The Quality of Labor Relations and Unemployment

Olivier Blanchard and Thomas Philippon*

November 26, 2006

Abstract

There is a clear negative relation across OECD countries between measures of the quality of labor relations and unemployment. We argue that conflictual labor relations cause high unemployment, and we propose a model to think about this issue. Empirically, we use historical evidence from the 19th century to construct an instrument for current labor relations and establish causality. Theoretically, we consider an economy where asymmetric information can result in bargaining failures, inefficiencies and high unemployment in equilibrium. These inefficiencies can however be alleviated by higher trust, sustained through repeated interactions between firms and workers. We think of countries with different labor relations as playing different equilibria of the same repeated game, and we use our model to interpret cross-country and time series facts about labor relations, strikes, and unemployment in OECD countries since the early 1970s.

*MIT and NBER, and NYU and NBER respectively. An earlier version of this paper circulated as MIT WP 04-25. Much of the empirical evidence and the model developed in this version are new. We thank Pierre Cahuc, our discussant at the IZA-PSE workshop on cultural economics. We are indebted to Youngjin Hwang for excellent research assistance.

There is a clear negative relation across OECD countries between measures of the quality of labor relations and unemployment. In this paper, we argue that this relation is causal, and offer a framework to think about the relation between the two. We consider an economy where asymmetric information can result in bargaining failures, inefficiencies and high unemployment. These inefficiencies can however be alleviated by higher trust, sustained through repeated interactions between firms and workers. We show how the equilibrium degree of trust, which we think of as capturing the quality of labor relations in our model, depends on both economic and non economic factors (history). We then use our model to interpret cross-country and time series facts about labor relations, strikes, and unemployment in OECD countries since the early 1970s.

In section 1, we study the empirical relation between labor relations, strikes, and unemployment across OECD countries since the early 1970s. We focus first on the relation between labor relations and unemployment. Looking across OECD countries, we show that countries with better labor relations have experienced a lower increase in unemployment. Using different instruments, we argue that this relation is causal, going from the quality of labor relations to unemployment. We then turn to the relation between labor relations, strikes, and unemployment. We show that the quality of labor relations is highly correlated with strikes in the 1960s – i.e. with strike activity before the increase in unemployment. We show that, until the early 1980s, countries where unemployment rates increased more also experienced a larger increase in strike activity. Since the early 1980s, however, strike activity has decreased, often dramatically, while unemployment has remained high in many countries.

In section 2, we present our benchmark model. The model is an extension of the standard search model to a setup with asymmetric information and bargaining failures. We model repeated interactions between the firm and its workers, so that inefficiencies might be alleviated by the reputation of the firm. In section 3 we characterize the properties of the equilibrium, and in particular the equilibrium degree of trust – defined as the proportion of firms with good reputation – the variable which captures the quality of labor relations in our model. The economic environment pins down the maximum sustainable degree of trust, but the actual degree of trust can be anywhere between zero and this maximum. Thus, for a given economic environment, some countries might have good labor relations, and some

might have bad labor relations. The countries with bad labor relations will have higher unemployment, and will be more strongly affected by shocks that increase the amount of firm-level asymmetric information. If the economic environment deteriorates, the maximum sustainable degree of trust may itself decrease. This may lead to a decrease in the actual degree of trust, to a deterioration of labor relations, and thus to a further effect of the shocks on unemployment.

In section 4, we show how this model can potentially explain the cross-country relation between the quality of labor relations and the rise of unemployment. The model also naturally explains how the increase in unemployment was accompanied with an increase in strikes. What it does not explain however is why strike activity has decreased so much since the 1980s, while unemployment remained high in many countries. We argue that to explain this fact, one needs to endogenize the technological choice of firms.

This leads us, in section 5, to extend our model to allow firms to adapt their technology in response to deteriorating labor relations. We show how this extended model can potentially account both for the cross country and time series facts presented in section 1.

1 Empirical Evidence

Figure 1 shows the strong negative cross-country correlation across 21 OECD countries between the unemployment rate in 2000 and the quality of labor relations, as reported in the 1999 Global Competitiveness Report. The measure of the quality of labor relations is constructed from the answers to the following question:"*Labor/employer relations are generally cooperative*". The 1999 survey was sent to about 4,000 executives in 59 countries. Responses could vary from 1 (strong disagreement) to 7 (strong agreement). Actual mean responses vary from 3.3 for France to 6.4 for Switzerland.[1]

The first column of **Table 1** presents the results of the associated OLS regression: The quality of labor relations is highly statistically and economically significant. The R^2 is 0.55, and an increase in the measure from 3.3 to 6.4 is associated with a decrease in the unemployment rate of 7.7 percentage points. The second column shows that the measure remains

[1] The same question was asked in a number of GCR surveys, starting in 1993; the measures are highly correlated, the rankings very stable, and the results very similar using earlier or later measures. For more details on this and other survey-based measures, see Mueller and Philippon (2006).

significant when one controls for other labor market institutions, taken from Blanchard and Wolfers (2000). Once the quality of labor institutions is allowed for, formal institutions do not appear to be very significant. In particular, union density and union coverage are not significant. The third column shows that the quality of labor relations is not a proxy for the bargaining power of unions. It does so by adding as an additional variable in the regression a measure of union strength taken from the same survey. The measure is constructed from the answer to the question: "*The collective bargaining power of workers is high.*" The answer to the question can vary from 1 (strong disagreement) to 7 (strong agreement). Actual mean responses vary from 3.4 for Switzerland to 5.8 for Finland. The quality of labor relations remains highly significant, while union strength is not.

The fourth and fifth columns turn to causality. The first potential source of endogeneity is that different countries may have been hit by different shocks between 1970 and 2000: Countries with worse shocks might have experienced both higher unemployment, more downsizing of firms, and thus worse labor relations. To deal with this type of endogeneity, we use measures of strike activity in the 1960s as instruments – i.e. measures of strike activity before the shocks that led to the eventual increase in European unemployment.[2]

Two measures of strike activity are available for most countries and most years for the 1960s, namely the number of workers involved in labor conflicts (WI) and the number of work-days not worked (DL). We use both, each per worker employed.[3] The two measures are highly but not perfectly correlated.[4]. Two empirical issues arise: The first is how to treat Portugal and Spain, which were dictatorships and where strikes were illegal in the 1960s. The wage explosion that took place in the two countries upon the end of the dictatorship suggests that the true measure of trust was in fact quite low in the 1960s. But we have no way to take this into account and so drop both countries from the sample in the relevant regressions. The other is how to treat the years 1968 and 1969, where, in a number of countries, most notably France and Italy, there was high labor unrest and unusually high

[2] A better instrument would be a measure of the quality of labor relations pre-1970. We could not find such a measure.

[3] The data come from the CEP-LSE data set. A third measure available in that data set, namely the number of conflicts, is missing too many observations for us to use it.

[4] "Days lost" is not defined consistently across countries. For instance, it sometimes includes only conflicts with more than 100 days lost (Germany), or it includes strikes only (as opposed to strikes plus lock-outs) for France. As a consequence, the ratio of DL/WI in the 1960s is more than 10 times lower in France that in the US. See Hibbs (1987)

levels of strikes. On the argument that these episodes reflected other factors than the one we want to capture, we construct our measure of strikes by using average strike activity over the period 1960 to 1967 rather than over the whole decade (Given that France and Italy are high unemployment countries, our results below would actually be stronger, were we to use the whole decade to construct the mean.)

To give a sense of the relation between strike activity in the 1960s and the quality of labor relations today, we plot in **figure 2** our measure of the quality of labor relations in 1999 against a synthetic measure of strike activity in the 1960s, constructed as $Conf60_i = max\left(\frac{DL_i/N_i}{std(DL_i/N_i)}, \frac{WI_i/N_i}{std(WI_i/N_i)}\right)$, where DL_i are days lost, WI_i are workers involved, and N_i is the number of employees in country i. The motivation for this specification is that recorded strikes happened for sure, but not all strikes are recorded, so that both measures are lower bounds on strike activity. The figure shows that higher strike activity in the 1960s is clearly associated with lower quality of labor relations today. The fourth column of **Table 1** shows the results of IV estimation, using both DL_i/N_i and WI_i/N_i (and not the synthetic measure) as instruments for current labor relations. It shows that our earlier OLS results are not driven by reverse causality from bad shocks to bad labor relations. The point estimate on the quality of labor relations does not change much relative to the OLS regression, perhaps because countries were hit by roughly similar shocks.

A second type of endogeneity is that both strikes in the 1960s and unemployment rates are driven by the same unobserved country characteristics. To deal with this issue, we borrow the theory of Crouch (1993) as explained in Mueller and Philippon (2006). Crouch (1993) argues that labor relations were strongly influenced by the attitudes of the state towards early unions in the 19th century. He distinguishes three categories of countries. In four countries, the state was hostile towards the unions: France, Italy, Spain and Portugal. In five countries, the state was neutral: Denmark, Norway, Sweden, Finland, the UK and Ireland. In four countries, the state was supportive: Germany, Switzerland, the Netherlands and Austria. Finally, Belgium borrowed from both the French and Dutch traditions: for much of the 19th century, it was heavily influenced by France, but the Guilds of the great Flemish cities played an important role in building the state, like in Germany. On balance, we therefore put Belgium together with the neutral states.[5]

[5] Crouch actually goes further and provides a theory for the attitudes of the states based on the political

The fifth column of **Table 1** reports the results of IV estimation using Crouch's categories as instruments for the quality of labor relations. The IV regression confirms that hostile labor relations cause high unemployment, and once again, the coefficient appears to be quite stable.

We now turn to the evolution of labor relations, strikes, and unemployment over time. We have no direct measure of labor relations before 1993, but the evidence since 1993 (the first time the GCR survey asked the question) suggests that the quality of labor relations is rather stable over time. **Figures 3** and **4** then present the evolution of unemployment and strike activity (using days lost per worker, the only series available for each country for the whole sample) for the three categories defined by Crouch – hostile, neutral, and cooperative. The figures show that, from the late 1960s to the late 1970s, both strikes and unemployment increased, more so in countries with hostile labor relations. Since the early 1980s, however, unemployment has increased or at least stayed constant, but strikes have decreased, especially in countries with bad labor relations, to the point that strike rates are now roughly similar in all the countries in our sample.

Our goal in the rest of the paper is to provide a model and offer interpretations for these facts.

---

struggles with the catholic church. He argues that, to affirm their authority over the Catholic church, liberal states confronted all forms of organized interests, including guild structures and labor organizations. By doing so, these states created hostile labor unions. By contrast,

> "Lutheran churches have historically been obedient national institutions, [...] asserting no superior political loyalty as did the Vatican-based Catholic Church [...] This lack of 'jealousy' reduced the extent to which these states confronted guilds and subsequently provoked the formation of highly oppositional labor movements." Crouch (1993)

Note that Crouch (1993)'s theory is not about religion as such, but about politics: according to him, what mattered were the state-church conflicts created by the political ambitions of the Catholic church, not the fact that citizens of these countries happened to be catholic. Of course, one would expect the conflicts to be stronger in more catholic countries, but there are two illuminating exceptions. The first is Ireland, which was under British rule at the time of the creation of labor unions. Therefore, early Irish labor institutions resemble the British ones, and differ greatly from those of other catholic countries. The second exception is Austria, which took Germany as a role model, and in which state-church conflict were remote because the state was very weak. As a result, early Austrian institutions resemble German ones. It seems plausible that the state-church conflicts of the 19th century do not affect unemployment directly today, so we can use the Crouch classification as a valid instrument.

2 Benchmark Model

A natural formalization approach, given our goals, is to introduce asymmetric information in an otherwise standard matching/search model of the labor market.

We start by describing the stage bargaining game between workers and firms in section 2.1. We consider the non-cooperative outcome of the stage game in section 2.2, and the cooperative outcome in section 2.3. We describe the macroeconomic closure in section 2.4. Section 3 characterizes the equilibrium level of unemployment as a function of the proportion of firms with good reputation – the degree of trust for short – and the equilibrium range for the degree of trust, and its dependence on economic and non economic factors.

2.1 Bargaining Game

Once a firm and a worker have matched, the initial productivity of the match is revealed to the firm, but not to the worker. Productivity, y, can take one of two values, y^h with probability p, or y^l with probability $1-p$. We assume that $y^h > y^l > 0$ and we define average productivity as $\bar{y} \equiv p\ y^h + (1-p)\ y^l$. Productivity remains constant until, with probability λ per unit of time, a new productivity is drawn from the same distribution, and, with probability δ per unit of time, the match becomes unproductive and ends.

We denote the reputation of the firm by the variable ρ. The reputation of the firm can be good, $\rho \equiv g$, or bad, $\rho \equiv b$. Associated with the two levels of productivity are the ongoing match-surpluses $S(y^h, \rho)$ and $S(y^l, \rho)$. The relation of the surplus to productivity depends on the rest of the model and will be derived later. We will later assume that the surplus is positive even if productivity is low, so that matches should never be dissolved. The average surplus is denoted $\bar{S}(\rho) \equiv E^y [S(y, \rho)]$.

Let U denote the value for the worker of being unemployed and V the value for the firm of having a vacancy. Let $J(y, \rho)$ and $W(y, \rho)$ be respectively the values for the firm and for the worker of being in an ongoing match with productivity y and reputation ρ. Then, by definition,

$$J(y, \rho) - V + W(y, \rho) - U = S(y, \rho). \tag{1}$$

Bargaining determines the values of $J(y, \rho)$ and $W(y, \rho)$ given $S(y, \rho), V$ and U. We formalize bargaining as follows:

- The firm makes an offer W.
- The worker either rejects the offer, with probability s, or accepts the offer, with probability $1-s$. The probability of rejection is endogenous and will be determined in equilibrium. In particular, it will be a function of the reputation of the firm.
- If the worker accepts the offer, the match takes place.
- If the worker rejects the offer, a fraction γ of the match-surplus is destroyed. The worker then makes a take-it or leave-it counter-offer W^c. If the firm rejects the offer, the match ends.

  An alternative formalization would be that, with probability γ, the match ends. This alternative formalization makes no difference to the bargaining game, but it creates inefficient separations and additional flows into unemployment, and so affects equilibrium unemployment. We shall return to this formalization choice later on, when we simulate the model.

We focus on the separating equilibrium, where the firm tells the truth about productivity. Under that condition, we can solve for the equilibrium backwards. The counteroffer by the worker will clearly be such as to extract all the surplus from the match. Thus

$$W^c(y,\rho) = U + (1-\gamma)\, S(y,\rho), \tag{2}$$

and, from (1),

$$J^c(y,\rho) = V.$$

The lowest initial offer by the firm that the worker will accept is therefore

$$W(y,\rho) = W^c(y,\rho) = U + (1-\gamma)S(y,\rho), \tag{3}$$

which implies

$$J(y,\rho) = V + \gamma S(y,\rho). \tag{4}$$

The firm gets a share γ of the surplus, the worker a share $1-\gamma$. The parameter γ therefore captures the bargaining power of the firm.

The key issue is how firms are induced to tell the truth. We consider two cases: non-cooperative Nash equilibrium played by firms with a bad reputation, and cooperative equilibrium sustained by good reputation. Let μ and $1-\mu$ be the fractions of firms with good reputation and bad reputation, respectively. For the moment we take μ as given.

2.2 Non Cooperative Equilibrium

A fraction $1-\mu$ of the matches have a bad reputation, $\rho = b$. These firms play the non-cooperative equilibrium. The worker does not observe the productivity of the match. The firm must therefore have the correct incentives the tell the truth. If productivity is high, the value for the firm of telling the worker that productivity is high must be at least equal to the value of telling the worker that productivity is low. Thus, the truth telling constraint is

$$S\left(y^h, b\right) - W(y^h, b) \geq (1-s)(S(y^h, b) - W(y^l, b)) + s\left((1-\gamma)S(y^h, b) - W^c(y^l, b)\right).$$

The LHS gives the value to the firm of telling the worker that productivity is high. The RHS gives the expected value of telling the worker instead that productivity is low. The first term represents the value to the firm if the worker accepts the offer $W(y^l)$, something that happens with probability $1-s$. The second term represents the value to the firm if the worker rejects its initial offer and makes the counteroffer $W^c(y^l)$, something that happens with probability s. Using the equations (2) and (3) above, the constraint can be rewritten to give the equilibrium probability of a rejection. Assuming the earlier condition holds as an equality (there is no reason for workers to choose a higher rejection probability than the minimum required to induce truth telling), we obtain

$$s\left(b\right) = \frac{1-\gamma}{\gamma} \ \frac{S(y^h, b) - S(y^l, b)}{S(y^h, b)}. \tag{5}$$

The probability of a rejection when the firm announces that productivity is low is an increasing function of $S(y^h, b) - S(y^l, b)$. Given that the firm gets a share of the surplus, the higher the difference between the surplus in the high and low productivity states, the larger the value to the firm of announcing low productivity when productivity is in fact high, and so the higher the probability of a rejection required to deter the firm from lying. The positive probability of a rejection creates an inefficiency. The average deadweight loss

due to asymmetric information is given by

$$\bar{D}\left(b\right) = \left(1-p\right)\ s\left(b\right)\ \gamma\ S(y^l, b). \tag{6}$$

It is useful to compute the average value of a match to a worker and to a firm, pre-bargaining. Denote them by $\bar{W^{\lambda}}$ and $\bar{J}^{\lambda}$. They are given by

$$\bar{W^{\lambda}}\left(\rho\right) = U + (1-\gamma)\bar{S}\left(\rho\right), \tag{7}$$

and

$$\bar{J}^{\lambda}\left(\rho\right) = V + \gamma\bar{S}\left(\rho\right) - \bar{D}\left(\rho\right). \tag{8}$$

Note that the partial equilibrium incidence of the deadweight loss falls fully on the firm, not on the worker.

2.3 Cooperative Equilibrium

A fraction μ of firms have a good reputation, $\rho = g$. The cooperative equilibrium is sustained by a trigger strategy. If the firm ever lies, the reputation of the firm switches to $\rho = b$ and bargaining becomes non-cooperative, as described in the previous section. Note that productivity is observable after bargaining, so that the worker can observe ex-post whether the firm has told the truth or not. Reputation is match specific, and ends with the end of the match (a δ shock). The critical constraint in this dynamic game is the dynamic truth-telling constraint

$$S(y^h, g) - W(y^h, g) + \frac{\lambda}{r+\delta+\lambda}\ \bar{J}^{\lambda}(g) > S(y^h, g) - W(y^l, g) + \frac{\lambda}{r+\delta+\lambda}\ \bar{J}^{\lambda}(b).$$

The issue of whether the firm will tell the truth arises only if productivity is high and the firm has a good reputation. The benefits from telling the truth are given by the LHS, the benefits from not telling the truth by the RHS. Not telling the truth increases the part of the surplus going to the firm today, but at the cost of a bad reputation in future bargaining. Naturally, we have

$$\bar{D}\left(g\right) = 0.$$

since workers never reject the offers from firms with a good reputation.

Using equations (7) and (8), we can rewrite the truth-telling constraint as

$$(1-\gamma)(S(y^h, g) - S(y^l, g)) \leq \frac{\lambda}{r+\delta+\lambda}\ \left[\bar{D}(b) + \gamma\left(\bar{S}\left(g\right) - \bar{S}\left(b\right)\right)\right]. \tag{9}$$

The LHS is the immediate payoff from giving a smaller fraction of the match surplus to the worker, and the RHS is the NPV of the future losses from having a bad reputation. The RHS has two component, the first is deadweight loss expected when bargaining takes place in the future, and the second is the lost surplus. To draw further implications, we need however to solve for the various surplus terms in equation (9), and so we turn to the macroeconomic closure.

2.4 Macroeconomic Closure

The macroeconomic closure follows closely the standard matching/bargaining model:

- There is a mass of workers of size 1, with u workers unemployed, and $1-u$ workers employed. The mass of vacancies is equal to v, and is endogenously determined.
- Matches are determined by a constant-returns matching function $m(u,v)$. Defining $\theta \equiv v/u$, so θ measures the tightness of the labor market, the matching rate for vacancies, $q(\theta) \equiv m/v = m(1/\theta, 1)$ is a decreasing function of θ. The matching rate for the unemployed is in turn equal to $\theta q(\theta)$ and is an increasing function of θ.

Given the equilibrium degree of tightness, unemployment dynamics follow

$$\dot{u} = \delta(1-u) - \theta q(\theta) u.$$

Note that we have ruled out inefficient separations, and so the destruction rate is simply δ. For $\dot{u} = 0$ (as we are limiting ourselves to look at steady states), the equilibrium unemployment rate is thus given by

$$u = \frac{\delta}{\delta + \theta q(\theta)}. \tag{10}$$

3 Equilibrium

There are four steps needed to solve for the macroeconomic equilibrium:

- The first two are the same as in Pissarides (2000): we need to find the various value functions, and then impose free entry. The free entry condition will give us a link between market tightness θ and the deadweight losses from bargaining failures. Absent

these deadweight losses, this would be enough to solve for θ, like in Pissarides (2000). Here, however, this is not enough since the deadweight losses from equation (6) are endogenous.

- The third step uses the incentive constraint (5) to obtain the deadweight losses as a function of θ and μ. After these three steps, we can solve for θ as a function of μ.
- The fourth and final step is to use the truth telling constraint (9) in order to compute the equilibrium range of values of μ.

We now detail these four steps.

3.1 Value Functions

The surplus associated with a match with productivity y and reputation ρ is given by:

$$rS(y,\rho) = y - r\left(U+V\right) - \delta S\left(y,\rho\right) + \lambda\left(\bar{S}\left(\rho\right) - \bar{D}\left(\rho\right) - S\left(y,\rho\right)\right).$$

The first two terms on the RHS give the flow value of the match, net of the opportunity cost. The next term gives the capital loss associated with the end of the match, times the probability that such a change takes place. The last term gives the expected capital gain or loss associated with a new draw of productivity, times the probability that such a change takes place. As we saw earlier, the expected value of the pre-bargaining surplus is equal to the expected surplus net of the expected deadweight loss coming from the positive probability of a bargaining failure. Define $\Delta \equiv y^h - y^l$, so that $y^h = \bar{y} + (1-p)\,\Delta$ and $y^l = \bar{y} - p\Delta$. It follows from the equation above that $S(y,\rho)$ is given by

$$S\left(y^h,\rho\right) = \bar{S}\left(\rho\right) + \frac{(1-p)\,\Delta}{r+\delta+\lambda}, \tag{11}$$

and

$$S\left(y^l,\rho\right) = \bar{S}\left(\rho\right) - \frac{p\Delta}{r+\delta+\lambda}, \tag{12}$$

where $\bar{S}\left(\rho\right)$, the average surplus from a match with reputation ρ is given by

$$\bar{S}\left(\rho\right) = \frac{\bar{y} - r\left(U+V\right) - \lambda\bar{D}\left(\rho\right)}{r+\delta}. \tag{13}$$

These equations imply a simple relation between differences in productivity and differences in the associated surplus

$$S\left(y^h,\rho\right)-S\left(y^l,\rho\right)=\frac{\Delta}{r+\delta+\lambda}. \tag{14}$$

We now need to derive the values of U and V. We assume that search is random. Therefore, the worker has probability μ of matching with a firm with good reputation, and probability $1-\mu$ of matching with a firm with bad reputation. On average, the value of a match for the worker is

$$E^{\rho}\left[\bar{W}^e\left(\rho\right)\right]\equiv\mu\bar{W}^e(g)+(1-\mu)\bar{W}^e(b).$$

Let $\underline{u}$ the flow utility associated with being unemployed, and c be the flow cost of having a vacancy. The value of being unemployed is

$$rU=\underline{u}+\theta q(\theta)\left(E^{\rho}\left[\bar{W}^e\left(\rho\right)\right]-U\right), \tag{15}$$

Using (7), we can rewrite (15) as

$$rU=\underline{u}+\theta q(\theta)\left(1-\gamma\right)E^{\rho}\left[\bar{S}\left(\rho\right)\right]. \tag{16}$$

Taking expectations of (13) with respect to reputation, we obtain

$$E^{\rho}\left[\bar{S}\left(\rho\right)\right]=\frac{\bar{y}-rU-\left(1-\mu\right)\lambda\bar{D}(b)}{r+\delta},$$

and using (16) we get

$$E^{\rho}\left[\bar{S}\left(\rho\right)\right]=\frac{\bar{y}-\underline{u}-\left(1-\mu\right)\lambda\bar{D}(b)}{r+\delta+\left(1-\gamma\right)\theta q(\theta)}. \tag{17}$$

This is a familiar relation, giving the surplus as the properly discounted value of productivity net of the flow utility of being unemployed. The difference is the presence of the deadweight loss, coming from the fact that changes in productivity in the future may lead to a bargaining failure.

3.2 Free Entry

The value of a vacancy is

$$rV=-c+q(\theta)\left(E^{\rho}\left[J^e\left(\rho\right)\right]-V\right), \tag{18}$$

and the free entry condition implies that the value of a vacancy V must be equal to zero. From equations (8), (18), and the free entry condition, we get

$$\frac{c}{q(\theta)} = \gamma E^{\rho}\left[\bar{S}\left(\rho\right)\right] - (1-\mu)\bar{D}(b). \tag{19}$$

This is again a familiar relation, linking the degree of tightness to the average surplus from a match. The difference with the standard case is the presence of the deadweight loss due to asymmetric information and bargaining failures. The higher the surplus, or the lower the deadweight loss, the tighter the labor market. To characterize the equilibrium in the traditional search model, we usually combine (19) and (17). In our model, this leads to

$$\frac{c}{q(\theta)} = \gamma \frac{\bar{y} - \underline{u} - (1-\mu)\,\lambda \bar{D}(b)}{r+\delta+(1-\gamma)\,\theta q(\theta)} - (1-\mu)\bar{D}(b). \tag{20}$$

In the particular case where $\mu = 1$ or $\bar{D}\left(b\right) = 0$, we have the same model in Pissarides (2000) and the above equation determines down the tightness of the labor market. In general however, to solve our model, we must obtain a equation for $\bar{D}\left(b\right)$.

3.3 Deadweight Losses

We just obtained θ as a function of $\bar{D}(b)$ using the free entry condition. We now derive $\bar{D}(b)$ as a function of θ from the non-cooperative IC constraint (5). Using (14), we can rewrite (5) as

$$s\left(b\right) = \frac{1-\gamma}{\gamma}\ \frac{\Delta}{r+\delta+\lambda}\ \frac{1}{S(y^h,b)}.$$

Replacing in (6) we get

$$\bar{D}(b) = (1-p)\left(1-\gamma\right)\ \frac{\Delta}{r+\delta+\lambda}\ \frac{S(y^l,b)}{S(y^h,b)}\ .$$

Using (11) and (12), we therefore obtain

$$\bar{D}(b) = (1-p)\left(1-\gamma\right)\ \frac{\Delta}{r+\delta+\lambda}\ \frac{\bar{S}\left(b\right) - \frac{p\Delta}{r+\delta+\lambda}}{\bar{S}\left(b\right) + \frac{(1-p)\Delta}{r+\delta+\lambda}}\ . \tag{21}$$

where, from (13)

$$\bar{S}\left(b\right) = E^{\rho}\left[\bar{S}\left(\rho\right)\right] - \frac{\mu\lambda\bar{D}\left(b\right)}{r+\delta}\ . \tag{22}$$

3.4 Characterization of Market Tightness

We have four equations (17), (19), (21) and (22) in four unknowns $\bar{D}(b)$, $\bar{S}(b)$, $E^{\rho}\left[\bar{S}\left(\rho\right)\right]$ and θ. In the appendix, we derive the following proposition:

Proposition 1 *For Δ not too large:*

1. *The degree of labor market tightness, θ is an increasing function of the proportion of firms with good reputation, μ and a decreasing function of Δ.*
2. *The deadweight loss, $\bar{D}(b)$ is a decreasing function of the proportion of firms with good reputation, μ, and an increasing function of Δ.*

Thus, the higher the degree of trust in the economy, the tighter the labor market – and by implication, the lower the unemployment rate – and the lower the deadweight loss. The higher the degree of uncertainty about productivity, the less tight the labor market – and by implication, the higher the unemployment rate – and the higher the deadweight loss.[6]

3.5 Sustainable Equilibria

We have derived the equilibrium conditional on a given value of μ, the fraction of firms with good reputation. The last step is to determine μ. Rewrite the dynamic truth telling constraint (9) as

$$(1-\gamma)(S(y^h,g)-S(y^l,g)) \leq \frac{\lambda}{r+\delta+\lambda}\bar{D}(b)\ \left[1+\frac{\gamma\lambda}{r+\delta}\right],$$

or

$$\lambda\ \left[1+\frac{\gamma\lambda}{r+\delta}\right]\ \bar{D}(b) \geq (1-\gamma)\Delta. \tag{23}$$

An increase in $r+\delta$ shortens the horizon and makes trust harder to sustain. An increase in λ, the probability of a new productivity draw and thus the probability of renegotiation, makes reputation more valuable and easier to sustain. An increase in γ increases the surplus going to the firm and makes it easier to sustain trust. Finally, the deadweight loss $\bar{D}(b)$ must

[6] This is subject to the caveat that Δ not be too large. In our simulations, we have found the derivatives to satisfy the sign conditions of Proposition 1 for any Δ satisfying the condition that the surplus from a low productivity match is positive. We have been unable, however, to prove it analytically.

be large enough since it represents the punishment in case the firm lies. The equilibrium is described by the following proposition:

Proposition 2 *Any $0 \leq \mu \leq \bar{\mu}$ is an equilibrium. The upper bound $\bar{\mu}$ is characterized as follows:*

1. *If the dynamic truth telling constraint (23) does not hold for $\bar{\mu} = 0$, then $\bar{\mu} = 0$. The maximum degree of trust is equal to zero.*

2. *If the dynamic truth telling constraint holds for $\bar{\mu} = 1$, then $\bar{\mu} = 1$. The maximum degree of trust is equal to one.*

3. *If the dynamic truth telling constraint holds for $\bar{\mu} = 0$, but does not hold for $\bar{\mu} = 1$, then $\bar{\mu}$ is strictly between zero and one, and given by the dynamic truth telling constraint holding with equality. (The existence of such an equilibrium follows from the fact that the deadweight loss is a decreasing function of μ.)*

The proposition gives a characterization of the maximum degree of trust as a function of the economic environment. It also states that, for a given $\bar{\mu}$, there is a continuum of equilibria between 0 and $\bar{\mu}$. It is clear that $\mu = 0$ is always an equilibrium since it involves only repeating the non-cooperative Nash solution of the stage game. On the other hand, μ cannot exceed $\bar{\mu}$ since this would violate the dynamic IC condition. While our proposition describes what the equilibrium must be like, it does not say how the equilibrium is reached, and the "mixed" equilibrium $0 < \mu < \bar{\mu}$ is consistent with many interpretations. The simplest is that it depends to some extent on human relations inside the firm. In some countries, managers and workers are more likely to get along than in others. For instance, when a worker and a firm meet for the first time, we could assume that both parties receive a signal about their "affinities." The signal is positive with probability μ, in which case they play the cooperative strategies, and this behavior is self-fulfilling.

It is clear that equilibria with higher values of μ ($\mu \leq \bar{\mu}$) Pareto-dominate the equilibria with lower values of μ, and there is nothing in the model that would prevent a country from jumping to the good equilibrium. There is nothing that would guarantee it either. That is the usual issue with multiple equilibria. One way to put more structure would be to depart

from the assumption of full rationality and argue that, in some countries, some workers do not trust the firms, no matter what the firms do.[7] In this case, $\bar{\mu}$ becomes a function of the fraction of hostile workers because the dynamic IC condition is more difficult to satisfy when there are more hostile workers. We could then assume that countries always coordinate on the Pareto dominating equilibrium, $\mu = \bar{\mu}$, but this Pareto dominating equilibrium would itself be a function of the historically given share of hostile workers. The results would be essentially the same as those obtained here.[8] Our model therefore offers an interpretation of differences in the quality of labor relations as being based partly on economic factors, and partly on non-economic factors. Economic factors, such as for example the degree of uncertainty Δ, determine $\bar{\mu}$, the upper bound on the degree of cooperation. But given this upper bound, the equilibrium degree of cooperation may be anywhere between 0 and $\bar{\mu}$. This suggests the following approach. In looking at differences across countries, it seems reasonable to start with the assumption that they are facing roughly the same economic conditions, and that differences in the evolution of unemployment come from differences in μ's. In looking instead at movements in unemployment in a given country over time, it seems reasonable to think of them as coming either from reactions to shocks for a given μ, or from movements in $\bar{\mu}$, which, if binding, lead in turn to movements in μ. This is the approach we follow in returning to the data in the next section.

4 Interpreting the Empirical Evidence

4.1 A Simple Case

To gain the basic intuition for the implications of the model, consider the case where Δ is small, and the first-order approximation to the deadweight loss around $\Delta = 0$ is given by:

$$\bar{D}(b) \approx (1-p)(1-\gamma)\,\frac{\Delta}{r+\delta+\lambda}.$$

Consider two countries, one country with $\mu = 0$ (say France for concreteness) and a country with $\mu = 1$ (say Denmark). From equation (20), equilibrium labor market tightness in France is given by:

$$\frac{c}{q(\theta)} = \gamma\,\frac{\bar{y}-\underline{u}-\lambda\bar{D}(b)}{r+\delta+(1-\gamma)\,\theta q(\theta)} - \bar{D}(b),$$

[7] It is tempting to replace "workers" by "unions", as some European unions are notoriously distrustful of firms. But our model has only bilateral bargaining.

[8] This was the approach we followed in an earlier draft.

and, in Denmark, by

$$\frac{c}{q(\theta)} = \gamma \frac{\bar{y} - \underline{u}}{r + \delta + (1-\gamma)\theta q(\theta).}$$

Now consider the effects of the same increase in Δ in both countries. The increase in Δ will have no effect in Denmark, but will decrease tightness, and thus increase unemployment in France. In other words, the lower the degree of trust, the worse the effects of an increase in uncertainty. The underlying mechanism is straightforward: Higher uncertainty leads to more strikes, thus to more bargaining failures, a lower surplus, and less entry by firms. This is an example of interactions between shocks and institutions emphasized by, among others, Blanchard and Wolfers (2000). The shocks is the same, but different institutions lead to different outcomes.

Our model also implies another type of interactions, which may also be relevant. We just assumed that μ remained unchanged in each country in the face of the increase in uncertainty. But $\bar{\mu}$ and by implication μ, may also decrease. This effect is not present under our first-order approximation around $\Delta = 0$: In that case both the LHS and RHS of the dynamic truth-telling condition are linear in Δ so changes in Δ do not affect whether the condition holds, and thus do not change the equilibrium value of $\bar{\mu}$. But in the general case, an increase in Δ will indeed decrease $\bar{\mu}$. In words: The adverse shocks may lead to a worsening of institutions, implying larger effects on unemployment.

4.2 A Calibration

To gain a sense of potential magnitudes, we now turn – with all the proper caveats – to a calibration of the model. The parameter values we choose are given in the table below. The choice of $\bar{y} - \bar{u}$ is simply a normalization. We set c so that the benchmark unemployment rate without asymmetric information is 6%. The values of r and δ are standard. The parameter γ determines the capital share, so we choose it to be 1/3. We choose $p < 1/2$ so that there is positive skewness in firm productivity, as in the data.

$\bar{y} - \bar{u}$	δ	r	λ	γ	p
1	0.1	0.03	1	1/3	1/3

We then solve the model numerically. **Figure 5** illustrates our results by plotting the equilibrium unemployment rate as a function of the degree of trust μ and the amount of

firm level asymmetric information Δ. μ varies between 0 and 1, Δ varies between 0.0 and 0.3 (the upper bound is thus equal to 0.3 of the net productivity of the match). For all the values of Δ within this range, $\bar{\mu}$ is equal to 1, so all values of μ between 0 and 1 can be equilibria. (The critical value of Δ which would lead to a decrease in $\bar{\mu}$ below one is equal to 0.36). In this simulation, the maximum difference in unemployment between countries with very good and very bad labor relations is 1.4%.

This is less than suggested by our regressions. Could the effect be larger? The answer is yes. There is, within the logic of our model, one channel which can make it substantially larger. Recall that we have assumed that bargaining failures lead to a lower surplus, but not to separations. Thus, the consequences of bad labor relations is only through lower entry. However, Bertola and Rogerson (1997) show that, despite stringent dismissal restrictions in most European countries, rates of job creation and destruction are remarkably similar across European and North American labor markets and suggest that this may be due in part to inefficient separations. Our model provides an easy way to capture their hypothesis. We only need to reinterpret the deadweight losses in case of bargaining failure as the probability of an inefficient termination of the match. That is, with probability γ, a rejection leads to the destruction of the match. This leaves the bargaining game unchanged, as well as all the value functions. In fact, the only equation that needs to be modified is the unemployment equation. Let us define the average inefficient destruction rate conditional on bargaining by

$$\tilde{\delta} \equiv (1-\mu)\,(1-p)\gamma s\,(b)\,.$$

Unemployment dynamics are then given by

$$\dot{u} = (\delta + \lambda\tilde{\delta})\ (1-u) - \theta q(\theta)(1-\tilde{\delta})u.$$

This equation reflects the fact that some separations are due to bargaining failures in response to changes in the productivity of existing matches, and some hiring do not lead to a match, again due to a bargaining failure. For $\dot{u} = 0$, we can then replace equation (10) by

$$u = \frac{\delta + \lambda\tilde{\delta}}{\delta + \lambda\tilde{\delta} + \theta q(\theta)(1-\tilde{\delta})}.$$

Figure 6 plots unemployment as a function of μ and Δ, but now under the assumption that all bargaining failures lead to separations. The quantitative impact of inefficient separations

is very large – probably too large. The shape of the unemployment rate looks very similar to the one in **figure 5**, starting at 6%, but the maximum value is 15.3% instead of 7.4%. Thus, if all bargaining failures result in inefficient separations, the model can explain differences unemployment of 8% or more. This happens because the inefficient separation rate $\lambda\tilde{\delta}$ can be as high as 11%, roughly doubling the total separation rate in the economy.

4.3 Pre-1980 and Post-1980 Outcomes

We can now go back to the evidence in Figures 3 and 4. One practical issue is how to relate the bargaining failures in our model to strikes in the data. It is clear that not all bargaining failures lead to strikes (see Gary-Bobo and Jaaidane (2006) for a discussion). It seems plausible, however, that some bargaining failures lead to strikes. If we assume that the probability that a bargaining failure translates into a strike stays roughly constant over time, then we can use the strike rate as a qualitative proxy for bargaining failures.

If we do so, our model provides a natural explanation for the pre-1980 evolution of strikes and unemployment. Countries differ in the quality of labor relations. Faced with similar adverse shocks, they reacted differently. Both strikes and unemployment increased more in countries with bad labor relations. In the absence of data on the evolution of labor relations during that period, it is impossible to say whether this was also accompanied by a decrease in the fundamental quality of labor relations within some countries. To the extent that it was, the adverse effects of the shocks on unemployment were reinforced.

The model however does not do well in explaining what has happened since 1980, namely the dramatic decline in strikes, together with a continued increase in unemployment. Within the model, this is not easy to explain. We have explored whether other shocks than increases in Δ may explain both an increase in unemployment and a simultaneous decrease in strikes. A decrease in $\bar{y} - \underline{u}$ does not work, because it increases strikes and unemployment together. The intuition for the increase in unemployment is the usual one. The intuition for the increase in strikes is that a lower surplus leads to an increase in rejection to keep the incentive constraint satisfied. If the $\bar{\mu}$ were binding, a decrease in $\bar{y} - \underline{u}$ would also make it harder to sustain trust. A increase in c goes in the right direction. It increases unemployment by making it more costly to post a vacancy. It decreases strikes because it increases the equilibrium match surplus. Starting from our benchmark case, for an economy with $\mu = 0.5$

– an economy where half the firms have a good reputation – doubling the entry cost would reduce the rejection rate by half. Thus, increases in c have the potential to account for the post 1980 experience, but the changes would have to be very large.[9] This leads us to explore, in the next section, an alternative explanation, based on endogenous technological choice.

5 Endogenous Technology

Faced with bargaining failures and strikes, firms are likely to change their technology or their activity so as to reduce either the likelihood or the cost of bargaining failures. One way to do so is for firms to reduce the role of labor in production, and thus reduce the stakes involved in bargaining with labor. This type of choice has been explored by Caballero and Hammour (1998), who explore the idea that an increase in bargaining power by workers in Europe in the 1970s may have led firms to shift to more capital intensive techniques in the 1980s and the 1990s, resulting in higher unemployment, and a lower labor share. Another direction is for firms to reduce the uncertainty associated with their activities, for example by choosing products with more stable demand over new products, or more established technologies over new technologies. This is the direction we explore here. Within the model we have developed, we now allow firms, when they open a vacancy, to choose between two technologies:

- The first technology is the one described above. The flow cost is c, the expected surplus going to capital owners is

$$\bar{J}^{\lambda} - V = \gamma E^{\rho}\left[\bar{S}\left(\rho\right)\right] - (1-\mu)\bar{D}(b),$$

  and the value of a vacancy is given by

$$\tilde{V} = \frac{q(\theta)\bar{J}^{\lambda} - c}{r + q(\theta)}.$$

[9] An interpretation which is sometimes given for these joint fact is that high unemployment has made it very costly for workers to go on strike and risk being unemployed. Our assumptions about bargaining do not however deliver such an outcome, as the value of being employed and unemployed move largely together. This aspect, which is not specific to our model, may perhaps be seen as a shortcoming of this class of search/bargaining models.

- The second technology has $\Delta = 0$, but a higher entry cost $c^o > c$ (this is nearly equivalent to assuming a lower value for productivity, but slightly simpler analytically. The surplus going to capital owners is

$$\bar{J}^o - V = \gamma \bar{S}^o,$$

where

$$\bar{S}^o = \frac{\bar{y} - \underline{u}}{r + \delta + (1-\gamma)\,\theta q(\theta)},$$

and the value of a vacancy is given by

$$V^o = \frac{q(\theta)\bar{J}^o - c^o}{r + q(\theta)}.$$

- Firms choose optimally which type of vacancy to open

$$V = \max\left(\tilde{V}, V^o\right).$$

and free entry implies that $V = 0$.

It follows from the equations above and from equation (17) that the safe technology dominates the risky one if and only if

$$(1-\mu)\bar{D}(b)\left(1 + \frac{\gamma\lambda}{r+\delta}\right) > \frac{c^o - c}{q(\theta)}. \tag{24}$$

Assume that initially $\mu < 1$ and that all firms are using the uncertain technology. Now consider an increase in Δ. We know from Proposition 1 that the deadweight loss $\bar{D}(b)$ increases and labor market tightness decreases. Both make the inequality more likely to hold, and so, for some critical value of Δ, firms shift to the safe technology, eliminating bargaining failures. Thus, increases in uncertainty lead initially to an increase in unemployment and strikes, until firms shift to the certain technology. At that point, further increases in Δ no longer have an effect on unemployment, and strikes remain equal to zero.

The extended model suggests a straightforward explanation for the facts in **figures 3** and **4**. Starting in the 1970s, firm-level uncertainty increased. In countries where the degree of trust was high, this had little effect on either unemployment or strikes. In countries with a low degree of trust, the result was an increase in both unemployment and strikes. It eventually became profitable for firms in those countries to shift to a more certain technology. As a result, unemployment has remained high, but strikes have decreased.

6 Conclusion

We see our paper as making two main contributions: The first is to document the strong, and apparently causal relation, between the quality of labor relations and unemployment. Given the standard focus on formal institutions, we see this as an important empirical finding. The second is to provide a natural framework in which to make the notion of "quality of labor relations" more precise, and to think about its determinants and its economic implications.

Further research is needed to better understand the economic implications of trust between workers and firms. We have focused on the implications of the quality of labor relations on bilateral bargaining. Bad labor relations may however have an impact through collective bargaining, say the ability of an economy to adjust to changes in terms of trade or in productivity growth. This remains to be satisfactorily formalized. We have left open the question of whether bargaining failures lead to lower surpluses or/and inefficient separations. This is an important issue, both theoretically and empirically. Finally, we have focused on an increase in firm level uncertainty as a major shock in our interpretation of the facts. While it is widely believed that uncertainty faced by firms has increased as a result of globalization and higher competition, and a similar idea has been explored by other authors working on unemployment (Ljungqvist and Sargent (1998) for example), hard evidence has been difficult to come by.

We have offered an interpretation of the decrease in strike activity since the early 1980s based on endogenous technology. We see this as an appealing explanation, but we admit that the evidence in support is mostly the very fact we want to explain, namely sustained unemployment and the decrease in strikes. Harder evidence is needed here as well. The choice of lower return/lower risk technologies, may well have important implications for growth. Testing whether this channel is indeed important will probably require the use of firm level data.

References

Bertola, G., and R. Rogerson (1997): "Institutions and Labor Reallocation," *European Economic Review*, 41(6), 1147–1171.

Blanchard, O., and J. Wolfers (2000): "Shocks and Institutions and the rise of European unemployment. The aggregate evidence," *Economic Journal*, 110(1), 1–33.

Caballero, R. J., and M. L. Hammour (1998): "Jobless Growth: Appropriability, Factor Substitution, and Unemployment," *Carnegie-Rochester Conference Series on Public Policy*, 48(0), 51–94.

Crouch, C. (1993): *Industrial Relations and European State Traditions*. Clarendon Press, Oxford.

Gary-Bobo, R., and T. Jaaidane (2006): "Strikes as the 'tip of the Iceberg' in a Theory of Firm-Union Cooperation'," Working Paper, Universite Paris I.

Hibbs, D. (1987): *The political economy of industrial democracies*. Harvard University Press.

Ljungqvist, L., and T. Sargent (1998): "The European unemployment dilemna," *Journal of Political Economy*, 106(3), 514–550.

Mueller, H., and T. Philippon (2006): "Concentrated Ownership and Labor Relations," Working Paper, NYU.

Pissarides, C. (2000): *Equilibrium Unemployment Theory*. MIT Press.

Appendix

We can reduce equations (17), (19), (21) and (22), to two equations in two unknowns, θ and $\bar{D}(b)$. The first is given by equation (20), which combines equations (17) and (19):

$$\frac{c}{q(\theta)} = \gamma \frac{\bar{y} - \underline{u} - (1-\mu)\,\lambda \bar{D}(b)}{r + \delta + (1-\gamma)\,\theta q(\theta)} - (1-\mu)\bar{D}(b)$$

Along this relation, $\partial\theta/\partial\bar{D}(b) < 0$, $\partial\theta/\partial\mu > 0$, and $\partial\theta/\partial\Delta = 0$. The second is given by equations (21) (22), and (17):

$$\bar{D}(b) = \frac{(1-p)\,(1-\gamma)\,\Delta}{r+\delta+\lambda} \frac{\bar{S}\,(b) - \frac{p\Delta}{r+\delta+\lambda}}{\bar{S}\,(b) + \frac{(1-p)\Delta}{r+\delta+\lambda}}$$

where

$$\bar{S}\,(b) = \frac{\bar{y} - \underline{u} - (1-\mu)\,\lambda \bar{D}(b)}{r + \delta + (1-\gamma)\,\theta q(\theta)} - \frac{\mu\lambda \bar{D}\,(b)}{r+\delta}$$

Along this relation, $\partial\bar{D}(b)/\partial d\theta < 0$, $\partial\bar{D}(b)/\partial\mu < 0$ and $\partial\bar{D}(b)/\partial\Delta$ is ambiguous, but positive for small enough Δ. Also, for Δ small enough, $\partial\bar{D}(b)/\partial d\theta \approx 0$. Putting these two relations together gives Proposition 1. We have found numerical examples where θ eventually increases with Δ, when Δ is large enough. We could not find an example where θ decreases with μ, but we could not analytically sign the partial derivative $\partial\theta/\partial\mu$.

Table 1: Labor Relations and Unemployment

	(i) OLS	(ii) OLS	(iii) OLS	(iv) IV	(v) IV
Labor Relation in 1999	**-0.025**	**-0.021**	**-0.026**	**-0.025**	**-0.028**
	-4.85	-2.63	-4.96	-3.83	-3.36
Union Density		**0**			
		0.7			
Union Coverage		**-0.013**			
		-0.77			
Replacement Rate		**0**			
		0.3			
Benefit Duration		**0.004**			
		0.94			
Employment Protection		**0.001**			
		0.85			
Active Labor Market Policies		**0**			
		0.77			
Tax Wedge		**0.001**			
		1.49			
Strength of Union			**0.006**		
			1.04		
N	21	20	21	18	15
R^2	0.553	0.647	0.578	0.509	0.558

Notes: The dependent variable is the unemployment rate in 2000, computed with data from the OECD. In (iv), labor relations are instrumented by workers involved and days lost to strikes over employment from 1961 to 1967. In (v), labor relations are instrumented by the attitude of the State towards early unions in the 19th century, as defined by Crouch (1993). Coefficients are in bold, t-statistics are below the coefficients.

Figure 1. Unemployment Rates and Labor Relations

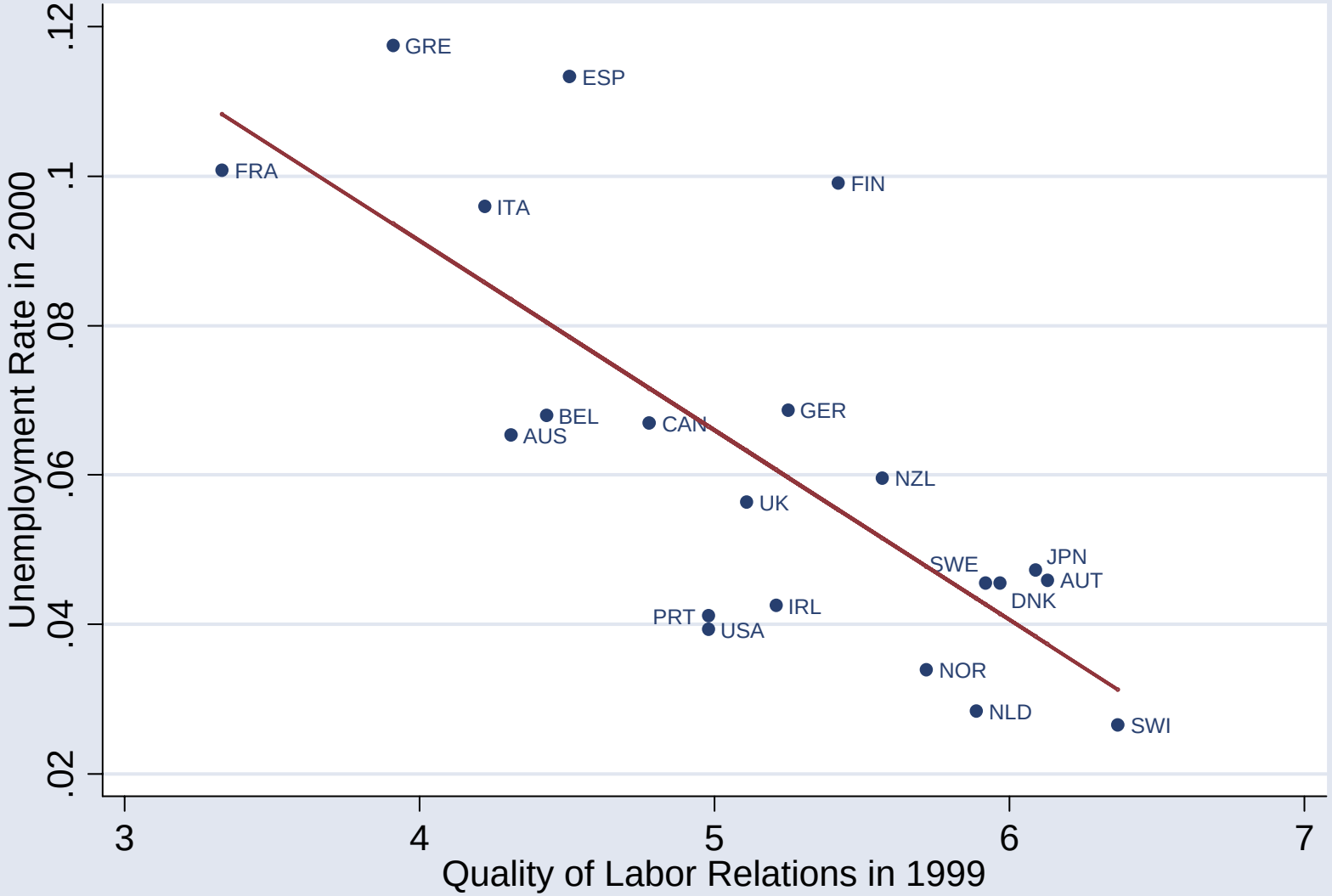

Figure 2. Current Labor Relations and Past Labor Conflits

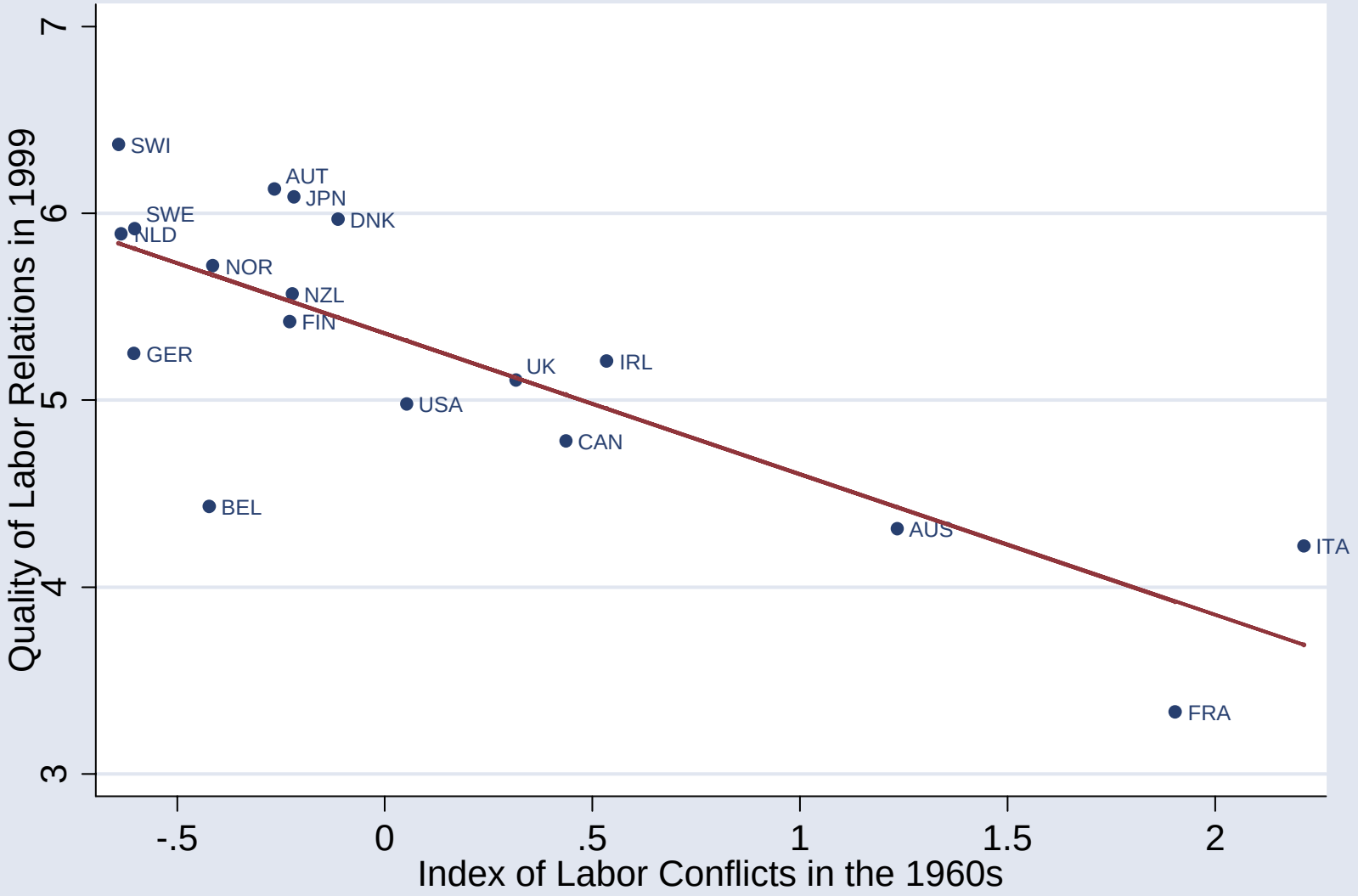

Figure 3. Unemployments Rates

Countries Sorted according to Labor Relations in 19th Century

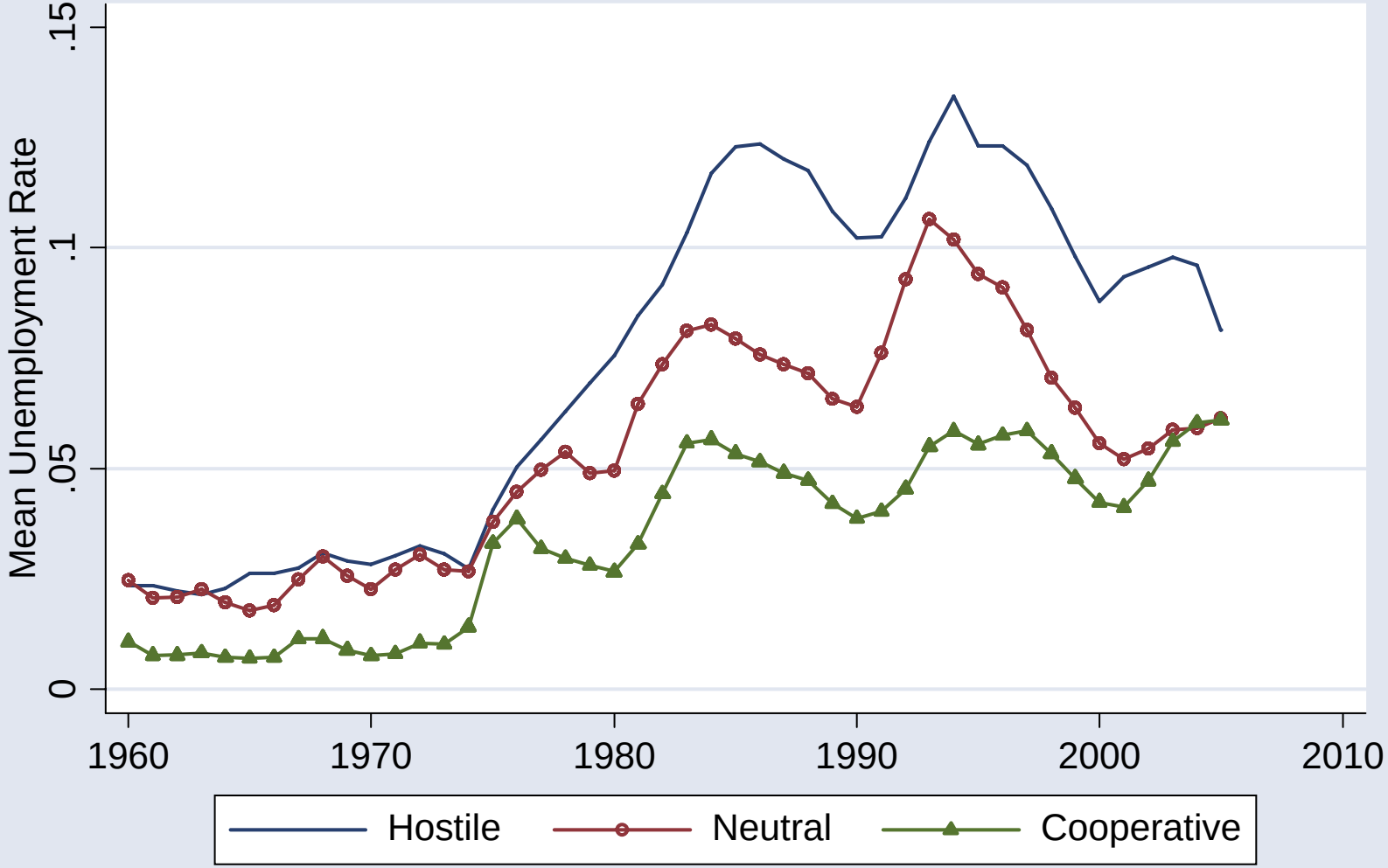

Figure 4. Strike Rates

Countries Sorted according to Labor Relations in 19th Century

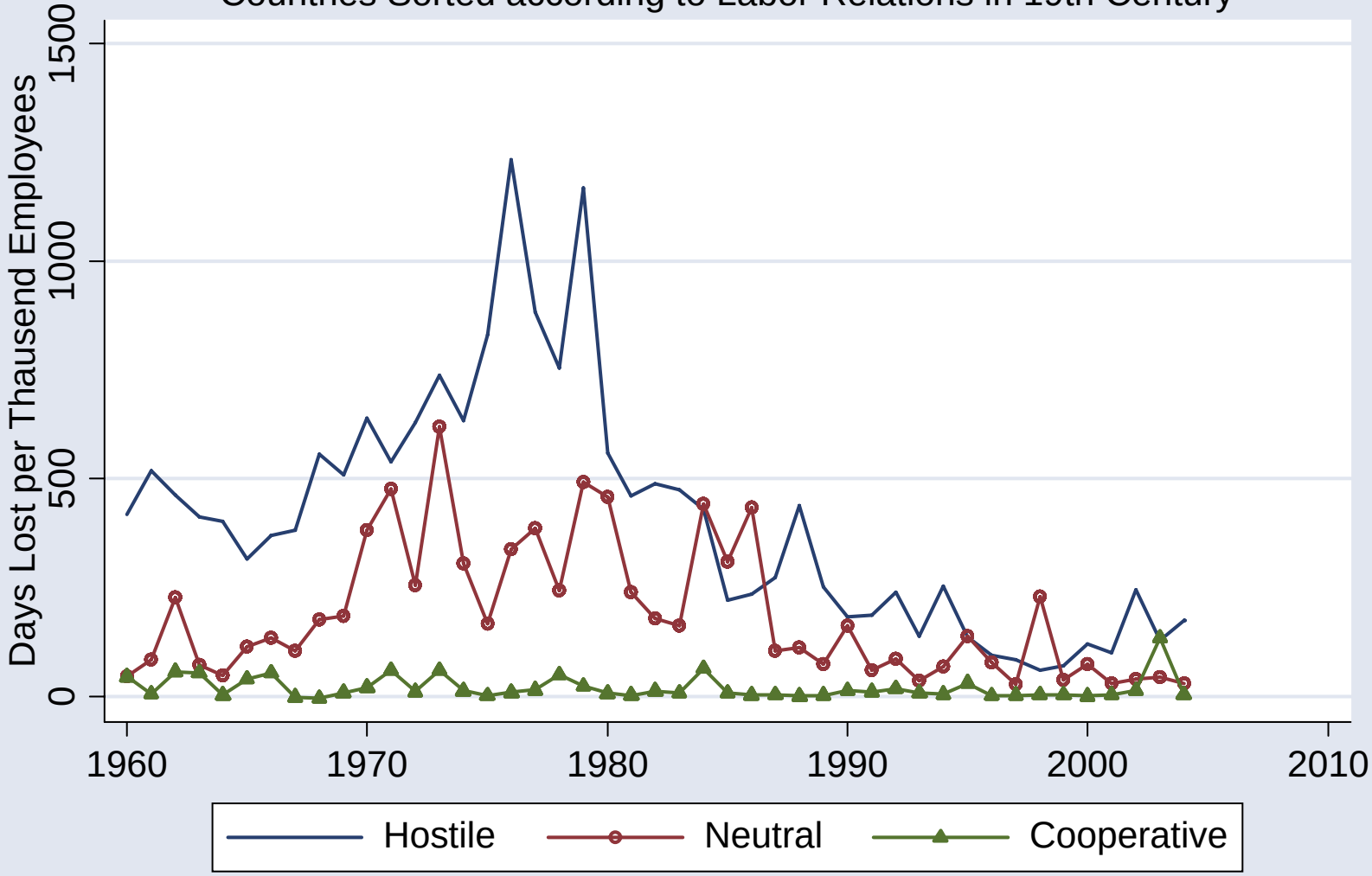

Figure 5: Unemployment Rate in Benchmark Model

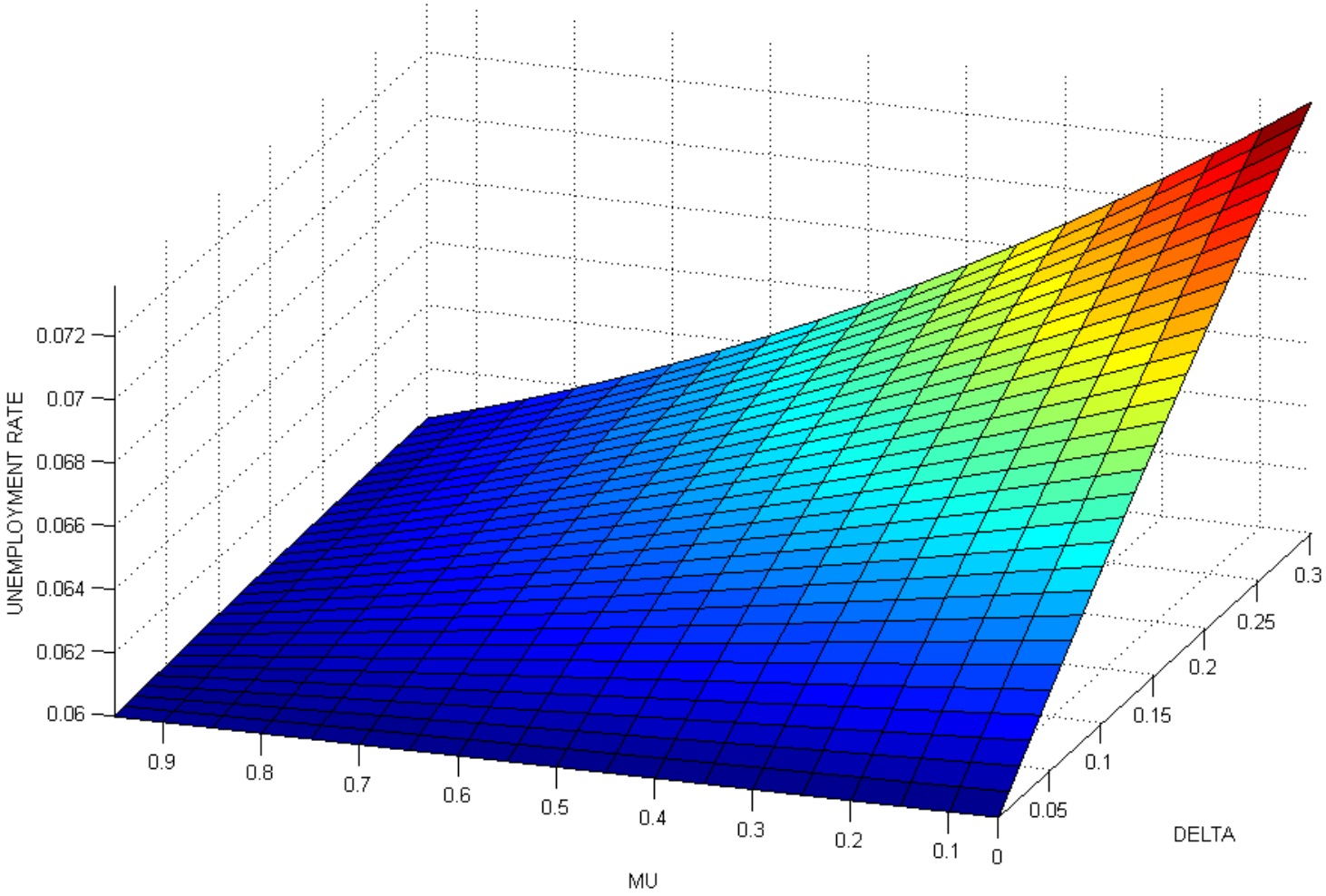

FIG 6: UNEMPLOYMENT RATE WITH INEFFICIENT SEPARATIONS