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Trade, Wages and Unemployment in the Presence of Hiring and Firing Costs

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This paper offers a new explanation of the recent Australian wage inequality and unemployment experience. Building on a standard international trade model, it is argued that trade affects wage inequality and unemployment through changes in the bargaining power of different groups of workers in the presence of hiring and firing costs. This allows previously puzzling aspects of the trends to be explained, including the inconsistency of the existing Stolper–Samuelson trade explanation with rising relative skilled wages at the same time as rising skilled labour intensity of production. Considering differences in labour market institutions, in particular hiring and firing costs and minimum wages, allows differences between the experiences of Australia, the USA and Europe to be explained.

I Introduction

Increased inequality and unemployment in Australia and other OECD countries over the past two decades has rightly absorbed the attention of economists.[1] By almost every measure the dispersion of wages has increased, and unskilled workers have been particularly hard hit as their wages have declined sharply relative to those of skilled workers. As well as declining wages, the unskilled have suffered deteriorating employment prospects. Patterns have differed between countries, with the USA experiencing more wage dispersion and less unemployment than Australia, and Europe the reverse. These wage and unemployment trends have most commonly been attributed to trade (e.g., Wood 1994; Leamer 1996) and skill biased technological change (e.g.,

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[1] There is a huge literature on the topic. Surveys include Lawrence (1996), Katz and Autor (1999), and for Australia, Borland (1999), Productivity Commission (1998), and Tyers and Duncan (1997).

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Krugman and Lawrence 1994; Berman *et al.* 1994) but several other possible causes have been suggested.[2]

The aim of this paper is to present an alternative explanation of the wage and unemployment trends where trade works through changes in labour rents. The potential role of labour rents was highlighted in the conclusion of the recent survey of Katz and Autor (1999, p. 1547–48) as being an important area for future work. Their view was that 'researchers should consider the roles of changes in labour market institutions – the incidence of labour market rents – as well as changes in competitive supply and demand in assessing changes in the wage structure' and that 'a key issue is how to model the effects on employment as well as on wages'.[3]

The structure of the paper is as follows: Section II discusses the standard trade explanation and some problems, Section III develops an alternative model with labour rents related to hiring and firing costs, Section IV then uses the model to explain aspects of the wage and unemployment trends in Australia. Section V compares Australia's experience to continental Europe and the USA, and Section VI concludes.

II The Stolper–Samuelson Trade Explanation and Some Problems

This paper will present a new trade based explanation of the wage and unemployment trends, but it is helpful to review to the standard Stolper–Samuelson trade explanation and some problems with it. The standard argument (e.g., Wood 1994) begins with growth of low skill intensive manufacturing in developing countries, which increases the world supply of unskilled labour intensive manufactured products and lowers their relative price on world markets. Reductions in tariffs and other costs of conducting international trade have also contributed to lower prices for unskilled labour intensive manufactured products in developed countries.[4] If prices of unskilled labour intensive products have declined, then in a standard competitive full employment model of a small trading economy, with skilled and unskilled labour as factors of production, it follows from the Stolper–Samuelson theorem that skilled wages will increase and unskilled wages will fall. Together with these wage changes goes substitution by all industries away from skilled labour towards unskilled labour, and an expansion of the skilled labour intensive industry at the expense of the unskilled labour intensive industry.

The alternative trade explanation offered in this paper differs from the standard Stolper–Samuelson explanation in that the changes in world prices affect the labour market through rents skilled workers earn in the presence of hiring and firing costs. The rising relative prices of skill intensive products in world markets improves the bargaining position of skilled workers allowing them to extract greater rents, increasing

[2] Other possible causes include outsourcing and investment liberalisation (Feenstra and Hanson 1999); changes in labour supply Katz and Murph (1992); failures of education and training systems (Nickell and Bell 1996); lack of incentives for human capital formation (Heckman *et al.* 1998); institutional changes (Fortin and Lemieux 1997); labour markets becoming more like winner take all tournaments (Frank and Cook 1995); and the collapse of social norms restraining inequality (Atkinson 1997).

[3] Two existing papers examine links between trade and labour rents, but in different ways to the present paper. Borjas and Ramey (1994) present empirical evidence of a link between the trade deficit in durable goods and inequality, arguing that increasing foreign competition in durable goods has depressed the previously high rents earned by unskilled workers employed in durable goods industries, and that this has significantly increased overall wage dispersion. Bhagwati and Dehejia (1997) present a model where increasing foreign competition in autos and steel can depress rents obtained by union members in these industries, with effects depending on the extent to which the increase in foreign competition is foreseen, and assumptions about the behaviour of the union. In these papers the rents are earned by unionised unskilled workers rather than skilled workers, and the focus is on particular industries.

[4] Early empirical studies of movements in the prices of these products were ambiguous (Lawrence and Slaughter 1993), but now there is strong evidence of a decline in the relative world prices of goods which use unskilled labour relatively intensively (Leamer 1996; Sachs and Shatz 1996; Slaughter 1999). For instance Sachs and Shatz (1996, p. 238), based on their own empirical work and an assessment of other studies, conclude 'relative value-added prices of low-skilled intensive products have in fact declined markedly during the period 1979–90… [and this] has continued during 1990–95'.

inequality. In general equilibrium this reduces the demand for unskilled labour, and if unskilled wages are rigid then unskilled unemployment will increase.

The explanation offered in this paper has three advantages over the standard trade explanation:

1 It can explain the wage and unemployment changes together. The Stolper–Samuelson theorem comes from a full employment model, so it cannot deal with simultaneous wage and unemployment changes. While it can be shown (e.g., Brecher 1974) that the Stolper–Samuelson type results carry over to a model with unemployment due to a minimum wage, such models have rarely been used in the debate over the causes of wage inequality and unemployment. An exception is Davis (1998) who considers how changes in world factor endowments might generate increased unemployment in countries with rigid labour markets, however, Davis' assumption of worldwide factor price equalisation does not allow wage and unemployment changes to be dealt with together.

2 It is consistent with the evidence on changes in the factor intensity of production. The Stolper–Samuelson effect on relative wages is associated with a decrease in the skill intensity of production in all industries. The empirical evidence (for instance Lawrence 1996; Krugman and Lawrence 1994) is sharply inconsistent with this implication, showing little change in factor intensity or an increase in the skill intensity of production.

3 Considering labour market institutions (e.g., minimum wages; hiring and firing costs; and rent extraction possibilities) allows the differences between countries to be explained. If the Stolper–Samuelson explanation is correct then we would expect to have seen similar changes in wages across the OECD as all countries have faced the same changes in goods prices. The diversity of wage and unemployment experiences suggests a role for labour market institutions in the explanation.

III Model

(i) Outline of the Structure of the Model

The model is based on a standard competitive general equilibrium model of a small open economy. There are two sectors, a primary sector that uses skilled labour and capital, and a secondary sector that uses unskilled labour and capital. Technology in each sector is represented by a production function which is concave and has constant returns to scale. Each sector has a large but fixed number of firms, and firms may make profits. Since we are dealing with a small open economy, firms take goods prices set in world markets as given.

The labour market is the novel feature of the model. Primary sector wages are bargained by individual firms and skilled workers. Hiring and firing costs give incumbent primary sector workers some market power, allowing them to force their wage above the value of their marginal product.[5] More detail about this bargaining is given in the following sections. Secondary sector unskilled workers earn an exogenously given minimum wage. This minimum wage need not be a legislated minimum; it could be floor created by the social security system or any other rigidity at the bottom of the wage distribution. Unemployed unskilled workers are assumed always to be available at this wage.

The total endowment of labour is given, but the division between skilled primary sector and unskilled secondary sector workers, as well as the level of unemployment are endogenous.

The endowment of capital is given and the rental price of capital competitively determined. This non-labour factor is labelled capital for convenience but could be any other intersectorally mobile factor of production, for instance intermediate skilled labour.

(ii) Hiring and Firing Costs

Hiring and firing costs are the crucial feature of the primary sector labour market. In the model, firing an incumbent primary sector worker costs a constant amount f per worker in discounted present value terms. These costs of firing include the firing procedure itself, as well as any termination payments or litigation. Hiring a primary sector worker costs h, which includes advertising and selection, outlays on

[5] The potential for incumbent workers to extract rents from hiring and firing costs was used by Lindbeck and Snower (1988) to explain hysteresis in unemployment, and some other macroeconomic phenomena. An Australian paper with a similar idea was Gregory (1986).

firm specific training, and lost output while a new worker learns about the firm's operations. Firm specific training is probably the largest component of these hiring costs. It is assumed that training is necessary for a worker to be productive in the primary sector, and the lump of training is provided by the firm on hiring. The value of the training is lost if the worker leaves the primary sector, either for the secondary sector or unemployment, but is transferable between primary sector firms.[6]

There has been surprisingly little empirical work on the size and form of hiring and firing costs. The main difficulty is that the data is not collected by government statistical agencies and firm level surveys are the main way of obtaining detailed information. Such surveys are costly and obtaining a sufficiently wide coverage to establish patterns across industries and occupations is difficult. The evidence we have from firm level studies beginning with Oi (1962), and summarised in the recent survey by Hamermesh and Pfann (1996) suggest that hiring and firing costs are empirically important. Although they lament the lack of data, Hamermesh and Pfann's (1996, p. 1268) conclusions are: (i) 'the external costs alone of adjusting labour demand are large, with some studies suggesting they amount to as much of 1 year of payroll cost for the average worker'; and (ii) 'the average cost of adjustment rises rapidly with the skill of the worker'. Later they suggest that linear asymmetric adjustment costs best fit the data. These conclusions are the basis for the specification of hiring and firing costs in the present paper.

To my knowledge, the only Australian work which tries to estimate the cost of firm specific training on hiring is the honours thesis of Smedes (1998). He used the 1995 Australian Workplace Industrial Relations Survey question on the time necessary for a newly hired worker to become fully productive in the workplace. Costing this time at the workers' wage gave amounts for firm specific training on hiring. These were large, and much higher for skilled than unskilled workers. He also found that in a simple wage regression the firm specific training variable was as important as general education, and more important than unionisation and gender in explaining wages, suggesting that workers may be extracting significant rents from this firm specific training. This work, while preliminary, supports the labour market specification in the present paper.

(iii) Primary Sector Employment Determination

The significance of hiring and firing costs in the model is that they give primary sector workers market power which can be exploited. It is assumed that bargaining between primary sector workers and firms takes place within a single period has two parts: first the wage is negotiated by the firm and workers, and second, the firm chooses employment to maximise profit, given the negotiated wage. As is the case with all such problems, they are solved backwards, initially considering the firm's profit maximising employment choice for a given wage, and then considering wage negotiations in the light of the parties knowledge of the optimal employment responses.[7]

A representative primary sector firm's profit maximisation problem is:

$$\begin{aligned} \text{Max}\,\pi = {} & pF(X,K) - WX_0 - R[X - X_0] - Kr \\ & \{-h[X - X_0] \text{ if } X > X_0\} \\ & \{-f[X_0 - X] \text{ if } X < X_0\} X, K \end{aligned} \tag{1}$$

This is a problem of choosing employment X and capital usage K to maximise profit π. Profit is the value of output $pF(X,K)$, less incumbent the incumbent wage W multiplied by initial employ-

[6] The literature on training stemming from Gary Becker's work on human capital distinguishes between training that is specific to the firm which is typically paid for by the firm, and general training which will be paid for by workers. General skills will not be considered as they do not generate the labour rents which are the focus of the present paper. A recent survey of this literature on training is Chapman (1993).

[7] This is analogous to the monopoly union process in the labour economics literature. Trade union bargaining models embodying this monopoly union process are open to the criticism that the outcome is Pareto dominated by the outcome of an alternative process where the firm and unions bargain jointly over employment and wages. This criticism has less force for the present model because the bargaining is between the firm and individual worker. Employment of an individual is less divisible and harder to bargain over than employment of a large number of union members.

ment X_0, less wages of additional workers hired $[X - X_0]$ at the minimum wage R, less the rental price capital r multiplied by the usage of capital K. Note that new workers are available from the pool of unemployed at R, but when they have been trained they will be paid W. If workers are hired or fired the bracketed costs of hiring or firing must be subtracted, which are the costs per worker h on f multiplied by number of workers hired or fired.

Conditions for a maximum are:

$$pF_X(X,K) - R\ \{-h \text{ if } X > X_0\}\ \{+f \text{ if } X < X_0\} = 0 \quad (2)$$

$$pF_K(X,K) - r = 0 \quad (3)$$

These conditions will form part of the equilibrium conditions of the full general equilibrium model, but are also used by firms and workers in bargaining over the wage, which will now be considered.

(iv) Primary Sector Wage Determination

Bargaining is analysed at the level of individual incumbent workers, who are assumed to maximise their expected wage, knowing that the firm will choose employment to maximise profits. This means that any market power that workers possess is justified within a rational agent framework and there is no need to resort to an arbitrary assumption of union monopoly power in the labour market. It does not mean that all bargaining actually takes place with each individual worker. It is assumed that each worker is identical and knows the parameters of the problem, is of negligible size and negotiate in a random order with the firm. Under these assumptions there is no interdependence between the individual workers actions, so we can consider how a representative worker behaves at the bargaining table. If the worker sets a wage above the level where the firm begins firing, they can expect to be fired because they are the worker with whom the firm is currently negotiating. For the representative worker then, maximising their expected wage is equivalent to setting their wage as high as possible without inducing the firm to fire an incumbent worker.

How high can the incumbent wage be pushed? A primary sector worker can never earn less than the minimum wage:

$$W \geq R \quad (4)$$

A worker must ensure that it is profitable for the firm to continue to employ them, so the wage cannot be set above the value of marginal product plus firing costs. This is the retention constraint:

$$W \leq pF_X(X,K) + f \quad (5)$$

A worker must also ensure it is not in the firm's interest to replace them with an unemployed worker, so the wage cannot be set above the minimum wage plus the sum of hiring and firing costs. This is the hiring constraint:

$$W \leq R + f + h \quad (6)$$

These conditions are the constraints on primary sector wage setting.[8]

It is assumed that workers can extract all the rents implicit in conditions (4)–(6) above. Formally the problem of the division of the rents between the worker and firm is similar to the non-cooperative bargaining analysis of Rubinstein (1982), where two parties with infinite time horizons negotiate about the division of a cake of fixed size until an offer is accepted. Rubinstein (1982, p. 107, Conclusion 1) proved that if there are fixed per period bargaining costs there is a unique subgame perfect Nash equilibrium where the party with the lower per period costs gets all

[8] The worker might also be concerned about being replaced by a unit of capital, and must ensure that $W \leq rpF_X(X,K)/pF_K(X,K) + f$ so that it is not in the firm's interest to replace a worker with a unit of capital. In equilibrium however, $r = pF_K(X,K)$ and this capital replacement constraint reduces to the retention constraint, and so is redundant. Another concern the worker might have is that the wage demands could bankrupt the firm, but because each worker is of negligible size and bargains individually with the firm, they have no incentive to moderate their own wage demands in the absence of a mechanism to coordinate the wage demands, so a bankruptcy constraint will not be included in the model. Another concern might be that the worker might be undermined by the firm hiring additional unemployed workers without firing incumbents. The firm has an incentive to do this if $pF_X(X,K) \geq R + h$, but this will not occur unless the hiring constraint binds, fixing the wage. There is thus no need for an additional constraint. Still another concern might be entry of new firms, but as new firms also have to hire and train workers, who in turn extract rents, this will not restrain wages of incumbent workers in the existing firms.

the cake.[1] This suggests that all the rents would go to whichever of the firm and the worker has lower per period bargaining costs. A plausible case can be made that the worker has lower costs, because of the high costs to the firm of administering wage negotiations, of lost production and adverse effects on morale when bargaining is prolonged. Incumbent workers also have the ability to temporarily and partially withhold work effort and adversely impact production during negotiations without the firm having adequate counter strategies short of the costly one of sacking them. In contrast to these potentially large costs for the firms, bargaining imposes few costs on incumbent workers. They keep drawing their wage during negotiations, and negotiations are typically during work time. Many issues, like liquidity constraints because of the lack of a wage during negotiations, which put unemployed workers at a disadvantage negotiating with firms in a weak position, do not apply to incumbent workers. We are talking about renegotiation of the employment contracts of incumbent workers, not the situation of an unemployed worker in a spot labour market, which is behind the perhaps unreliable intuition that workers have little bargaining power. The results of the present paper continue to hold if the workers cannot extract all the rents, provided they can extract some positive proportion of the rents.

(v) Equilibrium in the Primary Sector

There are three types of equilibrium, depending on which of the constraints (4)–(6) on primary sector wage setting binds. Figures 1 and 2 illustrate the possible employment and wage outcomes for different prices of the primary sector product, with given values of the other exogenous variables. In the left hand part of Figures 1 and 2 the price of the primary sector product is so low that firms are firing ($X < X_0$ to satisfy $pF_X(X, K) = R - f$ in condition 2) and wages are driven down to the minimum wage ($W = R$ in condition 4). At higher levels of p, the middle portion of the figures, primary sector firms are retaining their incumbent workforce ($X = X_0$ in condition 2) so that the wage is set by the retention constraint ($W = pF_X(X_0, K) + f$ in condition (5). At still higher levels of p, primary sector firms hire ($X > X_0$ to satisfy $pF_X(X, K) = R + h$ in condition (2) and the wage is set by the hiring constraint ($W = R + h + f$ in condition 6).

FIGURE 1
Primary Sector Wages

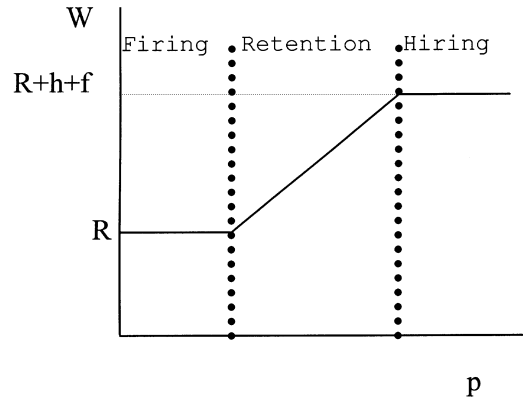
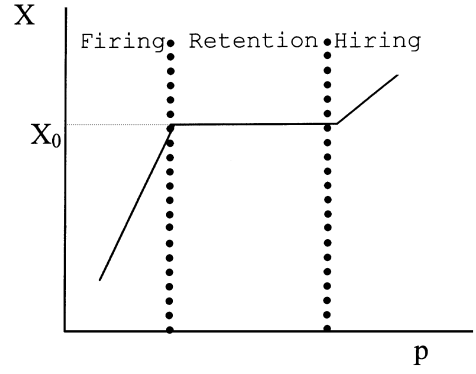


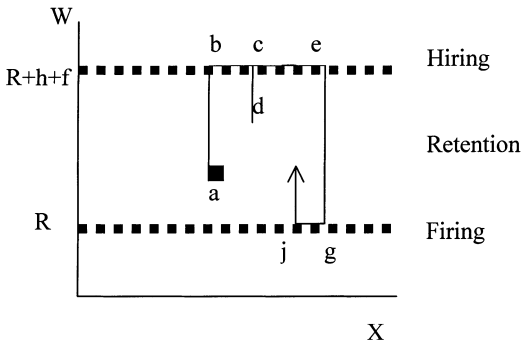
FIGURE 2
Primary Sector Employment



The critical values of p that induce hiring and firing (the vertical dotted lines in Figures 1 and 2) are determined by solving the wage constraint equations or employment conditions simultaneously, and are $p = (R - f)/F_X(X,K)$ for firing and $p = (R + h)/F_X(X,K)$ for hiring. Thus the range of product prices over which a firms workforce will remain constant is greater the larger are hiring and firing costs and the smaller is the marginal product of labour.

The dynamics are best understood by considering Figure 3 which illustrates paths of primary

FIGURE 3
Paths of Wages and Employment



sector wages and employment as prices change.[9] For purposes of illustration, start at point a within the retention region. If product prices increase the wage/employment outcome will move towards b, with wages increasing at a rate of $\delta W/\delta P = F_X(X, K)$ and no change in employment. Eventually, if product prices continue to increase, hiring will be triggered at b and hiring will adjust X until the previously given hiring condition $pF_X(X, K) = R + h$ holds. The rate of change of employment will be given by $\delta X/\delta P = -F_X(X, K)/pF_{XX}(X, K)$. Now let's say at c that product prices start falling. The primary sector will stop hiring and be pushed back into the retention region with falling wages and stagnant employment. At d prices improve again and the hiring line is hit again at c, and hiring continues until e. A long series of negative price shocks then push it all the way back through the retention region down to the firing boundary at g. Here firing will continue until the previously given firing condition $pF_X(X, K) = R + h$ holds, and the rate of change of employment will be $\delta X/\delta P = -F_X(X, K)/pF_{XX}(X, K)$. At j prices increase again and the economy is pushed back into the retention region. Primary sector wages and employment will continue their path around Figure 3 in response to price shocks.

(vi) General Equilibrium

Now that the primary sector has been described it will be embedded in a standard competitive general equilibrium model.[10] World goods prices are exogenous, so outputs, employment and factor prices can be determined solely by production conditions, without reference to demand.

The full equilibrium conditions of the model are:

Optimal employment of primary sector labour, from the previously described firm problem:

$$pF_X(X,K) - R\{-h \text{ if } X > X_0\}\{+f \text{ if } X < X_0\} = 0 \tag{7}$$

Optimal employment of capital in the primary sector, from the firm problem:

$$pF_K(X,K) - r = 0 \tag{8}$$

Optimal employment of secondary sector labour:

$$f_x(x,k) - R = 0 \tag{9}$$

Optimal employment of capital in the secondary sector:

$$f_K(x,k) - r = 0 \tag{10}$$

Constraints on skilled wage setting, as previously described, one of which will bind:

$$W = R \tag{11^{I}}$$

or,

$$W = pF_X(X,K) + f \tag{11^{II}}$$

or,

$$W = R + f + h \tag{11^{III}}$$

Capital, with endowment denoted V, is fully employed in the two sectors:

$$0 = V - K - k$$

Unemployment is the labour endowment N less employment in two sectors:

[9] The ideal would be to construct a fully dynamic model, with a stochastic price process along the lines of Bentolila and Bertola (1990) or Bertola (1990). However, these existing models are partial equilibrium with a fixed wage, and a dynamic stochastic model with an endogenous wage has thus far proved intractable. In a recent survey of dynamic labour demand models Hamermesh and Pfann (1996, p. 1270) comment that a departure from the assumption of given product and factor prices leads to 'substantial complications'.

[10] The structure of the model is closest to a specific factors model in the trade literature, but with a floor on the price of a specific factor.

$$U = N - X - x \tag{13}$$

These seven equilibrium conditions determine the values of the seven endogenous variables $X\ x\ W\ K\ k\ r\ U$, given values of the exogenous variables $p\ N\ X_0\ V\ R\ h\ f$. The secondary sector good is the numeraire with price 1.

IV Effects of a Change in World Prices[11]

Based on the evidence noted in the introduction (summarised for instance by Sachs and Shatz 1996) world prices of unskilled labour intensive manufactured products have declined, and this corresponds in the model to a decline in the relative price of the secondary sector product or equivalently to a rise in the relative price of the primary sector product.[12] We are interested in comparative static effects in the model of an increase in p.

If primary sector firms remain within the retention region in Figures 1 and 2, then an increase in p does not change primary sector employment. The value of marginal product of skilled labour in the primary sector rises, relaxing the marginal profitability constraint and increasing the skilled wage. Capital also moves into the primary sector from the secondary sector, increasing the marginal product of labour and reinforcing the increase in primary sector skilled wages. Now in the secondary sector capital has moved out, so the marginal product of unskilled labour will fall, reducing employment in the secondary sector since the secondary wage remains fixed at the floor. It is important to note that although skilled primary sector wages have risen, the employment losses have been borne by unskilled secondary sector workers.

Putting these effects together and comparing them with the Australian evidence, the rising skilled wages and stagnant unskilled wages gives the rise in inequality documented for instance in Borland (1999). The rise in inequality occurs without major reallocations of resources, and if anything an increase in the proportion of skilled to unskilled workers employed. Gregory and Vella (1995, p. 217ff, especially Figure 6.7) divide the Australian workforce into skill groups and find that there has been an increase in the ratio of skilled to unskilled employment over the period 1976–1990. I have checked these findings against the International Labour Organisation LABORSTA database (available on the web at www.ilo.org) classified in a similar way to Gregory and Vella (i.e., professional, technical and managers have been classified as skilled). The ratio of skilled to unskilled employment has risen steadily from 0.24 in 1976 to 0.31 in 1990.

Although retirements and new labour force entrants have not been included in the model, considering them in the model strengthens the effects. If the primary sector is at a retention equilibrium and a primary sector worker retires, then primary sector firms will not employ a replacement until either cumulative retirements or world price changes push the primary sector to the hiring boundary. Until that happens the increase in the value of the marginal product of the remaining primary sector workers will be captured by them as higher wages. If the retirement is balanced by a new labour force entrant this new worker will join the pool of unemployed workers. This means that balanced flows in and out of the labour force, which do not change the size of the labour force, can increase unemployment.

It must be emphasised, before moving on to the cross country experience, that although the model is built around hiring and firing costs, the wage and unemployment effects are not the result of changes in hiring and firing costs. Empirically hiring and firing costs have not increased over the period under consideration by anywhere near enough to explain the effects we have been observing. They may even have fallen. In the present model, the labour market changes are not coming from changes in hiring and firing costs but changes in world traded goods prices in the presence of hiring and firing costs. It is thus best seen as an alternative trade based explanation to the existing Stolper–Samuelson explanation.

V Differences Across Countries

The wage inequality and unemployment changes have been different in Australia, Europe and

[11] Algebraic expressions for the comparative statics are given in the appendix available from the author on request.

[12] If the economy is able to influence world prices of the goods, then there will be feedback effects on good prices from some of the events considered later in the paper. Considering these reduces the magnitudes of the responses without changing their nature, and the assumption of given world prices simplifies the exposition.

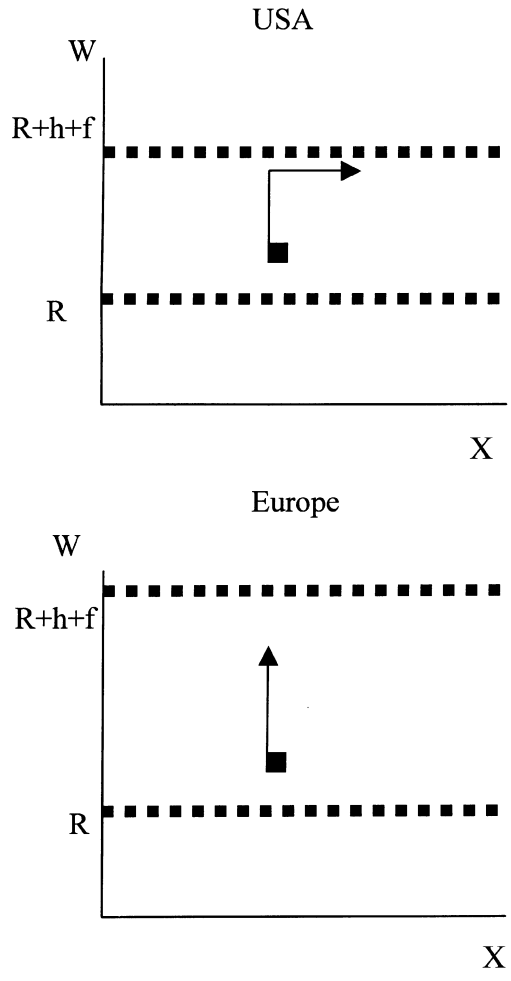
the USA, and it is important to explain this within the model. All countries face the same changes in prices of traded goods, so different labour market institutions are the logical candidate for explaining differences. In the model, differences in labour market institutions can be captured by different levels of hiring and firing costs and minimum wages.

Consider the effect of different hiring and firing costs. Earlier in the paper it was shown that the band through which product prices can fluctuate without inducing primary sector hiring or firing is wider the larger is the sum of hiring and firing costs. Europe, with more regulation of the employment relationship and higher firing costs will have a wider band.[13] This means that if the USA and Europe face the same world price shocks over the period the USA will be pushed more into the region where primary sector firms hire, and so we would expect the primary sector job creation record of the USA to be better over the period. Figure 4, based on the earlier Figure 3, illustrates this. The common world price shock represented in Figure 4 by the arrow pushes the USA to the firing line while Europe remains within the retention region.

The other institutional difference is the level of the wage floor. Europe with its more generous social security system and minimum wages will have a higher R than the USA. As well as the difference in levels, the minimum wage has fallen in the USA – Fortin and Lemieux (1997, p. 79) estimate that 'the real value of the minimum wage decreased by more than 30 per cent during the 1980s'. The effect of the minimum wage differences and changes is illustrated in Figure 5. The thin and then thick dotted lines on the USA part of Figure 5 indicate the boundaries before and after the decrease in the minimum wage.

The USA with its lower minimum wage begins closer to the hiring boundary for any given world goods prices, and this will reinforce the effect of lower hiring and firing costs in helping the USA create more primary sector jobs. There will be also

FIGURE 4
Effect of Hiring and Firing Cost Differences

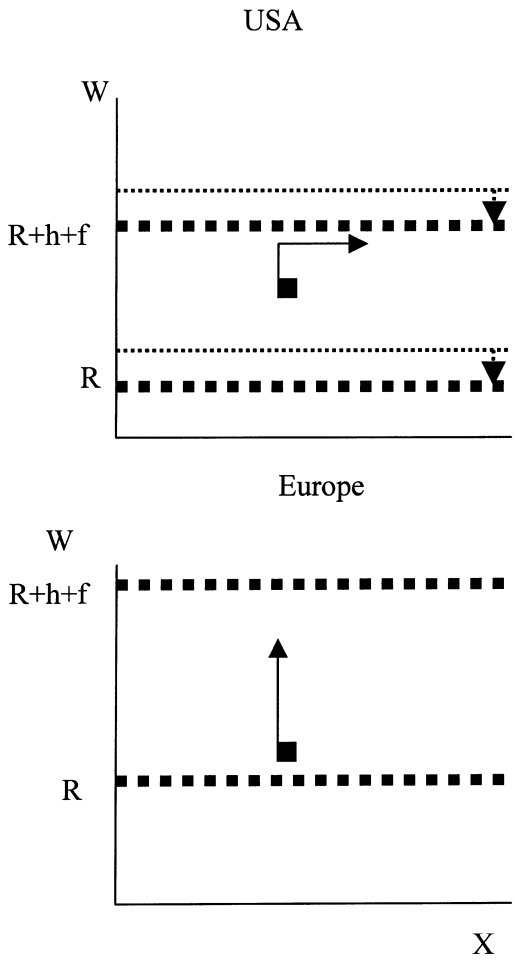


be more secondary sector jobs in the USA through the standard textbook minimum wage effect.

Besides affecting employment, the lower and falling USA minimum wage will affect the wage inequality outcomes. Since we are now making comparisons with different levels of the minimum wage, it is appropriate to consider the ratio of the skilled wage to the unskilled wage. This ratio rather than the absolute size of the gap has been the important thing in much of the empirical literature. The movements in the ratios for the USA and Europe are affected by the magnitudes

[13] Europe here means the continental European countries which generally have highly regulated labour markets and high wage floors. Finer differences between countries and exceptions within Europe are ignored for the purposes of generalisation. The USA is an example of a labour market at the opposite extreme, and Australia somewhere in between.

FIGURE 5
Effect of Minimum Wage Differences and Changes



of their changes in skilled wages and their minimum wages. Although in the model Europe may, paradoxically, have a higher skilled wage than the USA, the USA can have a bigger increase in the ratio of skilled to unskilled wages if the magnitude of the fall in the USA minimum wage over the period is large enough. Recent evidence presented by Lee (1999) suggests that the fall in the USA minimum wage has been the dominant influence in the USA, so the model can explain why the USA has experienced a greater increase in inequality than Europe.

Overall, based on the model we would expect the USA to have a better job creation record than Australia, and a much better record than Europe. The comparisons in wage dispersion are not as clear cut, but if the minimum wage fall in the USA dominates, then the USA would be expected to have more wage dispersion than Australia or Europe. This is consistent with what we have observed.

VI Conclusions

This paper has presented a new explanation of the recent trends in wage inequality and unemployment that has a number of advantages over the standard Stolper–Samuelson trade explanation. It accounts for the wage and unemployment movements in the same model, is more consistent with the evidence on changes in the factor usage and can explain some of the differences between countries. These advantages come from having trade work indirectly through rents associated with hiring and firing costs, and from considering labour market rigidities which generate unemployment.

In order for an explanation based on labour rents to be plausible rents must be large enough for their movements to be important. A long line of empirical papers, including Katz and Summers (1989) and Blanchflower *et al.* (1996) present evidence that labour rents are indeed large. For Australia, Preston (1997) highlights large unexplained wage differentials which are likely to be rents. Borland (1999, p. 213) mentions these differentials in relation to earnings inequality in Australia. However, it is unclear how much hiring and firing costs contribute to labour rents, as against efficiency wage and other effects. The studies of the magnitudes of hiring and firing costs cited earlier in the paper suggest they may be an important part of these rents, but to settle this we need better data on patterns of hiring and firing costs across industries and skill groups.

If increases in labour rents are a major contributor to the rise in inequality, then policies which reduce these rents will enhance efficiency, as well as equity through helping low skilled workers and the unemployed. Such policies might include training or subsidies which reduce the effective wage paid by firms hiring unemployed workers. The effects of such policies though are complex and issues besides those which are the focus of the present paper need to be considered.

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