}}_i}{T-K}$ with K the number of explanatory variables) and $\boldsymbol{\Delta}$ (see Eq. (28). Indeed, 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:

$$\begin{aligned} \widehat{\Delta} &= \frac{1}{N-1} \sum_{i=1}^{N} \left(\widehat{\boldsymbol{\varepsilon}}_i - \overline{\boldsymbol{\varepsilon}}\right)\left(\widehat{\boldsymbol{\varepsilon}}_i - \overline{\boldsymbol{\varepsilon}}\right)' - \frac{1}{N} \sum_{i=1}^{N} \widehat{Var}\left(\widehat{\boldsymbol{\varepsilon}}_i\right) \\ &= \underbrace{\frac{1}{N-1} \sum_{i=1}^{N} \left(\widehat{\boldsymbol{\varepsilon}}_i - \overline{\boldsymbol{\varepsilon}}\right)\left(\widehat{\boldsymbol{\varepsilon}}_i - \overline{\boldsymbol{\varepsilon}}\right)'}_{(1)} - \underbrace{\frac{1}{N} \sum_{i=1}^{N} \widehat{\sigma}_i^2 \left(X_i' X_i\right)^{-1}}_{(2)} \end{aligned} \tag{28}$$

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 (1970) 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 dispersion 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 and Griliches, 1990).[23]

[22] For the sake of parsimony, we denote the K explanatory variables by X_i and the K firm output elasticities by $\boldsymbol{\varepsilon}_i$.

[23] Besides the Swamy methodology, the random coefficient model literature suggests two other variance decomposition approaches. One approach uses the maximum likelihood (ML) estimator and the other is a more flexible approach that amounts to 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 independence of the firm slope parameters or independence between both the firm intercept and slope parameters and the other variables in the equation, i.e. the absence of correlated effects (for a comparison of the three different approaches, we refer to Mairesse and Griliches, 1990).

5.2 Firm heterogeneity in product and labor market imperfections

Do we observe sizeable heterogeneity in the production behavior of firms within industries? To gain insight into that issue, we focus on firm heterogeneity within the predominant regimes to which the industries belong (*IC-EB*, *IC-PR* and *PC-MO*). We only consider firms for which $\left(\widehat{\varepsilon}_N^Q\right)_i$ and $\left(\widehat{\varepsilon}_M^Q\right)_i$ are estimated to be positive, ending up 9032 firms. 8459 out of these 9032 firms belong to the industries for which *IC-EB*, *IC-PR* or *PC-MO* holds.

Table 6 summarizes the first-differenced OLS results of estimating Eq. (25) for each firm i. The first part of Table 6 presents the estimates of firms belonging to industries for which regime $R = IC\text{-}EB$ holds (5715 firms). The second part presents the estimates of firms belonging to industries for which regime $R = IC\text{-}PR$ holds (1845 firms). The third part presents the estimates of firms belonging to industries for which regime $R = PC\text{-}MO$ holds (899 firms). Within each regime, we focus on the firm input shares, the estimated firm output elasticities, the estimated firm joint market imperfections parameter and the relevant product and labor market imperfection parameters.

Since the number of observations for each firm varies between 12 and 24, we do not only report the *original* Swamy estimate of true dispersion but also the Swamy estimate of *weighted* true dispersion and the Swamy estimate of *robust* true dispersion. Therefore, each part of Table 6 is divided into three sections. The first section reports the simple mean and the corresponding observed dispersion ($\widehat{\sigma}_o$) and Swamy estimate of true dispersion [$\widehat{\sigma}_{true}$]. The second section reports the weighted mean and the corresponding weighted observed dispersion ($\widehat{\sigma}_o$) and Swamy estimate of weighted true dispersion [$\widehat{\sigma}_{true}$]. The third section reports the median and the corresponding interquartile observed dispersion ($\widehat{\sigma}_o$) and Swamy estimate of robust true dispersion [$\widehat{\sigma}_{true}$].[24] Given the imprecision of the firm estimates, we focus on the robust estimates when discussing Table 6 (see infra).

Table A.4 in Appendix –which is structured like Table 6– provides some technical details on the Swamy estimates of true dispersion. Within each regime, the first section of Table A.4 presents the *original* Swamy estimate of true variance [$\widehat{\sigma}_{true}^2$, corresponding to $\widehat{\Delta}$ in Eq. (28)], which are computed as the difference between the observed variance of the individually estimated firm coefficients [$\widehat{\sigma}_o^2$, corresponding to term (1) in Eq. (28)] and the mean of the corresponding sampling variance [$\widehat{\sigma}_s^2$, corresponding to term (2) in Eq. (28)].[25] 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 within each regime of Table A.4.[26] The weight is defined as the inverse of the sampling variance. In the third section within each regime of Table A.4, we report the Swamy estimate of the *robust* true variance, which is computed by subtracting the median of the individually estimated sampling variances from the interquartile

[24] The term *interquartile* observed dispersion indicates that the observed dispersion is computed from the interquartile range of the firm input shares and firm estimates. When focusing on the Swamy estimate of *robust* true dispersion, we assume that the individually estimated parameters are normally distributed and the sampling variance is distributed as χ^2.

[25] Taking into account the unbalanced nature of the sample, the equivalent of Eq. (25) for the input shares α_J $(J = N, M, K)$ can be expressed as: $\widetilde{\sigma}_{true}^2 = \frac{1}{N-1}\sum_{i=1}^{N}\left((\overline{\alpha}_J)_i - \overline{\alpha}_J\right)^2 - \frac{1}{\overline{T}}\widetilde{\sigma}_s^2$, where $\overline{T} = \sum_{n_t=12}^{24}\left(\frac{N_{n_t}}{N}n_t\right)$, $(\overline{\alpha}_J)_i = \frac{1}{\overline{T}}\sum_{t=1}^{n_t}(\alpha_J)_{it}$, $\overline{\alpha}_J = \frac{1}{N}\sum_{i=1}^{N}(\overline{\alpha}_J)_i$ and $\widetilde{\sigma}_s^2 = \frac{1}{N(\overline{T}-1)}\sum_{i=1}^{N}\sum_{t=1}^{n_t}\left((\alpha_J)_{it} - (\overline{\alpha}_J)_i\right)^2$. n_t denotes the number of years within firm i and N_{n_t} refers to the number of firms for which we observe n_t years of observations.

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

observed variance. Each section presents a F-statistic, testing the hypothesis of equality of the estimates.[27]

<Insert Table 6 about here>

How can we interpret the results reported in Table 6? Let us focus the discussion on the median values. Across the three regimes, the median values of the firm-specific output elasticities and the price-cost mark-up that would apply if firms were to consider input prices as given prior to deciding their level of inputs are quite comparable. The median value of $\left(\widehat{\varepsilon}_N^Q\right)_i$ lies in the [0.298-0.322]-range, the median value of $\left(\widehat{\varepsilon}_M^Q\right)_i$ lies in the [0.557-0.587]-range, the median value of $\left(\widehat{\varepsilon}_K^Q\right)_i$ lies in the [0.058-0.077]-range and the median value of $\widehat{\mu}_i$ *only* lies in the [1.085-1.105]-range. The Swamy corresponding robust estimates of true dispersion are within the [0.175-0.208]-range for $\left(\widehat{\varepsilon}_N^Q\right)_i$, within the [0.194-0.254]-range for $\left(\widehat{\varepsilon}_M^Q\right)_i$, within the [0.106-0.127]-range for $\left(\widehat{\varepsilon}_K^Q\right)_i$ and within the [0.179-0.185]-range for $\widehat{\mu}_i$ *only*.

Focusing on the relevant market imperfection parameters within each regime leads to the following insights.

- Within $R = IC\text{-}EB$, the median joint market imperfections parameter $\left(\widehat{\psi}_i\right)$ is estimated at 0.297 which is close to the median value at the industry level (0.315, see Table 5). The Swamy robust estimate of true dispersion amounts to 0.795, providing evidence of very sizeable within-industry firm dispersion within $IC\text{-}EB$. From $\widehat{\psi}_i$, we retrieve that the median of the estimated price-cost mark-up $(\widehat{\mu}_i)$ is 1.204 and the median of the estimated extent of rent sharing $\left(\widehat{\phi}_i\right)$ is 0.582. The Swamy corresponding robust estimates of true dispersion of 0.335 and 0.319 respectively are good indicators of a credible amount of dispersion.[28] The corresponding industry-specific median values are 1.188 for $\hat{\mu}_j$ and 0.363 for $\widehat{\phi}_j$.

- Within $R = IC\text{-}PR$, the median of $\widehat{\psi}_i$ is -0.008 which clearly deviates from the median value of 0.048 at the industry level. Indeed, the Swamy robust estimate of true dispersion of 0.954 points to large firm differences within industries. The median of $\widehat{\mu}_i$ is 1.122 with a Swamy corresponding robust estimate of true dispersion of 0.303. This firm median is equivalent to the industry median (1.123).

- Within $R = PC\text{-}MO$, the median of $\widehat{\psi}_i$ is -0.462 (compared to -0.563 at the industry level). The Swamy corresponding robust estimate of true dispersion of 1.374 illustrates the considerable amount of firm dispersion. From $\widehat{\psi}_i$, we infer that the median of $\widehat{\mu}_i$ is 1.015 and the median of the $\left(\widehat{\varepsilon}_w^N\right)_i$ is 0.194. The Swamy corresponding robust estimates of

[27] Except for $\widehat{\gamma}_i$ and $\hat{\phi}_i$ within $IC\text{-}EB$ and $\widehat{\beta}_i$ and $\left(\widehat{\varepsilon}_w^N\right)_i$ within $PC\text{-}MO$, all the F-statistics are significant at conventional significance levels since the critical value barely exceeds 1 for our sample size. 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 decrease the likelihood of rejecting the hypothesis of homogeneity (Mairesse and Griliches, 1990).

[28] At the firm level, the correlation between $\widehat{\mu}_i$ *only* and $\widehat{\mu}_i$ amounts to 0.45. For 61.7% of the firms, the lack of explicit consideration of labor market imperfections results in an underestimation of the firm-specific price-cost mark-up.

true dispersion of 0.317 and 1.440 respectively give evidence of substantial within-industry firm dispersion within $PC\text{-}MO$. The industry-specific median values are 0.984 for $\hat{\mu}_j$ and 1.711 for $\left(\widehat{\varepsilon}_w^N\right)_j$.

Going back to the more technical details of the Swamy estimates (see Table A.4 in Appendix) and focusing on the *original* Swamy estimates, it follows that the observed variance $\left(\widehat{\sigma}_o^2\right)$ illustrates the sizeable dispersion in the estimated firm output elasticities and the derived parameters. It shows that the dispersion 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 (relative) extent of rent sharing $(\widehat{\gamma}_i)$ $\widehat{\phi}_i$ within regime $R = IC\text{-}EB$ and in the individually estimated $\widehat{\beta}_i$ and labor supply elasticity $\left(\widehat{\varepsilon}_w^N\right)_i$ within regime $R = PC\text{-}MO$. In contrast, we find persistent individual firm differences in both the firm input shares, the firm estimated elasticities and the derived parameters within each regime when focusing on the Swamy estimate of the *weighted* true variance and the Swamy estimate of the *robust* true variance. For all the firm estimates, the weighted (interquartile) observed variance and –even more so– the weighted (robust) sampling variance are considerably smaller than the corresponding simple observed and simple sampling variance. As such, the Swamy estimate of the weighted (robust) true variance exceeds the corresponding Swamy estimate of the simple true variance within the three regimes.

Summing up, we observe quite sizeable within-industry firm dispersion in the joint market imperfections parameter and the corresponding product and labor market imperfection parameters within the three predominant regimes to which the industries belong. This statement holds even if we focus on *true* dispersion. This main finding can be interpreted in two ways. *First*, production behavior of firms within industries that are classified in the same regime is indeed truly heterogeneous. Following this interpretation, we investigate in the next section which firm-specific factors correlate with the market imperfection parameters within the dominant regime ($IC\text{-}EB$). *Second*, from the true dispersion of the joint market imperfections parameter, we derive that for firms within $R = IC\text{-}EB$ and $R = PC\text{-}MO$, there is room to move to another regime. This calls for an extension of our analysis which we consider as a topic for future research. Although we might expect that a majority of firms within an industry belong to the same regime as that particular industry, this presumption might be rebutted. Indeed, given that we condition the firm analysis on the industry classification, the substantial true firm dispersion might indicate that although the representative firm is characterized by the same regime as the industry to which it belongs, regime differences across firms within a given industry are important.

5.3 Different dimensions across firms within the $IC\text{-}EB$-regime

Consistent with Section 4.3, we investigate how the market imperfection parameters of firms within $R = IC\text{-}EB$ correlate with firm-specific variables like size, capital intensity, being an R&D firm and distance to the industry technology frontier.

Data description

We focus on the joint market imperfections parameter, the price-cost mark-up and the relative extent of rent-sharing parameters of the 5715 firms within $R = IC\text{-}EB$. More specifically, the dependent variable is either the vector of $\ln(\widehat{\mu}_i \ only - 1)$, the vector of $\ln\left(\widehat{\psi}_i\right)$, the vector of

$\ln(\widehat{\mu}_i - 1)$ or the vector of $\ln(\widehat{\gamma}_i)$. For each of these dependent variables, we have four different matrices of regressors. Each set consists of a firm-specific variable (size, capital intensity, the R&D identifier, distance to the industry technology frontier) and industry dummies. All variables are centered around the industry mean.

Size (n_i) is measured by the logarithm of the average number of employees in each firm. Based on the standard rent-sharing literature, firm size and the relative rent-sharing parameter are expected to be positively correlated. To the extent that large firms are typically multi-product firms, we might expect a positive correlation between firm size and price-cost mark-ups (Sutton, 1998).

Capital intensity is usually included in structure-performance models to capture the difference between capital-intensive and non-capital-intensive firms. We measure this variable ($capint_i$) by the logarithm of the gross book-value of fixed assets divided by sales. Since capital equipment usually constitutes sunk costs and the latter may necessitate mark-up pricing, we expect a positive correlation between capital intensity and price-cost mark-ups (see e.g. Odagiri and Yamashita, 1987). Likewise, capital intensity is expected to be positively correlated with the relative extent of rent sharing. The intuition is that if a bargaining partner receives extra income in case of a disagreement, this partner is more willing to tolerate disagreement and hence bargains for a larger share of the pie. In some studies (see e.g. Doiron, 1992), these costs are interpreted as strike costs in case the negotiating parties use strikes as a dispute resolution mechanism. Among other things, lower inventories and higher capital intensity are shown to increase a firm's strike costs and hence to decrease its extent of rent sharing (see e.g. Clark 1991, 1993; Doiron, 1992).

Technological change might exert an effect on the relative extent of rent sharing by affecting the nature of the production process. As discussed above, this effect is *a priori* unclear. It depends on the importance of labor costs in the firm's total costs and on the workers' essentiality in the production process (Horn and Wolinsky, 1988; Betcherman, 1991). We capture technological change by an R&D variable and a measure of the distance of a firm to its industry technology frontier). To construct the R&D variable, we merge accounting information of the considered firms from EAE (SESSI) with data of Research & Development collected by DEP ("Ministère de l'Education et de la Recherche"). 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 that does not report any R&D expenditure is considered to be a non-R&D firm. Based on this criterion, we define three subsamples: the pure non-R&D firms, the mixed R&D firms for which we have data on R&D expenditure for less than 12 years ($mixentr_i$) and the pure R&D firms for which we have data on R&D expenditure for at least 12 years ($rdentr_i$).[29] Our measure of the distance of a firm to its industry technology frontier is constructed as follows: $dist_i = p^{95} \ln\left(\frac{VA}{N}\right)_j - \ln\left(\frac{VA}{N}\right)_{ij}$, where i is a firm index, j an industry index and $\frac{VA}{N}$ real value added per employee. To drop outliers, we use the 95^{th} percentile instead of the maximum.

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 $\ln\left(\widehat{\psi}_i\right)$, the vector of $\ln(\widehat{\mu}_i - 1)$ or the vector of $\ln(\widehat{\gamma}_i)$ are reported in Table 7. The 0.50 quantile regression can be interpreted as a robust equivalent of OLS. Although the regression coefficients are listed in rows for each of the three sets of regressors, these coefficients

[29] Among the 5715 firms within $R = IC\text{-}EB$, 121 firms are identified as pure R&D firms, 476 as mixed R&D firms and –the complement– 5118 as pure non-R&D firms.

result from single firm-specific variable regressions (including industry dummies), except for the regression including the R&D identifier which includes two firm-specific variables ($mixentr_i$ and $rdentr_i$) and industry dummies.

Let us focus the discussion on the median regressions.

- Large firms, capital-intensive firms and firms which are nearer to the industry technology frontier are characterized by a higher $\widehat{\mu}_i$ *only*.
- Capital intensity is also positively correlated with $\widehat{\mu}$. In contrast, we find a negative correlation between size as well as distance of a firm to the industry technology frontier, and $\widehat{\mu}_i$.
- $\widehat{\gamma}_i$ appears to be negatively correlated with capital intensity and with one of our technology variables ($dist_i$). The latter result is consistent with the industry analysis that also reveals that low-technology industries seem to be typified by a higher extent of rent sharing.

Except for the negative correlation between $capint_i$ and $\widehat{\gamma}_i$, the results are not sensitive to running multivariate specifications.[30]

<Insert Table 7 about here>

6 Conclusion

This article departs from the empirical regularity that input factors' estimated marginal products are often larger than their measured payments. Starting from the belief that product and labor markets are intrinsically characterized by imperfections, we provide two extensions of Hall's (1988) framework for estimating price-cost margins. The first extension embeds a standard labor bargaining model (efficient bargaining) into the Hall approach, the second extension abstains from the assumption that the labor supply curve facing an individual employer is perfectly elastic and integrates the monopsony model into the Hall approach. Both extensions identify product and labor market imperfections as two sources of discrepancies between the output contribution of individual production factors and their respective revenue shares. Following the productivity measurement literature, we use econometric production functions as a tool for testing the competitiveness of product and labor markets. Using an unbalanced panel of 10646 French firms in 38 manufacturing industries over the period 1978-2001, we estimate a standard production function for each industry. From the estimated industry-specific output elasticities, we derive an industry-specific joint market imperfections parameter capturing (im)perfect competition in both the product and the labor market. Based on the type of competition prevailing in the product and the labor market, we classify industries into 6 distinct regimes. Depending on the regime, it follows from the parameter of joint market imperfections that the sources of discrepancies can be mapped into the firm price-cost mark-up and the extent of rent sharing if the first extension fits the data, or the firm price-cost mark-up and the firm labor supply elasticity if the second extension is not rejected by the data. Within the predominant regimes, we investigate across-industry differences in the product and labor market imperfection parameter estimates. Within the dominant regime, we tie these industry-specific estimates to industry observables. To explore how firm production behavior deviates from the industry average, we provide an extensive analysis of within-industry firm heterogeneity in the estimated output elasticities of the production function and the estimated imperfection parameters within

[30] In particular, we ran multivariate specifications for each set of regressors where we included all firm-specific variables and industry dummies. Results not reported but available upon request.

the predominant regimes to which the industries belong. We consider our firm results as a first attempt to understand how different firms are in their factor shares, in their marginal products and in the imperfections in the product and labor markets in which they operate, and how their behavior deviates from the behavior of the industry to which they belong.

Our analysis can be extended in several promising ways. This article investigates firm heterogeneity in product and labor market imperfections conditional on the industry classification. An obvious research avenue is to study the degree of true dispersion in the production behavior of firms when firms in a particular industry are allowed to belong to different regimes. Another research avenue is to analyze how the classification of industries and firms would be affected when using matched employer-employee data to control for unobserved worker abilities.

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Table 1
Summary statistics

Variables	1978-2001				
	Mean	Sd.	Q_1	Q_2	Q_3
Real firm output growth rate Δq	0.021	0.152	-0.061	0.019	0.103
Labor growth rate Δn	0.006	0.123	-0.043	0.000	0.054
Capital growth rate Δk	-0.001	0.151	-0.072	-0.020	0.060
Materials growth rate Δm	0.040	0.192	-0.060	0.038	0.139
Labor share in nominal output α_N	0.307	0.136	0.208	0.291	0.387
Materials share in nominal output α_M	0.503	0.159	0.399	0.510	0.614
$1 - \alpha_N - \alpha_M$	0.185	0.143	0.092	0.158	0.248
$\Delta q - \Delta k$	0.022	0.188	-0.081	0.024	0.126
$\Delta n - \Delta k$	0.007	0.166	-0.073	0.014	0.088
$\Delta m - \Delta k$	0.041	0.220	-0.079	0.041	0.160
SR^a	0.000	0.100	-0.056	0.000	0.054

Number of observations: 154363, except for α_N and α_M (165009).
[a] $SR = \Delta q - \alpha_N \Delta n - \alpha_M \Delta m - (1 - \alpha_N - \alpha_M)\Delta k$.

Table 2
Estimates of output elasticities $\widehat{\varepsilon}_J^Q$ $(J = N, M, K)$, joint market imperfections parameter $\left(\widehat{\psi}\right)$,
price-cost mark-up $\widehat{\mu}$ (*only*) and extent of rent sharing $\widehat{\phi}$:
Full sample: 10646 firms, each firm between 12 and 24 years of observations - period 1978-2001
Part 1: Imposing constant returns to scale: $\widehat{\varepsilon}_K^Q = 1 - \widehat{\varepsilon}_N^Q - \widehat{\varepsilon}_M^Q$

	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)	(0.003)	(0.020)	(0.008)	(0.032)	(0.015)
$\widehat{\varepsilon}_M^Q$	0.592	0.587	0.726	0.675	0.595	0.541
	(0.003)	(0.003)	(0.017)	(0.007)	(0.022)	(0.019)
$\widehat{\varepsilon}_K^Q$	0.077	0.115	0.137	0.027	0.271	0.258
λ	1	1	1	1	1	1
$\widehat{\mu}\,only = \frac{\widehat{\mu}\,only}{\lambda}$	1.144	1.112	1.129	1.211	1.041	0.934
	(0.003)	(0.002)	(0.013)	(0.007)	(0.032)	(0.020)
$\widehat{\psi}$	0.096	0.186	0.993	0.370	0.745	0.421
	(0.017)	(0.013)	(0.095)	(0.036)	(0.128)	(0.071)
$\widehat{\mu} = \frac{\widehat{\mu}}{\lambda}$	1.177	1.167	1.443	1.342	1.184	1.076
	(0.007)	(0.005)	(0.033)	(0.015)	(0.043)	(0.039)
$\widehat{\gamma}$	0.647	0.785	1.628	0.962	1.532	1.146
	(0.017)	(0.013)	(0.063)	(0.030)	(0.116)	(0.069)
$\widehat{\phi}$	0.393	0.440	0.619	0.490	0.605	0.534
	(0.006)	(0.004)	(0.009)	(0.008)	(0.018)	(0.015)
$\widehat{\rho}$					0.713	0.619
					(0.023)	(0.018)

Part 2: Not imposing constant returns to scale: $\widehat{\varepsilon}_K^Q = \widehat{\lambda} - \widehat{\varepsilon}_N^Q - \widehat{\varepsilon}_M^Q$

	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	0.189	0.149	0.240	0.111	0.057
	(0.001)	(0.002)	(0.022)	(0.011)	(0.031)	(0.025)
$\widehat{\varepsilon}_M^Q$	0.592	0.554	0.566	0.696	0.554	0.562
	(0.001)	(0.002)	(0.020)	(0.008)	(0.023)	(0.020)
$\widehat{\varepsilon}_K^Q$	0.077	0.049	-0.027	0.033	0.033	0.241
	(0.002)	(0.003)	(0.038)	(0.017)	(0.057)	(0.027)
$\widehat{\lambda}$	1	0.792	0.688	0.969	0.803	0.860
	(0.0006)	(0.003)	(0.020)	(0.004)	(0.052)	(0.025)
$\widehat{\mu}\,only$	1.153	1.011	0.890	1.219	1.011	0.916
	(0.004)	(0.004)	(0.022)	(0.008)	(0.035)	(0.033)
$\frac{\widehat{\mu}\,only}{\widehat{\lambda}}$	1.145	1.189	1.398	1.212	1.074	0.897
	(0.003)	(0.003)	(0.035)	(0.007)	(0.054)	(0.022)
$\widehat{\psi}$	0.100	0.488	0.639	0.602	0.729	0.582
	(0.019)	(0.012)	(0.101)	(0.047)	(0.128)	(0.077)
$\widehat{\mu}$	1.177	1.102	1.126	1.383	1.100	1.117
	(0.002)	(0.004)	(0.039)	(0.016)	(0.046)	(0.041)
$\widehat{\gamma}$	0.652	1.231	1.433	1.219	1.598	1.864
	(0.006)	(0.010)	(0.091)	(0.037)	(0.118)	(0.091)
$\widehat{\phi}$	0.395	0.552	0.589	0.549	0.615	0.651
	(0.002)	(0.002)	(0.015)	(0.007)	(0.017)	(0.011)
$\frac{\widehat{\mu}}{\widehat{\lambda}}$	1.178	1.392	1.637	1.427	1.371	1.299
	(0.002)	(0.006)	(0.055)	(0.020)	(0.088)	(0.057)
$\widehat{\rho}$					0.723	0.609
					(0.023)	(0.020)

Robust standard errors and first-step robust standard errors in columns 1-2 and columns 3-6 respectively.
Time dummies are included but not reported.
(1) Input shares: $\alpha_N = 0.307$, $\alpha_M = 0.503$, $\alpha_K = 0.190$.
(2) *GMM DIF*: the set of instruments includes the lagged levels of n, m and k dated $(t-2)$ and $(t-3)$.
(3) *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 3
Industry repartition

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

*Imposing $\left(\mu_j = \frac{(\epsilon_M^Q)_j}{(\alpha_M)_j}\right) \geq 1$ and estimating a non-lineair specification switches industry $j = 2, 3, 4, 9, 19$ and 32 from *PC-MO* to *IC-MO*.

$^{\triangledown}$Increasing the rejection region in both parts of the classification procedure by using the 40% statistical significance level, switches industry $j = 21$ from *PC-PR* to *PC-MO*, industry $j = 19$ and 25 from *PC-MO* to *IC-MO*, industry $j = 12, 13$ and 15 from *IC-PR* to *IC-EB* and industry $j = 29$ and 34 from *IC-PR* to *IC-MO*.

Table 4
Classification of industry $j \in \{1, \ldots, 38\}$ in
regime $R \in \Re = \{PC\text{-}PR, IC\text{-}PR, PC\text{-}EB, PC\text{-}MO, IC\text{-}EB, IC\text{-}MO\}$

MAIN CLASSIFICATION PROCEDURE

# ind. prop. of ind. (%)	**LABOR MARKET**			
PRODUCT MARKET	**Perfect competition or right-to-manage bargaining** (PR)	**Efficient bargaining** (EB)	**Monopsony** (MO)	
Perfect competition (PC)	1 2.6%	0 0%	8 21.1%	9 23.7%
Imperfect competition (IC)	10 26.3%	17 44.7%	2 5.3%	29 76.3%
	11 29%	17 44.7%	10 26.3%	38 100%

ROBUSTNESS CHECK 1

# ind. prop. of ind. (%)	**LABOR MARKET**			
PRODUCT MARKET	**Perfect competition or right-to-manage bargaining** (PR)	**Efficient bargaining** (EB)	**Monopsony** (MO)	
Perfect competition (PC)	1 2.6%	0 0%	2 5.3%	3 7.9%
Imperfect competition (IC)	10 26.3%	17 44.7%	8 21.1%	35 92.1%
	11 29%	17 44.7%	10 26.3%	38 100%

ROBUSTNESS CHECK 2

# ind. prop. of ind. (%)	**LABOR MARKET**			
PRODUCT MARKET	**Perfect competition or right-to-manage bargaining** (PR)	**Efficient bargaining** (EB)	**Monopsony** (MO)	
Perfect competition (PC)	0 0%	0 0%	7 18.4%	7 18.4%
Imperfect competition (IC)	5 13.2%	20 52.6%	6 15.8%	31 81.6%
	5 13.2%	20 52.6%	13 34.2%	38 100%

For details on the specific industries belonging to each regime: see Table 3.

Table 5

Summary industry analysis: Industry-specific output elasticities $\left(\widehat{\varepsilon}_J^Q\right)_j$ $(J = N, M, K)$, joint market imperfections parameter $\widehat{\psi}_j$, and corresponding price-cost mark-up $\widehat{\mu}_j$ (*only*) and extent of rent sharing $\widehat{\phi}_j$ or labor supply elasticity $\left(\widehat{\varepsilon}_w^N\right)_j^{a,b}$

				OLS DIF							
Regime $R = IC\text{-}EB$ **[17 industries]**	$(\alpha_N)_j$	$(\alpha_M)_j$	$(\alpha_K)_j$	$\left(\widehat{\varepsilon}_N^Q\right)_j$	$\left(\widehat{\varepsilon}_M^Q\right)_j$	$\left(\widehat{\varepsilon}_K^Q\right)_j$	$\widehat{\mu}_j$ *only*	$\widehat{\psi}_j$	$\widehat{\mu}_j$	$\widehat{\gamma}_j$	$\widehat{\phi}_j$
Industry mean	0.334	0.488	0.178	0.295 (0.012)	0.586 (0.010)	0.119 (0.010)	1.106 (0.012)	0.319 (0.053)	1.204 (0.022)	0.526 (0.079)	0.328 (0.036)
Industry Q_1	0.294	0.470	0.165	0.264 (0.010)	0.566 (0.008)	0.103 (0.008)	1.078 (0.011)	0.191 (0.040)	1.162 (0.019)	0.359 (0.054)	0.264 (0.029)
Industry Q_2	0.333	0.482	0.177	0.286 (0.012)	0.585 (0.011)	0.118 (0.010)	1.099 (0.012)	0.315 (0.054)	1.188 (0.022)	0.569 (0.073)	0.363 (0.033)
Industry Q_3	0.379	0.513	0.187	0.316 (0.015)	0.634 (0.012)	0.137 (0.013)	1.138 (0.014)	0.426 (0.065)	1.235 (0.024)	0.661 (0.093)	0.398 (0.036)
Regime $R = IC\text{-}PR$ **[10 industries]**	$(\alpha_N)_j$	$(\alpha_M)_j$	$(\alpha_K)_j$	$\left(\widehat{\varepsilon}_N^Q\right)_j$	$\left(\widehat{\varepsilon}_M^Q\right)_j$	$\left(\widehat{\varepsilon}_K^Q\right)_j$	$\widehat{\mu}_j$ *only*	$\widehat{\psi}_j$	$\widehat{\mu}_j$		
Industry mean	0.287	0.520	0.193	0.314 (0.017)	0.588 (0.014)	0.098 (0.013)	1.121 (0.015)	0.024 (0.080)	1.129 (0.027)		
Industry Q_1	0.257	0.496	0.170	0.287 (0.013)	0.550 (0.012)	0.083 (0.010)	1.081 (0.011)	-0.007 (0.065)	1.081 (0.022)		
Industry Q_2	0.286	0.531	0.197	0.309 (0.017)	0.577 (0.014)	0.088 (0.013)	1.116 (0.015)	0.048 (0.077)	1.123 (0.028)		
Industry Q_3	0.330	0.538	0.213	0.351 (0.020)	0.642 (0.017)	0.112 (0.017)	1.155 (0.019)	0.074 (0.085)	1.163 (0.031)		
Regime $R = PC\text{-}MO$ **[8 industries]**	$(\alpha_N)_j$	$(\alpha_M)_j$	$(\alpha_K)_j$	$\left(\widehat{\varepsilon}_N^Q\right)_j$	$\left(\widehat{\varepsilon}_M^Q\right)_j$	$\left(\widehat{\varepsilon}_K^Q\right)_j$	$\widehat{\mu}_j$ *only*	$\widehat{\psi}_j$	$\widehat{\mu}_j$	$\widehat{\beta}_j$	$\left(\widehat{\varepsilon}_w^N\right)_j$
Industry mean	0.223	0.565	0.211	0.328 (0.022)	0.557 (0.021)	0.115 (0.017)	1.074 (0.023)	-0.556 (0.140)	0.987 (0.038)	0.659 (0.064)	2.574 (1.099)
Industry Q_1	0.160	0.508	0.195	0.264 (0.020)	0.515 (0.019)	0.098 (0.015)	1.053 (0.020)	-0.701 (0.113)	0.960 (0.035)	0.584 (0.059)	1.408 (0.370)
Industry Q_2	0.231	0.548	0.212	0.338 (0.022)	0.536 (0.021)	0.111 (0.016)	1.065 (0.024)	-0.563 (0.129)	0.984 (0.036)	0.629 (0.062)	1.711 (0.442)
Industry Q_3	0.281	0.630	0.234	0.383 (0.023)	0.603 (0.024)	0.126 (0.019)	1.101 (0.026)	-0.342 (0.166)	1.015 (0.040)	0.748 (0.069)	2.973 (1.127)

Robust standard errors in parentheses.

[a] Detailed information on the industry-specific estimates is presented in Table A.2 [Part 1] in Appendix.

[b] $\widehat{\psi}_j = \frac{\left(\widehat{\varepsilon}_M^Q\right)_j}{(\alpha_M)_j} - \frac{\left(\widehat{\varepsilon}_N^Q\right)_j}{(\alpha_N)_j}$ $\quad \widehat{\gamma}_j = \frac{\left(\widehat{\varepsilon}_N^Q\right)_j - \left[\left(\widehat{\varepsilon}_M^Q\right)_j \frac{(\alpha_N)_j}{(\alpha_M)_j}\right]}{\frac{\left(\widehat{\varepsilon}_M^Q\right)_j}{(\alpha_M)_j}\left[(\alpha_N)_j + (\alpha_M)_j - 1\right]}$ $\quad \widehat{\beta}_j = \frac{\left(\widehat{\varepsilon}_w^N\right)_j}{1+\left(\widehat{\varepsilon}_w^N\right)_j} = \frac{(\alpha_N)_j}{(\alpha_M)_j}\frac{\left(\widehat{\varepsilon}_M^Q\right)_j}{\left(\widehat{\varepsilon}_N^Q\right)_j}$

$\widehat{\mu}_j = \frac{\left(\widehat{\varepsilon}_M^Q\right)_j}{(\alpha_M)_j}$ $\quad \widehat{\phi}_j = \frac{\widehat{\gamma}_j}{1+\widehat{\gamma}_j}$ $\quad \left(\widehat{\varepsilon}_w^N\right)_j = \frac{\widehat{\beta}_j}{1-\widehat{\beta}_j}$

Table 6

Summary firm analysis: Heterogeneity in firm-specific output elasticities $\left(\widehat{\varepsilon}_J^Q\right)_i$ $(J = N, M, K)$, joint market imperf. parameter $\widehat{\psi}_i$, and corresponding price-cost mark-up $\widehat{\mu}_i$ (*only*) and extent of rent sharing $\widehat{\phi}_i$ or labor supply elasticity $\left(\widehat{\varepsilon}_w^N\right)_i$

Different indicators and first-differenced OLS estimates[a,b]

Regime $R = IC\text{-}EB$ **[5715 firms]**	$(\alpha_N)_i$	$(\alpha_M)_i$	$(\alpha_K)_i$	$\left(\widehat{\varepsilon}_N^Q\right)_i$	$\left(\widehat{\varepsilon}_M^Q\right)_i$	$\left(\widehat{\varepsilon}_K^Q\right)_i$	$\widehat{\mu}_i$ *only*	$\widehat{\psi}_i$	$\widehat{\mu}_i$	$\widehat{\gamma}_i$	$\widehat{\phi}_i$
Simple mean	0.341	0.478	0.181	0.346	0.572	0.082	1.116	0.099	1.260	-2.298	0.439
Observed dispersion $\widehat{\sigma}_o$	(0.130)	(0.135)	(0.097)	(0.243)	(0.223)	(0.215)	(0.302)	(1.391)	(0.586)	(72.662)	(21.013)
True dispersion $\widehat{\sigma}_{true}$	[0.122]	[0.126]	[0]	[0.102]	[0.154]	[0.092]	[0.210]	[0.875]	[0.387]	[0]	[0]
Weighted mean	0.378	0.534	0.272	0.269	0.600	0.061	1.114	0.506	1.182	1.017	0.803
Weighted observed dispersion $\widehat{\sigma}_o$	(0.139)	(0.128)	(0.141)	(0.196)	(0.211)	(0.149)	(0.199)	(0.920)	(0.354)	(1.160)	(0.136)
Weighted true dispersion $\widehat{\sigma}_{true}$	[0.137]	[0.126]	[0.121]	[0.155]	[0.188]	[0.112]	[0.166]	[0.755]	[0.301]	[1.040]	[0.126]
Median	0.330	0.482	0.156	0.298	0.587	0.077	1.108	0.297	1.204	0.431	0.582
Interquartile observed dispersion $\widehat{\sigma}_o$	(0.128)	(0.134)	(0.089)	(0.242)	(0.232)	(0.182)	(0.239)	(1.097)	(0.435)	(1.757)	(0.440)
Robust true dispersion $\widehat{\sigma}_{true}$	[0.124]	[0.130]	[0]	[0.175]	[0.194]	[0.115]	[0.181]	[0.795]	[0.335]	[1.320]	[0.319]

Regime $R = IC\text{-}PR$ **[1845 firms]**	$(\alpha_N)_i$	$(\alpha_M)_i$	$(\alpha_K)_i$	$\left(\widehat{\varepsilon}_N^Q\right)_i$	$\left(\widehat{\varepsilon}_M^Q\right)_i$	$\left(\widehat{\varepsilon}_K^Q\right)_i$	$\widehat{\mu}_i$ *only*	$\widehat{\psi}_i$	$\widehat{\mu}_i$
Simple mean	0.287	0.519	0.194	0.368	0.574	0.058	1.128	-0.338	1.135
Observed dispersion $\widehat{\sigma}_o$	(0.106)	(0.119)	(0.100)	(0.252)	(0.229)	(0.221)	(0.294)	(1.580)	(0.465)
True dispersion $\widehat{\sigma}_{true}$	[0.097]	[0.108]	[0]	[0.060]	[0.146]	[0.066]	[0.191]	[0.934]	[0.271]
Weighted mean	0.299	0.578	0.276	0.294	0.610	0.051	1.122	0.220	1.116
Weighted observed dispersion $\widehat{\sigma}_o$	(0.110)	(0.118)	(0.134)	(0.221)	(0.215)	(0.158)	(0.194)	(1.101)	(0.342)
Weighted true dispersion $\widehat{\sigma}_{true}$	[0.107]	[0.116]	[0.113]	[0.172]	[0.190]	[0.117]	[0.159]	[0.889]	[0.289]
Median	0.271	0.526	0.174	0.324	0.580	0.058	1.117	-0.008	1.122
Interquartile observed dispersion $\widehat{\sigma}_o$	(0.105)	(0.121)	(0.091)	(0.264)	(0.243)	(0.197)	(0.242)	(1.318)	(0.407)
Robust true dispersion $\widehat{\sigma}_{true}$	[0.099]	[0.117]	[0]	[0.186]	[0.199]	[0.127]	[0.179]	[0.954]	[0.303]

Table 6 (ctd)

Summary firm analysis: Heterogeneity in firm-specific output elasticities $\left(\widehat{\varepsilon}_J^Q\right)_i$ $(J = N, M, K)$, joint market imperf. parameter $\widehat{\psi}_i$, and corresponding price-cost mark-up $\widehat{\mu}_i$ (*only*) and extent of rent of rent sharing $\widehat{\phi}_i$ or labor supply elasticity $\left(\widehat{\varepsilon}_w^N\right)_i$

Different indicators and first-differenced OLS estimates[a,b]

Regime $R = PC\text{-}MO$ **[899 firms]**	$(\alpha_N)_i$	$(\alpha_M)_i$	$(\alpha_K)_i$	$\left(\widehat{\varepsilon}_N^Q\right)_i$	$\left(\widehat{\varepsilon}_M^Q\right)_i$	$\left(\widehat{\varepsilon}_K^Q\right)_i$	$\widehat{\mu}_i$ *only*	$\widehat{\psi}_i$	$\widehat{\mu}_i$	$\widehat{\beta}_i$	$\left(\widehat{\varepsilon}_w^N\right)_i$
Simple mean	0.230	0.559	0.211	0.368	0.554	0.078	1.085	-0.984	1.004	6.786	-20.307
Observed dispersion $\widehat{\sigma}_o$	(0.108)	(0.143)	(0.112)	(0.260)	(0.247)	(0.211)	(0.312)	(2.325)	(0.436)	(79.36)	(583.099)
True dispersion $\widehat{\sigma}_{true}$	[0.098]	[0.132]	[0]	[0.092]	[0.182]	[0.053]	[0.226]	[1.427]	[0.264]	[0]	[0]
Weighted mean	0.261	0.650	0.300	0.264	0.615	0.044	1.116	-0.059	1.052	0.108	0.041
Weighted observed dispersion $\widehat{\sigma}_o$	(0.108)	(0.128)	(0.136)	(0.219)	(0.259)	(0.143)	(0.190)	(1.218)	(0.319)	(0.163)	(0.208)
Weighted true dispersion $\widehat{\sigma}_{true}$	[0.105]	[0.127]	[0.120]	[0.183]	[0.241]	[0.111]	[0.162]	[1.011]	[0.278]	[0.108]	[0.151]
Median	0.219	0.563	0.185	0.322	0.557	0.059	1.085	-0.462	1.015	0.694	0.194
Interquartile observed dispersion $\widehat{\sigma}_o$	(0.116)	(0.154)	(0.109)	(0.267)	(0.287)	(0.172)	(0.247)	(1.705)	(0.401)	(0.976)	(1.786)
Robust true dispersion $\widehat{\sigma}_{true}$	[0.111]	[0.151]	[0.035]	[0.208]	[0.254]	[0.106]	[0.185]	[1.374]	[0.317]	[0.865]	[1.440]

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

[b] Formulas of the market imperfection parameter estimates are given in footnote (b) of Table 5.

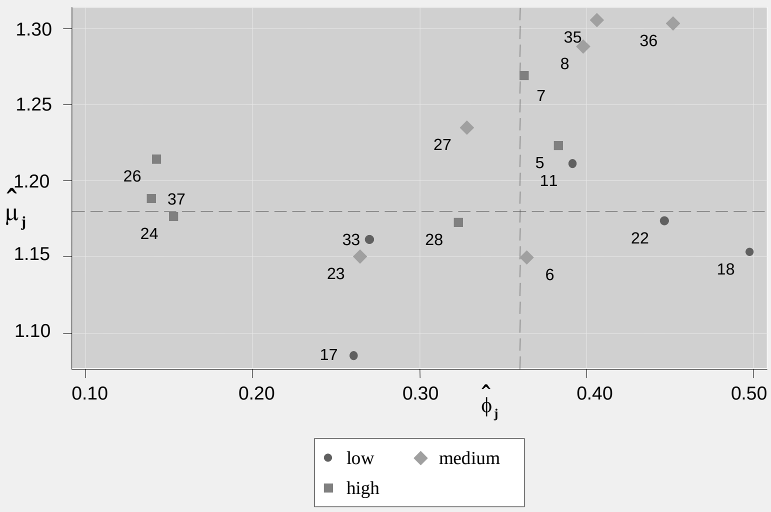
Table 7
Correlations between the firm-specific price-cost mark-up $\ln(\widehat{\mu}_i\ only - 1)$,
the joint market imperfections parameter $\ln\left(\widehat{\psi}_i\right)$,
the corresponding price-cost mark-up taking into account labor market imperfections $\ln(\widehat{\mu}_i - 1)$
and relative extent of rent sharing $\ln(\widehat{\gamma}_i)$, and firm-specific observables

OLS, WLS and median regression coefficients

Regime $R = IC\text{-}EB$ **[5715 firms]**	n_i	$capint_i$	$mixentr_i$	$rdentr_i$	$dist_i$
$\hat{\boldsymbol{\beta}}_{OLS}$					
$\ln(\widehat{\mu}_i\ only - 1)$	0.068***	0.128***	0.014	0.108	-0.349***
	(0.018)	(0.029)	(0.061)	(0.106)	(0.058)
$\ln\left(\widehat{\psi}_i\right)$	-0.081***	-0.013	-0.094	-0.100	0.123
	(0.021)	(0.028)	(0.074)	(0.155)	(0.064)
$\ln(\widehat{\mu}_i - 1)$	-0.108***	0.075*	-0.208**	-0.070	0.304***
	(0.020)	(0.029)	(0.072)	(0.138)	(0.061)
$\ln(\widehat{\gamma}_i)$	-0.290***	-0.138***	0.361***	-0.413**	1.208***
	(0.022)	(0.032)	(0.081)	(0.159)	(0.067)
$\hat{\boldsymbol{\beta}}_{WLS}$					
$\ln(\widehat{\mu}_i\ only - 1)$	0.007	0.060*	-0.016	-0.091	-0.026
	(0.028)	(0.030)	(0.060)	(0.128)	(0.078)
$\ln\left(\widehat{\psi}_i\right)$	-0.033	-0.024	0.219	-0.064	-0.248
	(0.043)	(0.058)	(0.117)	(0.203)	(0.174)
$\ln(\widehat{\mu}_i - 1)$	-0.080**	0.127***	-0.119	-0.316**	0.309***
	(0.027)	(0.037)	(0.115)	(0.122)	(0.068)
$\ln(\widehat{\gamma}_i)$	-0.213***	-0.229***	-0.607***	-0.846***	0.947***
	(0.044)	(0.046)	(0.063)	(0.098)	(0.108)
$\hat{\boldsymbol{\beta}}(\mathbf{0.50})$					
$\ln(\widehat{\mu}_i\ only - 1)$	0.063***	0.134***	0.002	0.099	-0.336***
	(0.019)	(0.029)	(0.070)	(0.135)	(0.052)
$\ln\left(\widehat{\psi}_i\right)$	-0.084***	0.002	-0.066	-0.038	0.089
	(0.018)	(0.028)	(0.070)	(0.146)	(0.059)
$\ln(\widehat{\mu}_i - 1)$	-0.093***	0.098***	-0.118	0.035	0.248***
	(0.017)	(0.025)	(0.066)	(0.137)	(0.073)
$\ln(\widehat{\gamma}_i)$	-0.316***	-0.153***	-0.336***	-0.352	1.181***
	(0.021)	(0.032)	(0.092)	(0.191)	(0.064)

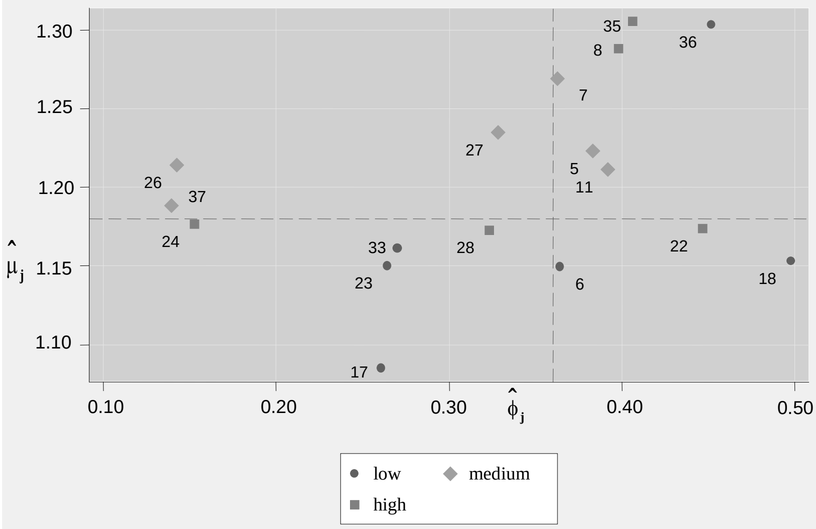
*** Significant at 1%, ** Significant at 5%, * Significant at 10%. Robust standard errors in parentheses.
(1) The dependent and the explanatory variables are centered around the industry mean.
(2) The coefficients are for single firm-specific variable regressions (including industry dummies), except for the regression including the R&D identifier which includes two firm-specific variables ($mixentr_i$ and $rdentr_i$) and industry dummies.

Graph 1 Profitability differences across industries within *R=IC-EB*



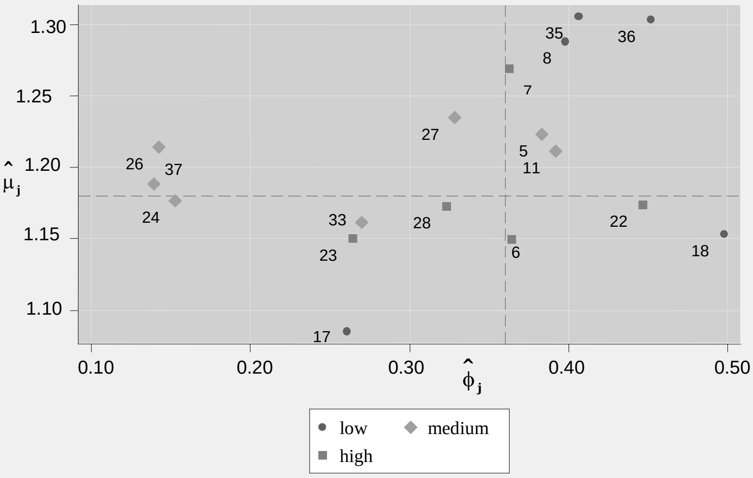
Source: Table A.2 [Part 1, *R=IC-EB*] estimates

Graph 2 Unionization differences across industries within *R=IC-EB*



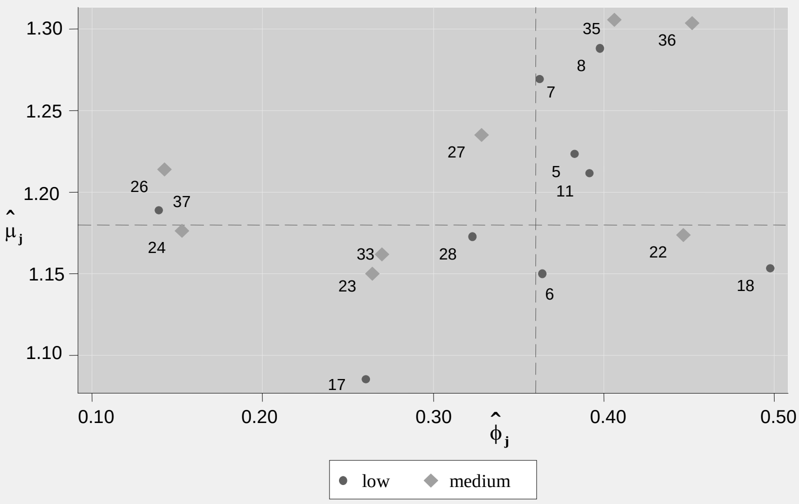
Source: Table A.2 [Part 1, *R=IC-EB*] estimates

Graph 3 Openness differences across industries within *R=IC-EB*



Source: Table A.2 [Part 1, *R=IC-EB*] estimates

Graph 4 Technology differences across industries within *R=IC-EB*



Source: Table A.2 [Part 1, *R=IC-EB*] estimates

Appendix: Detailed results

Table A.1
Summary industry analysis: Industry-specific output elasticities $\left(\widehat{\varepsilon}_J^Q\right)_j$ $(J = N, M, K)$, joint market imperfections parameter $\widehat{\psi}_j$, and corresponding price-cost mark-up $\widehat{\mu}_j$ (*only*) and extent of rent sharing $\widehat{\phi}_j$ or labor supply elasticity $\left(\widehat{\varepsilon}_w^N\right)_j^{a,b}$

				GMM SYS $(t-2)(t-3)$							
Regime $R = IC\text{-}EB$ **[17 industries]**	$(\alpha_N)_j$	$(\alpha_M)_j$	$(\alpha_K)_j$	$\left(\widehat{\varepsilon}_N^Q\right)_j$	$\left(\widehat{\varepsilon}_M^Q\right)_j$	$\left(\widehat{\varepsilon}_K^Q\right)_j$	$\widehat{\mu}_j$ *only*	$\widehat{\psi}_j$	$\widehat{\mu}_j$	$\widehat{\gamma}_j$	$\widehat{\phi}_j$
Industry mean	0.334	0.488	0.178	0.316 (0.034)	0.632 (0.028)	0.052 (0.025)	1.174 (0.029)	0.350 (0.150)	1.301 (0.058)	0.501 (0.211)	0.295 (0.136)
Industry Q_1	0.294	0.470	0.165	0.264 (0.030)	0.606 (0.023)	0.022 (0.020)	1.142 (0.024)	0.221 (0.115)	1.253 (0.044)	0.311 (0.132)	0.237 (0.055)
Industry Q_2	0.333	0.482	0.177	0.314 (0.035)	0.636 (0.030)	0.047 (0.024)	1.173 (0.026)	0.354 (0.165)	1.296 (0.060)	0.503 (0.214)	0.335 (0.084)
Industry Q_3	0.379	0.513	0.187	0.359 (0.039)	0.674 (0.033)	0.075 (0.029)	1.219 (0.033)	0.443 (0.183)	1.348 (0.065)	0.685 (0.239)	0.407 (0.142)
Regime $R = IC\text{-}PR$ **[10 industries]**	$(\alpha_N)_j$	$(\alpha_M)_j$	$(\alpha_K)_j$	$\left(\widehat{\varepsilon}_N^Q\right)_j$	$\left(\widehat{\varepsilon}_M^Q\right)_j$	$\left(\widehat{\varepsilon}_K^Q\right)_j$	$\widehat{\mu}_j$ *only*	$\widehat{\psi}_j$	$\widehat{\mu}_j$		
Industry mean	0.287	0.520	0.193	0.342 (0.036)	0.642 (0.034)	0.016 (0.029)	1.223 (0.035)	0.035 (0.176)	1.237 (0.065)		
Industry Q_1	0.257	0.496	0.170	0.301 (0.033)	0.600 (0.028)	-0.006 (0.025)	1.174 (0.030)	0.027 (0.137)	1.133 (0.053)		
Industry Q_2	0.286	0.531	0.197	0.339 (0.037)	0.649 (0.033)	0.019 (0.027)	1.234 (0.034)	0.050 (0.180)	1.260 (0.063)		
Industry Q_3	0.330	0.538	0.213	0.364 (0.042)	0.687 (0.040)	0.034 (0.034)	1.281 (0.037)	0.083 (0.207)	1.290 (0.075)		
Regime $R = PC\text{-}MO$ **[8 industries]**	$(\alpha_N)_j$	$(\alpha_M)_j$	$(\alpha_K)_j$	$\left(\widehat{\varepsilon}_N^Q\right)_j$	$\left(\widehat{\varepsilon}_M^Q\right)_j$	$\left(\widehat{\varepsilon}_K^Q\right)_j$	$\widehat{\mu}_j$ *only*	$\widehat{\psi}_j$	$\widehat{\mu}_j$	$\widehat{\beta}_j$	$\left(\widehat{\varepsilon}_w^N\right)_j$
Industry mean	0.223	0.565	0.211	0.309 (0.041)	0.650 (0.036)	0.041 (0.038)	1.204 (0.045)	-0.273 (0.236)	1.152 (0.065)	0.835 (0.149)	4.681 (60.01)
Industry Q_1	0.160	0.508	0.195	0.264 (0.034)	0.585 (0.030)	0.008 (0.029)	1.154 (0.036)	-0.486 (0.199)	1.107 (0.055)	0.706 (0.107)	1.514 (1.796)
Industry Q_2	0.231	0.548	0.212	0.331 (0.041)	0.646 (0.037)	0.028 (0.037)	1.199 (0.040)	-0.158 (0.247)	1.132 (0.067)	0.883 (0.146)	5.308 (12.11)
Industry Q_3	0.281	0.630	0.234	0.349 (0.045)	0.715 (0.041)	0.064 (0.048)	1.247 (0.060)	-0.085 (0.268)	1.189 (0.077)	0.936 (0.170)	8.852 (116.4)

First-step robust standard errors in parentheses.

[a] Detailed information on the industry-specific estimates is presented in Table A.2 [Part 2] in Appendix.

[b] Formulas of the market imperfection parameter estimates are given in footnote (b) of Table 5.

Table A.2
Industry analysis: Industry-specific output elasticities $\left(\widehat{\varepsilon}_J^Q\right)_j$ $(J = N, M, K)$, joint market imperfections parameter $\widehat{\psi}_j$, and corresponding price-cost mark-up $\widehat{\mu}_j$ (*only*) and extent of rent sharing $\widehat{\phi}_j$ or labor supply elasticity $\left(\widehat{\varepsilon}_w^N\right)_j^a$

Part 1: OLS DIF

Regime $R = IC\text{-}EB$ **[17 industries]**					**OLS DIF**							
Industry j	# Firms	$(\alpha_N)_j$	$(\alpha_M)_j$	$(\alpha_K)_j$	$\left(\widehat{\varepsilon}_N^Q\right)_j$	$\left(\widehat{\varepsilon}_M^Q\right)_j$	$\left(\widehat{\varepsilon}_K^Q\right)_j$	$\widehat{\mu}_j$ *only*	$\widehat{\psi}_j$	$\widehat{\mu}_j$	$\widehat{\gamma}_j$	$\widehat{\phi}_j$
37	599	0.322	0.442	0.236	0.337 (0.010)	0.526 (0.009)	0.137 (0.008)	1.144 (0.011)	0.141 (0.045)	1.188 (0.019)	0.162 (0.049)	0.140 (0.037)
26	391	0.294	0.471	0.236	0.309 (0.012)	0.571 (0.011)	0.120 (0.010)	1.068 (0.013)	0.162 (0.061)	1.214 (0.024)	0.166 (0.060)	0.143 (0.044)
24	205	0.265	0.497	0.238	0.261 (0.016)	0.585 (0.012)	0.154 (0.014)	1.135 (0.015)	0.191 (0.075)	1.177 (0.024)	0.180 (0.068)	0.153 (0.049)
17	171	0.286	0.594	0.120	0.265 (0.016)	0.645 (0.013)	0.090 (0.014)	1.054 (0.016)	0.160 (0.072)	1.085 (0.022)	0.352 (0.153)	0.261 (0.084)
23	203	0.385	0.450	0.165	0.375 (0.018)	0.518 (0.014)	0.107 (0.016)	1.090 (0.018)	0.177 (0.069)	1.150 (0.032)	0.360 (0.132)	0.264 (0.072)
33	600	0.282	0.552	0.166	0.256 (0.008)	0.641 (0.008)	0.103 (0.007)	1.099 (0.009)	0.254 (0.040)	1.162 (0.014)	0.370 (0.054)	0.270 (0.029)
28	310	0.334	0.483	0.183	0.289 (0.012)	0.566 (0.011)	0.145 (0.010)	1.078 (0.012)	0.308 (0.054)	1.173 (0.023)	0.478 (0.075)	0.324 (0.035)
27	1270	0.309	0.514	0.178	0.274 (0.013)	0.634 (0.011)	0.091 (0.011)	1.143 (0.012)	0.347 (0.060)	1.235 (0.022)	0.489 (0.078)	0.328 (0.035)
7	213	0.334	0.470	0.197	0.281 (0.015)	0.596 (0.013)	0.123 (0.012)	1.138 (0.015)	0.426 (0.065)	1.269 (0.027)	0.569 (0.076)	0.363 (0.031)
6	453	0.424	0.398	0.178	0.370 (0.011)	0.457 (0.008)	0.173 (0.009)	1.037 (0.011)	0.277 (0.039)	1.150 (0.020)	0.573 (0.073)	0.364 (0.029)
5	518	0.285	0.528	0.187	0.207 (0.009)	0.646 (0.011)	0.148 (0.008)	1.079 (0.011)	0.499 (0.046)	1.223 (0.020)	0.621 (0.049)	0.383 (0.018)
11	322	0.317	0.518	0.165	0.254 (0.011)	0.628 (0.011)	0.118 (0.010)	1.095 (0.012)	0.408 (0.052)	1.211 (0.022)	0.645 (0.073)	0.392 (0.027)
8	724	0.341	0.478	0.181	0.286 (0.008)	0.615 (0.008)	0.099 (0.005)	1.126 (0.007)	0.451 (0.037)	1.288 (0.016)	0.661 (0.047)	0.398 (0.017)
35	138	0.333	0.491	0.177	0.276 (0.017)	0.640 (0.016)	0.093 (0.015)	1.161 (0.018)	0.475 (0.075)	1.306 (0.033)	0.685 (0.093)	0.406 (0.033)
22	286	0.379	0.482	0.139	0.313 (0.015)	0.566 (0.011)	0.121 (0.013)	1.073 (0.014)	0.347 (0.054)	1.174 (0.022)	0.808 (0.115)	0.447 (0.035)
36	1000	0.385	0.443	0.172	0.317 (0.007)	0.577 (0.005)	0.106 (0.005)	1.129 (0.006)	0.481 (0.027)	1.303 (0.012)	0.925 (0.039)	0.452 (0.012)
18	294	0.406	0.482	0.112	0.341 (0.011)	0.556 (0.008)	0.103 (0.010)	1.053 (0.011)	0.315 (0.040)	1.153 (0.017)	0.992 (0.114)	0.498 (0.029)
Total	6697	0.335	0.480	0.185	0.294 (0.003)	0.584 (0.003)	0.122	1.106 (0.003)	0.341 (0.070)	1.217 (0.007)	1.123 (0.016)	0.529 (0.003)

Table A.2 (ctd)

Industry analysis: Industry-specific output elasticities $\left(\widehat{\varepsilon}_J^Q\right)_j$ $(J = N, M, K)$, joint market imperfections parameter $\widehat{\psi}_j$, and corresponding price-cost mark-up $\widehat{\mu}_j$ (*only*) and extent of rent sharing $\widehat{\phi}_j$ or labor supply elasticity $\left(\widehat{\varepsilon}_w^N\right)_j^a$

Part 1: OLS DIF (ctd)

Regime $R = IC\text{-}PR$ [10 industries]					**OLS DIF**					
Industry j	# Firms	$(\alpha_N)_j$	$(\alpha_M)_j$	$(\alpha_K)_j$	$\left(\widehat{\varepsilon}_N^Q\right)_j$	$\left(\widehat{\varepsilon}_M^Q\right)_j$	$\left(\widehat{\varepsilon}_K^Q\right)_j$	$\widehat{\mu}_j$ *only*	$\widehat{\psi}_j$	$\widehat{\mu}_j$
20	268	0.313	0.535	0.152	0.322 (0.015)	0.574 (0.012)	0.103 (0.012)	1.063 (0.013)	0.043 (0.065)	1.073 (0.022)
29	475	0.257	0.538	0.205	0.292 (0.010)	0.579 (0.010)	0.128 (0.008)	1.090 (0.010)	-0.063 (0.053)	1.076 (0.019)
16	110	0.245	0.496	0.159	0.352 (0.021)	0.536 (0.015)	0.112 (0.018)	1.066 (0.019)	0.061 (0.082)	1.081(0.030)
38	319	0.230	0.500	0.170	0.365 (0.013)	0.550 (0.010)	0.085 (0.010)	1.102 (0.011)	-0.007 (0.055)	1.100 (0.021)
13	156	0.322	0.465	0.213	0.323 (0.018)	0.519 (0.017)	0.158 (0.017)	1.081 (0.021)	0.111 (0.081)	1.115 (0.037)
34	125	0.218	0.569	0.213	0.279 (0.024)	0.643 (0.019)	0.078 (0.017)	1.153 (0.020)	-0.150 (0.135)	1.131 (0.033)
14	133	0.258	0.558	0.185	0.296 (0.020)	0.646 (0.017)	0.059 (0.014)	1.155 (0.017)	0.011 (0.101)	1.157 (0.031)
12	179	0.331	0.480	0.188	0.351 (0.016)	0.559 (0.014)	0.091 (0.012)	1.131 (0.015)	0.105 (0.073)	1.163 (0.029)
15	129	0.259	0.533	0.108	0.287 (0.017)	0.630 (0.014)	0.083 (0.014)	1.167 (0.016)	0.074 (0.085)	1.182 (0.026)
30	330	0.237	0.529	0.234	0.275 (0.012)	0.642 (0.012)	0.084 (0.008)	1.200 (0.011)	0.053 (0.070)	1.212 (0.022)
Total	2224	0.282	0.520	0.198	0.309 (0.006)	0.595 (0.006)	0.096	1.136 (0.006)	0.050 (0.031)	1.144 (0.011)

Regime $R = PC\text{-}MO$ [8 industries]					**OLS DIF**							
Industry j	# Firms	$(\alpha_N)_j$	$(\alpha_M)_j$	$(\alpha_K)_j$	$\left(\widehat{\varepsilon}_N^Q\right)_j$	$\left(\widehat{\varepsilon}_M^Q\right)_j$	$\left(\widehat{\varepsilon}_K^Q\right)_j$	$\widehat{\mu}_j$ *only*	$\widehat{\psi}_j$	$\widehat{\mu}_j$	$\widehat{\beta}_j$	$\left(\widehat{\varepsilon}_w^N\right)_j$
4	126	0.116	0.681	0.202	0.240 (0.022)	0.656 (0.027)	0.104 (0.017)	1.061 (0.027)	-1.099 (0.225)	0.963 (0.039)	0.457 (0.060)	0.876 (0.210)
2	122	0.137	0.693	0.170	0.234 (0.022)	0.675 (0.026)	0.092 (0.016)	1.049 (0.014)	-0.734 (0.192)	0.974 (0.037)	0.570 (0.072)	1.326 (0.391)
9	130	0.232	0.530	0.238	0.385 (0.024)	0.527 (0.022)	0.088 (0.018)	1.122 (0.025)	-0.668 (0.135)	0.994 (0.041)	0.598 (0.057)	1.489 (0.354)
3	106	0.183	0.579	0.238	0.288 (0.022)	0.549 (0.021)	0.163 (0.021)	1.027 (0.028)	-0.621 (0.140)	0.949 (0.036)	0.604 (0.060)	1.528 (0.385)
32	171	0.230	0.565	0.205	0.337 (0.021)	0.541 (0.019)	0.123 (0.015)	1.058 (0.020)	-0.505 (0.116)	0.957 (0.034)	0.654 (0.059)	1.894 (0.495)
10	114	0.250	0.531	0.219	0.339 (0.021)	0.532 (0.019)	0.129 (0.015)	1.080 (0.021)	-0.356 (0.111)	1.002 (0.036)	0.738 (0.066)	2.811 (0.959)
25	104	0.312	0.459	0.229	0.423 (0.016)	0.472 (0.022)	0.105 (0.019)	1.126 (0.025)	-0.328 (0.122)	1.028 (0.048)	0.758 (0.076)	3.136 (1.296)
19	182	0.326	0.486	0.188	0.381 (0.019)	0.502 (0.015)	0.117 (0.014)	1.070 (0.017)	-0.137 (0.082)	1.032 (0.031)	0.883 (0.065)	7.533 (4.702)
Total	1055	0.228	0.561	0.211	0.332 (0.010)	0.553 (0.010)	0.115	1.095 (0.010)	-0.471 (0.059)	0.986 (0.018)	0.677 (0.031)	2.092 (0.297)

Regime $R = IC\text{-}MO$ [2 industries]					**OLS DIF**							
Industry j	# Firms	$(\alpha_N)_j$	$(\alpha_M)_j$	$(\alpha_K)_j$	$\left(\widehat{\varepsilon}_N^Q\right)_j$	$\left(\widehat{\varepsilon}_M^Q\right)_j$	$\left(\widehat{\varepsilon}_K^Q\right)_j$	$\widehat{\mu}_j$ *only*	$\widehat{\psi}_j$	$\widehat{\mu}_j$	$\widehat{\beta}_j$	$\left(\widehat{\varepsilon}_w^N\right)_j$
31	192	0.260	0.544	0.196	0.339 (0.016)	0.566 (0.015)	0.094 (0.013)	1.100 (0.016)	-0.265 (0.085)	1.041 (0.028)	0.797 (0.055)	3.935 (1.351)
1	324	0.201	0.606	0.192	0.255 (0.012)	0.638 (0.013)	0.106 (0.009)	1.090 (0.012)	-0.214 (0.080)	1.053 (0.022)	0.831 (0.055)	4.927 (1.943)
Total	516	0.221	0.585	0.194	0.285 (0.013)	0.605 (0.015)	0.110	1.122 (0.012)	0.275 (0.067)	1.203 (0.029)	1.296 (0.085)	-4.374 (0.973)

Regime $R = PC\text{-}PR$ [1 industry]					**OLS DIF**					
Industry j	# Firms	$(\alpha_N)_j$	$(\alpha_M)_j$	$(\alpha_K)_j$	$\left(\widehat{\varepsilon}_N^Q\right)_j$	$\left(\widehat{\varepsilon}_M^Q\right)_j$	$\left(\widehat{\varepsilon}_K^Q\right)_j$	$\widehat{\mu}_j$ *only*	$\widehat{\psi}_j$	$\widehat{\mu}_j$
21	154	0.300	0.553	0.147	0.344 (0.021)	0.556 (0.016)	0.099 (0.016)	1.037 (0.018)	-0.139 (0.093)	1.006 (0.030)

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

Table A.2 (ctd)

Industry analysis: Industry-specific output elasticities $\left(\widehat{\varepsilon}_J^Q\right)_j$ $(J = N, M, K)$, joint market imperfections parameter $\widehat{\psi}_j$, and corresponding price-cost mark-up $\widehat{\mu}_j$ (*only*) and extent of rent sharing $\widehat{\phi}_j$ or labor supply elasticity $\left(\widehat{\varepsilon}_w^N\right)_j^a$

Part 2: GMM SYS

Regime $R = IC\text{-}EB$ **[17 industries]**					**GMM SYS (t-2) (t-3)**							
Industry j	# Firms	$\left(\widehat{\varepsilon}_N^Q\right)_j$	$\left(\widehat{\varepsilon}_M^Q\right)_j$	$\left(\widehat{\varepsilon}_K^Q\right)_j$	$\widehat{\mu}_j$ *only*	$\widehat{\psi}_j$	$\widehat{\mu}_j$	$\widehat{\gamma}_j$	$\widehat{\phi}_j$	$Sargan$	$m1$	$m2$
37	599	0.238 (0.040)	0.692 (0.032)	0.070 (0.024)	1.243 (0.029)	0.021 (0.182)	1.564 (0.072)	0.719 (0.132)	0.418 (0.045)	0.000	-11.94	-2.24
26	391	0.252 (0.032)	0.659 (0.030)	0.088 (0.028)	1.189 (0.038)	0.066 (0.210)	1.401 (0.064)	0.482 (0.120)	0.325 (0.055)	0.015	-9.16	-2.00
24	205	0.264 (0.038)	0.623 (0.030)	0.113 (0.020)	1.174 (0.024)	0.755 (0.260)	1.253 (0.061)	0.227 (0.167)	0.185 (0.111)	1.000	-6.16	0.52
17	171	0.331 (0.049)	0.626 (0.036)	0.043 (0.029)	1.081 (0.026)	0.355 (0.337)	1.053 (0.060)	-0.238 (0.520)	-0.312 (0.894)	1.000	-6.24	0.27
23	203	0.409 (0.040)	0.563 (0.041)	0.028 (0.041)	1.162 (0.050)	0.238 (0.208)	1.249 (0.092)	0.348 (0.292)	0.258 (0.161)	1.000	-8.18	-2.72
33	600	0.298 (0.034)	0.654 (0.027)	0.047 (0.019)	1.147 (0.021)	0.875 (0.187)	1.185 (0.048)	0.180 (0.229)	0.152 (0.164)	0.000	-12.15	-2.98
28	310	0.359 (0.042)	0.626 (0.034)	0.015 (0.027)	1.227 (0.031)	0.256 (0.189)	1.296 (0.070)	0.311 (0.244)	0.237 (0.142)	0.435	-8.87	-2.96
27	1270	0.280 (0.039)	0.674 (0.030)	0.046 (0.023)	1.193 (0.024)	0.190 (0.242)	1.312 (0.058)	0.536 (0.214)	0.349 (0.091)	0.692	-7.98	-1.73
7	213	0.359 (0.039)	0.566 (0.035)	0.075 (0.037)	1.164 (0.045)	0.286 (0.216)	1.206 (0.075)	0.183 (0.228)	0.155 (0.163)	0.999	-6.25	0.30
6	453	0.399 (0.030)	0.526 (0.017)	0.075 (0.029)	1.213 (0.033)	0.332 (0.174)	1.323 (0.043)	0.685 (0.157)	0.407 (0.055)	0.004	-9.91	-2.40
5	518	0.239 (0.016)	0.677 (0.023)	0.084 (0.022)	1.117 (0.028)	0.818 (0.175)	1.281 (0.043)	0.527 (0.086)	0.345 (0.037)	0.006	-9.15	-2.24
11	322	0.314 (0.042)	0.698 (0.034)	-0.012 (0.030)	1.247 (0.033)	0.542 (0.202)	1.348 (0.065)	0.503 (0.239)	0.335 (0.106)	0.676	-9.46	-2.81
8	724	0.295 (0.024)	0.682 (0.021)	0.023 (0.014)	1.219 (0.018)	1.079 (0.143)	1.429 (0.045)	0.746 (0.121)	0.427 (0.040)	1.000	-10.59	-0.33
35	138	0.335 (0.028)	0.668 (0.021)	-0.003 (0.022)	1.244 (0.025)	0.752 (0.246)	1.362 (0.044)	0.490 (0.147)	0.329 (0.066)	1.000	-7.18	-0.58
22	286	0.261 (0.035)	0.636 (0.025)	0.103 (0.026)	1.100 (0.027)	0.880 (0.215)	1.320 (0.052)	1.306 (0.230)	0.566 (0.043)	0.995	-9.91	2.41
36	1000	0.372 (0.020)	0.563 (0.017)	0.065 (0.023)	1.142 (0.016)	1.051 (0.125)	1.272 (0.038)	0.537 (0.132)	0.349 (0.056)	0.000	-16.96	-3.45
18	294	0.373 (0.030)	0.606 (0.030)	0.021 (0.016)	1.104 (0.018)	0.881 (0.180)	1.258 (0.061)	0.982 (0.332)	0.495 (0.084)	0.998	-8.24	0.59
Total	6697	0.287 (0.010)	0.676 (0.009)	0.037	1.198 (0.009)	0.551 (0.046)	1.409 (0.020)	1.326 (0.038)	0.570 (0.007)	0.000	-31.89	-3.12

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

(1) Input shares: see Part 1 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.2 (ctd)

Industry analysis: Industry-specific output elasticities $\left(\widehat{\varepsilon}_J^Q\right)_j$ $(J = N, M, K)$, joint market imperfections parameter $\widehat{\psi}_j$, and corresponding price-cost mark-up $\widehat{\mu}_j$ (*only*) and extent of rent sharing $\widehat{\phi}_j$ or labor supply elasticity $\left(\widehat{\varepsilon}_w^N\right)_j^a$

Part 2: GMM SYS (ctd)

Regime $R = IC\text{-}PR$ [10 industries]							**GMM SYS (t-2) (t-3)**					
Industry j	# Firms	$\left(\widehat{\varepsilon}_N^Q\right)_j$	$\left(\widehat{\varepsilon}_M^Q\right)_j$	$\left(\widehat{\varepsilon}_K^Q\right)_j$	$\widehat{\mu}_j$ *only*	$\widehat{\psi}_j$	$\widehat{\mu}_j$			*Sargan*	*m1*	*m2*
20	268	0.447 (0.039)	0.606 (0.040)	-0.053 (0.027)	1.222 (0.033)	0.635 (0.293)	1.133 (0.074)			0.983	-8.95	-1.79
29	475	0.301 (0.023)	0.665 (0.027)	0.034 (0.020)	1.220 (0.027)	-0.053 (0.202)	1.236 (0.050)			0.619	-11.45	-2.05
16	110	0.342 (0.042)	0.632 (0.030)	0.026 (0.034)	1.174 (0.037)	0.014 (0.246)	1.276 (0.061)			1.000	-5.89	-1.79
38	319	0.356 (0.035)	0.558 (0.038)	0.086 (0.025)	1.102 (0.031)	-0.217 (0.232)	1.116 (0.075)			0.172	-8.07	-1.86
13	156	0.406 (0.041)	0.600 (0.040)	-0.006 (0.035)	1.281 (0.046)	-0.604 (0.246)	1.290 (0.086)			1.000	-7.38	0.90
34	125	0.267 (0.034)	0.714 (0.045)	0.019 (0.037)	1.249 (0.049)	-0.198 (0.421)	1.255 (0.080)			1.000	-6.16	0.52
14	133	0.364 (0.042)	0.581 (0.037)	0.055 (0.026)	1.157 (0.030)	0.005 (0.263)	1.042 (0.066)			1.000	-6.57	-0.34
12	179	0.337 (0.033)	0.688 (0.025)	-0.025 (0.027)	1.285 (0.032)	-0.441 (0.242)	1.431 (0.052)			1.000	-7.58	-2.44
15	129	0.307 (0.043)	0.674 (0.029)	0.019 (0.033)	1.245(0.034)	-0.072 (0.280)	1.265 (0.054)			1.000	-5.42	-1.98
30	330	0.295 (0.024)	0.703 (0.028)	0.002 (0.025)	1.295 (0.035)	0.119 (0.228)	1.328 (0.053)			0.100	-8.52	-3.32
Total	2224	0.272 (0.015)	0.732 (0.015)	-0.004	1.253 (0.014)	0.443 (0.078)	1.408 (0.001)			0.000	-20.73	-4.68
Regime $R = PC\text{-}MO$ [8 industries]							**GMM SYS (t-2) (t-3)**					
Industry j	# Firms	$\left(\widehat{\varepsilon}_N^Q\right)_j$	$\left(\widehat{\varepsilon}_M^Q\right)_j$	$\left(\widehat{\varepsilon}_K^Q\right)_j$	$\widehat{\mu}_j$ *only*	$\widehat{\psi}_j$	$\widehat{\mu}_j$	$\widehat{\beta}_j$	$\left(\widehat{\varepsilon}_w^N\right)_j$	*Sargan*	*m1*	*m2*
4	126	0.217 (0.029)	0.754 (0.046)	0.028 (0.049)	1.186 (0.064)	-1.378 (0.525)	1.107 (0.067)	0.592 (0.093)	1.453 (0.562)	1.000	-2.07	-2.45
2	122	0.152 (0.035)	0.797 (0.024)	0.051 (0.027)	1.147 (0.025)	-1.307 (0.600)	1.151 (0.035)	1.034 (0.255)	-30.22 (218.1)	1.000	-4.03	-0.68
9	130	0.329 (0.046)	0.677 (0.027)	-0.005 (0.037)	1.309 (0.040)	-1.371 (0.478)	1.276 (0.051)	0.899 (0.150)	8.937 (14.78)	1.000	-4.37	-1.24
3	106	0.331 (0.044)	0.640 (0.038)	0.028 (0.052)	1.228 (0.058)	-1.033 (0.408)	1.107 (0.036)	0.612 (0.096)	1.574 (0.637)	1.000	-4.39	-1.42
32	171	0.311 (0.033)	0.611 (0.033)	0.078 (0.028)	1.162 (0.037)	-0.833 (0.315)	1.081 (0.059)	0.800 (0.118)	4.012 (2.955)	1.000	-5.28	-1.67
10	114	0.341 (0.039)	0.652 (0.037)	0.006 (0.030)	1.266 (0.036)	-0.986 (0.300)	1.228 (0.069)	0.898 (0.143)	8.768 (13.69)	1.000	-5.30	0.43
25	104	0.357 (0.053)	0.512 (0.039)	0.131 (0.048)	1.128 (0.062)	-0.509 (0.242)	1.115 (0.086)	0.973 (0.157)	36.32 (218.8)	1.000	-3.74	-1.36
19	182	0.431 (0.062)	0.559 (0.042)	0.010 (0.037)	1.211 (0.039)	-0.249 (0.259)	1.149 (0.087)	0.869 (0.182)	7.533 (10.53)	1.000	-7.77	-0.34
Total	1055	0.224 (0.024)	0.733 (0.022)	0.043	1.223 (0.024)	0.325 (0.133)	1.307 (0.039)	1.332 (0.171)	-4.011 (1.549)	0.000	-11.58	-1.90
Regime $R = IC\text{-}MO$ [2 industries]							**GMM SYS (t-2) (t-3)**					
Industry j	# Firms	$\left(\widehat{\varepsilon}_N^Q\right)_j$	$\left(\widehat{\varepsilon}_M^Q\right)_j$	$\left(\widehat{\varepsilon}_K^Q\right)_j$	$\widehat{\mu}_j$ *only*	$\widehat{\psi}_j$	$\widehat{\mu}_j$	$\widehat{\beta}_j$	$\left(\widehat{\varepsilon}_w^N\right)_j$	*Sargan*	*m1*	*m2*
1	324	0.415 (0.046)	0.576 (0.040)	0.009 (0.040)	1.014 (0.054)	-0.070 (0.263)	0.949 (0.067)	0.460 (0.074)	0.853 (0.256)	1.000	-6.84	-1.18
31	192	0.298 (0.043)	0.625 (0.053)	0.077 (0.028)	1.149 (0.036)	-0.771 (0.328)	1.149 (0.097)	1.002 (0.220)	-590.9 (76746)	0.972	-5.66	-1.08
Total	516	0.370 (0.036)	0.688 (0.031)	-0.058	1.314 (0.036)	0.275 (0.067)	1.369 (0.061)	1.135 (0.148)	-8.422 (8.168)	0.966	-7.77	0.75
Regime $R = PC\text{-}PR$ [1 industry]							**GMM SYS (t-2) (t-3)**					
Industry j	# Firms	$\left(\widehat{\varepsilon}_N^Q\right)_j$	$\left(\widehat{\varepsilon}_M^Q\right)_j$	$\left(\widehat{\varepsilon}_K^Q\right)_j$	$\widehat{\mu}_j$ *only*	$\widehat{\psi}_j$	$\widehat{\mu}_j$			*Sargan*	*m1*	*m2*
21	154	0.356 (0.047)	0.647 (0.042)	-0.003 (0.030)	1.175 (0.035)	-0.632 (0.333)	1.170 (0.076)			1.000	-6.88	-0.27

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

[a] Formulas of the market imperfection parameter estimates are given in footnote (b) of Table 5.

Table A.3
Different dimensions across industries within $R = IC\text{-}EB$

Industry j	Code	Name	Profit.[a] type	Union.[b] type	Imp.[c] type	Tech.[d] type
5	B05-B06	Other food products	H	M	M	L
6	C11	Clothing and skin goods	M	L	H	L
7	C12	Leather goods and footwear	H	M	H	L
8	C20	Publishing, (re)printing	M	H	L	L
11	C41	Furniture	L	M	M	L
17	E21	Metal products for construction	L	L	L	L
18	E22	Ferruginous and steam boilers	L	L	L	L
22	E27-E28	Other machinery for specific usage	L	H	H	M
23	E31-E35	Electric and electronic machinery	M	L	H	M
24	F11-F12	Mineral products	H	H	M	M
26	F14	Earthenware products and construction material	H	M	M	M
27	F21	Textile art	M	M	M	M
28	F22-F23	Textile products and clothing	H	H	H	L
33	F46	Transformation of plastic products	L	L	H	M
35	F53	Ironware	M	H	L	M
36	F54	Industrial service to metal products	M	L	L	M
37	F55-F56	Metal products, recuperation	H	M	M	L

L: low-type, **M**: medium-type, **H**: high-type.
[a] **L**: PCM $<$ 16.8% (5 industries), **M**: 16.8% $\leq$ PCM $<$ 17.7% (6 industries), **H**: PCM $\geq$ 17.7% (6 industries).
[b] **L**: union density $<$ 8.8% (6 industries), **M**: 8.8% $\leq$ union density $<$ 12.1% (6 industries), **H**: union density $\geq$ 12.1% (5 industries).
[c] **L**: import penetration $<$ 0.19 (5 ind.), **M**: 0.19 $\leq$ import penetration $<$ 0.34 (7 ind.), **H**: import penetration $\geq$ 0.34 (5 ind.).
[d] **L** (9 industries), **M** (8 industries).

Table A.4

Firm analysis: Heterogeneity in firm-specific output elasticities $\left(\widehat{\varepsilon}_J^Q\right)_i$ $(J = N, M, K)$, joint market imper. parameter $\widehat{\psi}_i$, and corresponding price-cost mark-up $\widehat{\mu}_i$ (*only*) and extent of rent sharing $\widehat{\phi}_i$ or labor supply elasticity $\left(\widehat{\varepsilon}_w^N\right)_i$

Different indicators and first-differenced OLS estimates[a]

Regime $R = IC\text{-}EB$ **[5715 firms]**	$(\alpha_N)_i$	$(\alpha_M)_i$	$(\alpha_K)_i$	$\left(\widehat{\varepsilon}_N^Q\right)_i$	$\left(\widehat{\varepsilon}_M^Q\right)_i$	$\left(\widehat{\varepsilon}_K^Q\right)_i$	$\widehat{\mu}_i$ *only*	$\widehat{\psi}_i$	$\widehat{\mu}_i$	$\widehat{\gamma}_i$	$\widehat{\phi}_i$
SIMPLE											
Observed variance $\widehat{\sigma}_o^2$	0.017	0.018	0.009	0.059	0.050	0.046	0.091	1.936	0.343	5279	441.53
Sampling variance $\widehat{\sigma}_s^2$	0.002	0.002	0.029	0.049	0.026	0.038	0.047	1.169	0.193	$1.57\ 10^9$	$2.83\ 10^9$
True variance $\widehat{\sigma}_{true}^2$ [b]	0.015	0.016	0	0.010	0.024	0.008	0.044	0.766	0.150	0	0
F-test[c]	9.039	7.523	0.331	1.212	1.907	1.225	1.941	1.655	1.774	$3.37\ 10^{-6}$	$1.56\ 10^{-7}$
WEIGHTED											
Observed variance $\widehat{\sigma}_o^2$	0.019	0.016	0.020	0.038	0.044	0.022	0.039	0.847	0.125	1.347	0.018
Sampling variance $\widehat{\sigma}_s^2$	$5.80\ 10^{-4}$	$5.10\ 10^{-4}$	0.005	0.014	0.009	0.010	0.012	0.277	0.035	0.264	0.003
True variance $\widehat{\sigma}_{true}^2$ [b]	0.019	0.016	0.015	0.024	0.035	0.013	0.027	0.570	0.090	1.083	0.016
F-test[c]	33.27	32.11	3.75	2.656	4.800	2.314	3.276	3.059	3.593	5.103	6.648
MEDIAN											
Interquartile observed variance $\widehat{\sigma}_o^2$	0.016	0.018	0.008	0.058	0.054	0.033	0.057	1.203	0.189	3.089	0.194
Robust sampling variance $\widehat{\sigma}_s^2$	0.001	0.001	0.013	0.028	0.016	0.020	0.024	0.571	0.077	1.347	0.092
Robust true variance $\widehat{\sigma}_{true}^2$ [b]	0.015	0.017	0	0.031	0.038	0.013	0.033	0.631	0.112	1.742	0.101
F-test[c]	16.28	18.17	0.606	2.106	3.288	1.665	2.330	2.105	2.456	2.293	2.104

Regime $R = IC\text{-}PR$ **[1845 firms]**	$(\alpha_N)_i$	$(\alpha_M)_i$	$(\alpha_K)_i$	$\left(\widehat{\varepsilon}_N^Q\right)_i$	$\left(\widehat{\varepsilon}_M^Q\right)_i$	$\left(\widehat{\varepsilon}_K^Q\right)_i$	$\widehat{\mu}_i$ *only*	$\widehat{\psi}_i$	$\widehat{\mu}_i$
SIMPLE									
Observed variance $\widehat{\sigma}_o^2$	0.011	0.014	0.010	0.064	0.052	0.049	0.086	2.497	0.216
Sampling variance $\widehat{\sigma}_s^2$	0.002	0.003	0.025	0.060	0.031	0.044	0.050	1.625	0.143
True variance $\widehat{\sigma}_{true}^2$ [b]	0.009	0.012	0	0.003	0.021	0.004	0.036	0.873	0.073
F-test[c]	6.184	5.262	0.394	1.059	1.695	1.098	1.729	1.537	1.512
WEIGHTED									
Observed variance $\widehat{\sigma}_o^2$	0.012	0.014	0.018	0.049	0.046	0.025	0.038	1.212	0.117
Sampling variance $\widehat{\sigma}_s^2$	$6.40\ 10^{-4}$	$4.97\ 10^{-4}$	0.005	0.019	0.010	0.011	0.012	0.421	0.033
True variance $\widehat{\sigma}_{true}^2$ [b]	0.011	0.013	0.013	0.030	0.036	0.014	0.025	0.791	0.084
F-test[c]	18.76	27.92	3.444	2.554	4.514	2.231	3.032	2.879	3.509
MEDIAN									
Interquartile observed variance $\widehat{\sigma}_o^2$	0.011	0.015	0.008	0.069	0.059	0.039	0.058	1.736	0.166
Robust sampling variance $\widehat{\sigma}_s^2$	0.001	$9.38\ 10^{-4}$	0.012	0.035	0.019	0.023	0.026	0.825	0.074
Robust true variance $\widehat{\sigma}_{true}^2$ [b]	0.010	0.014	0	0.035	0.039	0.016	0.032	0.911	0.092
F-test[c]	9.696	15.65	0.685	1.996	3.045	1.699	2.206	2.104	2.240

Table A.4 (ctd)

Firm analysis: Heterogeneity in firm-specific output elasticities $\left(\widehat{\varepsilon}_J^Q\right)_i$ $(J = N, M, K)$, joint market imperf. parameter $\widehat{\psi}_i$,

and corresponding price-cost mark-up $\widehat{\mu}_i$ (*only*) and extent of rent sharing $\widehat{\phi}_i$ or labor supply elasticity $\left(\widehat{\varepsilon}_w^N\right)_i$

Different indicators and first-differenced OLS estimates[a]

Regime $R = PC\text{-}MO$ **[899 firms]**	$(\alpha_N)_i$	$(\alpha_M)_i$	$(\alpha_K)_i$	$\left(\widehat{\varepsilon}_N^Q\right)_i$	$\left(\widehat{\varepsilon}_M^Q\right)_i$	$\left(\widehat{\varepsilon}_K^Q\right)_i$	$\widehat{\mu}_i$ *only*	$\widehat{\psi}_i$	$\widehat{\mu}_i$	$\widehat{\beta}_i$	$\left(\widehat{\varepsilon}_w^N\right)_i$
SIMPLE											
Observed variance $\widehat{\sigma}_o^2$	0.012	0.020	0.012	0.067	0.061	0.045	0.097	5.405	0.190	6299	$34\ 10^4$
Sampling variance $\widehat{\sigma}_s^2$	0.002	0.003	0.019	0.059	0.028	0.042	0.046	3.369	0.120	$4.74\ 10^{10}$	$5.89\ 10^{13}$
True variance $\widehat{\sigma}_{true}^2$ [b]	0.010	0.017	0	0.008	0.033	0.003	0.051	2.036	0.069	0	0
F-test[c]	5.716	6.974	0.655	1.145	2.192	1.066	2.114	1.604	1.578	$1.33\ 10^{-7}$	$5.77\ 10^{-9}$
WEIGHTED											
Observed variance $\widehat{\sigma}_o^2$	0.012	0.016	0.018	0.048	0.067	0.020	0.036	1.483	0.102	0.027	0.043
Sampling variance $\widehat{\sigma}_s^2$	$6.30\ 10^{-4}$	$3.79\ 10^{-4}$	0.004	0.014	0.009	0.008	0.010	0.461	0.025	0.015	0.020
True variance $\widehat{\sigma}_{true}^2$ [b]	0.011	0.016	0.014	0.033	0.058	0.012	0.026	1.022	0.077	0.012	0.023
F-test[c]	18.63	43.42	4.582	3.294	7.367	2.487	3.737	3.215	4.117	1.793	2.125
MEDIAN											
Interquartile observed variance $\widehat{\sigma}_o^2$	0.013	0.024	0.012	0.071	0.082	0.029	0.061	2.907	0.161	0.952	3.191
Robust sampling variance $\widehat{\sigma}_s^2$	0.001	$9.36\ 10^{-4}$	0.011	0.028	0.017	0.018	0.026	1.019	0.060	0.204	1.116
Robust true variance $\widehat{\sigma}_{true}^2$ [b]	0.012	0.023	0.001	0.043	0.065	0.011	0.034	1.887	0.100	0.748	2.074
F-test[c]	12.31	25.38	1.116	2.526	4.691	1.609	2.294	2.852	2.669	4.668	2.857

[a] Formulas of the market imperfection parameter estimates are given in footnote (b) of Table 5.

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

[c] F-test $= \frac{\widehat{\sigma}_o^2}{\widehat{\sigma}_s^2}$: F-statistic for the hypothesis of equality of the estimates (or the computed variables) across firms.