REAL UNCERTAINTY AND DELAYS IN RENEWAL OF LABOR CONTRACTS

LEIF DANZIGER

Department of Economics, York University, 4700 Keele Street, Toronto, Ontario M3J 1P3, Canada

SHOSHANA NEUMAN

Department of Economics, Bar-Ilan University, Ramat Gan 52900, Israel; and Centre for Economic Policy Research, London, England

The authors are Research Fellows at The Institute for the Study of Labor (IZA) in Bonn, where part of this work was carried out. We are grateful to Joseph Deutsch for help with the construction of the data and to Jacob Paroush for information about the regulation of the banking industry in Israel.

Abstract

This paper tests two theories of how real uncertainty affects the delay in renewal of labor contracts. Since bargaining pairs involving banking corporations are much more similar than other bargaining pairs, the implicit-contract approach predicts that the delay is negatively related to real uncertainty for contracts not involving banking corporations, while the informational approach predicts that this negative effect is countered by a positive effect for contracts involving banking corporations. The empirical evidence from Israel strongly supports both predictions. Real uncertainty reduces the average delay by 15 days for contracts not involving banking corporations, but increases the average delay by 24 days for contracts involving banking corporations.

1 Introduction

It is well documented that delays in the renewal of labor contracts occur frequently and can be very long. Thus, in the U. S. the holdout incidence is 47% and the average holdout is 63 days in contracts negotiated with large bargaining units (Cramton and Tracy, 1992); in Canada the holdout incidence is 81% and the average holdout is 80 days for major collective bargaining contracts (Gu and Kuhn, 1998); and in Israel the holdout incidence is 86% and the average holdout is 213 days for wage settlements (Danziger and Neuman, 2002). Since the legal system in these and many other countries automatically extends the old contract during the delay, the effective duration of labor contracts is quite flexible in spite of the fact that a specific expiration date is written into almost all labor contracts.[1] Although the language of most labor contracts seems to indicate that their duration is time dependent, in practice, a major element of state dependency is involved in the determination of contract durations.

In Gu and Kuhn's (1998) theoretical explanation, unions use holdouts to elicit information about a firm's willingness to pay by observing settlements between similar bargaining pairs during the holdout period. Their model implies that the delay should increase with real uncertainty, as this increases the value of the information that can be gleaned from observation of settlements between similar bargaining pairs during the delay.

In Danziger and Neuman's (2002) implicit-contract model, the option to delay the contract renewal reduces the variation in workers' real income. Due to worker risk aversion, real uncertainty provides an incentive to renew the contract immediately in order to reduce the uncertainty of the future real wage stemming from real shocks.

Consequently, while the informational considerations in Gu and Kuhn pull toward a positive relationship between the length of the delay and the real uncertainty, workers' risk aversion is shown by Danziger and Neuman to have the opposite effect and pull toward a negative relationship between the length of the delay and the real uncertainty.[2]

---

[1] Gray (1978), Dye (1985), Harris and Holmstrom (1987), and Danziger (1988, 1992) determine the optimal fixed contract duration. Christofides and Wilton (1983), Ehrenberg et al. (1984), Christofides (1985), Vroman (1989), Murphy (1992), Wallace and Blanco (1991), and Rich and Tracy (2000) examine contract durations empirically. Danziger (1995) analyzes reopening of a contract, which may be considered a negative delay and is another way of introducing flexibility in the contract duration. Empirically, contract reopenings occur much less often than delays in their renewal.

[2] See also Cramton and Tracy (1992) and Holden (1994).

This paper tests empirically the Gu-Kuhn and Danziger-Neuman predictions concerning the effect of real uncertainty. We employ the private-sector subsample of Israeli collective wage agreements used in Danziger and Neuman (2002). The strategy is to compare the effects of real uncertainty on the delay in contracts involving banking corporations with the effects of real uncertainty on the delay in contracts with firms in the rest of the economy. The crucial feature of contracts with banking corporations is the relatively similar bargaining pairs, making the informational argument in Gu and Kuhn particularly relevant. In the rest of the economy, the bargaining pairs are more dissimilar even within the same economic branch.

One reason for the similarity of the bargaining pairs involving banking corporations is that the banking industry in Israel is tightly supervised and highly regulated by the Bank of Israel. The regulations include barriers to entry in terms of required equity and other qualifications of the owner. The banks must follow the capital-adequacy recommendation of the Basel Accord that the risk-adjusted equity is at least 9%. Furthermore, a bank's loan to a single borrower is restricted to be at most 15% of its capital, and its loans to a single economic branch are not allowed to exceed 20% of its total loans. The Bank of Israel also regulates some of the banks' service charges and sets rules for provisions against bad loans. Although the regulations are not intended to constrain competition, the effect is nevertheless to set rigid limits for the banks' ability to compete. Another reason for the similarity of the different bargaining pairs is that more than 90% of the financial activity is concentrated in five large banks, which act like a cartel further reducing the competition among themselves.[3]

Hence, while the risk-reducing argument of Danziger and Neuman is always valid and leads to a negative relationship between the length of the delay and the real uncertainty, the

[3] See Meir (1981) and Elias and Samet (1994). The Herfindahl-Hirshman index of concentration was around 0.31-0.32 in the 1970s and 1980s, and has been decreasing a little since 1991. The concentration of the Israeli banking system is much higher than in the U. S., Japan, and many other countries. Thus, in 1981 the Herfindahl-Hirshman index was 0.312 for Israel, but only 0.03 for both the U. S. and Japan. See Shifron (1983).

The relative similarity of the bargaining pairs for contracts with banking corporations is illustrated by the fact that the delay relative to the contract duration is on average 0.8452 for contracts with banking corporations, but only 0.3264 for contracts with firms in the rest of the economy. The delays are also more uniform for contracts with banking corporations: the variance of the delay is 22.650 for contracts with banking corporations, but 42.791 for contracts with firms in the rest of the economy.

Striking evidence for the similarity of the bargaining pairs involving banking corporations is that some of them do not even conduct their own bargaining, but adopt the agreement obtained by another bargaining pair. Thus, during the 1990s, Bank Benleumi (the fourth biggest bank) and its union simply copied the labor agreements of Bank Leumi (the second biggest bank) with its union.

informational argument of Gu and Kuhn implies that the relationship should be positive, or at least not as negative, for contracts with banking corporations. The empirical findings strongly support *both* the risk-reducing and the informational arguments for delaying contract renewals: We find that in contracts with firms other than banking corporations, the real uncertainty *reduces* the average delay by 15 days, while for contracts with banking corporations, it *increases* the average delay by 24 days.

The data provides further support for the risk-reducing and informational explanations of delay. Presumably, upcoming elections as well as high levels of unemployment are associated with high levels of real uncertainty that are not captured by our productivity-based measure of real uncertainty. It is, therefore, in full accordance with the theory that both upcoming elections and high levels of unemployment are found to have a negative effect on the delay in contracts not involving banking corporations, but have no effect on the delay in contracts involving banking corporations.

2 The Empirical Model

The implicit-contract model of Danziger and Neuman (2002) emphasizes macroeconomic factors, and, in particular, uncertainty with respect to the value of money and the real value of a worker's marginal product in a firm's economic branch. Workers are risk averse and have no access to a capital market. Firms are risk neutral, have access to a capital market, and labor contracts are designed so that the discounted real payment to a worker within the contract period is equal to the real value of a worker's discounted expected marginal product in the contract period.

If contract renewal is delayed, then workers continue to work and are paid under the terms of the old contract. The new contract, when it is eventually concluded, is backdated to when the old contract should have expired. Since the parties to the contract know the real wage the workers received as well as the real value of their marginal product during the extension period, the new contract will compensate for any under- or overpayment during that time. Firms are therefore indifferent with respect to the delay decision and willingly agree to delay renewal of the labor contract if it would benefit the workers by reducing the variability of their real income.

In the empirical model, a central role is played by the real wage if contract renewal is delayed relative to what the real wage would be in a new contract. The ratio is denoted by

z and defined by

$$z \equiv \frac{1+\gamma x}{1+y}.$$

It reflects that the real wage during the delay increases with the realized nominal shock x, and that a fraction γ of the shock is transmitted to the real wage. This fraction decreases with the degree of wage indexation and increases with the trend in the value of money.[4] It also reflects that the real wage in a new contract increases with the realized real shock y. The benefit from a delay is maximized when z equals

$$z^* \equiv \frac{2+\xi+r}{2(1+r)},$$

where ξ is the trend in the real value of the marginal product and r is the real interest rate.

The delay increases in z for $z < z^*$ and decreases in z for $z > z^*$. The reason is that if $z = z^*$, the worker's intertemporal income stream is the best possible; the further z is from z^*, the less satisfactory is the intertemporal income stream, and the more beneficial it is to renew the contract sooner. The relationship between the delay and z is approximated by a piece-wise linear relationship. Let D be a dummy variable which equals unity if $z > z^*$ and zero otherwise. The regression analysis includes the additional variable $D(z - z^*)$ in order to distinguish between the effects of z for $z < z^*$ and for $z > z^*$.

The price level is known at the time the contract is signed and taken into account when the contractual wage is determined. However, the nominal uncertainty makes the real value of the future contractual wage increasingly uncertain. The longer the delay, the shorter the part of the contract period remaining after the signing of the contract, and the less the negative impact of nominal uncertainty on the real wage within the contract period. Consequently, it is optimal that the delay increases with the nominal uncertainty. Since the impact of the nominal uncertainty is reduced by wage indexation and γ is the fraction of the nominal shock transmitted to the real wage, the delay increases with $\gamma^2\sigma_x^2$, where σ_x^2 is the expected variance of the nominal shock.

The more uncertain the future real value of a worker's marginal product, the more a worker values an early contract settlement as it guarantees a more stable real wage during the contract period. This is because the contractual wage is determined at the time the

[4] By definition, $\gamma \equiv 1 - \theta/[1 + (1-\theta)\mu]$, where θ is the degree of wage indexation and μ is the trend in the value of money. In Israel, the degree of wage indexation is not determined by the parties to the labor contract, but is negotiated by the labor unions' and the employers' organizations and later extended by the Minister of Labor to cover all workers.

contract is signed on the basis of the expected future real value of a worker's marginal product. Accordingly, the delay decreases with the real uncertainty as measured by the expected variance of the real shock, σ_y^2.

Upcoming elections to the Israeli parliament are represented by a dummy variable ELEC with the value one, if the old contract expires less than one year before elections, and zero otherwise. Since elections may lead to important policy changes, they are associated with a heightened level of real uncertainty that is not captured by σ_y^2. Hence, upcoming elections should lead to a shorter delay.

A high unemployment rate increases the risk that a worker may lose his job and may lead to policy changes. This is also a form for real uncertainty that may not be captured by σ_y^2. The unemployment rate UNEMP should, therefore, affect the delay negatively.

Finally, the model includes dummies BRNCH for economic branches (private services, public services, manufacturing, commerce, and banking corporations).

The estimation equation for the delay is then

$$\begin{aligned} \text{DELAY} &= \hat{\alpha} + \hat{\beta}_1 z + \hat{\beta}_2 D(z - z^*) + \hat{\beta}_3 \gamma^2 \sigma_x^2 + \hat{\beta}_4 \sigma_y^2 + \hat{\beta}_5 \text{ELEC} \\ &\quad + \hat{\beta}_6 \text{UNEMP} + \hat{\delta}' \text{BRNCH}, \end{aligned}$$

with the model implying that $\hat{\beta}_1 > 0$, $\hat{\beta}_1 + \hat{\beta}_2 < 0$, $\hat{\beta}_3 > 0$, $\hat{\beta}_4 < 0$, $\hat{\beta}_5 < 0$, and $\hat{\beta}_6 < 0$.

As discussed above, Gu and Kuhn's (1998) model implies that for banking corporations, real uncertainty should increase the delay in the renewal of labor contracts, or at least should not reduce the delay as much as it would in the rest of the economy. Hence, we expect that $\hat{\beta}_4$ for banking corporations is positive or at least not as negative as for the rest of the economy. Since upcoming elections and high levels of unemployment are also accompanied by increased real uncertainty, we expect that $\hat{\beta}_5$ and $\hat{\beta}_6$ for banking corporations are not as negative as for the rest of the economy.

3 The Data

We analyze the private-sector subsample of the contacts analyzed in Danziger and Neuman (2002), and it consists of cross-sectional time-series information about labor contracts dealing with wage provisions signed in Israel from 1978 to 1995. Many firms enter into several agreements with the same or different labor unions during the sample period. Israeli employers are required to report all collective bargaining agreements to the Ministry of Labour

and Social Affairs, which subsequently publishes the main characteristics of the contracts in the Ministry's Monthly Bulletin. All the contracts have a fixed termination date and are signed either as soon as the previous contract expired or after a delay. The length of the delay is calculated as the difference between the signing date of the new contract and the expiry date of the old contract. As the banking corporations are part of the private sector, we here consider only the subsample of 1,731 contracts signed in this sector. The average delay of the contracts is 194 days, which is almost a third of the average contract duration of 629 days.[5]

Table 1 presents some background statistics about banks in Israel during the period of our empirical study. The number of banking corporations is around 60, with some decrease beginning in the early 1990s.[6] The number of ordinary banking corporations is around 30. Over 90% of the financial activity is concentrated in five large banks: Bank Hapoalim, Bank Leumi, Bank Discount, Bank Benleumi, and Bank Mizrahi. The number of offices was quite stable, with a maximum of 1,159 (in 1983) and a minimum of 1,036 (in 1991). The number of employees was also relatively stable, at around 30,000-35,000.[7] During this period of almost two decades, the Israeli population grew from 3.79 million in 1978 to 5.99 million in 1995, and employment went up from 1.21 million workers to 1.97 million workers. As a result, the number of residents per office went up from 3,623 in 1978 to 5,541 in 1995 (53% increase). While the share of employees of ordinary banking corporations in the total number of employees of the business sector went down from 3% in the 1980s to less than 2% in the 1990s (it was 1.85% in 1993), the share of banks in the GDP remained relatively constant.[8]

---

[5] The data set and the construction of the regression variables are described in detail in Danziger and Neuman (2002). We excluded 4% of the contracts signed before the previous contract expired.

[6] In 1995, the Israeli banking system consisted of 27 ordinary banking corporations fully subject to the liquidity regulations of the Bank of Israel, 17 specialized banking corporations not fully subject to the liquidity regulations, and 2 joint service companies. The ordinary banking corporations included 24 banks, 1 merchant bank, and 2 financial institutions. The specialized banking corporations included 9 mortgage banks, 2 investment finance banks, and 6 financial institutions. See the Annual Information on the Banking Corporations 1991-1995 (Supervisor of Banks, Bank of Israel). Shifron (1993) contains a history of banking corporations in Israel.

[7] After a crisis in 1983 during which the price of bank shares fell dramatically, the banks started a process of increasing efficiency. The number of employees in ordinary banking corporations dropped from 37,554 in 1983 to around 30,000 in the mid 1980s.

[8] See Goldschmidt (1995).

The data set includes 35 observations with nine different banking corporations. There are 28 contracts signed with commercial banks and seven contracts signed with mortgage banks. We do not have information about all the contracts signed with banking corporations between 1978 and 1995, probably because not all contracts were reported to the Ministry of Labour and Social Affairs. Nevertheless, we believe the sample for the banking corporations is representative, since it includes contracts with three of the five large banks, five of the small banks, and one mortgage bank.[9] For seven out of the nine banks, there is more than one observation.

If p_{m-1} and p_m denote the consumer price indexes in months $m-1$ and m, the rate of change in the actual value of money between the two months is $(p_{m-1}/p_m)-1$.[10] The trend in the value of money between the two months is estimated by AR(6), and the nominal shock as the difference between the rate of change in the actual value of money and the estimated trend in the value of money. The expected variance of the nominal shock in month m is estimated as the (moving-average) variance of the shocks in the previous six months.

The empirical analysis assumes that the real value of a worker's marginal product is proportional to the per-capita GDP in the firm's economic branch. If GDP_a and GDP_{a-1} denote the annual per-capita GDP in the branch in year $a-1$ and year a, the monthly rate of change in the actual per-capita GDP in the branch in year a is assumed to be $[(\mathrm{GDP}_a/\mathrm{GDP}_{a-1})-1]^{1/12}$.[11] The annual trend in the branch per-capita GDP from year $a-1$ to year a is estimated by AR(2), and the monthly trend in the branch per-capita GDP in year a as the $\frac{1}{12}$th power of the estimated annual trend. The estimated monthly real shock in a branch in year a is the deviation of the estimated monthly trend in the branch per-capita GDP from the monthly rate of change in actual branch per-capita GDP. The expected variance of the monthly shock is estimated as the (moving-average) variance of the monthly shocks in the previous two years.

As a measure of the degree of indexation, we use the indexation-induced rate of change in the wage during the contract period relative to the rate of change in the consumer price

---

[9] The three large banks for which we have data are Bank Leumi, Bank Discount, and Bank Mizrahi. The five small banks for which we have data are Bank Yahav, Bank Igud, Bank Otzar Hachayal, Bank Aliya, and Bank Pituach Taasiya. The mortgage bank for which we have data is Bank Tfachot.

Observe that there is no data for Bank Benleumi, a large bank whose contracts are simular to those of Bank Leumi (see note 3).

[10] The monthly consumer price index is published in the Monthly Bulletin of Statistics.

[11] The annual branch GDP is published in the Monthly Bulletin of Statistics.

index over the same period.

Table 2 lists the regression variables together with their mean, standard deviation, and minimum and maximum values.[12]

4 Estimation of the Delay Function

Since the present paper focuses on whether, for informational reasons, real uncertainty has a differential effect on the delay in the renewal of labor contracts involving banking corporations than on the delay in the renewal of labor contracts with other firms, we first exclude the contracts involving banking corporations and estimate the model using the 2,185 contracts from the other economic branches in the private sector.

Regression (1) in Table 3 presents the coefficients obtained by random-effects general-least-squares estimation of the delay. All the coefficients predicted by the model have the right sign and are significant.[13] The estimates provide strong support for the risk-reducing argument for delays and are similar in magnitude to those obtained for the private sector in Danziger and Neuman (2002), where banking corporations were included.

For $z < z^*$, an increase in z by 0.01 lengthens the delay by 5.062 days, while for $z > z^*$, it shortens the delay by $29.123 - 5.062 = 24.061$ days. A positive nominal shock equal to one standard deviation of the nominal shocks increases the real wage if the contract renewal is delayed by about 1%, while a positive real shock equal to one standard deviation of the real shocks increases the real value of a worker's marginal product by about 1%, and hence increases the real wage by about 1% if the contract is renewed.[14] Since z is the real wage with a delay relative to what the real wage would be if the contract is renewed, it follows that for $z < z^*$ $(z > z^*)$, a positive one-standard-deviation nominal shock increases (decreases) the delay by about 5 days (24 days), while a positive one-standard-deviation real shock decreases (increases) the delay by about 5 days (24 days).

The coefficient of γ^2*the expected variance of the nominal shock is 18.825, which is

[12] The values in Table 2 are calculated over the 1,731 private-sector contracts. The values of the macro variables calculated over the years 1978-1995 are similar.

[13] The effect of z for $z > z^*$ is $\hat{\beta}_1 + \hat{\beta}_2 = -24.061$. A χ^2-test yields $\chi^2(1) = 32.11$, which is significant at a level of $\sim 0\%$.

[14] The standard deviation of the nominal shocks is 0.0244 and the average γ is 0.4049. At the average γ, a one-standard-deviation nominal shock therefore increases the real wage if contract renewal is delayed by a factor of $0.0244 * 0.4049 = 0.0098796$.

positive and significant. Since the average value of γ is 0.4049 and the variance of the nominal shock is 6.8*(percent)^2, the overall effect of the nominal uncertainty is to increase the delay by $188250 * 0.4049^2 * 6.8*(\text{percent})^2 = 20.986$ days.

The main interest of this study is on the effect of the real uncertainty. Regression (1) shows that the expected variance of the real shock has a significant negative coefficient of -6.128. Since the average value of the expected variance of the real shock in the economy is 2.43*(percent)^2, this implies that, on average, the real uncertainty *reduces* the delay by $6.128 * 2.43*(\text{percent})^2 = 14.891$ days. Also note that, as predicted by the model, both upcoming elections and unemployment lead to shorter delays.

Gu and Kuhn's (1998) model indicates that for banking corporations, real uncertainty has two opposite effects on the delay. As for contracts with all other firms, the real uncertainty tends to reduce the delay in order to shield the worker from the uncertainty of the real value of his marginal product in the future. Especially for contracts involving banking corporations, however, real uncertainty also tends to increase the delay so that the union can obtain information from contract settlements between similar bargaining pairs. The overall effect of real uncertainty on the delay in contracts involving banking corporations is therefore expected to be less negative than in the rest of the economy, and perhaps even positive.

In order to examine the validity of this prediction, we now expand the regression by adding the 35 contracts involving banking corporations as well as interactions between a dummy for banking corporations, *BC*, and the explanatory variables used above.

Regression (2) in Table 3 presents the coefficients, which are also estimated by the random-effects general-least-squares method. The coefficients of the original explanatory variables are very similar to those obtained in regression (1). The interaction between banking corporations and the expected variance of the real shock has a significant positive coefficient of 33.852. For banking corporations, the coefficient of the overall effect of the expected variance of the real shock is $33.852 - 4.607 = 29.245$, which is positive and significant at the 7.15% level.[15] Since the average value of the expected variance of the real shock is

[15] A χ^2-test yields $\chi^2(1) = 3.25$. We also ran regressions using per-capita gross domestic product (rather than branch-specific productivity measures) to calculate the expected variance of the real shock. We then found no significant connection between the delay and the real uncertainty for banking corporations. The explanation for this is that the profitability of banks is relatively insulated from business cycles due to strict supervision and regulation. The positive effect of the real uncertainty stemming from informational considerations is therefore not as strong when the expected variance of the economy-wide real shock is used

$0.83*(\text{percent})^2$ for banking corporations, it implies that, on average, the real uncertainty *increases* the delay by 24 days.

Taking the interaction between banking corporations and elections into account, for banking corporations, the coefficient of the overall effect of elections is $-28.372 + 13.097 = -15.275$, which is not significant.[16] Similarly, taking the interaction between banking corporations and unemployment into account, for banking corporations the coefficient of the overall effect of unemployment is $-17.202 + 14.838 = -2.364$, which is not significant.[17] Since both elections and unemployment are additional measures of the uncertainty with respect to the real value of a worker's product, the fact that they have a negative effect on the delay in contracts not involving banking corporations, but no effect on the delay in contracts involving banking corporations, is further evidence favoring Gu and Kuhn's thesis for banking corporations.

Hence, the empirical findings provide strong support not only for the general relevance of the Danziger-Neuman implicit-contract approach which emphasizes the importance of delays in reducing the variation in the workers' real income, but also for the applicability of the Gu-Kuhn model of informational considerations for delays in contracts with banking corporations.

For $z < z^*$, an increase in z has a stronger positive effect on the delay, and for $z > z^*$, a stronger negative effect on the delay for banking corporations, while the effect of γ^2* the expected variance of the nominal shock has the same effect for banking corporations.

In order to concentrate on the banking corporations, regression (3) shows the coefficient estimates of the delay using only the 35 contracts involving banking corporations. This regression immediately shows that for banking corporations the expected variance of the real shock has a positive effect on the delay and that neither elections nor unemployment has any effect on the delay.

5 Conclusion

According to the implicit-contract model in Danziger and Neuman (2002), real uncertainty should affect the delay in the renewal of labor contracts negatively so as to reduce the

instead of the expected variance of the branch-specific real shock.

[16] Since $\chi^2(1) = 0.36$ and (Prob>χ^2)= 0.5477.

[17] Since $\chi^2(1) = 0.03$ and (Prob>χ^2)= 0.8627.

impact of risk. According to the informational considerations in Gu and Kuhn (1998), real uncertainty should have a positive effect on the delay since a bargaining pair would seek to delay the renewal in order to exploit the information that can be gleaned from new contracts concluded between similar bargaining pairs. These two theories are not exclusive, however, but rather complement each other.

In this paper we use data on the delay in renewal of Israeli labor contracts to test the inferences of both theories by contrasting the delay in labor contracts not involving banking corporations with the delay in labor contracts involving banking corporations. What differentiates the contracts with banking corporations from the other contracts is that the bargaining pairs are relatively similar for banking corporations, while this is not the case for the bargaining pairs in the rest of the economy. Hence, the implicit-contract approach predicts that the delay in the renewal of labor contracts is negatively related to real uncertainty for contracts not involving banking corporations, while the informational approach predicts that this negative effect is countered by a positive effect for contracts involving banking corporations. The overall effect of real uncertainty for contracts involving banking corporations is therefore less than for the rest of the contracts.

These predictions are strongly supported by the empirical findings. Real uncertainty reduces the average delay by 15 days for contracts involving non-banking corporations, but increases the average delay by 24 days for contracts involving banking corporations. Upcoming elections and high levels of unemployment, both of which are additional measures of real uncertainty not covered by our productivity-based measure, also have the predicted differential effects on the delay.

References

Bank of Israel, *Bank of Israel Annual Report*, Israel; various issues.

Bank of Israel, Research Department, *Recent Economic Developments*, Israel; various issues.

Bank of Israel, Supervisor of Banks, *Annual Information on the Banking Corporations*, Israel; various issues.

Central Bureau of Statistics, *Monthly Bulletin of Statistics*, Israel; various issues.

Central Bureau of Statistics, *Statistical Abstract of Israel*, Israel; various issues.

Christofides, Louis N., "The Impact of Controls on Wage Contract Duration." *Economic Journal 95*, March 1985, pp. 161-168.

Christofides, Louis N. and Wilton, David A., "The Determinants of Contract Length." *Journal of Monetary Economics 12*, June 1983, pp. 309-319.

Cramton, Peter C. and Tracy, Joseph S., "Strikes and Holdouts in Wage Bargaining: Theory and Data." *American Economic Review 82*, March 1992, pp. 100-121.

Danziger, Leif, "Real Shocks, Efficient Risk Sharing, and the Duration of Labor Contracts." *Quarterly Journal of Economics 103*, May 1988, pp. 435-440.

Danziger, Leif, "On the Prevalence of Labor Contracts with Fixed Duration." *American Economic Review 82*, March 1992, pp. 195-206.

Danziger, Leif, "Contract Reopeners." *Journal of Labor Economics 13*, January 1995, pp. 62-87.

Danziger, Leif and Neuman, Shoshana, "Delays in Renewal of Labor Contracts: Theory and Evidence." Working Paper, 2002. Forthcoming in *Journal of Labor Economics.*

Dye, Ronald A., "Optimal Length of Labor Contracts." *International Economic Review 26*, February 1985, pp. 251-270.

Ehrenberg, Ronald G.; Danziger, Leif, and San, Gee, "Cost-of-Living Adjustment Clauses in Union Contracts." In *Research in Labor Economics* 6, edited by Ronald G. Ehrenberg, pp. 1-63. Greenwich, CT: JAI Press, 1984.

Elias, Riki and Samet, Tsipi, "The Development of Competitiveness in the Banking System and in the Capital and Financial Market in Israel." *Banking Quarterly 32*, 1994, pp. 44-69 (Hebrew).

Goldschmidt, Amnon, "The Banking System in Israel – Efficiency, Competitiveness and Profitability." Banking Quarterly 33, 1995, pp. 27-33 (Hebrew).

Gray, Jo Anna, "On Indexation and Contract Length." *Journal of Political Economy 86*, February 1978, pp. 1150-1175.

Gu, Wulong and Kuhn, Peter, "A Theory of Holdouts in Wage Bargaining." *American Economic Review 88*, June 1998, pp. 428-449.

Harris, Milton and Holmstrom, Bengt, "On the Duration of Agreements." *International Economic Review 28*, June 1987, pp. 389-405.

Holden, Steinar, "Wage Bargaining and Nominal Rigidities." *European Economic Review 38*, May 1994, pp. 1021-1039.

Meir, Aharon, "Competition in the Banking Industry – Advantages and Disadvantages." *Banking Quarterly 20*, 1981, pp. 4-10 (Hebrew).

Ministry of Labour and Social Affairs, *Labour, Social Affairs and National Insurance; Monthly Bulletin of the Ministry of Labour and Social Affairs*, Israel; various issues.

Murphy, Kevin. J., "Determinants of Contract Duration in Collective Bargaining Agreements." *Industrial and Labor Relations Review 45*, January 1992, pp. 352-365.

Rich, Robert and Tracy, Joseph, "Uncertainty and Labor Contract Durations." NBER Working Paper No. 7731, June 2000.

Shifron, Gad, "Concentration of Banks in Israel and in Other Countries." *Banking Quarterly 31*, 1993, pp. 28-41 (Hebrew).

Vroman, Susan B., "Inflation Uncertainty and Contract Duration." *Review of Economics and Statistics 71*, November 1989, pp. 677-681.

Wallace, Frederick H., and Blanco, Herminio, "The Effects of Real and Nominal Shocks on Union-Firm Contract Duration." *Journal of Monetary Economics 27*, June 1991, pp. 361-380.

TABLE 1

Characteristics of the Israeli Banking System, 1978-1995

Year	Number of Banking Corporations (Ordinary)	Number of Offices Ordinary Banking Corporations	Employees in Ordinary Banking Corporations
1978	63(29)	1046	27600
1979	63(29)	1074	30500
1980	63 (30)	1099	32800
1981	62 (29)	1124	34104
1982	66 (29)	1144	35970
1983	66 (30)	1159	37554
1984	67 (30)	1109	36080
1985	67 (30)	1103	34086
1986	67 (30)	1080	32153
1987	65 (29)	1045	30558
1988	60 (29)	1045	30581
1989	60 (30)	1037	30832
1990	58 (29)	1038	30756
1991	55 (29)	1036	31699
1992	53 (28)	1049	32070
1993	51 (29)	1061	32519
1994	55 (33)	1086	33414
1995	46 (27)	1081	34007

Source: Bank of Israel, Supervisor of Banks, Annual Information on the Banking Corporations, various issues.

TABLE 2

Characteristics of Regression Variables, Private Sector Israeli Economy, 1978-1995 (1,731 Contracts)

Variable	Mean	Standard Deviation	Minimum Value	Maximum Value
Delay (days)	193.79	188.78	0	1391
Value of money				
- Trend in the value of money	-0.0378	0.0384	-0.1533	-0.0041
- Nominal shock	-0.0151	0.0244	-0.1185	0.1385
- Expected variance of nominal shock	6.8E-4	1.2E-3	2.7E-6	7.5E-3
GDP (per capita)				
Private services (407 contracts)				
- Trend in GDP	0.0061	0.0201	-0.0177	0.0527
- Real shock	0.0024	0.0296	-0.0306	0.0780
- Expected variance of real shock	2.6E-4	6.4E-4	1.5E-6	2.6E-3
Public services (15 contracts)				
- Trend in GDP	0.0012	0.0072	-0.0095	0.0238
- Real shock	0.0028	0.0111	-0.0191	0.0248
- Expected variance of real shock	2.2E-5	1.8E-5	7.0E-7	5.7E-5
Manufacturing (1,188 contracts)				
- Trend in GDP	0.0021	0.0116	-0.0224	0.0252
- Real shock	0.0051	0.0265	-0.0230	0.0751
- Expected variance of real shock	2.5E-4	5.5E-4	2.9E-7	2.4E-3
Commerce (82 contracts)				
- Trend in GDP	0.0021	0.0105	-0.0094	0.0274
- Real shock	2.7E-5	0.0181	-0.0265	0.0510
- Expected variance of real shock	1.4E-4	1.8E-4	2.2E-6	5.8E-4
Banking Corporations (35 contracts)				
- Trend in GDP	0.0015	0.0111	-0.0132	0.0331
- Real shock	0.0068	0.0266	-0.0149	0.0631
- Expected variance of real shock	8.3E-5	1.8E-4	5.9E-9	8.4E-4
Degree of indexation	0.5786	0.1748	0.0336	1
γ	0.4049	0.1766	0	0.9663
z	0.9915	0.0261	0.9031	1.0696
Real interest rate	0.0156	0.0128	-0.0101	0.0537
Election years	0.2363	-	-	-
Unemployment rate	0.0710	0.0228	0.0287	0.1117

Sources: Authors' calculations based on:
Bank of Israel: *Bank of Israel Annual Report*, various issues.
Bank of Israel, Research Department: *Recent Economic Developments*, various issues.
Central Bureau of Statistics: *Monthly Bulletin of Statistics and Statistical Abstract of Israel*, various issues.
Ministry of Labour and Social Affairs: *Labour, Social Affairs and National Insurance* (Monthly Bulletin), various issues.

Note: Trend, shock, and real interest rate are per month

TABLE 3

Length of Delay Regressions for the Private Sector Israeli Labor Market, 1978-1995

Independent variables	(1) Random-Effects GLS Regression, excluding Banking Corporations	(2) Random-Effects GLS Regression, including Banking Corporations	(3) Random-Effects GLS Regression, only Banking Corporations
	Coefficient (z-value)	Coefficient (z-value)	Coefficient (z-value)
z	5.062 (2.45)	5.065 (2.46)	46.610 (2.57)
D (z-z^*)	-29.123 (5.41)	-29.096 (5.42)	-106.145 (3.38)
γ^2 * exp. variance of shock to the value of money	18.825 (5.96)	18.814 (5.98)	62.539 (1.98)
Exp. Variance of productivity shock	-6.128 (7.97)	-6.132 (8.00)	33.542 (2.82)
Elections	-28.481 (2.82)	-28.372 (2.82)	-17.029 (0.34)
Unemployment rate (%)	-17.180 (7.78)	-17.202 (7.82)	1.875 (0.18)
Economic Branch			
Public Services	-85.263 (1.92)	-85.355 (1.92)	-
Manufacturing	-25.022 (1.92)	-25.039 (1.93)	-
Commerce	-14.376 (0.57)	-13.309 (0.53)	-
Banking Corporations (BC)	-	-3020 (1.14)	-
BC * z	-	30.347 (1.13)	-
BC * D (z-z^*)	-	-82.360 (2.00)	-
BC * γ^2 * exp. variance of nominal shock	-	19.324 (0.42)	-
BC * exp. variance of real shock	-	33.852 (2.20)	-
BC * Elections	-	13.097 (0.19)	-
BC * Unemployment rate	-	14.838 (1.07)	-
Constant	-152.061 (0.77)	-152.174 (0.77)	-4316.6 (2.42)
R^2	0.0891	0.1023	0.5054
χ^2 for Hausman test	5.66 Prob($\chi^2(9)>5.66$)=0.7731	9.39 Prob($\chi^2(16)>9.39$)=0.8964	4.74 Prob($\chi^2(6)>4.74$)=0.5775
χ^2 for Breutch-Pagan test	27280 Prob(χ^2 (1)>27280)=0.000	276.36 Prob(χ^2 (1)>276.36)=0.000	1.02 Prob(χ^2 (1)>1.02)=0.3125
Sample size	1,696	1,731	35

Notes:

1. STATA 7.0 is used for estimation.
2. Taken together, the Hausman and Breutch-Pagan tests indicate that the random-effects model is the correct specification in Regressions (1) and (2). It is less clear what is the correct specification in Regression (3).
3. The value of z, the ratio of the real wage with delay to the real wage without delay, is measured in percent. Similarly for $D(z\text{-}z^*)$. The expected variances of the nominal and real shocks are measured in (percent)^2. The real shocks are estimated for each economic branch separately.
4. The firm is used as the cross-section identifier.
5. The reference group for Economic Branch is: Private Services.