David Card, Francis Kramarz and Thomas Lemieux

LABOUR ECONOMICS

Centre for Economic Policy Research

OF CANADA, FRANCE AND THE UNITED STATES

David Card, Francis Kramarz and Thomas Lemieux

Discussion Paper No. 2008
October 1998

Centre for Economic Policy Research
90–98 Goswell Rd
London EC1V 7DB
Tel: (44 171) 878 2900
Fax: (44 171) 878 2999
Email: cepr@cepr.org

This Discussion Paper is issued under the auspices of the Centre's research programme in **Labour Economics**. Any opinions expressed here are those of the author(s) and not those of the Centre for Economic Policy Research. Research disseminated by CEPR may include views on policy, but the Centre itself takes no institutional policy positions.

The Centre for Economic Policy Research was established in 1983 as a private educational charity, to promote independent analysis and public discussion of open economies and the relations among them. It is pluralist and non-partisan, bringing economic research to bear on the analysis of medium- and long-run policy questions. Institutional (core) finance for the Centre has been provided through major grants from the Economic and Social Research Council, under which an ESRC Resource Centre operates within CEPR; the Esmée Fairbairn Charitable Trust; and the Bank of England. These organizations do not give prior review to the Centre's publications, nor do they necessarily endorse the views expressed therein.

These Discussion Papers often represent preliminary or incomplete work, circulated to encourage discussion and comment. Citation and use of such a paper should take account of its provisional character.

bigger employment losses if institutional factors like minimum wages or trade unions prevent real wages from declining. Some analysts have argued that this insight explains the dichotomy between the United States, where real wages of less-skilled workers fell over the 1980s and aggregate employment expanded vigorously, and Europe, where real wages of less-skilled workers were constant and employment was stagnant. We test this hypothesis by comparing recent changes in wage and employment rates for different age and education groups in Canada, France and the United States. We argue that similar trade and technology shocks that led to falling real wages for less-skilled workers in the United States have affected Canada and France. Consistent with the view that labour market institutions in these countries inhibit wage flexibility, we find that the relative wages of less-skilled workers fell somewhat less in Canada that in the United States during the 1980s and did not fall at all in France. Nevertheless, we find similar patterns of employment changes by skill group in the three countries.

JEL Classification: J23, J30, O33
Keywords: wage flexibility, relative employment changes, technical shocks

David Card
Department of Economics
631 Evans Hall
University of California Berkeley
Berkeley CA 94720
USA
Email: card@econ.berkeley.edu

Francis Kramarz
CREST-INSEE
15 Boulevard Gabriel Péri
92245 Malakoff cedex
FRANCE
Tel: (33 1) 4117 6033
Fax: (33 1) 4117 6046
Email: kramarz@ensae.fr

Fax: (1 514) 343 5831
Email: lemieuxt@crde.umontreal.ca

*This paper is produced as part of a CEPR research programme on *Labour Demand, Education, and the Dynamics of Social Exclusion*, supported by a grant from the Commission of the European Communities under its Targeted socio-economic research Programme (no. SOE2–CT97–3052). Earlier drafts of this paper were presented at the January AEA meetings and at the Wenner-Gren Centre conference 'Unemployment and Wage Dispersion – Is There a Trade-Off?', Stockholm, June 1995. The authors are grateful to Paul Beaudry, Rebecca Blank, Stephen Nickell and many seminar participants for comments and suggestions and to John Abowd and Dwayne Benjamin for help with the data. They are also grateful to Stephen Jones and two anonymous referees for comments and suggestions on an earlier draft of this paper. Special thanks to Alan Manning for many useful discussions

Submitted 16 September 1998

According to this hypothesis, job growth in the United States has been aided by flexible institutions that allowed real wages of younger and less-educated workers to fall. In Western Europe, on the other hand, minimum wages, union wage setting, and generous employment benefits have propped up the wages of the less-skilled workers, preventing a rise in wage inequality but also severely limiting job growth.

In this paper we attempt to evaluate the evidence in favour of this 'trade-off hypothesis' using data on detailed age and education groups for Canada, France and the United States. We argue that similar negative shocks have affected the relative demand for less-skilled workers in all three countries. In the United States, where labour markets are flexible, the trade-off hypothesis predicts that adverse shocks will primarily affect the relative wages of less-skilled workers. In France, where labour markets are relatively inflexible, the same shocks will primarily affect the relative employment of less-skilled workers. Finally, in Canada, where labour market institutions lie somewhere between those of France and the United States, adverse demand shocks will lead to smaller relative wage adjustments than in the United States, and smaller relative employment changes than in France.

To test the trade-off hypothesis we require comparable indexes of the relative demand shocks that have affected different skill groups in the three countries. We present two such indexes, the initial wage of the group and the proportion computer users in the group.

We compare the effects of these two alternative demand indexes on the structure of relative wages and employment across different age and education groups over the 1980s. For the United States, we find that groups with lower wages at the beginning of the 1980s – or lower rates of computer use at the end of the 1980s – had significantly slower wage growth over the decade, and somewhat slower employment growth. A simple reinterpretation of these patterns is that negative demand shocks put downward pressure on the relative wages of the less-skilled workers, ultimately leading to reductions in relative labour supply. In contrast to the patterns in the United States, systematic widening of employment outcomes across skill groups relative to the United States.

We conclude that the patterns of relative employment changes provide at best some weak support to the view that wage flexibility moderates the employment losses for groups affected by negative demand shocks.

illustrates a fundamental tradeoff between wage inequality and employment growth in the face of declining demand for less-skilled labor.[2] According to this hypothesis, job growth in the United States has been aided by flexible institutions that allowed real wages of younger and less-educated workers to fall. In Western Europe, on the other hand, minimum wages, union wage setting, and generous unemployment benefits have propped up the wages of less-skilled workers, preventing a rise in wage inequality but also severely limiting job growth.

In this paper we attempt to evaluate the evidence in favor of this "tradeoff hypothesis" using data on detailed age and education groups for the United States, Canada, and France. We argue that similar negative shocks have affected the relative demand for less-skilled workers in all three countries. In the United States, where labor markets are flexible, the tradeoff hypothesis predicts that adverse shocks will primarily affect the relative <u>wages</u> of less-skilled workers. In France, where labor markets are relatively inflexible, the same shocks will primarily affect the relative <u>employment</u> of less-skilled workers. Finally, in Canada, where labor market institutions lie

[1]An important exception to the Western European pattern is the U.K., where inequality and employment trends were closer to those in the U.S. See Freeman and Katz (1995).

[2]See Krugman (1994) for a clear statement of this view and Freeman (1994, page 14) and Katz, Loveman, and Blanchflower (1995, page 57) for more guarded statements.

Murphy, and Pierce, 1993, or Card and Lemieux, 1996). This pattern suggests that the level of wages for a particular skill group in the early 1980s can serve as a proxy for the relative demand shocks faced by the group over the decade. Our second index is linked to a more specific explanation for widening wage inequality: skill-biased technical change driven by innovations in computer technology.[3] We use the fraction of each skill group that used a computer on the job in the late 1980s as an alternative index of relative demand shifts over the preceding decade.

We compare the effects of these two alternative demand indexes on the structure of relative wages and employment across different age and education groups over the 1980s. For the U.S., we find that groups with lower wages at the beginning of the 1980s -- or lower rates of computer use at the end of the 1980s -- had significantly slower wage growth over the decade, and somewhat slower employment growth. A simple interpretation of these patterns is that negative demand shocks put downward pressure on the relative wages of less-skilled workers, ultimately leading to reductions in relative labor supply (this interpretation is suggested by Juhn, 1992, among others). In contrast

[3]See Krueger (1993) and Berman, Bound, and Griliches (1994) for example.

clearcut, although on balance we find smaller relative wage adjustments across skill groups than in the U.S. As in the French case, this relative wage inflexibility does not seem to have led to a systematic widening of employment outcomes across skill groups relative to the United States.

I. Labor Markets in the United States, Canada, and France

A. Sources of Relative Labor Demand Shocks

There is now an extensive U.S. literature documenting the fact that real wages of younger and less-educated workers fell over the 1980s and attempting to explain these trends -- see e.g. Murphy and Welch (1991), Bound and Johnson (1992), Katz and Murphy (1992), Borjas and Ramey (1994, 1995), Lawrence and Slaughter (1993), and Kosters (1994). A primary conclusion of this literature is that the declines are attributable to relative demand shifts.[4] The two leading explanations for these shifts are skill-biased technical change and trade.

With respect to technological change, many analysts have suggested that computers differentially raise the productivity of more highly-skilled workers, leading to a decline in relative demand for less-skilled labor (see

[4]Some authors (e.g. DiNardo, Fortin, Lemieux, 1996) have argued that institutional changes such as declining unionization and falling minimum wages have contributed to widening wage inequality in the U.S.

affected labor markets in France and Canada? To get a rough impression we assembled the comparative data in Tables 1 and 2. Table 1 shows the fraction of the workforce who report that they use a computer at work as of the late 1980s in the United States, Canada, and France. Computer use is slightly higher in the U.S. than in Canada or France, but the diffusion of computer technology seems to have proceeded at a fairly similar pace in the three economies. Women in each country are more likely to use a computer at work than men, perhaps reflecting occupational differences in the adoption of computers.

As shown in row 3 of Table 1, better-educated workers are also more likely to use a computer, and in fact usage rates for college graduates are fairly similar in the three countries. For those without a college degree computer usage rates are 30-45 percent higher in Canada and France than in the United States. Conditional on education, computer use is therefore lower in the U.S. than in Canada or France, but higher levels of education in the U.S. lead to a higher overall level of computer use.

---

[5]The empirical plausibility of the case that trade has affected relative wages is a matter of some dispute. See Bhagwati and Dehejia (1994), Lawrence (1994), and Leamer (1994) for example.

United States is a low-trade country. Nevertheless, the rate of growth of imports relative to domestic output was slightly faster in the United States than in France or Canada over the past two decades. Interestingly, however, U.S. imports expanded more rapidly during the 1970s than the 1980s. Concentrating only on the 1980s, imports grew more slowly in the United States than in the other two countries.[6]

One could argue that even though the United States is a low-trade country, it is more vulnerable to import competition from low-wage countries, or from countries with technological advantages in certain products (like Japan). To address this issue, we re-calculated the import-penetration ratios, excluding Canadian imports from the U.S. data, U.S. imports from the Canadian data, and European imports from the French data. The results, presented in the third column of Table 2, show that even under this more restrictive notion of import penetration, the rates of growth of imports in the three countries are roughly comparable. There is no indication that Canada or France are more isolated from rising international trade than the United States.[7]

---

[6]This conclusion continues to hold when we use 1969, 1979, and 1989 data.

[7]The large fraction of Canadian trade flows accounted for by trade with the U.S. suggests that shocks that affect the U.S. market will be transfered to Canada.

workers. In this section we briefly summarize some evidence on the importance of these institutions in the three labor markets.

The United States, Canada, and France all have minimum wage laws: the U.S. and France set national standards, while minimum wages in Canada are largely a provincial issue.[8] One useful summary measure of these laws is the ratio of the minimum wage to the average wage for a representative subset of workers. Figure 1 plots this ratio for the three countries over the 1966-93 period.[9] Relative minimum wages in Canada and the United States fell sharply from the late 1970s to the late 1980s, with modest rebounds in both countries in the early 1990s. In France, by comparison, minimum wages edged up slightly relative to average salaries in the early 1980s, and then remained constant.

---

[8]States in the U.S. can (and sometimes do) set minimum wage rates above the federal rate. For an overview of U.S. minimum wage laws, see Card and Krueger (1995). For a discussion of Canadian laws, see West and McKee (1980) and Baker, Benjamin, and Stanger (1994). For a discussion of the French minimum wage (the salaire minimum interprofessionnel de croissance, or SMIC) see Bayet (1994).

[9]For the United States, we divide the federal minimum wage by the average hourly wage in manufacturing. For Canada, we use a weighted average of province-specific ratios of the minimum wage to average hourly wage of manufacturing workers. We are grateful to Dwayne Benjamin for supplying his data for this calculation. For France, we use the ratio of the average annual SMIC (net of the employee share of the payroll tax), multiplied by an estimate of average hours per year (for full time full year workers) and divided by an estimate of average net annual salaries. See Bayet (1994).

France, on the other hand, suggests that minimum wages could have played an important role in reducing relative wage flexibility in the French labor market (see Katz, Loveman, and Blanchflower, 1995).

Table 3 summarizes some recent data on union membership and collective bargaining coverage in the three countries.[10] In Canada and the United States, collective bargaining is conducted at the establishment or firm level. Since about 90 percent of workers who are covered by union contracts in both countries are union members, it is customary to use union membership rates as a measure of the extent of collective bargaining coverage.[11] The data in the first two columns of Table 3 show that although unionization rates were similar in the United States and Canada in the early 1970s, by 1980 the Canadian rate was 50 percent higher. During the 1980s the divergence continued, with declining unionization in the United States and roughly steady rates in Canada. To the extent that North American unions resist real wage declines and fight to maintain relative wage differentials, the lower level of unionism in the U.S. would be expected to enhance downward relative wage flexibility vis-a-vis Canada.

Collective bargaining institutions in most European countries are very

[10]A closely related source of potential wage rigidity is the public sector. This may be particularly important for France.

[11]In both the United States and Canada, union membership rates and union coverage rates tend to show very similar cross-sectional patterns and trends. See Lemieux (1993) and Riddell (1993).

coverage remains very high. The broad coverage of industry-wide minimum pay rates suggests that collective bargaining institutions may have some effect on the French wage structure -- particularly in preventing wage reductions for low-skilled workers.[13]

A final set of institutions that play a role in determining the downward-flexibility of wages are unemployment insurance and income support programs for nonworkers. Standard models imply that workers will not accept jobs that pay less than they can receive from unemployment insurance or welfare payments: thus higher benefit levels, or broader eligibility rules, will tend crowd out low-wage jobs.[14] France, Canada, and the United States

---

[12]See U.S. Department of Labor (1992). The baseline pay scales apply to all firms belonging to the employer's association that signed the collective agreement. In about one-half of the cases, the agreement is extended by the Minister of Labor to the rest of the industry. In 1985, 86 percent of private sector workers employed in firms with at least 10 employees were covered by an industry level agreement while 35 percent of them were covered by a firm or establishment level agreement (Benveniste (1985)).

[13]Note, however, that the median value (across industries) of the baseline pay scale negotiated at the industry level was below the SMIC during our period of analysis (Barrat et al. (1994)). This suggests that low-wage workers were better protected against a decline in their relative wages by the active SMIC policy pursued by the government than by industry level agreements.

[14]In fact, both labor supply and search theoretic models suggest that the lowest wage a worker will accept is somewhat above the level of welfare or unemployment benefits.

OECD study (OECD, 1994) concludes that the French program is more generous than the Canadian program (especially after taking account of longer-term unemployed), and that both are more generous than the U.S.

In addition to time-limited programs for recent job-losers, France, Canada, and the United States all have income support programs for certain groups of nonworkers. In the U.S. food stamps are the only form of support widely available to able-bodied nonworkers; most states limit traditional "welfare" payments to single mothers.[17] By comparison, both Canada and France have social assistance programs that provide cash payments to nonworkers regardless of family structure. All three countries also have income support programs for disabled individuals which may be particularly important in determining the labor force behavior of relatively unskilled older workers (see Bound and Burkhauser, 1999). While the safety net systems of Canada, France, and the United States are quite complex, taken as a whole we believe

---

[15]The U.S. and Canadian programs are similar in broad outline, while the French system includes a second stage of extended benefits for those who exhaust the first stage.

[16]During the 1980s the Canadian program typically provided benefit payments to more people than were counted as unemployed (Card and Riddell (1993)), although recent reforms have scaled back coverage. Similarly, the French unemployment insurance program paid benefits to about as many people as were counted as unemployed in 1990 (OECD, 1994, Table 8.4).

[17]Most U.S. states and counties have very modest general assistance benefits for people who are ineligible for other forms of income assistance. See Blank and Hanratty (1993) for a detailed comparison of income support programs in the U.S. and Canada.

different skill groups. We utilize a model with only one output good because previous studies (e.g. Bound and Johnson (1992), Katz and Murphy (1992)) have ruled out between-industry factors as a major source of rising wage inequality in the U.S. Consider a competitive economy in which firms use labor inputs N_1, N_2,... N_J to produce a homogenous output Y. Suppose that output in period t is related to the inputs by a constant-returns-to-scale CES production function:

$$(2) \qquad Y_t = f(\ N_{1t},\ N_{2t}, \ldots N_{Jt}\ ),$$
$$= \{\ \Sigma_j \ (c_{jt}\ N_{jt})^{(\sigma-1)/\sigma}\ \}^{\sigma/(\sigma-1)}$$

where σ is the elasticity of substitution, and c_{jt} is a relative efficiency parameter for skill-group j in period t.[18] If the wage rate for skill group j is denoted by w_{jt}, then the demand for labor of the jth skill group in period t satisfies the following equation:

$$(3) \qquad \log N_{jt} = \log Y_t - \sigma \log w_{jt} + (\sigma-1) \log c_{jt} .$$

Assuming that $\sigma > 1$, a rise in c_{jt} leads to an increase in the relative demand

[18]Any "factor neutral" technical change results in a proportional shift in all the c_{jt}'s. A model similar to the one here, but ignoring labor supply, is presented by Bound and Johnson (1992).

individuals in the jth group, for example arising through changes in the quality of schooling.

Assume that the population in period t contains P_{jt} individuals in the jth skill class, and that each individual who chooses to work supplies a fixed number of hours per period (normalized to 1). Finally, assume that individuals within each skill group differ in their reservation wages, and that when the (real) wage rate is w_{jt}, a fraction p_{jt} choose to work, where

$$(4) \quad p_{jt} = N_{jt}/P_{jt} = a_j \, w_{jt}^{\varepsilon} \ ,$$

where a_j is a taste parameter that varies across groups and ε is the elasticity of labor supply, which we assume is constant across groups. Let P_t represent the total (adult) population in period t, let $y_t = Y_t/P_t$ represent per capita output in period t, and let $f_{jt} = P_{jt}/P_t$ represent the fraction of the population in skill group j. Making use of these definitions, equations (3) and (4) can be combined to yield:

$$(5a) \quad \log w_{jt} = \frac{1}{\sigma + \varepsilon} \{\log y_t + (\sigma-1) \log c_{jt} - \log(a_j) - \log f_{jt}\} \ ,$$

$$(5b) \quad \log p_{jt} = \frac{\sigma}{\sigma + \varepsilon} \log(a_j) + \frac{\varepsilon}{\sigma + \varepsilon} \{\log y_t + (\sigma-1) \log c_{jt} - \log f_{jt}\}.$$

These equations relate group-specific wages and employment-population rates to a year-specific aggregate term ($\log y_t$), the taste parameter a_j, and the demand and supply shift variables c_{jt} and f_{jt}.

If data are available for two periods, then the changes in wages and shifts.

We use two alternative proxies for the relative demand shifts that have affected different skill groups. The first is motivated by the observation that in the U.S. labor market, groups with higher wage levels have had faster real wage growth. For example, Juhn, Murphy and Pierce (1993) show that the real wage levels associated with different percentiles of the wage distribution "fanned out" over the 1980s. Card and Lemieux (1996) present formal tests of the hypothesis that the real changes for different demographic groups during the 1980s are a monotonic function of their initial wage levels. Although this hypothesis is rejected, it provides a relatively accurate description of relative wage movements. Assuming that relative wage changes in the U.S. labor market in the 1980s were driven by relative demand shocks, the findings in Juhn, Murphy and Pierce (1993) and Card and Lemieux (1996) imply that the level of wages of the jth group at the beginning of the decade (log w_{j0}) is a useful proxy for the relative demand shock faced by the group over the subsequent years, although the cause of the demand shifts is not explained.

Our second proxy is motivated by recent research linking rising wage this conclusion, our second demand shift index is simply the fraction of the jth skill group who are observed using computers at work at the end of the 1980s (cu_{j1}). Assuming that relative demand shocks are mainly driven by the diffusion of computer technologies (as argued by Krueger (1993); Berman, Bound, and Griliches (1994); Autor Katz, and Krueger (1997); Bound and Johnson (1992)) the magnitude of the relative demand shock faced by a certain skill group over the 1980s is proportional to the fraction of the group who used computers on the job at the end of the decade.

Let D_j represent the proxy variable (either cu_{j1} or $\log w_{j0}$) used to predict the relative demand shift experienced by group j. We assume that the relationship between the skill-group-specific relative productivity terms and the demand proxies is approximately linear:

$$(7) \quad (\sigma-1)\ \Delta\log c_{jt} = \alpha + \beta D_j + u_j,$$

where $\beta < 0$. Substitution of (7) into (6a) and (6b) leads to equations of the form:

$$(8a) \quad \Delta\log w_j = d_1 + \frac{\beta}{\sigma + \varepsilon} D_j - \frac{1}{\sigma + \varepsilon} \Delta\log f_{jt} + e_{j1} ,$$

and

$$(8b) \quad \Delta\log p_j = d_2 + \frac{\beta\varepsilon}{\sigma + \varepsilon} D_j - \frac{\varepsilon}{\sigma + \varepsilon} \Delta\log f_{jt} + e_{j2} ,$$

where d_1 and d_2 are constants, and e_{j1} and e_{j2} are stochastic terms representing a combination of the error term in the prediction equation for relative demand a full set of cross-elasticities of factor demand for each skill group can be introduced, but the number of parameters becomes unmanageable in the absence of some very restrictive assumptions about substitutability.

A second assumption is that workers within each skill group are equally productive and differ only in their reservation wages. This assumption implies that the mean wage for workers in a given skill group is an unbiased estimate of the wage that would be observed for the non-workers in the group if they chose to work. A (possibly) more realistic assumption is that workers in each group are perfect substitutes in production, but that different individuals in the group have different relative productivities. In this case, the potential wage of the ith person in the jth group in period t can be written as

$$\log w_{ijt} = \log w_{jt} + k_{ij},$$

where w_{jt} is the wage for a "standardized" person in group j (e.g., the person with the median productivity level). This assumption introduces two complications into the simple model of equations (6a) and (6b). First, the "effective" labor force of the jth skill group is no longer a simple head count, but must be adjusted for the relative productivities of those who are of a particular skill group that are attributable to changes in the composition of employment within the group, rather than to changes in underlying supply or demand factors. One simple method that we use in the next section is to assume that nonworkers would earn a relatively low wage -- specifically the minimum wage for the period of observation -- and recalculate the mean wage changes accordingly. An alternative (examined in Appendix 2) is to use the median wage (or some other percentile), assuming that non-workers in the skill group would be paid less than the median wage for the group.

A third strong assumption is the linearity of equation (7). Note that this is testable, since it implies that the observed relative wage changes (and relative employment changes) across demographic groups will also be linear in the observed demand proxies. We present some graphical evidence on this below. In principle, however, higher-order terms of the demand shift proxies can be easily added to equation (7) and will lead to a parallel set of higher order terms in equations (8a) and (8b).

B. Effect of Downward Wage Rigidity

Equations (8a) and (8b) are derived under the assumption that wages can freely adjust to demand and supply shocks. To analyse the effects of relative wage rigidity, denote the optimal wage change specified by equation (6a) as $\Delta \log w_j^*$. Assume that institutional rigidities or other constraints lead to and $\lambda_j = \lambda$ if $\Delta\log w_j < 0$.

If wages are upward flexible but downward rigid, employment is either in equilibrium or determined by the demand side of the market. Assuming that the relative demand shocks are related to the observable proxy variables by equation (7) and that the initial wage is in equilibrium, equations (8a) and (8b) will be replaced by:

$$(9a) \quad \Delta\log w_j = d_3 + \frac{\lambda_j\beta}{\sigma + \varepsilon} D_j - \frac{\lambda_j}{\sigma + \varepsilon} \Delta\log f_{jt} + e_{j3} ,$$

$$(9b) \quad \Delta\log p_j = d_4 + \frac{\beta(\varepsilon + \sigma(1-\lambda_j))}{\sigma + \varepsilon} D_j - \frac{\varepsilon + \sigma(1-\lambda_j)}{\sigma + \varepsilon} \Delta\log f_{jt} + e_{j4} ,$$

where d_3 and d_4 are constant across all skill groups and e_{j3} and e_{j4} are stochastic terms. Comparisons of equations (9a) and (9b) with (8a) and (8b) show that downward rigidities dampen the responsiveness of wages to negative demand shocks and accentuate the responsiveness of employment to such shocks.

Let $\bar{\lambda}$ represent the mean of λ_j across skill groups over a particular time interval. Equations (9a) and (9b) can be re-written as

$$(10a) \quad \Delta\log w_j = \pi_{10} + \pi_{11} D_j + \pi_{12} \Delta\log f_{jt} + u_{1j} ,$$

Our empirical strategy is to estimate models like (10a) and (10b) using changes in wages and employment rates across skill groups in the U.S., Canada, and France, and the two alternative demand proxies described above. Our primary hypothesis is that over the 1980s $\bar{\lambda}$ was smaller (wages were on average more downward rigid) in France and Canada than in the U.S. According to equations (10a) and (10b) we would therefore expect that relative wage changes in Canada and France would be <u>less sensitive</u> to relative demand shifts than in the U.S. (i.e. π_{11} will be smaller in magnitude than in the U.S.) while relative employment changes in Canada and France would be <u>more sensitive</u> to relative demand shifts (i.e. π_{21} will be larger in magnitude than in the U.S.).[19]

It is worth emphasizing that the validity of any comparisons of the reduced form coefficients from equations (10) across the three countries hinges on assumption that the mapping between relative demand shocks and the observed demand proxies is similar in the three countries: i.e. that the coefficient β in equation (7) is the same across countries. In the case of the computer usage proxy, we believe this is a reasonable assumption, since as

---

[19] Note that OLS estimation of equation (10a) will tend to yield downward-biased estimates of the coefficient π_{11}, since the demand index D_j is likely to be negatively correlated with the residual component $(\lambda_j-\bar{\lambda})/(\sigma+\varepsilon) \times \{ \beta D_j - \Delta \log f_{jt} \}$ if wages are downward rigid. A similar argument applies to the estimate of π_{21}.

across skill groups, then the β coefficient that links initial wage levels to subsequent demand shocks is probably <u>smaller</u> in the U.S. than in Canada or France. This will make it harder for us to find relative wage compression (and relative employment divergence) in Canada and France vis-a-vis the U.S. when we use initial wage levels as our relative demand proxy.

C. Microdata on Wages and Employment

We have assembled labor market survey data for men and women from the beginning and end of the 1980s for the U.S., Canada, and France. In order to control for the effect of cyclical factors on wages and employment, the beginning and end years are chosen to match the peaks of the business cycle in each country.[21] Our samples include individuals age 16-65 in the United States, age 17-64 in Canada, and age 15-60 in France. We further limit our

---

[20]Berman, Bound, and Machin (1997) make a similar argument.

[21]The two peaks of the U.S. business cycles are 1979 and 1989 with unemployment rates of 5.8 and 5.3 percent respectively. In the case of France and Canada, we can closely -- but not perfectly -- match the timing of the business cycle because of data limitations. The beginning and end years are 1981 and 1988 in Canada, with unemployment rates of 7.5 and 7.8 percent, respectively. The beginning and end years are 1982 and 1989 in France, with unemployment rates of 8.2 and 9.3 percent, respectively.

particular survey week. In all cases, the wage measure is a "point-in-time" estimate of the usual hourly wage for an individual's main job.[22] This measure differs from the one typically used in the literature, which is constructed from annual earnings and weeks of work over the year. Nevertheless, comparisons of alternative wage measures for the U.S. labor market reported in Card and Lemieux (1996) suggest that the two types of measures give similar estimates of the levels and changes in hourly wages. In our U.S. and Canadian data sets, wages are recorded before taxes, whereas in our French data sets, wages are recorded net of employee payroll tax contributions. Since the French payroll tax is a fixed proportion of gross earnings, this difference should not affect <u>relative</u> pay comparisons.

Tables 4 and 5 present the overall levels and changes in mean log wages and employment rates estimated from our samples. As shown in row 8 of table 4, mean log wages of men fell by 7.5 percent in our U.S. sample, rose by 3.9 percent in our Canadian sample, and fell by 2.7 percent in our French sample. For women, average real wage growth was slightly positive in the U.S. and Canada, and negative in France. The measured decline in real wages for French workers is due to the use of an after-tax wage. Between 1982 and 1989, the

---

[22]The French surveys collect usual monthly earnings and average hours per week, which we use to construct an hourly wage. The U.S. surveys collect usual hourly wages or usual weekly wages and usual hours per week, which we use to form an estimate of usual hourly pay. The two Canadian surveys ask about wage information for jobs held in the previous year, rather than currently. In all three countries, wages are unavailable for self-employed workers.

slightly in France. Rows 10-12 decompose the changes in the cross-sectional variances of wages in each country into a component attributable to changes in wage dispersion within narrowly-defined age-education cells, and a component attributable to changes in between-cell dispersion. The decompositions suggest that the sharp rises in wage inequality in the U.S. were about equally attributable to rising inequality within and between age-education groups. In Canada, the variances of wages between age-education cells rose only slightly less than in the United States. However, rising wage inequality between groups was counteracted by a decline in the within-cell variance of wages in Canada, leading to little net increase in overall dispersion.

Although it is possible that wage variation within age-education cells actually fell in Canada over the 1980s, an alternative explanation is that changes in survey procedures lowered the variability of survey-response errors.[23] Unlike our U.S. and French samples, our Canadian samples are based on slightly different survey instruments in 1981 and 1988. Nevertheless, we believe that changes in the Canadian survey should not have affected the

---

[23]Since the age-education cells in Canada contain a wider range of ages and education levels than in the United States, one might have actually expected a bigger increase in within-cell dispersion in Canada.

Turning to employment outcomes, the first two rows of Table 5 present average employment-population rates for the men and women in our samples at the beginning and end of the 1980s. As shown in row 3, male employment-population rates declined in all three countries during the decade, while female employment-population rates increased. Other things equal, changing age and education distributions over the 1980s would have been expected to lead to rising employment rates for both genders in all three countries. When we control for the effect of these changes (based on differences in the cross-sectional patterns by age/education at the start of the 1980s) the declines in employment for men are even more pronounced, while the increases for women are reduced -- see row 4.[24] For comparative purposes, we also report the overall changes in employment-population rates by gender over the same sample periods in row 5. These tend to be fairly similar to the adjusted changes from our sample.[25]

---

[24]A simple decomposition of the effect of changes in the age/education composition on the employment-population ratio -- the "explained" change in the employment rate -- indicates that, for men, changes in age composition plays a bigger role than changes in education. In all three countries, changes in the age composition account for roughly two thirds of the explained change in the employment rate. By contrast, for women, improvements in the level of education account for roughly 80 percent of the explained change in employment rates in all three countries.

[25]Most of the discrepancy between the two series is due to the fact that older individuals (above 60 in France, above 64 in Canada, and above 65 in the United States) are included in the calculation of the overall rates but are excluded from our samples. This is particularly important for France where the employment rate of men age 60-64 fell drastically during the 1980s as the normal retirement age was reduced from 65 to 60.

required to maintain a constant real wage.

As shown in Figure 2, the U.S. data show a strong positive correlation between the wage growth experienced by a given age-education group over the 1980s and the initial level of wages of the group in 1979. Among men (in the upper panel) only a few cells had average wage increases large enough to maintain the real value of their earnings. More of the female age-education groups had nominal wage growth in excess of inflation. On the employment side, the scatter of points in the upper panel of Figure 2 shows a much weaker correlation between the initial level of wages for different groups of men and the change in their employment rate, while the correlation across different groups of women (in the lower panel) is stronger.

The data for Canadian men and women in Figure 3 show some similarities with the U.S. data. For both genders, age-education groups with higher initial wages tended to have faster wage growth over the 1980s, although relative to the U.S. the correlation is less pronounced. The pattern of employment changes across groups is also less systematic in Canada. Indeed,

---

[26]Several studies such as Juhn, Murphy, and Pierce (1993) also analyse changes over time in within-group wage dispersion. We limit our analysis to between-group given our focus on both wages and <u>employment</u> (within-group employment dispersion is not a useful concept).

experienced large wage losses and significant employment gains over the 1980s.

Figure 4 shows that the patterns of relative wage changes in France over the 1980s were quite different from those in the U.S. or Canada. Unlike their counterparts in North America, French workers with relatively low wages at the beginning of the 1980s had about the same rate of wage growth as those with relatively high wages. Assuming that French employers were affected by the same demand shocks as employers in the United States and Canada, this pattern suggests substantial relative wage inflexibility. On the other hand, the patterns of employment growth across different age-education cells in France are fairly similar to those in the U.S. or Canada.

D. Models of Relative Changes in Wages and Employment Rates

Table 6 presents estimates of equations (10a) and (10b), fitted to the cell-level data for each country using two alternative proxies for the relative demand shocks faced by different age-education groups: the mean log wage of the group at the beginning of the 1980s; and the fraction of the group who used a computer at the end of the 1980s. For each demand proxy we present two estimates of equation (10a): one using the actual change in mean log wages of workers in the cell (columns 1 and 4); and another using an adjusted wage measure that assigns the minimum wage to non-workers (columns 2 and 5).[27] All

[27]We have also estimated the wage models using the 50th and the 75th percentiles of wages for each cell (constructed over workers and non-workers, assuming that non-workers are below the median). The estimates (summarized in

0.12). The signs and magnitudes of the estimated coefficients are not too different when we account for potential selectivity biases by assigning the minimum wage to non-workers in each cell (column 2).

The models in column 3 regress the change in the employment-population rate on the same explanatory variables. For U.S. men, the coefficient is positive (0.04) and marginally significant while for U.S. women, the coefficient is larger (0.12) and highly significant. Together with the estimates in column 1, these estimates support the conventional view that relative demand shocks reduced the demand for less-skilled workers of both genders, leading to relative declines in wages and employment. According to equations (8a) and (8b), the ratio of the coefficients of the relative demand index in models for the change in log employment and the change in log wages is an estimate of the labor supply (participation) elasticity. The estimates for U.S. men imply an elasticity of 0.21-0.24, while the estimates for U.S. women imply an elasticity of 0.32-0.40.

Appendix Table 2) are very similar to those in Table 6.

[28]The parameter estimates tend to be very similar regardless of whether the estimated are obtained by unweighted least squares, or by weighted least squares with any of a variety of cell weights.

growth was fairly even across skill groups, the change in employment is also only weakly related to the base wage level. There is no evidence that the rigidity of French relative wages gave rise to "excess" employment losses for workers whose relative wages would have been predicted to fall on the basis of U.S. patterns.

The models in columns 4-6 of Table 6 regress the changes in wages and employment rates on the alternative demand index variable based on observed computer use rates at the end of the 1980s. The general patterns and implications of the estimated coefficients are not too different from those in columns 1-3. Among U.S. men, for example, the coefficients relating wage and employment changes to computer use rates are slightly larger than the coefficients relating these outcomes to the base wage level, but their ratio is similar, implying a similar supply elasticity.

Experiments with other specifications revealed that the estimated demand-index coefficients for the models in Table 6 are sensitive to two issues: whether or not cells of very young and very old workers are included[29]; and whether or not the change in population share is included as an additional control variable. Our theoretical model suggests that age-education cells that increased their relative population shares should have

---

[29]This sensitivity is particularly notable for the Canadian models, which are estimated on relatively few cells.

model, workers in a given age-education cell may be good substitutes for workers with similar levels of age and education, in which case the relative population shares of the substitute groups must also be included in the reduced-form employment and wage models. An alternative explanation is that supply changes are an endogenous response to (unmeasured) changes in demand conditions.

Table 7 presents an alternative set of estimates of the wage and employment change models, excluding the population share variable.[30] We present estimates for both sexes using all the available age-education cells, and using only the subset of men age 25-54.

Generally speaking, the results reported in Table 7 follow a more stable pattern than those in Table 6. As expected, demand shift variables have a positive effect on employment in all but one of the 18 specifications reported in Table 7. By contrast, the effect is negative in almost half of the models reported. This suggests that including a "wrong signed" supply variable does

---

[30]A closer examination of equations 9 and 10 shows that the relative bias due to the omission of the population share variable will be the same in the three countries provided that β and the coefficient of a regression of the demand shift variable on the population share variable are the same in the three countries. If these conditions hold, excluding the population share variable should not bias the intercountry comparisons.

the simple demand and supply model.[31] Column 2 and 5 of Table 7 show that the effect of demand shifts on wages go from large and positive for the United States to not significant for France, with Canada somewhere in between. This suggest once again that wages are much more flexible in the United States than in France. If anything, wages in Canada are also less flexible than in the United States -- especially in column 5 -- but more flexible than in France.

By contrast, the effect of demand shifts on employment is of the same order of magnitude in all three countries. There is, nevertheless, some weak evidence in favor of the "tradeoff hypothesis" for these samples of prime age males. In both columns 3 and 6, the point estimates of the employment effects are higher in France than in the United States and this difference is marginally significant.

Taken at face value, however, the tradeoff is quite small. Take, for example, the model in which the computer use rate is used as demand shift index, which is arguably our "best" specification. The U.S.-France difference in the wage effects is 0.50 (column 5) relative to a (minus) 0.04 difference in employment effects (column 6). This means that relative wages have to decrease by more than 10 percent for relative employment rates to increase by 1 percent.

---

[31]The schooling and retirement are important decisions that should probably be modeled for younger and older workers, respectively. It is also hard to explain the rapid growth in female employment rates by standard supply and demand factors.

shows no evidence of a tradeoff. For the sample of all men, the effect of the demand shift variables on employment is almost identical in France and in the United States. For the sample of all women, this effect is significantly larger in the United States than in France, indicating that the relative employment rate of less-skilled women fell more in the United States than in France. Furthermore, the effect of the demand shift variables on employment is always smaller in Canada than in the United States (for all men and all women).

Overall, there is at best some weak evidence in favor of the "tradeoff hypothesis". Prime age males are the only group for which the large drop in relative wages of less-skilled workers in the United States has helped reduce the fall in their relative employment rate (relative to France or Canada). But even for this group, the tradeoff is small: the relative drop in wages is much larger than the relative gains in employment.

Finally, since downward wage rigidity is more likely to bind for low-wage than high-wage workers, we re-estimated the models for two separate samples of low- and high-wage workers in France and the United States.[32]

---

[32]High-wage cells are those whose base period wage is above the median base wage and vice versa. The analysis was not performed for Canada because of the small number of cells available.

play a major role too.

III. Conclusions

This paper is motivated by a very simple observation: in labor markets with rigid relative wages, negative employment demand shocks will lead to larger employment losses for the affected groups of workers than would be expected if wages could freely adjust. We test this "tradeoff hypothesis" by comparing changes in wages and employment rates for different age and education groups over the 1980s in the United States, Canada, and France. We argue that the same forces that are generally believed to have lowered the real wages of less-skilled workers in the U.S. labor market have affected labor markets in Canada and France. In comparison to the U.S. labor market, however, Canada and especially France have a variety of institutional features that tend to prevent relative wage adjustments. We would therefore expect the relative structure of wages to have changed less in Canada and France than in the United States during the 1980s, but the relative structure of employment to have changed more.

Using comparable micro-data from the beginning and end of the 1980s for each country, we relate changes in wages and employment-population rates for narrow age and education cells to two proxies for skill-group-specific relative demand shocks: the initial level of wages for the group, and the

Thus, relative wages appear to be slightly less flexible in Canada than the United States, and to be completely inflexible in France.

The patterns of relative employment changes provide at best some weak support to the view that wage flexibility moderates the employment losses for groups affected by negative demand shocks. In the United States, the relative employment rates of lower-wage groups declined over the 1980s. As has been noted in previous work (Juhn (1992)), the parallel trends in wages and employment rates for less-skilled workers are consistent with movements along an upward-sloping supply schedule. In Canada and in France, where one might have expected relative wage rigidity to lead to even bigger employment losses for low-wage workers, the patterns of relative employment growth over the 1980s are not systematically different from those in the United States. Prime age males are the only group for which relative employment losses are (slightly) larger in France and Canada than in the United States. We conclude that there is at best some weak support for the "tradeoff hypothesis".

University of Toronto Department of Economics Unpublished Research Paper, 1994.

Bayet, Alain. "Les salaires de 1991 à 1993 dans le secteur privé et semi-privé. INSEE Résultats. Paris: INSEE, 1994.

Bank of Canada. Bank of Canada Review. Ottawa: Bank of Canada, Autumn 1994.

Barrat, Odile, Thomas Coutrot, and Sylvie Mabile "Structures et Tendances de la Négociation Salariale en France," DARES, Ministry of Labor, mimeo, 1994.

Benveniste Corinne "Les Négociations Salariales: de la Convention Collective à l'Accord d'Entreprises," Economie et Statistique 199-200, (1987): 19-24.

Berman, Eli, John Bound, and Zvi Griliches, "Changes in the Demand for Skilled Labor within U.S. Manufacturing: Evidence from the Annual Survey of Manufactures." Quarterly Journal of Economics 109 (May 1994): 367-98.

Berman, Eli, John Bound, and Stephen Machin. "Implications of Skill-Biased Technological Change: International Evidence." National Bureau of Economic Research Working Paper No. 6166, September 1997.

Blank, Rebecca M., and Maria J. Hanratti. "Responding to Need: A Comparison of Social Safety Nets in Canada and the United States." In David Card and Richard B. Freeman, editors, Small Differences that Matter: Labor Markets and Income Maintenance in Canada and the United States. Chicago: University of Chicago Press, 1993.

Bhagwati, Jagdish and Vivek Dehejia. "International Trade Theory and Wages of the Unskilled." In Marvin H. Kosters and Jagdish Bhagwati, editors, Trade and Wages. Washington D.C.: American Enterprise Institute, 1994.

Borjas, George J. and Valerie A. Ramey. "Time Series Evidence on the Sources of Trends in Wage Inequality." American Economic Review Papers and Proceedings 84 (May 1994): 10-16.

Borjas, George J. and Valerie A. Ramey. "Foreign Competition, Market Power, and Wage Inequality: Theory and Evidence." Quarterly Journal of Economics 110 (November 1995): 1075-1110.

1996.

Card, David and Alan Krueger. Myth and Measurement: The New Economics of the Minimum Wage. Princeton: Princeton University Press, 1995.

Card, David and Thomas Lemieux. "Wage Dispersion, Returns to Skill, and Black-White Wage Differentials." Journal of Econometrics 74 (October 1996): 319-361.

Card, David and W. Craig Riddell. "A Comparative Analysis of Unemployment in the United States and Canada." In David Card and Richard B. Freeman, editors, Small Differences that Matter: Labor Markets and Income Maintenance in Canada and the United States. Chicago: University of Chicago Press, 1993.

Curme, M.A., Barry T. Hirsch, and David A. MacPherson. "Union Membership and Contract Coverage in the United States, 1983-1988," Industrial and Labor Relations Review 44 (October 1990): 5-33.

DiNardo, John, Nicole M. Fortin, and Thomas Lemieux, "Labor Market Institutions and the Distribution of Wages, 1973-1992: A Semiparametric Approach," Econometrica 65, (September 1996): 1001-1046.

Freeman, Richard B. "How Labor Fares in Advanced Countries." In Richard B. Freeman, editor, Working Under Different Rules. New York: Russell Sage Foundation, 1994.

Freeman, Richard B., and Lawrence F. Katz, "Introduction and Summary." In Richard B. Freeman, and Lawrence F. Katz, eds., Differences and Changes in Wage Structures. Chicago: University of Chicago Press and NBER, 1995.

Haeusler, Laurence. "Le Monde Associatif de 1978 à 1986." Données Sociales (1990 edition). Paris: INSEE, 1990.

Institut National de la Statistique et des Etudes Economiques (INSEE). "Enquête sur l'Emploi de 1989, Résultats détaillés," INSEE Résultats, Emploi-Revenus, vol 6-7. Paris: INSEE, 1989.

Juhn, Chinhui, Kevin M. Murphy and Brooks Pierce. "Wage Inequality and the Rise in Returns to Skill". Journal of Political Economy 101 (June 1993): 410-442.

Katz, Lawrence F., Gary W. Loveman, and David G. Blanchflower. "A Comparison of Changes in the Structure of Wages in Four Countries." In Richard B. Freeman, and Lawrence F. Katz, eds., Differences and Changes in Wage Structures. Chicago: University of Chicago Press and NBER, 1995.

Katz, Lawrence F., and Kevin M. Murphy. "Changes in Relative Wages, 1963-1987: Supply and Demand Factors". Quarterly Journal of Economics 107 (February 1992): 35-78.

Kosters, Marvin H. "Changing Wage Patterns in the Labor Market: The Main Results of Research." In Marvin H. Kosters and Jagdish Bhagwati, editors, Trade and Wages. Washington D.C.: American Enterprise Institute, 1994.

Krueger, Alan B. "How Computers Have Changed the Wage Structure: Evidence from Microdata, 1984-1989". Quarterly Journal of Economics 108 (February 1993): 33-60.

Krugman, Paul. "Past and Prospective Causes of High Unemployment." In Reducing Unemployment: Current Issues and Policy Options, Proceedings of a Symposium in Jackson Hole, Wyoming. Kansas City, MO: Federal Reserve Bank of Kansas City, 1994: 68-81.

Lawrence, Robert Z. "Trade, Multinationals, and Labor." National Bureau of Economic Research Working Paper No. 4836, August 1994.

Lawrence, Robert Z. and Matthew Slaughter. "Trade and U.S. Wages in the 1980s: Giant Sucking or Small Hickup?" Brookings Papers on Economic Activity: Microeconomics, 1993.

Leamer, Edward. "Trade, Wages and Revolving Door Ideas." National Bureau of Economic Research Working Paper No. 4716, April 1994

Lemieux, Thomas. "Unions and Wage Inequality in Canada and the United States." In David Card and Richard B. Freeman, editors, Small Differences that Matter: Labor Markets and Income Maintenance in Canada and the United States. Chicago: University of Chicago Press, 1993.

Lowe, Graham S. "Computers in the Workplace." Perspectives on Labor and Income 3 (Summer 1991): 38-50.

Statistics Canada. Canada Year Book (various years). Ottawa: Statistics Canada.

United States Department of Commerce Economics and Statistics Administration. Statistical Abstract of the United States (various years). Washington D.C.: USGPO.

United States Department of Labor, Bureau of International Affairs. Foreign Labor Trends: France. (FLT 93-40). Washington D.C.: USGPO, 1992.

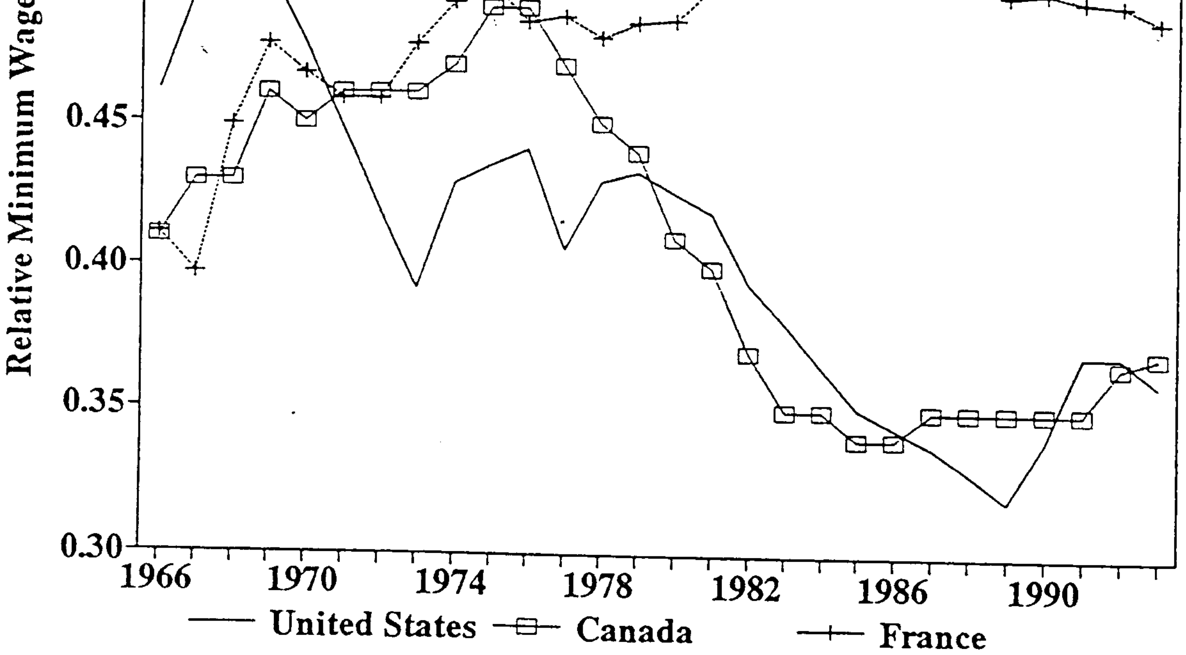
United States Office of the President. Economic Report of the President (1994 edition). Washington D.C.: USGPO.

West, E.G., and Michael McKee. Minimum Wages: The New Issues in Theory, Evidence, Policy and Politics. Ottawa, Canada: Economic Council of Canada and the Institute for Research on Public Policy, 1980.

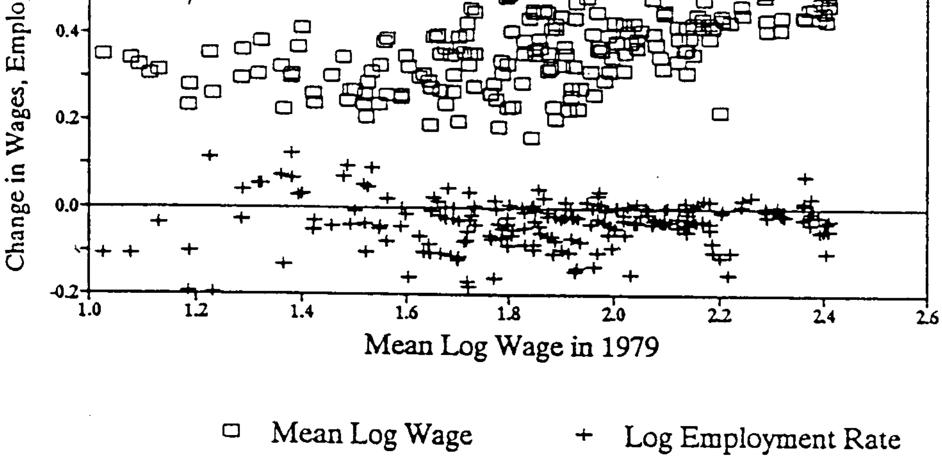
2. Men Age 25-54 Only	0.27 (0.03)	0.31 (0.04)	0.29 (0.03)	0.38 (0.04)	0.38 (0.04)	0.29 (0.03)	0.34 (0.04)	0.34 (0.04)
3. All Women	0.17 (0.02)	0.20 (0.02)	0.18 (0.02)	0.26 (0.02)	0.26 (0.02)	0.17 (0.02)	0.26 (0.02)	0.26 (0.02)
Canada 1981-88:								
1. All Men	0.31 (0.07)	0.20 (0.05)	0.26 (0.07)	0.24 (0.07)	0.24 (0.07)	0.31 (0.06)	0.24 (0.06)	0.24 (0.06)
2. Men Age 25-54 Only	0.22 (0.13)	0.28 (0.12)	0.13 (0.12)	0.20 (0.13)	0.20 (0.13)	0.04 (0.09)	0.06 (0.11)	0.06 (0.11)
3. All Women	0.31 (0.07)	0.20 (0.05)	0.26 (0.07)	0.24 (0.07)	0.24 (0.07)	0.31 (0.06)	0.24 (0.06)	0.24 (0.06)
France 1982-89:								
1. All Men	0.00 (0.03)	-0.02 (0.03)	0.01 (0.03)	-0.10 (0.05)	-0.10 (0.05)	0.00 (0.03)	-0.04 (0.04)	-0.04 (0.04)
2. Men Age 25-54 Only	-0.07 (0.03)	-0.03 (0.04)	-0.02 (0.04)	-0.12 (0.07)	-0.12 (0.07)	-0.02 (0.04)	-0.02 (0.04)	-0.02 (0.04)
3. All Women	-0.06 (0.03)	-0.08 (0.03)	-0.07 (0.04)	-0.17 (0.05)	-0.17 (0.05)	-0.04 (0.04)	-0.15 (0.05)	-0.15 (0.05)

Notes: Standard errors in parentheses. See note to Table 7. The independent variable in all models is the base-year mean log wage for the age-education cell.

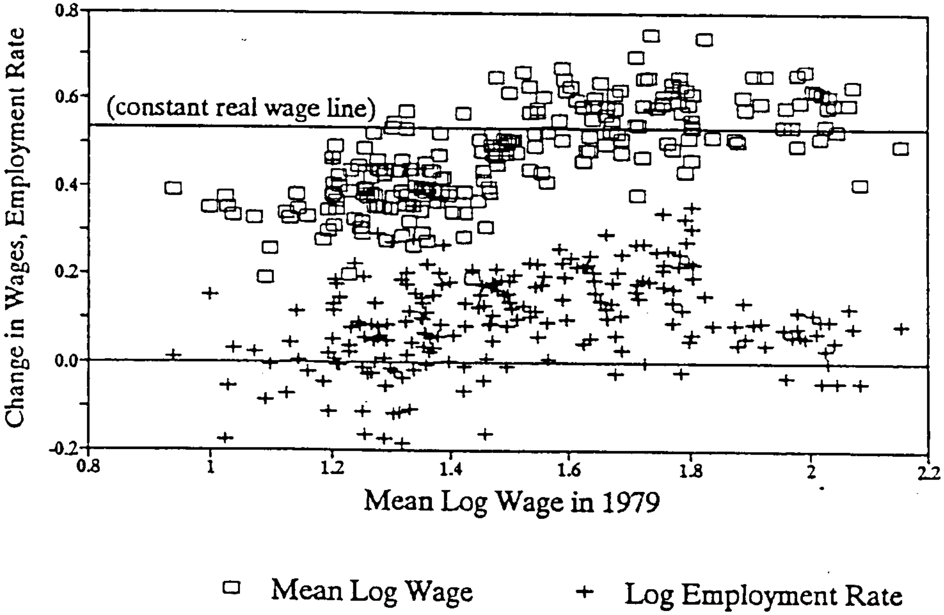
In column 1 the dependent variable is the change in the mean cell wage between the base year and the end year. In column 2 the dependent variable is the change in the mean cell wage, assuming that those who don't work earn the minimum wage in the respective year. In column 3 the dependent variable is the change in the median wage among workers. In column 4 the dependent variable is the change in the median wage in the population, assuming that those who don't work earn the minimum wage. The same dependent variable in used in column 5 but cells in which less than 50 percent of the population is employed in either the base or the end year are excluded. In columns 6 to 8 the dependent variable is as in columns 3 to 5 except that the median is replaced by the 75th percentile.

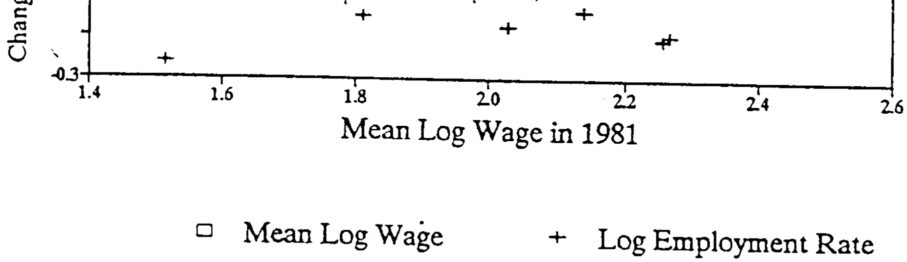


Note: minimum wage relative to average manufacturing wage in U.S. and Canada and relative to overall average wage in France.

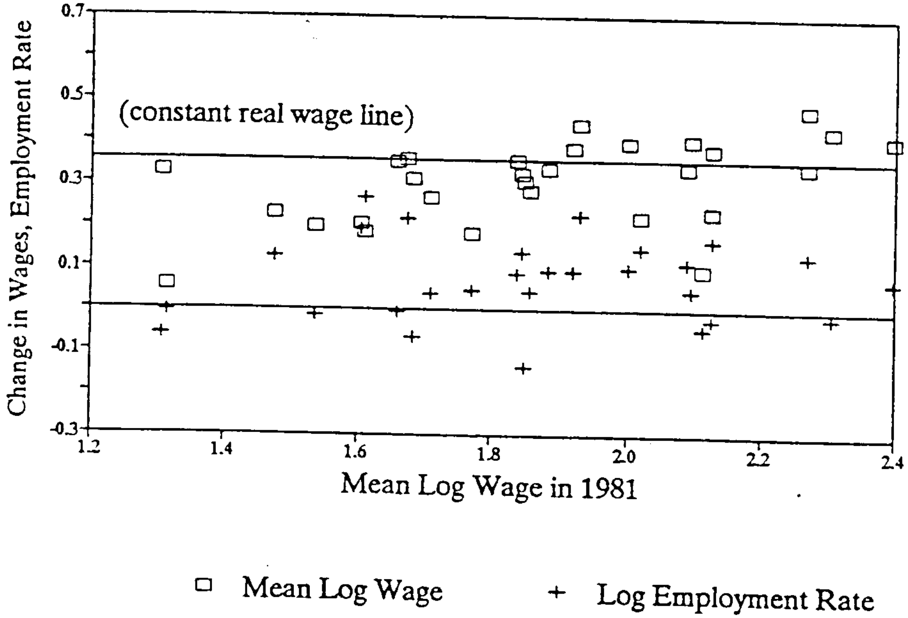


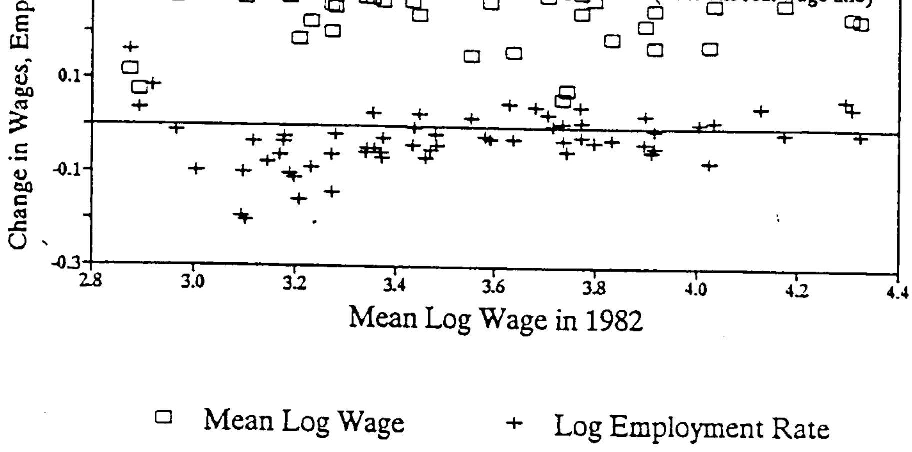
B. U.S. Women, 1979-1989



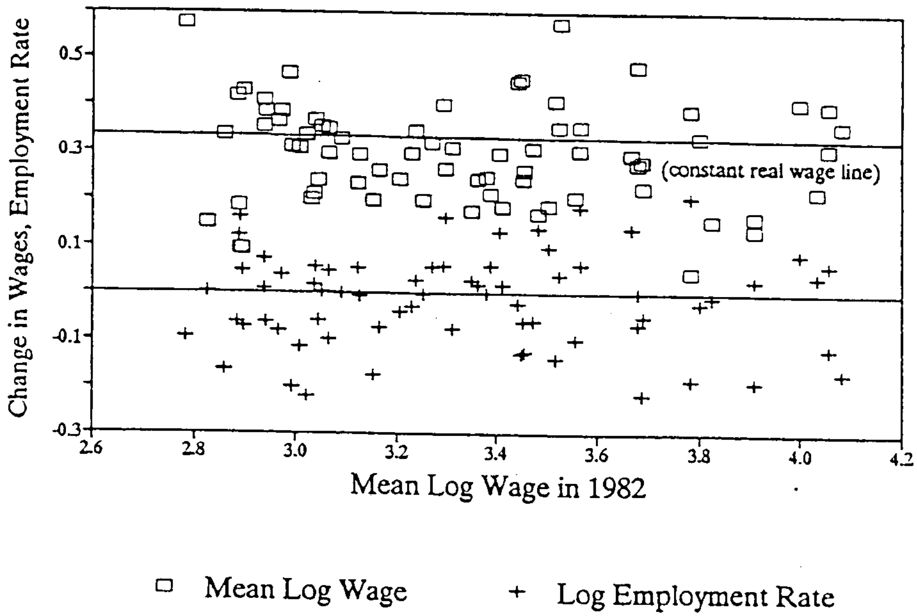


B. Canadian Women, 1981-1988





B. French Women, 1982-1989



Diploma			
College Degree[c]	58.2	54.5	54.9
Ratio: Less than High School/College	0.13	0.23	0.27
Ratio: High School/College	0.50	0.68	0.73

Notes: U.S. data are from Krueger (1993). Canadian data are from Lowe (1991). French data are from unpublished tabulations of the 1991 Labor Force Survey. In all three countries, use of a computer includes word-processing, micro- and mainframe computing.

aIn France, this category includes those with no degree, and those whose highest qualification is a CEP (elementary school) certificate.

bIn France, this category includes those whose highest qualification is either BEPC (roughly, junior high school) or CAP (vocational or technical school), or Baccalauréat (academic high school).

cIn U.S., this category includes those with 16 years of education. In Canada, it includes those with a university degree. In France, it includes those with an Etudes Supérieures qualification.

B. Canada

	Imports / GDP	Percent of Imports from U.S.	Imports / GDP Excluding U.S.
1973	17.8	70.7	5.2
1983	18.0	72.1	5.0
1993	24.1	73.2	6.5

C. France

	Imports / GDP	Percent of Imports from Europe[a]	Imports / GDP Excluding Europe
1973	14.7	67.8	4.8
1983	20.0	66.3	6.7
1993	24.1	73.2	6.5

Notes: U.S. data are taken from Economic Report of the President, (1994 ed) and Statistical Abstract of the U.S. (1977 ed). Canadian data are taken from Bank of Canada Review, (Autumn 1994 ed) and Canada Year Book (1980-81 ed). French data are taken from Annuaire Statistique de la France (1978 and 1990 eds) and Direction Générale des Douanes et Droits Indirects (1994 ed).

[a]Includes ECM, Sweden, Switzerland, Norway, Finland, USSR/Russia, and Eastern Europe. Entry for 1993 is based on 1989 data.

for 1975 (second entry) and later are based on individual micro data as reported in Curme, Hirsch, and Macpherson (1990, Summary Table).

Canadian data for 1970, 1975, and 1980 (first entry) are based on union records as reported in Riddell (1993, Table 4.1, column 1). Data for 1981 (second entry) and later are based on individual micro data as reported in Riddell (1993, Table 4.1, column 3).

French data for 1970, 1975, and 1985 (first entry) are based on union records (excluding retirees) as reported in Price (1989). Data for 1980 (second entry) and 1985 are based on individual micro data as reported in Haeusler (1990).

[a]Estimated fraction of employees covered by collective bargaining contracts, from OECD (1993).

End Year Data:						
4. Mean Log Wage	2.317	2.534	3.711	2.024	2.256	3.553
5. Exp(Mean Log Wage)	10.142	12.599	40.891	7.569	9.545	34.918
6. Standard Deviation	0.569	0.510	0.454	0.515	0.496	0.459
Change from Base to End Year:						
7. Mean Log Wage	0.460	0.403	0.312	0.556	0.389	0.307
8. Mean Log Real Wage	-0..075	0.039	-0.027	0.021	0.025	-0.032
9. Standard Deviation	0.077	0.006	0.020	0.101	-0.010	0.013
Decomposition of Change in Wage Inequality:[a]						
10. Change in Variance	0.082	0.006	0.018	0.094	-0.010	0.012
11. Change in Within-Cell Component	0.043	-0.030	0.009	0.050	-0.033	0.008
12. Change in Between-Cell Component	0.039	0.036	0.009	0.044	0.023	0.004

Notes: Wage measures refer to pre-tax hourly wages in U.S. and Canada, (in U.S. and Canadian dollars, respectively) and post-tax hourly wage in France (in French francs). U.S. data include whites only. Samples include individuals age 16-64 in the U.S., age 17-64 in Canada, and age 15-60 in France.

[a]Decomposition uses 225 age-education cells in U.S., 29 cells in Canada, and 70 cells in France.

in Age and Education[b]						
Aggregate Comparisons:[c]						
3. Change in Aggregate Employment Rate for Gender Group	-1.3	-2.0	-4.6	6.8	5.2	-0.1

Notes: Entries are employment-population ratios, in percent.

[a]U.S. sample includes whites age 16-65. Canadian sample includes people age 17-64. French sample includes people age 15-60.

[b]Change in employment-population rate, adjusting for expected change based on changing age-education distribution of the population and cross-sectional employment patterns by age-education group in the base year.

[c]Changes in overall employment rates (for gender-specific population age 16 and older in U.S., age 15 and older in Canada and France). U.S. data are from Economic Report of the President (1994, Table B-37). Canadian data are from Quarterly Economic Review (June 1991, Table 27). French data are from Annuaire Statistique de la France (1990, Tables C.01-1 and C.01-2).

2. Change in Log Population Share	-0.01 (0.02)	0.03 (0.02)	0.03 (0.02)	-0.01 (0.02)	0.01 (0.01)	0.01 (0.02)
3. R-squared	0.34	0.41	0.08	0.46	0.68	0.16
Canada 1981-88:						
1. Demand Shift Index	0.26 (0.10)	0.09 (0.06)	-0.30 (0.08)	-0.14 (0.12)	-0.00 (0.07)	-0.04 (0.03)
2. Change in Log Population Share	0.06 (0.08)	0.13 (0.05)	0.16 (0.07)	0.26 (0.08)	0.18 (0.04)	0.05 (0.09)
3. R-squared	0.43	0.55	0.34	0.31	0.51	0.01
France 1982-89:						
1. Demand Shift Index	0.01 (0.04)	-0.02 (0.03)	0.03 (0.04)	-0.11 (0.06)	-0.10 (0.06)	0.11 (0.06)
2. Change in Log Population Share	-0.01 (0.03)	-0.00 (0.03)	0.05 (0.03)	0.01 (0.03)	0.01 (0.03)	0.04 (0.03)
3. R-squared	0.00	0.01	0.08	0.04	0.04	0.12
Panel B: Women						
United States 1979-89:						
1. Demand Shift Index	0.30 (0.03)	0.38 (0.03)	0.12 (0.04)	0.18 (0.03)	0.38 (0.03)	0.13 (0.04)
2. Change in Log Population Share	0.07 (0.02)	0.12 (0.02)	0.07 (0.03)	0.14 (0.02)	0.15 (0.02)	0.08 (0.02)
3. R-squared	0.66	0.73	0.19	0.53	0.74	0.20
Canada 1981-88:						
1. Demand Shift Index	0.14 (0.09)	0.17 (0.09)	-0.06 (0.16)	-0.08 (0.11)	0.13 (0.10)	0.23 (0.17)
2. Change in Log Population Share	0.02 (0.06)	0.05 (0.06)	0.09 (0.10)	0.13 (0.06)	0.09 (0.05)	-0.09 (0.09)
3. R-squared	0.29	0.51	0.04	0.25	0.47	0.10
France 1982-89:						
1. Demand Shift Index	-0.12 (0.04)	-0.14 (0.03)	-0.04 (0.05)	-0.29 (0.05)	-0.29 (0.04)	-0.01 (0.08)
2. Change in Log Population Share	0.08 (0.03)	0.08 (0.02)	0.11 (0.03)	0.09 (0.02)	0.07 (0.02)	0.10 (0.03)
3. R-squared	0.18	0.26	0.15	0.33	0.40	0.14

Note: Standard errors in parentheses. Notes continue on next page.

log of the employment population
rate in the cell.

1. All Men	0.17 (0.02)	0.20 (0.02)	0.06 (0.01)	0.30 (0.02)	0.41 (0.02)	0.14 (0.02)
2. Men Age 25-54 Only	0.27 (0.03)	0.31 (0.04)	0.06 (0.01)	0.33 (0.02)	0.39 (0.02)	0.08 (0.01)
3. All Women	0.37 (0.02)	0.50 (0.02)	0.19 (0.03)	0.31 (0.03)	0.52 (0.03)	0.21 (0.03)
Canada 1981-88:						
1. All Men	0.31 (0.07)	0.20 (0.05)	-0.16 (0.06)	0.11 (0.11)	0.17 (0.07)	0.05 (0.09)
2. Men Age 25-54 Only	0.22 (0.13)	0.28 (0.12)	0.11 (0.05)	0.07 (0.10)	0.13 (0.09)	0.08 (0.03)
3. All Women	0.16 (0.05)	0.24 (0.05)	0.05 (0.08)	0.12 (0.07)	0.27 (0.06)	0.16 (0.10)
France 1982-89:						
1. All Men	0.00 (0.03)	-0.02 (0.03)	0.05 (0.03)	-0.10 (0.06)	-0.09 (0.05)	0.15 (0.06)
2. Men Age 25-54 Only	-0.07 (0.03)	-0.03 (0.04)	0.09 (0.02)	-0.18 (0.05)	-0.10 (0.06)	0.12 (0.02)
3. All Women	-0.06 (0.03)	-0.08 (0.03)	0.04 (0.04)	-0.20 (0.05)	-0.22 (0.04)	0.09 (0.07)

Notes: Standard errors in parentheses. See note to Table 6. In columns 1-3, the (sole) independent variable is the mean cell wage in the base year. In columns 4-6, the (sole) independent variable is the proportion of cell workers using computers at work at the end of the 1980s (1989 in the United States and Canada, 1991 in France).