Wages of Occupations in Theory… and Practice

Stephan Kampelmann et François Rycx [*]

Abstract – *Conventional models of earnings assume that the occupational pay structure reflects the distribution of marginal productivities. Although ubiquitious in the literature, the underlying hypothesis that wages equal marginal products rests on weak empirical footing: extant studies from the 1970s suggested that occupations at the top of the wage hierarchy are over- and occupations at the bottom underpaid with respect to their contributions to firm-level added value. This article surveys the theoretical literature on such productivtiy-wage gaps and presents recent econometric evidence that confirms a disconnection between the remuneration and the productivity of occupational groups.*

Keywords – *wage inequality, occupations, marginal productivity, labour market theory.*

Résumé – *Les modèles conventionnels de rémunération supposent que la structure salariale des professions reflète la distribution des productivités marginales. En dépit de son omniprésence, le fondement empirique de l'hypothèse sous-jacente d'une égalité entre salaire et produit marginal est faible : les études existantes datent des années 1970 et suggèrent que les professions en haut de la hiérarchie salariale sont sur-, et celles en bas sous-payées par rapport à leur contribution à la valeur ajoutée des entreprises. Cet article résume la littérature théorique sur de tels écarts et présente des résultats économétriques récents qui confirment une déconnexion entre rémunérations et productivités des catégories professionnelles.*

JEL codes: *J24, J31, J44.*

[*] Stephan Kampelmann is Postdoctoral researcher at the Université Libre de Bruxelles (DULBEA). E-Mail: stephan.kampelmann@ulb.ac.be. François Rycx is Associate Professor at the Université Libre de Bruxelles (SBS-EM, CEB and DULBEA) and Research Fellow of the Institute for the Study of Labor (IZA) in Bonn. E-mail: frycx@ulb.ac.be.

1 INTRODUCTION

According to standard economic theory, the competition among workers and among firms leads to relative factor prices that reflect economic forces: the closer labour markets are to perfect competition, the closer factor prices are to the value of the marginal product of labour. Labour market inequality would then boil down to differences in productivity between workers.

This explanation of pay inequality has been challenged by empirical and theoretical work on labour markets: "Sociologists have long been dissatisfied with [neoclassical and human capital theory], particularly with their silence about the many forces that generate a mismatch between marginal productivity or skills and wages in the ever-present short run" (Weeden, 2002, p. 71). Indeed, a range of labour market theories hypothesize sources of inequality other than labour productivity, such as collective action, labour market institutions, or the use of power and authority to obtain economic advantages (for overviews on sociological theories on labour market inequality, see Kalleberg and Sørensen (1979), Berg (1981), Müller and Schmid (2003)). Although each of these theories on inequality focuses on distinct social processes, they appear to have in common that they associate labour market inequality at least implicitly to an element of 'unearned' or 'unjust' allocation of resources to dominant groups. On the other hand, economists have also developed explanations of differences between productivity and wages without having to abandon the assumptions of individual rationality and profit-maximizing firms. In this literature, productivity-wage gaps are thought to be rational strategies with which firms address a range of market distortions (Lazear and Shaw, 2007).

The abundance of theories on productivity-wage gaps is not matched by a corresponding body of empirical literature. This also holds for the case of occupational categories on which we focus in this article: empirical studies typically refrain from measuring productivity of occupations. Instead, occupational categories are distinguished according to their average educational attainments, on-the-job training, work experience, etc. These characteristics are often lumped together under the catch-all term 'skills'. This boils down to using variables such as educational attainment as proxies for labour productivity, one of the basic assumptions of human capital theory (cf. Mincer, 1958, 1970). Such an approach can be problematic: without any direct measure of occupational productivity it is unclear to what extent the selected variables are acceptable proxies. Instead of using skill proxies, some authors have measured the marginal contributions of different occupational categories to firm-level added-value econometrically. This approach has been pioneered by Gottschalk (1978) and Gottschalk and Tinbergen (1982), who observed systematic differences between productivity and earnings for occupations. In sharp contrast to standard theory, occupational pay and productivity appear to be *negatively* related in their studies. Improved data and recent developments in measurement techniques, especially the identification and treatment of different forms of bias, have created the need and the tools to put Gottschalk's results to an updated test. Kampelmann and Rycx (2011) perform such a test with detailed matched employer-employee panel data from Belgium for the years 1999-2006.

2   WAGES AND PRODUCTIVITY OF OCCUPATIONS IN THEORY...

The predominant assumption about occupational wages is that market forces lead to the equalization of an occupation's marginal productivity and wage. This being said, there is also a range of theories predicting productivity-wage gaps for categories like age or gender. In this section, we show how some of the more prominent theories on mismatches between productivity and remuneration can be applied to the case of occupations.

2.1 Theories based on efficiency and individual rationality

A first set of theories emphasises the role of hiring and training costs. These costs can be considered as 'quasi-fixed' costs since they do not vary with the length of the employment period. To amortize quasi-fixed costs, a profit-maximising firm pays a wage below the marginal product (Oi, 1962). This effect can be further amplified if the skills acquired through training are firm-specific (cf. Acemoglu and Pischke, 1999, pp. 559-561). Quasi-fixed costs and skill-specificity are likely to differ across occupations, and we would expect lower-than-marginal-product wages for occupations requiring intensive training and/or specific skills.

Another strand of theories that can be applied to occupations uses more sophisticated assumptions about the individual utility function of the worker, notably by analysing the ramifications of two types of utility interdependence. First, utility may depend not only on one's own, but also on other people's wages (Hamermesh, 1975). As a consequence, high wage inequality could lead to lower utility and lower effort. Workers may perceive wage inequality as 'unfair' and decrease their efforts accordingly (Akerlof and Yellen, 1988; Levine, 1991). Hence, there is an efficiency argument in paying high-productivity occupations in a firm below and low-productivity occupations above their marginal products so as to compress the overall wage structure. The second type of interdependence is slightly more complex, as it takes into account not only wages but also non-monetary elements of so-called hedonic wages (cf. Lazear and Shaw, 2007, pp. 102-105). According to this model, individual effort depends on the worker's relative wage and her status within the firm. Status is interpreted as a good that can be purchased by foregoing a higher wage. The trade-off between wage and status would lead to the same pattern of deviations from a productivity-based pay as in the first type of utility interdependence, i.e. a compressed wage structure (Frank, 1984). Since occupations clearly differ with respect to status, from an efficiency viewpoint we would expect that high-status occupations are therefore underpaid compared to their marginal product and that low-status occupations are overpaid.

These theories predict a compressed wage structure, in which high-skilled/ high-status occupations are under- and low-skilled/low-status occupations are overpaid relative to their respective marginal products. By contrast, tournament

theory predicts a convex relationship between a worker's pay and her position in the firm's hierarchy. The result of such a tournament could be that workers at the top of the hierarchy receive wages beyond their marginal products. Tournament theory interprets these high wages as 'prizes' in a contest between workers at lower strata of the firm's hierarchy. Lazear and Rosen (1981) argue that these prizes are part of an incentive mechanism to trigger investment in skills and effort from competing workers at lower levels of the hierarchy: "the president of a corporation is viewed as the winner of a contest in which he receives the higher prize", but "his wage is settled on not necessarily because it reflects his current productivity as president, but rather because it induces that individual and all other individuals to perform appropriately when they are in more junior positions" (Lazear and Rosen, 1981, p. 847). Whether this mechanism applies to our problem depends on the extent to which the prizes of tournaments are also associated with an occupational promotion. For instance, the winner of a tournament among a group of office clerks might be promoted to a management position. In this case, the high wages of managers serve as prizes in a tournament among office clerks and can therefore exceed the manager's marginal product.

2.2 Socio-economic and institutionalist theories

The literature on social norms and remuneration has also some relatively straightforward implications for occupational over- or under-payment with respect to productivity. Skott (2005) treats wage norms as endogenous, with past events shaping what is considered to be 'fair' wages. This creates a hysteresis of the wage structure, slow adjustment to productivity shocks, and potential deviations from productivity-based pay. Similarly, Doeringer and Piore (1985) view the related concepts of 'customs' and 'habit' as important factors in the determination of employment rules in their model of internal labour markets. They argue that besides efficiency considerations (employer's interests) and demands for stability and job security (employees' interests), strong customs render changes in pay rules difficult. Given that technological change over the past decades appears to be skill- and therefore to some extent also occupation-biased (Autor et al., 1998; Acemoglu, 2002), the inertia of social norms could lead to overpayment of occupations whose productivity has been negatively affected by technological change and to underpayment of the occupations whose productivity increased. As a result, we would expect to find a compressed occupational wage structure.

Many institutional economists focus on collective processes that complement the analysis of market forces. Osterman et al. (2009) affirm that employment relations "are the result of a political process in which competing objectives and rationalities play out a contest" (Osterman et al., 2009, p. 705). The occupational wage structure could reflect to some extent the competing objectives of occupations and their respective weights in internal decision-making processes of organisations. For instance, it seems plausible that any rent generated by the firm could be unequally distributed among occupational groups in light of apparent informational and power asymmetries across occupations. There is a parallel between this idea

and the standard analysis of principal-agent problems: wages of occupations that cannot be controlled effectively by their principals (they have 'Managerial power') might be higher than predicted by the basic neoclassical model (Bebchuk and Fried, 2003).

3   ... AND IN PRACTICE

Surprisingly, only few empirical studies have focused on occupational differences between productivity and earnings. The empirical work on wage compression, for instance, does not consider productivity-wage gaps between but only within occupations (Scully, 1974; Frank, 1984). More recent econometric studies on productivity-wage comparisons have focused on categories like sex, ethnicity, or age instead of occupations (Hægeland and Klette, 1999; Aubert and Crépon, 2003; Ilmakunnas and Maliranta, 2005; Lallemand and Rycx, 2009; Vandenberghe and Waltenberg, 2010; Cardoso et al., 2011; Cataldi et al., 2011; Ilmakunnas and Ilmakunnas, 2011; Vandenberghe, 2011 ; van Ours and Stoeldraijer, 2011). Other studies only include relatively broad occupational categories as control variables in wage and productivity equations (Hellerstein et al., 1999; Crépon et al., 2002; Hellerstein and Neumark, 2007; Lallemand et al., 2007; Göbel and Zwick, 2009; Mahy et al., 2011a,b).

The empirical study on occupational pay differences by Weeden (2002) is therefore exceptional. Weeden measures to what extent occupational earnings inequality can be explained with activities directed at social closure, i.e. the construction by occupations of "social and legal boundaries that [...] affect the rewards of their members" (Weeden, 2002, p. 59). Applied to our question, the basic idea of closure theory is that occupational groups engage in activities that shield them from external competition. In its simplest form, occupational closure can be seen as a form of rent-seeking if closure yields monopoly rents to members of an occupation that restricts supply, for instance through a limited quota for licences needed to exercise in a profession (Sørensen, 1996, 2000). Weeden identifies a whole range of closure strategies: restricting the supply of practitioners, increasing diffuse demand for the services of the occupation, channelling demand to the occupation, and signalling quality of service (Weeden, 2002, p. 60). Her study concludes that "not all occupations benefit equally from social closure. The professions, in particular, benefit more than other occupations" (Weeden, 2002, p. 92). Unfortunately, it is unclear to what extent Weeden's results actually describe productivity-wage gaps. Although the author is interested in "the many forces that generate a mismatch between marginal productivity or skills and wages in the ever present short run" (p. 71), the particular set of closure strategies analysed in Weeden (2002) would not lead to such a mismatch. The reason for this is that strategies like "restricting the supply of practitioners" are equivalent to a shift of the supply curve of an occupation. While it is true that supply restrictions lead to higher rewards for members of the occupation – an observation that was already made by John Stuart Mill in his argument that social closure leads to wages that are the opposite of what one would expect from Adam Smith's theory of compensating wage differentials (Mill,

1909 [1848]) –, the *value* of their marginal product would rise accordingly and no mismatch between marginal productivity and wages could be observed.

Until recently, the reference for empirical inter-occupational comparisons of pro-ductivity-wage differences was Gottschalk's work from the late 1970s (Gottschalk, 1978). Comparing his estimation of marginal revenue products with median earn-ings, Gottschalk could not refute significant differences between productivity and earnings for a set of occupational groups, a finding later confirmed by Gottschalk and Tinbergen (1982). The overall conclusion of this study is that productivity dif-ferences appear to be inversely related to pay differences, a result that has to our knowledge not been directly refuted in the empirical literature. Nevertheless, new data and recent developments in measurement techniques, especially the identifi-cation and treatment of various forms of bias, have created the need and the instruments to put Gottschalk's results to an updated test.

Such a test was carried out by Kampelmann and Rycx (2011). Their method is based on the simultaneous estimation of a value-added function and a wage equa-tion at the firm-level. In a nutshell, the occupational composition of the firm is used as explanatory variable for the firm's average productivity and wage: the value-added function yields parameter estimates for the average marginal products for each occupation, while the wage equation estimates the respective impact of each occupation on the average wage paid by the firm. Given that both equations are estimated with the same set of firms and occupations, the parameters for marginal products and wages can be compared so that conclusions on occupational pro-ductivity-wage gaps can be drawn. This technique was pioneered by Hellerstein et al. (1999) and refined by Aubert and Crépon (2003), van Ours (2009), Göbel and Zwick (2009), van Ours and Stoeldraijer (2011), and others.

Kampelmann and Rycx (2011) estimate productivity and wage equations using matched employer-employee panel data that combines two complemen-tary sources: the *Structure of Earnings Survey* (SES) and the *Structure of Business Survey* (SBS), both compiled by Statistics Belgium. Their sample consists of an unbalanced panel of 1,735 firms yielding 5,459 firm-year-observations during a six year period (1999-2006). This panel is representative of all Belgian medium-sized and large firms employing at least ten employees within the sections C to K of the NACE 1 (Rev. 1) nomenclature. All of their models control for a range of firm and worker characteristics (firm vintage, two-digit industry codes, firm size, educational composition of the workforce, gender ratio, age composition, incidence of part time, and non-standard work contracts).

Tab. 1 : Are Occupations Paid What They Are Worth ? Econometric Results for the Belgian Private Sector, 1999-2006

	Pooled OLS			Between			Fixed effects (within)		
	1	2	3	4	5	6	7	8	9
	value added	wage	gap	value added	wage	gap	value added	wage	gap
Managers	0.28	0.46***	-0.18	0.45	0.62***	-0.17	0.04	0.35***	-0.31***
	(0.17)	(0.05)	(0.16)	(0.31)	(0.09)	(0.27)	(0.09)	(0.05)	(0.10)
Professionals	-0.16**	0.11***	-0.27***	-0.33***	0.09*	-0.42***	-0.01	0.11***	-0.12**
	(0.08)	(0.02)	(0.07)	(0.13)	(0.05)	(0.12)	(0.05)	(0.03)	(0.06)
Technicians and assoc. Profess.	-0.05	-0.03	-0.02	-0.23*	-0.03	-0.20*	-0.03	-0.04	0.01
	(0.07)	(0.02)	(0.06)	(0.13)	(0.04)	(0.12)	(0.05)	(0.02)	(0.05)
Clerical support workers	Reference			Reference			Reference		
Service and sales workers	-0.31***	-0.28***	-0.03	-0.33***	-0.21***	-0.12	-0.01	-0.13***	0.11**
	(0.08)	(0.03)	(0.06)	(0.12)	(0.04)	(0.10)	(0.04)	(0.04)	(0.06)
Craft and related trades workers	-0.49***	-0.34***	-0.14***	-0.43***	-0.26***	-0.17*	-0.09**	-0.21***	0.13**
	(0.06)	(0.02)	(0.05)	(0.11)	(0.03)	(0.10)	(0.04)	(0.03)	(0.05)
Plant and machine oper., assemblers	-0.33***	-0.29***	-0.03	-0.23**	-0.20***	-0.02	-0.06	-0.23***	0.17***
	(0.06)	(0.02)	(0.05)	(0.11)	(0.03)	(0.10)	(0.04)	(0.03)	(0.05)
Elementary occupations	-0.41***	-0.33***	-0.08	-0.36***	-0.29***	-0.07	-0.09	-0.24***	0.15**
	(0.06)	(0.02)	(0.06)	(0.12)	(0.04)	(0.10)	(0.06)	(0.03)	(0.07)
R squared	0.30	0.67	0.09	0.27	0.65	0.06	0.04	0.56	0.00
Overall model significance (p-value)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Flat profile (p-value)	0.00	0.00	0.00	0.00	0.00	0.00	0.62	0.00	0.00
Observations	5,459	5,459	5,459	5,459	5,459	5,459	5,459	5,459	5,459

All standard errors are robust and in parentheses. All models control for age and educational composition of the firm's workforce, share of female employees, conventional work hours and share of non-standard contracts. Pooled OLS and between models also control for firm size, firm vintage age and industry. Pooled OLS and within models include time dummies. The following diagnostic tests are presented: overall model significance = Chi-squared for OLS, F-test for between and fixed-effects; flat profile = Wald test for OLS, F-test for between and fixed-effects regressions testing hypothesis that all occupation coefficients are jointly equal to zero. Columns 3, 6 and 9 refer to the regression with the difference between added-value and wage as dependant variable. Source: Kampelmann and Rycx (2011).

The most important result of their study is a stark contrast between the parameters obtained for the productivity and wage equations (see Table 1). Using eight ISCO one-digit occupations as classification, occupational coefficients for the wage equation are clearly significant. In other words, occupations are differentiated in a clear wage hierarchy. This result (see columns 2, 5 and 8 of Table 1) is robust to a range of model specifications (pooled OLS, between, and fixed effects) and an econometric confirmation that occupational categories still play a central role in the determination of earnings at the firm-level: the distribution of individual wages and salaries is structured by occupational categories. By contrast, no similar occupational hierarchy is found in their estimation of marginal productivities. In a specification that eliminates unobserved firm-level fixed effects (see column 7 of Table 1), they find no significant differences between the relative productivities of the occupations in their sample.

Given this striking difference between productivity and wage coefficients, the authors provide a formal test for occupational productivity-wage gaps. Their preferred specification (see column 9 of Table 1) provides strong evidence for a clear pattern of significant over- and underpayment: the occupations at the top of the wage hierarchy ('Managers' and 'Professionals') appear to be overpaid, while 'Service and Sales workers' as well as all blue-collar occupations come out as being significantly underpaid with respect to their relative marginal productivities. This result stands up to a series of robustness tests that examine the respective effects of (i) different static and dynamic specifications of the value added and wage equations; (ii) alternative procedures to account for unobserved heterogeneity between firms; (iii) the potential endogeneity of the firm's occupational composition; (iv) changes in the set of control variables; and (v) changes in the occupational classification.

A flat occupation-productivity profile (i.e. the absence of a systematic relationship between occupational shares and firm productivity) is a surprising result in light of the standard hypothesis of wages being equal to productivity, but it actually echoes empirical findings of other authors who estimated marginal productivities for different groups of workers with fixed-effects regressions. Ilmakunnas and Maliranta (2005), interested in the effects of age, education, and gender in Finland, obtain highly significant relative marginal productivities under pooled OLS, but only three of their six education parameters remain significant when fixed effects are eliminated. In addition, all coefficients for education have the wrong sign in their fixed-effects regression. [1] In a similar OLS regression of added-value in Germany, almost all age, education, and occupation coefficients are found to be significant (Göbel and Zwick, 2009). In the specification with fixed effects, however, only gender and nationality appear to have a significant impact on productivity. Another related study is van Ours and Stoeldraijer (2011), who examine the impact of a firm's age composition on added-value in the Netherlands. Instead of using a fixed-effects estimator, they take unobserved firm heterogeneity into account by

---

1. In their fixed-effects regression all education coefficients are negative. Since the reference group is the lowest educational level (comprehensive schooling), this would mean than any additional schooling beyond comprehensive education leads to lower productivity (Ilmakunnas and Maliranta, 2005; p. 637, Table 3).

applying first differences. While all pooled OLS coefficients in their productivity equation are significant, their estimates in first differences are all insignificantly different from the reference group and indicate a flat productivity profile.

4 DISCUSSION AND CONCLUSION

How do firm practices regarding occupational remuneration compare with the theoretical literature on productivity-wage gaps? A compressed occupational wage distribution relative to the distribution of marginal productivities would lead to positive differences at the top and negative differences at the bottom of the occupational hierarchy. No evidence of such a pattern can be found in the empirical literature. The productivity-wage gaps in both Gottschalk (1978) and Kampelmann and Rycx (2011) display a clear pattern of significant overpayment at the top ('Managers', 'Professionals') and underpayment at the bottom of the occupational hierarchy ('Service and sales workers', 'Craft and related trades workers', 'Plant and machine operators', 'Elementary occupations'). Hence, empirical results speak against theories predicting a compressed wage distribution. If it is true that quasi-fixed costs and firm-specific skills are higher at the top of the occupational hierarchy than at the bottom, this appears not to be the main determinant of occupational pay rules. The prediction of the theory of interdependent preferences cannot be confirmed either: there appears to be no trade-off between a relatively high status and relatively high wages at the occupational level. No evidence is found that high-status occupations like 'Managers' and 'Professionals' are underpaid, and low-status occupations appear to be rather under- than overpaid in Kampelmann and Rycx's preferred specification. Similarly, the observed pattern of occupational productivity-wage differences does not corroborate the theory according to which gaps arise from slow adjustments of 'social norms' (or the firm's 'customs') to changes in occupational productivity. Since recent technological changes are typically assumed to have decreased the relative productivity of low-skilled occupations in the lower part of the occupational hierarchy, we would expect these occupations to be overpaid due to the inertia of wage norms. Again, the observed pattern of productivity-wage gaps provides no evidence for this hypothesis.

Observed remuneration practices are easier to reconcile with the set of theories that predict upward (downward) deviations from marginal productivity at the top (bottom) of the occupational hierarchy. This includes the structure of occupational overpayment implied by tournament theory [2] and institutional approaches to the employment relation. For instance, we could interpret the overpayment of white-collar occupations as the result of the appropriation of rent generated by the firm[3]. This could reflect that 'Managers' and 'Professionals' have typically better access to firm-related information and a more prominent position in the firm's hierarchy of authority and control compared to blue-collar occupations.

---

2. Mahy et al. (2011a, b) provide some indirect support for tournament theory on the basis of empirical tests based on Belgian data.

3. The existence of rent-sharing in Belgium is supported by Goos and Konings (2001), Rycx and Tojerow (2004), du Caju et al. (2011) and Rusinek and Rycx (2011).

While it is not easy to pinpoint the specific mechanism generating the observed pattern of over- and underpayment of occupations, it is even more difficult to reconcile the empirical results with the neoclassical postulate that occupational wages equal their respective marginal products. In fact, in most of the existing empirical studies on occupational productivity the hypothesis of a flat productivity profile cannot be rejected. This result is surprising in light of the wide-spread hypothesis of productivity being the main determinant of occupational earnings. Insignificant productivity differences between occupations can of course be attributed to the notorious imprecision of added-value equations, but this imprecision merely unveils a substantial variation in the occupation-productivity profiles among firms. One way to interpret the results described in this article is to see the absence of systematic productivity differences between occupations as a result of changes in production processes: the more complex, specialised, and idiosyncratic firm-level value creation becomes, the more difficult it is to identify systematic productivity differences between occupations for the economy as a whole. It is striking, however, that firm-level idiosyncrasies in occupational productivity have apparently not affected the wide-spread use of occupational categories in decisions on employee remuneration.

Combined with a clear wage hierarchy among occupations, the absence of significant productivity differences suggests that occupations at the top of the wage hierarchy are overpaid with respect to their marginal productivity and occupations at the bottom underpaid. Kampelmann and Rycx (2011) therefore confirm Gottschalk's results from the late 1970s and highlight the importance of alternative theories beside marginal productivity for our understanding of occupational pay differences. In this sense, the findings presented in this article lend econometric backing for Max Weber's warning that "the 'law of marginal productivity' also holds for 'marginal productivity theory'" (Weber, 1991 [1904]).

REFERENCES

Acemoglu, D. (2002), Technical Change, Inequality, and the Labor Market, *Journal of Economic Literature*, 40(1), pp. 7-72.

Acemoglu, D. & Pischke, J.-S. (1999), The Structure of Wages and Investment in General Training, *Journal of Political Economy*, 107(3), pp. 539-572.

Akerlof, G. & Yellen, J. (1988), Fairness and Unemployment, *American Economic Review (Papers and Proceedings)*, 78(2), pp. 44-49

Aubert, P. & Crépon, B. (2003), Age, salaire et productivité: La productivité des salariés décline-t-elle en fin de carrière?, *Économie et statistique*, 368, pp. 95-119.

Autor, D., Katz, L. & Krueger, A. (1998), Computing Inequality: Have Computers Changed the Labor Market?, *Quarterly Journal of Economics*, 113(4), pp. 1169-1213.

Bebchuk, L. & Fried, J. (2003), Executive Compensation as an Agency Problem, *Journal of Economic Perspectives*, 17(3), pp. 71-92.

Berg, I. (1981), *Sociological Perspectives on Labor Markets*. Academic Press.

Cataldi, A., Kampelmann, S. & Rycx, F. (2011), Productivity-Wage Gaps Among Age Groups: Does the ICT Environment Matter?, *De Economist*, 159(2), pp. 193-221.

CARDOSO, A., GUIMARÃES, P. & VAREJÃO, J. (2011), Are Older Workers Worthy of their Pay? An Empirical Investigation of Age-productivity and Age-wage Nexuse, *De Economist*, 159(2), pp. 95-111.

CRÉPON, B., DENIAU, N. & PÉREZ-DUARTE, S. (2002), Wages, Productivity, and Worker Characteristics: A French Perspective, CREST Working Paper.

DOERINGER, P. & PIORE, M. (1985), *Internal Labor Markets and Manpower Analysis*. ME Sharpe.

du Caju, P., Rycx, F. & Tojerow, I. (2011), Inter-Industry Wage Differentials: How Much Does Rent Sharing Matter ?, *The Manchester School*, 79(4), pp. 691-717.

FRANK, R. (1984), Are Workers Paid Their Marginal Products?, *American Economic Review*, 74 (4), pp. 549-571.

GÖBEL, C. & ZWICK, T. (2009), Age and Productivity - Evidence from Linked Employer Employee Data, ZEW Discussion Paper, No. 09-020.

GOOS, M. & KONINGS, J. (2001), Does Rent-Sharing Exist in Belgium? An Empirical Analysis Using Firm Level Data, *Reflets et Perspectives de la vie économique*, XL(1-2), pp. 65-79.

GOTTSCHALK, P. (1978), A Comparison of Marginal Productivity and Earnings by Occupation, *Industrial and Labor Relations Review*, 31(3), pp. 368-378.

GOTTSCHALK, P. & TINBERGEN, J. (1982), Methodological Issues in Testing the Marginal Productivity Theory, *De Economist*, 130(3), pp. 325-335.

HÆGELAND, T. & KLETTE, T. (1999), Do Higher Wages Reflect Higher Productivity? Education, Gender and Experience Premiums in a Matched Plant-worker Data set, in: Haltiwanger, J., Lane, J. Spletzer, J., Theeuwes, J. & Troske, K. (eds.), *The Creation and Analysis of Employer-Employee Matched Data*. Amsterdam: North-Holland.

HAMERMESH, D. (1975), Interdependence in the Labour Market, *Economica*, 42(168), pp. 420-429.

HELLERSTEIN, J., NEUMARK, D. & TROSKE, K. (1999), Wages, Productivity, and Worker Characteristics: Evidence from Plant-Level Production Functions and Wage Equations, *Journal of Labor Economics*, 17(3), pp. 409-446.

HELLERSTEIN, J. & NEUMARK, D. (2007), Production Function and Wage Equation Estimation with Heterogeneous Labor. Evidence from a New Matched Employer-Employee Data Set, in: Berndt, E. & Hulten, C. (eds.), *Hard-to-Measure Goods and Services: Essays in Honor of Zvi Griliches.* University of Chicago Press.

ILMAKUNNAS, P. & MALIRANTA, M. (2005), Technology, Labour Characteristics and Wage-productivity Gaps, *Oxford Bulletin of Economics and Statistics*, 67(5), pp. 623-645.

ILMAKUNNAS, P. & ILMAKUNNAS, S (2011), Diversity at the Workplace: Whom Does It Benefit?, *De Economist*, 159(2), pp. 223-255.

KAMPELMANN, S. & RYCX, F. (2011), Are Occupations Paid What They Are Worth? An Econometric Study of Occupational Wage Inequality and Productivity, IZA Discussion Paper, No. 5951.

KALLEBERG, A. & SØRENSEN, A. (1979), The Sociology of Labor Markets, *Annual Review of Sociology*, 5(1), pp. 351-379.

LALLEMAND, T. & RYCX, F. (2009), Are Older Workers Harmful for Firm Productivity?, *De Economist*, 157, pp. 273-292.

LALLEMAND, T., PLASMAN, R. & RYCX, F. (2007), Wage Structure and Firm Productivity in Belgium, NBER Working Paper, No. 12978.

LAZEAR, E. & ROSEN, S. (1981), Rank-order Tournaments as Optimum Labor Contracts, *Journal of Political Economy*, 89(5), pp. 841-864.

LAZEAR, E. & SHAW, K. (2007), Personnel Economics: The Economist's View of Human Resources, *Journal of Economic Perspectives*, 21(4), pp. 91-114.

LEVINE, D. (1991), Cohesiveness, Productivity, and Wage Dispersion, *Journal of Economic Behavior & Organization*, 15(2), pp. 237-255.

MAHY, B., RYCX, F. & VOLRAL, M. (2011a), Wage Dispersion and Firm Productivity in Different Working Environments, *British Journal of Industrial Relations*, 49(3), pp. 460-485.

MAHY, B., RYCX, F. & VOLRAL, M. (2011b), Does Wage Dispersion Make All Firms More Productive?, *Scottish Journal of Political Economy*, 58(4), pp. 455-489.

MILL, J. (1909 [1848]), *Principles of Political Economy with some of their Applications to Social Philosophy*. 7th edition, Longmans, Green and Co.

MINCER, J. (1958), Investment in Human Capital and Personal Income Distribution, *Journal of Political Economy*, 66(4), pp. 281-302.

MINCER, J. (1970), The Distribution of Labour Incomes: A Survey with Special Reference to the Human Capital Approach, *Journal of Economic Literature*, 8(1), pp. 1-26.

MÜLLER, H.-P. & SCHMID, M. (2003), *Hauptwerke der Ungleichheitsforschung*. Westdeutscher Verlag.

OI, W. (1962), Labor as a Quasi-fixed Factor, *Journal of Political Economy*, 70(6), pp. 538-555.

OSTERMAN, P., AUER, P., GAUTIÉ, J. & MARSDEN, D. (2009), Discussion: A New Labour Economics?, *Socio-Economic Review*, 7(4), pp. 695-726.

RUSINEK, M. & RYCX, F. (2011), Rent-Sharing Under Different Bargaining Regimes: Evidence from Linked Employer-Employee Data, *British Journal of Industrial Relations*, forthcoming.

RYCX, F. & TOJEROW, I. (2004), Rent Sharing and the Gender Wage Gap in Belgium, *International Journal of Manpower*, 25(3-4), pp. 279-299.

SCULLY, G. (1974), Pay and Performance in Major League Baseball, *American Economic Review,* 64(6), pp. 915-930.

SKOTT, P. (2005), Fairness as a Source of Hysteresis in Employment and Relative Wages, *Journal of Economic Behavior and Organization*, 57(3), pp. 305-331.

SØRENSEN, A. (1996), The Structural Basis of Social Inequality, *American Journal of Sociology*, 101(5), pp. 1333-1365.

SØRENSEN, A. (2000), Toward a Sounder Basis for Class Analysis, *American Journal of Sociology*, 105(6), pp. 1523-1558.

VANDENBERGHE, V. (2011), Boosting the Employment Rate of Older Men and Women: An Empirical Assessment Using Belgian Firm-Level Data on Productivity and Labour Costs, *De Economist*, 159(2), pp. 159-191.

VANDENBERGHE, V. & F. WALTENBERG (2010), Ageing Workforce, Productivity and Labour Costs of Belgian Firms, IRES Discussion Paper, No. 2010-3.

van Ours, J. (2009), Will You Still Need Me - When I'm 64?, *De Economist*, 157(4), pp. 441-460.

van Ours, J. & Stoeldraijer, L. (2011), Age, Wage and Productivity in Dutch Manufacturing, *De Economist*, 159(2), pp. 113-137.

Weber, M. (1991 [1904]), Die 'Objektivität' sozialwissenschaftlicher und sozialpolitischer Erkenntnis, in : Weber, M., *Schriften zur Wissenschaftslehre*. Philipp Reclam jun.

Weeden, K. (2002), Why Do Some Occupations Pay More than Others? Social Closure and Earnings Inequality in the United States, *American Journal of Sociology*, 108(1), pp. 55-101.