

Trade and Job Loss in U.S. Manufacturing, 1979-94

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May 6, 1998

Paper prepared for the National Bureau of Economic Research conference on "The Impact of International Trade on Wages," February 1998, Monterey, CA. This research is supported by the W.E. Upjohn Institute for Employment Research. Jeannine Bailliu and Ivy Kosmides provided excellent research assistance. I appreciate the helpful comments and suggestions of Lisa Lynch, J. David Richardson, and seminar participants at UC Berkeley, the University of Arizona, and Stanford University.

Abstract

This paper examines the relationship between increasing foreign competition and job displacement in U.S. manufacturing over the 1975-94 period. This was a period of increased trade flows, large swings in the value of the dollar, and falling trade barriers in developing countries. This period was also characterized by widespread permanent job loss, particularly in manufacturing. The results are broadly consistent with the perception that imports displace some domestic jobs. This broad consistency appears to be a result of a strong positive relationship between increasing foreign competition and job displacement for industries long identified as import-competing, industries such as Footwear, Leather Products, Radio and Television, Watches and Clocks, Toys. At the same time, there are a number of import-competing industries with below-average rates of job loss, and there was also considerable job loss from industries facing little or no change in import competition. Overall, it appears that increasing foreign competition accounts for a small share of job displacement. There is mixed evidence about the role of technological change, with results sensitive to both specification and proxy.

Sizeable earnings losses follow job displacement. Workers displaced from import-competing Manufacturing, mostly Durable Goods, have the largest average earnings losses of any industrial group (with the exception of Mining) and their losses are particularly large if reemployed in Trade and Services. Even if the causal model remains unclear, workers have good reason to worry about job and income insecurity in the face of increasing foreign competition.

1. Introduction

Since the late 1970s, millions of workers have lost their jobs following plant closures, plant relocations, or large-scale reductions in operations. Job insecurity remains at the forefront of public discourse, a stubborn reminder that even a prolonged expansion and a steadily falling national unemployment rate cannot erase perceptions created by widespread experiences of permanent job loss. Today, globalization and technological change are often cited as key factors in changes in employment stability.

This paper examines the relationship between increasing foreign competition and job displacement in U.S. manufacturing over the 1975-94 period.¹ This was a period of increased trade flows, large swings in the value of the dollar, and falling trade barriers in developing countries.² This period was also characterized by widespread permanent job loss, particularly in manufacturing.³

Labor reallocation is a likely implication of a move to freer trade, and there is a sizeable empirical literature that examines the link between increasing trade and changes in industry net employment and wages. These net employment changes are a result of changes in the gross flows of new hires, recalls, quits, displacements, temporary layoffs, and retirements. My focus here on displacement is motivated by the perspective that the amount of social and private adjustment to freer trade depends importantly on gross employment changes, and it is the job loss component of employment change that most concerns workers, the general public, and policymakers. There is no

¹As commonly understood, job displacement is an involuntary (from the worker's perspective) termination of employment based on the employer's operating decisions, and not on a worker's individual performance.

²For a discussion of the last of these three events, see Sachs and Warner (1995).

³See Fallick (1996) and Kletzer (1998a) for reviews of the literature on the incidence and consequences of job displacement.

doubt that the assertion, “trade costs jobs,” plays an important role in the domestic political economy of free trade.

This paper extends earlier research, first reported in Kletzer (1998b,c), that found evidence that as imports become more competitive, domestic industry displacement rises.⁴ The research is motivated by the expectation, based on theory and previous empirical work, that trade liberalization will lead to labor reallocation, with jobs moving away from import-competing industries and toward export industries. From that starting point, several questions are posed. Descriptively, how does the survey evidence on job displacement accord with standard measures of increasing foreign competition? Causally, is the incidence of job displacement across and within industries related to changes in foreign competition? Such changes may occur with developments such as the North American Free Trade Agreement (NAFTA) and the General Agreement on Tariffs and Trade (GATT). Lastly, what does the pattern of labor reallocation look like, based on individual-level data? Do workers displaced from import-competing industries become reemployed in export industries or do they move to services (where average wages are lower)?

This paper is organized as follows. Section 2 reviews recent studies of the relationship between increasing foreign competition and changes in U.S. employment and wages, and the more recent studies of trade and job loss. Theoretical issues related to measures of industry trade sensitivity are discussed in section 3, followed by a discussion of the various data sources in section 4. Section 5 presents a descriptive analysis of the link between trade and job loss. The empirical model and estimation strategy are discussed in section 6. Results from the econometric analysis are presented in section 7. Individual-level data from the Displaced Worker Surveys are used in Section 8 to examine the pattern of

⁴See also Haveman (1994) and Addison, Fox, and Ruhm, (1995).

reemployment following job displacement. Section 9 offers concluding remarks.

2. A Brief Background from Previous Research

This examination of trade and job loss joins and complements recent work on trade, wages, and employment. This literature is motivated by standard theories of international trade that predict that trade liberalization will reduce lower-skill domestic employment and widen the wage gap between skilled and unskilled workers. The effects of trade on U.S. changing employment patterns and wage inequality is a subject of considerable debate. Over the years, the debate has ranged widely, and there are several reviews that help summarize this extensive and diverse literature. Dickens (1988), with a focus on trade and employment, assessed the literature up to the mid-1980s as reaching a common conclusion that import competition caused only a small fraction of employment losses. Most employment change was judged to result from changes in domestic demand, real wages, and productivity.⁵ In their review of more recent studies, Belman and Lee (1995) reach a different assessment, that increased import competition affects negatively both employment and wages, with the employment effects several times larger than the wage effects.⁶ Revenga (1992) is particularly notable. She shows that for a sample of manufacturing industries over the period 1977-1987, changes in import prices have a sizeable effect on employment and a smaller yet significant effect on wages. She concludes that most of the adjustment in an industry to an adverse trade shock occurs through

⁵Grossman (1986, 1987) is widely cited on this point.

⁶See Borjas, Freeman, and Katz (1992), Freeman and Katz (1991), Murphy and Welch (1991), Revenga (1992), Sachs and Schatz (1994), and Davis, Haltiwanger, and Schuh (1996). Not all studies agree. A number of studies written in the late 1980s and early 1990s concluded that trade plays a small role. See Mann (1988), Krugman and Lawrence (1994), Lawrence and Slaughter (1993), and Lawrence (1994)). Berman, Bound, and Griliches (1994) conclude that trade plays a small role in increasing the relative employment of skilled workers.

employment. Revenga takes these results to suggest that workers are mobile across industries. This mobility implies that the effects of trade on the manufacturing sector are not limited to that sector, as workers seek new jobs in nonmanufacturing industries.

Richardson (1995) sees trade as making a "moderate" contribution to increasing income inequality that warrants attention (pg. 51).⁷ Cline (1997) offers a detailed, comprehensive, and critical survey of the trade and wage inequality literature. He concludes that about 20-25 percent of the rise in the skilled/unskilled wage gap over the past 20 years has been due to the combined forces of trade and immigration.

U.S. trade with developing countries is the most recent focus, in part due to 1980s trade liberalization in these countries. To date, there is an emerging consensus, both theoretical and empirical, that U.S.- developing country trade lowers the employment and wages of U.S. lower-skilled workers. Sachs and Shatz (1998) emphasize skill differences between the manufacturing and nontraded sectors, noting that a reduction in manufacturing employment, particularly import-competing manufacturing, will release relatively unskilled workers into the nontraded (service) sector, leading to a fall in the relative wage of unskilled workers.

Using a factor proportions model, Borjas, Freeman, and Katz (1997) find that the growth of U.S. imports of LDC manufacturing goods has increased the effective supply of lesser-skilled labor, lowering relative earnings of low wage workers. They conclude that increased trade has a substantially smaller effect on relative wages than increased immigration.

None of these studies deny a role of increasing trade. The debate is over how large a role trade

⁷Leamer (1993, 1994) and Wood (1994) conclude more strongly about the role of increasing globalization in increasing income inequality in the U.S.

plays in changing employment patterns and relative wages, and whether trade or technological change is more important.⁸

3. Measuring industry trade sensitivity

There are differences within the trade and employment literature on how to measure changes in international trade. Some studies measure trade changes and increasing foreign competition as changes in import prices and other studies use changes in import share. Kletzer (1998b) discusses in detail the various measures available and how the measures may (or may not) be related to changes in employment and job loss. Here, I summarize that discussion to provide a background for the empirical research that follows.

Import penetration ratios (or import shares) provide an intuitively appealing way to categorize industries facing significant foreign competition. More generally, industries with a large (or rising) share of output (or supply) internationally traded are often labelled "trade-sensitive" (or import/export-sensitive), on the basis of calculated import and export penetration ratios. If the flow of imports reduces domestic employment, high import penetration ratio industries are where that result is most likely to be found.⁹

From a theoretical perspective, there is no simple causal link between the volume of trade and employment changes because the rise in import share could indicate a number of foreign or domestic

⁸See also Berman, Bound, and Machin (1997).

⁹An import penetration ratio is calculated by dividing industry imports by the sum of industry output plus imports (the denominator is industry supply). An export penetration ratio is calculated by dividing industry exports by industry output. See Schoepfle (1982) for classifications over the period 1972-79 and Bednarzik (1993) for the period 1982-87. Davis, Haltiwanger, and Schuh (1996) find high rates of job destruction for plants in industries with very high import penetration ratios over the period 1972-88. Plants in the top quintile of industries ranked by import penetration ratios had average annual employment reductions of 2.8%.

developments. A few examples may be illustrative.¹⁰ Take the case of perfect competition, increasing but different marginal costs of production for both domestic and foreign firms, with substitutability between domestic and foreign goods. Let foreign supply expand, perhaps from technological diffusion (or an export promotion scheme) that lowers foreign costs while domestic costs remain unchanged. This reduces the foreign good price and imports rise. With constant demand, the rise in imports reduces price, domestic output, and domestic employment. With declining domestic output, import share also rises. How much import share rises depends on the elasticity of domestic supply. As domestic supply becomes more elastic, a given increase in imports produces a bigger reduction in domestic quantity (and presumably employment), and rising import share.

When trade is measured as quantity flows, it is important also to consider the role of domestic demand. In the perfectly competitive case, imports may also rise if domestic demand increases. Price moves accordingly, and if foreign supply is more elastic than domestic supply, import share will also rise because the increase in imports will exceed the increase in domestic output. Alternatively, if domestic supply is more elastic than foreign supply, the rise in imports will be accompanied by a decline in import share. Here, the use of quantities reveals an ambiguity: rising imports and import share are associated with increased domestic employment and presumably less displacement, and rising imports may not be associated with rising import share. These two cases imply that over time, industry import shares will differ as a result of differences in supply elasticities as well as differences in the competitiveness of domestic firms relative to foreign firms.

In a standard Heckscher-Ohlin model, industries face increasing import price competition when import prices fall, thus the appeal of using a price measure to examine whether job loss occurs when

¹⁰See also the discussion in Richardson (1995).

imports become more competitive. The link between import price competition and industry employment is fairly straightforward. If the price of an imported (substitutable) good falls, labor's marginal revenue product falls. This drop in the derived demand for labor reduces employment (on an upward sloping labor supply curve). Flexible wages dampen the fall in employment. If wages adjust fully to equate labor demand and labor supply (a competitive labor market), employment falls to desired levels through (employee-initiated) quits. How much wages and employment change will depend on supply and demand elasticities, but there will be no displacement. Only if prices fall enough that firms find it more profitable to shut down than to continue to operate will displacements occur (through plant closings).

In a market where wages differ from market-clearing, the likely consequences of increasing import competition are a bit more complicated. In unionized labor markets, if current wages exceed opportunity wages the presence of rents may leave room for wage concessions. These concessions may dampen employment loss. If wages diverge from market-clearing for efficiency wage reasons, firms may be reluctant to impose wage reductions if they anticipate negative productivity consequences. Alternatively, senior union members may prefer to maintain wages (and their jobs), with layoffs reducing the employment of junior workers.

There are at least two reasons to think that price, arguably the preferred measure, is not completely informative about the effect of changes in trade policy or foreign supply. The first is that during some of the time period studied here some industries had quota protection (Apparel, Footwear, Radio and Television). Import price changes will not necessarily reflect these quantity restraints. More importantly, these quota restraints imply that market share (import share) is likely to be a determinant of foreign and domestic supply.

The second difficulty with price alone is more fundamental. Using a monopolistically competitive dominant/fringe model, Mann (1988) shows how market share is likely to be a determinant of both foreign and domestic supply. She notes that quantity is a key variable in monopolistic competition with heterogeneous outputs. Furthermore, in the context of a three factor Cobb-Douglas production function with no restrictions on returns to scale and with capital fixed in the short run, she discusses how increasing returns to scale are an important determinant of price. In her empirical analysis, covering the period 1974-1981 for a subset of import-sensitive industries, Mann finds that foreign competition, measured as both import prices and import share, plays a small role in determining employment relative to the role played by domestic demand and prices for most industries.

4. Data: Measuring international trade and job displacement

Trade indicators

Data on U.S. import and exports, by 4-digit SIC category, for the period 1958-94, are available as part of the NBER Trade Database. The import and export data file, available on-line, also reports the 1958-1994 value of domestic shipments from the NBER Productivity Database.¹¹

Import and export price indices data are available for many 4-digit SIC manufacturing industries starting in 1983-84 and currently ending with 1992, with coverage of a small number of industries available from 1978. The price measure is a fixed weight Laspeyres index with a 1985 base period.¹²

¹¹The 1958-94 file combines data from the earlier NBER Trade and Immigration data file (described in Abowd (1991)) with the NBER Trade Database (see Feenstra (1996)).

¹²These indices are described in more detail in U.S. Bureau of Labor Statistics (1992). They are based on a survey of actual transactions prices, and to the degree possible, they reflect c.i.f. (cost, insurance, freight) prices. The NBER trade data was used to aggregate up to 3-digit SIC industry. When aggregation was needed, the SIC indices were weighted by their relative shares in total imports.

Relative import and export prices are obtained by deflating by the Producer Price Index as a proxy for the aggregate price level.

The SIC-based industry trade data must be aggregated up to a 3-digit CIC industry level to combine trade information with information on job displacement. Aggregating up from 4-digit SIC to 3-digit CIC is somewhat "costly" for the import price data. Coverage is not complete for all manufacturing industries, so that not all the 4-digit SIC industries within a 3-digit CIC industry have information available for constructing an aggregate 3-digit CIC industry price index.

Job Loss

The Displaced Worker Surveys (DWSs) provide information on displacement. Available surveys, administered biennially as supplements to the Current Population Survey (CPS), cover displacements occurring over the period 1979-95. In each survey, adults (aged 20 years and older) in the regular monthly CPS were asked if they had lost a job in the preceding five year period due to "a plant closing, an employer going out of business, a layoff from which he/she was not recalled, or other similar reasons." If the answer was yes, a series of questions followed concerning the old job and period of joblessness.

A common understanding of job displacement is that it occurs without personal prejudice; terminations are related to the operating decisions of the employer and are independent of individual job performance. In the DWSs, this definition can be implemented by drawing the sample of displaced from individuals who respond that their job loss was due to the reasons noted above. Other causes of job loss, such as quits or firings are not considered displacements.¹³ This operational definition is not

¹³Individuals may also respond that their job loss was due to the end of a seasonal job or the failure of a self-employed business. These individuals are not considered displaced.

without ambiguity: the displacements are "job" displacements, in the sense that an individual displaced from a job and rehired into a different job with the same employer is considered displaced.

Some of the distinctions may be too narrow or arbitrary. The distinction between quits and displacements is muddied by the ability of employers to reduce employment by reducing or failing to raise wages. Wage changes may induce some workers to quit (and not be in the sample) while others opt to stay with the firm (and they get displaced and enter the sample).¹⁴ This distinction means that the displaced worker sample will underestimate the amount of job change "caused" by trade. In addition, if the workers who stay on with the firm until displacement are those who face the worst labor market outcomes of all those at risk of displacement, then the displaced sample will be potentially nonrandom and it will overstate the costs of job loss. Without data on quits, these issues cannot be addressed.

The sample here is limited to workers displaced from manufacturing industries, aged 20 to 64 at the time of displacement. Because the information is retrospectively gathered, it has potential recall error. Problems of recall are compounded by the overlapping coverage of years of displacement by surveys, with some years covered in two or three surveys.¹⁵ This bias is believed to be significant. As Topel and Farber show, it is likely that the surveys seriously underestimate job loss that occurred long before the survey date due to inaccuracies in recall as well as question design.¹⁶ This makes it desirable to have non-overlapping recall periods (that is, each year of displacement drawn from only one survey). For this analysis I restrict the sample to displacements occurring in the two-year period prior to each

¹⁴Jacobson, LaLonde, and Sullivan (1993) show that wages fall for displaced workers before they are displaced.

¹⁵The 1984 DWS covered the period 1979-83; the 1986 survey, 1981-1985; the 1988 survey, 1983-1987; the 1990 survey, 1985-1989; the 1992 survey, 1987-1991, the 1994 survey, 1991-93, and the 1996 survey, 1993-95.

¹⁶If more than one job was lost, information is gathered only for the job held longest. See Topel (1990) and Farber (1993).

survey. This makes recall periods shorter and eliminates overlapping year coverage. I drew a larger sample from the 1984 survey by also including workers displaced during 1979-80.

I calculated industry displacement rates by dividing the number of workers displaced from an 3-digit CIC industry in a year by the number of workers employed in that industry in that year. The annual industry employment numbers were calculated from merged CPS Outgoing Rotation Group data files, and they are a proxy for industry workers at risk of displacement.

5. A Descriptive Look at Trade and Job Loss, 1979-94

Job Loss

Based on calculations from sample described above drawn from the Displaced Worker Surveys, 32 million workers reported experiencing at least one permanent job loss over the 1979-94 period (excluding agriculture). Manufacturing accounted for 35.5 percent of total job loss, with 10.2 million workers reporting a job loss from that sector. Averaging over the 16-year time period, manufacturing accounted for 18-19 percent of total nonagricultural employment, starting with 23.4 percent in 1979 and ending at 16.0 percent in 1994.

For the period as a whole, the top job loss manufacturing industries, measured by total workers displaced, were:

<u>Industry (CIC)</u>	<u>Workers displaced (1000s)</u>	<u>Average annual displacement rate</u>
Electrical machinery, nec (342)	688.3	.038
Motor vehicles (351)	618.9	.051
Apparel (151)	617.7	.052
Printing, publishing, exc. newspapers (172)	522.1	.038
Machinery, ex. electrical (331)	509.2	.044
Electronic computing equip. (322)	337.9	.045

Fabricated structural metals (282)	313.3	.056
All manufacturing industries	11,380	.051

In part, these industries accounted for much job loss because they are large industries in terms of employment. By adjusting for employment, the displacement rate offers a proxy for the “risk of job loss.” All these industries were near or below the average job loss rate for manufacturing industries.

Figure 1 plots the total and manufacturing displacement rates over the 1979-94 period. The rate of job loss from manufacturing is considerably higher than for all industries. The manufacturing displacement rate rose to 8 percent in the early 1980s recession and then fell sharply until the late 1980s. It rose steadily through the prolonged early 1990s recession and then fell. Although the rate of job loss is down from its 1992 peak, it remains high given the extent of the 1990s expansion. The total displacement rate follows a similar, although dampened, pattern. The overall rate of job loss was high in 1994, given the strength of the economy (for more on the pattern of job loss over the 1980s and 1990s, see Farber (1997)).¹⁷

Trade and Job Loss by industry

The above discussion highlights the widespread job displacement of the last 16 years. Are high rates of job loss associated with import competition? Are import-competing industries characterized by high rates of job loss? As a preliminary, I stay within the tradition of using import shares to classify industries as “import-competing.” Mean annual import share across the industries in the sample was .117 over the period 1975-94, ranging from .002 to .523. Mean annual displacement rate across the industries in the sample was .052, ranging from .0078 to .142. Ranking industries by mean annual displacement rates, the top quartile is listed in Table 1, along with their mean displacement rate, mean

¹⁷My estimates of the rate of job loss are lower than Farber’s due to differences in sample construction.

import share, and mean change in import share. Overall, the industry list is consistent with the perception that import-competing industries have experienced high rates of job loss. The list has the “usual suspects;” Footwear, Leather products, Pottery, Radio & Television, Watches & Clocks, Toys. For the most part, these high job loss rate industries are either high import share (traditionally import-competing) or have experienced a large (positive) change in import share (increasing import competition), or both.

Table 2 contains additional summary univariate classifications of trade and job loss. Panel I reports the mean annual displacement rate for each quartile of the industry mean import share distribution. The highest import share industries have, on average, the highest job loss rate, but from below the top quartile, job loss rates are relatively uniform. Within each quartile, the distribution of job loss rates is fairly similar. Panel II reports mean job loss rates by industry mean change in import share. In this panel, job loss rates are higher for industries with above average changes in import share.

At this level of industry aggregation, industries are both importers and exporters, and Panel III reports the mean annual displacement rate for each quartile of the industry mean annual change in net export share (calculated as $(\text{exports}-\text{imports})/\text{shipments}$). Here, we might expect declining job loss with a positive change in net exports, so that from the top quartile to the bottom, job loss rates would rise. This is the pattern in Panel III, although the decline in job loss as net exports rise is not smooth, and the range of job loss rates within each quartile is fairly similar. Lastly, Panel IV reports mean import share for the full job loss industry distribution. Similar to Table 1, import share is highest among the high job loss rate industries, and the top half of the job loss rate distribution has distinctly higher import share than the lower half of the distribution. For the four measures used in Table 2, Appendix tables 1-4 report a full industry listing by quartile.

One suggestion from these univariate classifications is that the combination of “trade with job loss” arises from continued, sustained import competition. That is, high rates of job loss are found for industries with high import share and large (positive) changes in import share. For the most part, increasing import competition (positive changes in import share), from a lower level of import share, is associated with below-average job loss (Photographic equipment, Scientific and Controlling Instruments, Pulp and Paper).

To examine the full industry-by-year range of observations, figures 2 and 3 are scatterplots of annual industry displacement rates and percent changes, from the previous year, in import penetration ratios (figures 2), or real import prices (figure 3). In each scatterplot, the circles are scaled to reflect industry employment size. Each plot contains a regression line for the simple regression of the displacement rate on the chosen trade indicator (and a constant term).

Figure 2 contains the scatterplot for displacement rates and import share for the period 1979-94. There are a number of industry/year observations where import share changes very little and displacement is high. At the same time, there are enough industries where positive (negative) changes in import share are associated with a high (low) displacement rates so that the regression line has positive slope (with t-statistic of 1.907 for the estimated slope coefficient).¹⁸ A few traditionally trade-sensitive industries, such as Footwear, Leather Products, Apparel, and Steel are important in determining the slope of the regression line.

In Figure 3, it is important to note that the price coverage is less comprehensive than the trade flow coverage (only 20 3-digit CIC industries are included), and the period of coverage is 1983-92.

¹⁸The estimated regression, using industry employment weights, is:
Displacement rate = .0401 + .1534 (%? Import Penetration Ratio).
(.0011) (.0805)

This scatterplot seems to reveal little evidence of a negative correlation between import prices and job loss rates. There are a few industry-year observations where an increase in import prices (a reduction in import competition) is associated with lower displacement rates. The regression line has a negative slope, with a t-statistic of -0.813.¹⁹ There are also a number of industry observations with high displacement rates and little change in relative import prices.

A few observations stand out from these descriptive figures and tables. There is a set of industries facing sustained import competition, those with both high levels of import share and positive changes in import share where the rate of job loss is high. The scatterplots provide additional evidence, revealing industries where decreases in import prices are associated with high rates of job loss. These industries are consistent with the perception that “trade costs jobs,” although inferences about causality should not be made based on the descriptive evidence. At the same time, the scatterplots reveal a considerable amount of variation in job displacement across industries. There are numerous industry-year observations where job loss is high in the absence of changes in foreign competition. Thus “trade” itself can explain only a small share of the variation in job displacement.

6. Empirical model

Increasing foreign competition, changes in industry employment, and industry job loss

This section presents a simple empirical framework for examining the relationship between international trade and job displacement that follows Kletzer (1998b). It starts with a discussion of trade and employment change that follows Revenga (1992). A model of labor turnover is used to relate

¹⁹The estimated regression, using industry employment weights, is:
Displacement rate = .0387 - .0254 (Log Diff Real Import Price).
(.0019) (.0312)

employment change to displacement.

To simplify the analysis, assume wages adjust to equate labor supply and labor demand. Using first differences, the demand for labor in industry i in year t (N_{it}) can be written as:

$$(1) \quad d\ln N_{it} = \beta_1 d\ln W_{it} + \beta_2 d\ln X_{it}^1 + \beta_3 d\ln X_{it}^2 + v_{1it},$$

where W_{it} is the industry wage, X_{it}^1 is a vector of trade-related factors (discussed in more detail below) that shift labor demand for industry i in year t , X_{it}^2 is a vector of non trade-related factors, and v_{1it} is the error term.

Also in first differences, labor supply can be written as:

$$(2) \quad d\ln N_{it} = a_1 d\ln W_{it} + a_2 d\ln H_{it} + v_{2it},$$

where H_{it} is a vector of factors that shift labor supply and v_{2it} is an error term. Labor market clearing implies:

$$(3) \quad d\ln N_{it} = \beta_1 d\ln W_{it} + \beta_2 d\ln X_{it}^1 + \beta_3 d\ln X_{it}^2 + g_{it}, \text{ and}$$

$$(4) \quad d\ln W_{it} = a_1 d\ln N_{it} + a_2 d\ln H_{it} + u_{it}$$

Equation (3) is a basic reduced-form equation for net changes in employment. A simple model of turnover can be used to modify and narrow the focus to just one of the gross flows, job displacement. Firms implement net employment reductions through the use of displacements and unreplaced attritions. Attritions are separations due to quits, discharges (for cause), retirements, and deaths. Attritions that are not replaced by employers are called unreplaced attritions. For an industry, net employment change in year t can be written as:

$$(5) \quad DIS + UA = -\Delta N,$$

where DIS is displacements, and UA is unreplaced attritions (other non-displacement separations minus

Accessions).²⁰ This net change in employment can be expressed as a proportion of total employment:

$$(6) \quad \text{DIS}/N_{t-1} = \text{Displacement Rate} = -(N_t - N_{t-1})/N_{t-1} - \text{UA}/N_{t-1}$$

Relying on the approximation of the rate of change of employment, $(N_t - N_{t-1})/N_{t-1}$, to the change in log employment, $(\ln N_t - \ln N_{t-1})$, for small changes, equation (6) is approximately equal to:

$$(7) \quad \text{Displacement Rate}_t = -d \ln N_t - \text{UA Rate},$$

where $\text{UA Rate} = \text{UA}/N_{t-1}$.

Equations (3) and (7) can be combined to yield a reduced-form equation for industry i displacement:

$$(8) \quad \text{Displacement Rate}_{it} = \beta_1 d \ln X_{it}^1 + \beta_2 a_2 d \ln H_{it} + \beta_3 d \ln X_{it}^2 + \beta_4 \text{UA Rate}_{it} + (\eta_{it} + \epsilon_{it}),$$

where η_{it} reflects unobservable factors related to displacement.

In the context of a turnover model, it is inappropriate to include quits, discharges, and accessions (summed here as UA Rate) as independent variables in a displacement relationship. Quits are very likely to be influenced by conditions within the industry.²¹ Firms and industries are likely to differ in their use of the various components of turnover to implement desired changes in employment.

The elements of the vector X^1 need be specified. There are two alternatives. The first, using relative import prices, yields:

$$(9) \quad \text{Displacement Rate}_{it} = d_1 d \ln P_{it}^m + d_2 d \ln X_{it}^2 + G_i + e_{it}^1,$$

where P_{it}^m is the domestic price (\$) of the import good (relative to the aggregate price level). Elements of H are subsumed in X^2 and the UA Rate is now subsumed in the industry fixed effect G_i . d_1 and d_2 are

²⁰Accessions are new hires and rehires. The term unreplaced attritions appears in Brechling (1978).

²¹Brechling (1978) presents a model of turnover with endogenous quits. In that model, quits rise and fall with industry employment growth and the state of the overall economy. In depressed industries, workers are much less likely to quit; therefore, "normal" attrition cannot be counted on to reduce employment.

coefficients to be estimated, and e_{it}^1 is the error term.

An alternative specification uses import (and export) share. The discussion above suggests that import share be used along with measures of domestic demand. Total sales can be decomposed into its component parts: the domestic market (Domestic=Sales-Exports+Imports); exports; and import share. A first-order approximation gives:

$$(10) \quad d\text{Sales} = w_1 d\ln(\text{domestic}) + w_2 d\ln\text{exports} - w_3 d(\text{importshare}),$$

where $w_1 = (\text{sales}-\text{exports})/\text{sales}$, $w_2 = \text{exports}/\text{sales}$, and $w_3 = \text{domestic}/\text{sales}$. The weights adjust changes in the three components for the difference in the absolute magnitude of sales generated by the domestic side as compared to the trade side.²² The following equation relates changes in sales to displacement:

$$(11) \text{ Displacement Rate} = d_3 w_1 d\ln(\text{domestic}) + d_4 w_2 d\ln\text{exports} + d_5 w_3 d(\text{importshare}) \\ + d_6 d\ln X_{it}^2 + \gamma_i + e_{it}^2,$$

where the d's are coefficients to be estimated, γ_i is the industry fixed effect, and e_{it}^2 is the error term.

Before turning to the estimation results for job loss, it is useful to consider the “trade” version of equation (3), where the log change in employment is the dependent variable. Table 3 reports coefficient estimates for a specification using changes in import prices (Panel A) and changes in import shares, exports, and domestic demand (Panel B), with the log change in blue collar employment as the dependent variable. The changes are annual, and the specification includes industry fixed effects. Consistent with expectations, industry employment is positively correlated with industry relative import prices. In Panel B, employment falls as import share rises, and it rises as exports and domestic demand rise.

²²This decomposition of sales is explained in detail by Freeman and Katz (1991).

7. Multivariate analysis of the evidence on trade and job loss

Turning to the regression framework, tables 4 and 5 report cross-section estimates of a very simple specification relating annual industry displacement rates to two industry trade indicators.²³ Table 4 reports estimates from a cross-section time-series version of equation (11), where the explanatory variables are changes in domestic demand, exports, and import share. Table 5 reports estimates of equation (9), where the main explanatory variable is the change in relative import prices. In both tables, the dependent variable is the difference between an industry's annual displacement rate and its mean displacement rate over the time period. Subtracting out the mean industry displacement rate eliminates some industry-specific differences in displacement. Turning first to table 4, increases in domestic demand and exports are associated with declining job loss. Rising import share is positively related to job loss, and the hypothesis that the export and import coefficients are the same in magnitude cannot be rejected. Over the time period, there was a significant downward trend in the rate of job loss.

Technological change is one of the important elements missing from the discussion so far. The literature points clearly in the direction of technological change as a key explanation to declining unskilled employment in manufacturing and increasing wage inequality (see Krugman and Lawrence (1994), Lawrence and Slaughter (1993), Bound, Berman, and Griliches (1994), Berman, Bound, and Machin (1997)). The challenges of proxying technological change are clear, and in this case there is the additional issue of potential endogeneity. Industries facing increasing foreign competition may be driven toward technological change as a response.²⁴ As a first step, columns 2 and 3 use two different proxies for technological change, ignoring endogeneity, with insignificant results. Column 2 uses the

²³The reported standard errors are corrected for heteroscedasticity and the clustering of observations by industry.

²⁴See the chapter by Lawrence in this volume.

year-to-year change in total factor productivity (TFP), calculated from the NBER Productivity data file. Changes in TFP appear to be positively correlated with job loss rates, although the coefficient estimate is imprecise. In column 3, technological change is proxied by a variable that measures worker-reported changes in computer usage within the 3 digit CIC industry over the period 1984-93.²⁵ Increases in the usage of computers are negatively correlated with industry displacement, but the coefficient is imprecisely estimated.

Controls for changes in industry union density and capital intensity are also included in columns (2)-(5). Because the trend in unionization in manufacturing was sharply downward over this time period (and therefore collinear with the time trend), changes in density are measured as the annualized long period change in density over the period 1983-95. Although not measured precisely, industries with smaller declines in unionization had smaller job loss rates. Through collective bargaining, workers may have been able to restrict displacement (through wage or other concessions). Lower job loss rates are associated with the more capital intensive industries, although the correlation is not statistically significant.

In an abbreviated fashion, column 4 considers the question of outsourcing. Does the use of imported intermediate goods reduce the demand for labor and contribute to job displacement? In column 4, imports are measured as the annualized difference in imputed imports of intermediate goods between 1979 and 1990.²⁶ The estimated coefficient on the import measure is positive as expected, but not statistically significant.

²⁵Computer usage is available from CPS data for 1984 and 1993. The variable used here is the annualized change in computer usage for workers in a 3-digit industry between 1984 and 1993. The data are described in Autor, Katz, and Krueger (1997). I am grateful to David Autor for providing the computer usage data.

²⁶The data are described in Feenstra and Hanson (1997). I am grateful to Gordon Hanson for providing the imported intermediate goods data.

Columns (6)-(11) present results separately for blue-collar and white-collar workers.²⁷ The results are basically the same across groups, with a few exceptions. Rising import share is associated with higher rates of job loss for both occupational groups, but the estimated coefficients are statistically insignificant for both. The significant downward time trend in job loss rates is found only for blue collar workers. Technological change, as proxied by changes in TFP, is associated with increasing job loss, although the estimates are imprecise.

For further comparison to the import price regressions reported in Table 5, columns (5), (8), and (11) of Table 4 report estimates for the time period , 1983-92, and for the subset of industries for which the import price data are available. For this shorter time period, the coefficient on domestic demand falls appreciably in magnitude and is statistically insignificant. Job loss is positively related to import share and negatively related to exports. For the shorter time period, the proxies for technological change, changes in unionization, and capital intensity are all statistically insignificant.

Table 5 uses changes in relative import price indices as the main explanatory variable. As expected, the correlation between changes in import price and job loss is negative. For all workers and for blue collar workers, the estimates are imprecise, while for white collar workers, the estimated coefficients are statistically significant. The sensitivity of displacement rates to the business cycle is captured by the change in the index of manufacturing industrial production, with the negative, but imprecisely estimated, coefficient showing the countercyclical nature of displacement. The main difference between the results in Tables 4 and 5 is the sign of estimated correlation between technological change and job loss. Using import price over the 1983-92 time period, the correlation

²⁷Service workers are combined with white-collar workers, so the divisions are approximately production and nonproduction.

between changes in TFP and job loss rates is negative, whereas the correlation is positive in the trade quantity regression over the longer time period. The difference is not the specification of increasing foreign competition; it is the time period. Columns (5), (8), and (11) in Table 4, using trade quantities, report a negative correlation between changes in TFP and job loss for the 1983-92 period. This estimated effect is consistent with the Rybczynski Theorem, where factors flow into sectors experiencing technological advance. In an expanding sector, job loss rates are expected to fall.

Overall, the estimates are consistent with some of the expectations about increasing foreign competition and job loss. Across industries, there is some evidence that the risk of job loss increases as imports rise and/or import prices fall. At the same time, this simple cross-industry specification explains little of the variation in job loss rates.

Within-industry estimates

Without more satisfactory proxies for technological change, and given the likely heterogeneity across industries in the use of layoffs, hiring, discharges and quits to change employment levels, it may be desirable to estimate the relationships in an industry fixed effects framework. With industry fixed effects, the estimation focuses on changes over time in job loss and trade within an industry. That is, when a given industry faces increasing foreign competition, what happens to job loss?

Table 6 reports panel fixed effect estimates of a very simple specification relating annual industry displacement rates to the two sets of industry trade indicators. Panel A reports estimates from a specification using changes in relative import price indices. Column 1 uses the sample of 17 industries for which data is available over the 1983-92 period. Column 2 is restricted to a group of “high-import” industries, those industries with in the top quartile of mean import share over the 1975-94 period. The

estimated coefficients in columns 1 and 2 reveal that as relative import prices fall and imports become more competitive, displacement rises (the estimated effect of changes in relative import prices includes one lagged term). The effect of a change in relative import price is not different for the high-import share set of industries. The business cycle component of displacement is proxied by the index of manufacturing industrial production. Counterintuitively, the sign of the estimated correlation is positive (as it is in Table 5), although the estimate is imprecise. Similar to Table 5, technological change is associated with lower rates of job loss. Although generally consistent with expectations, this simple specification does not explain much of the within-industry variation in displacement.

Panel B of Table 6 reports estimates from a specification of trade flows and domestic demand. Columns 2 and 3 break up the time period into 1979-85 and 1986-92. Displacement rates are lower with increases in domestic demand and exports. Increases in import share are positively correlated with industry job loss, with a considerably stronger effect found for the first half of the 1980s than for the second half. The fit of the regression is somewhat better for the first half of the decade. Column 4 uses a balanced panel of industries, with the results little changed.

As a check, Table 7 reports coefficient estimates for a specification using the natural log of industry displacement as the dependent variable. This specification matches Haveman (1994), and it uses changes in relative import prices as the primary independent variable. The estimated coefficient is negative, as expected, and statistically significant. A one-percent fall in import price raises industry displacement by 1.56 percent. This estimate is close to Haveman's elasticity estimate of 1.69.

The measured response of job loss to changes in import prices and import share is likely understated. Revenga (1992) notes that if the import price variable (in equation 3) is correlated with any of the components of the disturbance term, OLS parameter estimates will be biased and

inconsistent. She notes several factors that may induce correlation between the import price measure and the error terms, such as unmeasured worldwide shocks to materials costs or unobserved and unmeasured taste or demand shifts in the U.S. that influence import prices due to the size of the U.S. market.²⁸ Similar arguments can be made for the endogeneity of the import share variable. A comparison of Revenga's OLS and IV estimates suggests rather strongly the likelihood of omitted variables (or simultaneity) that influence industry employment, wages, and import price, as OLS estimates of import price elasticities appear significantly downward biased.²⁹ The use of displacement here may weaken this correlation empirically, but conceptually it is still likely to exist.

8. Reemployment following Job Loss: Where do displaced workers become reemployed?

Does increasing foreign competition lead to a reallocation of labor? The linkages of changing trade patterns to changing employment patterns have been examined in a number of papers, including Borjas, Freeman, and Katz (1992, 1997), and Sachs and Shatz (1994, 1998). These studies confirm that the rise of net imports from developing countries is unskilled-intensive relative to the rest of manufacturing and the rest of the economy. Sachs and Shatz (1998) show, “that a cutback in manufacturing employment (particularly import-competing manufacturing employment) will release relatively unskilled workers into the service sector, with the effect being larger should those employees come from the import-competing sector of manufacturing.” (pg. 30) These studies reveal a potentially important aspect of the link between “trade and wages,” that the reemployment of displaced import-

²⁸Closer to the model discussed in Mann (1988), import prices may be set specifically for the U.S. market, and this price-setting will produce a correlation between import price and the disturbance terms.

²⁹Revenga's primary instrument is a source-weighted industry exchange rate, defined as a geometric average of the nominal exchange rates of countries accounting for more than two percent of industry imports.

competing manufacturing workers in the (lower-wage) service sector provides one avenue for downward pressure on wages with increasing trade. These papers consider the economy-wide aspects of labor reallocation, and the implications for increasing earnings inequality. The individual-level implications of labor reallocation are equally important, certainly for displaced workers, and for understanding the costs of trade-related displacement. In this section, I use the information available in the Displaced Worker Surveys to directly examine the pattern of reemployment following job loss and the possible link between reemployment sector and earnings losses.

The individual-level consequences of job displacement are well-studied and well known. The state of knowledge in two areas may be usefully restated here (interested readers should consult Kletzer (1998a) for more details). There is a sizeable literature on the question of whether workers displaced from import-competing industries face different (or worse) post-displacement outcomes than workers displaced from (manufacturing) industries less influenced by trade.³⁰ In Kletzer (1998b), I reported that workers displaced from high import share industries have different characteristics than workers displaced from other manufacturing industries: they are younger, less educated, less tenured, and more likely to be female. Average pre-displacement real weekly earnings are significantly lower in high import share industries. Workers displaced from high import share industries are significantly less likely to be reemployed following displacement and most of the difference is due to the fact that women is disproportionately employed in import-competing industries and women are less likely to be reemployed following displacement from any industry. Trade-displaced workers may have more difficult labor market adjustments, but the source of the difficulty is their otherwise disadvantaged characteristics, not

³⁰The Bureau of International Labor Affairs (ILAB) of the U.S. Department of Labor sponsored a number of empirical studies of trade-affected workers in the 1970s and early 1980s. See Aho and Orr (1981) and studies and citations in Dewald (1978).

the characteristics of their displacement industry.³¹

Second, displaced worker studies have also revealed that industry (or more broadly sector) may be an important dimension across which skills are transferable. The post-displacement earnings of individuals who change industry are lower than the earnings of otherwise comparable individuals who stay in the same industry (see citations in Kletzer (1998a)). It is important to note that larger earnings losses for workers who change industry may not necessarily reflect lost specific human capital. Industry wage effects due to efficiency wages, union rents, incentive pay schemes, or internal labor markets may partially account for the earnings losses.

With these studies as a backdrop, Table 8 reports a matrix of transitions, from pre-displacement industrial sector to post-displacement industrial sector, using a sample of reemployed displaced workers drawn from the Displaced Worker Surveys. The sample contains workers displaced over the years 1979-94, with each of the 16 years drawn from only one survey. The transitions are only available for those workers reemployed at their survey date. “Old” sector refers to time of displacement and those sectors are listed in the first column; “new” sector refers to reemployment and those sectors are listed across the top of the matrix. Each cell contains two entries: the first is the percent of reemployed old sector workers who are reemployed in the new sector, and the second entry is the mean difference in log weekly earnings, predisplacement to post-displacement, for those workers. For example, the first cell reports that 5.3% of reemployed mining workers were reemployed in agriculture, and their mean weekly earnings loss was approximately 79%.

Focusing attention on manufacturing - nonmanufacturing comparisons, several points stand out. Sizeable proportions of the sample stay within the same industrial sector. The highest “return”

³¹See Neumann (1978) and Kruse (1988, 1991) for more on this point.

proportions are Professional Services (62.6 percent); Construction (48.9 percent); Wholesale and Retail Trade (46.9 percent). Within manufacturing, 32 percent of reemployed Nondurable Goods workers remain in the sector, and 39 percent of Durable Goods workers remain in the sector. Overall, there is movement out of manufacturing. Approximately 34 percent of reemployed workers were displaced from manufacturing; the percentage of workers reemployed in manufacturing was 23 percent. Trade and Services represent approximately 54 percent of post-displacement employment, up from 44 percent of predisplacement employment. Thus, many displaced workers are reemployed in the (growing) nontradable sector. The variation in earnings change is considerable. The average earnings change for the overall sample was -11.1 percent (a loss), and -8.7 percent for Nondurable Goods workers and -18.3 percent for Durable Goods workers. Among manufacturing workers, the largest earnings losses are experienced by workers reemployed in Trade and Services (ranging from 15 to 40 percent). It is interesting to note that workers displaced from relatively lower-wage Trade and Services experience earnings gains if reemployed in Manufacturing (and the reemployment percentages are small, ranging from three to seven percent).

What happens to “trade-displaced” workers? It is difficult to isolate a set of workers displaced by trade. Rather than “trade-displaced,” Table 8 offers three definitions of import-competing. The first, listed in the table as “Top Job Loss,” are workers displaced from the top quartile of mean job loss rate industries, those industries listed in Table 1. For the most part, these industries are import-competing. How do these workers fare? Thirteen of the 17 top job loss rate industries are Durable Goods industries, so perhaps it is not surprisingly that the reemployment pattern of the top job loss group

looks like the Durable Goods group overall.³² More than one-third of the group is reemployed in a Durable Goods industry, and these workers have the smaller earnings losses (9.8 percent). Very large earnings losses are experienced by workers who are reemployed in Trade and Services, ranging from 29 to 52 percent. Mean earnings change for this group is -18.6 percent, the median is -10.2 percent. For comparison, the mean earnings change for workers not in this group is -10.7 percent and the median is -4.7 percent.

The second group, called “Top Job Loss and Top Trade,” includes workers displaced from industries that are top quartile of the mean job loss rate distribution and either top quartile of the mean import share distribution or the top quartile of the mean change in import share distribution. This tighter definition of import-competing job loss industry includes: Footwear; Watches, Clocks; Leather products; Toys; Pottery and Related Products; Radio and Television; Leather tanning; Other primary metals; and Cycles and Misc. Transport. This group looks very similar to the “Top Job Loss” group, with slightly smaller mean (13 percent) and median (7 percent) earnings losses. Again, large earnings losses are experienced by those workers reemployed in Trade and Services.

The last “trade displaced” group is called “Top Trade” and it includes workers from industries that are top quartile in both mean import share and mean change in import share, but without regard to job loss rate. These industries (with their mean job loss rate) are: Footwear (.090); Watches, Clocks (.091); Leather products (.142); Misc. Manufacturing (.053); Apparel (.052); Office and Accounting Machines (.0078); Toys (.067); Photographic equipment (.029); Electronic Computing equipment (.045); Pottery and Related Products (.071); Electrical Machinery (.039); Radio and Television (.125);

³²The NonDurable Goods industries are Footwear; Leather products, ex Footwear; Leather tanning and Misc. Petroleum and Coal products.

and Leather tanning (.074). Not all of the import-competing industries have high job loss rates, in particular those industries with sustained strong demand such as Office and Accounting Machines, Computers and Photographic Equipment. This group has the smallest average earnings losses of the three identified groups and losses that are slightly lower than the overall average (the mean change is -9.1 percent and the median change is -4.5 percent). Notably, this last group, while still predominantly Durable Goods industries, has smaller earnings losses across reemployment sectors. Those workers who return to Manufacturing have smaller earnings losses than the average returning Manufacturing worker and workers who become reemployed in Services have smaller earnings losses than the average worker displaced from Manufacturing and reemployed in Services.

Table 8 confirms some priors: workers displaced from Manufacturing and reemployed in Trade and Services experience large earnings losses. Workers displaced from import-competing Manufacturing, mostly Durable Goods, have the largest average earnings losses of any industrial group (with the exception of Mining) and their losses are particularly large if reemployed in Trade and Services. An important qualifier to the last point is that earnings outcomes for workers displaced from *import-competing and high job loss* manufacturing industries appear to be different from (worse than) the outcomes of workers displaced from industries defined by import competition alone.

What cannot be learned from this kind of descriptive analysis is why earnings losses are large. The losses are partly due to lost firm and industry-specific skills, but also due to losses of union rents, efficiency wages, and other industry-specific components of pay. These questions are beyond the scope of this paper.

Are Workers Reemployed in Exporting Industries?

Table 8 provides one straightforward answer to this question: no. The largest share of workers

displaced from import-competing industries are reemployed in Trade and Services, largely nontradable sectors. The question can be rephrased and narrowed to: within manufacturing, are workers reemployed in exporting industries? Durable Goods industries dominate the top quartile of export share industries (15 of the 18 are Durable Goods industries). As noted above, Durable Goods industries also dominate the group of highly import-competing industries. As larger (by employment) industries, Durable Goods industries account for larger shares of both displacement (22.9 percent) and reemployment (14.9 percent) than Nondurable Goods industries (12.6 percent and 8.1 percent). Within Durable Goods, the top reemployment industries were:

Industry	# reemployed (000s)	% of Mfg.Reemploy	Export Share	Import Share
Machinery, exc. Electrical	367.6	7.0	.139	.128
Electrical Machinery	354.6	6.7	.138	.180
Motor Vehicles	274.7	5.2	.094	.237
Furniture & Fixtures	190.4	3.6	.017	.080
Fabricated Structural Metals	177.1	3.4	.031	.012
Manufacturing Avg.			.075	.117

Large employers tend to dominate this list, rather than exporting industries, although Electrical and non-Electrical Machinery industries have both characteristics. If we consider the set of industries that are top quartile in both export share and changes in export share over the 1975-94 period, these industries accounted for 14.8 percent of manufacturing reemployment and 3.4 percent of all reemployment. The industries, with their mean import and export shares are:

Industry	Export Share	Import Share	High Wage
Ordnance	.131	.059	*
Scientific & Controlling Instruments	.209	.126	*
Aircraft & Parts	.266	.091	*
Office & Accounting Machines	.180	.210	*
Leather Tanning & Finishing	.143	.208	
Electronic Computing Equipment	.246	.239	*
Electrical Machinery	.138	.180	
Cycles & Misc. Transport Equip.	.163	.254	*
Engines & Turbines	.217	.149	*

For workers and policy-makers, an important characteristic of manufacturing exporting industries is that they tend to be “high-wage,” in the sense of paying wages that are above average for

manufacturing (and considerably above average for all industries). In the chart above, “high-wage” industries are those with sizable positive wage differentials, in the range of .083 to .207, as measured by Katz and Summers (1989).³³ Workers reemployed in the above industries experience smaller earnings losses than workers reemployed elsewhere. For Nondurable Goods displaced workers, reemployment in the above resulted in average earnings changes of +13.8 percent compared to losses of 9.4 percent for workers reemployed elsewhere. For Durable Goods displaced workers, average earnings losses were -4.8 percent if reemployed in these industries, compared to losses of -19.9 percent if reemployed elsewhere.

9. Conclusion

This paper has investigated the relationship between changes in foreign competition and job displacement for a sample of manufacturing industries over the period 1979-94. The results are broadly consistent with the perception that imports displace some domestic jobs. This broad consistency appears to be a result of a strong positive relationship between increasing foreign competition and job displacement for industries long identified as import-competing, industries such as Footwear, Leather Products, Radio and Television, Watches and Clocks, Toys. At the same time, there are a number of import-competing industries with below average rates of job loss, such as Office and Accounting Machines and Photographic equipment. Over this time period, there was also considerable job loss from industries facing little or no change in import competition (Guided missiles and space vehicles,

³³Katz and Summers (1989) control for the usual worker characteristics and estimate wage differentials for two-digit CIC industries, using the full year 1984 Current Population Survey (see their Table 2, pg. 218-219). These numbers are the proportionate difference in wages between the average workers in a given two-digit industry and the average worker in all industries.

Wood Buildings and Mobile Homes, Optical and Health Services Supplies). With this variation, the overall relationship between increasing foreign competition and permanent job loss appears much less systematic. What is unknown is whether the trade/job loss relationship might be stronger within more narrowly defined industries. The displacement data do not allow further industry detail.³⁴

Across industries, increasing foreign competition accounts for a small share of job displacement. There are high rates of job loss for industries with very little trade. This conclusion would be highlighted if the analysis sample included trade and service industries, where rates of job loss are high while the services produced are mostly nontradables. In the absence of satisfactory high frequency proxies for technological change, the role of technological change remains in debate.

There is an important limitation to this analysis. Displacement is just one of the flows that contribute to net changes in employment. It is likely that firms use all the components of turnover (quits, new and replacement hiring, as well as displacement) to move actual employment toward its desired level as foreign competition changes. It may be difficult for the data to isolate one flow in the absence of the others.

Sizeable earnings losses follow job displacement. Workers displaced from import-competing Manufacturing, mostly Durable Goods, have the largest average earnings losses of any industrial group (with the exception of Mining) and their losses are particularly large if reemployed in Trade and Services. Even if the causal model remains unclear, workers have good reason to worry about job and income insecurity in the face of increasing foreign competition.

³⁴For related studies using establishment- and plant-level data, see Davis, Haltiwanger, and Schuh (1996) and Bernard and Jensen (1995).

References

- Abowd, John M. 1991. "The NBER Immigration, Trade, and Labor Markets Data Files." In Immigration, Trade and the Labor Market, edited by J.M. Abowd and R.B. Freeman, 407-422. University of Chicago Press.
- Addison, John, Douglas A. Fox, and Christopher J. Ruhm. 1995. "Trade and displacement in manufacturing." Monthly Labor Review 118(April): 58-67.
- Aho, C. Michael and James A. Orr. 1981. "Trade-sensitive employment: who are the affected workers?." Monthly Labor Review, 104(2): 29-35.
- Autor, David, Lawrence F. Katz, and Alan B. Krueger. 1997. "Computing Inequality: Have Computers Changed the Labor Market?," National Bureau of Economic Research Working Paper #5956, March.
- Bednarzik, Robert W. 1993. "Analysis of U.S. industries sensitive to international trade." Monthly Labor Review 116(2): 15-31.
- Belman, Dale and Thea M. Lee 1995. "International Trade and the Performance of U.S. Labor Markets," in Robert Blecker, ed., U.S. Trade Policy and Global Growth. M.E. Sharpe: Armonk, NY, pp. 61-107.
- Berman, Eli, John Bound, and Zvi Griliches. 1994. "Changes in the Demand for Skilled Labor within U.S. Manufacturing Industries: Evidence from the Annual Survey of Manufacturing." Quarterly Journal of Economics 109(2): 367-397.
- Berman, Eli, John Bound, and Stephen Machin. 1997. "Implications of Skill-Biased Technological Change: International Evidence," NBER Working Paper #6166, September.
- Bernard, Andrew B. and J. Bradford Jensen. 1995. "Exporters, Jobs and Wages in U.S. Manufacturing: 1976-1987." Brookings Papers on Economic Activity: Microeconomics 1995. 67-119.
- Borjas, George J., Richard B. Freeman and Lawrence F. Katz. 1992. "On the Labor Market Effects of Immigration and Trade," in Immigration and the Work Force: Economic Consequences for the United States and Source Areas, edited by George J. Borjas and Richard B. Freeman, Chicago: University of Chicago Press, pp. 213-244.
- Borjas, George J., Richard B. Freeman and Lawrence F. Katz. 1997. "How Much Do Immigration and Trade Affect Labor Market Outcomes," Brookings Papers on Economic Activity, 1: pp. 1-90.
- Brechling, Frank. 1978. "A Time Series Analysis of Labor Turnover." In The Impact of International Trade and Investment on Employment, in William G. Dewald, ed., Bureau of International Labor Affairs, U.S. Department of Labor: pp. 67-86.
- Cline, William R. 1997. Trade and Income Distribution. Institute for International Economics:

Washington, DC.

- Davis, Steven J., John C. Haltiwanger, and Scott Schuh. 1996. Job Creation and Destruction. MIT Press: Cambridge.
- Dewald, William G. 1978. The Impact of International Trade and Investment on Employment, Bureau of International Labor Affairs, U.S. Department of Labor.
- Dickens, William T. 1988. "The Effects of Trade on Employment: Techniques and Evidence." In The Dynamics of Trade and Employment, edited by Laura D'Andrea Tyson, William T. Dickens and John Zysman, 41-85. Ballinger Press: Cambridge, Mass.
- Evans, David S. and Linda S. Leighton. 1995. "Retrospective Bias in the Displaced Worker Surveys," Journal of Human Resources, 30: 386-396.
- Fallick, Bruce C. 1996. "A Review of the Recent Empirical Literature on Displaced Workers," Industrial and Labor Relations Review, 50(1): 5-16.
- Farber, Henry S. 1993. "The Incidence and Costs of Job Loss: 1982-91." Brookings Papers on Economic Activity: Microeconomics 1993. 73-119.
- Farber, Henry S. 1997. "The Changing Face of Job Loss in the United States, 1981-1995," Brookings Papers on Economic Activity: Microeconomics, pp. 55-142.
- Feenstra, Robert C. 1996. "U.S. Imports, 1972-1994: Data and Concordances," National Bureau of Economic Research Working Paper #5515, March.
- Feenstra, Robert C. and Gordon H. Hanson. 1997. "Productivity Measurement and the Impact of Trade and Technology on Wages: Estimates for the U.S., 1972-1990," University of California, Davis, working paper, March.
- Freeman, Richard B. and Lawrence F. Katz. 1991. "Industrial Wage and Employment Determination in an Open Economy." In Immigration, Trade, and the Labor Market, edited by J.M. Abowd and R.B. Freeman. University of Chicago Press, pp. 235-60.
- Grossman, Gene. 1986. "Imports as a Cause of Injury: The Case of the U.S. Steel Industry." Journal of International Economics 20(3/4): 201-23.
- _____. 1987. "The Employment and Wage Effects of Import Competition," Journal of International Economic Integration 2(1):1-23.
- Haveman, Jon D. 1994. "The Influence of Changing Trade Patterns on Displacements of Labor." Purdue University, Krannert School of Management.
- Jacobson, Louis, Robert LaLonde, and Daniel Sullivan. 1993. The Costs of Worker Dislocation. Kalamazoo, MI: W.E. Upjohn Institute for Employment Research.

- Katz, Lawrence F. and Lawrence H. Summers. 1989. "Industry Rents: Evidence and Implications," Brookings Papers on Economic Activity: Microeconomics, pp. 209-290.
- Kletzer, Lori G. 1998a. "Job Displacement," Journal of Economic Perspectives, Winter, pp. 115-136.
- _____. 1998b. "International Trade and Job Loss in U.S. Manufacturing, 1979-91," in Susan M. Collins, ed., Imports, Exports, and the American Worker, Washington, DC: The Brookings Institution, pp. 423-472.
- _____. 1998c. "Increasing Foreign Competition and Job Insecurity: Are They Related?," Proceedings of the Fiftieth Annual Meeting, Industrial Relations Research Association, forthcoming.
- Krugman, Paul. 1991. Geography and Trade. Cambridge, Mass. and London: The MIT Press.
- Krugman, Paul and Robert Lawrence. 1994. "Trade, Jobs, and Wages," Scientific American, April, pp. 22-27.
- Kruse, Douglas L. 1988. "International Trade and the Labor Market Experience of Displaced Workers." Industrial and Labor Relations Review, 41(3): 402-417.
- _____. 1991. "Displaced versus Disadvantaged Workers." In Job Displacement: Consequences and Implications for Policy, John T. Addison, ed., Detroit: Wayne State University Press, pp. 279-96.
- Lawrence, Robert Z. 1994. "Trade, Multinationals, and Labor." Working Paper 4836. Cambridge, Mass.: National Bureau of Economic Research (August).
- Lawrence, Robert Z. and Matthew J. Slaughter. 1993. "International Trade and American Wages in the 1980s: Giant Sucking Sound or Small Hiccup?." Brookings Papers on Economic Activity: Microeconomics, 1993: 161-210.
- Leamer, Edward E. 1993. "Wage Effects of a U.S.-Mexican Free Trade Agreement." In The Mexico-U.S. Free Trade Agreement, edited by P.M. Garber, Cambridge, Mass.: MIT Press, pp.57-125.
- _____. 1994. "Trade, Wages and Revolving Door Ideas". Working Paper 4716. Cambridge, Mass.: National Bureau of Economic Research (April).
- Mann, Catherine L. 1988. "The Effect of Foreign Competition in Prices and Quantities on the Employment in Import-Sensitive U.S. Industries." The International Trade Journal, II(Summer): 409-444.
- Murphy, Kevin M. and Finis Welch. 1991. "The Role of International Trade in Wage Differentials." In Workers and Their Wages: Changing Patterns in the United States, edited by Marvin H. Koster, 39-69. Washington, D.C.: The AEI Press.

- Neumann, George R. 1978. "The Labor Market Adjustments of Trade Displaced Workers: The Evidence from the Trade Adjustment Assistance Program." In Research in Labor Economics, volume 4, edited by Ronald Ehrenberg, Greenwich, CT: JAI Press, 353-81.
- Revena, Ana L. 1992. "Exporting Jobs? The Impact of Import Competition on Employment and Wages in U.S. Manufacturing." Quarterly Journal of Economics 107(1): 255-284.
- Richardson, J. David. 1995. "Income Inequality and Trade: How to Think, What to Conclude," Journal of Economic Perspectives, 9(3):33-56.
- Sachs, Jeffrey D. and Howard J. Shatz. 1994. "Trade and Jobs in U.S. Manufacturing." Brookings Papers on Economic Activity, 1-69.
- Sachs, Jeffrey D. And Howard J. Shatz. 1998. "International Trade and Wage Inequality in the United States: Some New Results," in Susan M. Collins, ed., Imports, Exports, and the American Worker, Washington, DC: The Brookings Institution, pp. 215-254.
- Sachs, Jeffrey D. and Andrew Warner. 1995. "Economic Reform and the Process of Global Integration," Brookings Papers on Economic Activity, 1: pp. 1-118.
- Schoepfle, Gregory K. 1982. "Imports and domestic employment: identifying affected industries." Monthly Labor Review, 105(8): 13-26.
- Shelburne, Robert and Robert Bednarzik. 1993. "Geographic concentration of trade-sensitive employment." Monthly Labor Review, 116(6): 3-13.
- Topel, Robert. 1990. "Specific Capital and Unemployment: Measuring the Costs and Consequences of Job Loss." Carnegie-Rochester Conference Series on Public Policy 33(Autumn): 181-214.
- United States Bureau of Labor Statistics. 1992. BLS Handbook of Methods. Bulletin 2414. U.S. Government Printing Office.
- Wood, Adrian. 1994. North-South Trade, Employment and Inequality. Oxford: Clarendon Press.

Figure 1: Manufacturing and Total Displacement Rates, by year

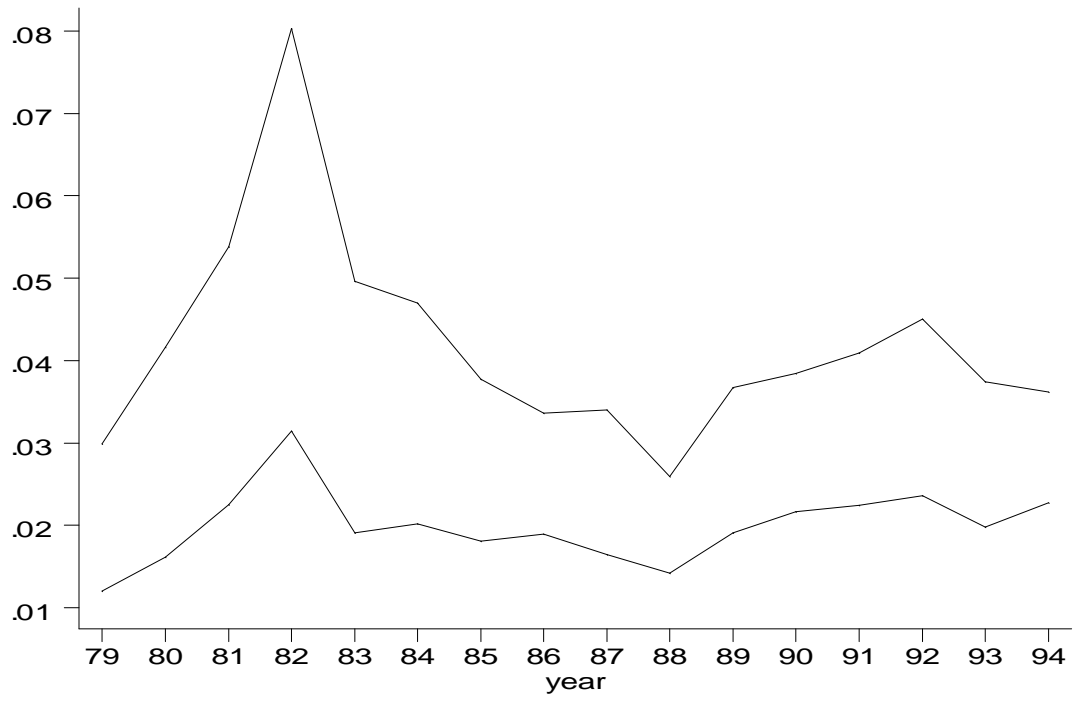


Figure 2: Industry Displacement Rates and Changes in Import Share

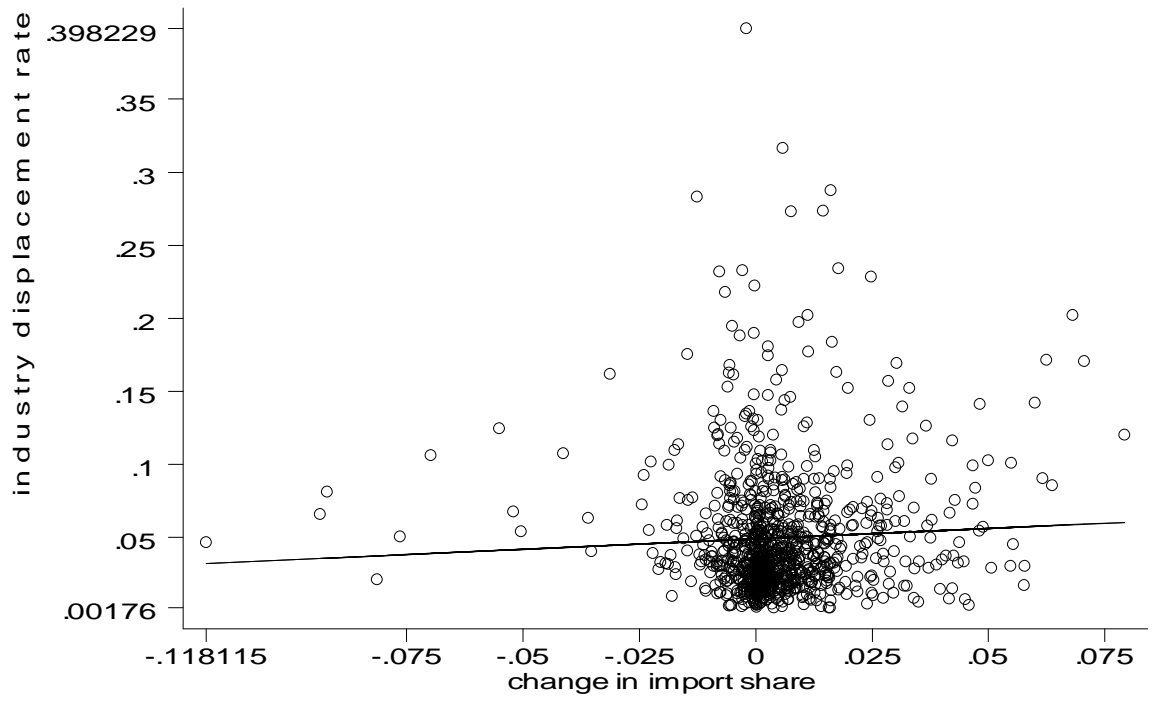


Figure 3: Industry Displacement Rates and Changes in import prices

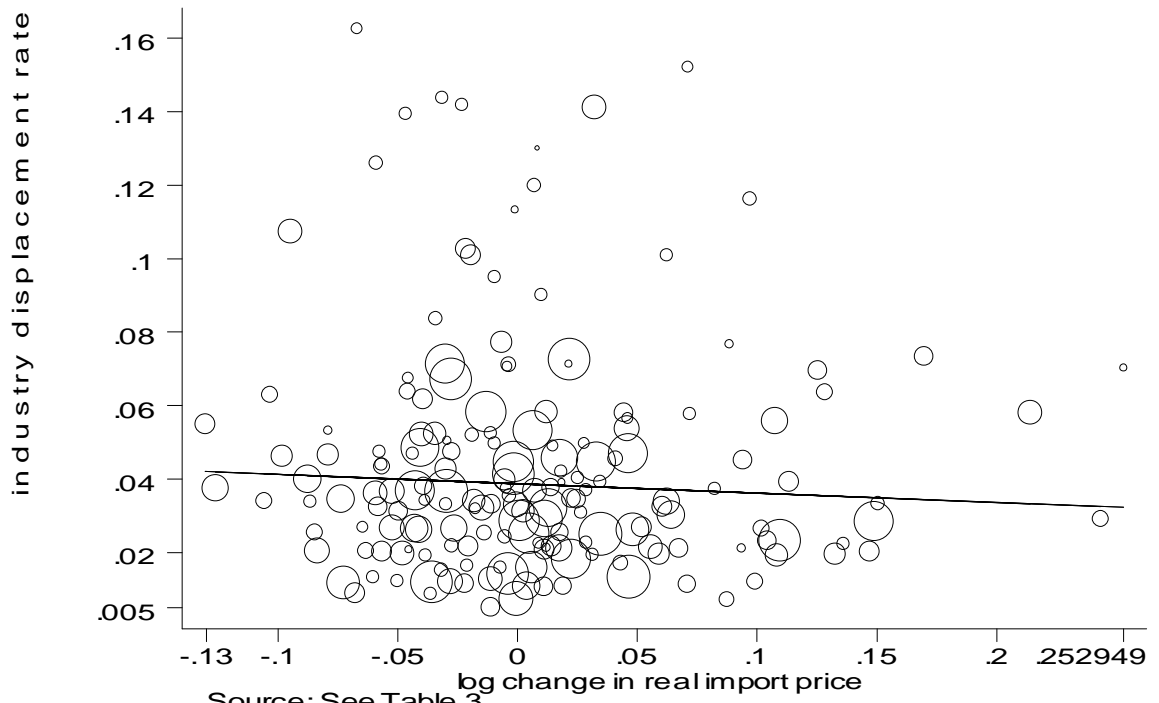


Table 1
Top quartile, mean annual displacement rate, >.061

Industry	CIC	Mean displacement rate	Mean import share	Mean Chg in import share
Leather products	222	.142046	.4079864 *	.0238756 *
Optical & health supplies	372	.1262741	.0801311	.003507
Radio, TV	341	.1259439	.1957753 *	.0081509 *
Railroad locomotives	361	.1077487	.0925145	.0067265
Wood Bldgs & mobile homes	232	.0972105	.0434898	.0001035
Cycles & Misc. Transport	370	.093942	.2542767 *	-.0068314
Watches, clocks	381	.0913399	.5229867 *	.0278894 *
Footwear	221	.0906134	.4954904 *	.0241364 *
Structural clay products	252	.083527	.1209288	.0060668
Guided missiles	362	.0803838	.0256684	.0021725
Other primary metals	280	.0775787	.1853473 *	.0038447
Ship & Boat Bldg.	360	.0746358	.027272	.0012961
Leather tanning	220	.0739732	.2082242 *	.00799*
Misc. Petroleum & coal	201	.0720061	.064999	-.0013748
Pottery & related products	261	.0717307	.3800826 *	.0105394 *
Primary aluminum	272	.0702517	.0828264	.0063072
Toys	390	.0677491	.3408123 *	.0177078 *

Notes: * denotes top quartile of respective distribution.

Author's calculations from the Displaced Worker Surveys and U.S. Import and Export Data, 1958-94.

Table 2
Trade and Job Loss by industry

	Lowest quartile	2nd quartile	3rd quartile	Top quartile
I.				
By mean import share	< .043	.044 - .087	.088-.1537	> .154
Mean annual displacement rate [Min, Max]	.046 [.024, .097]	.045 [.021, .126]	.045 [.016, .108]	.065 [.008, .142]
II.				
By mean change in import share	<.0007	.0007-.003	.003-.0075	> .0075
Mean annual displacement rate [Min, Max]	.045 [.021, .097]	.042 [.021, .080]	.055 [.024, .126]	.059 [.008, .142]
III.				
By mean change in net exports/shipments	<-.0029	-.003 to -.0008	-.0008 - .00059	>.00059
Mean annual displacement rate [Min, Max]	.059 [.008, .142]	.044 [.015, .080]	.053 [.022, .126]	.044 [.021, .094]
IV.				
By mean annual displacement rate	<.031	.031 - .044	.045 - .061	>.061
Mean import share [Min, Max]	.087 [.002, .209]	.081 [.01, .179]	.084 [.007, .264]	.207 [.025, .522]

Source: Author's calculations from the Displaced Worker Surveys and U.S. Imports and Exports, 1958-94.

Table 3
Changes in industry blue collar employment, Changes in Relative Import Prices, and Changes in Import Shares
Panel, Fixed Effect Estimates

Panel A	(1)		
Sample	Full		
Time period	1983-92		
Log change relative import price index	.1005 (.0673)		
Change in mfg. industrial production index	.0039 (.0011)		
Industry Fixed Effects	Yes		
Constant	-.0296 (.0053)		
R2 (within)	.091		
R2 (between)	.071		
R2 (overall)	.073		
Number of observations	214		
Number of industries	27		
Panel B			
Sample	1979-94	1975-94	1970-94
Weighted log change in domestic demand	.2851 (.0298)	.3202 (.0249)	.3402 (.0275)
Weighted log change in exports	.7002 (.1439)	.5901 (.1171)	.4927 (.1247)
Weighted change in import share	-.3221 (.0929)	-.3149 (.0863)	-.3919 (.1014)
Industry Fixed Effects	Yes	Yes	Yes
Constant	-.0277 (.0030)	-.0293 (.0026)	-.0264 (.0030)
R2 (within)	.135	.159	.126
R2 (between)	.396	.527	.462
R2 (overall)	.147	.170	.134
Number of observations	1100	1372	1612
Number of industries	70	70	70

Note: Author's calculations from data drawn from the NBER Trade Database , Bureau of Labor Statistics, U.S. Import and Export Price Indices, and the Displaced Worker Surveys. Standard errors in parentheses. Panel A includes one lag in the import price index.

Table 4
Industry Displacement Rates and Changes in Import Share:
Cross-section estimation

Sample	All Workers				(5)	Blue Collar Workers			White Collar Workers		
	(1)	(2)	(3)	(4)		(6)	(7)	(8)	(9)	(10)	(11)
	1979-94	1979-94	1979-94	1979-94	1983-92	1979-94	1979-94	1983-92	1979-94	1979-94	1983-92
Weighted In change domestic demand	-.0697 (.0247)	-.0719 (.0254)	-.0704 (.0240)	-.0714 (.0252)	-.0006 (.0541)	-.0875 (.0208)	-.0935 (.0232)	-.0011 (.0424)	.0628 (.0567)	.0564 (.0547)	.0868 (.0961)
Weighted In change in exports	-.3060 (.0724)	-.3114 (.0716)	-.3068 (.0722)	-.3168 (.0713)	-.2803 (.1025)	-.3130 (.0676)	-.3134 (.0702)	-.3303 (.0901)	-.4801 (.1546)	-.4806 (.1529)	-.2803 (.1846)
Weighted change in import share	.1037 (.0587)	.0999 (.0636)	.0943 (.0631)		.1840 (.0910)	.0508 (.0850)	.0527 (.0866)	.1519 (.0500)	.0549 (.1040)	.0699 (.0992)	-.0940 (.1404)
Change in intermediate goods imports				.2916 (.3331)							
Change in mfg. industrial production index	-.0005 (.0003)	-.0005 (.0003)	-.0005 (.0003)	-.0004 (.0003)	-.0003 (.0008)	-.0004 (.0003)	-.0005 (.0004)	-.0008 (.0007)	-.0006 (.0008)	-.00072 (.0009)	.0002 (.0013)
Time trend	-.0010 (.0004)	-.0010 (.0004)	-.0009 (.0003)	-.0010 (.0004)	-.0010 (.0012)	-.0008 (.0004)	-.0009 (.0004)	-.0019 (.0009)	.00012 (.0007)	.0001 (.0008)	-.0020 (.0024)
Change in unionization (1983-95, annualized)		-.0041 (.0028)	-.0046 (.0029)	-.0041 (.0029)	.0012 (.0062)		.0006 (.0009)	.0022 (.0038)		-.0006 (.0013)	-.0041 (.0103)
Change in TFP		.0084 (.0274)		.0053 (.0276)	-.0091 (.0691)		.0231 (.0258)	-.0407 (.0745)		.0616 (.0742)	-.0812 (.1457)
Change in computer usage (1984-93, annualized)			-.1172 (.1193)								
Ln(Capital Stock/Shipments)		-.0034 (.0026)	-.0033 (.0027)	-.0033 (.0024)	.0015 (.0016)		-.0015 (.0014)	-.00002 (.0022)		.0021 (.0017)	-.0006 (.0066)
Constant	.0198 (.0033)	.0136 (.0041)	.0155 (.0042)	.0132 (.0045)	.0120 (.0157)	.0134 (.0029)	.0131 (.0027)	.0226 (.0105)	.0010 (.0070)	.0026 (.0074)	.0167 (.0289)
R2	.086	.090	.091	.088	.124	.083	.084	.154	.025	.026	.049
Number of observations	934	934	934	934	215	846	846	194	674	674	167
Number of industries	70	70	70	70	26	70	70	25	70	70	26

Notes: Author's calculations from the Displaced Worker Surveys, 1984-96, U.S. Import and Export data, 1958-94, and the NBER Productivity data set. Standard errors in parentheses. Samples used in columns 5, 8, and 11 matches the industries and time period used in Table 5.

Table 5
Industry Displacement Rates and Changes in Import Prices, 1983-92:
Cross-section estimation

	All Workers			Blue Collar		White Collar	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log change relative import price index	-.0403 (.0322)	-.0460 (.0306)	-.0406 (.0307)	-.0496 (.0384)	.0527 (.0400)	-.0702 (.0553)	-.0716 (.0583)
Change in index of mfg. industrial production	.0004 (.0008)	.0008 (.0007)	.0005 (.0007)	-.0005 (.0008)	-.0009 (.0008)	-.0006 (.0014)	-.0007 (.0013)
Time trend	-.0017 (.0011)	-.0016 (.0011)	-.0016 (.0012)	-.0031 (.0012)	-.0032 (.0012)	-.0030 (.0022)	-.0030 (.0023)
Change in unionization (1983-95, annualized)			.0013 (.0074)	.0043 (.0027)	.0063 (.0029)	-.0092 (.0096)	-.0094 (.0097)
Ln(Capital Stock/Shipments)		.0002 (.0027)	.0005 (.0032)	-.0016 (.0018)	-.0024 (.0021)	-.0012 (.0075)	-.0019 (.0075)
Change in TFP		-.1040 (.0545)		-.1308 (.0662)		-.0380 (.1454)	
Change in computer usage (1984-93 , annualized)			-.3028 (.2351)		.0459 (.1171)		.1861 (.4532)
Constant	.0174 (.0140)	.0177 (.0143)	.0254 (.0130)	.0335 (.0127)	.0350 (.0141)	.0255 (.0238)	.0214 (.0230)
R2	.074	.089	.093	.132	.114	.046	.047
Number of observations	168	168	168	148	148	129	129
Number of industries	26	26	26	24	24	26	26

Note: Author's calculations from Displaced Worker Surveys, 1984-96 and U.S. Import and Export Data, 1958-94. Standard errors in parentheses. Specification includes one lag in the import price index.

Table 6
Industry Displacement Rates, Changes in Relative Import Prices, and Changes in Import Shares
Panel, Fixed Effect Estimates

Panel A	(1)	(2)			
Sample Time period	Full 1983-92	High Import 1983-92			
Log change relative import price index	-.0868 (.0461)	.0831 (.1091)			
Change in mfg. industrial production index	.0011 (.0009)	-.00007 (.0014)			
Ln(Capital Stock/Shipments)	-.0155 (.0217)	-.0236 (.0277)			
Time trend	-.0017 (.0012)	-.0019 (.0021)			
Change in TFP	-.1364 (.0714)	-.1725 (.0917)			
Constant	.0514 (.0181)	.0581 (.0257)			
Industry Fixed Effects	Yes	Yes			
R2 (within)	.134	.113			
R2 (between)	.181	.351			
R2 (overall)	.096	.274			
Number of observations	132	76			
Number of industries	17	13			
Panel B					
Sample Time period	Full 1979-94	Full 1979-85	Full 1986-94	Balanced 1979-94	Panel A 1983-92
Weighted ln change in domestic demand	-.0733 (.0191)	-.0571 (.0256)	-.0675 (.0298)	-.0576 (.0344)	-.0050 (.0475)
Weighted ln change in exports	-.3436 (.0605)	-.2364 (.0810)	-.2655 (.0945)	-.5614 (.0919)	-.4290 (.1118)
Weighted change in import share	.0703 (.0627)	.1266 (.0883)	.0126 (.0855)	.2037 (.1399)	-.0797 (.1022)
Change in mfg. industrial production index	-.0005 (.0003)	-.0011 (.0004)	.0002 (.0006)	-.0010 (.0005)	.0008 (.0009)
Ln(Capital Stock/Shipments)	-.0041 (.0078)	.0091 (.0143)	.0131 (.0159)	-.0218 (.0113)	-.0576 (.0203)
Change in TFP	.0329 (.0341)	-.0449 (.0482)	.0853 (.0473)	.0928 (.0604)	-.0477 (.0818)
Time trend	-.0009 (.0003)	.0012 (.0010)	.0007 (.0005)	-.0014 (.0004)	-.0021 (.0011)
Constant	.0600 (.0061)	.0644 (.0121)	.0491 (.0128)	.0535 (.0009)	.0215 (.0174)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes
R2 (within)	.088	.137	.048	.141	.225
R2 (between)	.025	.0009	.139	.017	.004
R2 (overall)	.056	.0525	.0007	.046	.032
Number of observations	966	438	528	433	168
Number of industries	72	70	71	27	17

Note: Author's calculations from data drawn from the NBER Trade Database, Bureau of Labor Statistics, U.S. Import and Export Price Indices, the Displaced Worker Surveys, and the NBER Productivity data set. Full sample denotes the largest feasible data set with information on the relevant variables. Standard errors in parentheses. Panel A specification includes one lag in the import price index.

Table 7
Changes in industry In displacement and Changes in Relative Import Prices
Panel, Fixed Effect Estimates

	(1)
Sample	Full
Time period	1983-92
Log change relative import price index	-1.5625 (.7457)
Change in mfg. industrial production index	-.0105 (.0107)
Industry Fixed Effects	Yes
Constant	8.9664 (.0510)
R2 (within)	.041
R2 (between)	.026
R2 (overall)	.011
Number of observations	209
Number of industries	28

Note: Author's calculations from data drawn from the NBER Trade Database , Bureau of Labor Statistics, U.S. Import and Export Price Indices, and the Displaced Worker Surveys. Standard errors in parentheses. Specification includes one lag in the import price index.

Table 8
Post-displacement employment by sector, 1979-94

Old sector	New Sector										
	Agricult.	Mining	Construction	Mfg - Non Durables	Mfg - Durables	Transportation	Trade	Prof Services	Other Services	Government	Total
Mining	5.3%	26.84%	10.44%	2.08%	10.71%	9.85%	12.19%	10.65%	9.16%	2.76%	2.2%
	-.791	-.027	-.552	-.885	-.339	-.349	-.527	-.586	-.762	-.558	-.382
	17.2 (9)	124.9 (82)	44.5 (34)	9.6 (6)	49.0 (26)	30.5 (25)	56.5 (34)	38.0 (27)	28.6 (21)	6.9 (7)	406.2 (271)
Construction	1.92%	0.44%	48.93%	3.25%	7.91%	5.47%	12.48%	11.22%	6.32%	2.06%	10.1%
	-.088	-.081	-.037	0.77	-.215	-.097	-.325	-.238	-.246	-.064	-.128
	30.7 (14)	7.0 (4)	878.2 (458)	52.9 (36)	157.7 (82)	104.6 (59)	224.9(128)	229.0 (128)	126.8 (69)	41.5 (27)	1853.8 (1005)
Mfg - Non Durables	1.37%	0.30%	3.81%	32.0%	14.27%	5.05%	15.73%	15.48%	9.98%	2.00%	11.9%
	.132	-.098	.020	-.015	.007	.009	-.190	-.146	-.279	-.180	-.087
	26.5 (16)	5.6 (5)	84.0 (50)	761.1 (424)	318.7 (159)	111.5 (61)	359.1(215)	347.8 (203)	215.4 (114)	51.2 (30)	2281.3 (1277)
Mfg - Durables	1.15%	0.54%	6.44%	7.55%	39.16%	5.17%	14.08%	12.45%	11.28%	2.14%	22.5%
	-.604	-.002	-.205	-.048	-.072	-.124	-.376	-.289	-.393	.028	-.183
	31.4 (16)	27.6 (13)	262.4 (147)	341.3 (190)	1749.4 (929)	210.3 (107)	598.3(348)	530.2 (275)	428.7 (218)	94.9 (56)	4275.0 (2299)
Transportation	1.72%	0.57%	5.73%	3.55%	6.36%	42.04%	14.92%	11.95%	10.68%	2.49%	6.89%
	-.498	.106	-.192	-.248	-.194	-.083	-.242	-.248	-.294	-.203	-.174
	16.8 (6)	9.0 (5)	64.4 (43)	42.9 (23)	76.3 (42)	538.9 (291)	185.4(100)	150.2 (82)	127.4 (62)	35.6 (17)	1247.4 (671)
Trade	1.04%	0.17%	4.52%	4.84%	7.15%	4.84%	46.93%	17.17%	11.40%	1.95%	20.17%
	-.066	.154	-.156	.019	.053	-.047	-.052	-.022	-.073	.089	-.038
	26.4 (15)	7.0 (8)	168.1 (87)	182.5 (97)	277.1 (144)	178.8 (103)	1691.8(940)	673.3 (350)	383.0 (202)	80.3 (47)	3668.7 (1993)
Prof. Services	0.63%	0.42%	2.92%	3.61%	4.37%	3.14%	10.58%	62.63%	8.77%	2.91%	14.55%
	-.559	-.040	-.335	.009	.085	-.112	-.191	-.036	-.355	.188	-.078
	6.2 (5)	9.1 (8)	78.9 (39)	105.3 (53)	121.7 (65)	78.5 (44)	289.0(151)	1677.9 (876)	236.9 (119)	88.6 (55)	2692.5 (1415)
Other Services	1.39%	0.53%	4.78%	3.76%	7.46%	6.55%	19.11%	19.87%	35.09%	1.45%	10.45%
	-.179	.287	.012	.174	.124	.062	-.120	-.112	-.068	.147	-.043
	16.1 (7)	12.5 (7)	88.1 (47)	71.0 (41)	146.4 (75)	138.5 (71)	363.2 (198)	350.4 (195)	594.6 (321)	30.4 (18)	1811.9 (980)
Government	1.42%	0.00%	2.35%	5.42%	2.93%	8.12%	11.09%	34.83%	7.73%	26.11%	1.21%
	-.062	-----	.144	-.020	-.053	-.162	-.404	-.101	-.199	.119	.079
	3.9 (3)	0 (0)	4.0 (4)	14.0 (8)	6.1 (6)	21.5 (10)	23.7 (14)	85.8 (53)	15.0 (10)	56.4 (37)	230.7 (145)
Total	1.32%	0.98%	9.32%	8.10%	14.88%	7.65%	20.74%	21.92%	12.64%	2.45%	100.0%
	-.316	.0036	-.104	-.017	-.049	.073	-.168	-.108	-.220	.030	-.111
	175.6 (91)	203.0(132)	1673.0 (909)	1581.2 (878)	2902.8 (1528)	1413.4 (771)	3792.3(2128)	4083.0 (2189)	2156.8 (1136)	486.3 (294)	18467.8 (10056)
Top Job Loss	0.51%	0.22%	5.28%	10.01%	37.74%	5.32%	15.69%	12.55%	10.11%	2.55%	4.2%
	-.156	.134	-.106	-.148	-.098	-.198	-.291	-.385	-.518	.637	-.186
	2.1 (1)	2.1 (1)	37.9 (23)	85.5 (52)	323.7 (172)	35.8 (18)	124.8 (74)	95.7 (50)	69.9 (33)	24.7 (14)	802.6 (438)
Top Job Loss & top trade	0.0%	0.47%	3.03%	14.62%	35.26%	7.51	17.33%	10.81%	8.06%	2.72%	2.0%
	-----	.134	-.029	-.138	-.051	-.054	-.264	-.215	-.608	1.09	-.131
	0 (0)	2.1 (1)	11.8 (8)	58.4 (38)	138.9 (83)	20.3 (8)	70.5 (44)	44.1 (25)	33.5 (18)	12.3 (8)	392.4 (233)
Top trade	0.57%	0.34%	2.11%	19.53%	31.38%	4.58%	14.62%	14.27%	10.82%	1.78%	8.2%
	-.352	-.081	.067	-.038	-.036	-.238	-.221	-.111	-.171	.369	-.091
	2.1 (2)	6.4 (3)	29.2 (20)	327.1 (182)	505.2 (265)	61.0 (29)	228.0 (126)	232.2 (123)	172.0 (92)	31.4 (20)	1595.1 (862)

Notes: Author's calculations from Displaced Worker Surveys, 1984-96 and U.S. Import and Export data file, 1958-94.

First entry in cell: percent of reemployed old sector workers who are employed in the new sector; second entry: mean difference in log weekly earnings; third entry: weighted cell count, in thousands, with unweighted cell count in parentheses.

Top Job Loss includes industries in top quartile of industry mean job loss rate distribution; Top Job Loss & Top Trade includes industries in top job loss rate quartile and either top mean import share quartile or top mean change in import share quartile; Top Trade group includes industries in both top import share quartile and top change in import share quartile.

Appendix Table 1

Industries ranked by mean import share, 1975-94, with mean displacement rate, 1979-94

Lowest quartile, mean import share <.043

Industry	CIC	Mean import share	Mean displacement rate
Newspaper publishing & printing	171	.0023761	.0250716
Paperboard containers	162	.0064723	.0244208
Paints, varnishes	190	.007349	.0445853
Bakery products	111	.0085282	.0270649
Grain mill products	110	.0099001	.0327966
Logging	230	.0117149	.0597909
Fabricated structural metal	282	.0117886	.0558123
Dairy products	101	.0149561	.0444522
Printing, publishing ex. newspapers	172	.0153291	.0379967
Cement, concrete, gypsum	251	.0167538	.034515
Soaps & Cosmetics	182	.0182893	.0347624
Guided missiles, space vehicles	362	.0256684	.0803838
Ship & Boat Building	360	.027272	.0746358
Iron & Steel foundries	271	.0318033	.0514859
Metal forgings & stampings	291	.0363809	.0268301
Meat products	100	.0379604	.032494
Wood bldgs & mobile homes	232	.0434898	.0972105

Second quartile, mean import share .044-.087

Industry	CIC	Mean import share	Mean displacement rate
Plastics, synthetics	180	.0473768	.0271835
Canned & preserved fruits & vgs.	102	.0476178	.0326721
Misc. Food	121	.0509952	.0395866
Misc. Fabricated metals	300	.0560881	.0316113
Floor coverings	141	.0570617	.0491985
Ordnance	292	.0586891	.0594666
Drugs	181	.0639753	.021542
Misc. Petroleum & coal products	201	.064999	.0720061
Yarn, thread & fabric mills	142	.0666864	.0424119
Beverages	120	.0674657	.0215012
Misc. Wood products	241	.0753061	.0360452
Misc. Nonmetallic mineral & stone	262	.0789392	.0521278

Misc. Fabricated textiles	152	.0795402	.036756
Optical & health supplies	372	.0801311	.1262741
Furniture & Fixtures	242	.0804759	.0242372
Glass & glass products	250	.0814068	.04817
Primary aluminum	272	.0828264	.0702517
Petroleum refining	200	.0879131	.0259471

Third quartile, mean import share .088-.1537

Industry	CIC	Mean import share	Mean displacement rate
Aircraft & parts	352	.0909808	.0292094
Railroad locomotives	361	.0925145	.1077487
Industrial & Misc. Chemicals	192	.0961335	.0314104
Screw machine products	290	.1100422	.0292981
Sugar & Confectionary	112	.1104992	.0391602
Cutlery, handtools	281	.1158531	.0281042
Household appliances	340	.115925	.0471302
Structural Clay products	252	.1209288	.083527
Misc. Textile mill	150	.1228917	.0424784
Sawmills & millwork	231	.1233245	.0387356
Other rubber products	211	.1257362	.0512525
Scientific & controlling instruments	371	.1265785	.0157536
Knitting mills	132	.128416	.0204538
Machinery, ex. Electric	331	.1285396	.0439213
Construction & material moving	312	.1327857	.0567377
Farm machinery	311	.1369748	.0614961
Engines & turbines	310	.1492626	.0393126
Metalworking machines	320	.1522968	.0356374
Blast furnaces	270	.1537628	.061097

Top quartile, mean import share > .154

Industry	CIC	Mean import share	Mean displacement rate
Pulp, paper & paperboard	160	.1569003	.0227719
Tires & Inner tubes	210	.1600136	.0439544
Photographic equip.	380	.1682403	.0294131
Electrical machinery	342	.1799477	.0388985
Other primary metals	280	.1853473	.0755787
Radio, Television	341	.1957753	.1259439
Leather tanning	220	.2082242	.0739732
Office & Accting machines	321	.2099128	.0078594
Apparel	151	.2258708	.0523536

Motor vehicles	351	.2371851	.0507589
Electronic computing	322	.2396241	.0455519
Cycles & Misc.			
Transport	370	.2542767	.093942
Misc. Mfg.	391	.264089	.0536586
Toys	390	.3408123	.0677491
Pottery & Related prod.	261	.3800826	.0717307
Leather products,			
ex. Footwear	222	.4079864	.142046
Footwear	221	.4954904	.0906134
Watches, clocks	381	.5229867	.0913399

Appendix Table 2

Industries ranked by mean displacement rate, 1979-94, with mean import share, 1975-94

Lowest quartile, mean displacement rate, <.031

Industry	CIC	Mean displacement rate	Mean import share
Office & Accting machines	321	.0078594	.2099128
Scientific & Controlling instruments	371	.0157536	.1265785
Knitting mills	132	.0204538	.128416
Beverages	120	.0215012	.0674657
Drugs	181	.021542	.0639753
Pulp, paper & paperboard	160	.0227719	.1569003
Furniture & Fixtures	242	.0242372	.0804759
Paperboard containers	162	.0244208	.0064723
Newspaper publishing & printing	171	.0250716	.0023761
Petroleum refining	200	.0259471	.0879131
Metal forgings & stampings	291	.0268301	.0363809
Bakery products	111	.0270649	.0085282
Plastics, synthetics	180	.0271835	.0473768
Cutlery, handtools	281	.0281042	.1158531
Aircraft & Parts	352	.0292094	.0909808
Screw machine products	290	.0292981	.1100422
Photographic equip.	380	.0294131	.1682403
Industrial & Misc. Chemicals	192	.0314104	.0961335
Misc. Fabricated metals	300	.0316113	.0560881

Second quartile, mean displacement rate, .031-.0439

Industry	CIC	Mean displacement rate	Mean import share
Meat products	100	.032494	.0379604
Canned & preserved fruits & vegs.	102	.0326721	.0476178
Grain mill products	110	.0327966	.0099001
Cement, concrete, gypsum	251	.034515	.0167538
Soaps & Cosmetics	182	.0347624	.0182893
Metalworking machines	320	.0356374	.1522968
Misc. Wood Products	241	.0360452	.0753061
Misc. fabricated textiles	152	.036756	.0795402
Printing, publishing ex. newspapers	172	.0379967	.0153291
Sawmills & millwork	231	.0387356	.1233245
Electrical machinery	342	.0388985	.1799477

Sugar & Confectionary	112	.0391602	.1104992
Engines & turbines	310	.0393126	.1492626
Misc. Food	121	.0395866	.0509952
Yarn, thread & fabric mills	142	.0424119	.0666864
Misc. Textile mill	150	.0424784	.1228917
Machinery, ex. electric	331	.0439213	.1285396

Third quartile, mean displacement rate, .045-.061

Industry	CIC	Mean displacement rate	Mean import share
Tires & Inner tubes	210	.0439544	.1600136
Dairy products	101	.0444522	.0149561
Paints, varnishes	190	.0445853	.007349
Electronic computing	322	.0455519	.2396241
Household Appliances	340	.0471302	.115925
Glass & Glass products	250	.04817	.0814068
Floor coverings	141	.0491985	.0570617
Motor vehicles	351	.0507589	.2371851
Other rubber products	211	.0512525	.1257362
Iron & Steel foundries	271	.0514859	.0318033
Misc. Nonmetallic mineral & stone	262	.0521278	.0789392
Apparel	151	.0523536	.2258708
Misc. Mfg.	391	.0536586	.264089
Fabricated structural metal	282	.0558123	.0117886
Construction & Material mvg.	312	.0567377	.1327857
Ordnance	292	.0594666	.0586891
Logging	230	.0597909	.0117149
Blast furnaces	270	.061097	.1537628
Farm machinery	311	.0614961	.1369748

Top quartile, mean displacement rate, >.061

Industry	CIC	Mean displacement rate	Mean import share
Toys	390	.0677491	.3408123
Primary aluminum	272	.0702517	.0828264
Pottery & Related prod.	261	.0717307	.3800826
Misc. Petroleum & coal products	201	.0720061	.064999
Leather tanning	220	.0739732	.2082242
Ship & Boat Building	360	.0746358	.027272
Other primary metals	280	.0755787	.1853473
Guided missiles, space vehicles	362	.0803838	.0256684
Structural Clay products	252	.083527	.1209288
Footwear	221	.0906134	.4954904
Watches, clocks	381	.0913399	.5229867

Cycles & Misc.			
transport	370	.093942	.2542767
Wood bldgs &			
mobile homes	232	.0972105	.0434898
Railroad locomotives	361	.1077487	.0925145
Radio, Television	341	.1259439	.1957753
Optical & health			
supplies	372	.1262741	.080131
Leather products,			
ex. Footwear	222	.142046	.4079864

Appendix Table 3

Industries ranked by mean change in import share, 1975-94, with mean displacement rate, 1979-94

Lowest quartile, mean change in import share <.0007

Industry	CIC	Mean Change in import share	Mean displacement rate
Cycles & Misc.			
transport	370	-.0068314	.093412
Sugar & Confectionary	112	-.0053447	.0391602
Petroleum refining	200	-.0033942	.0259471
Misc. Petroleum & coal products	201	-.0013748	.0720061
Misc. Textile mill	150	-.0012623	.0424784
Meat products	100	-.0002888	.032494
Dairy products	101	-.0000962	.0444522
Newspaper publishing & printing	171	-.0000713	.0250716
Cement, concrete, gypsum	251	-.0000165	.034515
Wood bldgs & mobile homes	232	.0001035	.0972105
Logging	230	.0002047	.0597909
Bakery products	111	.0004583	.0270649
Printing, publishing ex. newspapers	172	.0004609	.0379967
Beverages	120	.0004957	.0215012
Fabricated structural metal	282	.0004979	.0558123
Paperboard containers	162	.0005126	.0244208
Grain mill products	110	.0006532	.0327966
Paints, varnishes	190	.0007758	.0445853

Second quartile, mean change in import share .0007-.003

Industry	CIC	Mean Change in import share	Mean displacement rate
Pulp, paper & paperboard	160	.0008016	.0227719
Misc. Food	121	.0008925	.0395866
Ship & Boat Building	360	.0012961	.0746358
Metal forgings & stampings	291	.0013335	.0268301
Canned & preserved fruits & vogs.	102	.0013905	.0326721
Sawmills & millwork	231	.0014915	.0387356
Iron & Steel foundries	271	.001629	.0514859
Soaps & Cosmetics	182	.0016824	.0347624
Floor coverings	141	.001952	.0491985
Guided missiles, space vehicles	362	.0021725	.0803838
Screw machine products	290	.0025258	.0292981

Misc. Wood Products	241	.0025542	.0360452
Drugs	181	.0025735	.021542
Misc. Fabricated metals	300	.0026224	.0316113
Farm machinery	311	.00266	.0614961
Industrial & Misc. Chemicals	192	.0033692	.0314104
Misc. Nonmetallic mineral & stone	262	.003402	.0521278

Third quartile, mean change in import share .003-.0075

Industry	CIC	Mean Change in import share	Mean displacement rate
Optical & health supplies	372	.003507	.1262741
Blast furnaces	270	.0037119	.061097
Plastics, synthetics	180	.0037193	.0271835
Other primary metals	280	.0038447	.0755787
Glass & Glass products	250	.003995	.04817
Furniture & Fixtures	242	.0050339	.0242372
Household Appliances	340	.0052597	.0471302
Motor vehicles	351	.0054276	.0507589
Ordnance	292	.0055606	.0594666
Cutlery, handtools	281	.0058958	.0281042
Yarn, thread & fabric mills	142	.0059667	.0424119
Misc. fabricated textiles	152	.006024	.036756
Structural Clay products	252	.0060668	.083527
Primary aluminum	272	.0063072	.0702517
Machinery, ex. electric	331	.0063173	.0439213
Aircraft & Parts	352	.0065456	.0292094
Railroad locomotives	361	.0067265	.1077487
Engines & turbines	310	.0071777	.0393126
Tires & Inner tubes	210	.0075621	.0439544

Top quartile, mean change in import share >.0075

Industry	CIC	Mean Change in import share	Mean displacement rate
Leather tanning	220	.00799	.0739732
Radio, Television	341	.0081509	.1259439
Knitting mills	132	.0084907	.0204538
Scientific & Controlling instruments	371	.0086181	.0157536
Metalworking machines	320	.0089322	.0356374
Other rubber products	211	.0092831	.0512525
Photographic equip.	380	.0095574	.0294131
Construction & Material mvg.	312	.0096119	.0567377
Pottery & Related prod.	261	.0105394	.0717307
Electrical machinery	342	.0118051	.0388985
Misc. Mfg.	391	.0121933	.0536586

Apparel	151	.0152491	.0523536
Toys	390	.0177078	.0677491
Office & Accting machines	321	.0191396	.0078594
Electronic computing	322	.0192546	.0455519
Leather products, ex. Footwear	222	.0238756	.142046
Footwear	221	.0241364	.0906134
Watches, clocks	381	.0278894	.0913399

Appendix Table 4

Industries ranked by mean change in net exports (as a share of output), 1975-94, with mean displacement rate, 1979-94

Lowest quartile, mean change in net export share <-.0029

Industry	CIC	Mean Change in net export share share	Mean displacement rate
Footwear	221	-.0173007	.0906134
Watches, clocks	381	-.0160877	.0913399
Leather products, ex. Footwear	222	-.015963	.142046
Misc. Mfg.	391	-.0111059	.0536586
Apparel	151	-.0107097	.0523536
Office & Accting machines	321	-.0104705	.0078594
Toys	390	-.0091293	.0677491
Photographic equip.	380	-.0085043	.0294131
Electronic computing	322	-.0079246	.0455519
Structural Clay products	252	-.0063408	.083527
Knitting mills	132	-.0057957	.0204538
Misc. fabricated textiles	152	-.0056321	.036756
Other rubber products	211	-.0056314	.0512525
Railroad locomotives	361	-.0055018	.1077487
Pottery & Related prod.	261	-.0044469	.0717307
Metalworking machines	320	-.0038791	.0356374
Construction & Material mvg.	312	-.0035712	.0567377
Blast furnaces	270	-.0034804	.061097
Furniture & Fixtures	242	-.0029966	.0242372

Second quartile, mean change in net export share, -.003 to -.0008

Industry	CIC	Mean Change in net export share share	Mean displacement rate
Yarn, thread & fabric mills	142	-.0029837	.0424119
Metal forgings & stampings	291	-.0028382	.0268301
Machinery, ex. electric	331	-.00264	.0439213
Tires & Inner tubes	210	-.0025678	.0439544
Motor vehicles	351	-.002472	.0507589
Primary aluminum	272	-.0024263	.0702517
Drugs	181	-.0023017	.021542
Cutlery, handtools	281	-.0021052	.0281042
Electrical machinery	342	-.0019275	.0388985
Scientific & Controlling instruments	371	-.0018343	.0157536
Iron & Steel foundries	271	-.0018204	.0514859
Logging	230	-.0017241	.0597909
Household Appliances	340	-.0016676	.0471302
Misc. Wood Products	241	-.001543	.0360452

Glass & Glass products	250	-.00122	.04817
Misc. Nonmetallic			
mineral & stone	262	-.000999	.0521278
Sawmills & millwork	231	-.0009384	.0387356
Guided missiles, space vehicles	362	-.0008502	.0803838

Third quartile, mean change in net export share, -.0008 - .00059

Industry	CIC	Mean Change in net export share	Mean displacement rate
Misc. Food	121	-.0007332	.0395866
Misc. Fabricated metals	300	-.0006225	.0316113
Fabricated structural metal	282	-.0005097	.0558123
Optical & health supplies	372	-.0003269	.1262741
Grain mill products	110	-.0002926	.0327966
Ship & Boat Building	360	-.0002632	.0746358
Floor coverings	141	-.0002121	.0491985
Canned & preserved fruits & vogs.	102	-.0001781	.0326721
Wood bldgs & mobile homes	232	-.0000265	.0972105
Bakery products	111	8.26e-07	.0270649
Ordnance	292	.0000759	.0594666
Newspaper publishing & printing	171	.0001095	.0250716
Printing, publishing ex. newspapers	172	.000126	.0379967
Cement, concrete, gypsum	251	.0001543	.034515
Farm machinery	311	.0003342	.0614961
Paperboard containers	162	.0003597	.0244208
Pulp, paper & paperboard	160	.0004148	.0227719
Radio, Television	341	.0005997	.1259439

Top quartile, mean change in net export share, > .00059

Industry	CIC	Mean Change in net export share	Mean displacement rate
Aircraft & Parts	352	.000614	.0292094
Dairy products	101	.0006212	.0444522
Industrial & Misc. Chemicals	192	.0006395	.0314104
Paints, varnishes	190	.0006576	.0445853
Beverages	120	.0006595	.0215012
Screw machine products	290	.0006609	.0292981
Leather tanning	220	.000763	.0739732
Soaps & Cosmetics	182	.0008036	.0347624
Plastics, synthetics	180	.0009911	.0271835

Misc. Petroleum & coal products	201	.0013933	.0720061
Meat products	100	.0028748	.032494
Engines & turbines	310	.0044416	.0393126
Petroleum refining	200	.0048386	.0259471
Other primary metals	280	.0052128	.0755787
Misc. Textile mill	150	.0058516	.0424784
Sugar & Confectionary	112	.0089662	.0391602
Cycles & Misc. transport	370	.0155033	.093942