Unions, Monopolistic Competition and Unemployment

by

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22nd May 2000

Abstract

This paper develops a general equilibrium dual labour market model which incorporates union bargaining with monopolistically competitive firms. It is shown that not only the degree of union bargaining power but also the market power firms possess on the product market have a positive influence on unemployment. The reason for this is that less intense product market competition increases the negotiated wage rates as well as the price mark-up firms charge over their marginal costs, both of which reduce labour demand. It is also shown that higher competition intensity will force firms to merge to larger units.

JEL classification: J42 J51 J31

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1 Introduction

How does the presence of trade unions affect unemployment? Most labour market models analyse this question within a single labour market economy. However, there is substantial empirical evidence that wages differ significantly and persistently across sectors of an economy and that this wage structure cannot be solely explained by differences in human capital or general work characteristics (see, e.g. OECD (1994)). This leads to the conclusion, that the wage differences are more likely to stem from market imperfections and that emphasis needs to be placed on the differences between sectors of the economy.

The paper presented here, explains these wage differentials by the interaction of unions with firms facing imperfect competition on the product market. This is done by assuming the existence of a dual labour market, an approach first developed by HARRIS, TODARO (1970) and further developed in seminal articles by CALVO (1978), McDONALD, SOLOW (1985) and BULOW, SUMMERS (1986). In this class of models, the labour market is dichotomised into a primary sector where, for example, wages are higher, there is more job security, lower turnover rates etc. and a secondary sector, where the exact opposite holds. Essentially, seeing as these permanent wage differences cannot be explained by differences in human capital, age, race or other worker characteristics, it is assumed that wages are attached more to jobs rather than workers, with all "good" jobs in one sector. Although in reality, of course, the labour market can be segregated into a whole continuum of sectors, the simplifying assumption of only two sectors has proven to be a good approximation with a large body of empirical evidence in support of the theory (see, e.g. DICKENS, LANG (1993) and the survey in SAINT-PAUL (1996)). Within the framework here, the economy produces a composite manufacturing good in the high-wage (or primary) sector and a traditional good in the secondary sector.

The traditional sector is comprised of menial jobs for which the wage is determined by market clearing. However, as the product market in the manufacturing sector is characterised by imperfect competition, rents will accrue here. This gives unions an incentive to operate in this sector as they will bargain for a share of this economic surplus for their members. As a result, wages in this sector will be above their market clearing level, i.e. an equilibrium non-competitive wage

differential exists between the two sectors. These higher wages will induce agents currently not employed in this sector to be prepared to spend a longer time (a longer unemployment spell) applying for these jobs. Therefore, increased competition on the product market which leads to lower rents and thus also lower wages, should also lead to lower unemployment. This is exactly the idea stated in the *OECD Jobs Study* (see OECD (1994), p.23) and presented more formally below.

The interaction of unions and price-setting firms has been taken up by DUTT, SEN (1997) and ARNSPERGER, DE LA CROIX (1990). However, in contrast to here, both of these models only assume a single sector labour market. There are also several recent papers which analyse various affects of unions within a dual labour market setup. ROBERTS *et al.* (2000) analyse a two-stage bargaining process in which unions first determine a national minimum wage and then subsequently the wage in the primary sector. A dynamic innovation-based growth model is developed by STADLER (1999). The original CALVO (1978) model is extended by DIXON *et al.* (1999), who incorporate a standard menu cost setup. Finally, BURDA (1992), analyses how unions affect unemployment duration spells. However, apart from the model by STADLER (1999), all of these papers have in common that the product market is treated as being perfectly competitive. However, this is, of course, not only an unrealistic assumption, but also overlooks the fact that the labour and product market are uniquely interdependent.[1] The approach used here, is to extend the original CALVO (1978) model by introducing monopolistic competition in the manufacturing sector. This means that firms here have some degree of market power, but this market power decreases as competition becomes more intense. In fact, one of the main expected effects of European monetary unification often stated, is that product market competition is expected to become more fierce, leading to lower unemployment rates in the long run. Seeing as especially in countries like Germany, unions still have considerable influence on labour market outcomes, the paper here analyses the effects of increased competition when firms and unions bargain over wages.

We find that higher market power on the producer side increases wages and also reduces the negative unemployment effect of higher wages. The reason for this is

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[1] STADLER (1999) assumes a perfectly competitive consumer goods sector and an imperfectly competitive intermediate goods sector. Whereas in that model, market power arises due to innovative activities, here it stems from the consumer demand side.

that less intense product market competition allows firms to more easily pass on higher labour costs to consumers. Therefore, the (absolute) elasticity of labour demand with respect to wages decreases. As union utility is assumed to depend both on the attained wage level for its members as well as the number of members themselves, a lower wage elasticity will induce unions to raise their wage demands so that the bargained wage level and consequently unemployment, increase. These theoretical findings are confirmed in empirical research by, amongst others, NICKELL (1999), and NICKELL *et al.* (1994).

The next section derives the optimal consumption and production decisions of the agents in the economy. Sections 3 and 4 outline the wage bargaining process and general equilibrium. A conclusion is presented in Section 5.

2 Household and Producer Decisions

The economy is divided into two sectors. In one sector, a composite manufacturing good M, is produced, whilst the other sector is engaged in the production of a traditional good T. Unions operate in the high-wage manufacturing sector and bargain with the employers over the wage level, whereas the labour market in the traditional sector is assumed to be perfectly competitive.[2] The assumption that unions only operate in the high-wage sector is common, (see, e.g. LAYARD *et al.* 1991) the reason being that there are no economic rents to be shared in the traditional sector. As shown below, the bargained wage is always above the wage level paid in the traditional good sector.

The economy consists of N homogeneous and risk-neutral workers who are allocated across the sectors as follows

$$N = N_M + N_T \tag{1}$$

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[2] Market clearing in the secondary labour market is not contradicted by empirical evidence in Europe (see DOLADO *et al.* 1996). There is of course a wage floor influenced either by the level of social security in a country or national minimum wage levels. However, seeing as unions here are concerned about relative wages, the absolute height of the wage in the traditional sector is not important. See, e.g. JONES (1987) for a model with a binding minimum wage level in the secondary sector.

$$N_T = L_T, \qquad N_M = L_M + U_M \qquad (2)$$

where N_T is the total size of the traditional, N_M that of the manufacturing workforce and L_M the number of workers actually employed in the (high-wage) manufacturing sector.

Due to the above market-clearing wages, unemployment U_M occurs in the manufacturing sector as some individuals choose to wait for a high-paying job, i.e. they decide not to take up a job in the low-wage sector. This is in accordance with the empirical evidence, that although unemployment is a bad signal, being in a low-wage job may well be an even worse signal.[3] As the labour market in the traditional sector always clears, the employed labour force L_T, and the total size of this sector N_T, always coincide.

2.1 Households

Each household is treated as a dynasty for which the consumption level of future members is important. All dynasties are assumed to have the same discount rate and identical preferences. To simplify the analysis, an intertemporal elasticity of substitution equal to unity is chosen, so that the optimisation problem can be written as

$$U(C) = \int_0^\infty e^{-\rho t} \ln C_t dt \qquad (3)$$

where ρ is the subjective rate of time preference and C_t is total consumption of a composite good at time t with

$$C_t = M_t^\mu T_t^{1-\mu} \qquad (4)$$

where μ is the expenditure share spent on manufacturing goods. M represents a bundle of n varieties of the manufacturing good for which households' preferences

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[3] See Laing (1993) and McCormick (1990), for theoretical models of signalling and job search as well as Bulow, Summers (1986), who provide both theoretical arguments and empirical facts within a dual labour market model on the assumption that only the currently unemployed will receive jobs in the high-wage sector and as to whether this kind of unemployment is voluntary or involuntary. This assumption is further justified by van den Berg, Ridder (1998), who found empirical evidence in a number of OECD countries that workers search more easily – and therefore find jobs more easily – when unemployed than while employed.

are given by a CES utility function (see DIXIT, STIGLITZ 1977)

$$M = \left[\sum_1^n m_i^\kappa \right]^{\frac{1}{\kappa}}, \qquad 0 < \kappa < 1 \tag{5}$$

where m_i is the consumed quantity of the manufacturing good of brand i. Here, κ is a measure of the homogeneity of the goods. As κ approaches one, the goods become almost perfect substitutes for one another, whereas the goods become more heterogeneous the closer κ is to zero. Defining $\sigma \equiv 1/(1 - \kappa)$, then σ represents the elasticity of substitution between any two variants.

Consumers face a three stage optimisation problem. First, they must decide how to divide total income between savings and consumption. Formally, households maximise utility as given by (3) subject to the intertemporal budget constraint

$$\dot{A} = r_t A_t + I_{wt} - P_t C_t \tag{6}$$

where A denotes household assets, r is the interest rate, I_w is wage income and P the macroeconomic price index. A dot over a variable denotes the derivative with respect to time.

Solving this intertemporal optimisation problem results in the standard KEYNES-RAMSEY

$$\frac{\dot{C}}{C} = r - \rho \tag{7}$$

which implies

$$r = \rho \tag{8}$$

in equilibrium.

In a second stage, in each period (so that the time index t can be omitted without loss of information) consumers optimally allocate their total income between manufacturing and traditional goods, that is they choose M and T so as to

$$\max C = M^\mu T^{1-\mu} \quad \text{s.t} \quad p_M M + p_T T = I$$

where p_T the price of the traditional good and I denotes total household income. p_M is the price index of the composite manufacturing good which is defined as

$$p_M \equiv \left[\sum_1^n p_{m_i}^{1-\sigma} \right]^{\frac{1}{1-\sigma}} \tag{9}$$

with p_{m_i} as the price demanded by firm i in the manufacturing sector. Thus, a higher number of firms operating in this sector reduces the price index. As can be seen from equation (5), consumers have a "love of variety" and an increase in the number of brands produced between which consumers can choose increases their utility.

This optimisation problem results in

$$T = \frac{1-\mu}{p_T}I \text{ and } M = \frac{\mu}{p_M}I \tag{10}$$

as the income shares spent on traditional and manufacturing goods respectively.

In a third step, consumers decide how to divide their total spending on manufacturing goods amongst the n variants. This leads to a demand for variant i by household j of

$$m_{ij} = \frac{p_{m_i}^{-\sigma}}{p_M^{-(\sigma-1)}}\mu I \tag{11}$$

Assuming that the number of firms n is large means that the effect on the price index p_M of a change in the price of a single firm p_{m_i} can be neglected. In this case, the (absolute) price elasticity of demand for each variety is constant and equal to σ.

2.2 Firms

Each firm in the traditional sector produces according to an identical technology, with aggregated output given by

$$T = L_T \tag{12}$$

This means that labour in this sector has a constant unitary marginal productivity. Seeing as firms in this sector face perfect competition, it must hold that

$$p_T = w_T \tag{13}$$

with w_T as the traditional sector wage rate.

Labour productivity in this sector is normalised to one. Therefore, the price level in the traditional sector is also unity.

Production by a single manufacturing sector takes places according to

$$m_i = \Gamma L_{m_i}^{\alpha}, \quad \Gamma > 0, \quad 0 < \alpha < 1 \tag{14}$$

where Γ is a parameter denoting the technological level and L_{m_i} is the amount of labour employed by firm i in the manufacturing sector. Further, firms also incur fixed costs F. This means that there are a finite number of firms and the sector is characterised by increasing returns to scale. Therefore, given the demand function for variants of the manufacturing good (11), firms maximise their present discounted value V_{m_i}

$$\max_{L_{m_i}} \int_0^{\infty} \pi_i e^{-rt} dt = \int_0^{\infty} [p_{m_i}(m_i)m_i - w_{m_i}L_{m_i} - F]e^{-rt} dt \tag{15}$$

where w_{m_i} is the wage paid by firm i in the manufacturing sector. This optimisation problem is identical in every period so that the time index t can be omitted without loss of content. Profit maximisation leads to

$$p_{m_i} = \frac{1}{\kappa} \frac{w_{m_i}}{\partial m_i / \partial L_{m_i}} \tag{16}$$

From (16) it can be seen that κ, defined above as $1 - 1/\sigma$, is both a measure of the heterogeneity of goods and also indicates the degree of product market competitiveness. Thus, $1/\kappa$ denotes the mark-up factor by which prices exceed marginal costs. Thus, a higher value of κ implies a higher degree of market competition, with $\sigma = \infty (\kappa = 1)$ as the special case of perfect competition. Put differently, a lower value of σ or κ, means that firms have a greater degree of market power.

Totally differentiating (16) with respect to labour and wages and assuming symmetrical firms, making it possible to drop the index i gives

$$\kappa \frac{\partial p_m}{\partial m} \frac{\partial m}{\partial L_m} dL_m + \frac{w_m \partial^2 m_i / \partial L_m^2}{(\partial m / \partial L_m)^2} dL_m - \frac{1}{\partial m / \partial L_m} dw_m = 0$$

which using the production function as given by (14) and rearranging yields

$$\frac{dL_m}{dw_m} \frac{w_m}{L_m} \equiv \epsilon_{L_m, w_m} = \frac{-1}{1 - \alpha\kappa} \tag{17}$$

Equation (17) shows that a reduction in product market competitiveness, i.e. a lower value of κ, reduces (in absolute terms) the elasticity of labour demand. This is because lower pressure from competitors means that firms can demand higher

mark-up prices. Therefore, if wages increase, firms do not have to bear the total burden of these increased costs by dismissing workers, but can instead pass on some of the higher costs to the consumer. The more market power a firm has, the higher is the share of the burden that is passed on to consumers and the lower is the share that the firm itself has to bear, i.e. the lower is the number of workers that are dismissed.

The wage rate in the manufacturing sector results from negotiations between unions and employers. Unions derive utility from wages and employment levels. Specifically, the unions' aim is to demand higher wages than those paid in the traditional sector, i.e.

$$\max_{w_m} V = \int_0^\infty [L_{m_t}(w_{m_t} - w_{T_t})]e^{-\rho t}dt \tag{18}$$

where V represents intertemporal union utility and ρ is the union discount rate. As above, the wage rate will be constant in a steady state so that the time index t can be omitted. Thus, during the wage bargaining process, a necessary condition for unions to maximise their utility is

$$\frac{dV}{dw_m} = \frac{\partial V}{\partial w_m} + \frac{\partial V}{\partial L_m}\frac{dL_m}{dw_m} \overset{!}{=} 0 \tag{19}$$

There are two opposing effects in (19). On the one hand, increases in the wage level directly increase union utility. On the other hand, there is an indirect effect as the size of the workforce will decline with higher wages, thereby reducing union utility. In the optimum these two effects need to be equalised.

3 Wage Bargaining

The most common way of modelling such negotiations is the (generalised) co-operative Nash bargaining solution. Here, the Nash-maximand which is simply the product of the respective difference in payoffs if an agreement is reached to the payoff each party receives if no agreement is reached, is maximised with respect to the wage level. If no agreement is reached, firms have a (negative) fallback position $\pi_0 = -w_m F$ due to their fixed costs. For this reason, the Nash-maximand effectively only contains variable profits π_V net of the fixed costs, i.e.

$\pi + w_m F \equiv \pi_V$. For the unions on the other hand, this fallback position is the wage rate paid in the traditional sector, which all workers could receive at any time.[4] Therefore, the Nash-maximand Ω is given by

$$\Omega = V^\beta (\pi_V)^{1-\beta} \tag{20}$$

where β is the bargaining power that unions have.

Maximising the above with respect to the wage rate w_m, leads to the following (absolute and relative) wage in the manufacturing sector

$$w_m = \frac{\alpha\kappa + \beta(1 - \alpha\kappa)}{\alpha\kappa} \tag{21}$$

Proof: See Appendix 1.

As is to be intuitively expected, the wage differential increases with union bargaining power β. For the extreme case that unions have no bargaining power, ($\beta = 0$), the wages in the two sectors equalise irrespective of the intensity of product market competition. At the other extreme, if all the bargaining power is with the unions, ($\beta = 1$), then the wage differential between the two sectors is

$$w_m = \frac{1}{\alpha\kappa} \tag{22}$$

Equation (22) shows that the optimal wage from the viewpoint of the unions is a decreasing function of product market competitiveness κ. This is because more intense competition increases the labour demand elasticity with respect to wages. Therefore, a given increase in the wage level will lead to a larger decrease in labour demand. In other words, the negative effect on union utility of higher wages gains in importance. For this reason, unions will lower their respective wage demands. Thus, although product market competition is assumed to not directly influence union bargaining power, it does have an indirect effect through the elasticity of labour demand and thereby on the resulting wage rate. Therefore, not only stronger union bargaining power, but also the product market power of firms leads to higher relative wages. The first effect is a well-known result in the literature. However, the effect that market power by firms has is often neglected.

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[4] Unions treat this wage as exogenous. In other words, they ignore the effect wage negotiations in the manufacturing sector have on the labour supply in the traditional sector.

A standard result in the literature is that wage bargaining solutions can be improved, i.e. there exist Pareto-superior outcomes, if the employment as well as the wage level are negotiated over.[5] How efficient bargaining effects the results obtained so far is discussed below.

4 General Equilibrium

As has been shown above, due to the presence of unions in the primary sector, a non-competitive wage differential exists. Since labour is homogeneous, all workers would prefer a job in the high-wage manufacturing sector. However, this wage differential leads to lower labour demand than the market-clearing level, so that not all workers can be absorbed by this sector. Therefore, workers at the beginning of their careers or those that become unemployed if the firm they are working for is forced out of the market, must decide whether to try and obtain a high-wage job but face the risk of a period of unemployment, or to enter the traditional sector where they can instantaneously find a job. In a steady-state equilibrium, the present value of the income streams must be identical between these two options.

For the reasons discussed above, only workers from the unemployed pool are considered for primary jobs. As there must be a positive probability of finding a job in this sector, there must also be layoffs in any period of time. These occur due to structural change in the economy, which means that each job in the manufacturing sector faces the constant exogenous probability s of being terminated. Similarly, there exists a job-finding rate a, determined endogenously below. This means that all possible transitions between the states of unemployment and the primary sector are time-independent POISSON processes. As wages in both sectors are constant and we concentrate on the symmetrical equilibrium where all firms in the manufacturing sector pay the same wage, i.e. $w_{m_i} = w_M$, the BELLMAN equations for the three possible states a worker can be in, i.e. employed in the

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[5] See McDonald, Solow (1981), for a more detailed analysis and McDonald, Solow (1985), for a dual labour market model with efficient bargaining.

traditional sector, employed in the manufacturing sector or unemployed, are[6]

$$\rho V_T = w_T \tag{23}$$

$$\rho V_M = w_M + s(V_U - V_M) \tag{24}$$

$$\rho V_U = a(V_M - V_U) \tag{25}$$

with V_T, V_M and V_U as the respective present values associated with the three states. Using the fact that in equilibrium the present value of becoming unemployed must be equal to that of taking up a job in the traditional sector, $V_U = V_T$, means that equations $(23) - (25)$ yield a job-finding rate a of

$$a = \frac{\rho + s}{w_M - 1} \tag{26}$$

Equation (26) together with the steady-state flow condition whereby the number of people being dismissed from the primary sector during any period of time must equal the number finding a job in this time period, $aU_M = sL_M$, determines unemployment as

$$U_M = \frac{sL_M(w_M - 1)}{\rho + s} \tag{27}$$

Equation (27) fully closes the model. In Appendix 2 the general equilibrium values for all endogenous variables are derived. The corresponding comparative static results are given in Table 1.

The focus here is on the number of firms n and the unemployment rate u_M. The reason for this is that with the DIXIT, STIGLITZ (1977) setting of monopolistic competition assumed here, firms act strategically independent of each other. This has as a consequence that the size of the market neither has an influence on the mark-up factor firms can charge over their marginal costs, nor does it influence the scale at which these firms produce. Instead, all market effects work through a change in the number of equilibrium varieties n which are produced in the economy. This number is derived in Appendix 2 as

$$n = \frac{\mu(\rho + s)N}{F(1 - \mu)(\rho + s) + L_m(w_m(\rho + s - \mu\rho) + \mu\rho)} \tag{28}$$

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[6] It is assumed that individuals have the same subjective discount rate ρ as do unions.

Table 1: Comparative Statics

	α	β	κ	μ	ρ	Γ	s	F	N
w_m	-	+	-						
L_m	+	-	+					+	
p_m	?	+	-			-		+	
n	-	+	-	+	+		-	-	+
p_M	?	+	?	-	-	-	+	+	-
M	?	?	?	+	+	+	-	-	+
L_M	+	-	+	+	+		-		+
N_M	+	-	+	+	-		+		+
N_T	-	+	-	-	+		-		+
Y	-	+	-	+	+		-		+
u_M	-	+	-		-		+		

with the wage rate as given by (21) and per-firm employment L_m as

$$L_m = \frac{F\alpha\kappa}{w_m(1 - \alpha\kappa)}$$

From (28), it can be seen that the number of firms is negatively related to labours' output elasticity α, and product market competition intensity κ. In both cases a lower manufacturing sector wage results. However, this effect is outweighed by the positive effect of both α and κ on labour demand, so that net costs increase, forcing some firms to exit this sector as they now make a loss. Increases in κ have the further effect of reducing the price a firm can demand, so that *c.p.*, revenue drops. As there is no strategic interaction between firms, lower revenue forces some firms out of the market (or to merge with other firms). As can be seen from equation (11), a lower number of firms, which reduces the price index p_M, shifts the demand curve for the remaining firms upwards. As prices and wages remain unaffected by the number of firms, these higher sales automatically increase firms' revenues. In other words, more intense product market competition leads to fewer but larger firms. Similarly, higher fixed costs F, are also counteracted by fewer firms operating at higher output levels. By analogy, higher union bargaining power β, will lead firms to shed labour, reducing their wage bill. These firms will then earn short-run positive profits, which will be eroded in the long-term as new firms enter the manufacturing sector.

Increases in either the consumption share of manufacturing goods μ, the subjective rate of time preference ρ, or the size of the population N, all lead to higher demand for manufacturing goods. This ensures that firms increase their revenue and make positive profits in the short-term which induces more firms to enter this sector.

The higher the exogenous job-separation rate s, the lower is the equilibrium number of firms. The reason for this is that frictional unemployment increases so that total wage income earned by the households in the economy declines. This in turn means that demand for manufacturing products decreases, forcing some firms to exit the market as they would make losses.

The other endogenous variable of crucial interest is the unemployment rate u_M. This is given by

$$u_M = \frac{U_M}{N_M} = \frac{\beta s(1 - \alpha\kappa)}{\beta s(1 - \alpha\kappa) + \alpha\kappa(\rho + s)} \tag{29}$$

To understand the comparative static effects, it is necessary to analyse both the change in employment and the number of workers looking for jobs in this sector. Changes in either labours' output elasticity α, competition intensity κ, or union bargaining power β, all gives rise to an "output" and a "number of firms" effect on total employment. The output effect occurs as higher values of α or κ both lower wages (see equation (21)) and thus increase per-firm labour demand and output. However, changes in these exogenous variables also lead to a lower number of firms which has a negative effect on total output. It can be shown however, that the per-firm output effect always dominates so that employment increases. By analogy, a higher value of β, lowers both per-firm and total employment. The effect on unemployment is not so clear cut. On the one hand, unemployment increases with higher employment in this sector, (see equation (27)), on the other hand, a higher value of α lowers the wage which reduces the number of unemployed. However, it can be shown that the first effect dominates the second, so that increases in α cause a rise in both the number of employed L_M, as well as the number of unemployed U_M. Consequently, the total number of people in this sector also increases. The same argumentation also holds for higher product market competition intensity κ. However, since both also lead to higher labour demand and, via lower wage rates, to a higher job-finding rate a (see equation (26)), the net effect of both is a lower unemployment rate. Put differently, higher

market power by firms, i.e. a lower value for κ, which leads to higher prices but consequently also to lower product demand, will increase the unemployment rate. The reverse arguments hold for higher values of union bargaining power β, which decrease employment but increase unemployment. This has the net effect of reducing the number of individuals in the manufacturing sector. Therefore, just as higher market power by firms is bad for employment, so is higher union bargaining power β. If unions have no bargaining power, i.e. $\beta = 0$, no unemployment will exist. This is because in this case the wage differential between the two sectors collapses, so that both markets pay the market-clearing wage rate.

The final two effects which can be seen from (29) is the influence that the subjective discount rate ρ, and the job-separation rate s, have. Turning to the former, it can be seen that a higher discount rate lowers the unemployment rate. This can be explained twofold. Firstly, the consumption level increases as a result, leading firms to produce more and consequently hire increased levels of labour. This means that the job-finding rate a increases. Secondly, some of the formerly unemployed will now opt for a job in the traditional sector as with higher values of ρ, the future is valued less. Therefore, an immediate low-wage income as opposed to a spell of no income whilst applying for a high-wage job becomes more attractive. Both effects lower the unemployment rate. The opposite holds for increases in s. Although it too leads to a higher job-finding rate a, at the same time more people become unemployed at any given time. This not only directly increases unemployment but also indirectly via lower national income Y which in turn reduces production and labour demand. Lastly, it can be seen from equations (27) and (29), that if $s = 0$, implying that there are no job-separations, then no unemployed individual can ever hope to find a job in the high-wage sector. For this reason, all workers who do not find a manufacturing sector job, will immediately take up a job in the traditional sector.

5   Conclusion

This paper has developed a dual labour market model of wage bargaining between unions and monopolistically competitive firms. It was shown that not only higher union bargaining power increases wages but also that the wage rate is positively

related to the amount of market power that firms face on the product market. Since the unemployment rate is positively correlated to the wage differential between the sectors, this means that both higher bargaining strength as well as higher market power by firms will lead to an increase in unemployment. There are two effects by which the level of product market competition influences unemployment. Firstly, there is the direct effect by which more intense competition leads to lower mark-up prices. This price reduction is concomitant with higher product market (and therefore labour) demand. But there is also an indirect effect associated with the competition intensity. More intense competition means that firms are less well able to pass on increased costs to consumers. Therefore, the only other way firms can reduce their costs is by dismissing a part of their workforce. Therefore, higher product market competition intensity also leads to a higher (absolute) elasticity of labour demand. However, seeing as the level of employment is important for union utility, unions will lower their wage demands correspondingly. These lower bargained wages in turn mean that fewer workers are dismissed and consequently, that the unemployment rate is lower.

It is these positive effects on unemployment of increased competition which are often stated as one of the benefits of European Monetary Union. As price levels become more comparable within the EU, it does indeed seem likely that this will increase the elasticity of substitution between two variants leading not only to lower wages but consequently also lower unemployment. The model here predicts that this increased competition will also have the effect of forcing firms to merge, i.e. there will be fewer firms operating at higher output levels. With new takeovers and mergers being continuously announced, this fits well with current empirical observations. However, this emphasises that it is increasingly important that government policies are aimed at strengthening product market competition and that it is recognised that unions as such only have a dwindling influence on national unemployment levels.

Appendix

Appendix 1   Derivation of the Bargained Wage Rate

Maximising the Nash-maximand (20), with respect to the wage rate yields

$$\frac{\partial \Omega}{\partial w_m} = \beta V^{\beta-1} \pi_V^{1-\beta} \frac{\partial V}{\partial w_m} + (1-\beta) V^\beta \pi_V^{-\beta} \frac{\partial \pi_V}{\partial w_m} \overset{!}{=} 0$$

which, using the envelope theorem can be simplified to

$$\pi_V \frac{\partial V}{\partial w_m} = \frac{1-\beta}{\beta} V L_m$$

with union utility given by (18), the above equation can be written as

$$\pi_V \left(\frac{\partial L_m}{\partial w_m}(w_m - w_T) + L_m \right) = \frac{1-\beta}{\beta} L_m^2 (w_m - w_T)$$

$$\frac{\pi_V}{w_m L_m} \left(\frac{\partial L_m}{\partial w_m} \frac{w_m}{L_m}(w_m - w_T) + w_m \right) = \frac{1-\beta}{\beta}(w_m - w_T) \tag{A.1}$$

With the specification of the production function as given by (14), it holds that the variable profits to labour costs ratio is

$$\frac{\pi_V}{w_m L_m} = \frac{1 - \alpha\kappa}{\alpha\kappa} \tag{A.2}$$

With the wage rate in the traditional sector given by (13), the primary wage can be determined by inserting (A.2) and the elasticity of labour demand as given by (17) into (A.1) and rearranging to give

$$w_m = \frac{\alpha\kappa + \beta(1 - \alpha\kappa)}{\alpha\kappa} \tag{A.3}$$

Appendix 2   Derivation of the General Equilibrium

Profit maximisation with respect to the (variable) labour stock employed in the manufacturing sector yields

$$\frac{\partial \pi}{\partial L_m} = \Gamma\alpha\kappa p_m L_m^{\alpha-1} = w_m$$

$$p_m = \frac{w_m L_m^{1-\alpha}}{\Gamma\alpha\kappa} \tag{A.4}$$

with w_m as defined by (21).

Due to the fact that there are no institutional barriers to market entry, in a steady state, equilibrium profits in the manufacturing sector must be equal to zero. More formally, by (15), this means that

$$p_m = \frac{w_m L_m + F}{m} = \frac{w_m L_m + F}{\Gamma L_m^\alpha} \tag{A.5}$$

Combining (A.4) with (A.5) and inserting (21) for the wage rate yields

$$L_m = \frac{F(\alpha\kappa)^2}{(1-\alpha\kappa)(\alpha\kappa + \beta(1-\alpha\kappa))} \tag{A.6}$$

Inserting this result into either (A.4) or (A.5) yields the price level as

$$p_m = \frac{1}{\Gamma}\left(\frac{F}{1-\alpha\kappa}\right)^{1-\alpha}\left(\frac{\alpha\kappa + \beta(1-\alpha\kappa)}{(\alpha\kappa)^2}\right)^\alpha \tag{A.7}$$

The equilibrium number of firms can be found by noting that size of the traditional labour force L_T, is given from equation (1) as

$$L_T = N_T = N - N_M$$

with the size of the manufacturing labour force N_M, defined by (2) as

$$N_M = L_M + U_M$$

which, using (29), gives

$$N_M = L_M\left(1 + \frac{s(w_m - 1)}{\rho + s}\right)$$

$$\Rightarrow N_T = N - nL_m\left(1 + \frac{s(w_m - 1)}{\rho + s}\right) \tag{A.8}$$

$$\tag{A.9}$$

Total income Y, in the economy is by definition

$$Y = w_T L_T + w_M L_M + nF = p_T T + p_M M \tag{A.10}$$

Using the optimal income shares spent on traditional and manufacturing goods respectively, equation (10) yields

$$\frac{p_T T}{p_M M} = \frac{1 - \mu}{\mu}$$

which, using (5) and (9), assuming symmetrical firms and noting that the production function (12) can be written as

$$L_T = \frac{1-\mu}{\mu} n p_m m$$

$$= \frac{1-\mu}{\mu} n(w_m L_m + F)$$

$$= \frac{1-\mu}{\mu} (w_m n L_m + nF)$$

$$= \frac{1-\mu}{\mu} (w_m(N - N_T - U_M) + nF)$$

$$N_T\left(1 + \frac{1-\mu}{\mu} w_m\right) = \frac{1-\mu}{\mu} (w_m(N - U_M) + nF)$$

$$N_T = \frac{(1-\mu)\left(w_m\left(N - \frac{snL_m(w_m-1)}{\rho+s}\right) + nF\right)}{\mu + (1-\mu)w_m} \tag{A.11}$$

Solving equations (A.8) and (A.11) for the number of firms n yields

$$n = \frac{\mu(\rho+s)N}{F(1-\mu)(\rho+s) + L_m(w_m(\rho+s-\mu\rho)+\mu\rho)} \tag{A.12}$$

$$= \frac{\mu(\rho+s)(1-\alpha\kappa)(\alpha\kappa + \beta(1-\alpha\kappa))N}{F\big[[(1-\mu)(\rho+s) + \mu s\alpha\kappa][\alpha\kappa + \beta(1-\alpha\kappa)] + \mu\rho(\alpha\kappa)^2\big]}$$

With symmetrical firms this leads to a price index given by

$$p_M = p_m n^{-\frac{1-\kappa}{\kappa}}$$

which, by inserting (A.7) and (A.12) yields

$$p_M = \frac{1}{\Gamma}\left(\frac{F}{1-\alpha\kappa}\right)^{1-\alpha}\left(\frac{\alpha\kappa + \beta(1-\alpha\kappa)}{(\alpha\kappa)^2}\right)^{\alpha} \times$$

$$\left(\frac{F\big[[(1-\mu)(\rho+s) + \mu s\alpha\kappa][\alpha\kappa + \beta(1-\alpha\kappa)] + \mu\rho(\alpha\kappa)^2\big]}{\mu(\rho+s)(1-\alpha\kappa)(\alpha\kappa + \beta(1-\alpha\kappa))N}\right)^{\frac{1-\kappa}{\kappa}} \tag{A.13}$$

Total manufacturing output is given by

$$M = mn^{\frac{1}{\kappa}}$$

which, using the above, leads to

$$= \Gamma\left(\frac{F(\alpha\kappa)^2}{(1-\alpha\kappa)(\alpha\kappa + \beta(1-\alpha\kappa))}\right)^{\alpha} \times$$

$$\left(\frac{\mu(\rho + s)(1 - \alpha\kappa)(\alpha\kappa + \beta(1 - \alpha\kappa))N}{F\big[[(1 - \mu)(\rho + s) + \mu s\alpha\kappa][\alpha\kappa + \beta(1 - \alpha\kappa)] + \mu\rho(\alpha\kappa)^2\big]}\right)^{\frac{1}{\kappa}} \quad \text{(A.14)}$$

With the per-firm labour demand given by (A.6) and the number of firms by (A.12), the total number of employed workers in this sector is

$$L_M = \frac{\mu(\rho + s)(\alpha\kappa)^2 N}{[(1 - \mu)(\rho + s) + \mu s\alpha\kappa][\alpha\kappa + \beta(1 - \alpha\kappa)] + \mu\rho(\alpha\kappa)^2} \quad \text{(A.15)}$$

Inserting (A.15) into the steady-state unemployment condition (29) gives

$$U_M = \frac{\mu s\beta\alpha\kappa(1 - \alpha\kappa)N}{[(1 - \mu)(\rho + s) + \mu s\alpha\kappa][\alpha\kappa + \beta(1 - \alpha\kappa)] + \mu\rho(\alpha\kappa)^2} \quad \text{(A.16)}$$

Equations (A.15) and (A.16) determine the size of the manufacturing sector as

$$N_M = \frac{\mu\alpha\kappa[\alpha\kappa(\rho + s) + \beta s(1 - \alpha\kappa)]N}{[(1 - \mu)(\rho + s) + \mu s\alpha\kappa][\alpha\kappa + \beta(1 - \alpha\kappa)] + \mu\rho(\alpha\kappa)^2} \quad \text{(A.17)}$$

Finally, with the size of the manufacturing sector as given by (A.17), employment in the traditional sector is

$$N_T = \frac{(1 - \mu)(\rho + s)(\alpha\kappa + \beta(1 - \alpha\kappa))N}{[(1 - \mu)(\rho + s) + \mu s\alpha\kappa][\alpha\kappa + \beta(1 - \alpha\kappa)] + \mu\rho(\alpha\kappa)^2} \quad \text{(A.18)}$$

and national income is

$$Y = \frac{(\rho + s)(\alpha\kappa + \beta(1 - \alpha\kappa))N}{[(1 - \mu)(\rho + s) + \mu s\alpha\kappa][\alpha\kappa + \beta(1 - \alpha\kappa)] + \mu\rho(\alpha\kappa)^2} \quad \text{(A.19)}$$

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