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by
Frank Barry

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**Declining Industries and Monopoly Unions:
A Further Argument against Protection**

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February 1995

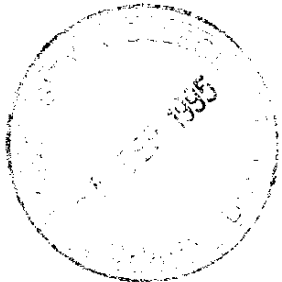
Abstract

Wage stickiness is frequently cited as a justification for (temporary) protection when a sector is hit by an adverse shock. The present paper, rather than assuming arbitrary wage stickiness, instead models it as an outcome of monopoly union behaviour. It is shown that if intervention was not undertaken before the shock, because of a high marginal social cost of taxation, protection or subsidisation is even less appropriate after the shock occurs.

JEL Classification Numbers: D61, E24, J51, R13.

Keywords: Declining Industries, Monopoly Unions, Adjustment Assistance.

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1: Introduction

Much of the literature on declining industries alludes to "trade union behaviour" as a justification for the assumption of wage stickiness in the sector. Wage stickiness in turn is taken to imply that the output or employment loss in the declining industry is excessive, which justifies intervention (in the form of subsidisation or protection) to slow down the rate of decline.

This argument surfaces very frequently. It appears, for example, in Lapan (1976), Hillman (1977), Ray (1979), Neary (1982), Forster and Rees (1983), Flam, Persson and Svensson (1983), Steigum (1984), Djajic and Purvis (1987) and Fields and Grinols (1991). It may be used as a justification for the protection induced by increased import penetration, as found empirically for the US by Trefler (1993).

Optimal intervention, however, is impossible to identify if the microfoundation underlying the wage distortion is left unspecified, as it is in this literature. It is important therefore to test whether the implications drawn from models assuming arbitrary wage stickiness are supported by models of how unions behave.

There are two standard approaches to the modelling of trade union behaviour: the "monopoly union" and the "Nash bargaining" models [McDonald and Solow (1981), Oswald (1985)].¹ In a companion paper to the present one, Barry (1995) adopts the Nash bargaining approach and shows that when the industry is large relative to the size of the local labour market the unionised sector releases insufficient rather than excessive labour in the event of a sectoral shock.

This assumption about the declining industry's size relative to the local labour market is important in the Nash model since the shock would not otherwise necessitate wage adjustment, and wage stickiness would not therefore present a problem. The assumption may be appropriate because of the regional concentration of industries such as coal and iron ore

¹ There are circumstances in which the two approaches are consistent with each other; see e.g. Oswald (1985; Section 5) and Espinosa and Rhee (1989).

mining, steel and car production and shipbuilding to which the original analyses were applied. Given this regional concentration the union will release less than the socially-efficient amount of labour to other sectors so as to moderate the drop in wages its laid-off members must face. Optimal intervention in the Barry model should encourage labour transfer from the declining sector rather than inhibit it or slow it down as suggested in most of the literature.

The present paper analyses the declining industries problem in the context of the monopoly-union model. The size of the industry relative to the local labour market is not crucial in this context since (unlike in the Nash case) higher wages in the unionised sector reduce labour demand and generate Pareto inefficiencies regardless of the sector's size. In the monopoly-union case, then, we can treat the wage in the rest of the economy as given.

Lawrence and Lawrence (1985) apply the monopoly-union model to an end-game scenario in which the shock leads to a complete halt in investment. In this case, given putty-clay technology, it becomes more difficult to substitute capital for labour. Thus the absolute elasticity of labour demand falls, which under monopoly-union behaviour leads wages in the declining sector to rise. Policies to protect the sector under these circumstances, they argue, will simply transfer resources from the taxpayer to union members without revitalising the industry.

This anti-protectionist argument does not go through, of course, if the elasticity of labour demand remains constant or actually increases (as it would if labour-demand functions were approximately linear). The present paper presents an anti-protectionist argument applicable to these cases by showing that the shock which sends the industry into decline alleviates rather than compounds the inefficiencies resulting from monopoly-union behaviour.

Two widely-held but apparently contradictory views of the effects of trade unions show up in the present analysis. First, since unionisation drives the industry up its labour-demand function employment in the unionised sector is sub-optimal.² If some partial wage adjustment

² Using a microeconomic data set on UK establishments, Blanchflower, Millward and Oswald (1991) find that employment in the typical unionised establishment grows three percentage points less per annum than in a typical non-unionised establishment. Leonard

occurs in the event of a shock, however, it indicates the union's desire to protect employment in the high-wage sector; less labour is released than is socially efficient. The shock therefore partially corrects the initial distortion. Even when this does not arise, however, as in the constant-elasticity case, we find that the cost to benefit ratio of intervention increases. In contrast to the literature based on arbitrary wage rigidities, therefore, we argue that there is less reason for protection or subsidisation once the sector goes into decline.

2: The Pre-Shock Equilibrium

Consider a two-sector economy consisting of the unionised sector, X, and the (competitive) remainder of the economy, Y. We take GNP as our measure of social welfare Ω :

$$(1) \quad \Omega = R(L_X) + F(L_Y)$$

Production functions are normal, with the marginal products of labour positive but declining in L: $R_L, F_L > 0$ and $R_{LL}, F_{LL} < 0$.

Maximisation of GNP yields the standard Pareto efficiency condition:

$$(2) \quad R_L = F_L$$

Profit maximisation in each sector equates the value of the marginal product of labour and the sectoral wage rate:

$$(3) \quad R_L = w_X \text{ and } F_L = w_Y$$

The wage in Y is determined competitively while the X-sector union chooses w_X to maximise the total income of its membership:³

$$(4) \quad w_X L_X + [N_X - L_X] w_Y$$

As in Hall and Lilien (1979) and McDonald and Solow (1981, 1985), the size of the union,

(1992) arrives at similar conclusions using data on Californian manufacturing plants.

³ In McDonald and Solow (1981) the union is concerned with the utility of the wage bill, rather than with the wage bill per se. To keep the notation simple we follow Hall and Lilien (1979) in assuming a constant marginal utility of income. This is not important for our results.

N_x is treated as a constant throughout.⁴

The union chooses the wage that maximises (4) subject to the labour-demand function (3). This yields a differential between the union wage and the opportunity cost of labour that is expressible in terms of the elasticity of labour demand in the unionised sector:

$$(5) \quad w_x - w_y = w_x/\epsilon = -L_x R_{LL} = w_y/(\epsilon - 1)$$

where ϵ is the absolute value of the elasticity of labour demand in the X-sector. Obviously the union model is only relevant if this elasticity is above unity.⁵ If so the X-sector wage is above the opportunity cost of labour; the union pushes the firm up its labour-demand function, reducing output and employment in the sector.

Comparing (3) and (5) with (2) it is clear that Pareto efficiency is not achieved in the presence of a monopoly union. There is therefore a social benefit to increasing the X-sector workforce. The marginal social benefit (MB) of transferring an extra worker into the X-sector is

$$(6) \quad MB = R_L - F_L$$

Policies capable of achieving this include subsidising X-sector employment or production. Such policies to offset the effects of unionisation are rarely encountered in practise however. One might speculate that the reason for this is that in the absence of non-distortionary taxation the marginal gain from offsetting the distortion may be less than the marginal social cost of the taxes required to finance the subsidies⁶.

⁴ Carruth and Oswald (1985; appendix 2) show that this assumption is defensible for a declining industry. See Grossman (1984) for a model in which union membership is endogenous.

⁵ In the textbook case of a monopoly firm the equivalent condition would guarantee that marginal revenue is positive.

⁶ Brander and Spencer (1994) list a number of recent studies which find the marginal welfare costs of taxation to be quite substantial. Ballard, Shoven and Whalley (1985) for example suggest a net efficiency loss of between 17 and 56 cents per dollar of tax revenue raised in the US. Some of Honohan and Irvine's (1987) estimates for Ireland, a country with a high ratio of tax revenue to GNP and a narrow tax base, range to well in excess of £1 per £ of additional tax revenue.

We can compute the taxation required to finance a labour subsidy sufficient to increase X-sector employment by one unit.⁷ When an employment subsidy s_x is offered to the X-sector the first-order condition becomes

$$(7) \quad R_L = w_x - s_x$$

Combining this with the union behaviour described by equation (5) yields expressions for dw_x/ds_x and dL_x/ds_x . Setting $dL_x = 1$ then yields the required subsidy, s_x^* .

In general this subsidy (and the associated tax cost TC) has the rather complex form

$$(8) \quad TC = s_x^* = -[2R_{LL} + L_x R_{LL}]$$

It will be convenient to illustrate our argument using constant-elasticity or linear labour-demand functions. In the constant-elasticity case (8) boils down to⁸:

$$(9) \quad TC = s_x^* = -R_{LL} = w_x/L_x \epsilon$$

and in the linear case⁹:

$$(10) \quad TC = s_x^* = -2R_{LL}$$

We can now calculate the ratio of the marginal benefit of the subsidy relative to its tax cost. From equations (5), (6) and (8), this works out in general as

$$(11) \quad MB/TC = L_x R_{LL} / [2R_{LL} + L_x R_{LL}]$$

With a constant elasticity of labour demand this is

$$(12) \quad MB/TC = L_x$$

while the ratio for a linear labour-demand function is

$$(13) \quad MB/TC = L_x/2$$

If no action is taken to offset the initial distortion it suggests that these ratios are below

⁷ Assuming that total labour supply in the economy is variable will ensure that labour taxes in the present model are distortionary.

⁸ At any given wage note that $d\epsilon = [R_{LL} + L_x R_{LL}] [w_x / (L_x R_{LL})^2] dL_x$

⁹ To see why the tax cost is higher in the linear case (when the initial slope R_{LL} is the same) note that as employment rises the labour-demand elasticity, and hence the responsiveness of employment to the subsidy, falls. A greater subsidy is required therefore to elicit any given employment response.

the prevailing marginal social cost of taxation. We will adopt this assumption from here on.

3. The Post-Shock Equilibrium

Now let the X-sector be hit by a permanent adverse shock. We introduce a shock term α into the X-sector gross revenue function $R(L_X, \alpha)$, with the property: $R_{L\alpha} < 0$.¹⁰

These shocks may be thought of as arising either on the supply side or on the demand side, e.g. through an increase in the price of raw materials that the sector uses relatively intensively, or through an inward shift of the demand function resulting from increased competition from abroad.¹¹

From equation (5) above it is clear that the impact on X-sector wages depends on the effect the shock has on the sector's labour-demand elasticity. A priori this can move in any direction.

Lawrence and Lawrence (1985) have explored the end-game scenario where the elasticity is reduced, leading to an increase in declining-sector wages. This process is only thrown into reverse when the end of the end game is reached; i.e. when unions face the credible threat of permanent plant closures.¹²

They argue that protectionist policies in such end-game situations increase the difficulties of adjustment by strengthening unions' incentives to seek higher wages. We show here that even in other cases, where the labour-demand elasticity remains constant or rises rather than falls, protection is unlikely to be justified.

¹⁰ R_{α} can also be negative.

¹¹ In the raw-materials case $R()$ should be interpreted as revenue net of raw-material costs. In the case of demand shocks, we need to assume either that firms in the sector are competitive or that all the sector's output is exported. Otherwise intervention would be necessary to offset the sector's domestic market power.

¹² Espinosa and Rhee (1989) interpret such wage concessions as the union's efforts to endogenise the probability that the game will continue.

If the labour-demand elasticity rises in the event of a sector-specific shock, the sectoral wage differential falls [equation (5)]. The "beginning of the endgame" interpretation of the US steel industry notwithstanding, there is ample evidence that many unionised industries respond in this way to adverse shocks.¹³

In the context of the monopoly union model, the union accepts such (partial) wage adjustment in order to minimise the amount of labour to be released from the high-wage sector. Hence our argument that this entails inefficiently low labour release.

Why might the labour-demand elasticity move in this direction, the opposite case to that analysed by Lawrence and Lawrence? One possibility is that labour-demand functions may be approximately linear. If this is so, the amount of labour released by the unionised sector is found from equations (3) and (5), for constant R_{LL} , as

$$(14) \quad dL_X/d\alpha = -R_{L\alpha}/2R_{LL} < 0$$

while the optimal degree of labour shedding is found from (2) to be

$$(15) \quad dL_X^*/d\alpha = -R_{L\alpha}/R_{LL} < 0$$

where L_X^* is the Pareto efficient level of employment.

Efficiency clearly requires a greater degree of labour movement out of the unionised sector than will in fact arise. This suggests that the adverse sector-specific shock, by correcting some of the initial distortion, actually raises welfare.

To verify this, note that the effect of the initial distortion on welfare in the linear case is measured exactly by (the negative of) the area of the Harberger triangle):

$$(16) \quad -(L_X^* - L_X)[R_L - F_L]/2$$

From this the welfare effect of the sector-specific shock is found to be:

$$d\Omega/d\alpha = -R_{L\alpha}L_X^*/4 > 0$$

This situation is illustrated in Figure 1, where the initial distortion is measured by the area

¹³ Orr and Orr (1984) for example, in a study of twenty-five import-sensitive US industries, show that relative wage declines are common. Sachs and Shatz (1994) note that increased foreign competition both eroded rents earned by low-skilled workers in the US and eliminated jobs in the industries that paid those rents.

of the triangle ABC. If the union wage remained the same after the shock that shifts the labour-demand function inwards, the distortion would also remain constant. However, with a linear labour-demand function the wage adjusts downwards somewhat and so the distortion is also reduced (to the area of the triangle DEB).

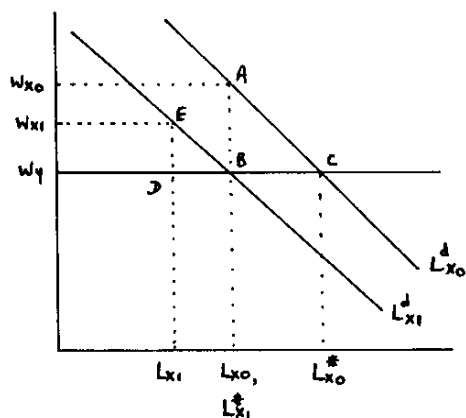


Figure 1: The sectoral shock reduces the Harberger triangle when labour-demand functions are linear.

The marginal benefit of correcting the distortion is reduced by the shock, while the tax cost, as we see from equation (10) remains constant. Clearly if intervention was not undertaken to correct the initial distortion because the ratio of the marginal social benefit to the tax cost was too low, intervention to correct the distortion is even less desirable after the shock.¹⁴

For the general case where the elasticity of labour demand rises with the shock the marginal benefit of intervention will also decline:

¹⁴ Since the declining sector is small relative to the rest of the economy, the shock does not affect the marginal social cost of raising an extra unit of tax revenue.

$$dMB/d\alpha = -(R_{LL} + L_X R_{LL}) (dL_X/d\alpha) < 0^{15}$$

The tax cost can go in either direction

$$dTC/d\alpha = -(3R_{LLL}) (dL_X/d\alpha)$$

As will become clear in a moment this is because the labour-demand function may become steeper or flatter as it shifts to the left. In any case the ratio of the marginal benefit of intervention to the cost in terms of taxation is reduced.¹⁶

$$d(MB/TC)/d\alpha = [(2R_{LL}^2 + L_X^2 R_{LLL}^2)/(2R_{LL} + L_X R_{LL})^2] (dL_X/d\alpha) < 0$$

What if labour demand functions display a constant rather than a rising elasticity? As equation (5) reveals, the shock does not affect wage demands when the elasticity is constant. The marginal benefit of the subsidy programme is therefore unchanged.¹⁷ However, unlike in the linear demand case where it remained constant, the tax cost of the programme now rises [equation (9) with w_X and ϵ constant].

This effect can be understood as follows. If the labour-demand function has a constant elasticity, it must be more steeply sloped (at any given wage rate) the closer to the vertical axis it lies [Figure 2]. Any given subsidy shifts us a constant vertical distance down the labour demand curve. A higher subsidy is required therefore to effect any given level of labour reallocation the smaller the sector is.¹⁸

¹⁵ Refer footnote 8.

¹⁶ This assumes that the fourth derivative of the production function can be set to zero.

¹⁷ The socially efficient level of labour reallocation occurs in this case (compare equations (2) and (5)), in contrast to the excessively low reallocation occurring when the elasticity rises.

¹⁸ In other words, one worker represents a higher proportion of the workforce the smaller the workforce is. With a constant elasticity therefore the tax cost of reallocating one worker rises.

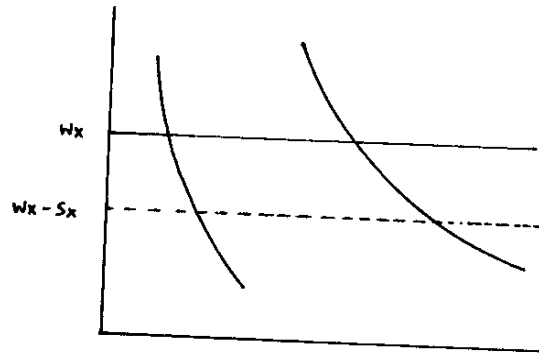


Figure 2: The impact of employment subsidies in the constant elasticity case.

In this case also, then, the shock reduces the marginal benefit of intervention relative to the taxation required to finance it. For both constant and increasing-elasticity labour-demand functions therefore, the shock worsens the terms of the trade-off between the benefits and costs of combatting the distortion. If intervention was not undertaken before the shock it is even less desirable afterwards.

4. Conclusions

Much of the literature on declining industries justifies some degree of (temporary) protection of the sector on the basis of an arbitrary wage rigidity. The research strategy adopted here is to test whether this conclusion continues to hold when an explicit model of trade union behaviour is introduced.

Barry (1995) adopted the Nash-bargaining model and showed that insufficient rather than excessive labour release from the declining sector was consistent with wages in that sector remaining relatively high. Optimal policy in that model should expedite labour transfer from

the sector rather than protect it even temporarily.

Lawrence and Lawrence (1985) employed the alternative monopoly-union model but confined themselves to cases where sectoral shocks reduced the elasticity of labour demand in the declining sector. Policies to protect the sector under these circumstances, they argue, are likely to transfer resources from the taxpayer to union members without revitalising the industry.

The present paper extends the analysis of the monopoly-union case to situations where the elasticity of labour demand remains constant or rises as a result of the shock. In the latter case, which arises if labour-demand functions are approximately linear for example, some (though not enough) wage adjustment occurs in the declining sector. We cited evidence that many industries have responded to sectoral shocks in this way. Such shocks were shown, however, to offset some of the initial union-induced distortion.

This does not arise if the elasticity of labour-demand is constant. Even in this case, however, the benefit of intervention declines relative to its cost. If intervention was not warranted before the shock because of the high marginal social cost of the taxes needed to finance it, the paper shows that it is even less warranted once the industry goes into decline.¹⁹

Finally, explicit modelling of trade union behaviour would also appear to cast doubt on the argument for declining-industries protection that posits congestion effects in the labour market [Lapan (1976), Cassing and Ochs (1978)]. If the union takes congestion into account it will release less labour than would be released under free-market conditions. Some of the initial distortion will again be rectified and the need for intervention accordingly reduced.

¹⁹ By an argument of symmetry, the results of the present paper would also apply to declining monopolised industries facing competitive labour markets.



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