USING REGIONAL VARIATION TO EXPLAIN WIDENING EARNINGS DIFFERENTIALS BY EDUCATIONAL ATTAINMENT

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The sharp increase in earnings inequality over the last decade and a half has received considerable attention both in the popular media and among economists. The increase in inequality has been observed over a number of dimensions; in the aggregate distribution, across groups, and within groups narrowly defined in terms of factors such as gender, educational attainment, industry, occupation, and location. While all of these aspects of the earnings distribution are of interest, in this article the emphasis is on explaining the widening of differentials between highly-educated and less-educated workers. (Table 1). Differences across states in the industry composition are exploited in an attempt to distinguish between competing explanations for the widening earnings gap. At the same time, we can also explore causes of widening differentials between states and regions.

Two major explanations proposed to explain widening differentials across educational attainment groups are the effects of competition from imports, and the impact of technological change. Under the factor price equalization theorem, competition from imported goods produced by unskilled labor in low wage countries would tend to drive down the wages of American workers producing similar goods. We would expect the impact to fall predominantly on less-skilled workers. At the same time, competition from imports (from any country) could displace workers from manufacturing employment, forcing them to compete with other semi-skilled or unskilled workers for a limited number of jobs, thus putting downward pressure on all

less-skilled workers' wages in an affected region.

Technological change can likewise influence earnings through more than one channel. On the one hand, the introduction of advanced equipment is likely to enhance the productivity of those who use it. This should be reflected in the earnings of users. Increasingly the introduction of such equipment requires that workers have the knowledge and adaptability to take full advantage. Consequently, technological improvement raises the demand for educated workers relative to less-educated workers. On the other hand, advanced equipment is often employed as a substitute for labor, especially unskilled and semi-skilled. Thus, by replacing unskilled and semi-skilled workers, introducing new machinery can have similar effects on a regional labor market as trade.

The rest of this paper proceeds as follows. Section 2 examines the literature on the impacts of trade and technology on relative earnings, and on regional variations in earnings patterns. Section 3 provides an overview of these regional variations. Section 4 presents measures of technological change and exposure to imports by state and region. Preliminary tests aimed at discerning the relationship between these measures and regional earnings patterns are discussed in Section 5. The main findings are that during the 1980s rates of aggregate wage growth are positively associated with the level of technological advancement (though not changes in the index) and negatively associated with exposure to imports. Extending the analysis to

1993, the link to technology is strengthened while that of trade disappears. Moreover, even during the 1980s technology appears to go much further than trade in explaining widening differentials, though trade has a modest impact during that period.

Literature Review

Considerable attention has been paid in the literature to the causes of the widening gap nationally. A number of authors have concluded that many of the observed changes in relative earnings could be linked to technological change. In some cases, including Bound and Johnson (1992, 1995), this is done by ruling out other directly observable causes. Others, such as Mincer (1991) and Krueger (1993), find a direct connection between wages and some aspect of technological change. On the other hand, Howell (1993) argues that technological change was at least as rapid during the 1970s and earlier decades, when earnings differentials were not widening, than in the 1980s when differentials did widen sharply, concluding that technology therefore could not have been the driving force behind the observed wage developments.

Those who have examined trade effects on wages have generally found at best modest effects. Katz and Murphy (1992) found that increases in import penetration ratios could not explain widening differentials over the period from 1963 to 1987, though they did discern some effect toward the end of the period.

Lawrence and Slaughter (1993) suggest that imports from developing countries could not have affected relative wages because they did not affect relative prices of low-skill manufactured goods, while Krugman and Lawrence (1994) argue that they were too small relative to total output to have a discernable effect. Sachs and Shatz (1994) found little evidence that imports had a direct effect on wages, but a possible indirect effect through displacement of unskilled workers. However, Borjas and Ramey (1993) conclude that imports did reduce earnings directly in highly-concentrated industries such as autos and steel.

Brauer and Hickok (1994) looked at the effect of both trade and technology on earnings across industries during the 1980s. Concerning technology, the main finding was a strong positive link between technological improvement and hourly earnings of highly-educated workers, with a weaker connection for less-educated workers. Somewhat surprisingly, trade was positively associated with earnings among the most skilled, and had little effect on the less-skilled. Both technology and trade were found to have displaced particularly less-skilled workers. Changes in the observable technological change variables could explain about one-fourth of the widening in the differential between college graduates and high-school dropouts, and one-fifth of the change in the differential between college and high school graduates. Increases in imports could in both cases account for about 5

percent of the increase in the earnings gap.[1]

Although, as noted, the literature on widening wage inequality has expanded exponentially in recent years, relatively little attention has been devoted to regional variations in the patterns of wage inequality. Grubb & Wilson (1989) found that between 1960 and 1980 earnings levels converged across regions, while at the same time distributions within-regions became increasingly similar. They therefore concluded that in analyzing national shifts in income and earnings inequality one could safely ignore regional variations. However, Eberts (1989) found that earnings differentials across regions tended to diverge in the 1980s after having converged in the 1970s. The divergence in the 1980s is attributed to differences in returns to worker characteristics, though Eberts does not explore further why these differences emerged.

Although either trade or technological change could have increased unemployment via displacement especially of less-skilled workers, with the resulting crowding working to widen wage differentials. Burtless (1990) notes that male wage inequality rose within all regions during the 1980s, but found no clear link between regional unemployment rates and the degree of wage inequality.

Blanchard and Katz (1992) focus on the nature of regional

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[1]Several other proposed explanations not directly addressed here include changes in labor supply (Blanchard, 1995), immigration (Borjas, 1995), weaker unions (Blackburn, Bloom and Freeman, 1990), and declines in the real and relative minimum wage (DiNardo, Fortin and Lemieux, 1995).

booms and slumps. Their model begins with the observation that states produce different combinations of goods and services, and consequently the effect of a particular sector-specific shock on any state will depend on the sector's importance in that state's economy. Blanchard and Katz find that much of the long run adjustment to an adverse shock affecting a state occurs through out-migration, with little if any permanent effect on the unemployment rate. In the context of a long-run tendency for wages of similarly-endowed workers to converge across regions, they find that relative wage shocks tend to be transitory, "disappearing within a decade or so".

Topel (1994) did attempt to use regional differences in inequality to examine the determinants of relative wages. He found that technological change favoring skilled workers tended to increase inequality, that the relatively smaller supply of uneducated workers tended to reduce inequality, and that in the West immigration of unskilled workers may have been large enough to negate most of the domestic supply-side effect. However, rather than using direct measures of skills, Topel defines skill solely in terms of wages. In addition, his analysis is conducted solely at the level of Census regions, ignoring potentially significant differences between states within the same region.

Finally, Karoly & Klerman (1994) examine developments in inequality both within and across regions between 1973 and 1988. During the 1970s earnings gaps narrowed across regions. Between 1973 and 1979 earnings differentials narrowed within all regions

for women, with mixed results for men. In general differentials for men tended to narrow in those regions where they were initially widest, but widened in some others. Between 1979 and 1988 earnings gaps widened across regions mostly because earnings in the high-wage Northeast grew more rapidly than elsewhere. This, however, could explain only 2% of national inequality for men, and 3% for women. During this period inequality widened within all regions for both men and women. For men, sectoral shifts, particularly the decline of "rust-belt" manufacturing, could explain about 13% of the rise in inequality nationally and anywhere from 0 to 23% of the increase in inequality within regions between 1979 and 1988. However, sectoral shifts had no discernable impact on female inequality either nationally or within regions. These sectoral shifts could be linked to trade and/or technology. In a direct test of the impact of trade, Karoly and Klerman find that aggregate national import measures can account for between 55 and 145% of the increasing within-region inequality, though they are properly cautious about ascribing causal significance to this variable.

Regional Differences: Descriptive Evidence

During the 1980s and early 1990s two major developments characterized earnings patterns across regions. First, as noted in Karoly and Klerman, the tendency toward convergence in relative wage levels across regions reversed itself in the 1980s, though there is at least a hint that the process of convergence

has resumed in the last several years. Second, earnings gaps between persons with a college degree and those without one widened substantially both nationally and within all regions during the 1980s. Between 1989 and 1993 the earnings ratio between male college graduates and dropouts continued to grow in all regions, in most cases at a pace comparable to that of the 1980s. However, the growth in the gap between both male and female college graduates and high school graduates slowed in most states and regions, and the gap actually declined slightly in several.

Tables 2 and 3 illustrate the key developments in aggregate earnings levels across regions and for a number of large state.[2] Essentially the picture is one in which during the 1980s real weekly earnings rose at a 1 to 2 percent annual rate in the Northeast, and modestly in other coastal regions, while declining in the industrial heartland. Because earnings increases were

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[2]Earnings figures in all tables are based on tabulations from the Current Population Survey Outgoing Rotation Groups. Essentially, one-fourth of the households sampled are included in each month. No household will appear more than once in the same calendar year. The fact that samples are scientifically rather than randomly chosen, with some locations oversampled relative to others, means that median levels are not necessarily precisely comparable across states at a point in time. Changes in medians within a state (though not necessarily within a region or nationally) over time are apparently fairly reliable, as are relative median earnings levels of subgroups within a state. Because earnings weights are given, it is possible to fairly accurately estimate relative mean earnings levels across states or regions at a point in time. However, calculations of changes in mean earnings, especially among high-income groups, are vulnerable to top-coding biases. As a consequence, while mean earnings figures are presented in Table 2, the analysis in this paper is conducted primarily in terms of medians.

concentrated in areas with average or above-average initial earnings levels, the result was to increase the divergence across regions. Between 1989 and 1993 real earnings losses were greatest in those areas hit hardest by the 1990-91 recession, including the Northeast and California, but also declined significantly in Texas. Overall, earnings dispersion across states and regions does not appear to have widened further since 1989, but even though the hardest hit areas tended to be those with above average earnings levels, most of the shifts in across-region earnings patterns have persisted.

Turning to relative earnings patterns within regions, Table 4 shows that the median weekly earnings ratio among full-time employees between college graduates and high school dropouts rose substantially in all regions and, with the exception of Connecticut, states, between 1979 and 1989. Since 1989 it has continued to rise almost everywhere, in some cases at a faster rate than during the 1980s. In 1979, the ratio was lowest in areas that could be characterized as heavily industrialized and unionized, including Pennsylvania and the East North Central, and highest in the South Atlantic, Texas, and California. Over time, the increase in the earnings ratio has been especially large in Texas and California. As will be shown later, Texas can be characterized as having a slightly above-average but rapidly growing level of technological development and below-average exposure to imports. California also exhibits slightly above-average technological development but its exposure to imports is

roughly average and growing faster than average. What the two states have in common is substantial immigration of unskilled workers, an issue that cannot be directly addressed with the data employed here.

Table 5 shows relative levels of and changes in the ratio between college graduates and high school graduates for males. Generally, the same patterns hold across states and regions as for male college graduates versus dropouts, but the differences are less stark with Texas and California no longer standing out as outliers. One notable feature is the much-below-average increase in differentials in the Northeast during the 1980s. Table 6 shows that for women the differences across states and regions in earnings patterns were considerably smaller than for men.

Indices of Technology and Trade

In order to assess the impact of technological change and trade on earnings across states, we need to devise measures of a state's level of technological development and of its sensitivity to imports. These indicators should be able to capture both relative levels at a point in time as well as changes within a state over time. If possible, these measures should be tied to employment patterns in the state.

One could suggest a number of measures that are at least to some degree associated with technological change. If technological change has a substantial impact on relative wages,

especially by enhancing the productivity of those who work most intensively with advanced equipment, we would expect to see above-average increases in such high-skill occupations as engineer, technician, and computer programmer. Here, however, we instead adopt an industry-based measure. To illustrate the desirability of such an approach, Table 7 shows 1979, 1989, and 1993 median weekly earnings in constant dollars for full-time workers in nine industries which can be characterized as high-skill and technology-intensive. The median wage level higher than average in 8 of the 9 industries in 1979, and in all of them in both 1989 and 1993. Moreover, while real weekly earnings declined in all other industries, they rose in 8 of 9 between 1979 and 1993 (though several show significant declines since 1989).

The specific measure of a state's technological advancement adopted here is based on the technological-intensity of the industries in which its residents are employed. Specifically, for each industry we obtained from the BEA Fixed Reproducible Tangible Wealth series annual measures of the year-end net stock of information processing and related equipment, valued in 1987 dollars. This category is defined to include office, computing, and accounting machinery, communication equipment, instruments, and photocopy and related equipment. These figures are expressed on a per employee basis, using employment derived from the BLS Establishment Survey. Where possible we calculated the industry measures at the 2-digit level; however, mining, construction,

transportation, wholesale trade and retail trade were not subdivided and some 2-digit industries in the service sector were combined.[3] Agriculture and public administration were excluded from these calculations. Table 8 lists 1993 values for the five highest-tech industries, the five lowest-tech industries, and several others. For the most part, the high-tech industries tend to also be high-skill, and the low-tech industries low-skill, but there are some anomalies.

The next step is to calculate the average amount of high-tech capital per worker for any group of workers. To do so we first assign all workers the characteristics of the industry in which they are employed, then calculate an average value weighted by total hours worked. 1979 and 1993 figures are based on the CPS Outgoing Rotation Groups, with weights reflecting both usual weekly hours worked and population weights resulting from the oversampling of some states or metropolitan areas. 1989 figures are based on the 5% sample (reduced through random selection to 1%) of the 1990 Census Public Use Microdata Survey, with weights reflecting both usual weekly hours and number of weeks worked in 1989.

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[3] Finance, insurance, and real estate was split into finance (SIC 60-62, 67) and insurance and real estate (SIC 63-65). In services hotels and lodging places and personal services (SIC 70, 72) were combined, as were auto-related and miscellaneous repair services (SIC 75, 76), entertainment and recreation services and motion pictures (SIC 78, 79), and legal services, social services, museums, membership organizations, engineering and management services, and miscellaneous services (SIC 81, 83-87, 89). In manufacturing transportation equipment (SIC 37) was split into motor vehicles and equipment (SIC 371) and other transportation equipment.

Table 9 illustrates the link between educational attainment and high-tech capital per worker.[4] Clearly high school dropouts use much less high-tech capital than other groups. However, college graduates do not use appreciably more high-tech capital than do either high school graduates or persons with some college. This is presumably related to the concentration of highly-educated persons in health, educational, and other professional services, all of which have below-average levels of high-tech capital per worker. Because this measure probably understates the importance of technology in these industries, this could generate a bias against finding a strong effect of technological change on the wage gap by educational attainment. It is also notable that real high-tech capital per worker has increased sharply within all educational attainment groups, especially during the 1980s.[5]

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[4]Because the CPS educational attainment variable changed in 1992, 1993 categories are not exactly comparable to those of earlier periods. The old measure was based on years of schooling. Here, dropouts are defined as persons who completed fewer than 12 years (including those with exactly 12 years of school attendance who did not complete the last year). High school graduates are those who completed exactly 12 years. College graduates are defined as persons with at least 16 years completed. The 1993 measure is, by contrast, based on actual degree attainment. High school graduates are persons with a diploma or GED who did not attend college. The some college group includes persons with an associate degree in an occupational, vocational, or academic program as well as those who attended college but did not receive a degree. College graduates are those with a Bachelor's or higher degree. For information on translating between the old and new attainment measures, see Jaeger (1994).

[5]Because the price of high-tech capital equipment has fallen rapidly in recent years, the magnitude of these increases is undoubtedly overstated by using 1987 dollars. The conversion of

Indices of high tech capital per worker by region and in a number of large states are shown in Table 10. In 1979 this measure was significantly above the national average in New Jersey, New York, (perhaps surprisingly) Florida, and California, and below average in the heavily industrial Midwest and East South Central. Measured in absolute terms, the states that exhibited the most rapid growth during the 1980s were New Jersey, Connecticut, Illinois and Texas. Ohio registered the greatest growth in percentage terms, though its level remained significantly below the national average in 1993. Technological improvement appears to have occurred at a below average pace in Michigan, New York, and Florida. Although summary statistics are presented for each of the nine Census regions, there are clearly substantial differences in the degree of technological development across states within particular regions; this suggests that a focus at the state level is appropriate.

One can calculate a similar measure for exposure to imports. Here, we estimate the import penetration ratio for each 2-digit manufacturing industry.[6] Manufacturing workers are assigned the value of their industry, with those in all other industries given

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the national income accounts to a chain-weighted basis later this year will presumably reduce these magnitudes. It is unclear whether this will significantly affect relative levels or rates of increase across educational attainment groups, states or regions.

[6]The ratio is defined as imports divided by the sum of shipments plus imports less exports. Again, transportation equipment is divided into motor vehicles and other transportation equipment.

a value of zero. Table 11 shows relative levels and changes in the regional and state import penetration measure. Not surprisingly, both levels and changes are greatest in regions dominated by manufacturing. North Carolina, where the apparel sector has a substantial presence, has also exhibited a particularly rapid rise.

Testing for Links

The previous discussion suggests several testable hypotheses concerning the linkages between trade and technology, and relative earnings growth both in the aggregate across states and across groups classified by educational attainment within states. First, we would expect real earnings to rise most (or decline least) in states with the largest increases in the index of high-tech capital per worker and rise least (decline most) in areas with below-average technological improvement. This should be true both in the aggregate and within gender/educational attainment groups. We would also expect, other things equal, to see the gap between the educated and less-educated widen most in the states with the greatest degree of technological improvement. Concerning imports, we would expect relative earnings to decline in states that experienced the greatest increase in its index of import exposure. Because these declines would be concentrated at the low-skill end of the work force, we would therefore also expect to see increasing imports associated with a wider gap.

To test for effects on earnings levels, we conducted some

simple OLS regressions. In each case, the dependent variable was the percent change in real median weekly earnings of full-time workers by state or by gender/educational attainment group within a state. The right-hand side variables are the initial (1979) levels of both the indices of technology and import sensitivity, changes in those levels, and the 1979 median earnings level. The regressions were carried out separately for 1979-1989 changes (Table 12), and 1979-93 changes (Table 13).

The first regression in Table 12 is based on aggregate state median earnings levels, encompassing both men and women in all educational attainment groups. Between 1979 and 1989 earnings growth is positively associated with the initial level of the technology index and with the initial level of imports. More importantly for our purpose, the coefficients on the change variables both have the expected sign, but neither is statistically significant.

In order to obtain additional variation which could help to sort out the effects of technology and trade, results in the second row are based on a pooled regression using changes in median earnings levels in 8 different gender/educational attainment groups in each state as described in the last section. The right-hand-side variables are the state-level, not group-specific, indices of technology and trade. Dummy variables are also included in order to control for group fixed effects; however, in this regression the impacts of trade and technology are not allowed to vary across groups. Under this specification

the coefficient on the change in imports variable becomes negative and significant, while that for the change in the technology index remains insignificant.[7] Thus, it appears that over this period the increase in imports was indeed associated with declining aggregate earnings.

However, adding just four years to the period of analysis changes the results substantially. As shown in Table 13, under both of these specifications the technological change variable becomes positive and significant at least the 10 percent level, while the change in imports takes on the "wrong" sign and is no longer significant. This suggests that any effect of imports on earnings levels during the 1980s may have been transitory, while the impact of technological advancement did not fully manifest itself until after 1989.

The above results are reinforced by examining separate regressions for specific groups. In the earlier period, the technological change variable is positive in 4 of the 5 cases shown, but never significant, while the change in imports variable is always negative, and significant only for male high school graduates--the group most likely to have been employed in

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[7]To take a concrete example of how these coefficients can be interpreted, between 1979 and 1993 aggregate median weekly earnings rose by 11.6 percent in New Jersey, a high-technology, low import state, and declined by 8.6 percent in Michigan, a low-technology, high import state. Multiplying the coefficient of .0043 by the difference in the change in technology measure between the two states (6395-3573=2822) yields a contribution of 12.1 percentage points of the actual 20.2 point difference. At the same time, the positive coefficient on the change in imports suggests that this variable actually worked in Michigan's favor.

import-sensitive manufacturing industries. But for the longer period the change in imports coefficient is never significant, while that on the change in high-tech capital per worker is positive and significant for both college-educated men and women.

Although many of the coefficients for the group-specific regressions are not statistically significant, differences between them can still be used to examine possible effects of trade and technology on differentials between groups. Three comparisons of particular interest are male college graduate versus dropout, male college graduate versus high school graduate, and female college graduate versus high school graduate. Table 14 shows, for both periods, the contribution of changes in the technology and trade indices to changes in earnings. They are derived by multiplying the difference in coefficients between groups by the national all-groups average, with figures in parentheses indicating the percent of the actual change explained.

Several interesting findings emerge. First, we are much more successful in explaining the widening gap between college and high school graduates than between male college graduates and dropouts. This suggests that examining supply factors, such as immigration, may be an important area for further research into the continuing deterioration in the position of the least-educated males. Second, even during the 1980s when we were unable to discern an effect on aggregate levels, technology appears to be more important than trade as an explanation for

widening differentials. And for men trade completely disappears as an explanation once the analysis is extended into the 1990s, though it remains a modest factor contributing to the widening gap for women.

Conclusions

The preliminary results presented in this paper are consistent with those fiding that technological change had a substantial impact on the earnings distribution during the 1980s, while trade had at most a modest effect. However, trade appears to have had an important, though transitory, impact on aggregate earnings levels across states. Both the pronounced widening of differentials in California and Texas and the relative inability of trade and technology to explain the widening between male college graduates and dropouts suggest that labor supply factors (including immigration) may be worthy of further attention. In addition, in further work it would be desirable to control for exogenous influences on demand for a state's output. Another area worthy of consideration is the effects of declining unionization, though it may be difficult to distinguish exogenous shifts from the effects of trade and technology on the industry composition.

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Table 1

Median Weekly Earnings Ratios, Full-Time Workers

	1979	1989	1993
Male College Graduates/Dropouts	1.67	2.15	2.35
Male College Graduates/High School Graduates	1.36	1.72	1.78
Female College Graduates/High School Graduates	1.47	1.74	1.82

Source: Tabulations from Current Population Survey, Outgoing Rotation Groups.

Table 2

Mean Weekly Earnings, Regions and Selected States, Full-time Wage and Salary Workers

				Real % Change*		
	1979	1989	1993	79-89	89-93	79-93
National	272	469	543	2.9	-0.6	2.2
New England	264	518	594	17.1	-1.6	15.2
Mid-Atlantic	275	500	585	8.5	0.4	8.9
East North Central	286	473	547	-1.3	-0.8	-2.1
West North Central	267	444	505	-0.8	-2.4	-3.1
South Atlantic	252	442	513	4.7	-0.4	4.3
East South Central	243	394	462	-3.2	0.6	-2.6
West South Central	260	436	501	0.1	-1.4	-1.3
Mountain	279	451	527	-3.5	0.3	-3.3
Pacific	301	518	604	2.7	0.1	2.8
MA	267	543	620	21.4	-2.0	18.9
CT	283	539	627	13.7	-0.2	13.5
NY	273	511	597	11.7	0.3	12.0
NJ	286	545	637	13.7	0.3	14.1
PA	269	452	535	0.3	1.6	1.9
OH	281	462	530	-1.9	-1.6	-3.4
IL	297	491	569	-1.3	-0.6	-1.9
MI	301	504	582	-0.1	-0.9	-1.0
NC	224	403	476	7.4	1.4	8.8
FL	235	425	488	7.9	-1.5	6.3
TX	265	449	510	1.1	-2.5	-1.4
CA	300	524	609	4.2	-0.3	4.0

* Deflated using CPI-U-X.

Table 3

Median Weekly Earnings, Selected States
Full-time Wage and Salary Workers

				Real % Change*		
	1979	1989	1993	1979-89	1989-93	1979-93
National	240	399	463	-0.8	-0.4	-1.2
MA	234	465	538	18.6	-0.7	17.7
CT	240	480	540	19.4	-3.5	15.2
NY	240	440	500	9.4	-2.5	6.7
NJ	250	475	545	13.4	-1.5	11.6
PA	240	400	456	-0.5	-2.2	-2.7
OH	250	400	460	-4.5	-1.3	-5.8
IL	260	420	484	-3.6	-1.1	-4.7
MI	280	442	500	-5.8	-2.9	-8.6
NC	192	335	400	4.1	2.5	6.7
FL	200	350	400	4.4	-1.9	2.4
TX	225	374	415	-0.8	-4.8	-5.5
CA	260	450	500	3.3	-4.7	-1.5

*Deflated using CPI-X.

Table 4

Median Weekly Earnings Ratio, Male College Graduates versus Dropouts, Full-time Wage and Salary Workers, by Region and Selected States

	1979	1989	1993	Change 79-89	Change 89-93
National	1.67	2.15	2.35	0.48	0.20
New England	1.59	1.94	2.04	0.35	0.10
Mid-Atlantic	1.67	1.92	2.13	0.25	0.21
East North Central	1.38	1.82	2.00	0.44	0.18
West North Central	1.47	1.80	2.14	0.33	0.34
South Atlantic	1.98	2.24	2.26	0.26	0.02
East South Central	1.75	2.04	2.11	0.29	0.07
West South Central	1.80	2.61	2.70	0.81	0.09
Mountain	1.46	2.15	2.25	0.69	0.10
Pacific	1.65	2.50	2.89	0.85	0.39
MA	1.56	1.97	1.82	0.41	-0.15
CT	1.67	1.68	2.00	0.01	0.32
NY	1.67	1.97	2.00	0.30	0.03
NJ	1.73	2.00	2.31	0.27	0.31
PA	1.48	1.77	1.97	0.29	0.20
OH	1.38	1.81	2.00	0.43	0.19
IL	1.47	1.84	2.30	0.37	0.46
MI	1.33	1.88	2.00	0.55	0.12
NC	1.68	2.05	2.14	0.37	0.09
FL	1.67	2.20	2.33	0.53	0.13
TX	1.86	2.80	2.92	0.94	0.12
CA	1.84	2.69	3.00	0.85	0.31

Table 5

Median Weekly Earnings Ratio, Male College Graduates versus
High School Graduates, Full-time Wage & Salary Workers, by Region and Selected States

				Change	
	1979	1989	1993	79-89	89-93
National	1.36	1.72	1.78	0.36	0.06
New England	1.40	1.59	1.70	0.19	0.11
Mid-Atlantic	1.43	1.64	1.70	0.21	0.06
East North Central	1.29	1.59	1.66	0.28	0.07
West North Central	1.27	1.47	1.67	0.20	0.20
South Atlantic	1.58	1.78	1.88	0.20	0.10
East South Central	1.35	1.65	1.79	0.30	0.14
West South Central	1.37	1.78	1.91	0.41	0.13
Mountain	1.18	1.63	1.60	0.45	-0.03
Pacific	1.26	1.63	1.72	0.37	0.09
MA	1.44	1.52	1.57	0.08	0.05
CT	1.50	1.55	1.68	0.05	0.13
NY	1.38	1.59	1.60	0.21	0.01
NJ	1.47	1.67	1.83	0.20	0.16
PA	1.36	1.69	1.56	0.33	-0.15
OH	1.32	1.65	1.70	0.33	0.05
IL	1.26	1.56	1.62	0.30	0.06
MI	1.33	1.61	1.60	0.28	-0.01
NC	1.35	1.76	1.88	0.41	0.12
FL	1.39	1.74	1.75	0.35	0.01
TX	1.35	1.93	1.94	0.58	-0.01
CA	1.38	1.79	1.85	0.41	0.06

Table 6

Median Weekly Earnings Ratio, Female College Graduates Versus High School Graduates, Full-time Wage and Salary Workers, by Region and Selected States

				Change	
	1979	1989	1993	79-89	89-93
National	1.47	1.74	1.82	0.27	0.08
New England	1.44	1.58	1.74	0.14	0.16
Mid-Atlantic	1.43	1.66	1.81	0.23	0.15
East North Central	1.47	1.70	1.71	0.23	0.01
West North Central	1.44	1.69	1.59	0.25	-0.10
South Atlantic	1.56	1.81	1.83	0.25	0.02
East South Central	1.53	1.73	1.79	0.20	0.06
West South Central	1.63	1.73	1.75	0.10	0.02
Mountain	1.50	1.64	1.67	0.14	0.03
Pacific	1.49	1.69	1.69	0.20	0.00
MA	1.44	1.58	1.60	0.14	0.02
CT	1.43	1.58	1.64	0.15	0.06
NY	1.48	1.67	1.79	0.19	0.12
NJ	1.39	1.59	1.69	0.20	0.10
PA	1.47	1.69	1.82	0.22	0.13
OH	1.42	1.72	1.76	0.30	0.04
IL	1.49	1.67	1.67	0.18	0.00
MI	1.59	1.80	1.78	0.21	-0.02
NC	1.66	1.67	1.73	0.01	0.06
FL	1.60	1.79	1.92	0.19	0.13
TX	1.56	1.75	1.84	0.19	0.09
CA	1.44	1.68	1.71	0.24	0.03

Table 7

Median Weekly Earnings, Full-time Workers in Selected Industries (1993 Dollars)

	Levels			Percent Change,
	1979	1989	1993	1979-93
Computer Manufacturing	586	769	725	23.7
Electrical Machinery	469	513	482	2.8
Instruments	469	536	550	17.2
Communication	586	618	610	4.1
Finance	390	466	500	28.2
Research (Commercial, Educational, and Scientific)	683	675	673	-1.5
Business Management & Consulting Services	508	583	675	32.9
Computer & Data Processing Services	564	679	711	26.1
Engineering & Architectural Services	615	664	675	32.9
All Other Industries	469	466	450	-4.1

Source: Author's tabulation from Current Population Survey, Outgoing Rotation Groups, 1979, 1989, and 1993.

Table 8

1993 High Tech Capital per Worker, Selected Industries (1987 Dollars)

High-Tech Industries	
Communications	101,659
Utilities	33,824
Petroleum and Coal Products	31,044
Insurance and Real Estate	29,653
Chemicals and Allied Products	24,834
Low-Tech Industries	
Furniture Fixtures	1,100
Construction	669
Leather and Leather Products	650
Educational Services	174
Appeal	105
Selected Other Industries	
Finance	16,593
Electrical Machinery	9,817
Food	4,524
Motor Vehicles	3,719
Retail Trade	3,268
Health Services	2,264
All Industries	7,757

Table 9

Indices of Constant Dollar High Tech Capital per Worker, by Gender and Educational Attainment Group

				Changes		% Change	
	1979	1989	1993	79-89	89-93	79-89	89-93
Total	3165	6555	7757	3390	1202	107.1	18.3
Male:							
Dropout	1649	4873	5606	3224	733	195.5	15.0
High School Graduate	3373	6512	7829	3139	1317	93.1	20.2
Some College	3838	7850	8982	4012	1132	104.5	14.4
College Graduate	3227	7129	9111	3902	1982	120.9	27.8
Female:							
Dropout	1889	4127	4331	2238	204	118.5	4.9
High School Graduate	4146	6756	7863	2610	1107	63.0	16.4
Some College	3964	7396	8293	3432	897	86.6	12.1
College Graduate	2426	5293	6306	2867	1013	118.2	19.1

Table 10

Indices of Constant Dollar High Tech Capital per Worker, by Region and Selected States

				Change		% Change	
	1979	1989	1993	79-89	89-93	79-89	89-93
Total	3165	6555	7757	3390	1202	107.1	18.3
New England	2746	6432	7450	3686	1018	134.2	15.8
Mid-Atlantic	3615	6837	8482	3222	1645	89.1	24.1
East North Central	2804	6166	7249	3362	1083	119.9	17.6
West North Central	2829	6374	7236	3545	862	125.3	13.5
South Atlantic	3245	6663	7940	3418	1277	105.3	19.2
East South Central	2861	6078	7298	3217	1220	112.4	20.1
West South Central	3222	6913	7877	3691	964	114.6	13.9
Mountain	3201	6800	7832	3599	1032	112.4	15.2
Pacific	3486	6558	7888	3072	1330	88.1	20.3
MA	2924	6423	7389	3499	966	119.7	15.0
CT	3213	7276	8602	4063	1326	126.5	18.2
NY	3795	6629	8144	2834	1515	74.7	22.9
NJ	4204	8264	10,599	4060	2335	96.6	28.3
PA	2974	6088	7563	3114	1475	104.7	24.2
OH	2503	6012	7192	3509	1180	140.2	19.6
IL	2952	6928	8117	3976	1189	134.7	17.2
MI	2833	5628	6406	2795	778	98.7	13.8
NC	2732	5698	7048	2966	1350	108.6	23.7
FL	3984	7091	8130	3107	1039	78.0	14.7
TX	3204	7050	8198	3846	1148	120.0	16.3
CA	3504	6705	8034	3201	1329	91.4	19.8

Table 11

Import Penetration Indices, by Region and Selected States

	1979	1989	1993	Change 79-89	Change 89-93
National	2.21	2.81	3.11	0.60	0.30
New England	2.70	3.10	3.79	0.40	0.69
Mid-Atlantic	2.29	2.66	2.76	0.37	0.10
East North Central	3.24	3.95	4.50	0.71	0.55
West North Central	1.88	2.62	2.92	0.74	0.30
South Atlantic	1.78	2.45	2.57	0.67	0.12
East South Central	2.43	3.79	4.14	1.36	0.35
West South Central	1.63	2.19	2.40	0.56	0.21
Mountain	1.15	1.72	1.92	0.57	0.20
Pacific	1.83	2.50	2.81	0.67	0.31
MA	2.48	3.10	3.47	0.62	0.37
CT	2.84	2.88	3.76	0.04	0.88
NY	1.97	2.45	2.46	0.48	0.01
NJ	2.09	2.22	2.59	0.13	0.37
PA	2.89	3.30	3.29	0.41	-0.01
OH	3.25	3.98	4.61	0.73	0.63
IL	2.32	2.93	3.15	0.61	0.22
MI	4.39	5.08	5.77	0.69	0.69
NC	2.65	3.89	4.36	1.24	0.47
FL	1.12	1.53	1.71	0.41	0.18
TX	1.55	2.12	2.36	0.57	0.24
CA	1.87	2.64	3.13	0.77	0.49

Table 12

Effect of Technology and Trade on Earnings, 1979-89

Dependent Variable: % Change in Real Median Weekly Earnings, 1979-89
(standard errors in parentheses)

Group	TECH79	TECHCHG	IMPORT79	IMPCHG	$\bar{R}^2$
State Aggregate	.0052*	.0021	3.079*	-3.091	.124
	(.0029)	(.0025)	(1.597)	(3.656)	
All Workers	.0030**	.0010	3.344**	-4.507**	.610
	(.0010)	(.0008)	(.544)	(1.704)	
Male Dropout	.0003	.0004	4.695**	-4.977	.355
	(.0029)	(.0027)	(1.704)	(3.901)	
Male High School Graduate	.0045*	-.0020	4.814**	-6.641*	.409
	(.0024)	(.0020)	(1.316)	(2.909)	
Male College Graduate	.0030	.0016	2.802*	-3.154	.135
	(.0028)	(.0020)	(1.331)	(2.791)	
Female High School Graduate	-.0000	.0005	1.684	-3.887	.073
	(.0024)	(.0019)	(1.243)	(2.718)	
Female College Graduate	.0036	0.0034	2.189	-0.429	.111
	(.0034)	(.0027)	(1.774)	(3.896)	

Note: All regressions include a constent term and the 1979 earnings level. The all workers regression also includes seven gender-education group dummies.

* = significant at 10 percent level.
** = significant at 1 percent level.