

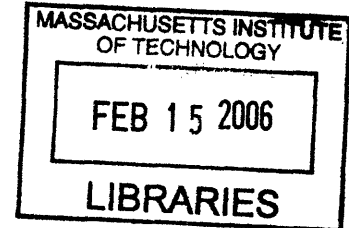
**Economic Advancement or Social Exclusion?
Less-Educated Workers, Costs-of-Living and Migration
in High-Tech Regions**

By

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ABSTRACT

Several high-tech regions today show signs of displacement and exclusion of low-skill workers from the employment and wage benefits of a booming economy. Whether high-tech activities are responsible for these trends or if the *ex ante* characteristics of the region could predispose its residents to exclusion, in the absence of high-tech growth, are issues that regional scientists have left largely unexplored. Understanding what low-skill and high-skill workers undergo in the presence of this activity, and how that compares to the reality of those who reside in regions whose economy is not dependent on knowledge-intensive sectors, provides a backdrop for policy makers to evaluate industry-choice decisions in the interest of economic growth and social equity in regional development. To provide that backdrop, I empirically answer: *How are the benefits of high-tech development distributed between less- and more-educated workers? How does this distribution compare to that of regions that do not follow an education-intensive development path? Are social equity and sustained growth possible under these conditions?*

Through regression analysis across 50 regions in the United States during the 1990s, I show that shifts in regional economic-base composition towards a greater concentration of high-tech activity cannot be held on its own responsible for exclusionary patterns in these regions. As high-tech activity increases in a region it attracts workers of all skill levels, causing employment upsurges that are more substantial for college graduates than for high-school graduates. This shift in economic-base composition yields wage drops for low-skill workers but only when migration and cost-of-living are taken into consideration. Conversely, shifts in the composition of the region's workforce towards a more-educated labor pool resulting from migration flows lead to an employment-growth shrinkage for all skill groups, this adverse effect in supply being stronger on high-skill labor than on low-skill labor. As the proportion of college graduates increases, it deters high-skill workers from entering the region, slowing down growth in their supply, their wages, and overall growth in an economy based in this input. Once cost-of-living and migration are taken into consideration, an increase in this proportion yields wage drops for high-school graduates and a small wage gain in college graduate wages, causing greater wage inequality between more- and less-educated workers and more- and less-educated regions.

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Introduction

During the 1990s, the birth and implementation of new technologies, such as the internet, changed the playing field not only for firms but also for regions and cities around the world as it allowed firms to tap into new resource pools and markets in what used to be remote regions. Nonetheless, both firms and regions simultaneously became more susceptible to ever-changing market trends, forcing them to compete in terms of innovative capacity, and distance (speed) to market. Research and Development (R&D) activities, as creators of new knowledge and facilitators of innovation, are the feeders of these inputs into all economic activities today (Benner 2002). High-tech industries have taken a central role in the New Economy for their R&D-intensity, which enables them to remain innovative and adapt quickly to constantly changing market trends. Regions, in turn, today see high-tech activities as their opportunity for growth in the New Economy under the assumption and expectation of a significant trickling down effect to come from these activities (Markusen et al. 1999).

While theoretically, due to the multipliers in regional economies, activities in one sector (e.g., high-tech) can stimulate activities in others (e.g., construction, retail sales, and personal trainers, among others) potentially benefiting everyone, there is limited empirical evidence as to whether in reality knowledge-intensive activities work that way or whether they disproportionately may favor privileged groups. Furthermore, several high-tech regions today show signs of displacement and exclusion of low-skill workers from the employment and wage benefits of a booming economy. Whether high-tech activities inherently are responsible for these trends or if the *ex ante* characteristics of the region could predispose its low-skill residents to exclusionary patterns, even in the absence of high-tech growth, are issues that regional science, economics and development analysts had left largely unexplored.

In this study, I seek empirical evidence of the existence or lack of this exclusionary pattern and its sources. Understanding what low-skill and high-skill workers go through in the presence of education-intensive economic activity, and how that compares to the reality of those who reside in regions whose economy is not dependent on knowledge-intensive sectors, provides a backdrop for policy makers to evaluate industry-choice decisions in the interest of economic growth and social equity in regional development. To provide that backdrop, I empirically answer: *How are the benefits of high-tech-driven economic development distributed between less- and more-educated workers? How does this distribution compare to that of regions that do not follow an education-intensive development path? Are social equity and sustained growth possible under these conditions?*

In order to answer the questions posited above, I conducted a comparative case study of the Boston, Massachusetts Metropolitan Area, a typical high-tech region that is well-known for its concentration of biotechnology, information technology, and other knowledge-intensive sectors, and the Nashville, Tennessee Metropolitan Area, a typical non-high-tech region characterized by a more diverse economic base and strong service sectors. I investigated the impacts of a relatively large concentration of high-tech industry in Boston on its social equity indicators, specifically with regards to the changes in college and high-school graduate employment and wages during the 1990s, and how those compare to the prevailing patterns in Nashville for the same period.

As the fraction of all jobs that high-tech activity accounted for increased in Boston during the 1990s, the inflation-adjusted wages of college graduates increased and those of high-school graduates decreased broadening the wage gap and creating greater inequality between the more-educated and the less-educated. Conversely, Nashville's more diverse economy sustained low-skill demand, moving wages towards convergence between skill groups. Furthermore, college

graduate in-migration in response to increases in demand and high-school graduate out-migration due to hikes in cost-of-living played an important role in determining the composition of the workforce (i.e., high vis-à-vis low proportions of college graduates), wage patterns and the overall distribution of benefits from high-tech growth in Boston. The impact that cost-of-living exerted on migration flows in and out of Boston not only affected the displaced workers but also jeopardized the economic development process of the region, as a whole, by slowing down or reducing the inflow of more-educated labor, the primary input for Boston's biotech and information technology sectors, into the region, and, thus, hindering its growth potential.

While high-tech sectors were responsible, at least partially, for the wage, supply, cost-of-living and migration patterns that Boston experienced during the 1990s, it is unclear whether the phenomenon of exclusion of low-skill workers is inherent of high-tech sectors, or of all knowledge-intensive activities. Moreover, the case study provided evidence that college graduates in a high-tech region could be at a disadvantage too, particularly when cost-of-living is very high.

In order to assess whether or not these findings could be generalized to all high-tech regions, and/or similarly education-intensive development paths, I conducted more rigorous statistical tests through the use of regression analysis across 50 metropolitan areas in the United States for the 1990-to-2000 period. Using a set of regression models, I measured the impact of the 1990 workforce composition, the 1992 economic-base composition, and location-specific traits on the employment, wage and migration patterns for college and high-school graduates by 2000.

Through this regression analysis, I show that shifts in regional economic-base composition towards a greater concentration of high-tech activity cannot be held on its own responsible for exclusionary patterns in high-tech regions. As high-tech activity increases in a region it attracts

workers of all skill levels, causing employment upsurges that are more substantial for college graduates than for high-school graduates. This shift in economic-base composition yields wage drops for low-skill workers but only when migration and cost-of-living are taken into consideration. Conversely, shifts in the composition of the region's workforce towards a more-educated labor pool resulting from migration flows lead to an employment-growth shrinkage for all skill groups, this adverse effect in supply being stronger on high-skill labor than on low-skill labor. As the proportion of college graduates increases, it deters high-skill workers from entering the region, slowing down growth in their supply, their wages, and overall growth in an economy based in this input. Once cost-of-living and migration are taken into consideration, an increase in this proportion yields wage drops for high-school graduates and a small wage gain in college graduate wages, causing greater wage inequality between more- and less-educated workers and between more- and less-educated regions.

Thus, any regional economic development strategy that, either intentionally or through chance, leads to a more-educated workforce is likely to show signals of displacement, being more acute for low-skill workers who exhibit lower mobility and fewer (re)location choices than high-skill labor. Finally, I show that migration in the long run can compete away any employment and wage benefits (as well as any negative repercussions) that result from growth in a regional economy that is dependent on maintaining a more-educated workforce, reducing its long-term growth potential.

Document Organization and Structure

In this dissertation, I explain the approach I took in order to explore how low-skill and high-skill labor performed in "education-intensive" regions and how I arrived at the above-mentioned conclusions. First, I present a discussion of the economic growth – social equity dilemma that

high-tech regions face today and the forces that may determine the spread of costs and benefits deriving from a development strategy that is centered on a more-educated labor force (Chapter 1). Then, I provide an analytical critique of the academic discussions regarding the potential impacts of the economic-base composition over costs-of-living, specifically housing costs, and the influence of these over labor-market dynamics. In Chapter 2, I draw from the urban economics field, particularly within the labor and migration literature, in order to establish a theoretical framework for the impact analysis of an education-intensive development path.

In Chapter 3, I lay out the methodology that I followed for both the comparative case study and the 50-region regression analysis. I describe the study variables and data sources as well as the relevance of the Boston-Nashville case study in discussions of economic growth vis-à-vis social equity. Then, I draw from the theoretical framework and case-study findings to devise a broader analysis of individual variables across 50 regions in the United States as well as a series of regression models that allowed proper testing of the null hypothesis of no effect from high-tech concentration -- and more broadly from an education-intensive development path -- on the 1990-through-2000 changes in employment growth and wages.

In Chapter 4, I present the findings of the Boston-Nashville case study. In Chapter 5, through a look at the cross-regional regression results, I distinguish between those patterns that were observable in Boston and that are true of all regions that are dependent on knowledge-intensive sectors and those that seem to hold true only in regions with specific constraints to development. In Chapter 6, I take a closer look at the linkages between growth in knowledge-intensive activities and the migration flows of college and high-school graduates. I close with a discussion of the importance of considering the distribution as well as the aggregate of benefits of knowledge-intensive growth when analyzing its wage and employment impacts and its policy

implications (Chapter 7). I illustrate this with a set of wage-bill simulations based on the regression findings presented in Chapters 5 and 6.

Chapter 1. High-Tech Growth: Road to Advancement or Exclusion?

During the 1990s knowledge creation and innovation became important determinants of a firm's competitiveness. The birth and implementation of new technologies, especially in telecommunications and transportation, changed the playing field for regions and challenged them to compete against each other on the basis of their capacity to improve a firm's ability to respond to ever-changing market trends in the New Economy. As a result, regions attempt to survive by attracting activities that are both dependent on those inputs and that can (re)produce them. Research and Development (R&D) activities, as creators of new knowledge and facilitators of innovation, are the feeders of these inputs into all economic activities today (Benner 2002). Nevertheless, high-tech industries have taken a central role in the New Economy for their R&D-intensity, which enables them to remain innovative and adapt quickly to constantly changing market trends. Consequently, regions strive to attract high-tech activities under the assumption that multiplier effects will lead to not only direct, but also indirect and induced growth in employment, income, and consumption.

Theoretically, due to these multipliers, an economy could feel the benefits of investment or growth in one activity throughout many if not all economic sectors. However, empirical evidence supporting this claim in the case of knowledge-intensive economic activity is lacking specially at the regional scale of analysis. Furthermore, the physical displacement of entire communities and the exclusion of low-skill workers and their families from opportunities of economic advancement, such as access to well-paying jobs, are noticeable today in high-tech regions in the European Union, Asia, and the United States (Lauder 2001; Schienstock 2001).

It is not evident that new jobs created directly in high-tech sectors and those resulting from any linkages to other activities are accessible to low-skill workers, who are unemployed or could become unemployed due to increased skill requirements associated with an education-intensive development strategy (Brown 2001). Well-known high-tech cities, such as Boston, Massachusetts, often find that the jobs being created in the Information Technology and Biotechnology sectors, for example, are not accessible to their residents; instead, economic migrants from neighboring regions (perhaps with higher incomes, greater mobility, and capable of affording longer -interstate-commutes via car or train) come in and take those jobs, further thinning the employment-opportunity and affordable-housing pool for local residents (Boston Redevelopment Authority 2002). For instance, several states which are widely known for hosting high-tech activity, including Massachusetts, are suffering from a “growing exodus” of working families towards neighboring states as a result of skyrocketing housing prices (The New York Times 2003, Hartford Courant 2003). (Table 1) It is unclear whether or not high-tech regions can sustain growth under these migratory patterns, which may result in “more economically and socially stratified” regions (The Massachusetts Institute for a New Commonwealth 2003).

Table 1. Median Sales Price of Existing Single-Family Homes for Metropolitan Areas with High Relative High-Tech Concentration vs. the United States, 2002-2003*

Metropolitan Area	Median Sales Price	% Increase
San Francisco Bay Area, CA	\$ 560,200	3.6
Boston, MA	\$ 409,100	2.9
New York- New Jersey-Long Island, NY-NJ-CT	\$ 350,900	15.5
Charlotte- Gastonia-Rock Hill, NC-SC	\$ 153,300	1.9
United States	\$ 168,900	7.4

* 2003 second quarter not seasonally adjusted prices
Source: National Association of Realtors

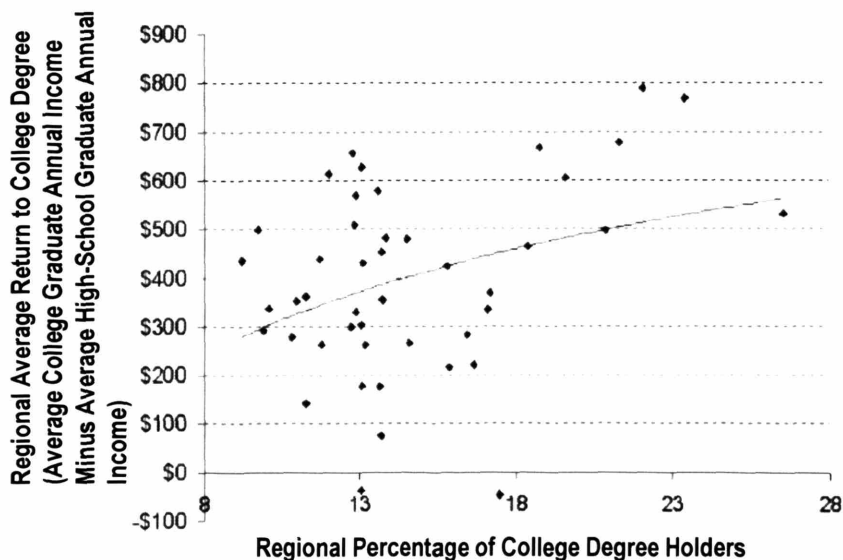
These patterns challenge the proposition that knowledge-intensive activities could generate a trickling-down effect that could improve the level of living in a region, for all to enjoy in more-or-less the same way. However, whether high-tech activities inherently are responsible for these trends or if the *ex ante* characteristics of the region (such as a privileged location near a coast and other amenities, or an already tight housing market) could predispose its residents to exclusionary patterns, even in the absence of high-tech growth, are issues that regional science, economics, and development analysts had left largely unexplored.

Many analysts argue that these patterns reflect a demand shift, towards high-skill labor and away from low-skill workers, that is not exclusive of high-tech regions, and that wage differentials between low-skill and high-skill labor reflect a premium on higher education levels (Lash 1994; Katz et al. 1996). However, low-skill workers could be at a disadvantage, beyond the expected wage disparities that are derived from a shift in relative demand towards more-educated labor, in regions whose economic base is progressively more concentrated in sectors requiring increasingly higher levels of skill, as it is the case in high-tech regions, especially if those sectors generate or attract large gross inflows of workers from other regions. Depending on the labor market's supply-demand balance within each region, this disadvantage can take, on one hand, the shape of increased unemployment and underemployment when low-skill labor supply exceeds low-skill labor demand. On the other hand, clustering of high-tech firms and immigration into urban areas and their pressure over land markets could decrease the net number of non-college graduates who are able to remain in the region if the prevailing low-skill wage cannot meet higher housing costs.

Regional scientists and labor economists often attribute limited mobility to low-skill individuals based on their low wages which do not allow the individual to absorb the economic risks

and the high moving costs (in terms of financial, human, physical and social capital) involved with changing residence and/or work locations (Sjaastad 1962; Smith 1979; Stark et al. 1985). From that perspective, at least in theory, high-skill workers could react to demand shocks through migration. However, low-skill workers could be locked in low-cost pockets within high-tech regions that are often disadvantaged with regards to the availability of amenities and provision levels for services, such as education. This, in turn, could further impair their ability to migrate from one region to another, as a feasible choice in response to demand shocks in their regional labor and housing markets. Notwithstanding, in places with few physical obstacles to mobility, as it is the case in the 48 contiguous states, low-skill, low-income workers as well could be displaced or pushed towards other low-cost areas at short distances beyond the geographic boundaries of their region of origin where the transaction costs and risk would be relatively low (Greenwood 1975; U.S. Census Bureau 2003).

Figure 1. Regional Average Return to Higher Education vs. Regional Proportion of College Graduates, 1990



Source: Goetz, Stephan J. and Anil Rupasingha. (2003) The Returns on Higher Education: Estimates for the 48 Contiguous States, *Economic Development Quarterly*, Vol. 17, No. 4, pp. 337-351.

Migration-driven changes in workforce composition could affect the labor market outcomes of high-skill labor as well. The average regional return to education, that is, the difference between the college graduate and high-school graduate average annual income for a particular region, for an individual who resides in a region primarily dominated by a more-educated workforce can be very different from the wage differential that another with equivalent education in a region characterized by a less-educated workforce, when controlling for his/her own industry of employment and other individual and regional traits (Goetz et al. 2003). According to Goetz et al., the return to education increases with the proportion of college graduates in a region, but at a decreasing rate. As the proportion of the population that holds a college degree in his/her region of residence increases, it changes the overall composition of labor supply thus affecting the determination of relative wages and the return to migration from one region to the other. (Figure 1)

Although the observations of Goetz et al. correspond to only one point in time (i.e., 1990), they pose the possibility of a decreasing return to the geographic clustering of highly educated labor, or even a gradual return to equilibrium, both from the perspective of the region and that of its labor force. This possibility challenges the proposition that agglomeration of knowledge-intensive sectors creates increasing returns to scale. Thus, whether or not growth in these sectors can successfully attract highly educated labor and generate increasing returns to scale from agglomeration could determine how low-skill and high-skill workers perform in high-tech regions.

Net migration flows into regions with relatively high concentrations of education-intensive economic activity may affect not only wage determination but also regional cost-of-living differences. Furthermore, costs-of-living also could hinder a region's capacity to attract and retain labor, and, consequently, its ability to sustain long-term growth in sectors that depend of that input. Differences in the regional land markets, especially with regards to housing supply price elasticity,

could be partly at fault for the exclusionary trends present in high-tech regions today. High-tech regions with few restrictions on urban growth could exhibit different housing prices and wage patterns (than regions that already are urbanized to a large extent), which would allow its residents to stay in the region and enjoy both the employment and wage benefits from economic growth in knowledge-intensive sectors.

This highlights the possibility that the concentration of a region's economic base in high-tech activities could create a society of exclusion, by reducing employment opportunities for low-skill workers, but also that the interaction between the migration flows that education-intensive activity could generate and the *ex ante* regional traits, such as the characteristics of its housing market, could exacerbate the situation by crowding out those who cannot meet price increases from the clustering of these activities, if it in fact occurs. With decreases in demand and wages, low-skill workers are likely to be displaced. Furthermore, as migration changes the composition of the workforce and the costs-of-living in a region, it is possible that returns to migration into a high-tech region could decrease even for the more-educated. This could place regions in a shortage of its most important resource for education-intensive economic growth, high-skill workers. Whether or not high-tech sectors could have the potential of sustaining long-term economic growth in regions that follow that path, it is not clear that the prosperity that could come to a regional economy as a result of that choice would benefit the entire population.

In this study, I seek empirical evidence of the existence or lack of this exclusionary pattern and its sources. After understanding the forces that in the Boston case study were at play in determining exclusionary patterns, I decided to look for evidence of exclusion not only in high-tech regions but also to find whether or not those patterns were present in regions that followed other education-intensive development paths during the 1990s. Understanding what low-skill and high-

skill workers go through in the presence of above-average concentrations of high-tech activity and of an increasingly more-educated labor force, and how that compares to the reality of those who live, work and play in regions whose economy is not dependent on knowledge-intensive economic activity, provides a backdrop for economic developers and policy makers to evaluate industry-choice decisions in the interest of economic growth and social equity in regional development.

Specifically, I seek to answer three general questions:

1. *How are the benefits of technology-driven economic development distributed between less- and more-educated workers?*
2. *How does this distribution compare to that of regions that do not follow an education-intensive development path?*
3. *Are social equity and sustained growth possible under these conditions?*

I break down these questions into smaller pieces for which I build appropriate hypotheses and statistical tests. First, I categorized regions according to whether or not in 1992 they were considered high-tech regions for maintaining a concentration of high-tech activity above the national average. Second, I categorized regions once again according to whether or not in 1990 they had succeeded at developing a highly educated labor force, measured as whether the regional proportion of college graduates was below or above the national average. I look at how each of these regions performed at the end of the decade in terms of employment and wages for low-skill and high-skill workers. More importantly, I look at the wage bill as a compound measure of the depth and spread of benefits derived from each region's development path.

With regards to the first categorization, I hypothesize that, holding all other factors constant, an increase in high-tech activity increases college graduate relative demand and wages while it decreases high-school graduate relative demand and wages, thus, creating greater inequality across skill groups. High-tech growth attracts more-educated labor into a region increasing cost-of-living and displacing low-skill workers. With a decrease in supply, however, those low-skill workers who are able to stay in the region could obtain wage gains. Alternatively, increasing high-tech activity and cost-of-living could deter college graduates from entering a region jeopardizing the sustainability of economic growth in these activities.

High-tech activities affect regional labor demand for each of these skill groups very differently and thus are likely to play an important role in the determination of their wages and the overall distribution of benefits that a region derives from growth in knowledge-dependent economic sectors. The spatial clustering of high-tech firms in highly urbanized areas not only is likely to increase relative demand for high-skill labor but also may drive prices up for everyone. This could increase factor costs for firms who employ low-skill worker so high as to outweigh any benefits from local demand for their goods pushing them to leave in search of a lower cost location. This could, in turn, decrease low-skill labor demand and wages in the presence of increasingly high costs-of-living.

With regards to the second categorization, I hypothesize that education-intensive activities create increasing returns to scale. Accordingly, holding all else constant, as the proportion of college graduates increases it would attract more high-skill workers. Agglomeration externalities would improve the outcomes of all workers in this category. Alternatively, an increase in the proportion of college graduates would decrease returns to migration for that skill group deterring

them from entering the region, regardless of the costs-of-living in the area. This would slow down growth in high-skill labor supply and wages.

The more-educated and the less-educated are not equally mobile. The wage differentials that accompany high education levels provide high-skill workers, as they compared to low-skill labor, with a greater capacity to absorb larger economic risks, to identify and follow opportunities for advancement in distant regions, and thus to adjust to labor-demand shocks through migration. If these sectors experience increasing returns to scale, a region would attract an increasing supply of college graduates who could squeeze low-skill labor out of the region. In the presence of decreasing returns, however, a region would fail to attract highly educated labor, the primary input that it would need to sustain an education-intensive path to development.

Evidence of these patterns not only would lead to the rejection of a null hypothesis of no effect from high-tech concentration on the 1990-through-2000 changes in low-skill and high-skill employment, wages, and migration but also could challenge the multiplier effect story that drives many regions to seek a high-tech path to development. Furthermore, it would validate a story of the exclusion of low-skill workers from the benefits of education-intensive economic growth as a reality that policy makers should address when balancing economic growth and social equity interests in regional development. More importantly, it would shed light on whether or not both economic growth and equity could be sustained in the long term when following an education-intensive development path.

Chapter 2. Theoretical Framework: Cost-of-Living, Migration, and Education-Intensive Economic Growth

Several regional scientists have been successful at establishing an associative relationship between changes in a region's characteristics, such as its average or median education level and the existence of intra-regional supply chains, and its rate of economic growth (Brown 2001, Polenske 2001). Notwithstanding, few have written about the role that the presence and concentration of specific industries, such as those in high-tech sectors, or those requiring very specific inputs, as it is the case in knowledge-intensive activities, could play in defining the relationship between generated economic growth and social equity. Furthermore, these scientists have not explored whether displacement or exclusion could stem from labor-demand shocks, such as a shift in the relative composition of the regional economic base towards an increasing high-tech fraction of jobs, from the *ex ante* characteristics of the region such as the characteristics of the region's housing market, or from the interaction between these factors.

Existing theoretical and empirical models of regional economies (e.g., REMI and other Input-Output-based models) include as an assumption the presence of linkages among sectors of the economy that can be measured in terms of direct, indirect, and induced employment, incomes, and consumption. Several analysts have attempted to measure these impacts as generated by investment on high-tech activities. Their attempts have shown multipliers of substantial magnitude (Milken Institute 1999); however, they have failed to measure the spread of the multiplier throughout a regional population. Consequently, the assumption of these models is not backed up by sufficient empirical evidence supporting a trickling-down effect of that investment across labor groups. This deficiency stems from the fact that these models historically have concentrated on analyzing the aggregate impacts of investment or growth in one industry over other economic

sectors, not their distribution across population groups. In their framework, analysts generalize and group households as one category or sector. This impedes measuring how the potential benefits of the investment could be distributed across different skill-level segments of a regional population.

In order to measure and evaluate properly the magnitude and spread of the impacts that could derive from industry-specific economic growth, I establish a theoretical framework that recognizes labor heterogeneity and the potential effect of an individual's traits and behavior on his/her outcomes. Furthermore, this framework considers the following four factors that seem to be at play in determining whether or not the presence and growth of high-tech activities could produce exclusionary patterns in regions that follow that path to development:

1. The first factor is the capacity or inability of knowledge-intensive activities to generate increasing returns to scale and the effect of these upon the relative supply and wages of low-skill and high-skill workers. In the presence of increasing returns to scale, growth in knowledge-intensive sectors not only would originate from a more-educated workforce but it would also attract more high-skill workers. Furthermore, through externalities, it could improve wages even in the presence of an increasing supply of college graduates.
2. The second factor is whether or not knowledge-intensive sectors are able to increase returns to migration, as an incentive to attract the right mix of employable labor and job opportunity pool. Workers would only migrate when it is in their best interest to do so. Furthermore, migration can provide workers with a way to adjust to labor-demand shocks by moving to regions where they would obtain higher wages and level-of-living.

3. Thirdly, it is important to assess whether or not *ex ante*, location-specific characteristics of a region (i.e., weather, access to a coast or an already tight housing market) make it more or less attractive to low-skill vis-à-vis high-skill workers as a destination, when controlling for the composition of the workforce and the economic base, among other factors.
4. Lastly, regions may not be able to generate strong increasing returns to scale. In this case, migration flows over a decade would compete away any benefits from growth in an education-intensive development path, returning regional wage levels and employment rates back to their long-run equilibrium, and threatening the extended sustainability of the development process.

The economic development and urban economics fields, particularly within the labor and migration literature, provide an excellent foundation for this framework.

In the labor literature, Hanushek and Kimko (2000) recognized a direct relationship between an individual's educational attainment and his/her wage due to a labor-demand shift in the economy, and that a positive wage differential exists in favor of college graduates and away from non-college graduates. Day and Newburger (2002) empirically showed that, even as real individual incomes stagnated or declined during the 1980s and 1990s, college graduates earned a wage premium over those holding not more than a high-school diploma. Goetz and Rupasingha (2003), more recently, added that the size of this differential diverges among regions and that it is dependent, not only on the regional economic-base composition and its labor-needs, but also on the aggregate characteristics of the local workforce. They looked specifically at the variation in wages of college graduates between regions with high vis-à-vis low proportions of college

graduates. They found that the wage gap between college graduates and non-college graduates was larger in regions with high proportions of college degree holders, even in the absence of nationally ranked higher education institutions. This is reflected in their ranking of the 48 contiguous states according to the average return to a college degree at each location. (Table 2) As previously explained, they showed that the average return to a college degree across those 48 states increased but at a decreasing rate with higher regional proportions of college graduates. In their cross-section, however, it is not clear whether the observed patterns are evidence of increasing returns to scale or whether they captured regions before migration has had time to compete away differences from a temporary demand shock.

Table 2. State Rankings by Returns on Higher Education

<i>Top Quartile</i>	<i>Second Quartile</i>	<i>Third Quartile</i>	<i>Bottom Quartile^a</i>
California	Colorado	Alabama	Arizona
Connecticut ^b	Florida	Arkansas	Delaware ^b
Illinois	Idaho	Georgia	Kansas
Maryland	Indiana	Iowa	Louisiana
Massachusetts	Kentucky	Maine	Mississippi
Nevada	Michigan	Missouri	Montana
New Hampshire	Minnesota	North Carolina	Nebraska
New Jersey	New Mexico	Oregon	North Dakota
Ohio	New York	Pennsylvania	Oklahoma
Vermont	Rhode Island ^b	Texas	South Dakota
Virginia	South Carolina	Washington	Utah
Wisconsin	Tennessee	West Virginia	Wyoming

a. States with negative returns or returns that are not statistically different from zero were placed in the bottom quartile.

b. Ranking needs to be interpreted with caution because of the small sample size.

Source: Goetz, Stephan J. and Anil Rupasingha. (2003) The Returns on Higher Education: Estimates for the 48 Contiguous States, *Economic Development Quarterly*, Vol. 17, No. 4, pp. 337-351.

Although Goetz et al. looked at relative wages within each state, they did not assess the absolute wage differences for workers of equivalent skill levels across states, and the relationship of these wage differences with the regional composition of the economic base and that of the labor

force resulting from inter-regional migration. Blanchard and Katz (1992) found that wage differentials could be an important driver for inter-regional migration in the United States. Yet Williamson (1988) highlighted the rate of return to migration, as a function of the achievable absolute wages for the individual at the origin and destination region as well as the transaction costs involved in relocation, as a more significant determinant in migration models.

Since Harris and Todaro (1970), many other researchers have extended their migration model by incorporating new factors that could increase or decrease the choices of individuals to migrate. Bruekner and Kim (2001) looked at differences in land markets and housing prices as potential factors at play in the migration choice equation. Choi, Baladi, and Chen (2001) explored the role that welfare policies and the economic and social safety net that those can provide could play in the decision to migrate. Rosen (1986) assessed the extent at which individuals' willingness to "pay" a hedonic premium to live and work in an area with amenable attributes, such as favorable regional weather or distance to the coast, determines where he/she is likely to locate and the effect of preference-based migration flows on long-term wage and employment equilibrium across regions. He deemphasized the self-sorting process that Tiebout's model depicts assuming that people have a common basis for assessing the level-of-living. In Rosen's model, migration attracted by high-amenity locations both increases rents and decreases wages, and hence is self-limiting. According to him, in equilibrium the difference in amenity values among locations just offsets differences in wages and rents, which implies that a uniform level-of-living across locations is possible.

However, the prevailing migration literature also establishes that workers are "rational self-interested individuals" looking for a better level-of-living and that they may choose migration as a viable option for that goal if the economic benefits, in terms of expected wages and costs-of-living

(especially housing prices), at the destination exceed the economic costs of moving and of foregone wages at the origin (Lucas 1997). The rationality component that Lucas (1997) described implies that individuals with better education, skills, connections, and labor market experience, and thus higher wages, are likely to have a comparative advantage in job and home searches at destination labor markets, and therefore are more prone and willing to migrate. Accordingly migration often is seen as a selective, rather than an accidental or random, process. The same logic would suggest that non-migrants do not move because their comparative advantage lies in staying (Tunali 2000). Consequently, it would be acceptable to infer that, other things being equal, migrants are more likely to be from *ex ante* better-off groups, as it is the case for the more-educated and high-skill workers, than non-migrants. Because poorer households are frequently headed by low-skill workers with limited connections to regional and national networks, they face tighter financial constraints. Furthermore, the transaction costs that are associated with migration limit the set of destination choices available to them, and might discourage mobility (Waddington et al. 2003).

Recent empirical research on inter-regional migration has focused on measuring the strength of the migration response to labor demand shocks and the duration of the effects of these factors over wages and employment. Although both the literature on wages and the estimates of migration response with respect to labor demand are highly sensitive to model assumptions, according to Bartik (1991) and Blanchard (1992), migration can bring regional wage levels and employment rates back to their long-run levels in seven to ten years. If Bartik and Blanchard assumptions held true during the 1990-through-2000 period, it is possible that any negative or positive impacts that could stem from the attraction of high-tech activities and/or a more-educated labor force could be transient and dissipate over time. Then it would not be clear whether regions

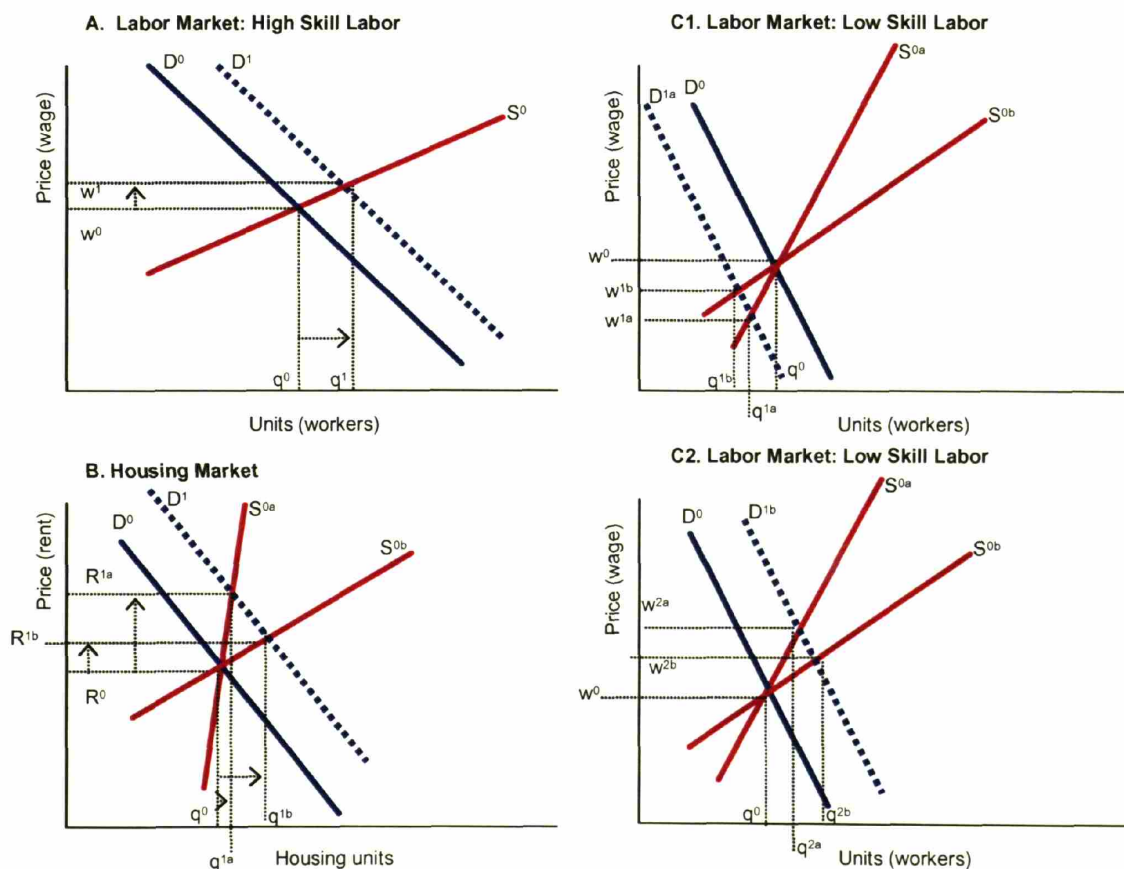
that undergo growth in high-tech or other knowledge-intensive sectors would perform any differently than regions that take alternate routes to development.

Keeping this in mind, I can build a theoretical model that portrays the plausible behavior of labor and housing markets in high-tech regions. According to this model, as technology drives up the demand for high-skill labor and high-tech firms come into a region, drawn by the presence of a specialized-labor pool, suppliers, and competitors (Porter 1995), both the relative and absolute demand of high-skill workers (college graduates) are expected to go up along with their wages. (In Figure 2.A. high-skill labor demand and wages increase from D^0 to D^1 and w^0 to w^1 , respectively.) In areas of relatively high labor mobility, as it is the case across the United States, high-skill labor would be inclined to migrate from regions offering lower to those offering higher returns to education (in addition to other externalities), and thus to migration. Theoretically speaking, as more-educated workers come into the region, wages could continue to rise with continuous increases in demand and/or if the geographic clustering of knowledge-intensive economic activity and more-educated labor could successfully create increasing returns to scale.

Given limited availability of space in cities, a higher demand for land and housing for these workers could drive up prices and lock in or displace others who cannot afford higher housing prices to low-cost pockets across the region, in a gentrifying pattern (Milken Institute 1999). Depending on the elasticity of the housing supply (S^{0a} vs. S^{0b}), in terms of constraint for development, an increase in demand from these workers could translate into significant increases in rents or prices affecting the overall cost-of-living in the region. (In Figure 2.B. housing demand increases from D^0 to D^1 and prices can escalate from R^0 to R^{1a} in case of a highly inelastic supply or to R^{1b} in regions with greater supply elasticity).

Notwithstanding, we know little about what happens to demand and supply of low-skill workers. First, we do not know the elasticity of their supply, that is, can they adjust by moving or do they get trapped in low-cost pockets. (Figure 2.C1. and 2.C2. illustrate a low supply response to wage changes as S^{0a} and high low-skill labor elasticity as S^{0b}). As for their demand, we expect their relative demand to drop (that is as compared to high-skill labor) but, in absolute terms, it could stay the same, go up (from D^0 to D^{1b} in Figure 2.C2.) or down (from D^0 to D^{1a} in Figure 2.C1.), depending on whether or not high-tech activities are able to generate demand for these workers in other sectors of the economy.

Figure 2. Expected Behavior of Labor and Housing Markets in High-Tech Regions



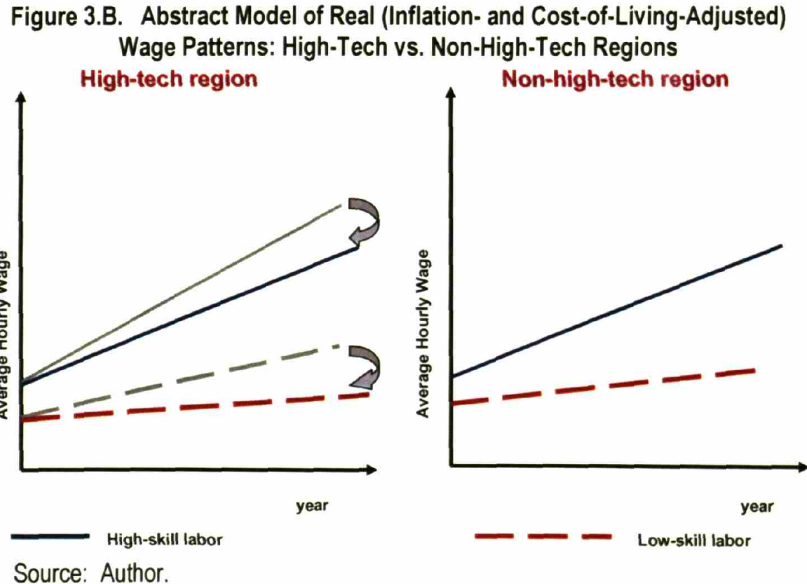
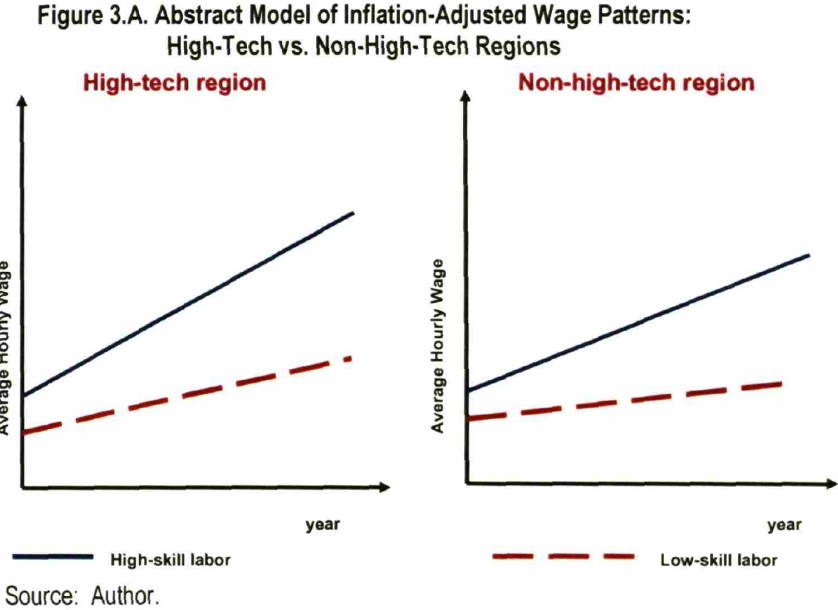
Source: Author.

Figure 2.C. shows how alternative scenarios would yield very different results with regards to employment and wages. Whether or not the supply of low-skill labor shrinks and/or changes its elasticity due to displacement (move to another region and/or become unemployed) or skill upgrading (in order to move into the high-skill labor market) would determine how they fare as they get caught between fewer job opportunities and higher living (and particularly housing) costs. Holding low-skill supply constant, with a decrease in demand (from q^0 to q^{1a} or q^{1b} in Figure 2.C1.), wages are likely to drop (from w^0 to w^{1a} or w^{1b} in Figure 2.C1.), while an increase in demand (from q^0 to q^{2a} or q^{2b} in Figure 2.C2.) would drive wages up (from w^0 to w^{2a} or w^{2b} in Figure 2.C2.). Furthermore, the elasticity of the supply would determine the magnitude of these changes in employment and wages. However, with a decreasing low-skill labor supply, from migration, their pre-high-tech wages could be sustained or rise moderately.

Whether or not the concentration of education-intensive economic activity can drive up costs-of-living and/or generate migration in or out of a region could determine not only how low-skill labor fares in the short-run but also how high-skill labor could fare in the long-term in regions with those characteristics. Migration alters the overall composition of the regional workforce, which often is an important component of the region's competitive edge. In the absence of increasing returns to scale, it is possible that as the proportion of college graduates in a region rises, growth in wages could slow down until there are no differences in returns to education across regions and thus these workers have no incentive to migrate. This would slow down growth in supply and wages. Moreover, these conditions could hinder a region's capacity for growth in education-intensive economic activities.

With regard to low-skill wages in high-tech regions and how they compare to non-high-tech regions, existing labor-market models, such as those of Goetz et al. (2003) and Hanushek et al.

(2000), would predict that even in the presence of larger inequality (as compared to high-skill labor), low-skill workers could earn higher wages at a high-tech region than they would otherwise (in a region with lower concentrations of high-tech activity). As demand for their labor would not automatically disappear and their supply, relative to a non-high-tech region, would be lower, they potentially could reap higher relative wages. (Figure 3.A. illustrates higher wages for both high- and low-skill labor in high-tech regions than in non-high-tech regions.)



However, those models control for inflation over time but fail to acknowledge regional cost-of-living disparities, that is, the difference in purchasing power of an individual's wage across regional jurisdictions. High-tech regions have shown higher living costs, especially with regards to land and real estate prices (ACCRA 1990, 2000). Controlling for cost-of-living differences across regions, wages reflect that the level-of-living that low-skill workers can afford could be very different. Their relative wages (both with regards to high-skill labor in high-tech regions and labor of equivalent levels of skill at non-high-tech regions), and subsequent purchasing power, could be substantially lower. (Figure 3.B. illustrates a drop in purchasing power when the wages in high-tech regions are adjusted for cost-of-living differences across regions.) The wages of low-skill workers in high-tech and non-high-tech regions could be equivalent in magnitude, yet the income gap between them and their skill-level counterparts could even be wider in the former, that is, that in a high-tech region low-skill workers could be in the presence of both lower wages and larger inequality. Furthermore, this difference in purchasing power between regions that follow an education-intensive development strategy and those that do not could affect high-skill workers also. Possibly, they could obtain lower purchasing power in a high-tech region than in a region with a more diverse economic base.

It is unclear whether or not the differences in attainable wages and the costs-of-living across regions, would be sufficient to drive the migration of low-skill workers out of and high-skill workers into high-tech regions. Furthermore, if any divergences that derive from high-tech growth do push migration, it is possible that if these flows occur for a long enough time, wages and employment would return to their long-run equilibrium.

In the long run, whether or not the situation of the less-educated is able to improve could depend on a variety of events, including the presence or absence of a *trickling-down* effect from

high-tech investment (i.e., multipliers maintaining or generating a certain level of demand for low-skill labor in other sectors and the resulting wages), the individual's ability to adapt to demand shifts through skill upgrading (higher wages in other economic sectors) or migration (lower costs-of-living and more employment opportunities elsewhere), and/or other external factors, such as public policies and programs, that may give him/her tools to bridge the gap between wages and living expenses.

With this theoretical framework, I have shown that analyzing the impacts of an education-intensive development path on regional equity indicators would require an empirical model that allows to explore the effects of labor demand shifts, and population adjustments, through migration across metropolitan areas, on the employment and earnings of less-educated and more-educated workers. Bound and Holzer (2000) developed a regression model that allowed them to look at the impact of demand shocks on regional labor markets and migration during the 1980s. Their model recognizes that the demand for low-skill and high-skill labor is determined simultaneously according to the elasticity of substitution among the two labor categories. They found that from 1980 through 1990 population shifts across areas at least partially offset the effects of demand shifts. However, less-educated workers exhibited a lower capacity for adjustment to shifts in labor demand through migration. These limited supply responses seemed to contribute to lower employment and wages for this group in declining areas during the 1980s. According to Bound and Holzer, low-skill workers were trapped in these areas and had very limited resources that would connect them to opportunities for advancement that were available in other areas throughout the nation. (Bound et al. 2000)

In this study, I take a similar approach to test the null hypothesis of no effect from education-intensive economic growth over wages and employment across skill groups during the

1990s. I look at the 1990 workforce characteristics (as a measure of the supply composition and its skill make-up), and the 1990 prevailing wages for each skill group and each region's economic base composition (as measures of demand and employment potential for more-educated vis-à-vis less-educated workers), and assess the impact, if any, that those variables have on how regions performed with regards to labor supply and wages across skill groups at the end of the decade. In addition, the empirical model includes regional dummy variables to account for non-labor-related *ex ante* regional characteristics, such as the characteristics of the housing market, access to a coast, and weather, among other. Furthermore, it measures any relationship that may exist among high-tech concentration, wage and employment patterns, and intra-regional, inter-regional and foreign migration. In Chapter 3, I discuss in detail the process that I followed to implement this empirical model, including the selection of variables and regions for the broader analysis of the forces at play in determining the suspected relationship between high-tech growth and social exclusion.

Chapter 3. Research Design and Methodology

In order to test the null hypothesis of no effect from high-tech growth over employment, wages and migration patterns across skill groups during the 1990s and identify potential areas for policy interventions that these trends could generate, I conducted a comparative case study of a typical high-tech region and a typical non-high-tech region. The Boston, Massachusetts Metropolitan Area, is a typical high-tech region that is well-known for its concentration of biotechnology, information technology, and other knowledge-intensive sectors. The Nashville, Tennessee Metropolitan Area, is a typical non-high-tech region characterized by a more diverse economic base and strong service sectors. I investigated the impacts of the high-tech growth that Boston experienced during the 1990s on its social-equity indicators, specifically with regards to differences in employment and wages across skill groups, the role that migration played in determining the relative composition of the workforce (i.e., the proportion of college graduates in the labor force), and how those compare to the prevailing patterns in Nashville for the same period. Furthermore, in order to assess whether or not the case study findings could be generalized to regions that follow any other education-intensive development path, I developed weighted least square (WLS) regression equations for the changes in employment, wages and migration flows that 50 metropolitan areas throughout the United States experienced during the 1990s. In this chapter, I describe in detail the methodology that I followed for both the comparative case study and the 50-region regression analysis. I describe the study variables and data sources as well as the relevance of the Boston-Nashville case study in discussions of economic growth vis-à-vis social equity.

Defining high-tech industry sectors and regions

In order to understand the region choice as typical or representative of their region type, I define what I consider as high-tech sectors and regions in this study, as follows. High-tech activities are those occurring in industries that spend an above-average proportion of their revenue on research and development and that employ an above-average number of technology-using occupations, such as scientists, engineers, mathematicians, and programmers (Milken Institute 1999). Service industries, such as communications services, computer and data processing services, and research and testing services naturally fall into this category. In addition, this high-tech industry definition includes several manufacturing industries that satisfy these conditions. Among these are drugs, computers and equipment, communications equipment, and electronic components. Table 3 provides a complete list of the manufacturing and service sectors that I included in the definition along with each industry's Standard Industry Code (SIC). The SIC breakdown provided the most complete employment data for these sectors, as compared to the North America Industry Code (NAIC) which at the time of this study still showed several gaps when bridging the data between the 1992 and 1997 values.

From this perspective, a high-tech region would be a region that exhibits above-average concentrations of firms, output, and employment in the below-indicated sectors as compared to national average values, i.e., regions with high-tech location quotients (LQ_{ht}) of value equal or greater than 1. Although the sectors included in this high-tech definition in 1997 accounted for about 7% of the national economy, today they are responsible for roughly one third of U.S. Gross Domestic Product (GDP) growth and 29% of U.S. exports (Milken Institute 2001). The concentration of these activities varies across regions, from places where they are virtually absent to places like the Rochester, MN Metropolitan Area, with a high-tech location quotient of 5.6 or

roughly 60% of its regional economy, indicating that its high-tech base has 5.6 times the concentration of that activity in the United States. Since employment in high-tech sectors accounted for roughly 7% of all jobs at the national level in 1997, I classify 21 regions as high-tech regions and 29 as non-high-tech.

Table 3. High-Tech Industry Definitions

MANUFACTURING		SERVICES
SIC Code Sector 283 Drugs	SIC Code Sector 376 Guided Missiles, Space Vehicles & Parts	SIC Code Sector 481 Telephone Communications Services
357 Computer & Office Equipment	381 Search, Detection, Navigation, Guidance, Aeronautical Nautical Systems, Instruments, & Equipment	737 Computer Programming, Data Processing, & Other Computer Related Services
366 Communications Equipment	382 Laboratory Apparatus and Analytical, Optical, Measuring, & Controlling Instruments	781 Motion Picture Production & Allied Services
367 Electronic Components & Accessories	384 Surgical, Medical, & Dental Instruments & Supplies	871 Engineering, Architectural, & Surveying Services
372 Aircraft & Parts		873 Research, Development, & Testing Services

Source: U.S. Bureau of Labor Statistics

Defining “education intensity”

In this dissertation, I also would like to establish whether or not any “education-intensive” development path could generate the exclusion phenomenon observed in the Boston-Nashville case study. The concern surrounding an education-intensive development strategy is that by nurturing relatively large proportions of college graduates, a region could inadvertently place its residents in a disadvantageous position as compared to other groups in the region (i.e., as would be the case for low-skill workers) and/or relative to all workers in regions with a different workforce and industry mix, which could affect college graduates adversely as well. Thus, here I define “education intensive” as those regions that in 1990, either by chance or conscious effort, had

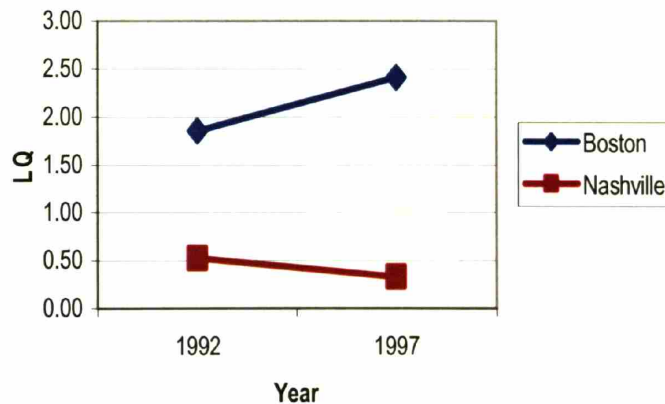
succeeded at creating a more-educated workforce. Then, I split the 50 regions included in this study into two groups: those regions that had an above-average proportion of college graduates in 1990 and those regions that had a below-average proportion of college graduates in 1990. Given that in 1990 the proportion of college graduates at the national level was 31% or 0.31, there are 29 and 21 regions in the above- and below-average classifications, respectively.

Comparative Case Study: Boston, MA and Nashville, TN Metropolitan Areas

The Greater Boston Metropolitan Area is a prime example of a high-tech region. Between 1990 and 2000, Boston's employment structure shifted from traditional manufacturing jobs to technology and service jobs. The region's manufacturing location quotient, as illustrated in Figure 4, went from 1.44 to 0.45 by the end of the decade (U.S. Economic Census 1992; 1997). Boston has an education-intensive economic base that primarily rests on high technology, related services, and supporting educational and medical institutions (Boston Redevelopment Authority 2003). It possesses one of the highest concentrations of high-tech activities, particularly biotechnology, in the entire United States (Ernst & Young 2003). Although Boston had managed to host a good amount of high-tech activity prior to 1990 (significantly higher than the national average), during this decade it was able to increase its share of high-tech activity even further, from an LQ_{ht} of 1.85 in 1990 to 2.41 at the end of the decade (U.S.=1). Today, roughly 17% of Boston's economic activity occurs within high-tech sectors. Furthermore, this region accounts for 4% of the total activity in those sectors at the national level (Milken Institute 2001). In addition, the state and local governments take advantage of the synergies created through the clustering of firms in these sectors, and assist with their establishment within the region facilitating the permitting process and making real-estate space available to them (Boston Redevelopment Authority 2002).

In order to isolate the effect of Boston's development path during the 1990s over regional equity issues, I compared Boston to a region whose economic base is not dependent on high-tech activity. The Nashville Metropolitan Area not only satisfies this condition but also maintains a more diverse economic base, including a strong service sector (Partnership-2000 2003). During the 1990s, Nashville's high-tech location quotient decreased from 0.52 to 0.33, while its services location quotient increased from 0.85 to 1.18 over the same period (U.S. Economic Census 1992; 1997).

Figure 4. High-Tech Location Quotient: Boston and Nashville; 1992-1997.

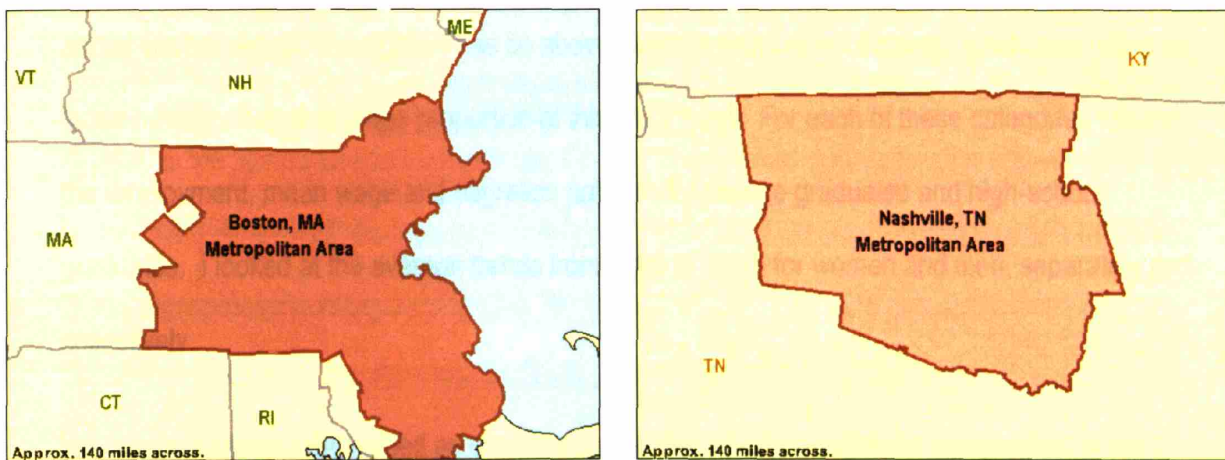


Sources: U.S. Economic Census 1992 and 1997. U.S. Department of Commerce, Bureau of the Census.
 U.S. Census of Population 2000. U.S. Department of Commerce, Bureau of the Census.

I looked at each region's economic-base composition, particularly the fraction of the employment base that high-tech sectors accounted for in 1992 and 1997, as well as their high-tech location quotient for the same period, that is, how the high-tech fraction of jobs in each region compared to that of the United States as a whole. I studied the 1990 and 2000 composition of the workforce in terms of its size (i.e., number of workers) and (un)employment rate according to school-attainment categories, mainly college graduate equivalence and high-school graduate equivalence. Here I define college graduate equivalence and high-school graduate equivalence in

a way similar to that Katz and Murphy (1992) used to look at similar variables for previous decades (i.e., 1963-1987). College graduate equivalence includes those individuals who have a minimum of a four-year college degree and half of those who attended college for at least one year but have not graduated yet. The second half of the latter group, i.e., the “some college” group, is part of the high-school graduate equivalence category along with individuals who have their high-school diploma or equivalent. The target population is limited to workers of 25-through-45 years of age in order to control for the impact of early employment and retirement over employment and wage patterns.

Figure 5. Boston and Nashville Metropolitan Areas, 2000.



Source: U.S. Census of Population 2000. U.S. Department of Commerce, Bureau of the Census.

I considered the 1990-through-2000 population growth in each region during the decade as well as changes in costs-of-living in each region, particularly with regards to housing prices. I included in the analysis the prevailing wage rates for each skill category, during the 1990s, with and without regional costs-of-living adjustments. Lastly, I studied the migration patterns in both regions, specifically what proportion of the low-skill and high-skill supply is not local, that is, workers who prior to 1985 (for the 1990 Census) and 1995 (for the 2000 Census) lived in a different region, state or country, and how their wage and (un)employment rates compare to that of

native workers. Figure 5 shows the geographic boundaries of each study area at the same scale, each being 140 miles across. Each variable that I included in the analysis of the Boston and Nashville Metropolitan Areas refers to these geographic definitions.

Education Intensity, Employment and Wage Determination: A 50-Region Regression Analysis

For the cross-regional analysis, first, with a set of thematic maps, I study the geographic distribution of high-tech activity, workforce composition, and cost-of-living changes between 1990 and 2000 across the United States. Then, I flagged each worker in the 25-to-45 years of age cohort as to whether or not s/he resided in a high-tech region (vis-à-vis a non-high-tech region) and/or his/her region of residence has an above-average proportion of college graduates (vis-a-vis those having a below-average proportion of this labor type). For each of these categories I found the employment, mean wage and migration patterns for college graduates and high-school graduates. I looked at the average trends from 1990 to 2000, for women and men, separately and collectively.

In addition, I developed an empirical model that would consider the composition of the workforce, the economic-base make-up, and a set of dummy variables to control for a region's *ex ante*, location-specific characteristics (which may include size, weather, and distance to amenities, among other) at the beginning of the decade, as potential determinants of the employment growth and wage changes that college and high-school graduates experienced throughout the 1990s.

The empirical model is made up of equations for four dependent variables:

1. 1990-to-2000 change in college-graduate equivalent average hourly wage ($\Delta w_{1990-2000}^{CollEq}$), defined as

[College-graduate equivalent average hourly wage in 2000] – [College-graduate equivalent average hourly wage in 1990].

2. 1990-to-2000 change in high-school-graduate equivalent average hourly wage ($\Delta w_{1990-2000}^{HSEq}$), defined as

[High-school-graduate equivalent average hourly wage in 2000] – [High-school-graduate equivalent average hourly wage in 1990].

3. 1990-to-2000 change in college-graduate equivalent employment ($\Delta S_{1990-2000}^{CollEq}$), defined as

[College graduate count in 2000] – [College graduate count in 1990].

4. 1990-to-2000 change in high-school-graduate equivalent employment ($\Delta S_{1990-2000}^{HSEq}$), defined as

[High-school graduate count in 2000] – [High-school graduate count in 1990].

In the model the independent variables pertain to the starting point of each region with regards to the workforce and economic base composition, which determines the opportunity for employment for low-skill vis-à-vis high-skill labor, and the average hourly wage for each skill group, which determines the willingness to work for native labor and the return to migration into that region. In this framework the high-tech fraction of a regional employment pool is a measure of relative demand for high-skill and low-skill workers. The proportion of college graduates becomes a proxy for the education intensity of each region at the beginning of the decade. In addition, I created regional dummies to control for non-labor-related *ex ante* characteristics. The independent variables are defined as follows.

For workforce composition from the perspective of college-graduate equivalent workers:

[Proportion of college graduate workers in 1990] and [College graduate count in 1990] or $Prop_{1990}^{CollEq}$ from $\frac{\# CollEq}{\# All}_{1990}$ and $\# CollEq_{1990}$.

For workforce composition from the perspective of high-school-graduate equivalent workers:

[Proportion of college graduate workers in 1990] and [High-school graduate count in 1990] or $\text{Prop}_{1990}^{\text{CollEq}}$ from $\frac{\# \text{CollEq}}{\# \text{All}}_{1990}$ and $\# \text{HSEq}_{1990}$.

For the composition of the economic base regardless of skill classification:

[Fraction of jobs that employment in high-tech sectors provided in 1992] or $\text{Frac}_{1992}^{\text{High-Tech}}$ from $\frac{\# \text{High-Tech Jobs}}{\# \text{All Jobs}}_{1992}$.

For wages from the perspective of college-graduate equivalent workers:

[College-graduate equivalent average hourly wage in 1990] or W_{1990}^{CollEq} .

For wages from the perspective of high-school-graduate equivalent workers:

[High-school-graduate equivalent average hourly wage in 1990] or W_{1990}^{HSEq} .

The regional dummies follow the 1960 Census Division Code. These organize states and metropolitan areas throughout the United States into the 9 macro-regions presented in Figure 6.

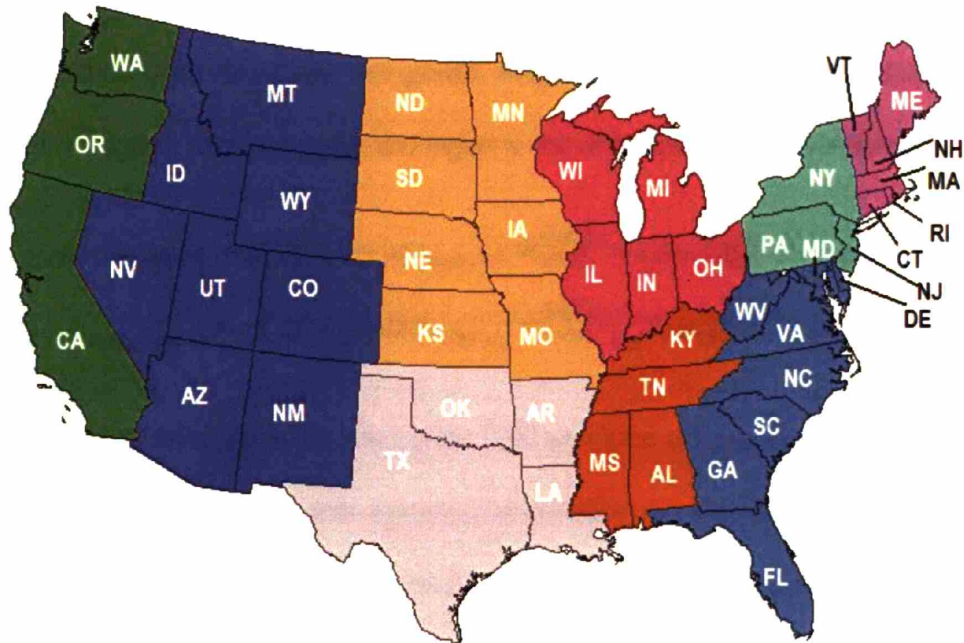
The final equations for the four dependent variables are organized into 4 models.

1. The first model explores the effect of the 1990 workforce composition, the 1992 economic-base composition, and *ex ante* regional characteristics over the 1990-to-2000 change in college and high-school graduate inflation-adjusted average hourly wages.

$$\Delta W_{1990-2000}^{\text{CollEq}} = \text{constant} + a \text{Prop}_{1990}^{\text{CollEq}} + b W_{1990}^{\text{CollEq}} + c \text{Frac}_{1992}^{\text{High-Tech}} + d \text{RegionalDummies}.$$

$$\Delta W_{1990-2000}^{\text{HSEq}} = \text{constant} + a \text{Prop}_{1990}^{\text{CollEq}} + b W_{1990}^{\text{HSEq}} + c \text{Frac}_{1992}^{\text{High-Tech}} + d \text{RegionalDummies}.$$

Figure 6. Geographic Divisions Defined



Middle Atlantic Division
 New York
 New Jersey
 Pennsylvania

Mountain
 Montana
 Idaho
 Wyoming
 Colorado
 New Mexico
 Arizona
 Utah
 Nevada

West North Central Division
 Minnesota
 Iowa
 Missouri
 North Dakota
 South Dakota
 Nebraska
 Kansas

East North Central Division
 Ohio
 Indiana
 Illinois
 Michigan
 Wisconsin

South Atlantic Division
 Delaware
 Maryland
 D.C.
 Virginia
 West Virginia
 North Carolina
 South Carolina
 Georgia
 Florida

West South Central
 Arkansas
 Louisiana
 Oklahoma
 Texas

New England Division
 Maine
 New Hampshire
 Vermont
 Massachusetts
 Rhode Island
 Connecticut

Pacific
 Washington
 Oregon
 California
 Alaska
 Hawaii

East South Central
 Kentucky
 Tennessee
 Alabama
 Mississippi

Source: Public Use Micro Sample Data. Census of Population, 1990, 2000. U.S. Department of Commerce, Bureau of the Census.

2. The second model explores the effect of the 1990 workforce composition, the 1992 economic-base composition, and *ex ante* regional characteristics over the 1990-to-2000 college and high-school graduate employment growth. In this model the 1990 inflation-adjusted average hourly wage for each skill group and region is one of the independent variables.

$$\Delta S_{1990-2000}^{\text{CollEq}} = \text{constant} + a \text{Prop}_{1990}^{\text{CollEq}} + b \# \text{CollEq}_{1990} + c W_{1990}^{\text{CollEq}} + d \text{Frac}_{1992}^{\text{High-Tech}} + e \text{RegionalDummies.}$$

$$\Delta S_{1990-2000}^{\text{HSEq}} = \text{constant} + a \text{Prop}_{1990}^{\text{CollEq}} + b \# \text{HSEq}_{1990} + c W_{1990}^{\text{HSEq}} + d \text{Frac}_{1992}^{\text{High-Tech}} + e \text{RegionalDummies.}$$

3. The third model explores the effect of the 1990 workforce composition, the 1992 economic-base composition, and *ex ante* regional characteristics over the 1990-to-2000 change in college and high-school graduate cost-of-living-adjusted average hourly wages.

$$\Delta W_{1990-2000}^{\text{CollEq}} = \text{constant} + a \text{Prop}_{1990}^{\text{CollEq}} + b W_{1990}^{\text{CollEq}} + c \text{Frac}_{1992}^{\text{High-Tech}} + d \text{RegionalDummies.}$$

$$\Delta W_{1990-2000}^{\text{HSEq}} = \text{constant} + a \text{Prop}_{1990}^{\text{CollEq}} + b W_{1990}^{\text{HSEq}} + c \text{Frac}_{1992}^{\text{High-Tech}} + d \text{RegionalDummies.}$$

4. The last model again considers the effect of the 1990 workforce composition, the 1992 economic-base composition, and *ex ante* regional characteristics over the 1990-to-2000 change in college and high-school graduate employment growth; however, in this case the 1990 average hourly wage for each skill group and region is also adjusted for regional cost-of-living differences.

$$\Delta S_{1990-2000}^{\text{CollEq}} = \text{constant} + a \text{Prop}_{1990}^{\text{CollEq}} + b \# \text{CollEq}_{1990} + c W_{1990}^{\text{CollEq}} + d \text{Frac}_{1992}^{\text{High-Tech}} + e \text{RegionalDummies.}$$

$$\Delta S_{1990-2000}^{\text{HSEq}} = \text{constant} + a \text{Prop}_{1990}^{\text{CollEq}} + b \# \text{HSEq}_{1990} + c W_{1990}^{\text{HSEq}} + d \text{Frac}_{1992}^{\text{High-Tech}} + e \text{RegionalDummies.}$$

Each of these models includes six equations that comprise different portions of the 25-to-45-year-old labor force: a) all college-graduate-equivalent workers, b) all high-school-graduate-equivalent workers, c) male college-graduate-equivalent workers, d) male high-school-graduate-equivalent workers, e) female

college-graduate-equivalent workers, and f) female high-school-graduate-equivalent workers. I applied a weighted least square regression (WLS) on these equations for each group. All equations used New England as the reference category for the regional dummy variables.

Migration Analysis

As mentioned above, it is quite possible that migration could be an important force in determining whether or not workers are able to adapt to labor-demand shocks from an increase in high-tech growth or from a development strategy that is based on a more-educated workforce, and whether or not a region could sustain growth in either of these development paths. In order to test the strength of that force, first, I break down the national population of 25-to-45 years of age who are active in the labor force into those who by the end of the 1990s resided in a high-tech region and those who resided in a region of low high-tech concentration. I also categorize these workers according to whether in 1990 they resided in a region with an above-average or below-average proportion of college graduates. Then, for each region type, I aggregate workers according to their skill level and migration status for the beginning and for the end of the decade. I separated college and high-school graduate workers into non-migrants, if they stayed within the metropolitan area of residence, or migrants if they moved into the region from a non-metropolitan area in the state, from another state in the United States, or from another country. I found employment as well as wages for each skill and migration category.

In addition, I present another set of four WLS (Weighted Least Square) regression models.

5. The first one (Model 5) looks at the migration patterns at the end of the decade, i.e., those workers who came into the region between 1995 and 2000, as a function of the 1990 workforce composition, the 1992 economic-base composition, *ex ante* regional characteristics

and the difference between the 1990 regional and national average wages for each skill category. This model considers inflation-adjusted wages.

$$\text{Migrant Supply}_{1990-1995}^{\text{CollEq}} = \text{constant} + a \text{ Prop}_{1990}^{\text{CollEq}} + b \# \text{CollEq}_{1990} + c W_{1990}^{\text{CollEq}} + d \text{Frac}_{1992}^{\text{High-Tech}} + e \text{RegionalDummies}.$$

$$\text{Non - Migrant Supply}_{1990-1995}^{\text{CollEq}} = \text{constant} + a \text{ Prop}_{1990}^{\text{CollEq}} + b \# \text{CollEq}_{1990} + c W_{1990}^{\text{CollEq}} + d \text{Frac}_{1992}^{\text{High-Tech}} + e \text{RegionalDummies}.$$

$$\text{Migrant Supply}_{1990-2000}^{\text{HSEq}} = \text{constant} + a \text{ Prop}_{1990}^{\text{CollEq}} + b \# \text{HSEq}_{1990} + c W_{1990}^{\text{HSEq}} + d \text{Frac}_{1992}^{\text{High-Tech}} + e \text{RegionalDummies}.$$

$$\text{Non - Migrant Supply}_{1990-2000}^{\text{HSEq}} = \text{constant} + a \text{ Prop}_{1990}^{\text{CollEq}} + b \# \text{HSEq}_{1990} + c W_{1990}^{\text{HSEq}} + d \text{Frac}_{1992}^{\text{High-Tech}} + e \text{RegionalDummies}.$$

6. The second model (Model 6) measures the impact of migration patterns between 1985 and 1990, the 1990 workforce composition, the 1992 economic-base composition and location-specific regional traits on the 1990-to-2000 wage changes for college and high-school graduates. As in Model 5, this model considers inflation-adjusted wages as well.

$$\Delta W_{1990-2000}^{\text{CollEq}} = \text{constant} + a \text{ Prop}_{1990}^{\text{CollEq}} + b W_{1990}^{\text{CollEq}} + c \text{Frac}_{1992}^{\text{High-Tech}} + d \text{RegionalDummies} + e \text{Non - Migrant Supply}_{1985-1990}^{\text{CollEq}} + f \text{Migrant Supply}_{1985-1990}^{\text{CollEq}}.$$

$$\Delta W_{1990-2000}^{\text{HSEq}} = \text{constant} + a \text{ Prop}_{1990}^{\text{CollEq}} + b W_{1990}^{\text{HSEq}} + c \text{Frac}_{1992}^{\text{High-Tech}} + d \text{RegionalDummies} + e \text{Migrant Supply}_{1985-1990}^{\text{HSEq}} + f \text{Non - Migrant Supply}_{1985-1990}^{\text{HSEq}}.$$

7. Model 7 is identical in structure as Models 5. However, it includes inflation- and cost-of-living-adjusted wages.

$$\text{Migrant Supply}_{1990-1995}^{\text{CollEq}} = \text{constant} + a \text{ Prop}_{1990}^{\text{CollEq}} + b \# \text{CollEq}_{1990} + c W_{1990}^{\text{CollEq}} + d \text{Frac}_{1992}^{\text{High-Tech}} + e \text{RegionalDummies}.$$

$$\text{Non - Migrant Supply}_{1990-1995}^{\text{CollEq}} = \text{constant} + a \text{ Prop}_{1990}^{\text{CollEq}} + b \# \text{CollEq}_{1990} + c W_{1990}^{\text{CollEq}} + d \text{Frac}_{1992}^{\text{High-Tech}} + e \text{RegionalDummies}.$$

$$\text{Migrant Supply}_{1990-2000}^{\text{HSEq}} = \text{constant} + a \text{ Prop}_{1990}^{\text{CollEq}} + b \# \text{HSEq}_{1990} + c W_{1990}^{\text{HSEq}} + d \text{Frac}_{1992}^{\text{High-Tech}} + e \text{RegionalDummies}.$$

$$\text{Non - Migrant Supply}_{1990-2000}^{\text{HSEq}} = \text{constant} + a \text{ Prop}_{1990}^{\text{CollEq}} + b \# \text{HSEq}_{1990} + c W_{1990}^{\text{HSEq}} + d \text{Frac}_{1992}^{\text{High-Tech}} + e \text{RegionalDummies}.$$

8. Model 8 is identical in structure as 6. However, it includes inflation- and cost-of-living-adjusted wages.

$$\Delta W_{1990-2000}^{CollEq} = \text{constant} + a \text{ Prop}_{1990}^{CollEq} + b W_{1990}^{CollEq} + c \text{ Frac}_{1992}^{\text{High-Tech}} + d \text{ RegionalDummies} \\ + e \text{ Non - Migrant Supply}_{1985-1990}^{CollEq} + f \text{ Migrant Supply}_{1985-1990}^{CollEq}.$$

$$\Delta W_{1990-2000}^{HSEq} = \text{constant} + a \text{ Prop}_{1990}^{CollEq} + b W_{1990}^{HSEq} + c \text{ Frac}_{1992}^{\text{High-Tech}} + d \text{ RegionalDummies} \\ + e \text{ Migrant Supply}_{1985-1990}^{HSEq} + f \text{ Non - Migrant Supply}_{1985-1990}^{HSEq}.$$

As with the previous four models I constructed a set of equations for each group that comprises the 25-to-45-year-old labor force: a) all college-graduate-equivalent workers, b) all high-school-graduate-equivalent workers, c) male college-graduate-equivalent workers, d) male high-school-graduate-equivalent workers, e) female college-graduate-equivalent workers, and f) female high-school-graduate-equivalent workers. I ran these equations as weighted least square regressions (WLS) that used New England as the reference category for the regional dummy variables.

The Wage Bill and Policy Implications

There are two dimensions to the definition of success or evaluation criteria of a region's development path. The first component is wages and whether or not growth in an economic activity can generate growth in those wages. Wages are a measure of the depth of benefits derived from growth. The second component is the spread of those benefits, as measured by the number of workers who are able to enjoy those wages. In order to assess whether regions that follow an education-intensive development path perform relatively better or relatively worse than other regions, I look at both dimensions.

To summarize and illustrate the implications of this study's findings I ran two simulations. These simulations look at the 1990-to-2000 changes in the wage bill, as measure of both the depth and spread of

benefits from growth. The wage bill is the product of wages and employment for each skill category in a region. The first simulation compares the wage-bill changes in those regions that have relatively high proportions of college graduates vis-à-vis those regions that have relatively low proportions of college graduates. In the second and last simulation I conduct the same comparison for regions of relatively high concentrations of high-tech activity and those of relatively low concentrations of high-tech activities.

Data sources and variable selection

I utilized five secondary data sources. To obtain the economic-base composition and location quotients, I used 1992 and 1997 Economic Census employment data for each SIC included in the high-tech sector definition. In addition, I employed individual 1990 and 2000 data from the Current Population Survey (CPS), the government's monthly household survey of employment and labor markets. The National Bureau of Economic Research (NBER) compiles and standardizes these CPS data in Merged Outgoing Rotation Group (MORG) Files that contain disaggregated data for about 30,000 individuals for selected variables. In this study, I used the MORG files to derive the employment and average hourly wage variables from information regarding an individual's hours worked, weekly earnings, highest grade completed, employment classification and industry, among others. I used the 1990 and 2000 Census of Population and its Public Use Microdata Samples to obtain aggregate and individual data regarding migration status (place of residence five years prior to the Census), as well as the income, wages, and school attainment, among others, for each migration category. Furthermore, I used the Bureau of Labor Statistics consumer price index (CPI) and the cost-of-living indices that the ACCRA-Association for Economic Development Researchers and Analysts develops to help account for inflation and regional cost-of-living differences.

While the United States has hundreds of metropolitan areas as defined by each of these data sources, when taking into consideration the required variables and their availability for each region of at least two observations (i.e., 1990 and 2000 for socio-demographic variables and 1992 and 1997 for economic variables), the number of regions that I could include in this analysis is only 50. These 50 regions are the aggregate of all metropolitan areas for each state in the country, except Wyoming which did not have any metropolitan areas in 1990. I substituted Washington, D.C. for Wyoming as the 50th region to include in the analysis. I hereafter label these metropolitan areas according to their state name abbreviations.

Chapter 4. Comparative Case Study Results: Boston, MA and Nashville, TN Metropolitan Areas

The Boston and the Nashville Metropolitan Areas both experienced significant economic growth during the 1990s; however, the source of growth in each region was very different. Given the strengths of each region, it is no surprise that each followed a different path to development, especially during that decade. Boston took advantage of a steady influx of highly educated workers from the numerous universities in the region, and funding from government and private organizations, and became one of the top 40 high-tech centers around the globe, and one of the top three in the United States (Boston Redevelopment Authority 2004). Nashville's location, relatively low costs of doing business, and well-trained workers in skilled occupations made it a vital transportation, business and tourism center of the U.S. South (Nashville Office of Economic Development 2005).

In this chapter, I discuss the factors that shaped their economic performance during the 1990s and the impact that their development paths had over the composition of their workforce, costs-of-living in each region, and wages for their less-educated vis-à-vis more-educated resident-workers. I find that high-tech concentration in Boston increased the demand for college graduates, away from those only holding a high-school diploma or equivalent, while the more diverse economic base present in Nashville sustained demand for low skill workers. This is reflected in their wages, resulting in greater inequality in Boston and greater convergence in Nashville across skill levels. Furthermore, college-graduate in-migration in response to increases in demand and high-school graduate out-migration due to hikes in cost-of-living played an important role in determining the composition of the workforce, wage patterns and the overall distribution of benefits from high-tech growth. I identified three potential areas for policy intervention in response to

exclusionary patterns in Boston. They are skill-upgrading, housing affordability and diversity in the composition of a regional economic base.

Foundations for economic growth during the 1990s: Boston Metropolitan Area

Four key industries comprise the foundation of the Boston metropolitan economy: high technology, health services, financial services and higher education. One out of every four workers in the Boston area is employed in these sectors of the economy, and a similar number of jobs are provided by secondary service industries (such as legal, accounting, transportation, printing, and business services) that maintain forward and backward linkages with these key sectors. Boston has evolved into one of the top centers for financial services in the world. Important financial institutions in Boston, such as Fidelity, Putnam, and Scudder, manage about one-quarter of all U.S. mutual funds assets. In addition, the area hosts some of the nation's largest banks, including Bank of American and State Street. (Metropolitan Area Planning Council 2000)

Within high-tech sectors, the area stands out as a pioneer in the development of the information technology and biotechnology industry of the entire nation. Software developers emerged as economic growth leaders in the region's information technology industry of the 1990s, largely replacing computer hardware manufacturers, the mainstay of the 1980s. According to the Massachusetts Software Council, there were 2,200 software companies in the Bay State in 1996 (most located in metropolitan Boston), up from 800 in 1989. Much of Boston's software activity centered on Internet and related telecommunications products. The proliferation of internet-related companies contributed to Boston's economic boom during the 1990s in the telecommunications industry. Between 1993 and 1996, Massachusetts employment in telecommunications increased

by 61%. In fact, one out of every five jobs created in Massachusetts during that period was in the telecommunications industry. (Metropolitan Area Planning Council 2000)

A spin-off of the region's premier medical research facilities and technical universities, including the Massachusetts Institute of Technology (MIT), Harvard University, Massachusetts General Hospital, Beth-Israel Deaconess Medical Center, and the New England Medical Center, among others is the biotechnology sector. The birth of the biotech sector in the area took place during the 1960s (Massachusetts Biotechnology Directory 2002). Nonetheless, the sector did not grow much until the 1980s. Since the mid-1980s, the Boston Metropolitan Area's biotech sector skyrocketed. Dozens of new biotechnology firms have been born and established in the area in the past two decades (The Brookings Institution 2002; Massachusetts Biotechnology Directory 2002). In 2002, there were over 120 biotechnology companies in Massachusetts, most located in the Boston area. These companies employed 15,000 people and garner over \$1.6 billion in revenues. As stated in the Ernst & Young's annual biotechnology report (2002), this high-tech, knowledge-intensive cluster has been able to establish close links with local suppliers of factors of production and, at the same time, provide intermediate goods that feed other regional industry sectors, such as health services and pharmaceuticals. The region has produced one of the largest patent volumes in the country, for all high-tech sectors, second only to the San Francisco Bay area (The Brookings Institution 2002).

Regardless of high real-estate costs and space scarcity in the area, relative to other localities in Massachusetts and other New England states, the sector has shown a tendency to agglomerate around what are thought as continuous sources of highly skilled, specialized labor and knowledge: MIT and Harvard University. Approximately 75% of Massachusetts's biotech firms are located within a few miles of the Massachusetts Institute of Technology, the Whitehead

Institute, Harvard University Schools, and Massachusetts General Hospital (Boston Redevelopment Authority 2002). However, that has not been a continuous trend. During the late 1980s and 1990s, rapid industry growth pushed existing firms to expand through a merger-and-acquisitions strategy. Firms, such as Genzyme, acquired well-established production plants, particularly those dedicated to pharmaceuticals manufacturing, which were operating and available outside of the city. Consequently, we see biotech firms in Framingham, MA and Worcester, MA, for example (Quezada 2002). Furthermore, as the industry matures as a whole and new product commercialization-driven firms are born, many new start-ups choose to locate in the suburbs to pursue a lower cost, less traffic, and greater expansion potential (Demarco 2002).

During the 1990s the Boston Metropolitan Area became the leading region across the nation in National Institute of Health (NIH) funding receipts. The region received an average of \$1.5 billion in awards every year since the late-1990s (Maloney 2000). The City of Boston is also a center for venture capital investment, the main source of capital for the biotechnology industry. The City has attracted approximately \$2 billion in venture capital since the mid-1990s. Together with a clear regulatory framework (with regards to zoning, and permitting, among others), these factors created a natural entrepreneurial engine that fueled economic growth (The Brookings Institution 2002). This is evidenced by the foreseen expansion of the biotech sector in the Boston Metropolitan Area. Over the next 10 years, several development projects, either under construction or in advanced planning phases, in Boston and Cambridge will increase by approximately 30% the built area devoted to biotech activities in the region and will create between 5,000 and 7,000 biotech-related, direct jobs (an average 38% job increase), depending on the intensity of the use (Boston Redevelopment Authority 2002).

Foundations for economic growth during the 1990s: Nashville Metropolitan Area

The 1990s Nashville economy, contrary to that of Boston, was not reliant on any one area of business activity. It has a diverse economic base and experienced tremendous growth in every sector of the economy over the last ten years. The Nashville Metropolitan Area is a regional leader in publishing and printing, finance and insurance, health care management, music and entertainment, automobile and related industry manufacturing, higher education and tourism. Since 1990, the region experienced simultaneous gains in services, manufacturing and trade in skilled occupations at competitive salaries and wages (Nashville Office of Economic Development 2005).

Recent industrial research concludes that Tennessee ranks among the top five in the nation in car production and that it is the leader in the South. The state also ranks 15th in the nation for the production of light trucks. In total, 29% of all cars and light trucks produced in the United States are manufactured within a 350-mile radius of Nashville. (Tennessee Department of Economic and Community Development 2005)

The Nashville Metropolitan Area also is a transportation hub with excellent air, rail and highway access to any part of the country with distances of 1-to-2 days by truck or rail to almost anywhere in the country. It also offers competitive tax incentives to businesses, which include a job tax credit of up to \$2,000 per new employee, no sales tax on qualified industrial equipment and machinery, and no state income tax. A combination of its transportation positioning, the tax structure and relatively low labor costs (i.e., as they compare to wages in competitor regions) (Table 4) have made the Nashville Metropolitan Area an attractive location for distribution and warehousing operations as well as many corporate headquarters, including:

- The largest investor-owned hospital management company in America – HCA
- One of the world's largest manufacturers of tires – Bridgestone/Firestone
- The leading service provider of parking services in America and Europe – Central Parking Corporation
- A leading manufacturer of dry pet food – Doane Pet Care Inc.
- A top manufacturer of fine walking shoes – Mephisto
- One of the largest religious publishers in the United States – Thomas Nelson Publishing
- An international distributor of religious publications – Gideons International
- The largest advocacy organization representing small and independent businesses – National Federation of Independent Business
- The largest operator of retail farm and ranch stores in America – Tractor Supply Company
- More health care headquarters than any other metropolitan area in the United States.

Table 4. Selected Average Wage Statistics for Nashville and its Competitors, 1999

Occupation	Nashville	Detroit	Atlanta	St.Louis	Okla. City	San Jose
Electrical Engineers	\$23.01	\$29.24	\$25.08	\$25.88	\$24.53	\$37.22
Computer Engineers	\$21.46	\$27.64	\$28.32	\$27.37	NA	\$33.78
Mechanical Engineers	\$22.49	\$29.06	\$23.60	\$26.46	\$26.03	\$33.26
First-line Supervisors, Production Workers	\$16.17	\$22.76	\$16.59	\$17.92	\$15.44	\$21.00
Extruding and Drawing Mach. Setup Operators	\$13.42	\$13.45	\$11.75	\$11.58	NA	\$11.12
Machine Forming Operators And Tenders	\$7.99	\$11.43	\$10.18	\$9.30	\$8.96	\$10.00
Plastic Molding and Casting Mach. Operators	\$8.10	\$9.20	\$9.46	\$9.79	\$6.98	\$7.65
Coating, Painting and Spraying Mach. Operators	\$9.71	NA	\$10.92	\$10.64	\$10.45	\$11.42
Electrical and Electronic Equipment Assemblers	\$9.63	\$11.30	\$10.09	\$16.65	NA	\$12.30

Source: Bureau of Labor Statistics.

Furthermore, a strong office market in the Nashville Metropolitan Area illustrates its economy's ability to absorb new space as employment builds. (Tennessee Department of Economic and Community Development 2005)

Population Growth and Costs-of-Living

A direct relationship exists between the high-tech location quotient and the cost-of-living index for the Boston and Nashville Metropolitan Areas. This suggests that as the regional economy becomes more concentrated in high-tech sectors (i.e., with a larger fraction of all jobs in high-tech sectors) the cost-of-living increases significantly as well, especially with regards to housing costs. Boston, which experienced an increase in the high-tech share of its economy, has one of the highest costs-of-living indexes in the United States, going from 119 in 1990 to 133 in 2000 (US=100). Conversely, Nashville has a below-average cost-of-living index, going from 99 in 1990 to 93 in 2000. (ACCRA 1990, 2000)

The housing component of the cost-of-living indexes increased in Boston and fell in Nashville, as did the overall index; however, the magnitude of the change in the housing component was larger than that of the overall index in both areas. Boston's housing-cost component increased from 152 in 1990 to 171 in 2000. For Nashville, its housing-cost index component fell from above the national average (103 in 1990) to below average by the end of the decade (87 in 2000). (ACCRA 1990, 2000)

These patterns stem partly from a higher population growth and household creation rates in Boston and partly from what seems to be a more elastic housing supply in Nashville, that is, greater responsiveness to changes in demand. During the 1990s, both Boston and Nashville

Table 5. Population Growth, Costs of Living, Workforce Composition and Employment: Selected Variables for Boston and Nashville Metropolitan Areas, 1990-2000

Variable	Massachusetts			Boston Metro Area			Tennessee			Nashville Metro Area			United States		
	1990	2000	% Change	1990	2000	% Change	1990	2000	% Change	1990	2000	% Change	1990	2000	% Change
Land Area															
Population	7,840	7,840	0%	5,627	5,627	81%	41,217	41,217	0%	4,073	4,073	0%	3,537,438	3,537,438	0%
Households	6,016,425	6,349,097	6%	4,171,747	5,819,101	39%	4,877,185	5,689,283	17%	985,026	1,231,311	25%	248,709,873	281,421,906	13%
Regional Cost of Living Index (RCOLI)	2,244,406	2,443,580	9%	1,545,347	2,221,499	44%	1,853,515	2,232,905	20%	375,649	479,569	28%	91,947,410	105,480,101	15%
Housing price component	NA	NA	-	119	133	12%	NA	NA	-	99	93	-6%	100	100	0%
Industry Composition (Employment LQ for 1992 & 1999)*															
High-tech LQ	1.67	1.56	-7%	1.85	2.41	30%	0.42	0.50	19%	0.52	0.33	-37%	1	1	0%
Manufacturing LQ	0.85	0.70	-18%	1.44	0.45	-69%	1.45	1.47	1%	4.85	1.03	-79%	1	1	0%
Racial Composition															
% Minority	10%	16%	54%	11%	15%	35%	17%	20%	17%	17%	21%	22%	20%	25%	26%
% Non-Minority	90%	85%	-6%	89%	85%	-4%	83%	80%	-3%	83%	79%	-4%	80%	75%	-6%
Income Profile															
Median household income	\$48,685	\$50,502	4%	\$53,578	\$52,792	-1%	\$32,684	\$36,360	11%	\$39,819	\$44,223	11%	\$39,599	\$41,994	6%
Under poverty															
% population	9%	9%	4%	8%	9%	9%	16%	14%	-14%	11%	10%	-11%	13%	12%	-5%
% households	9%	10%	4%	8%	9%	10%	16%	14%	-10%	11%	10%	-12%	15%	12%	-22%
Truncated Workforce**															
unemployed	454,158	413,416	-9%	416,246	386,749	-7%	341,676	354,101	4%	236,284	253,349	7%	17,265,809	18,443,455	7%
% holding a college degree	5%	1%	-90%	5%	1%	-89%	3%	4%	40%	5%	4%	-19%	4%	3%	-23%
unemployed	37%	50%	35%	37%	51%	39%	16%	37%	137%	21%	46%	119%	25%	25%	23%
% without a college degree	4%	0%	-100%	5%	0%	-100%	0%	3%	3%	0%	3%	3%	2%	1%	-45%
unemployed	63%	50%	-20%	63%	49%	-23%	84%	63%	-26%	79%	54%	-32%	75%	69%	-8%
% holding a high-school diploma or equivalent	7%	1%	-84%	7%	1%	-83%	6%	5%	-15%	6%	5%	-26%	6%	4%	-38%
unemployed	53%	45%	-16%	54%	43%	-20%	61%	52%	-14%	62%	47%	-25%	61%	60%	-3%
% without a high-school diploma or equivalent	7%	1%	-81%	7%	1%	-80%	5%	2%	-66%	7%	3%	-59%	5%	3%	-43%
unemployed	10%	6%	-44%	10%	6%	-37%	23%	10%	-56%	17%	7%	-56%	14%	10%	-29%
unemployed	8%	0%	-100%	8%	0%	-100%	6%	20%	221%	4%	17%	312%	10%	9%	-11%

All data are for 1990 and 2000, when not otherwise indicated.

*Employment Location Quotient=%employment in industry i in region j/%employment in industry i in US

**Workers between 25 and 45 years of age who are in the labor force

Sources: 1990 and 2000 Census of Population; 1990 and 2000 Current Population Survey; 1992 and 1997 Economic Census; 1990 and 2000 ACCRA's Regional Cost-of-Living Index.

experienced significant growth in terms of population and household formation. Although similar in geographic extension (i.e., physical size), Boston's growth (39% and 44%, respectively) was 1.6 times that of Nashville (25% and 28%, respectively). Boston markedly exceeded Massachusetts' population growth rate, which grew at approximately 1/7 of its capital's rate, while Nashville grew at only 1.5 times Tennessee's population growth rate. (Census of Population 1990, 2000)

The number of households in Boston increased 44% (from 1,545,347 to 2,221,499) during the decade. Furthermore, most household growth statewide occurred in the Metropolitan Area. The household creation rate for the state of Massachusetts increased only 9% (from 2,244,406 to 2,443,580). Nashville households increased 28% (from 375,849 to 479,569) in the same period. However, household growth at the state level was not significantly different from that of the Nashville's Metropolitan Area. Tennessee's household creation rate increased 20% (from 1,853,515 in 1990 to 2,232,905 in 2000). With the exception of Massachusetts, all other household creation rates are above the national average rate, 15% (from 91,947,410 to 105,480,101), suggesting significant increases in demand for housing in these areas; however, given the decrease in housing costs in Nashville it suggests that the area had a greater capacity to absorb the demand hike without negatively affecting prices than did Boston during this period. (Census of Population 1990, 2000)

Workforce Composition

I was able to get an idea of what happened to labor supply in the Boston and Nashville Metropolitan Areas by looking at the composition of the workforce in each region and the changes that each experienced during the 1990s. Throughout this period, Boston had a larger workforce

(25-to-45 years of age) than did Nashville. However, for the same decade Boston had a decrease of 7% in the size of that labor force (from 416,246 to 386,749) while Nashville experienced an increase of 7% (from 236,284 to 253,349). Considering that both regions are of equivalent territorial extension, it is possible that Nashville had a greater capacity to absorb that growth. Thus, in order to evaluate whether or not the nature of economic growth in Boston and Nashville had a differentiated effect over less-educated vis-à-vis more-educated workers, it becomes important to evaluate the composition of each workforce in terms of the proportions of each skill group in each region rather than bare counts.

Overall, there was an increasing supply of high-skill labor and a decreasing supply of low-skill labor in both Boston and Nashville, yet the magnitude of the high-skill supply increase and the low-skill supply decrease is different in each region. Furthermore, the migration patterns in each region also played an important role in determining the composition of the workforce in Boston and Nashville during the 1990s, as follows.

In 1990, the proportion of the resident workforce (25-to-45 years of age) holding college degrees in Boston (37%) was higher than that of Nashville (21%). The difference in proportions between the two, however, diminished significantly by the end of the decade (51% vs. 46% in 2000). It is worth noting that the proportion of the population without a college degree in Nashville was and continues to be higher than that of Boston (63% vs. 79% in 1990; 49% vs. 54% in 2000). However, Nashville reduced that proportion at a faster rate than that of Boston (a decrease of 14 percentage-points vs. a decrease of 25 percentage-points, respectively) during the decade under study. This stems from the fact that during the 1990s Nashville was able to reduce the proportion of high-school dropouts from 17% to 7% (a decrease of 9 percentage-points).

Table 6. Migration Patterns: Boston and Nashville Metropolitan Areas, 1990-2000

NON-MIGRANTS												
Stayed in same house				Moved within the state				All non-migrants				
BOSTON MSA		NASHVILLE MSA		BOSTON MSA		NASHVILLE MSA		BOSTON MSA		NASHVILLE MSA		
	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000
COLLEGE GRAD												
n	256,331	266,491	86,070	104,414	275,497	302,614	112,503	136,933	531,828	569,105	198,573	241,347
row %	48%	47%	43%	43%	52%	53%	57%	57%	100%	100%	100%	100%
column %	32%	34%	21%	23%	37%	40%	24%	27%	35%	37%	23%	25%
HIGHSCHOOL GRAD												
n	464,579	445,591	261,585	301,215	407,717	388,724	282,819	306,418	872,296	834,315	544,404	607,633
row %	53%	53%	48%	50%	47%	47%	52%	50%	100%	100%	100%	100%
column %	59%	57%	63%	65%	54%	52%	60%	61%	57%	55%	62%	63%
DROPOUTS												
n	70,693	63,908	66,003	56,054	66,523	61,658	72,150	61,600	137,216	125,566	138,153	117,654
row %	52%	51%	48%	48%	48%	49%	52%	52%	100%	100%	100%	100%
column %	9%	8%	16%	12%	9%	8%	15%	12%	9%	8%	16%	12%
TOTAL												
N	791,603	775,990	413,658	461,683	749,737	752,996	467,472	504,951	1,541,340	1,528,986	881,130	966,634
row %	51%	51%	47%	48%	49%	49%	53%	52%	100%	100%	100%	100%
column %	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
MIGRANTS												
From other state in the United States				From other country				All migrants				
BOSTON MSA		NASHVILLE MSA		BOSTON MSA		NASHVILLE MSA		BOSTON MSA		NASHVILLE MSA		
	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000
COLLEGE GRAD												
n	113,730	123,697	57,528	72,255	22,747	37,718	4,206	7,832	136,477	161,415	61,734	80,087
row %	83%	77%	93%	90%	17%	23%	7%	10%	100%	100%	100%	100%
column %	60%	66%	36%	41%	42%	51%	35%	34%	56%	62%	36%	40%
HIGHSCHOOL GRAD												
n	67,857	56,180	87,111	91,499	20,136	23,735	6,870	10,130	87,993	79,915	93,981	101,629
row %	77%	70%	93%	90%	23%	30%	7%	10%	100%	100%	100%	100%
column %	36%	30%	55%	51%	37%	32%	58%	44%	36%	31%	55%	51%
DROPOUTS												
n	8,893	8,246	14,016	14,227	11,149	12,023	831	4,862	20,042	20,269	14,847	19,089
row %	44%	41%	94%	75%	56%	59%	6%	25%	100%	100%	100%	100%
column %	5%	4%	9%	8%	21%	16%	7%	21%	8%	8%	9%	10%
TOTAL												
N	190,480	188,123	158,655	177,981	54,032	73,476	11,907	22,824	244,512	261,599	170,562	200,805
row %	78%	72%	93%	89%	22%	28%	7%	11%	100%	100%	100%	100%
column %	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
ALL WORKERS												
Non-migrants				Migrants				All workers				
BOSTON MSA		NASHVILLE MSA		BOSTON MSA		NASHVILLE MSA		BOSTON MSA		NASHVILLE MSA		
	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000
COLLEGE GRAD												
n	531,828	569,105	198,573	241,347	136,477	161,415	61,734	80,087	668,305	730,520	260,307	321,434
row %	80%	78%	76%	75%	20%	22%	24%	25%	100%	100%	100%	100%
column %	35%	37%	23%	25%	56%	62%	36%	40%	37%	41%	25%	28%
HIGHSCHOOL GRAD												
n	872,296	834,315	544,404	607,633	87,993	79,915	93,981	101,629	960,289	914,230	638,385	709,262
row %	91%	91%	85%	86%	9%	9%	15%	14%	100%	100%	100%	100%
column %	57%	55%	62%	63%	36%	31%	55%	51%	54%	51%	61%	61%
DROPOUTS												
n	137,216	125,566	138,153	117,654	20,042	20,269	14,847	19,089	157,258	145,835	153,000	136,743
row %	87%	86%	90%	86%	13%	14%	10%	14%	100%	100%	100%	100%
column %	9%	8%	16%	12%	8%	8%	9%	10%	9%	8%	15%	12%
TOTAL												
n	1,541,340	1,528,986	881,130	966,634	244,512	261,599	170,562	200,805	1,785,852	1,790,585	1,051,692	1,167,439
row %	86%	85%	84%	83%	14%	15%	16%	17%	100%	100%	100%	100%
column %	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

NOTE: These tables only consider workers between 25 and 45 years of age.

Source: Census of Population 1990, 2000. U.S. Department of Commerce, Bureau of the Census.

The source of these changes in the skill-composition of the workforce in Boston and Nashville could originate from the migration patterns in each region. (Table 6.) In 1990, migrants (both domestic and foreign as compared to 1985) accounted for about 14% of the labor force in Boston and just over 16% in Nashville. In Boston, 20% of its college graduates had migrated into the area from another region or country. In Nashville that proportion was 24%. Notwithstanding, over half of the migrants in Boston possessed a college degree or higher (56%), while in Nashville over half of the migrants were within the high-school graduate category (55%). While the proportion of college graduates in Boston's migrant population was lower than Nashville's (which had a proportion of 36%), in absolute terms it had more than twice the magnitude of the Nashville migrant college graduate count (from 136,477 vs. 61,734), partly from the influx of recent graduates from Boston's technical schools into its region.

By 2000 the composition of the migrant workforce had changed in both regions, especially in Boston. In 2000 migrants accounted for about 15% of the labor force in Boston and just over 17% in Nashville, which were minor increases in either region from the beginning of the decade. In Boston, 22% of its college graduates had entered the region in the previous five years, which was a significant increase both in relative and absolute terms. In Nashville that proportion remained nearly constant (25%) but in terms of absolute supply of migrant college graduates it had a larger percentage-increase than Boston (30% vs. 18%). In addition, the proportion of high-school graduates in Nashville's migrant population dropped a bit since 1990 (from 55% to 51%). An increase in the proportion of high-school dropouts who entered the Nashville region between 1990 and 2000 is significant both in statistical and substantive terms (from 10% in 1990 to 14% in 2000).

The proportion of foreign migrants that made up the workforce during the 1990s is also different between these regions. Boston had more migrants from foreign countries both in relative

(from 22% to 28%) and absolute (from 54,032 to 73,476) terms throughout the decade than did Nashville (from 7% to 11% and from 11,907 to 22,824). However, the large majority of migrants from foreign countries in Boston had at least a college degree (42% in 1990 and 51% in 2000), while in Nashville the majority of the foreign migrants had only a high-school diploma or equivalent (58% in 1990 and 44% in 2000).

In Boston, over half of the dropouts who entered the region came from another country (56% in 1990 and 59% in 2000). Conversely, in Nashville dropouts who came into the region from another area within the United States are the largest group of migrant dropouts. That proportion increased from 6% to 25%. Although this constitutes a larger percentage-increase than for Boston, in absolute terms Boston (from 11,149 in 1990 to 12,023 in 2000) experienced a larger influx of foreign school dropouts than did Nashville (from 831 in 1990 to 4,862 in 2000).

I especially note that, at least with regards to Boston, there was a large out-migration flow as well. For the age group of interest to this study (25-45), these flows exhibit two predominant patterns: one to the five neighboring states (i.e., Connecticut, Maine, New Hampshire, Rhode Island, and Vermont) and the other to similar high-tech regions or economic competitors, among which are California (Silicon Valley), North Carolina (Research Triangle Park), Connecticut, Colorado, Minnesota, New Jersey, and New York. Those who migrate to neighboring states still could work in the Boston Metropolitan Area, yet they would have longer commutes. Those migrating to economic competitors are disproportionately of high skill. The proportion of low-skill workers who lived in the same house or in different houses within the same state decreased significantly, which puts them in the likelihood of being or becoming migrants into neighboring states. (The Massachusetts Institute for a New Commonwealth 2003)

The observed inflows of high-school graduate migrants into Nashville suggest that Nashville did not produce enough high-school graduates and had to import low-skill labor and/or that college graduates did not anticipate a high return to their degree in this region, discouraging their in-migration into Nashville. In Boston's case an already high concentration of college graduates further attracted a gross inflow of workers with the same level of skill, with the expectation of increasing returns to scale and migration due to greater demand for their labor. Relative wages, as proxies for demand, for each labor type confirm this fact.

Wage Patterns

I compared the above-mentioned workforce composition to wage patterns to get an idea of what happened to demand for each labor skill group. I used the Bureau of Labor Statistics Consumer Price Index (CPI) to transform all wages into 2000 constant dollars. When controlling only for inflation during the decade, in absolute terms, Boston offers higher wages than Nashville across the board. In percentage changes, however, the story is a bit different.

College graduate wages increased in Boston, while Nashville wages for this skill group stayed nearly constant in the presence of an increase in supply for both regions. This suggests that high-skill labor demand in both regions must be rising at a greater rate than supply; more markedly in Boston than in Nashville. Although the difference between the college graduate wages across these regions is statistically insignificant (standard error of the difference is \$1.89, p-value > 0.30) in 1990, it is statistically significant for 2000 (standard error of the difference is \$2.18, p-value < 0.05). The wage rate is particularly higher in Boston, as compared to Nashville, at the end of the decade (\$23.11 vs. \$21.83). (Table 7 and Figure 7)

Table 7. Wage Patterns: Boston and Nashville Metropolitan Areas, 1990-2000

Variable	Massachusetts			Boston Metro Area			Tennessee			Nashville Metro Area			United States		
	1990	2000	% Change	1990	2000	% Change	1990	2000	% Change	1990	2000	% Change	1990	2000	% Change
Average Hourly Wage*															
holding a college degree	\$21.59	\$23.05	7%	\$21.54	\$23.11	7%	\$20.66	\$21.59	5%	\$20.99	\$21.83	4%	\$20.38	\$21.90	7%
without a college degree	\$14.85	\$15.02	1%	\$15.03	\$14.86	-1%	\$9.97	\$12.48	25%	\$10.67	\$14.53	36%	\$13.50	\$13.74	2%
holding a high-school diploma or equivalent	\$15.43	\$15.17	-2%	\$15.65	\$15.01	-4%	\$10.16	\$12.93	27%	\$10.75	\$15.21	41%	\$13.95	\$14.22	2%
without a high-school diploma or equivalent	\$11.32	\$13.20	17%	\$11.40	\$13.20	16%	\$9.26	\$9.48	2%	\$10.25	\$10.74	5%	\$10.55	\$10.51	0%
Regional Cost of Living Index (RCOLI)															
Housing price component	NA	NA	-	119	133	12%	NA	NA	-	99	93	-6%	100	100	0%
Comparable Average Hourly Wage**															
holding a college degree				\$17.89	\$16.08	-10%				\$20.99	\$21.83	4%			
without a college degree				\$12.48	\$10.34	-17%				\$10.67	\$14.53	36%			
holding a high-school diploma or equivalent				\$13.00	\$10.44	-20%				\$10.75	\$15.21	41%			
without a high-school diploma or equivalent				\$9.46	\$9.18	-3%				\$10.25	\$10.74	5%			

Notes:

All data are for 1990 and 2000, when not otherwise indicated.

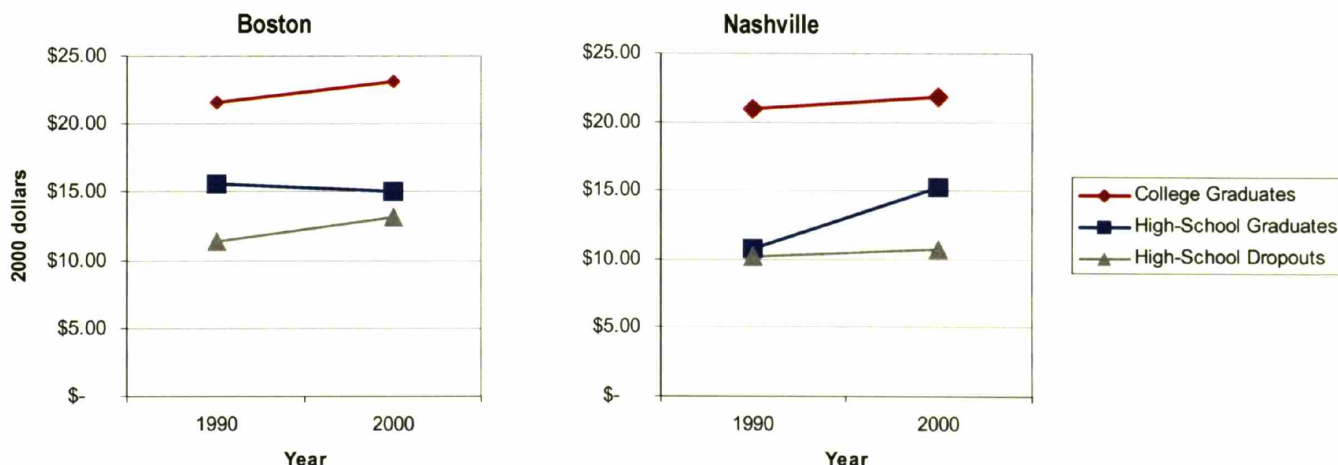
*Adjusted for inflation and expressed in 2000\$.

**Adjusted for regional cost-of-living differences and expressed in Nashville \$.

Sources: 1990 and 2000 Current Population Survey; 1990 and 2000 ACCRA's Regional Cost-of-Living Index.

In Boston high-school graduates experienced a small decrease in wages, even as their supply shrunk. According to this, low-skill labor demand must have dropped during the decade. While the average hourly wage of this group decreased about 4% (from \$15.65 with a standard error of \$0.42 in 1990 to \$15.01 with a standard error of \$0.84 in 2000), both college graduates and high-school dropouts exhibit significant increases. The average hourly wages of college graduates went from \$21.54 (with a standard error of \$0.48) in 1990 to \$23.11 (with a standard error of \$0.81) in 2000, a 7%-increase. High-school dropouts, on their part, experienced the largest percentage increase (15.82%) in average hourly wages, from \$11.40 to \$13.20 during the same period. Notwithstanding, due to limited degrees of freedom, the change in this estimate is statistically insignificant as a population estimate (p-value > 0.50).

Figure 7. Average Hourly Wages, Controlling for Inflation Only: Boston and Nashville; 1990-2000.



Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

In Nashville, although college graduate wages did not change significantly during the 1990s, they are still higher than any other education bracket in the region, going from \$20.99 (with a standard error of \$2.14) in 1990 to \$21.83 (with a standard error of \$2.82) in 2000. While college graduate absolute supply increased significantly, the premium over their college degree, that is, the

wage gap with regards to lower skill levels, diminished over the decade. Furthermore, the percentage increase on their average hourly wages was smaller than the analogous value for Boston and was also the smallest of all education brackets for this region. Again this suggests an increase in high-skill labor demand in Nashville yet smaller in magnitude than that of Boston. With regards to high-school graduates, in Nashville they exhibit the largest percentage wage increase (36%) during the 1990s from \$10.75 (with a standard error of \$0.47) to \$15.21 (with a standard error of \$2.42), which actually exceeds Boston's wage level for the equivalent labor type (controlling for inflation only) and suggests an increasing demand for their labor. High-school dropouts, on their part, experienced little change in wages (5%) from \$10.25 in 1990 to \$10.74 in 2000, even though supply dropped for that group, which would indicate a decrease in demand. However, again due to limited degrees of freedom in the sample, the change in these wages is not statistically significant as population estimates ($p\text{-value} > 0.40$).

The convergence of high-school graduate wages with those of high-school dropouts in Boston and with those of college graduates in Nashville in the samples is worth noting. In Boston many sectors that provided employment for high-school graduates disappeared entirely (i.e., agriculture and paper-allied products) or substituted their labor for higher levels of skill (in other technology-intensive manufacturing sectors) or lower levels of skill (in construction work and other crafts). By the end of the decade less than 30% of high-school graduates were working in sectors that were considered among the top five highest paying for their skill bracket: construction (\$20.65/hr), utilities and sanitary services (\$19.85), insurance and real estate (\$19.34), banking and other finances (\$18.03), and social services (\$17.54). High-school dropouts, even as their supplied shrunk, were able to penetrate high-paying sectors, such as repair services (\$20.00) and construction (\$13.00). Conversely, in Nashville, most high-school graduates (over 60%) are

employed in the top five highest paying sectors of the economy, including retail (\$19.01/hr) and professional services (\$34.18/hr as well as primary metals manufacturing (\$20.88/hr). (Table 8.)

Impact of Costs-of-Living Differences on Wage Patterns Across Regions

When recognizing the cost-of-living differences that exist across regions, wage patterns show a significantly different picture. In recognition of these patterns, I brought the average hourly wages to comparable terms by transforming the Boston values into Nashville dollars using the regional cost-of-living indexes that ACCRA produces annually. Adding this component, Boston performs consistently worse than Nashville, the non-high-tech region. This is especially true for the high-school graduate. While in Boston they experienced a 20%-decrease in the purchasing power of their average hourly wages (from \$13.00 in 1990 to \$10.44 in 2000), in Nashville the equivalent group enjoyed a 41%-increase (from \$10.75 to \$15.21). College graduates did significantly worse in Boston than in Nashville as well. In the former they had a 10%-decrease in the purchasing power of their average hourly wages (from \$17.89 in 1990 to \$16.08 in 2000), while in the latter the equivalent group actually saw a small (4%) increase, from \$20.99 to \$21.83, which even in absolute terms is higher than Boston wages for this education bracket throughout the entire study period. As for high-school dropouts in Boston, although they suffer the least in terms of percentage changes over the decade (a 3%-decrease in the purchasing power of their average hourly wages vs. a 5%-increase in Nashville), they receive consistently lower wages as compared to Nashville (\$9.46 vs. \$10.15 in 1990; \$9.18 to \$10.74 in 2000). (Figure 8.)

These patterns suggest that the increase in regional costs-of-living can outweigh the employment and wage benefits that could come from in the high-tech industry, even for more-

Table 8.

Employed Workers by Level of Skill and Industry Classification: Boston 1990, 2000

Industry Classification	MORG code	All Workers		College Graduates		Non-College Graduates		High-School Graduates		High-School Dropouts	
		1990	2000	1990	2000	1990	2000	1990	2000	1990	2000
Agriculture Service	1	1,380	4,115	-	4,115	1,380	-	1,380	-	-	-
Other Agriculture	2	1,323	-	-	-	1,323	-	-	-	1,323	-
Construction	4	15,174	8,835	3,412	-	11,762	8,835	10,656	6,517	1,106	2,318
Furniture and fixtures	6	944	2,318	-	-	944	2,318	944	2,318	-	-
Fabricated metal	9	3,477	6,319	2,391	2,143	1,086	4,176	1,086	2,088	-	2,088
Machinery, except electrical	11	22,267	5,940	13,470	1,980	8,797	3,960	7,695	3,960	1,102	-
Electrical Machinery, equipment, and supplies	12	9,471	10,739	1,811	8,592	7,660	2,147	7,660	2,147	-	-
Motor vehicles and equipment	13	-	2,309	-	2,309	-	-	-	-	-	-
Aircrafts and parts	14	-	6,532	-	-	-	6,532	-	6,532	-	-
Other transportation equipment	15	1,323	2,298	-	-	1,323	2,298	1,323	2,298	-	-
Professional and photographic equipment	16	1,208	6,532	1,208	2,318	-	4,214	-	4,214	-	-
Miscellaneous and not specified manufacturing industries	18	-	1,771	-	-	-	1,771	-	1,771	-	-
Food and kindred products	19	1,183	-	-	-	1,183	-	1,183	-	-	-
Textile mill products	21	2,228	-	-	-	2,228	-	-	-	2,228	-
Paper and allied products	23	2,437	1,988	-	1,988	2,437	-	2,437	-	-	-
Printing, publishing and allied industries	24	10,067	3,971	5,434	-	4,633	3,971	2,119	3,971	2,514	-
Chemicals and allied products	25	4,415	3,760	-	-	4,415	3,760	4,415	3,760	-	-
Petroleum and coal products	26	2,292	-	-	-	2,292	-	2,292	-	-	-
Rubber and miscellaneous plastics products	27	-	4,248	-	4,248	-	-	-	-	-	-
Transportation	29	16,743	6,102	3,482	4,181	13,261	1,921	9,067	1,921	4,194	-
Communications	30	5,422	-	1,085	-	4,337	-	3,207	-	1,130	-
Utilities and Sanitary Services	31	2,289	6,227	2,289	2,054	-	4,173	-	2,119	-	2,054
Wholesale Trade	32	12,099	9,921	5,493	7,815	6,606	2,106	5,539	2,106	1,067	-
Retail Trade	33	39,285	25,061	13,824	11,490	25,461	13,571	22,639	11,914	2,822	1,657
Banking and Other Finance	34	19,804	16,661	12,182	12,734	7,622	3,927	6,590	3,927	1,032	-
Insurance and Real Estate	35	15,740	19,497	9,141	13,347	6,599	6,150	6,599	6,150	-	-
Private Household Services	36	-	2,100	-	-	-	2,100	-	2,100	-	-
Business Services	37	22,338	19,526	12,610	10,536	9,728	8,990	9,728	8,990	-	-
Repair Services	38	6,286	3,892	951	1,815	5,335	2,077	3,490	-	1,845	2,077
Personal Services, Except Private Household	39	7,263	2,251	2,652	2,251	4,611	-	3,305	-	1,306	-
Entertainment and Recreation Services	40	1,107	-	-	-	1,107	-	1,107	-	-	-
Hospitals	41	18,792	3,097	12,852	3,097	5,940	-	5,940	-	-	-
Health Services, Except Hospitals	42	14,143	2,124	9,570	-	4,573	2,124	4,573	2,124	-	-
Educational Services	43	13,616	25,010	8,559	14,499	5,057	10,511	3,927	10,511	1,130	-
Social Services	44	4,350	12,519	3,366	1,824	984	10,695	-	10,695	984	-
Other professional Services	45	14,971	29,680	10,693	25,318	4,278	4,362	4,278	4,362	-	-
Public Administration	52	11,035	18,212	5,484	9,638	5,551	8,574	5,551	8,574	-	-
Total		304,472	273,555	141,959	148,292	162,513	125,263	138,730	115,069	23,783	10,194

Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

Table 8.

Employed Workers by Level of Skill and Industry Classification: Nashville 1990, 2000

Industry Classification	MORG code	All Workers		College Graduates		Non-College Graduates		High-School Graduates		High-School Dropouts	
		1990	2000	1990	2000	1990	2000	1990	2000	1990	2000
Agriculture Service	1	-	2,468	-	2,468	-	2,468	-	2,468	-	2,468
Construction	4	10,031	12,101	-	-	10,031	12,101	6,680	9,279	3,351	2,822
Lumber and wood products , except furniture	5	-	4,371	-	-	-	4,371	-	-	-	4,371
Furniture and fixtures	6	2,917	-	-	-	2,917	-	-	-	2,917	-
Stone clay ,glass and concrete product	7	2,828	-	-	-	2,828	-	2,828	-	-	-
Primary metals	8	-	4,237	-	-	-	4,237	-	4,237	-	-
Fabricated metal	9	2,940	-	2,940	-	-	-	-	-	-	-
Electrical Machinery, equipment ,and supplies	12	2,957	-	-	-	2,957	-	2,957	-	-	-
Aircrafts and parts	14	3,332	-	-	-	3,332	-	3,332	-	-	-
Other transportation equipment	15	6,502	-	3,650	-	2,852	-	2,852	-	-	-
Miscellaneous and not specified manufacturing industries	18	2,910	-	-	-	2,910	-	2,910	-	-	-
Food and kindred products	19	-	3,220	-	-	-	3,220	-	3,220	-	-
Apparel and other finished textile prod.	22	7,736	-	-	-	7,736	-	7,736	-	-	-
Paper and allied products	23	3,110	-	-	-	3,110	-	3,110	-	-	-
Transportation	29	27,500	20,335	2,873	9,396	24,627	10,939	21,732	10,939	2,895	-
Communications	30	-	3,837	-	-	-	-	-	-	-	-
Utilities and Sanitary Services	31	11,238	-	8,428	-	2,810	-	2,810	-	-	-
Wholesale Trade	32	-	8,583	-	3,090	-	-	-	2,783	-	2,710
Retail Trade	33	27,351	13,470	-	-	27,351	13,470	21,712	13,470	5,639	-
Banking and Other Finance	34	9,085	9,109	3,369	6,376	5,716	2,733	5,716	2,733	-	-
Insurance and Real Estate	35	5,694	6,559	5,694	6,559	-	-	-	-	-	-
Business Services	37	5,980	14,790	-	10,531	5,980	4,259	5,980	4,259	-	-
Personal Services , Except Private Household	39	2,812	3,063	-	3,063	2,812	-	-	-	2,812	-
Entertainment and Recreation Services	40	-	13,624	-	9,950	-	3,674	-	3,674	-	-
Hospitals	41	11,440	-	5,650	-	5,790	-	5,790	-	-	-
Health Services , Except Hospitals	42	-	7,189	-	3,978	-	3,211	-	3,211	-	-
Educational Services	43	30,670	17,202	19,317	17,202	11,353	-	8,437	-	2,916	-
Social Services	44	3,110	8,776	-	4,217	3,110	4,559	3,110	4,559	-	-
Other professional Services	45	2,873	6,968	-	3,264	2,873	3,704	2,873	3,704	-	-
Forestry and Fisheries	46	2,852	3,877	-	3,877	2,852	-	2,852	-	-	-
Public Administration	52	8,941	3,196	6,146	-	2,795	3,196	2,795	3,196	-	-
Total		194,809	166,975	58,067	85,340	136,742	81,635	116,212	69,264	20,530	12,371

Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

Table 8.

Average Hourly Wages of Employed Workers by Level of Skill and Industry Classification: Boston 1990, 2000

Industry Classification	MORG code	All Workers		College Graduates		Non-College Graduates		High-School Graduates		High-School Dropouts	
		1990	2000	1990	2000	1990	2000	1990	2000	1990	2000
Agriculture Service	1	\$10.54	\$15.50	\$15.50	\$10.54	\$10.54	\$10.54	\$10.54	\$10.54		
Other Agriculture	2	\$7.91			\$7.91	\$7.91	\$7.91	\$7.91	\$7.91	\$7.91	\$13.00
Construction	4	\$22.69	\$18.64	\$20.03	\$23.47	\$18.64	\$23.47	\$18.64	\$24.26	\$20.65	\$15.81
Furniture and fixtures	6	\$13.18	\$16.00		\$13.18	\$16.00	\$13.18	\$16.00	\$13.18	\$16.00	\$6.00
Fabricated metal	9	\$23.29	\$13.90	\$27.91	\$22.10	\$9.70	\$13.18	\$13.40	\$13.18	\$13.40	
Machinery, except electrical	11	\$22.20	\$18.67	\$22.61	\$24.03	\$15.99	\$21.57	\$15.99	\$22.67	\$15.99	\$13.91
Electrical Machinery, equipment, and supplies	12	\$16.38	\$25.05	\$23.98	\$28.23	\$14.57	\$14.57	\$12.30	\$14.57	\$12.30	
Motor vehicles and equipment	13	\$33.65	\$33.65	\$33.63							
Aircrafts and parts	14	\$15.96			\$15.96	\$15.96		\$15.96		\$15.96	
Other transportation equipment	15	\$10.69	\$16.83		\$10.69	\$16.83	\$10.69	\$16.83	\$10.69	\$16.83	
Professional and photographic equipment	16	\$21.41	\$18.87	\$21.41	\$24.78	\$15.61		\$15.61		\$15.61	
Miscellaneous and not specified manufacturing industries	18	\$9.55	\$10.00		\$9.55	\$10.00		\$10.00	\$9.55	\$10.00	
Food and kindred products	19	\$9.96			\$9.96				\$9.55		
Textile mill products	21	\$9.96			\$9.96				\$10.42		\$9.96
Paper and allied products	23	\$10.42	\$26.43		\$26.43				\$10.42		
Printing, publishing and allied industries	24	\$18.10	\$11.30	\$21.92			\$13.61	\$11.30	\$13.68	\$11.30	\$13.57
Chemicals and allied products	25	\$10.54	\$12.29		\$10.54	\$12.29	\$10.54	\$12.29	\$10.54	\$12.29	
Petroleum and coal products	26	\$13.91			\$13.91		\$13.91		\$13.91		
Rubber and miscellaneous plastics products	27	\$26.58	\$26.58		\$26.58				\$26.58		
Transportation	29	\$17.25	\$17.99	\$23.16	\$22.24		\$15.68	\$8.75	\$18.50	\$8.75	\$9.62
Communications	30	\$22.99		\$45.07			\$17.46		\$20.01		\$10.21
Utilities and Sanitary Services	31	\$16.61	\$19.73	\$16.61	\$23.08	\$18.08		\$18.08		\$19.85	\$16.25
Wholesale Trade	32	\$17.81	\$23.74	\$22.57	\$26.64	\$12.98	\$13.86	\$12.98	\$14.06	\$12.98	\$12.85
Retail Trade	33	\$13.82	\$13.79	\$16.50	\$17.01	\$11.08	\$12.36	\$11.08	\$12.42	\$11.19	\$11.88
Banking and Other Finance	34	\$17.72	\$25.19	\$21.21	\$27.40	\$18.03	\$12.13	\$18.03	\$12.32	\$18.03	\$10.87
Insurance and Real Estate	35	\$21.55	\$25.26	\$25.44	\$27.98	\$19.34	\$16.17	\$19.34	\$16.17	\$19.34	
Private Household Services	36	\$2.76	\$2.76		\$2.76		\$2.76		\$2.76		\$2.76
Business Services	37	\$19.78	\$21.32	\$23.06	\$27.38	\$14.21	\$15.51	\$14.21	\$15.51	\$14.21	\$20.00
Repair Services	38	\$19.80	\$22.33	\$28.16	\$25.00	\$20.00	\$18.31	\$20.00	\$17.55		\$19.76
Personal Services, Except Private Household	39	\$11.30	\$23.06	\$15.65	\$23.06		\$8.81		\$8.76		\$8.93
Entertainment and Recreation Services	40	\$52.70			\$52.70		\$52.70		\$52.70		
Hospitals	41	\$21.26	\$12.50	\$23.57	\$12.50	\$16.30	\$16.30	\$16.30	\$16.30		
Health Services, Except Hospitals	42	\$15.98	\$9.75	\$19.13		\$9.75	\$9.41	\$9.75	\$9.41	\$9.75	
Educational Services	43	\$13.87	\$18.67	\$16.32	\$20.86	\$9.72	\$9.72	\$15.66	\$9.67	\$15.66	\$9.88
Social Services	44	\$12.90	\$16.13	\$16.10	\$7.90	\$17.54	\$1.98	\$17.54	\$17.54	\$17.54	\$1.98
Other professional Services	45	\$22.70	\$19.03	\$25.45	\$19.93	\$13.81	\$15.81	\$13.81	\$15.81	\$13.81	
Public Administration	52	\$19.16	\$19.63	\$19.63	\$22.10	\$16.86	\$18.68	\$16.86	\$18.68	\$16.86	
Total		\$18.06	\$19.33	\$21.54	\$23.11	\$14.86	\$15.03	\$14.86	\$15.65	\$15.01	\$11.40
											\$13.20

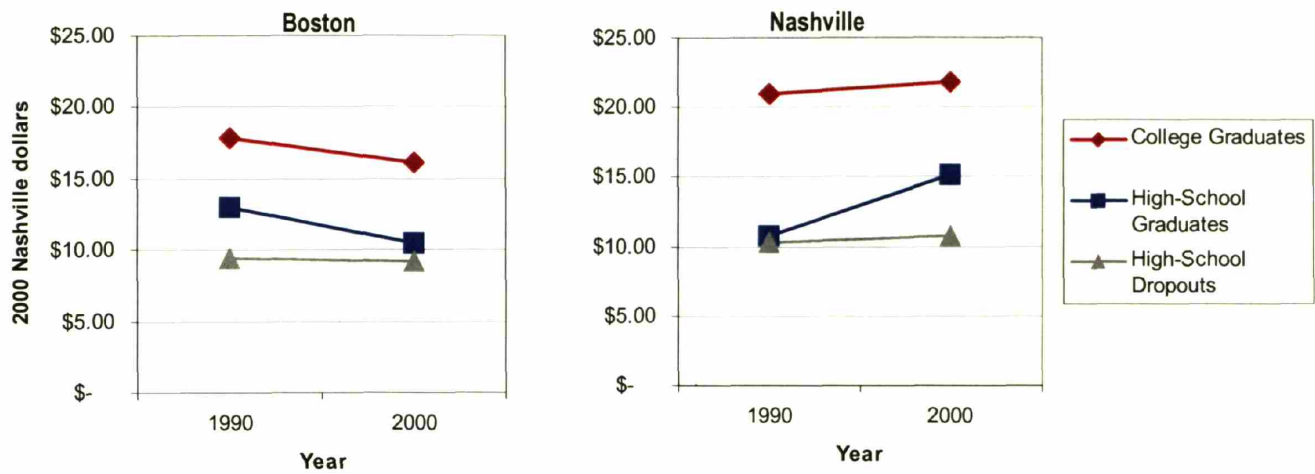
Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

Table 8.
Average Hourly Wages of Employed Workers by Level of Skill and Industry Classification: Nashville 1990, 2000

Industry Classification	MORG code	All Workers		College Graduates		Non-College Graduates		High-School Graduates		High-School Dropouts	
		1990	2000	1990	2000	1990	2000	1990	2000	1990	2000
Agriculture Service	1		\$9.18		\$9.18						
Construction	4	\$13.27	\$12.63			\$13.27	\$12.63	\$12.48	\$11.35	\$14.82	\$16.83
Lumber and wood products , except furniture	5		\$10.00								
Furniture and fixtures	6	\$11.66				\$11.66				\$11.66	
Stone clay ,glass and concrete product	7	\$19.76				\$19.76		\$19.76			
Primary metals	8		\$20.88								
Fabricated metal	9	\$16.47						\$20.88			
Electrical Machinery, equipment ,and supplies	12	\$13.83				\$13.83					
Aircrafts and parts	14	\$20.96				\$20.96		\$13.83			
Other transportation equipment	15	\$21.55				\$11.20		\$20.96			
Miscellaneous and not specified manufacturing industries	18	\$8.56				\$8.56		\$8.56			
Food and kindred products	19		\$9.00								
Apparel and other finished textile prod.	22	\$10.13				\$10.13		\$10.13			
Paper and allied products	23	\$9.88				\$9.88		\$9.88			
Transportation	29	\$15.92				\$10.57		\$11.09		\$6.59	
Communications	30		\$12.00					\$17.06			
Utilities and Sanitary Services	31	\$23.81				\$11.86		\$11.86			
Wholesale Trade	32		\$13.94								\$7.00
Retail Trade	33	\$9.42				\$9.42		\$8.34		\$13.57	
Banking and Other Finance	34	\$16.13				\$10.09		\$10.09			
Insurance and Real Estate	35	\$10.67				\$26.35		\$42.55			
Business Services	37	\$8.60				\$10.67		\$32.85			
Personal Services , Except Private Household	39	\$5.01				\$29.75		\$8.60		\$10.00	
Entertainment and Recreation Services	40		\$15.00			\$15.00					
Hospitals	41	\$17.62				\$20.80				\$5.01	
Health Services , Except Hospitals	42		\$16.17			\$20.17		\$15.11		\$7.88	
Educational Services	43	\$13.06				\$16.22		\$9.40		\$9.40	
Social Services	44	\$8.74				\$14.71		\$8.31			
Other professional Services	45	\$12.32				\$17.30		\$8.74		\$8.74	
Forestry and Fisheries	46	\$5.18				\$10.76		\$12.32		\$12.32	
Public Administration	52	\$11.98				\$8.00		\$5.18		\$52.61	
Total		\$13.74	\$18.26	\$20.99	\$0.00	\$10.67	\$14.53	\$11.86	\$15.21	\$10.25	\$10.74

Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

Figure 8. Average Hourly Wages, Controlling for Inflation and Regional Cost-of-Living Differences: Boston and Nashville; 1990-2000.



Source: Author's calculation using data from the Current Population Survey 1990 and 2000, U.S. Department of Labor, Bureau of Labor Statistics and Cost of Living Indexes 1990 and 2000, ACCRA.

educated labor. A recently published study, authored by the National Low Income Housing Coalition (2003), illustrates this point. Using Census data they calculated the “housing wage” for a 2-bedroom residence in Massachusetts and the Boston Metropolitan Area. The housing wage is the average hourly wage that a household would need to cover their housing, utilities, food, clothing, and transportation costs in each area. They estimated that in the Boston Metropolitan Area and Massachusetts, as a whole, the sum of the average yearly costs for all these expenses for the average-priced 2-bedroom residence is \$56,784 (138% the 2003 median renter annual income in Boston) and \$46,690 (129% the 2003 median renter annual income in the state), respectively, which divided by 2,080 hours of work per year, yields \$27.29 and \$22.40 as the 2003 housing wage in these areas. Table 9 presents these housing wages as they compare to the average hourly wages of each skill bracket considered in the case study.

Clearly, on average, less-educated workers cannot afford to live in the region, given these housing wages, unless they live in over-crowded units and/or in public or other subsidized housing.

College graduates, on average, can afford to live in the state, although only those in the higher percentiles can afford to live comfortably in the city. These patterns support that changes in low-skill labor supply are likely to stem from the migratory patterns that high costs-of-living can generate.

Table 9. Housing Wages and Affordability by Skill Level: Boston 2000.

<u>Wages in 2000\$</u>	<u>Massachusetts</u>	<u>Boston MSA</u>
Housing Wage for 2-Bedroom Family Residence	\$22.40	\$27.29
College Graduate Average Hourly Wage	\$23.05	\$23.11
High-School Graduate Average Hourly Wage	\$15.17	\$15.01
High-School Dropout Average Hourly Wage	\$13.20	\$13.20

Source: Current Population Survey 2000, U.S. Department of Labor, Bureau of Labor Statistics, and Out of Reach 2003, National Low Income Housing Coalition.

Impact of Migration on Wage Patterns Across Regions

Migratory patterns seem to affect wages in both the Boston and Nashville Metropolitan Areas, through their effect over supply for each skill group, though differently in each region. In 1990 there were statistically significant differences for migrant vis-à-vis local workers in each skill category in both regions. However, these differences were substantively significant mostly for college graduates in Boston and for high-school dropouts in Nashville. Furthermore, wages only favored migrants of low skill in Nashville. The effect is as sizable as to cause overall average wages to be higher for migrants than for workers who had resided in the area for over five years. In all skill categories in Boston as well as college graduates in Nashville, workers who had been there for more than five years exhibited higher wages than the equivalent migrant labor. (Table 10)

**Table 10. Average Hourly Wage Rate and Employment by Migration Status and Skill Level:
Boston and Nashville, 1990-2000.**

	NON-MIGRANTS				MIGRANTS				ALL WORKERS			
	BOSTON MSA		NASHVILLE MSA		BOSTON MSA		NASHVILLE MSA		BOSTON MSA		NASHVILLE MSA	
	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000
COLLEGE GRAD												
estimate	\$23.10	\$27.52	\$20.20	\$22.55	\$21.03	\$25.63	\$19.31	\$22.12	\$22.67	\$27.10	\$19.99	\$22.44
st. error	0.03	0.06	0.09	0.09	0.04	0.11	0.09	0.14	0.03	0.05	0.07	0.07
n	531,828	569,105	198,573	241,347	136,477	161,415	61,734	80,087	668,305	730,520	260,307	321,434
row %	80%	78%	76%	75%	20%	22%	24%	25%	100%	100%	100%	100%
column %	35%	37%	23%	25%	56%	62%	36%	40%	37%	41%	25%	28%
HIGHSCHOOL GRAD												
estimate	\$16.27	\$16.71	\$12.61	\$14.18	\$14.73	\$16.81	\$13.31	\$13.48	\$16.13	\$16.72	\$12.71	\$14.08
st. error	0.03	0.03	0.02	0.06	0.04	0.26	0.17	0.06	0.02	0.04	0.03	0.05
n	872,296	834,315	544,404	607,633	87,993	79,915	93,981	101,629	960,289	914,230	638,385	709,262
row %	91%	91%	85%	86%	9%	9%	15%	14%	100%	100%	100%	100%
column %	57%	55%	62%	63%	36%	31%	55%	51%	54%	51%	61%	61%
DROPOUTS												
estimate	\$13.52	\$14.47	\$10.13	\$11.45	\$12.23	\$21.69	\$12.37	\$10.29	\$13.35	\$15.48	\$10.35	\$11.29
st. error	0.04	0.08	0.03	0.07	0.13	1.52	0.23	0.09	0.04	0.22	0.03	0.06
n	137,216	125,566	138,153	117,654	20,042	20,269	14,847	19,089	157,258	145,835	153,000	136,743
row %	87%	86%	90%	86%	13%	14%	10%	14%	100%	100%	100%	100%
column %	9%	8%	16%	12%	8%	8%	9%	10%	9%	8%	15%	12%
TOTAL												
estimate	\$18.38	\$20.55	\$13.93	\$15.94	\$18.04	\$22.63	\$15.40	\$16.62	\$18.33	\$20.85	\$14.17	\$16.06
st. error	0.02	0.03	0.02	0.04	0.03	0.16	0.10	0.06	0.02	0.03	0.03	0.04
n	1,541,340	1,528,986	881,130	966,634	244,512	261,599	170,562	200,805	1,785,852	1,790,585	1,051,692	1,167,439
row %	86%	85%	84%	83%	14%	15%	16%	17%	100%	100%	100%	100%
column %	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Source: Public Use Microdata Samples, U.S. Census of Population 1990 and 2000. U.S. Department of Commerce, Bureau of the Census.
Note: This table only considers workers between 25 and 45 years of age. All wage rates are stated in 2000\$.

In 2000, the wage differences between migrants and non-migrants for each skill category across the two regions are statistically significant with the exception of the difference between migrant and non-migrant high-school graduates in Boston. However, wage differences are only substantively significant for high-school dropouts in Boston, benefiting migrants, especially from abroad.

This tells us that in Nashville during the 1990s, all workers, and specially low-skill workers, experienced wage increases even in the presence of increasing migration. Furthermore, by the end of the decade non-migrant low-skill workers were able to obtain wage gains that exceeded the wage rates for equivalent migrant labor. Consequently, it seems that during the 1990s Nashville was able to attract workers of all levels. In this case migration affected negatively those with the

lowest levels of skill (i.e., school dropouts) not with regard to wages but creating decreases in the non-migrant relative supply of this labor type.

During the 1990s in-migration in Boston negatively affected low-skill workers supply and wages even in the presence of a decreasing number of migrants in those skill brackets. Since Boston saw a decrease in the number and proportion of non-migrant low-skill workers, and migrant low-skill workers fared better with regards to wages as compared to non-migrants, these patterns confirm that changes in their supply are largely due to migration (vis-à-vis skill upgrading).

Summary of Findings and Policy Implications for the Boston and Nashville Metropolitan Areas

The findings of this Boston-Nashville comparative case study shed a first light on the distributional effects of high-tech-driven economic growth, and provide evidence of skill-based exclusion in the Boston Metropolitan Area of the 1990s. As the fraction of all jobs that high-tech activity accounted for increased in Boston during the 1990s, the inflation-adjusted wages of college graduates increased and those of high-school graduates decreased broadening the wage gap and creating greater inequality between the more-educated and the less-educated. Conversely, in Nashville, wages moved towards convergence between skill groups.

Given an increase in high-skill labor supply in the two regions, it is evident that demand for college graduates increased in both, but more dramatically in Boston than in Nashville, and that the difference in rates stems, at least partially, from the economic-base composition of each metropolitan area. Boston's low-skill supply shrunk while their wages continued to decrease, indicating that high-tech growth reduced not only the relative but also the absolute demand for their

labor. The more diverse economic base present in Nashville sustained demand for low-skill workers. This is reflected in their wages.

Two factors, in addition to the economic-base composition, proved to be important determinants of the spread of benefits that derived from Boston's growth during the 1990s. These are cost-of-living and migration. During the decade, Boston not only experienced greater natural population growth than Nashville, but it also had a more inelastic housing supply. Boston could not increase its housing pool in response to a larger demand, without hiking up prices significantly. The geographic agglomeration from knowledge-intensive sectors further worsened the situation. The cost-of-living-adjusted wages show that purchasing power in Boston was increasingly smaller than that of Nashville. This meant that low-skill workers in Boston were in the presence of greater inequality (i.e., increasingly larger wage gap) but also earned less than low-skill labor in Nashville.

Given the increase in cost-of-living and decrease in purchasing power in Boston, college graduates adjusted to these shocks migrating out of the metropolitan core into neighboring states and economic competitors with similar economic base but lower cost-of-living. Low-skill workers, however, due to limited mobility and greater aversion to risks involved in the decision to migrate, were pushed out into the outskirts of the regions. The impact that cost-of-living exerted on migration flows in and out of Boston not only affected the displaced workers but also jeopardized the economic development process of the region, as a whole, by deterring more-educated labor, the primary input for high-tech sectors, from entering the region and, thus, hindering growth potential.

These patterns call for intervention along three policy lines. First, there is an evident need for skill upgrading for low-skill workers in Boston, not only in terms of completing associate or

college degrees but also in terms of equipping residents with flexible sets of skills that may allow them to move across industries (and even occupations) in the presence of economic shocks. The public school (K-12) system can develop many of these flexible skills, especially if industry leaders can participate in periodic curricula revisions. Boston has one of the highest (if not the highest) concentrations of colleges and universities per square mile in the world; notwithstanding, most are private institutions that are beyond what is affordable for low-to-moderate income families. The state's university/college system needs to provide more affordable alternatives for individuals to get or complete a career (i.e., financial aid, short programs, paid internships with employers, customized training, etc.).

The second area that requires intervention is that of availability, accessibility, and affordability of housing. Rising housing costs across Massachusetts, and particularly in the Boston Metropolitan Area, not only generate out-migration of low-to-moderate income families to the outskirts of the region and other states, but could also discourage immigration of any type of labor hindering the region's potential for further economic growth.

Finally, the increasing demand for land in the Boston Metropolitan Area partly results from the spatial clustering of high-tech firms and both firms in related sectors and specialized labor. The metropolitan and state governments could strive to diversify the economic base creating activities in sectors that may provide jobs for lower levels of skill at decent or living wages. They could diffuse the benefits of development even further if those activities are created in areas other than Boston proper throughout the region.

All in all, the findings of this case study highlight the need for synchronization of high-tech-driven economic development efforts and education and housing policies and programs. These

factors are critical components of the regional infrastructure upon which the success and sustainability of development rest.

Notwithstanding, my analysis also demonstrates the need for further research on this topic. First, while high-tech sectors seem to be, at least partially, responsible for the wage, employment, cost-of-living and migration patterns that Boston experienced during the 1990s, it is unclear whether the phenomenon of exclusion of low-skill workers is inherent of high-tech sectors, or of all knowledge-intensive activities. Second, this case study provides evidence that college graduates in a high-tech region could be at a disadvantage too, particularly if cost-of-living is very high.

In order to provide a more complete picture of these phenomena present in the Boston Metropolitan Area, I assessed whether or not these findings could be generalized to all high-tech regions, and/or similarly education-intensive development paths, by conducting more rigorous statistical tests through the use of regression analysis across 50 metropolitan regions in the United States. I present the results of this broader analysis in Chapter 5. Finally, in Chapter 6, I include a more profound look at migration flows as potential determinants of labor supply and wage changes across metropolitan areas in the United States.

Chapter 5. Education Intensity, Employment Growth and Wage Determination: A 50-Region Regression Analysis

The Boston-Nashville case study provided evidence of skill-based exclusion in the Boston Metropolitan Area throughout the 1990s. During that period, high-tech growth led to the spatial clustering of firms, mainly in the information technology and biotechnology sectors. An increase in demand for college graduates in these sectors attracted a large inflow of workers with that level of skill into an area that was already highly urbanized and expensive to live in, consequently further driving up housing prices. Furthermore, growth in these sectors shifted labor demand away from the less-educated, benefiting unilaterally the wages (and employment opportunities) of the college graduate. As the inflation-adjusted wages of college graduate increased those of high-school graduates decreased, creating greater inequality. Once I adjusted wages to take account of cost-of-living differences between Boston and Nashville, college graduates performed poorly too, relative to workers of equivalent skill in Nashville. Migration seemed to play an important role in adjusting to changes in labor demand (and wages) and costs-of-living, and more importantly in determining the overall composition of the workforce by the end of the decade. Consequently, with limited mobility, low-skill workers performed significantly worse than high-skill workers in Boston and other low-skill workers in Nashville.

In this chapter, I explore the expandability of the case-study results to all high-tech regions during the 1990s. Furthermore, since Boston experienced increases not only in high-tech activity but also on college graduate supply and costs-of-living, I seek to distinguish between those impacts that could be inherent of the nature of other development paths that rely on the concentration of a highly educated workforce (i.e., financial services, among others), and those that *ex ante* regional characteristics could be responsible for in the absence of growth in education-

intensive economic sectors. Consequently, I include both the high-tech fraction of overall employment in each region, as well as their proportion of college graduates, as potential determinants of their 1990-to-2000 wage and employment growth patterns. This allows me to differentiate between impacts that demand (i.e., increase in high-tech activity) could generate directly and those that are the result of changes to the composition of the workforce towards a larger proportion of college graduates (relative supply).

In this chapter, I first look at the distribution of high-tech activity across the United States, and how that distribution changed during the 1990s. I compare those patterns to the geographic distribution of college graduates throughout the United States for the same period. Then I divided the national workforce (25-to-45 years of age) into those workers who in 1997 resided in a high-tech region (i.e., with a high-tech location quotient ≥ 1) and those who did not, as well as according to whether they lived in a region that had an above-average or below-average proportion of college graduates in 1990. I looked at the breakdown of each of the four groups according to their educational attainment and their wage patterns to identify any potential bias (be it negative or positive) from being in any of these categories. Later I present a set of regression equations that explores the impact of the 1990 workforce composition, the 1992 economic-base composition and location-specific regional traits on employment and wage growth for college and high-school graduates during the 1990s.

Then I discuss cost-of-living patterns for that decade and compare them to the geographic distribution of high-tech activity and college graduates to establish a potential relationship between these variables and housing-cost changes from 1990 to 2000. Thematic maps for high-tech activity and cost-of-living patterns allow to recognize regions that may be prone to high costs due to *ex ante* traits, even in the absence of high-tech growth, and to identify any geographic spillover

effects from high-tech activity. Finally, I incorporate cost-of-living considerations into the supply and wage models to explore the impact of the 1990 workforce composition, the 1992 economic-base composition and location-specific regional traits on the employment and wage changes that college and high-school graduates experienced during the 1990s, when cost-of-living-adjusted wages are held constant.

Model results suggest that the observable exclusion and displacement in high-tech regions do not come from increases in relative and absolute demand for high-skill labor necessarily or exclusively. Instead they seem to come from changes in the workforce composition of a region, which could reach a saturation point slowing down growth in supply, wages and, possibly, overall economic activity. I found that relative labor demand, measured as the fraction of a region's job base that corresponds to high-tech sectors, and relative labor supply, measured as the proportion of all workers who have at least a college degree or equivalent, at the beginning of the 1990s have opposing effects on how regions performed with regards to college- and high-school-graduate employment, wages and migration patterns at the end of the decade. The following regression models indicate that shifts in the relative composition of the regional economic base or relative labor demand towards a bigger fraction of the job base in high-tech sectors cannot be held on its own responsible for exclusionary patterns, here defined as fewer employment opportunities, lower wages and an overall decrease in non-migrant supply (displacement), for low-skill workers in regions characterized by a large concentration of high-tech activity.

According to this study, when two regions are identical in every way except their economic-base composition, the region with a larger concentration of high-tech activity will experience greater employment growth than the second region. However, this research did not find sufficient evidence to claim that regions that are identical in every way except economic-base

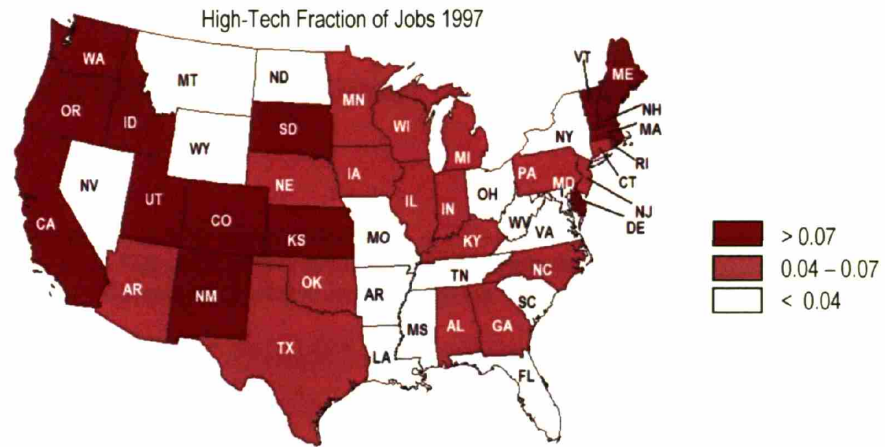
composition would have different wage patterns for either skill group, in the absence of cost-of-living and migration considerations. When cost-of-living is held constant across regions a region with a higher concentration of high-tech activity ends up offering lower wages than a region with a lower high-tech fraction of jobs for both skill groups. Although regions with a lower fraction of high-tech jobs exhibit lower employment growth across skill groups than regions with higher fractions of high-tech jobs, they offer greater depth (i.e., higher wages) of benefits from economic growth.

On the other hand, according to this study, shifts in the composition of the region's workforce (relative supply) towards a more-educated labor pool (i.e., an increasing proportion of college graduates in the labor force) lead to smaller growth in employment for all skill groups, this adverse gross effect in supply being stronger on high-skill labor than on low-skill labor. In addition, once cost-of-living is taken into consideration, an increase in the proportion of college graduates yields wage drops for high-school graduates and close to no changes (small wage gain) in college graduate wages, causing greater wage inequality across skill groups (high-skill vis-à-vis low-skill workers) and across regions (more-educated vis-à-vis less-educated regions). Thus, regions of small proportions of college graduates exhibit greater employment and wage growth across the board generating a broader spread of benefits from economic growth than regions with large proportions of college graduates. Furthermore, these findings suggest that an education-intensive economic development path could be self-limiting.

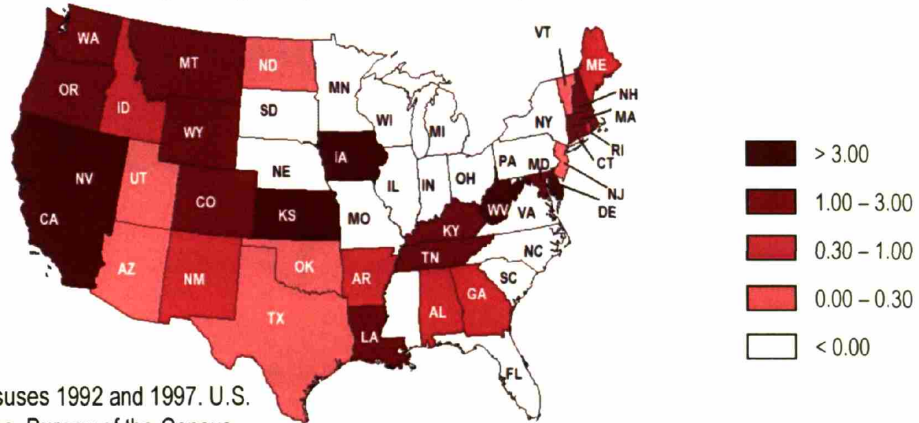
National Spread of High-Tech Activity in the United States

As previously stated, in this study, I consider a region to be a high-tech region if it exhibits an above-average concentration of high-tech activity, as compared to national values, i.e., a high-tech location quotient of one or above ($LQ_{ht} \geq 1$). According to this definition, in 1997 there were 21

Figure 9.
High-Tech Fraction of Jobs Across Regions, 1992-1997



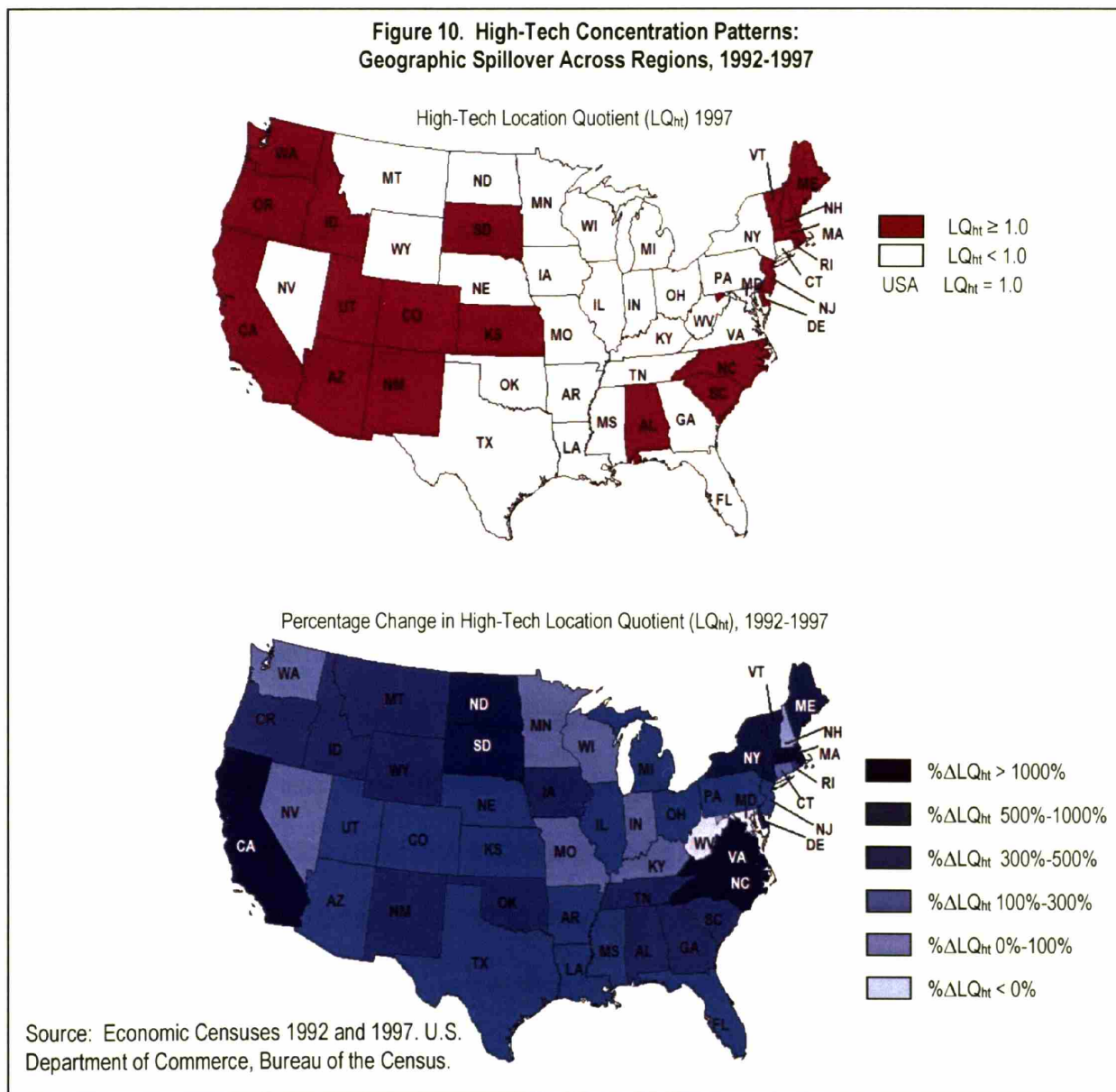
Percentage Change in High-Tech Fraction of Jobs, 1992-1997



Source: Economic Censuses 1992 and 1997. U.S. Department of Commerce, Bureau of the Census.

high-tech regions in the United States, not a significant change from the 22 regions that had such designation in 1992. However, as the United States as a whole increased its high-tech activity, from 5% to roughly 7% of the job base, several regions lost their status as a region of above-average high-tech concentration, while others experienced fast growth in the fraction of jobs that high-tech employment accounts for, thus, gaining such designation. Those that lost their high-tech region status were the metropolitan areas of Virginia as well as those of all the states that comprise the East North Central Division (Ohio, Indiana, Illinois, Michigan and Wisconsin) and those in the Middle Atlantic Division (New York and Pennsylvania, with the exception of New Jersey) of the

country. These metropolitan areas did not experience significant change in the fraction of employment that high-tech activities account for (Figure 9), but by the end of the decade, with an increase in the national average for that fraction, their location quotient decreased significantly (Figure 10).



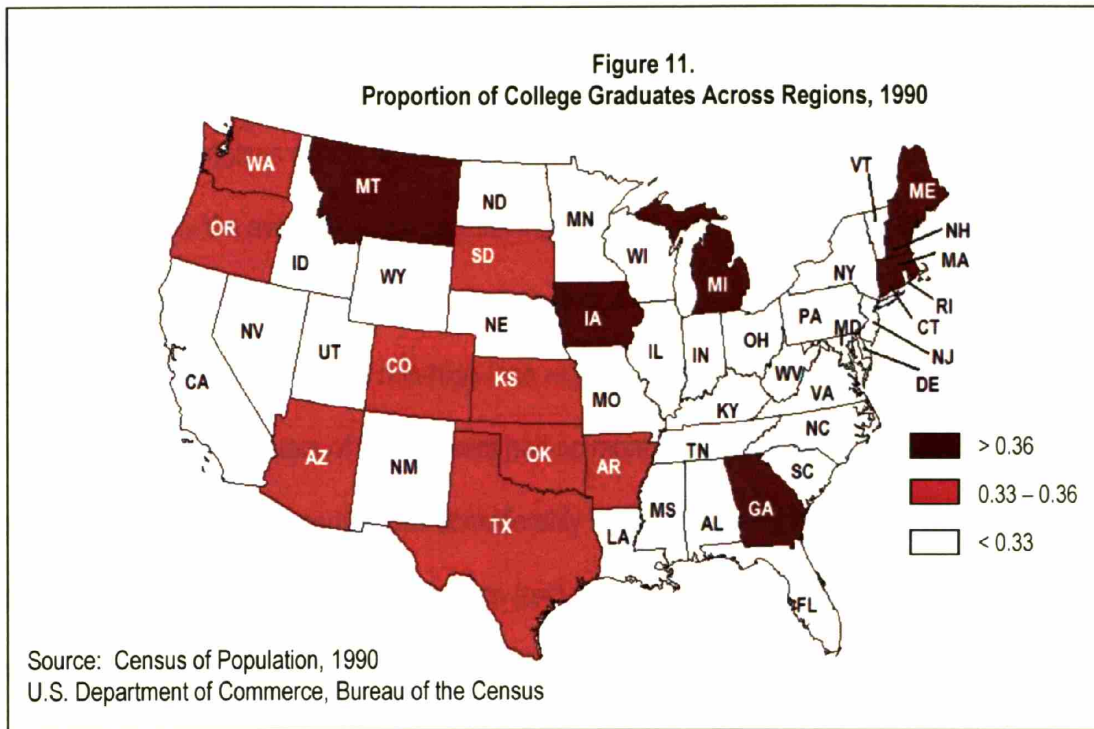
Among those that gained the high-tech designation were the metropolitan areas of Rhode Island, Kansas, Delaware, Washington D.C., Colorado, Washington, and Oregon. Several of these

regions developed high-tech activity within information technology and pharmaceuticals, among others, just after 1992 (point of measurement of the 1992 high-tech location quotient). A notable example is that of the Microsoft Corporation and other software development activity in Seattle, WA.

Within the areas of the country that experienced the greatest growth in the fraction of jobs that high-tech activity accounts for are the New England, Pacific, and South Atlantic Divisions, apparently as a geographic spillover across neighboring states of activity that was taking place in Massachusetts, California, and the Carolinas prior to 1992. (Figure 10)

National Spread of High-Skill Labor in the United States

The geographic distribution of college graduates across the nation is somewhat different than that of high-tech activity. First of all, there is a larger number of regions with above-average proportions of college graduates than regions with above-average fractions of high-tech jobs. Notwithstanding, there is an overlap between these categories, as would be expected, given the knowledge-intensity of high-tech sectors. Those areas that experienced growth in high-tech sectors during the 1990s, thus gaining high-tech region designation by 1997, at the beginning of the decade had above-average proportions of college graduates, including Washington and Oregon. Those regions that during the 1990s had close to no high-tech activity at all, mostly the West North Central and the East South Central states, had very low proportions of college graduates. With the exception of Michigan, the areas that lost their high-tech designation by the end of the decade, in 1990 had below-average proportions of that labor type, mostly because they were not able to increase their high-skill supply at the rate that the nation did as a whole. (Figure 11)



Two out of the three most important high-tech regions, which had significant activity in those sectors prior to the 1990s (Silicon Valley and the North Carolina Research Triangle Park), in 1990 had below-average proportions of college graduates. Neither region was keeping up with the nation growth rate for that labor category. The Boston Metropolitan Area was the only one of those three regions that had an above-average proportion of college graduates in 1990, yet by the end of the decade had experienced a 14%-decrease in that proportion. This suggest that as the high-tech fraction of jobs increases it could attract more high-skill labor into a region, but also that there could be a saturation point, so that as those sectors mature or college graduates occupy too large a proportion of the labor force, a metropolitan area would not be able to keep up with national growth levels for that labor type. Changes in workforce composition and wage patterns would allow to test this argument.

Workforce Composition

High-tech regions exhibit significantly different workforce composition patterns than non-high-tech regions. On average, those regions that by 1997 met the requirement for the high-tech designation (high-tech location quotient $LQ_{ht} \geq 1$) started out with a higher proportion of college equivalent labor ($p=0.46$) than did non-high-tech regions ($p=0.44$). While at national levels the majority of the 25-to-45 years of age workers had no more than a high-school diploma or equivalent in 1990, that proportion was considerably higher in regions that by 1997 had an LQ_{ht} of less than 1 ($p=0.44$) than in high-tech regions ($p=0.39$). High-tech regions also had a larger proportion of workers with less than a high-school diploma ($p=0.15$) than non-high-tech regions did in 1990 ($p=0.11$).

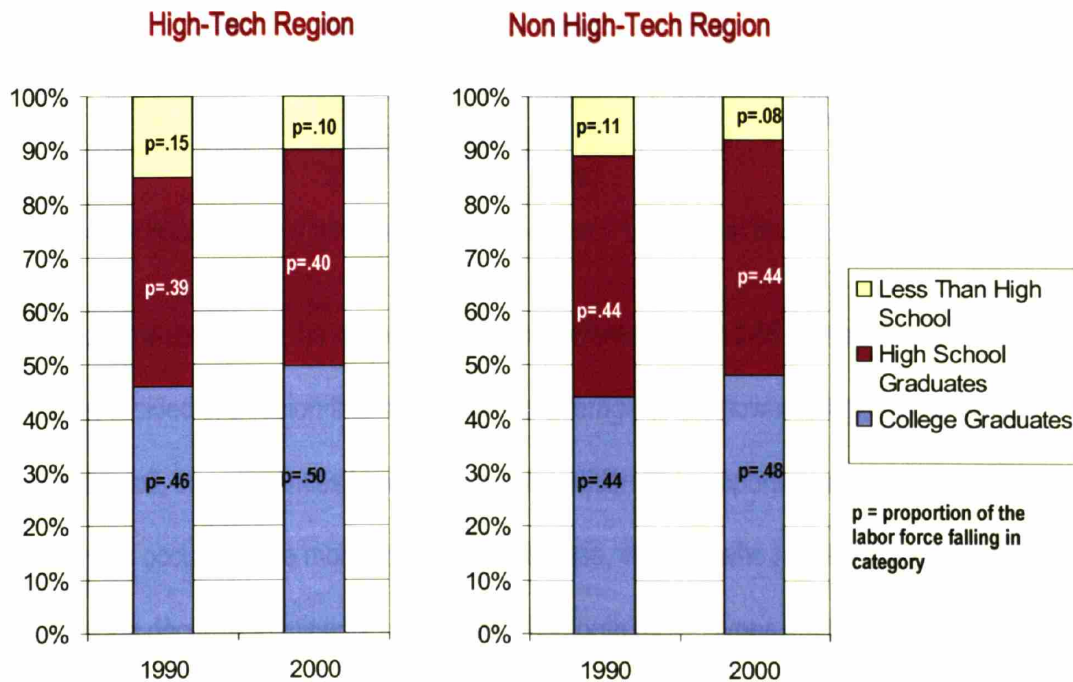
The absolute supply of workers who had less than a high-school diploma or equivalent decreased in absolute terms in both region-types between 1990 and 2000, 17% for non-high-tech regions and 27% for high-tech regions. The latter also experienced the largest loss in the proportion (or relative supply) of less-than-high-school workers (from $p=0.15$ to $p=0.10$ for high-tech regions vs. from $p=0.11$ to $p=0.08$ for non-high-tech regions) during the decade. By 2000, however, high-tech regions had a higher proportion of this type of worker than did regions with an LQ_{ht} of less than 1.

Although high-school graduate supply increased by 11% the average proportion of high-school graduates remained constant in non-high-tech regions. However, high-tech regions experienced increases in both absolute and relative supply for this group. Absolute high-school graduate supply increased 13%, taking the proportion of high-school graduates from $p=0.39$ to

p=0.40. Nonetheless, they were not able to meet the relative supply of high-school graduates (i.e., the proportion of the workforce that they occupy) in non-high-tech regions.

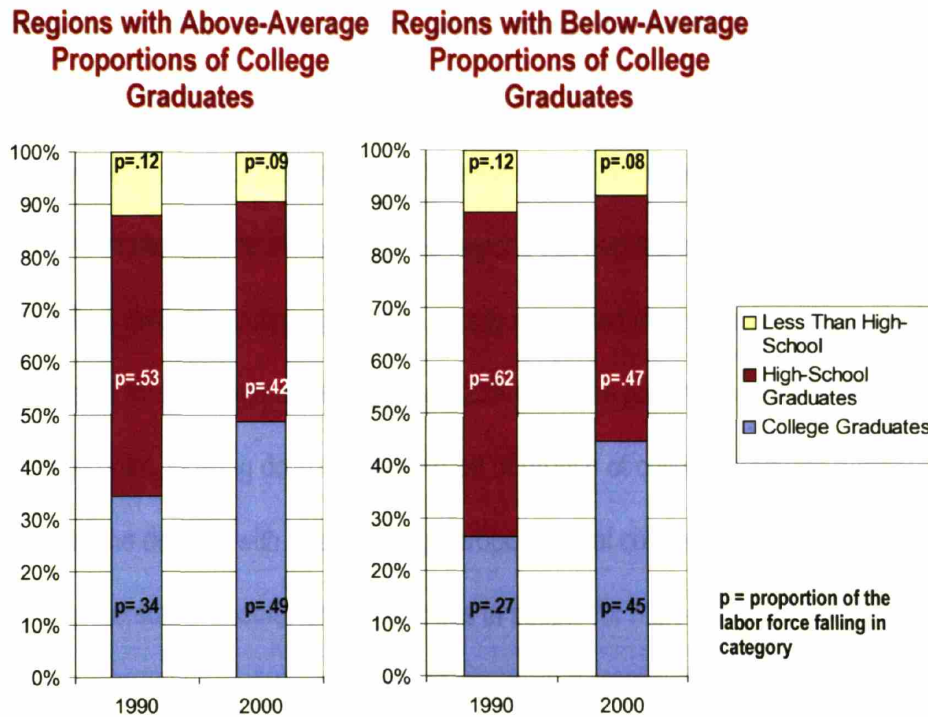
With regards to college graduates, high-tech regions had the highest proportion of this group throughout the decade, (from p=0.46 to p=0.50 for high-tech regions vs. from p=0.44 to p=0.48 for non-high-tech regions). However, it was the non-high-tech region that experienced the largest increase in absolute college graduate supply (22%), as compared to high-tech regions (19%). (Figure 12)

**Figure 12. Workforce Composition and Changes:
High-Tech vs. Non High-Tech Regions, 1990-2000**



Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

Figure 13. Workforce Composition and Changes:
Regions with Above-Average Proportions of College Graduates vs. Regions with Below-Average Proportions of College Graduates 1990-2000



Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

Once I re-categorize the national workforce, between 25 and 45 years of age, according to whether they resided in a region that had an above-average or a below-average proportion of college graduates, the differences in workforce composition (the proportion of the labor pool that each skill group occupies) are more striking. In this case, workers who have not completed high-school still are a decreasing minority. However, while both region types started the decade with identical proportions of less-than-high-school workers ($p=0.12$), as in the previous categorization, regions that had an above-average concentration of college graduates experienced the greatest loss of this labor type. Absolute supply of high-school graduates increased in above-average regions (7%), while it decreased in below-average regions (10%). Furthermore, the proportion of high-school graduates, or relative demand, decreased in both region types, but more markedly in

regions of below-average proportions of college graduates ($p=0.53$ to $p=0.42$) than for regions with above-average proportions of college graduates (from $p=0.62$ to $p=0.47$). (Figure 13)

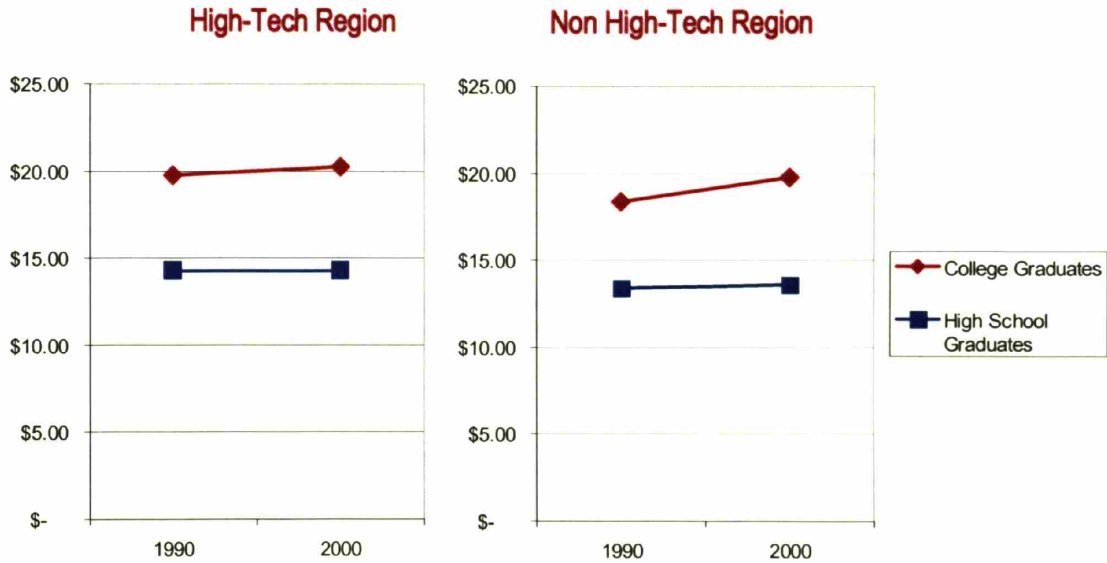
By definition, the more-educated region started the decade having a larger proportion of college graduates than the less-educated region ($p=0.34$ vs. $p=0.27$). The gap in this categorization, however, is larger than in the split between high-tech and non-high-tech regions. Although at the end of the decade more-educated regions still had the largest proportion of college graduates ($p=0.49$ vs. $p=0.45$), college graduate supply increased more slowly in these regions than in less-educated metropolitan areas. (20% vs. 23%). These patterns support the idea of a potential saturation point, slowing down or leveling-off of growth of college graduate supply in regions that started the decade with relatively high proportions of college graduates. The following section allows to understand whether or not changes in supply for high-skill and low-skill labor are related to demand patterns or variation in economic-base composition.

Average Hourly Wage Patterns

When controlling for inflation with the use of the Consumer Price Index (CPI), the hourly wage patterns are also different for workers who resided in high-tech vis-à-vis non-high-tech regions by 1997. While the 1990 wages of college graduates who resided in high-tech regions were higher than those of equivalent skill in non-high-tech regions, by 2000 their wages tended towards convergence across regions. College graduates obtained significant wage gains during the decade in regions of low high-tech location quotients (from \$18.40 to \$19.74). The gains for this group in high-tech regions were much smaller (from \$19.78 to \$20.25). This wage increase, in the presence of increases in supply, indicates that college graduate demand must have increased in both region types. Furthermore, demand for this labor type must be larger in the high-tech

region. Notwithstanding, as in the case of absolute supply, wage growth in high-tech regions is smaller than that in less-educated regions.

**Figure 14. Average Hourly Wages for All Workers:
High-Tech vs. Non High-Tech Regions, 1990-2000**

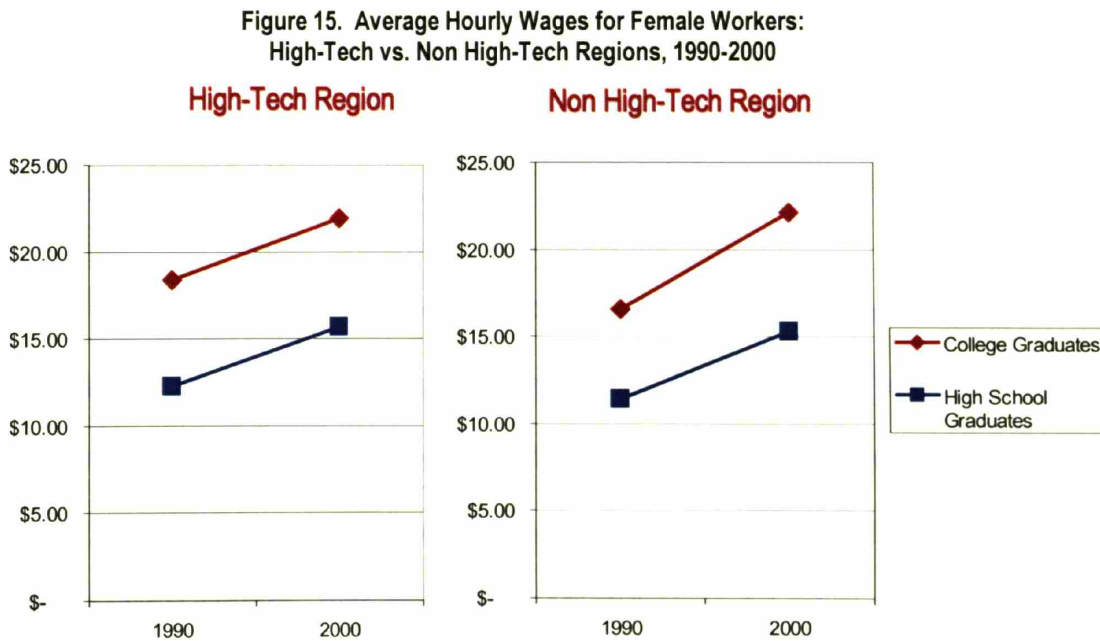


Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

High-school graduate wages were stagnant in high-tech regions (from \$14.29 to \$14.30). Given that this group experienced an increase in supply in that region type, their wages suggest that not only relative but also absolute demand for their labor dropped during the 1990s. Although lower than in regions of high LQ_{ht} throughout the entire decade, high-school wages experienced a small change in non-high-tech regions, from \$13.42 to \$13.62, in the presence of an increase in their supply. This suggests an increase in demand for high-school graduates in non-high-tech regions. (Figure 14)

These wage patterns are significantly different when male and female workers of 25-to-45 years of age are considered separately. Female wages improved markedly during the 1990s across the nation. Female college graduates who resided in non-high-tech regions obtained the greatest wage gains (from \$16.55 to \$22.15), exceeding the wages of equivalent labor in high-tech

regions (\$18.35 to \$21.93) by the end of the decade. Female high-school graduates who resided in regions of low concentrations of high-tech activity also experienced the largest wage gains for this labor group (\$11.41 to \$15.30). However, they were not able to meet the wages of equivalent-skill labor residing in high-tech regions (\$12.28 to \$15.71). This wage patterns, however, could be picking up the effect of diminishing gender-inequality in the work environment. To avoid mistakenly attributing these large wage increases to high-tech growth, I look at male wages separately as well. (Figure 15)

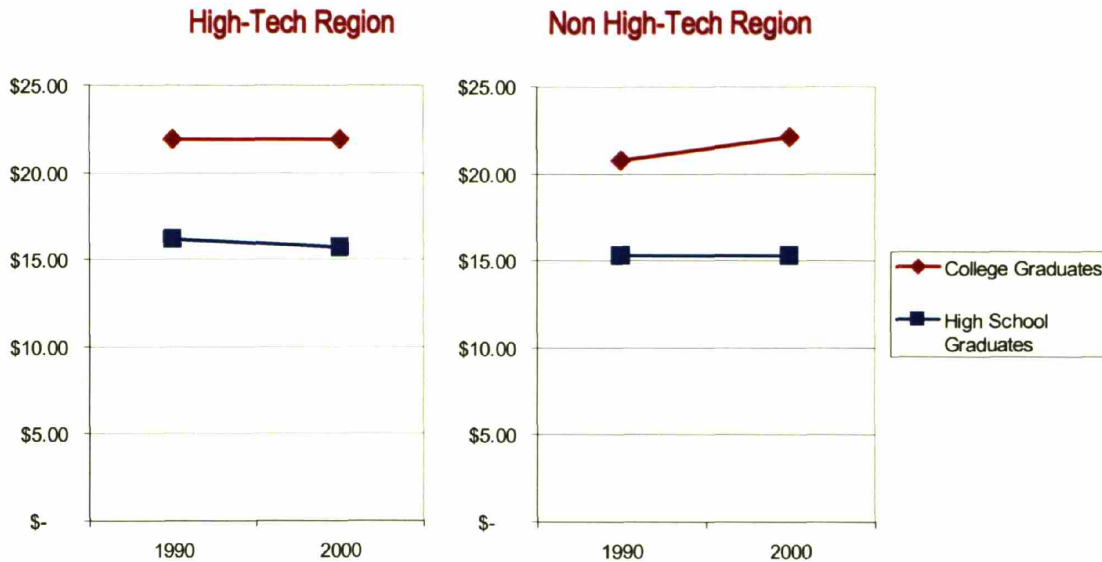


Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

While college wages for males remained nearly stagnant (from \$21.89 to \$21.93) in high-tech regions, the wages of male college graduates who resided in non-high-tech regions not only increased significantly faster (from \$20.78 to \$22.15) but also exceeded the high-tech wage for this group. With regards to high-school males, those who resided in regions of low high-tech quotients did not experienced significant changes in wages over the decade (from \$15.26 to \$15.30). Those who resided in high-tech regions had a small decrease in wages (from \$16.13 to \$15.71), yet their

wages remained higher than those of equivalent-skill labor in non-high-tech regions throughout the entire period. (Figure 16)

**Figure 16. Average Hourly Wages for Male Workers:
High-Tech vs. Non High-Tech Regions, 1990-2000**



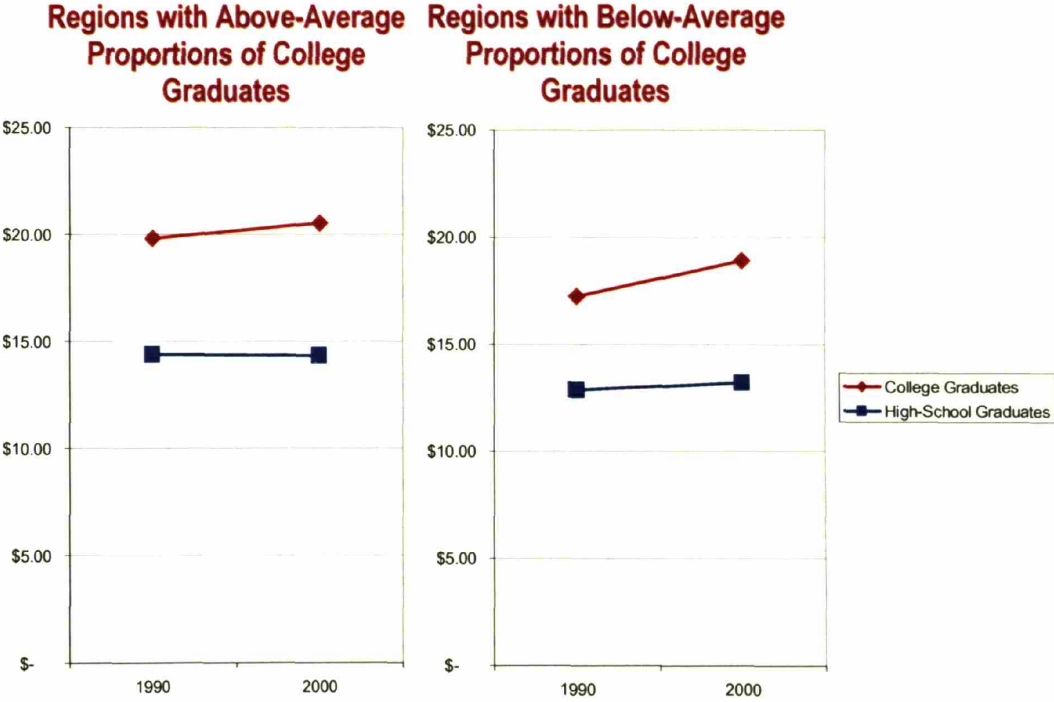
Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

Gender-specific wage patterns suggest four conditions: First, an increase in female participation in the workforce benefited average hourly wages, especially in the case of high-tech regions. Second, high-tech wages had a general tendency to decrease, while those in non-high-tech regions tended to increase. Third, from inflation-adjusted wages, it is not clear that the wage gap would be significantly different between these two region types. Fourth, although growth in college graduate absolute supply grew more slowly than in non-high-tech regions, wages did not increase as they would be expected to rise if their supply was limited, all else being constant.

When I divided the regions according to the proportion of college graduates that each one held in 1990, divergence in wages for each skill group and region type became more evident than when I looked at high-tech regions and non-high-tech regions. Although college graduate wages still grew more slowly in more-educated regions than in less-educated regions (4% vs. 9%), the

former sustained higher wages (from \$19.79 to \$20.53) than the latter for this category throughout the decade (from \$17.25 to \$18.89). Since supply increased in both regions, these wage increases show that demand must be on the rise. (Figure 17)

**Figure 17. Average Hourly Wages for All Workers:
Regions with Above-Average Proportions of College Graduates vs. Regions with Above-Average Proportions of College Graduates, 1990-2000**

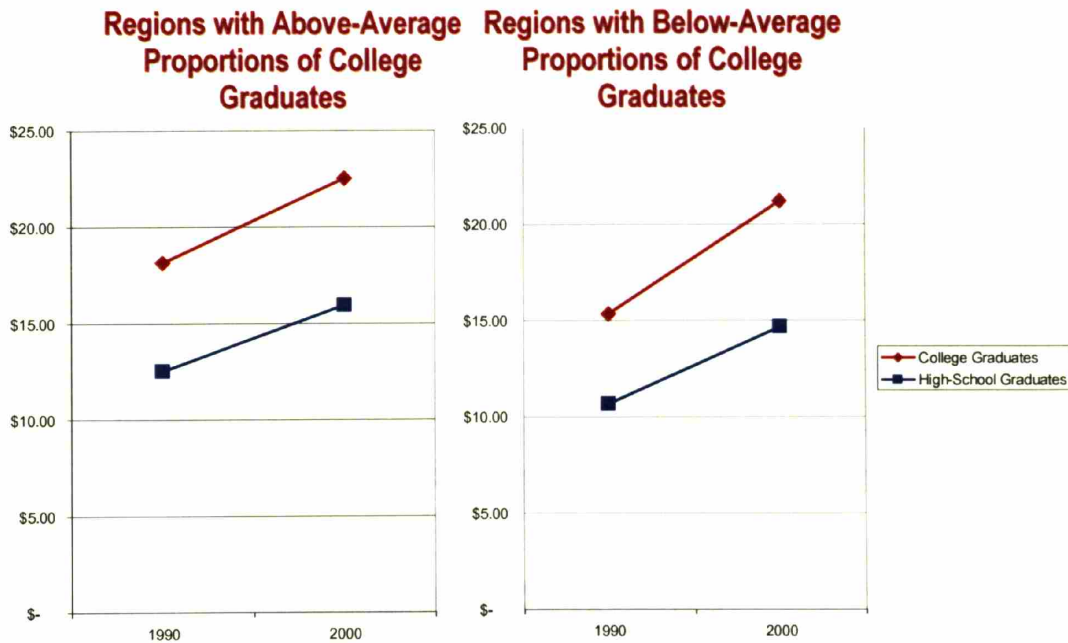


Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

With the exception of males, high-school wages are no longer stagnant under this categorization. They rise in regions with below-average proportions of college graduates, indicating an increase in demand (from \$12.84 to \$13.20). They decrease in regions of relatively large proportions of college graduates, signaling that lower wages could come from an increase in supply rather than a drop in their demand (from \$14.39 to \$14.31). Consequently, inequality is greater in regions with large concentrations of more-educated labor, than in those that had a

relatively low proportion of college graduates in 1990. (Figure 17) Gender-specific wages confirm that pattern. (Figures 18 and 19)

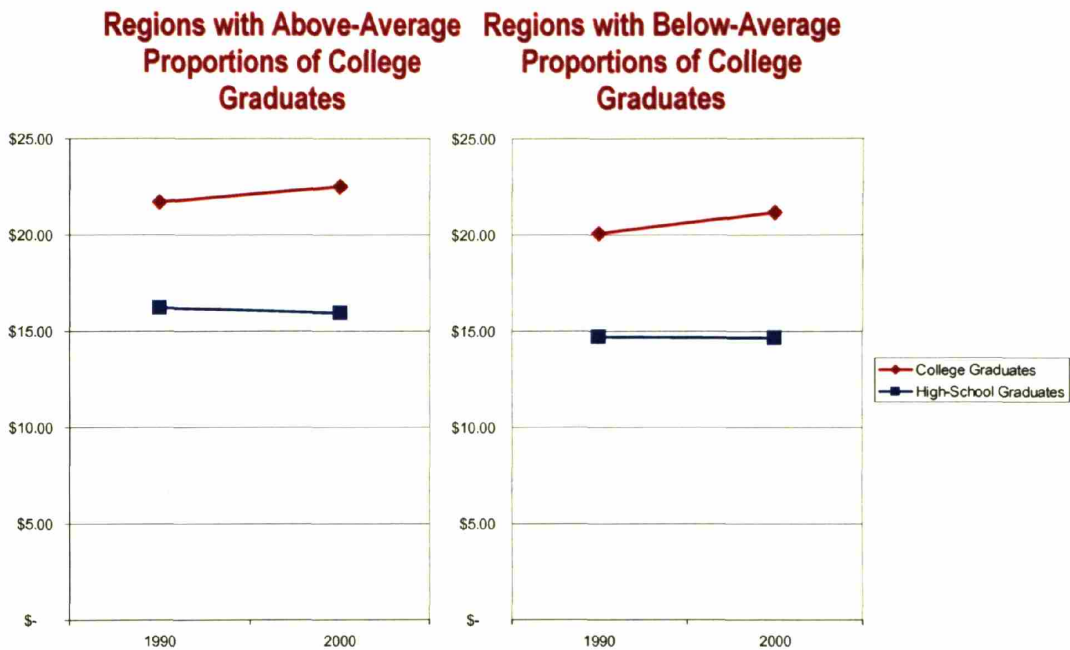
**Figure 18. Average Hourly Wages for Female Workers:
Regions with Above-Average Proportions of College Graduates vs. Regions with Above-Average Proportions of College Graduates, 1990-2000**



Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

This categorization shows that workers who reside in regions with education-intensive activity and high-tech regions have similar wage patterns, with the exception of high-school wages. However, it is not evident that a slowing down or decrease in high-school wages would result from demand changes. They seem to stem from changes in the overall composition of the workforce and its influence on an individual's decision to migrate into or out of a region. Furthermore, I note that divergence between skill groups is larger in regions with above-average proportions of college graduates than those with lower college graduate relative supply.

Figure 19. Average Hourly Wages for Male Workers:
Regions with Above-Average Proportions of College Graduates vs. Regions with Above-Average Proportions of College Graduates, 1990-2000



Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

Assessing Employment and Wage Growth During the 1990s

While in the previous sections I described the general patterns of high-tech activity, workforce composition and wages across the United States in a tabular, 2-dimensional way, in this section, I quantify the effect of these factors in determining how college graduates and high-school graduates fare in the presence of high-tech activity, and, more generally, in regions that follow a development path that is dependent on a more-educated labor force. Here, I present the results of two WLS (Weighted Least Square) regression models. In the first model, I explore the effect of the 1990 workforce composition, the 1992 economic-base composition, and *ex ante* regional characteristics over the 1990-to-2000 change in college and high-school graduate inflation-adjusted average hourly wages. In the second model, I explore the effect of the 1990 workforce composition, the 1992 economic-base composition, and *ex ante* regional characteristics over the

1990-to-2000 change in college and high-school graduate employment. In this model, the 1990 inflation-adjusted average hourly wage for each skill group and region is one of the independent variables. Each of these models includes six equations that comprise different portions of the 25-to-45-year-old labor force: a) all college-graduate-equivalent workers, b) all high-school-graduate-equivalent workers, c) male college-graduate-equivalent workers, d) male high-school-graduate-equivalent workers, e) female college-graduate-equivalent workers, and f) female high-school-graduate-equivalent workers. In this chapter I discuss a summary of the most critical findings from these regression results. Given the observed divergence in outcomes of females and males, as women gained territory in the 1990s work place, I focus on the regression results for all workers and males. However, all detailed regression-output tables for the employment and wage equations, including coefficients, their significance, and R square, among other, are part of Appendix A.

As previously stated, according to these models relative labor demand (a region's high-tech fraction of jobs), and relative labor supply (the proportion of college graduates in the workforce), at the beginning of the 1990s have opposing effects on how regions performed with regards to college- and high-school-graduate employment and wage growth during the decade. These models indicate that shifts in the relative composition of the regional economic base towards a bigger fraction of the job base in high-tech sectors cannot be held on its own responsible for exclusionary patterns reported in regions characterized by a large concentration of high-tech activity. Although this research does not provide sufficient evidence to claim that high-tech regions would exhibit wage patterns that are different from wage trends in regions of lower concentration of high-tech activity, I show that high-tech regions experience faster employment growth than their counterparts, in the absence of cost-of-living considerations.

First, the coefficients of the wage model equations (Model 1) show that the average hourly wages of low-skill workers tend to grow more slowly than those of high-skill labor ($B = -0.77$ vs. $B = -0.81$) regardless of the regional economic-base or workforce composition. With this in mind, I held all factors constant or identical across regions with the exception of the economic-base composition. Separately, I ran the same exercise holding all factors across regions with the exception of the composition of the workforce.

According to these exercises, when considering both female and male workers together, a change in the high-tech fraction of jobs did not produce a statistically significant effect on wages. This research did not find sufficient evidence to claim that changes in a region's economic-base composition would affect wage patterns (neither positively nor adversely) for either skill group, in the absence of cost-of-living and migration considerations. (Table 11)

An increase in the proportion of college graduates, however, benefits both college- and high-school-graduate wages more or less evenly, that is, that both experience comparable changes in wages in absolute terms (vs. percentage-wise) of \$0.07/hr per 1%-increase and prior to consideration of regional cost-of-living differences. In that sense, regions that become more- or less-educated by increasing or decreasing the proportion of college graduates in the workforce, respectively, would not experience statistically significant changes in equity or income (in)equality between skill groups in the same region, although those with higher proportions of college graduates would offer higher wages to both skill groups than would regions with lower proportions of college graduates. (Table 11)

Table 11. Wage Growth: 50 Metropolitan Areas in the United States, 1990-2000

Independent Variables	R-square = 0.69	R-square = 0.55	R-square = 0.70	R-square = 0.44
	College Graduates	High-School Graduates	College Graduates	High-School Graduates
1990 Wage for Skill Category				
	-0.771137 **	-0.814558 **	-0.837948 **	-0.852454 **
1990 Proportion of College Graduates				
	7.015951 *	7.35984 **	8.760829 **	1.307422
1992 Fraction of High-Tech Jobs				
	3.827061	-5.899637	-0.343675	-5.552301
New England (Reference Category for Ex Ante Regional Characteristics)				
South Atlantic	-1.586541 *	0.612347	-1.184241	0.131435
Middle Atlantic	0.498565	0.943538	-0.055026	0.813092
East North Central	-0.412673	1.086956	0.287232	1.182805
West North Central	-2.967729 **	1.269781	-4.847388 **	0.432134
East South Central	-0.481956	0.098688	-0.517282	-0.032211
West South Central	-0.558006	-0.302253	0.418892	-0.225907
Mountain	0.003263	2.112132 **	0.666328	1.642536
Pacific	-0.288612	1.048069	-1.114077	1.179347
(Constant)	13.773343 **	8.513252 **	16.42523 **	12.385798 **

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

* $0.20 \geq p \geq 0.10$ ** $p \leq 0.10$

When considering male workers alone, an increase in the proportion of college graduates results in wage increases for high-skill labor exclusively (\$0.08/hr per 1%-increase), not affecting low-skill labor wages in a statistically significant manner. Thus, excluding the impact of higher female participation in the workforce and greater gender equality in the workplace (i.e., looking at the wage patterns of males alone, regions with higher proportions of college graduates (or more-educated regions) would exhibit greater wage inequality between high- and low-skill labor than regions with a lower proportion of college graduates. (Table 11)

According to the employment model equations (Model 2), an increase in high-tech jobs is associated with increases in college-graduate- and high-school-graduate-equivalent employment, though at different levels. Specifically, a 1%-increase in the high-tech fraction of all jobs is associated with a 903-worker increase in college graduate employment and a 439-worker increase in high-school graduate employment, holding all other factors constant, a 9:4 college-to-high-school graduate ratio or proportion in the 1990-to-2000 employment growth of a region. This means that of every 13 people who gained employment during the 1990s from growth in high-tech activity –including direct, indirect and induced jobs, nine are likely to have at least a college degree or equivalent. The remaining four workers would have less than college-graduate equivalence. When considering male workers alone, the breakdown of employment growth during the 1990s resulting from a 1%-increase in the high-tech fraction of jobs is an 8:3 college-to-high-school-graduate ratio. Analogous to the previous comparison, this means that eight of 11 males that gain employment from an increase in high-tech activity have at least a college degree or equivalent, while the remaining three do not. (Table 12)

Thus, when comparing two regions that are identical in every way (i.e., size, workforce composition, weather, etc.), except with regards to their relative economic-base composition (i.e., high-tech jobs vs. all jobs), the region with the highest high-tech fraction of jobs would experience the largest gain in both high- and low-skill employment. These upsurges in high-skill and low-skill employment, given no evident change in wages for either group, clearly indicates that a shift towards more high-tech activity also would increase demand for both skill categories, this effect being more substantial for college graduates than for high-school graduates, holding all other factors constant. (Table 12)

Table 12. Employment Growth: 50 Metropolitan Areas in the United States, 1990-2000

Independent Variables	All Workers		Male Workers	
	R-square = 0.76 College Graduates	R-square = 0.26 High-School Graduates	R-square = 0.67 College Graduates	R-square = 0.54 High-School Graduates
1990 Wage for Skill Category	179.072388	71.498878	116.184107	-398.062064 *
1990 Supply of Skill Category	0.973758 **	-0.079458 *	0.708752 **	-0.140991 **
1990 Proportion of College Graduates	-59758.80338 **	-4253.39846	-40422.6669 **	-12142.0644 *
1992 Fraction of High-Tech Jobs	90255.94241 **	43882.1281	84087.0548 **	27991.2873 *
New England (Reference Category for Ex Ante Regional Characteristics)				
South Atlantic	9857.396575 **	143.819866	3668.90431 *	-2083.08936
Middle Atlantic	-701.610505	-16485.4526	-1771.02002	-8949.71338
East North Central	-46386.99146 **	-2901.50528	-13164.653 *	-5405.54699
West North Central	8327.707623 **	-1022.4803	969.752711	-2578.0024 *
East South Central	9770.895719 *	-2276.01181	5218.69757	1235.82787
West South Central	236.859294	10538.0607	-1600.26823	1404.4333
Mountain	10765.44222 **	8188.71718 *	4079.99782 **	2848.52958 *
Pacific	16377.40776 **	5087.61538	10178.678 **	2727.81161 *
(Constant)	3581.700871	-4232.42496	5484.56623 *	9372.43883 *

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

* $0.20 \geq p \geq 0.10$ ** $p \leq 0.10$

Conversely, a 1%-increase in the proportion of college graduates or relative workforce composition results in employment-growth shrinkage for both college- and high-school graduate labor, holding all other factors constant. For that percentage change in this proportion, high-skill employment-growth decreases by 598 workers, while the equivalent change leads to a low-skill employment-growth reduction of 425 workers, a 3:2 college-to-high-school-graduate ratio in the 1990-to-2000 employment-growth shrinkage of a region. When considering male workers alone, the breakdown of this employment-growth reduction during the 1990s resulting from a 1%-increase in the proportion of college graduates is a 4:1 college-to-high-school-graduate ratio. Consequently,

when comparing two regions that are identical in every way (i.e., size, economic-base composition, weather, etc.) except with regards to their relative workforce composition (i.e., proportion of workers who hold at least a college degree or equivalent), the region with the highest proportion of college graduates would experience the smallest growth in both high- and low-skill employment. (Table 12)

As the composition of the workforce varies to become more-educated (i.e., larger proportion of college-equivalent labor), employment growth for both labor types slows down, more significantly for high-skill workers, hindering the region's capacity to sustain long-term economic growth from education-intensive activity. Furthermore, this drop in high-school graduate employment growth suggests that the increase in wages that they would experience as regions become more-educated could stem from changes in supply and not from spillover demand for low-skill labor. Chapter 6, pertaining to migration patterns, explores changes in labor inflows and outflows resulting from this variable.

Regional Cost-of-Living Differences and their Impact on Wage and Employment Determination

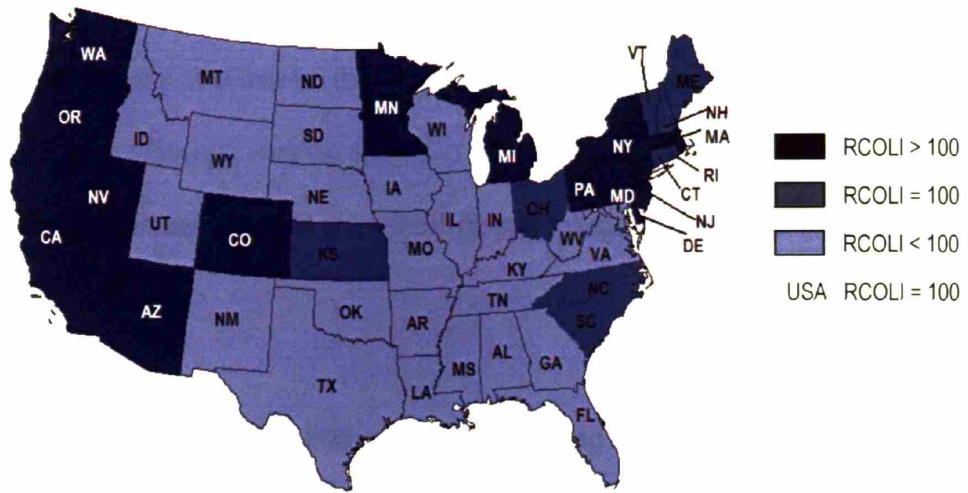
Cost-of-living was an important determinant of how low-skill and high-skill workers performed in the Boston-Nashville case study, especially affecting the purchasing power of wages at each location. Here, I explore whether or not an association exists between increases in high-tech activity and cost-of-living hikes and/or between labor supply shifts towards a larger concentration of college graduates and higher cost-of-living across these 50 regions in the United States.

Five of the 50 regions included in this study (10%) did not experience a significant change in cost-of-living relative to national levels (i.e., their cost-of-living increased in absolute terms but

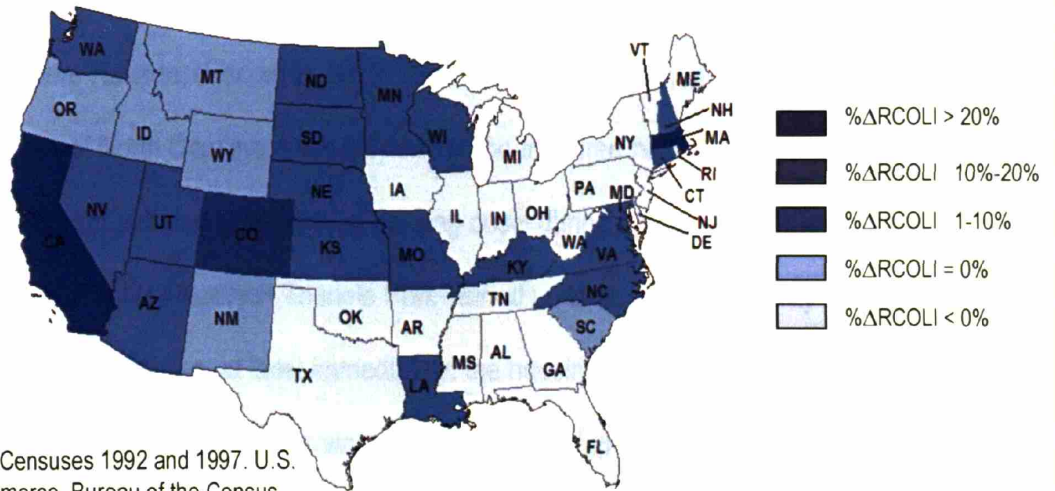
this growth was comparable to national values). Approximately 56% (28) of the regions decreased their costs-of-living, while only 34% (17) exhibited significant increases in this factor. (Figure 20)

Figure 20. Regional Cost-of-Living Index (RCOLI): Geographic Patterns, 1990-2000

20.a. Regional Cost-of-Living Index 2000



20.b. Percentage Change in Regional Cost-of-Living Index, 1990-2000



Source: Economic Censuses 1992 and 1997. U.S. Department of Commerce, Bureau of the Census.

The housing component of the regional costs-of-living index is the largest and heaviest source of living expenses in all regions throughout the United States; however, this component

exhibits somewhat different patterns with regards to changes in those regions. This housing component increased in 15 regions (30%), decreased in 34 regions (68%), and in one region (2%) did not change at all, relative to national values. For example, all of the regions that did not change its costs-of-living index significantly were able to do so partly because the national housing-cost growth rate exceeded their own, which translates into an overall decrease in the housing component of the index in each of these areas. Twenty-six of the regions that experienced decreases in the costs-of-living also lowered their housing component of the index during the 1990s. Only Oklahoma and Georgia were exceptions to this pattern. While the housing component of the former increased 5% that of the latter did not change at all (relative to national averages).

With the exception of four regions that lowered their housing costs relative to national averages, the majority (13 of 17) of the regions that increased their regional costs-of-living index significantly during the 1990s also raised the housing component of the index in the same period. These exceptions were Nevada, Wisconsin, North Carolina, and Kentucky. It is worth noting that the metropolitan area of North Carolina is the only one of the top three high-tech regions in the United States that did not suffer of increasing housing costs during the decade. This is due at least partly to the fact that the Research Triangle Park started up in an area with plenty of space available to grow without affecting, at least immediately, the housing market. Conversely, the high-tech areas of California and Massachusetts were already highly urbanized, thus exhibiting high housing costs relative to the United States.

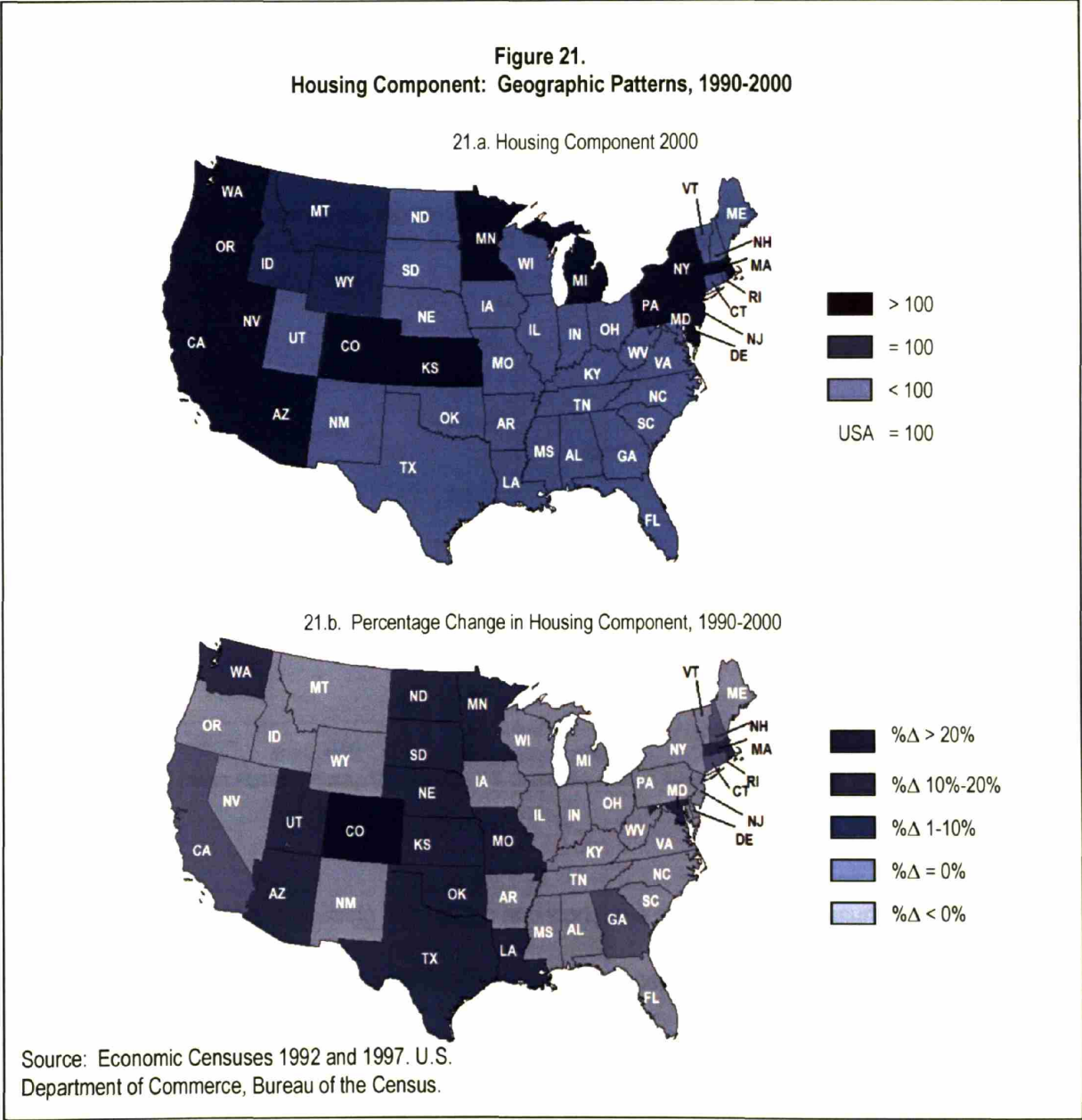
The 1990-to-2000 change in high-tech concentration seems to exert a limited impact over changes in this regional cost-of-living index. The variation in the 1990-to-2000 percentage change

of the high-tech location quotient seems to explain only about 5% of the variation in regional cost-of-living index, and 6% of the variation in its housing component. The variation in the 1990-to-2000 percentage change in the fraction of the job base that high-tech employment accounts for, however, seems to explain about 12% of the variation in regional cost-of-living index, and 25% of the variation in the housing component. According to a WLS (Weighted Least Square Regression), holding all other *ex ante*, location-specific factors constant, a 1%-increase in that fraction between 1992 and 1997, predicted a 2%-increase in the housing component of the cost-of-living index over the entire decade (p -value=0.059). Furthermore, these costs increased more rapidly in small states and those states of which their metropolitan area was largely built up and/or had policy or geographic restrictions to urban growth, e.g., the New England states. (See Figures 21a-21b)

The magnitude of the effect from the interaction of high-tech activity and regional cost-of-living differences is most noticeable in the wage patterns of these regions. Adjusting the average hourly wages for these differences, in each skill category and region type, significantly changes the patterns that I discussed earlier. I used the Regional Cost-of-Living Index to bring all wages to 2000 United States dollars (RCOLI for USA=100), as a measure of purchasing power at each region.

When I control for this factor, while workers (both male and female) who resided in high-tech regions started the decade with higher wages than equivalent-skill labor in non-high-tech regions, by 2000, those who resided in regions of low high-tech location quotient had gains that allowed them to exceed the wage rates for regions of high concentrations of high-tech activity. High-school graduate wages remained stagnant (from \$13.06 to \$13.08) in high-tech regions during the 1990s; while those of college graduates experienced a 3%-increase (from \$17.95 to

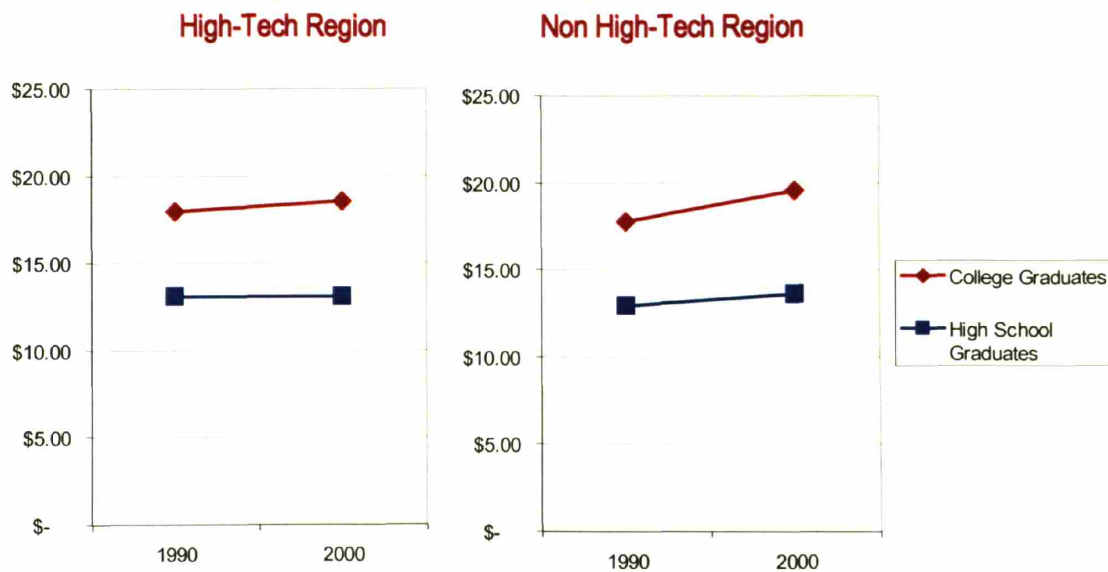
\$18.55). In non-high-tech regions, while high-school graduate wages went up 5% (from \$17.73 to \$19.59), those of college graduates rose 10% (from \$12.93 to \$13.59). (See Figure 22)



Considering male workers alone, college graduates who resided in non-high-tech regions sustained higher wages and wage growth rate than equivalent-skill labor in high-tech regions throughout the entire decade. In high-tech regions they experienced a 2% wage increase (from

\$19.56 to \$20.02), while in regions of low high-tech location quotient the equivalent group obtained a 9% gain (\$20.16 to \$22.06). Male high-school graduates performed significantly different across region types as well. The wages of those who resided in non-high-tech regions went up from \$14.70 to \$15.25 (a 4%-increase). Those who resided in high-tech regions had a 3%-decrease instead (from \$14.76 to \$14.38). (See Figure 23)

**Figure 22. Cost-of-Living-Adjusted Average Hourly Wages for All Workers:
High-Tech vs. Non High-Tech Regions, 1990-2000**

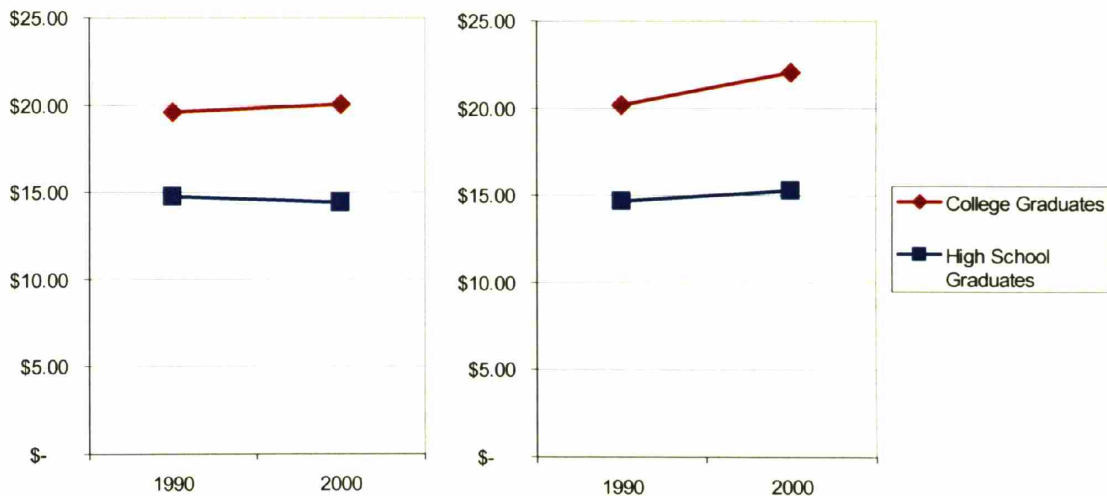


Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

The interaction of cost-of-living differences and workforce composition, measured as the proportion of college graduates in a region, is different than that between cost-of-living and high-tech concentration. In this case, when controlling for regional cost-of-living differences, wages for college graduates and high-school graduates (both male and female) were higher in regions of above-average proportions of college graduates than in regions of below-average proportions of college graduates at the beginning of the decade (\$18.25 vs. \$16.97 for college graduates; \$13.29 vs. \$12.57 for high-school graduates). However, wages for both groups grew much more quickly in

less-educated regions (13% vs. 6% for college graduates; 6% vs. 2% for high-school graduates), bringing these region-types towards convergence in wages (\$19.27 vs. \$19.19 for college graduates; \$13.50 vs. \$13.34 for high-school graduates). (Figure 24)

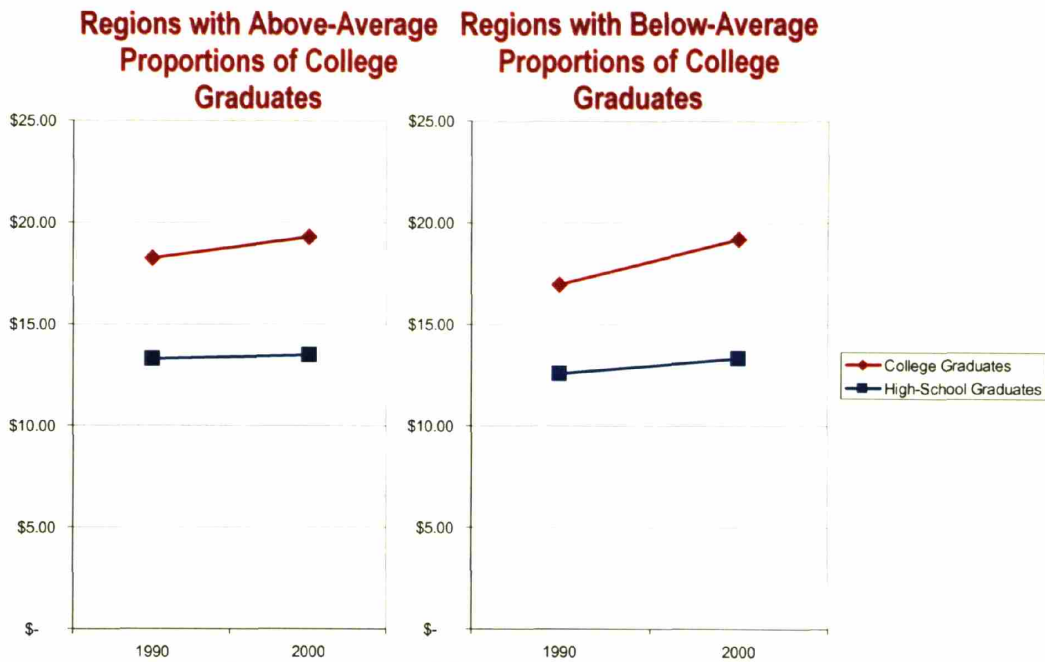
**Figure 23. Cost-of-Living-Adjusted Average Hourly Wages for Male Workers:
High-Tech vs. Non High-Tech Regions, 1990-2000**



Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

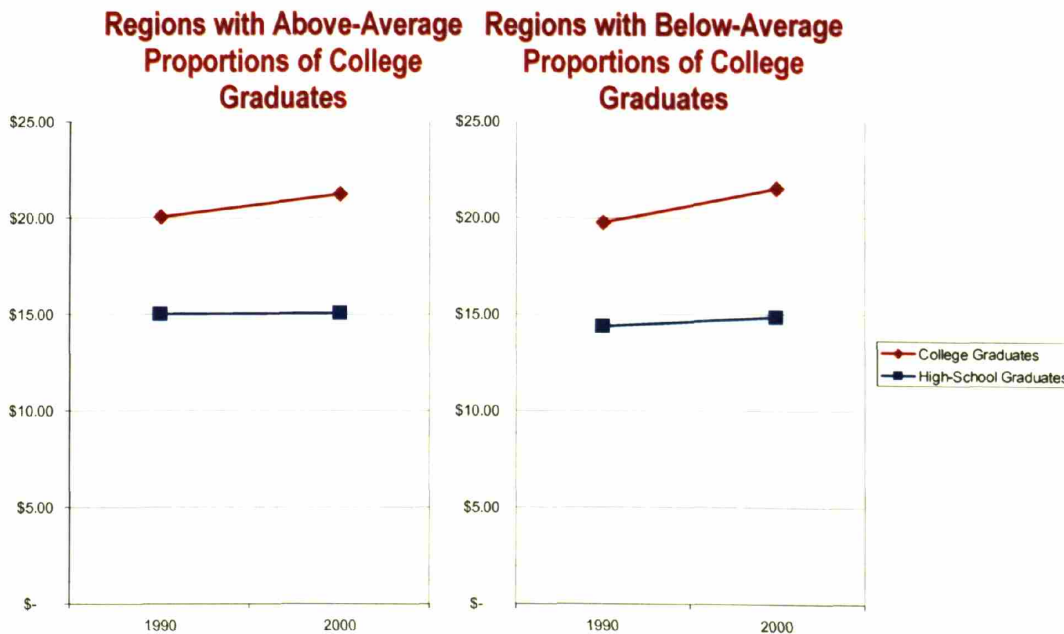
Considering males alone, not only did college graduate wages increased more quickly in less-educated regions but also (8% vs. 6%), by the end of the decade, they had exceeded the equivalent wage rate for high-skill labor in more-educated regions (\$21.53 vs. \$21.25). Although high-school graduate wages were lower in less-educated regions than in more-educated regions, throughout the decade, they grew faster in regions with below-average proportions of college graduates than in those with a larger proportion of high-skill supply (3% in less-educated regions vs. nearly stagnant in more-educated regions). (Figure 25) These patterns suggest that cost-of-living exacerbates wage inequality in high-tech regions. Furthermore, that effect is more significant in regions with relatively large proportion of college graduates.

**Figure 24. Cost-of-Living-Adjusted Average Hourly Wages for All Workers:
Regions with Above-Average Proportions of College Graduates vs. Regions with Above-Average Proportions of College Graduates, 1990-2000**



Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

**Figure 25. Cost-of-Living-Adjusted Average Hourly Wages for Male Workers:
Regions with Above-Average Proportions of College Graduates vs. Regions with Above-Average Proportions of College Graduates, 1990-2000**



Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

I re-ran the employment and wage models of the previous section, this time controlling for regional-cost-of-living differences. As previously stated, Models 3 and 4 are identical in structure to Models 1 and 2 with the exception of the cost-of-living adjustment to wages. In Model 3, pertaining to wage changes, although the R square drops for all its equations, cost-of-living increases the significance of the coefficients, that is, the significance of the impact that each factor exerts over the change in wages for each skill group. Cost-of-living generally increases the R-square of the employment growth model (Model 4).

The cost-of-living adjustment exerts a small positive effect on the wage outcomes of high-skill labor. Once cost-of-living is taken into account, college graduates earn \$0.01/hr more than prior to the adjustment. That is not the case for high-school graduates, though. When cost-of-living differences are taken into consideration, an increase in the proportion of college graduates results in smaller wage gains for low-skill labor than prior to cost-of-living adjustments, a \$0.02/hr drop, which would create growing inequality between skill groups in a region that is becoming more high-tech intensive. Similarly, an increase in the high-tech fraction of jobs when cost-of-living differences are taken into account yields larger wage losses for low-skill workers ($B = -\$0.06/\text{hr}$ per 1%-increase vs. $B = -\$0.08/\text{hr}$ per 1%-increase) than prior to cost-of-living adjustments. This pattern suggests that the apparently high wages that more-educated regions offer to low-skill labor are due at least partially to cost-of-living differences and that they are not indicative of a better level-of-living. (Table 13)

According to the employment model equations (Model 4) cost-of-living adjustments do not change the proportion of the impact derived from a region's relative workforce composition, as measured by the share of college graduates in that region, on overall college graduate and high-school graduate employment growth in a significant way. After cost-of-living adjustments, an

increase in the high-tech fraction of all jobs results in smaller increases in high-skill-labor employment (both men and women) than prior to such an adjustment (B=903 per 1%-increase vs. B=827 per 1%-increase). (Table 14)

**Table 13. Wage Growth: 50 Metropolitan Areas in the United States, 1990-2000
Cost-of-Living Adjusted**

Independent Variables	All Workers		Male Workers	
	R-square = 0.53	R-square = 0.44	R-square = 0.65	R-square = 0.42
	College Graduates	High-School Graduates	College Graduates	High-School Graduates
1990 Wage for Skill Category	-0.762792 **	-0.595504 **	-0.815357 **	-0.79035 **
1990 Proportion of College Graduates	8.071105 *	5.2891 *	9.1575 **	0.652233
1992 Fraction of High-Tech Jobs	1.204204	-8.493025 **	-4.931985	-6.04812
New England (Reference Category for Ex Ante Regional Characteristics)				
South Atlantic	-0.135272	2.062031 **	1.890703	1.376602
Middle Atlantic	1.02846	1.511204 *	1.432249	0.896612
East North Central	1.082753	2.12594 **	3.025175 **	2.151183 *
West North Central	-1.748801 *	2.05354 **	-2.29581	1.313329
East South Central	1.80164	1.796488 *	3.26506 *	1.600791
West South Central	1.27089	1.457 *	4.4794 **	1.518019
Mountain	0.235468	2.556493 **	2.532415 *	2.032154 *
Pacific	-0.59561	0.437502	-0.897456	0.557925
(Constant)	11.977903 *	5.385695 **	13.466455 **	10.771177 *

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

* 0.20 ≥ p ≥ 0.10 ** p ≤ 0.10

When considering male workers alone, an increase in the high-tech fraction of jobs results in smaller employment gains for college graduates (B=841 per 1%-increase vs. B=803 per 1%-increase) and larger labor supply gains for high-school graduates (B=280 per 1%-increase vs. B=313 per 1%-increase) when there are no cost-of-living differences across regions than when this factor is allowed to vary from one region to another. An increase in the proportion of college graduates produces smaller employment-growth drops for male high-school graduates (B=-121 per 1%-increase vs. B=-116 per 1%-increase) when regions have the same level of cost-of-living than when this factor was not accounted for in the regression models. (Table 14)

**Table 14. Employment Growth: 50 Metropolitan Areas in the United States, 1990-2000
Cost-of-Living Adjusted**

Independent Variables	All Workers		Male Workers	
	R-square = 0.76	R-square = 0.27	R-square = 0.67	R-square = 0.54
	College Graduates	High-School Graduates	College Graduates	High-School Graduates
1990 Wage for Skill Category	298.654981	1366.73085	166.536328	-38.380894
1990 Supply of Skill Category	0.965902 **	-0.088224 *	0.700854 **	-0.155894 **
1990 Proportion of College Graduates	-59668.9655 **	-17290.414	-39862.765 **	-11586.585 *
1992 Fraction of High-Tech Jobs	82697.21569 **	53377.8702	80302.7762 **	31346.5395 **
New England (Reference Category for Ex Ante Regional Characteristics)				
South Atlantic	8668.502504 **	-1922.4444	3161.76715 *	-1841.7204
Middle Atlantic	-243.354355	-16883.176	-1300.1005	-7028.4625
East North Central	-46906.1369 **	-5995.6585	-13570.602 *	-3888.1646
West North Central	7067.203624 **	-3894.902	256.560993	-1481.709
East South Central	8782.952409	-6698.8756	4720.76239	1166.73589
West South Central	-801.540641	8762.69307	-2142.0534	2559.12739
Mountain	9713.612903 **	4316.55613	3657.86849 **	2682.79258
Pacific	16093.02817 **	5239.4373	10261.1451 **	1992.75036
(Constant)	2910.205248	-13971.429	5024.66165	3309.23484

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

* 0.20 ≥ p ≥ 0.10 ** p ≤ 0.10

Finally, holding cost-of-living-adjusted wages constant (along with all other variables), geography and location-specific traits (such as weather, size, and other non-labor-market-related regional characteristics) no longer exert a statistically significant effect on employment growth of either skill level. (Table 14) This means that once cost-of-living is constant across regions locations lose amenity value. Chapter 6 explores further how this pattern affects migration flows in and out of these metropolitan areas.

Summary of Findings

In this chapter, we see that although certain regions around the country, such as those states in both coasts and around the Great Lakes, seem to experience or are more prone to increases in costs-of-living than others (like Middle America), high-tech growth also contributes to those changes particularly by attracting both firms and workers in search for better job opportunities and pay, thus, rising housing costs for everyone in a region. However, we also find that it is possible to become a leading high-tech region without suffering extreme increases in housing prices, as it is the case in North Carolina, which experienced minor increases in overall costs-of-living but also had a decrease in housing prices relative to national averages (i.e., the increases in costs-of-living came from other components such as transportation, food, entertainment and education, among others). A weighted least squares (WLS) regression revealed that a 1%-increase in the high-tech fraction of jobs could result in a 2%-increase in the housing component of the regional cost-of-living index (USA=100), which suggests that pursuing a high-tech path to development in a region that is already expensive to live in could limit the number of workers who could afford to live there and in doing so potentially hinder the region's capacity to grow. This is consistent with the housing prices, employment, wages and migration patterns that were observable in Boston during the 1990s and that were discussed in Chapter 4.

With regards to wages, those workers who resided in high-tech regions on average experienced slower growth in wages and had lower wages by 2000 than did workers who resided in regions of a low LQ_{ht} , regardless of skill level. Any sizable changes in wages for workers who resided in high-tech regions during the 1990s seem to stem at least partially from an increase in the participation of women in the regional workforce and improvement in their wage rates. High-

tech regions started the decade with higher wages and had less space for these wages to grow, while non-high-tech regions started low and were able to catch up with them.

When costs-of-living differences are accounted for, given the relationship between high-tech growth and costs-of-living patterns, workers who reside in high-tech regions earn less than those who reside in non-high-tech regions. The situation is particularly harmful for male high-school graduates who actually suffer drops in cost-of-living-adjusted wages. All women caught up in wages with males of equivalent skill level in each region type. All skill categories, though, end up with greater purchasing power in non-high-tech regions, regardless of gender. Furthermore, I reasonably argue that growth in wages was more equitable in non-high-tech regions. Contrary to wage patterns in high-tech regions, both college and high-school graduates experienced similar percentage increases in wage rates in non-high-tech regions during the 1990s.

The results of the models included in this analysis confirm these findings. Increases in high-tech activity drive up employment growth for all skill groups, more markedly for college graduates than for low-skill labor. This on its own, however, does not exert an adverse effect on how workers perform across regions. As a matter of fact, the relative composition of the workforce has an opposing effect to that of economic-base composition. Regions with higher proportions of college graduates experienced smaller increases in employment for either skill level; however, the deterrence effect is larger for college graduates who associate smaller returns to migration in the presence of greater competition in the regional workforce. According to the models, a development strategy that is centered on a more-educated labor force, i.e., relatively high proportion of college graduates, has a leveling-off effect which slows down overall employment growth. This, in turn, would limit a region's capacity to sustain growth using their more-educated labor as its competitive edge.

Once cost-of-living differences are considered three patterns emerge. First, regions with higher proportions of college graduates exert a larger deterrence effect, and thus, grow even more slowly with regards to high-skill employment, than prior to cost-of-living adjustments. Second, the negative impact that regions with larger high-tech concentrations had on high-school graduate wages is further accentuated. Finally, when cost-of-living-adjusted wages and all other variables in the model are held constant, with the exception of the West North Central division, all other regions (with significant coefficients) experienced larger wage gains for both college graduates and high-school graduates than did New England. Under these conditions, the Pacific region loses terrain as a competitor for New England, both in labor attraction and attainable wage rates.

This would suggest that the negative impacts observable today in so-called high-tech regions do not come directly from changes in demand but instead from changes in the composition of the workforce throughout a decade. This factor can increase cost-of-living by increasing absolute labor supply (which translates into larger demand for housing). It can affect wage determination as well by determining relative supply of low-skill vis-à-vis high-skill supply. In the following chapter, I analyze the impact of economic-base and workforce composition on migration flows and the effect of this on employment and wage determination during the 1990s.

Chapter 6. Regional Economic-Base and Workforce Composition and Migration Patterns

In Chapter 5, I showed that changes in the composition of the workforce played a significant role on how regions fared at the end of the 1990s, specifically with regards to the employment and wage patterns of college and high-school graduates. Furthermore, putting aside its impact on housing demand and costs-of-living during that decade, in the Boston-Nashville comparative case study (Chapter 4), migration was an important determinant of employment and wage growth between 1990 and 2000. In this chapter, thus, I test whether or not an economic development strategy that is based on the promotion of high-tech activities and/or the abundance of highly educated labor can exert a differentiated pull into a region or push out of a region on high-skill workers vis-à-vis low-skill workers. More importantly, I explore the impact of migration patterns on labor supply and wage changes of college and high-school graduates across 50 metropolitan areas in the United States in an effort to discern whether or not the workforce composition and wage patterns that were observable in Boston are common to all areas of high concentration of high-tech activity and/or large concentrations of more-educated labor.

First, as I did at the beginning of Chapter 5, I break down the national population of 25-to-45 years of age who are active in the labor force into those who by the end of the 1990s resided in a high-tech region and those who resided in a region of low high-tech concentration. I also categorize them according to whether in 1990 they resided in a region with an above-average proportion of college graduates or a region with a below-average proportion of workers of that skill level. Then, for each region type, I aggregated these workers according to their skill level and migration status. I separated college and high-school graduate workers into non-migrants, if they stayed within the metropolitan area of residence, or non-migrants if they moved into the region from a non-metropolitan area in the same state, from another state in the United States, or from

another country. I found the total count and proportions as well as wages for each skill and migration category.

Finally, I present another set of four WLS (Weighted Least Square) regression models. The first one (Model 5) looks at the migration patterns at the end of the decade, i.e., those workers who came into the region between 1995 and 2000, as a function of the 1990 workforce composition, the 1992 economic-base composition, *ex ante* regional characteristics and the difference between the 1990 regional and national average wages for each skill category. The second model (Model 6) measures the impact of migration between 1985 and 1990, the 1990 workforce composition, the 1992 economic-base composition and location-specific regional traits on the 1990-to-2000 wage changes for college and high-school graduates. Both of these models consider inflation-adjusted wages. Models 7 and 8 are identical in structure to Models 5 and 6. However, they include inflation- and cost-of-living-adjusted wages.

I found that, during the 1990s, the United States as a whole experienced an overall increase in migration across states (domestic migration) and from other countries (foreign migration). However, movement from non-metropolitan to metropolitan areas (within-state) decreased significantly, partly due to suburbanization and sprawl.

According to this study, workers who hold at least a college degree or equivalent exhibit greater mobility than low-skill labor, which allows them to adjust to employment and wage opportunity changes through migration. Workers also respond differently to employment and wage opportunity changes according to gender. While female college graduates performed better than males (i.e., obtained larger increases in workforce participation, employment and wages), female high-school graduates were the least mobile group perhaps for being the group that is the most

susceptible to disruptions of their existing social support nets. This tendency, in turn, affected negatively their wage and employment performance relative to their male and more-educated counterparts.

Changes in the relative composition of the workforce, towards more-educated or less-educated, and shifts in the composition of the regional economic base, towards more high-tech activity or less high-tech activity, as well as variations in regional cost-of-living are drivers of migration flows as well. As a matter of fact, the most important findings of this chapter deal with the impact of migration on long-term economic growth and wage determination. I found that if migration could stay identical across regions, college graduate and high-school graduate wages would tend towards convergence. I provide evidence that although high-tech activity attracts immigration of both college graduates and high-school graduates increasing their supply and affecting their wages, holding all else constant (cost-of-living and migration, particularly), an increase in that activity, on its own, does not result in physical displacement. Conversely, as the proportion of college graduates increases it reduces non-migrant supply, that is, the number of workers who are able to stay in the region. An increasingly large proportion of college graduates slows down growth in non-migrant supply, crowding or displacing them out of the region. These patterns suggest that a development path that relies on maintaining a relatively high proportion of college graduates would be self-limiting, as migration would change the composition of the workforce over time and compete away the competitive edge of more-educated regions.

Migrant Contribution to Regional Labor Supply.

In Chapter 5, I showed that the skill composition of the workforce is very different for high-tech and non-high-tech regions. As it is observable in Table 15, the contribution of migration to

labor-force composition in these region types is also different. However, before discussing the differences in the migratory patterns of these regions, I would like to highlight that during the 1990s the United States experienced an overall increase in migration across states and countries (i.e., domestic and foreign migration). Nonetheless, there was also a decrease in within-state migration, that is, migration from a non-metropolitan area of the state into its metropolitan core. Furthermore, although the number of high-school graduates who do not migrate at the national level increased during the decade, that increase was significantly smaller than the equivalent percentage increase for college graduates. This, in conjunction with significantly smaller increases in immigration of high-school graduates from other states and countries, confirms that workers of this level of skill tend to exhibit lower mobility than do college graduates.

That said, in general, non-high-tech regions experienced a larger percentage-decrease in within-state immigration and a larger percentage-increase in foreign and domestic immigration than did high-tech regions. High-tech regions seem to exert a deterrence effect, relative to non-high-tech regions, on all migrant groups, with the exception of high-school graduates who migrate from abroad. (Table 15)

As stated in Chapter 5, between 1990 and 2000 college graduate supply grew more slowly in high-tech regions than in non-high-tech regions (19% vs. 23%). So it did in regions of above-average proportions of college graduates as compared to regions with below-average proportions of more-educated labor (20% vs. 23%). Conversely, net high-school supply increased more quickly in regions of large high-tech concentration and high proportions of college graduates (13% vs. 11%; 15% vs. 8%). (Tables 15 and 16)

**Table 15. Labor Supply Growth According to Migrant Status and Skill Level:
High-Tech vs. Non-High-Tech Regions in the United States;1990-2000**

Workers who are in the Labor Force (25-to-45 Years Old)						
	Non-High-Tech Region			High-Tech Region		
	1990	2000	%Δ	1990	2000	%Δ
All College Graduates						
Non-Migrant	357,363	626,829	0.75	148,590	262,769	0.77
Migrants	347,030	237,626	(0.32)	179,591	126,396	(0.30)
Migrant from Non-Metropolitan Area in State	223,595	78,703	(0.65)	115,431	47,753	(0.59)
Foreign and Domestic Migrant	123,435	158,923	0.29	64,160	78,644	0.23
Foreign Migrants	16,124	29,433	0.83	9,785	15,500	0.58
Domestic Migrants	107,311	129,490	0.21	54,375	63,144	0.16
All High-School Graduates						
Non-Migrant	438,277	641,963	0.46	149,826	244,313	0.63
Migrants	273,223	145,043	(0.47)	126,499	69,016	(0.45)
Migrant from Non-Metropolitan Area in State	193,026	57,644	(0.70)	90,161	30,908	(0.66)
Foreign and Domestic Migrant	80,197	87,399	0.09	36,338	38,108	0.05
Foreign Migrants	16,212	17,429	0.08	6,741	8,106	0.20
Domestic Migrants	63,985	69,971	0.09	29,597	30,003	0.01
Male College Graduates						
Non-Migrant	190,131	306,308	0.61	79,685	132,895	0.67
Migrants	195,173	129,775	(0.34)	101,963	68,546	(0.33)
Migrant from Non-Metropolitan Area in State	121,474	40,960	(0.66)	63,861	24,403	(0.62)
Foreign and Domestic Migrant	73,700	88,815	0.21	38,102	44,143	0.16
Foreign Migrants	10,426	17,971	0.72	6,202	9,507	0.53
Domestic Migrants	63,273	70,844	0.12	31,900	34,636	0.09
Male High-School Graduates						
Non-Migrant	228,246	343,024	0.50	77,652	130,396	0.68
Migrants	146,528	80,892	(0.45)	70,515	39,059	(0.45)
Migrant from Non-Metropolitan Area in State	103,167	31,808	(0.69)	49,357	17,099	(0.65)
Foreign and Domestic Migrant	43,360	49,084	0.13	21,157	21,960	0.04
Foreign Migrants	7,202	10,421	0.45	4,230	4,885	0.15
Domestic Migrants	36,159	38,663	0.07	16,928	17,075	0.01

Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

During the same period, the number of college graduates who had migrated into high-tech regions from another state or country increased 23%. However, that value was six percentage-points below the growth rate for this migrant group in regions of low high-tech concentration (29%). Although foreign migration of college graduates experienced faster growth (58%) than domestic migration (16%), it only accounts for a small portion of the population growth during the decade. Furthermore, the growth rates for college graduate equivalent foreign and domestic migrants are

significantly lower in high-tech regions than in non-high-tech regions, with 83% and 21%, respectively. (Table 15 and 16)

Table 16. Labor Supply Growth According to Migrant Status and Skill Level: Regions with Below- and Above-Average Proportions of College Graduates in the United States; 1990-2000

Workers who are in the Labor Force (25-to-45 Years Old)						
	Region with Below Average Proportion of College Graduates			Region with Above Average Proportion of College Graduates		
	1990	2000	%Δ	1990	2000	%Δ
All College Graduates						
Non-Migrant	217,728	373,888	0.72	254,520	454,656	0.79
Migrants	206,439	146,331	(0.29)	286,246	195,654	(0.32)
Migrant from Non-Metropolitan Area in State	125,374	46,144	(0.63)	189,944	72,453	(0.62)
Foreign and Domestic Migrant	81,065	100,187	0.24	96,303	123,202	0.28
Foreign Migrants	8,438	15,715	0.86	15,616	25,906	0.66
Domestic Migrants	72,627	84,472	0.16	80,687	97,295	0.21
All High-School Graduates						
Non-Migrant	292,412	406,033	0.39	260,482	423,294	0.63
Migrants	172,166	93,950	(0.45)	203,163	107,777	(0.47)
Migrant from Non-Metropolitan Area in State	113,478	34,009	(0.70)	150,507	48,838	(0.68)
Foreign and Domestic Migrant	58,688	59,941	0.02	52,656	58,939	0.12
Foreign Migrants	10,959	9,913	(0.10)	10,726	13,807	0.29
Domestic Migrants	47,729	50,028	0.05	41,930	45,132	0.08
Male College Graduates						
Non-Migrant	115,746	183,127	0.58	136,115	226,343	0.66
Migrants	116,514	79,327	(0.32)	161,636	106,817	(0.34)
Migrant from Non-Metropolitan Area in State	67,894	23,339	(0.66)	104,508	37,771	(0.64)
Foreign and Domestic Migrant	48,619	55,988	0.15	57,129	69,046	0.21
Foreign Migrants	5,479	9,610	0.75	9,956	15,849	0.59
Domestic Migrants	43,141	46,378	0.08	47,173	53,197	0.13
Male High-School Graduates						
Non-Migrant	151,652	219,466	0.45	135,758	224,129	0.65
Migrants	91,291	52,287	(0.43)	112,418	60,759	(0.46)
Migrant from Non-Metropolitan Area in State	60,197	18,491	(0.69)	81,955	27,202	(0.67)
Foreign and Domestic Migrant	31,094	33,796	0.09	30,463	33,557	0.10
Foreign Migrants	3,973	5,973	0.50	6,679	8,259	0.24
Domestic Migrants	27,121	27,823	0.03	23,784	25,298	0.06

Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

The number of college graduates who did not migrate from another territory increased in both high-tech and non-high-tech regions. Although the growth rate for this group was higher in high-tech regions than in regions of low high-tech location quotient (77% vs. 75%), it did not reach the same average level of absolute supply of workers in this category as did non-high-tech regions

(from 357,363 to 626,829 vs. 148,590 to 262,769). This could be the result of two opposing forces: the sprawling or suburbanization of America that has driven many people far from metropolitan cores, and the clustering of activities for innovation purposes. At this point it seems like the clustering of high-tech activity has not been sufficiently strong to counteract the flows of people out of urban areas. Furthermore, it seems like college graduates are more likely to migrate out of a high-tech region than from a non-high-tech region once they get there. Similarly, workers who move out from a high-tech region are more likely to be college graduates than high-school graduates. (Table 15)

During the same period the number of high-school graduates who migrated into a region from another state or country increased 5% in high-tech regions and 9% in regions of low high-tech concentration. The growth rate for aggregated domestic and foreign migration is larger in non-high-tech regions than in regions with high concentrations of high-tech activity (9% vs. 5%). Although the growth rate for foreign migration, by itself, is larger in high-tech regions than in non-high-tech regions (20% vs. 8%), the absolute supply of this group in the former never meets that of the latter (from 6,741 to 8,106 vs. 16,212 to 17,429). Non-migrant supply of high-school graduates grew faster in high-tech regions than in non-high-tech regions (63% vs. 46%), but absolute supply did not meet that of regions of low high-tech concentrations (from 149,826 to 244,313 vs. 438,277 to 641,963). These patterns suggest that low-skill workers are less mobile than their more-educated counterparts, and that high-tech regions attract fewer low-skill workers than high-skill workers. Furthermore, foreign low-skill migrants are more willing to take the economic risks associated with migration and/or perceive greater returns to migration as compared to their economic situation in their native countries. (Table 15)

High-tech and non-high-tech regions are also different in terms of relative supply of migrant and non-migrant labor within the college and high-school graduate skill categories. At the beginning of the 1990s, 51% of the college graduates and 62% of the high-school graduates were non-migrants in non-high-tech regions, while 45% of college graduates and 54% of high-school graduates fell into the equivalent migration category in high-tech regions. By the end of the decade, although all regions experienced an increase in the proportion of workers falling into non-migrant college and high-school graduate categories, those proportions were significantly higher for regions of low high-tech concentrations than it was for high-tech regions. In 2000, non-migrant college graduates accounted for 73% of the total college graduate population in regions of low high-tech location quotient and 68% in high-tech regions. Non-migrant high-school graduates were 82% and 78% of the workers of that level of skill in non-high-tech and high-tech regions, respectively. These patterns suggest that a smaller proportion of workers, regardless of skill, were able to stay in high-tech regions than in non-high-tech regions. (Table 17)

This increase in the proportion of college and high-school graduates who are non-migrants as well stems, at least partly, from a larger participation of women in the workforce, who exhibit a different level of mobility than males of equivalent levels of skill. While the proportion of college-level males who did not migrate during the decade increased from 49% to 70% and from 44% to 66% for non-high-tech and high-tech regions, respectively, females experienced increases in that proportion from 53% to 75% in regions of small high-tech concentrations and from 47% to 70% in regions of large high-tech location quotient. The non-migrant proportion of male high-school graduates increased from 61% to 81% and from 52% to 77% in non-high-tech regions and high-tech regions, respectively. Females in the same category increased from 63% to 83% in regions of small high-tech location quotient, and from 56% to 80% in high-tech regions. (Table 17)

**Table 17. Change in Migrant and Non-Migrant Proportion of the Population:
High-Tech vs. Non-High-Tech Regions in the United States;1990-2000**

Proportion of Workers who are in the Labor Force (25-to-45 Years Old)							
	Non-High-Tech Region			Non-High-Tech Region			%Δ
	1990	2000	%Δ	1990	2000	%Δ	
All College Graduates							
Non-Migrant	0.51	0.73	0.43	0.45	0.68	0.49	
Migrants	0.49	0.27	(0.44)	0.55	0.32	(0.41)	
Migrant from Non-Metropolitan Area in State	0.32	0.09	(0.71)	0.35	0.12	(0.65)	
Foreign and Domestic Migrant	0.18	0.18	0.05	0.20	0.20	0.03	
Foreign Migrants	0.02	0.03	0.49	0.03	0.04	0.34	
Domestic Migrants	0.15	0.15	(0.02)	0.17	0.16	(0.02)	
All High-School Graduates							
Non-Migrant	0.62	0.82	0.32	0.54	0.78	0.44	
Migrants	0.38	0.18	(0.52)	0.46	0.22	(0.52)	
Migrant from Non-Metropolitan Area in State	0.27	0.07	(0.73)	0.33	0.10	(0.70)	
Foreign and Domestic Migrant	0.11	0.11	(0.01)	0.13	0.12	(0.08)	
Foreign Migrants	0.02	0.02	(0.03)	0.02	0.03	0.06	
Domestic Migrants	0.09	0.09	(0.01)	0.11	0.10	(0.11)	
Male College Graduates							
Non-Migrant	0.49	0.70	0.42	0.44	0.66	0.50	
Migrants	0.51	0.30	(0.41)	0.56	0.34	(0.39)	
Migrant from Non-Metropolitan Area in State	0.32	0.09	(0.70)	0.35	0.12	(0.66)	
Foreign and Domestic Migrant	0.19	0.20	0.06	0.21	0.22	0.04	
Foreign Migrants	0.03	0.04	0.52	0.03	0.05	0.38	
Domestic Migrants	0.16	0.16	(0.01)	0.18	0.17	(0.02)	
Male High-School Graduates							
Non-Migrant	0.61	0.81	0.33	0.52	0.77	0.47	
Migrants	0.39	0.19	(0.51)	0.48	0.23	(0.52)	
Migrant from Non-Metropolitan Area in State	0.28	0.08	(0.73)	0.33	0.10	(0.70)	
Foreign and Domestic Migrant	0.12	0.12	0.00	0.14	0.13	(0.09)	
Foreign Migrants	0.02	0.02	0.28	0.03	0.03	0.01	
Domestic Migrants	0.10	0.09	(0.05)	0.11	0.10	(0.12)	

Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

Although the share of college and high-school graduates that foreign and domestic migrants account for did not change for either region type, they were significantly higher in high-tech regions than in non-high-tech regions. They were particularly high for college graduates. The foreign and domestic migrant proportion of college graduates was 18% for non-high-tech regions and 20% for regions of large high-tech concentrations throughout the decade. The proportion of

high-school graduates who came into a region from a different state or country stayed at 11% and 13% in non-high-tech and high-tech regions, respectively. Notwithstanding, I note that foreign migrants are more likely to be male than females. This fact supports the claim of a lower mobility for females than for male workers throughout the decade. (Table 17)

Table 18. Change in Migrant and Non-Migrant Proportion of the Population: Regions with Below- and Above-Average Proportions of College Graduates in the United States; 1990-2000

Proportion of Workers who are in the Labor Force (25-to-45 Years Old)						
	Region with Below Average			Region with Above Average		
	Proportion of College Graduates			Proportion of College Graduates		
	1990	2000	%Δ	1990	2000	%Δ
All College Graduates						
Non-Migrant	0.51	0.72	0.40	0.47	0.70	0.49
Migrants	0.49	0.28	(0.42)	0.53	0.30	(0.43)
Migrant from Non-Metropolitan Area in State	0.30	0.09	(0.70)	0.35	0.11	(0.68)
Foreign and Domestic Migrant	0.19	0.19	0.01	0.18	0.19	0.06
Foreign Migrants	0.02	0.03	0.52	0.03	0.04	0.38
Domestic Migrants	0.17	0.16	(0.05)	0.15	0.15	0.00
	Region with Below Average			Region with Above Average		
	Proportion of College Graduates			Proportion of College Graduates		
	1990	2000	%Δ	1990	2000	%Δ
All High-School Graduates						
Non-Migrant	0.63	0.81	0.29	0.56	0.80	0.42
Migrants	0.37	0.19	(0.49)	0.44	0.20	(0.54)
Migrant from Non-Metropolitan Area in State	0.24	0.07	(0.72)	0.32	0.09	(0.72)
Foreign and Domestic Migrant	0.13	0.12	(0.05)	0.11	0.11	(0.02)
Foreign Migrants	0.02	0.02	(0.16)	0.02	0.03	0.12
Domestic Migrants	0.10	0.10	(0.03)	0.09	0.08	(0.06)
	Region with Below Average			Region with Above Average		
	Proportion of College Graduates			Proportion of College Graduates		
	1990	2000	%Δ	1990	2000	%Δ
Male College Graduates						
Non-Migrant	0.50	0.70	0.40	0.46	0.68	0.49
Migrants	0.50	0.30	(0.40)	0.54	0.32	(0.41)
Migrant from Non-Metropolitan Area in State	0.29	0.09	(0.70)	0.35	0.11	(0.68)
Foreign and Domestic Migrant	0.21	0.21	0.02	0.19	0.21	0.08
Foreign Migrants	0.02	0.04	0.55	0.03	0.05	0.42
Domestic Migrants	0.19	0.18	(0.05)	0.16	0.16	0.01
	Region with Below Average			Region with Above Average		
	Proportion of College Graduates			Proportion of College Graduates		
	1990	2000	%Δ	1990	2000	%Δ
Male High-School Graduates						
Non-Migrant	0.62	0.81	0.29	0.55	0.79	0.44
Migrants	0.38	0.19	(0.49)	0.45	0.21	(0.53)
Migrant from Non-Metropolitan Area in State	0.25	0.07	(0.73)	0.33	0.10	(0.71)
Foreign and Domestic Migrant	0.13	0.12	(0.03)	0.12	0.12	(0.04)
Foreign Migrants	0.02	0.02	0.34	0.03	0.03	0.08
Domestic Migrants	0.11	0.10	(0.08)	0.10	0.09	(0.07)

Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

The migration patterns of college graduates and high-school graduates in regions with above-average proportions of college graduates are similar in direction to those of high-tech regions. Nonetheless, the deterrence effect in more-educated regions seems to be larger in magnitude than that of high-tech regions. The growth rates of college graduate equivalent immigration and high-school graduate equivalent immigration in more-educated regions were two percentage-points below those of high-tech regions. While the migrant supply of college graduates decreased 30% in high-tech regions, in more-educated regions that decrease was of 32%. Regions with above-average proportions of college graduates had a loss in high-school graduate supply of 47%. High-tech regions had a loss of 45%. (Table 16)

Regions with above-average proportions of college graduates also have more trouble hanging on to labor. The proportion of college and high-school graduates who were non-migrant (that is, who stay in the region) at the beginning of the decade was smaller in more-educated regions than in regions with fewer college graduates (51% vs. 47%; 63% vs. 56%). Furthermore, it remained lower by the end of the decade (72% vs. 49%; 81% vs. 80%). (Table 18)

Average Hourly Wages for Migrants and Non-Migrants.

The migration patterns that I previously described affect the labor supply available in a region. They can be a determinant for wage setting in the presence of changes in the composition of the regional economic base. However, I would like to explore whether or not the impact of migration on wage setting differs according to high-tech concentration and growth. Here, I first control for inflation with the use of the consumer price index that the Bureau of Labor Statistics produces every year. Later, I correct for regional costs-of-living differences with the cost-of-living index that the ACCRA produces annually, to measure purchasing power and the extent at which

the influx of workers of various levels of skill affects the job opportunities and wages of native residents.

When considering inflation-adjusted wages, non-migrant wages were not only consistently higher (in absolute terms) than migrant wages throughout the decade but also experienced greater growth, regardless of skill level. This increase in wages would discourage out-migration and justify the workers' decision to stay within a region. Wages were also consistently higher in high-tech regions. However, the percentage-increase in wages for non-migrant college graduates (males and females together) was equal in magnitude across regions. At the beginning of the decade, college graduates in non-high-tech regions earned \$21.56/hr but ended the decade earning \$23.73/hr, a 10%-increase. The wages of college graduates who resided in high-tech regions went from \$22.96/hr in 1990 to \$25.31/hr in 2000, also a 10%-increase. (Table 19)

The wage growth rate for non-migrant high-school graduates was lower than that of non-migrant college graduates across regions. The rate for high-tech and non-high-tech regions, however, is similar. In regions of low concentrations of high-tech activities high-school graduates average hourly wages increased 7%, from \$15.09/hr to \$16.14/hr. High-school wages in high-tech regions experienced an 8%-increase, from \$16.04/hr to \$17.40/hr. Given the increase in non-migrant college and high-school supply, I reasonably argue that there must have been an increase in demand, but that this demand must have been much stronger for college graduates than for high-school graduates. Furthermore, the increase in demand must have been larger in high-tech regions than in non-high-tech regions. (Table 19)

With the exception of female high-school graduates, within-state migrant wages decreased for all groups during the 1990s. The decrease in college-level within-state migrant wages was

larger in regions of small high-tech concentration than it was in high-tech regions. The former experienced a decrease of 31%, from \$20.23/hr to \$13.69/hr, while the latter went through a drop of 22%, from \$21.43/hr to \$16.68/hr. It is worth noting that this group experienced the largest drop in wages across regions and skill groups. The drop in high-school graduate within-state migrant wages was minimal in high-tech regions (i.e., a 1%-decrease from \$17.15/hr to \$16.92/hr). In non-high-tech regions this group did not experience a significant change in wages, from \$15.38/hr to \$15.32/hr. This drop in wages would diminish the returns to migration and would discourage inflows of college and high-school graduates from non-metropolitan areas of the state into its core region, as in fact happened during the decade. (Table 19)

During the 1990s, the wages of foreign and domestic migrants increased across regions and regardless of skill; however, the increase was larger for college graduates than for high-school graduates. Furthermore, high-tech regions experienced larger gains in domestic and foreign migrant wages than did non-high-tech regions. The difference between the change in wages of domestic and foreign migrants in a high-tech region vis-à-vis a non-high-tech region is more substantial for high-school graduates than it is in non-high-tech regions. With the exception of high-school graduates in non-high-tech regions, for whom domestic and foreign migrant wages experienced comparable growth (6%), in all other skill groups, foreign migrant wages increased more significantly than domestic migrant wages. (Table 19)

Domestic migrants who are high-school graduates (or equivalent) sustained wages that in absolute terms are higher than those of foreign migrants, especially in high-tech regions. Conversely, by the end of the decade college graduates who had migrated from a different country had reached higher wages than those college graduates who came into a region from another state. The difference between college graduate domestic and college graduate foreign migrant

wages was larger in high-tech region than it was in regions with small high-tech location quotients.

This evidences that high-tech regions are more attractive for foreign migrants than for domestic migrants. (Table 19)

Table 19. Change in Inflation-Adjusted Average Hourly Wages According to Skill Group and Migrant Status: High-Tech vs. Non-High-Tech Regions in the United States; 1990-2000

Inflation-Adjusted Average Hourly Wage								
	Non-High-Tech Region			High-Tech Region				
	1990	2000	%Δ	1990	2000	%Δ		
All College Graduates								
Non-Migrant	\$ 21.56	\$ 23.73	0.10	\$ 22.96	\$ 25.31	0.10		
Migrants	\$ 20.43	\$ 20.14	(0.01)	\$ 21.15	\$ 21.26	0.00		
Migrant from Non-Metropolitan Area in State	\$ 20.23	\$ 13.69	(0.32)	\$ 21.43	\$ 16.78	(0.22)		
Foreign and Domestic Migrant	\$ 20.79	\$ 23.33	0.12	\$ 20.65	\$ 23.97	0.16		
Foreign Migrants	\$ 19.00	\$ 23.71	0.25	\$ 18.94	\$ 24.43	0.29		
Domestic Migrants	\$ 21.07	\$ 23.25	0.10	\$ 20.97	\$ 23.87	0.14		
All High-School Graduates								
Non-Migrant	\$ 15.09	\$ 16.14	0.07	\$ 16.04	\$ 17.40	0.08		
Migrants	\$ 15.04	\$ 15.20	0.01	\$ 16.36	\$ 16.27	(0.01)		
Migrant from Non-Metropolitan Area in State	\$ 15.38	\$ 15.32	(0.00)	\$ 17.15	\$ 16.92	(0.01)		
Foreign and Domestic Migrant	\$ 14.23	\$ 15.13	0.06	\$ 14.40	\$ 15.74	0.09		
Foreign Migrants	\$ 13.56	\$ 14.35	0.06	\$ 12.66	\$ 14.90	0.18		
Domestic Migrants	\$ 14.42	\$ 15.31	0.06	\$ 14.80	\$ 15.97	0.08		
Male College Graduates								
Non-Migrant	\$ 24.83	\$ 27.03	0.09	\$ 26.66	\$ 28.77	0.08		
Migrants	\$ 22.83	\$ 22.05	(0.03)	\$ 23.45	\$ 23.30	(0.01)		
Migrant from Non-Metropolitan Area in State	\$ 22.50	\$ 13.27	(0.41)	\$ 23.80	\$ 16.96	(0.29)		
Foreign and Domestic Migrant	\$ 23.39	\$ 26.10	0.12	\$ 22.84	\$ 26.81	0.17		
Foreign Migrants	\$ 20.35	\$ 26.71	0.31	\$ 20.63	\$ 27.62	0.34		
Domestic Migrants	\$ 23.88	\$ 25.95	0.09	\$ 23.27	\$ 26.58	0.14		
Male High-School Graduates								
Non-Migrant	\$ 17.48	\$ 17.84	0.02	\$ 18.57	\$ 19.33	0.04		
Migrants	\$ 16.83	\$ 16.61	(0.01)	\$ 18.06	\$ 17.72	(0.02)		
Migrant from Non-Metropolitan Area in State	\$ 17.21	\$ 16.88	(0.02)	\$ 19.02	\$ 18.39	(0.03)		
Foreign and Domestic Migrant	\$ 15.93	\$ 16.43	0.03	\$ 15.82	\$ 17.20	0.09		
Foreign Migrants	\$ 13.81	\$ 15.59	0.13	\$ 13.56	\$ 16.57	0.22		
Domestic Migrants	\$ 16.36	\$ 16.64	0.02	\$ 16.39	\$ 17.40	0.06		

Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

Table 20. Change in Inflation-Adjusted Average Hourly Wages According to Skill Group and Migrant Status: Regions with Below- and Above-Average Proportions of College Graduates in the United States;1990-2000

Inflation-Adjusted Average Hourly Wage								
	Region with Below Average Proportion of College Graduates			Region with Above Average Proportion of College Graduates				
	1990	2000	%Δ	1990	2000	%Δ		
All College Graduates								
Non-Migrant	\$ 20.73	\$ 22.13	0.07	\$ 22.92	\$ 25.64	0.12		
Migrants	\$ 19.73	\$ 19.26	(0.02)	\$ 21.27	\$ 21.36	0.00		
Migrant from Non-Metropolitan Area in State	\$ 19.42	\$ 13.53	(0.30)	\$ 21.37	\$ 15.80	(0.26)		
Foreign and Domestic Migrant	\$ 20.21	\$ 21.89	0.08	\$ 21.07	\$ 24.63	0.17		
Foreign Migrants	\$ 17.53	\$ 21.96	0.25	\$ 19.57	\$ 24.95	0.27		
Domestic Migrants	\$ 20.54	\$ 21.89	0.07	\$ 21.37	\$ 24.54	0.15		
All High-School Graduates								
Non-Migrant	\$ 14.62	\$ 15.43	0.06	\$ 16.04	\$ 17.39	0.08		
Migrants	\$ 14.56	\$ 14.79	0.02	\$ 16.18	\$ 16.16	(0.00)		
Migrant from Non-Metropolitan Area in State	\$ 14.77	\$ 14.72	(0.00)	\$ 16.79	\$ 16.65	(0.01)		
Foreign and Domestic Migrant	\$ 14.15	\$ 14.84	0.05	\$ 14.42	\$ 15.75	0.09		
Foreign Migrants	\$ 13.37	\$ 13.85	0.04	\$ 13.14	\$ 14.94	0.14		
Domestic Migrants	\$ 14.34	\$ 15.03	0.05	\$ 14.76	\$ 15.99	0.08		
Male College Graduates								
Non-Migrant	\$ 23.86	\$ 25.63	0.07	\$ 26.52	\$ 28.91	0.09		
Migrants	\$ 22.26	\$ 21.40	(0.04)	\$ 23.53	\$ 23.22	(0.01)		
Migrant from Non-Metropolitan Area in State	\$ 21.70	\$ 13.17	(0.39)	\$ 23.69	\$ 15.70	(0.34)		
Foreign and Domestic Migrant	\$ 23.04	\$ 24.83	0.08	\$ 23.25	\$ 27.34	0.18		
Foreign Migrants	\$ 19.52	\$ 25.14	0.29	\$ 20.86	\$ 27.98	0.34		
Domestic Migrants	\$ 23.48	\$ 24.76	0.05	\$ 23.74	\$ 27.15	0.14		
Male High-School Graduates								
Non-Migrant	\$ 17.03	\$ 17.34	0.02	\$ 18.48	\$ 19.08	0.03		
Migrants	\$ 16.38	\$ 16.28	(0.01)	\$ 17.88	\$ 17.53	(0.02)		
Migrant from Non-Metropolitan Area in State	\$ 16.62	\$ 16.37	(0.01)	\$ 18.63	\$ 18.09	(0.03)		
Foreign and Domestic Migrant	\$ 15.92	\$ 16.24	0.02	\$ 15.86	\$ 17.08	0.08		
Foreign Migrants	\$ 12.65	\$ 14.79	0.17	\$ 14.18	\$ 16.61	0.17		
Domestic Migrants	\$ 16.42	\$ 16.54	0.01	\$ 16.33	\$ 17.24	0.06		

Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

Female high-school graduates are the only group that experiences an increase in wages in all migration categories, including within-state, foreign and domestic migrants. Also important is the fact that this group in non-high-tech regions was the only to exhibit higher wage percentage-

increases for domestic migrants than for foreign migrants. Female high-school graduates who came from a different country experienced a 12%-gain in wages (from \$13.98/hr to \$15.69/hr), while those who came from another state had a 15%-increase from \$11.92 to \$13.67. The ending wage for female high-school graduate domestic migrants was lower than that of female high-school graduate foreign migrants, as it was for males of the same level of skill and place of origin. (Table 19)

Table 21. Change in Inflation- and Cost-of-Living-Adjusted Average Hourly Wages According to Skill Group and Migrant Status: High-Tech vs. Non-High-Tech Regions in the United States;1990-2000

Cost-of-Living-Adjusted Average Hourly Wages								
	Non-High-Tech Region			High-Tech Region				
	1990	2000	%Δ	1990	2000	%Δ		
All College Graduates								
Non-Migrant	\$ 20.74	\$ 23.49	0.13	\$ 20.89	\$ 22.96	0.10		
Migrants	\$ 19.63	\$ 20.19	0.03	\$ 19.05	\$ 19.51	0.02		
Migrant from Non-Metropolitan Area in State	\$ 19.40	\$ 14.08	(0.27)	\$ 19.15	\$ 15.14	(0.21)		
Foreign and Domestic Migrant	\$ 20.05	\$ 23.21	0.16	\$ 18.88	\$ 22.16	0.17		
Foreign Migrants	\$ 17.98	\$ 23.29	0.30	\$ 16.78	\$ 21.99	0.31		
Domestic Migrants	\$ 20.36	\$ 23.18	0.14	\$ 19.30	\$ 22.21	0.15		
All High-School Graduates								
Non-Migrant	\$ 14.58	\$ 16.08	0.10	\$ 14.77	\$ 15.99	0.08		
Migrants	\$ 14.50	\$ 15.34	0.06	\$ 14.79	\$ 15.03	0.02		
Migrant from Non-Metropolitan Area in State	\$ 14.78	\$ 15.46	0.05	\$ 15.41	\$ 15.60	0.01		
Foreign and Domestic Migrant	\$ 13.84	\$ 15.26	0.10	\$ 13.24	\$ 14.57	0.10		
Foreign Migrants	\$ 13.08	\$ 14.22	0.09	\$ 11.28	\$ 13.45	0.19		
Domestic Migrants	\$ 14.02	\$ 15.52	0.11	\$ 13.73	\$ 14.92	0.09		
Male College Graduates								
Non-Migrant	\$ 23.89	\$ 26.78	0.12	\$ 24.24	\$ 26.11	0.08		
Migrants	\$ 21.98	\$ 22.16	0.01	\$ 21.12	\$ 21.41	0.01		
Migrant from Non-Metropolitan Area in State	\$ 21.61	\$ 13.84	(0.36)	\$ 21.29	\$ 15.32	(0.28)		
Foreign and Domestic Migrant	\$ 22.59	\$ 25.99	0.15	\$ 20.83	\$ 24.78	0.19		
Foreign Migrants	\$ 19.35	\$ 26.27	0.36	\$ 18.28	\$ 24.89	0.36		
Domestic Migrants	\$ 23.12	\$ 25.93	0.12	\$ 21.35	\$ 24.76	0.16		
Male High-School Graduates								
Non-Migrant	\$ 16.90	\$ 17.76	0.05	\$ 17.05	\$ 17.74	0.04		
Migrants	\$ 16.21	\$ 16.72	0.03	\$ 16.33	\$ 16.42	0.01		
Migrant from Non-Metropolitan Area in State	\$ 16.54	\$ 16.96	0.03	\$ 17.12	\$ 16.97	(0.01)		
Foreign and Domestic Migrant	\$ 15.43	\$ 16.56	0.07	\$ 14.49	\$ 15.99	0.10		
Foreign Migrants	\$ 13.01	\$ 15.46	0.19	\$ 12.14	\$ 15.01	0.24		
Domestic Migrants	\$ 15.92	\$ 16.85	0.06	\$ 15.15	\$ 16.30	0.08		

Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

Table 22. Change in Inflation- and Cost-of-Living-Adjusted Average Hourly Wages According to Skill Group and Migrant Status: Regions with Below- and Above-Average Proportions of College Graduates in the United States;1990-2000

Cost-of-Living-Adjusted Average Hourly Wages								
	Region with Below Average Proportion of College Graduates			Region with Above Average Proportion of College Graduates				
	1990	2000	%Δ	1990	2000	%Δ		
All College Graduates								
Non-Migrant	\$ 20.38	\$ 22.37	0.10	\$ 21.05	\$ 23.91	0.14		
Migrants	\$ 19.29	\$ 19.49	0.01	\$ 19.48	\$ 20.19	0.04		
Migrant from Non-Metropolitan Area in State	\$ 18.96	\$ 13.69	(0.28)	\$ 19.46	\$ 14.95	(0.23)		
Foreign and Domestic Migrant	\$ 19.80	\$ 22.17	0.12	\$ 19.50	\$ 23.27	0.19		
Foreign Migrants	\$ 17.13	\$ 22.15	0.29	\$ 17.62	\$ 23.09	0.31		
Domestic Migrants	\$ 20.14	\$ 22.16	0.10	\$ 19.87	\$ 23.31	0.17		
All High-School Graduates								
Non-Migrant	\$ 14.38	\$ 15.64	0.09	\$ 14.85	\$ 16.35	0.10		
Migrants	\$ 14.22	\$ 14.97	0.05	\$ 14.85	\$ 15.41	0.04		
Migrant from Non-Metropolitan Area in State	\$ 14.38	\$ 14.92	0.04	\$ 15.35	\$ 15.80	0.03		
Foreign and Domestic Migrant	\$ 13.92	\$ 14.99	0.08	\$ 13.41	\$ 15.09	0.13		
Foreign Migrants	\$ 13.37	\$ 13.99	0.05	\$ 11.80	\$ 13.94	0.18		
Domestic Migrants	\$ 14.03	\$ 15.19	0.08	\$ 13.83	\$ 15.46	0.12		
Male College Graduates								
Non-Migrant	\$ 23.46	\$ 25.92	0.10	\$ 24.36	\$ 26.95	0.11		
Migrants	\$ 21.79	\$ 21.66	(0.01)	\$ 21.58	\$ 22.01	0.02		
Migrant from Non-Metropolitan Area in State	\$ 21.21	\$ 13.34	(0.37)	\$ 21.61	\$ 15.00	(0.31)		
Foreign and Domestic Migrant	\$ 22.59	\$ 25.12	0.11	\$ 21.53	\$ 25.84	0.20		
Foreign Migrants	\$ 19.10	\$ 25.34	0.33	\$ 18.83	\$ 25.93	0.38		
Domestic Migrants	\$ 23.06	\$ 25.10	0.09	\$ 22.09	\$ 25.82	0.17		
Male High-School Graduates								
Non-Migrant	\$ 16.74	\$ 17.54	0.05	\$ 17.10	\$ 17.92	0.05		
Migrants	\$ 16.00	\$ 16.46	0.03	\$ 16.41	\$ 16.72	0.02		
Migrant from Non-Metropolitan Area in State	\$ 16.21	\$ 16.57	0.02	\$ 17.04	\$ 17.15	0.01		
Foreign and Domestic Migrant	\$ 15.60	\$ 16.40	0.05	\$ 14.73	\$ 16.37	0.11		
Foreign Migrants	\$ 12.37	\$ 14.93	0.21	\$ 12.79	\$ 15.51	0.21		
Domestic Migrants	\$ 16.09	\$ 16.72	0.04	\$ 15.29	\$ 16.64	0.09		

Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

When regional cost-of-living differences are taken into account, the wage patterns are very different than prior to such adjustment. Now, with the exception of female college graduates, all non-migrants experienced greater wage gains in non-high-tech regions than in high-tech regions. Furthermore, non-migrants who reside in regions of low high-tech location quotient end the decade

with higher wage rates or purchasing power than did those who resided in high-tech regions. The cost-of-living-adjusted wages of non-migrant college graduates rose 10% in high-tech regions and 13% in non-high-tech regions. Non-migrant high-school wages rose 8% in high-tech region and 10% in non-high-tech regions. (Table 21)

With regards to domestic and foreign migrants there are no significant differences in the percentage-change of wages between college graduates in high-tech regions (17%) vis-à-vis non-high-tech regions (16%). However, non-high-tech regions at the end of the decade were able to offer higher wages to this skill-migration category than high-tech regions (\$23.21/hr vs. \$22.16/hr). Although when considered together there are no differences across region types in the wages of domestic and foreign migrants who have a high-school diploma or equivalent (10% increase across), when considered separately the patterns are very different for foreign migrants in this skill category. Foreign high-school graduates experienced a 9%-increase in wages in non-high-tech regions, while they experienced a 19%-increase in high-tech regions. (Table 21)

Within-state migrants who have a college degree experience smaller decreases in wages than prior to cost-of-living adjustments, especially in non-high-tech regions (from a 22%-decrease to a 21%-decrease in high-tech regions vs. from a 32%-decrease to a 27%-decrease in non-high-tech regions). Within-state migrants who have a high-school diploma or equivalent no longer experience wage losses. They experience a 1%-increase in wages in high-tech regions while the equivalent group in non-high-tech regions obtains a 5%-increase in wages. (Table 21)

The wage patterns of non-migrant and migrant workers in regions with above-average proportions of college graduates are similar to that of high-tech regions. However, as with overall wage patterns, there is greater wage divergence between more-educated and less-educated

regions than between high-tech and non-high-tech regions. Although non-migrant wages in regions with above-average proportions of college graduates are nearly identical to those of high-tech regions (regardless of skill), those of non-high-tech regions are generally higher than in regions with below-average proportions of college graduates. (Tables 20 and 22)

College graduate equivalent migrant wages (foreign and domestic) by the end of the decade were higher in more-educated regions than in high-tech regions, which would indicate that there was an increasing demand for high-skill labor in regions with above-average proportions of college graduates, which was not being met with non-migrant supply. High-school graduate equivalent migrant wages, however, are much lower in more-educated regions than in high-tech regions, broadening a wage gap between native and migrant workers. (Tables 20 and 22)

As in the case of high-tech regions, college graduate migrants from within the state suffer wage losses in more-educated regions, especially when I control for cost-of-living differences, which act as a disincentive for migration into the metropolitan core. This suggests that the movement out and deterrence effect for within-state migrants could be attributed at least partially to cost-of-living differences between regions. (Tables 20 and 22) The following regression analysis will allow us to look at the relationships among the composition of the economic base, costs-of-living, wages and these migration patterns.

Quantifying the Impact of Migration on Supply and Wage Determination

In this section, I quantify the effect of workforce composition, economic-base composition, and *ex ante*, location-specific regional traits on migration. Furthermore, I estimate the effect of migration on wage determination. Specifically, in Model 5, I explore how variation on the 1990

proportion of college graduates in the workforce, the 1992 high-tech fraction of the job base, the difference between the 1990 national and regional wages, and *ex ante* regional traits can influence migration patterns. In Model 6, I estimate the impact of the 1985-to-1990 migration patterns, in addition to the 1990 workforce composition, the 1992 economic-base composition, and *ex ante* regional traits, on 1990-to-2000 wage growth. Models 7 and 8 are identical in structure to Models 5 and 6, except that they include cost-of-living- and inflation-adjusted wages, instead of considering inflation alone. Each of these models includes equations for different portions of the 25-to-45-year-old labor force: a) all college-graduate-equivalent workers, b) all high-school-graduate-equivalent workers, c) male college-graduate-equivalent workers, d) male high-school-graduate-equivalent workers, e) female college-graduate-equivalent workers, and f) female high-school-graduate-equivalent workers. As in Chapter 5, here I discuss the most important findings of these regression equations, concentrating on those for all workers and males alone. Notwithstanding, all detailed regression-output tables are part of Appendix B.

According to this research, larger differences between the 1990 national and regional average hourly wage level for college graduates at the beginning of the decade, as an indicator of return to migration to this skill group, attracted a gross influx of more-educated workers, when all other factors were identical across regions. Approximately 1,366 college graduates would come into a region that offers average hourly wages for this group that are \$1 above the national average for that skill category. The equivalent wage difference for high-school graduates attracted a gross inflow of less-educated workers as well but at a larger extent. In this case 4,018 high-school graduates would enter a region offering average hourly wages for this group that are \$1 above national values for their skill category. Notwithstanding, the difference between the national and regional average wage levels at the beginning of the decade does not exert a statistically

significant effect on non-migrant supply; that is, that this factor does not seem to significantly influence an individual's decision to stay in the region once they get there, regardless of skill.

(Table 23)

The 1990 supply of high-skill labor further attracted college graduate equivalent labor into regions during the 1990s, regardless of economic-base and workforce composition, that is, even when these factors were held constant. For each college graduate that the region had in 1990, three had come in by the end of the decade. In addition, it increased the number of more-educated workers who stayed (as non-migrants) in a region. For every college graduate that the region had in 1990, the number of workers of this skill level who stayed in the region increased by six. (Table 23)

Increases in the 1990 low-skill-labor supply slowed down low-skill labor immigration during the decade, that is, that regions with larger high-school graduate supply experienced smaller increases in immigration of this labor type ($B=0.91$ for each worker of that skill level that the region had at the beginning of the decade) than regions with smaller high-school graduate supply. However, according to this study, this variable increases the number of high-school graduates who stay in a region regardless of its economic-base and workforce composition ($B=3.47$). This confirms again lesser mobility for this group. (Table 23)

The proportion of college graduates, as a measure of workforce composition, does not have a statistically significant impact on immigration regardless of skill when male and female workers are considered jointly. However, increases in that proportion reduces the number of workers who are able to stay in a region, that is, that it creates a gross out-flow of workers, more so

Table 23. Migration Patterns: 50 Metropolitan Areas in the United States, 1990-2000

	All College Graduates		All High-School Graduates	
	Migrants R-square = 0.88	Non-Migrants R-square = 0.97	Migrants R-square = 0.84	Non-Migrants R-square = 0.95
1990 Difference between Regional and National Wages for Skill Group	1366.28329 **	457.05801	4017.868489 **	-274.873931
1990 Supply for Skill Group	3.04431 **	6.457099 **	0.912835 **	3.468955 **
1990 Proportion of College Graduates	-14868.6114	-338380.532 **	-13433.9317	-113463.942 **
1992 Fraction of High-Tech Jobs	41667.1355	19475.70984	65310.4584 *	-85251.6219
New England (Reference Category for Ex Ante Regional Characteristics)				
South Atlantic	21430.9086 **	-29695.3167 **	15720.89748 **	-35987.8716 **
Middle Atlantic	-72050.7937	142428.7325 *	-101338.399 *	-61745.1478
East North Central	-64998.4658 **	-18149.0572	-44100.2629 *	57795.19173
West North Central	16161.2167 **	8672.651298 *	11161.12665 **	-2198.7211
East South Central	6811.10106	-21714.8819 *	3948.622118	-2452.9699
West South Central	15958.56 *	3334.033312	27734.2932 **	47479.02691 **
Mountain	17174.6432 **	17232.03133 **	8405.535596 *	10314.443
Pacific	1623.52671	11120.59887	-1512.48168	-5315.22446
(Constant)	-3435.97305	117210.1688 **	3657.079329	57456.96112 **

	Male College Graduates		Male High-School Graduates	
	Migrants R-square = 0.86	Non-Migrants R-square = 0.96	Migrants R-square = 0.85	Non-Migrants R-square = 0.94
1990 Difference between Regional and National Wages for Skill Group	892.142134 **	189.081882	1002.898066 **	572.389733
1990 Supply for Skill Group	3.042779 **	5.958701 **	1.065079 **	3.713498 **
1990 Proportion of College Graduates	-34317.7135 *	-166587.254 **	3969.532037	-32318.4389 *
1992 Fraction of High-Tech Jobs	37438.9386	223042.1151 **	27518.1153	-22468.5441
New England (Reference Category for Ex Ante Regional Characteristics)				
South Atlantic	7524.39623 *	-12142.6096 *	10767.16345 **	-26638.9782 **
Middle Atlantic	-46937.0205	48726.93945	-69550.2979 **	-20712.8959
East North Central	-18378.9386	10988.06126	-30513.3804 *	-3481.15829
West North Central	4632.44385 *	-1048.73061	6086.55914 **	-3428.90625
East South Central	-3922.61942	-10693.342	2281.814071	-9534.52935
West South Central	8727.06471 *	2467.220237	13052.66271 **	21835.36333 *
Mountain	6788.73303 *	4444.628629	5777.715027 **	-2410.04672
Pacific	266.347044	11110.89737 *	2794.545462	-10084.6091 *
(Constant)	9969.27897	54592.73069 **	-3664.65761	27496.0381 **

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

* 0.20 ≥ p ≥ 0.10 ** p ≤ 0.10

Table 24. Migration Patterns: 50 Metropolitan Areas in the United States, 1990-2000 (Cost-of-Living Adjusted)

	All College Graduates		All High-School Graduates	
	Migrants R-square = 0.87	Non-Migrants R-square = 0.97	Migrants R-square = 0.82	Non-Migrants R-square = 0.96
1990 Difference between Regional and National Wages for Skill Group	1402.89994 **	658.948392	2777.595433 *	1135.29592
1990 Supply for Skill Group	3.020617 **	6.441324 **	0.925125 **	3.455135 **
1990 Proportion of College Graduates	-15783.272	-338340.02 **	-16065.129	-128185.68 **
1992 Fraction of High-Tech Jobs	40766.0082	6881.127	47706.03742	-78704.413
New England (Reference Category for Ex Ante Regional Characteristics)				
South Atlantic	19100.3181 **	-31934.54 **	14724.797.82: **	-38512.766 **
Middle Atlantic	-69791.233	143452.441 *	-101842.168 *	-61615.575
East North Central	-68701.461 **	-19443.669	-51024.9987 *	55193.4125
West North Central	9714.12388 *	5829.43074	1647.317683	-4760.1424
East South Central	1704.13457	-23949.673 *	-3060.13752	-7285.3872
West South Central	10342.9706	955.870212	17794.39613 *	46183.8672 **
Mountain	12309.4669 **	14920.2181 **	3721.437115	6142.31973
Pacific	5239.2572	11077.3587	7484.122181	-6417.0688
(Constant)	282.833245	119731.244 **	7460.678668	65535.2524 **

	Male College Graduates		Male High-School Graduates	
	Migrants R-square = 0.86	Non-Migrants R-square = 0.96	Migrants R-square = 0.84	Non-Migrants R-square = 0.95
1990 Difference between Regional and National Wages for Skill Group	687.866205 **	149.760649	707.268685 *	459.73822
1990 Supply for Skill Group	3.00038 **	5.956481 **	1.085282 **	3.716408 **
1990 Proportion of College Graduates	-18175.654 -	-165715.02 **	1850.649501	-28172.048 -
1992 Fraction of High-Tech Jobs	19322.3783	224345.053 **	25374.67701	-19744.733
New England (Reference Category for Ex Ante Regional Characteristics)				
South Atlantic	8717.59138 **	-12416.163 *	9960.882651 **	-25351.036 **
Middle Atlantic	-40056.459	48775.4902	-72528.6746 **	-25104.634
East North Central	-18165.722	10450.4725	-34497.7101 **	-9485.3504
West North Central	2497.84826	-2036.8111	2692.317502	-5056.7732
East South Central	-4964.6109	-11588.483	-157.707693	-9955.2811
West South Central	7335.35238 *	1497.89187	9580.907586 *	17529.178 *
Mountain	6402.0252 *	3572.67418	4042.153352 *	-3071.3331
Pacific	3450.23675	11457.3959 *	4943.192789 *	-8557.7301
(Constant)	4963.36814	54738.2891 **	-1588.67994	26123.2544 **

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

* 0.20 ≥ p ≥ 0.10 ** p ≤ 0.10

for college graduates than for high-school graduates ($B=-3,384$ per 1%-increase vs. $B=-1,135$ per 1%-increase). (Table 23)

An increase in the high-tech fraction of all jobs attracts a gross influx of high-school graduates into a region (653 per 1%-increase). This variable, however, does not exert a statistically significant effect on college graduates migration patterns nor in the decision of high-school graduates to move out of a region, when both male and female workers are considered jointly. Furthermore, when cost-of-living is taken into account, the high-tech fraction of jobs no longer exerts a statistically significant attraction on high-school graduates. (Tables 23 and 24)

When females are excluded from the analysis, increases in the proportion of college graduates, as a measure of workforce composition, exert a deterrence effect on all labor types. These increases reduce the gross influx of college- and high-school graduates (migrant supply) ($B= -343$ per 1%-increase for college graduates and $B=-397$ per 1%-increase for high-school graduates) and create gross out flows of workers in both categories through a decrease in non-migrant supply ($B=-1,666$ per 1%-increase for college graduates and $B=-323$ per 1%-increase for high-school graduates). (Table 23)

When cost-of-living is accounted for, the proportion of college graduates no longer exert a significant deterrence effect on male college graduates. This adjustment also decreases the displacement effect of this proportion on college and high-school graduates. (Table 24)

An increase in the high-tech fraction of jobs increases the non-migrant supply of college graduates (2,230 per 1%-increase), when males are considered alone. When cost-of-living is taken into consideration, a 1%-increase in the high-tech fraction of jobs results in a larger number of college graduates who are able to stay in the region ($B=2,243$). This means that if cost-of-living

Table 25. Wage Growth: 50 Metropolitan Areas in the United States, 1990-2000 (Migration Considered)

Independent Variables	All Workers		Male Workers	
	R-square = 0.75	R-square = 0.56	R-square = 0.75	R-square = 0.45
	College Graduates	High-School Graduates	College Graduates	High-School Graduates
1985-1990 Migrant Supply for Skill Group	8.27272E-06 **	-1.96211E-06	1.53E-05 **	4.91E-06
1985-1990 Non-Migrant Supply for Skill Group	-2.82871E-06 **	3.27202E-07	-4.47E-06 *	-1.71E-06
1990 Wage for Skill Group	-0.762858 **	-0.811812 **	-0.853428 **	-0.828661 **
1990 Proportion of College Graduates	7.168131 *	6.85668 *	10.744941 **	0.969825
1992 Fraction of High-Tech Jobs	11.430258 *	-6.685312 *	5.176528	-3.970048
New England (Reference Category for Ex Ante Regional Characteristics)				
South Atlantic	-2.421555 *	0.798934	-2.068227 *	0.085773
Middle Atlantic	0.998424	0.846743	0.159611	1.293504
East North Central	0.147724	0.98365	0.705469	1.485663
West North Central	-2.485867 **	1.172286	-4.275921 **	500711
East South Central	-0.261881	0.036603	-0.105017	0.040115
West South Central	-1.320054 *	-0.148109	-1.078203	-0.081159
Mountain	-0.778676	2.220788 **	0.140876	1.483501
Pacific	-0.872132	1.203761	-2.818728 **	1.525128
(Constant)	12.924182 **	8.756175 **	15.180836 **	12.097045 **

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

* 0.20 ≥ p ≥ 0.10 ** p ≤ 0.10

Table 26. Wage Growth: 50 Metropolitan Areas in the United States, 1990-2000 (Migration Considered and Cost-of-Living Adjusted)

Independent Variables	All Workers		Male Workers	
	R-square = 0.59	R-square = 0.48	R-square = 0.68	R-square = 0.45
	College Graduates	High-School Graduates	College Graduates	High-School Graduates
1985-1990 Migrant Supply for Skill Group	1.01E-05 **	-4.92E-08	1.87E-05 **	8.02E-06
1985-1990 Non-Migrant Supply for Skill Group	-3.92E-06 **	-5.40E-07	-7.28E-06 **	-3.19E-06
1990 Wage for Skill Group	-0.727517 **	-0.593257 **	-0.790595 **	-0.774035 **
1990 Proportion of College Graduates	6.292061	4.621559	9.794071 **	0.147303
1992 Fraction of High-Tech Jobs	9.533403	-6.711989 *	5.426966	-3.141335
New England (Reference Category for Ex Ante Regional Characteristics)				
South Atlantic	-0.925996	2.192724 **	0.792683	1.257864
Middle Atlantic	1.948556 *	1.766699 *	2.108498	1.836983
East North Central	1.752132 *	2.296628 **	3.622649 **	2.684701 **
West North Central	-1.405872	1.978197 **	-1.796583	1.351457
East South Central	1.870114	1.711697 *	3.69378 **	1.615861
West South Central	0.879352	1.893298 **	3.429702 **	1.763407
Mountain	-0.536373	2.447273 **	1.606229	1.666541
Pacific	-0.471827	1.395658 *	-1.276762	1.378603
(Constant)	11.473561 **	5.745374 **	11.990019 **	10.756832 **

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

* 0.20 ≥ p ≥ 0.10 ** p ≤ 0.10

was identical across regions high-tech regions would have greater capacity for labor supply growth than non-high-tech regions for all skill groups. (Tables 23 and 24)

Although the impact of migration on wages is minimal, controlling for this factor (migrant and non-migrant migration patterns) changes the coefficients of the high-tech fraction of jobs for all college graduates (when male and females are considered as one group), as well as that of the proportion of college graduates on male workers of that skill level. The impact of the economic-base composition on college graduate wages changes significantly when migration patterns are included in the wage determination model. When regions are identical in every way (including migration flows) except for the high-tech fraction of the regional job base, a region with a larger fraction will offer higher wages for college graduates than a region with a smaller concentration of high-tech activity ($B = \$0.11/\text{hr}$ per 1%-increase vs. $B = \$0.04/\text{hr}$ per 1%-increase prior to controlling for migration). (Table 25)

If females are excluded from the analysis a 1%-increase in the proportion of college graduates results in a $\$0.11/\text{hr}$ -increase in college graduate wages, a $\$0.02/\text{hr}$ more than prior to controlling for migration patterns. (Table 25) When cost-of-living is taken into account, the economic-base and workforce composition no longer exert a statistically significant impact on wages for college graduates (males and females together). High-school graduates experience a smaller wage loss from increases in the high-tech fraction of jobs than prior to controlling for both cost-of-living differences and migration patterns ($B = -\$0.6/\text{hr}$ per 1%-increase vs. $B = -\$0.08/\text{hr}$ per 1%-increase). (Table 26) This confirms that migration exacerbates any negative impacts from growth and that it can also compete away the positive impacts from that growth in the long-term future of a region.

Summary of Findings

This chapter provides evidence that during the 1990s, the United States experienced an overall increase in migration across states and from foreign countries and an overall decrease in with-in state migration. Low-skill workers exhibit lower mobility as compared to high-skill labor due to the economic risks associated with migration. Although female participation in the labor force increased during the decade, low-skill female workers exhibit lower mobility and greater aversion to migration than male workers of equivalent skill. This could stem at least partially from the fact that I am looking at the 25-to-45 year old population, which is a child-bearing age for females, and that those workers who have families with small children are more risk averse than single workers or child-less couples. Even in the presence of these patterns at the national level, changes in the proportion of college graduates and/or the high-tech fraction of jobs alter these trends.

During the decade, high-tech regions attracted fewer low-skill workers than non-high-tech regions. Furthermore, fewer low-skill workers are able to stay as non-migrant workers in high-tech regions than in regions of low high-tech location quotient. High-tech regions are more attractive for college graduates; however, as we see in the regression results in Chapter 5 and this one, an increasingly more-educated labor supply, as measured by the 1990 proportion of college graduates, has an opposing deterrence effect that slows down high-skill labor supply growth, both from native and foreign population changes. While an economic development policy that is based on the presence of a relatively large college graduate supply increases demand, as migrants are drawn into the region in search for jobs they increase the costs-of-living along with the competition for job opportunities and slow down their wage growth rate.

With regards to low-skill labor, high-tech regions, although at a smaller degree than non-high-tech regions, attract high-school graduates from non-metropolitan areas of the state, other states in the United States or foreign countries. High-tech regions also seem to lose a large number of low-skill workers. This suggests that migrant low-skill workers could crowd out of a region's native high-school graduates.

Non-migrant wages are consistently higher than the inflation-adjusted wages of workers who came from non-metropolitan areas in the state, other states in the United States and abroad. The difference between migrant and non-migrant wages for college graduates is increasingly high in high-tech regions. The difference in high-school graduate wages between migrant and non-migrants is also larger in high-tech regions. This should encourage non-migrants to stay in a high-tech region and attract new workers from abroad, especially college graduates who see a greater return for the decision to remain in the region. However, as the regression results in Chapter 5 and this one show, college-graduate supply growth has slowed down in high-tech regions. A look at cost-of-living-adjusted wages suggests that cost-of-living differences play an important role in the determination of migration flows into and out of high-tech regions. Once I control for regional cost-of-living differences, the return to immigration of college graduates into high-tech regions decreases.

When I control for cost-of-living, as well as for all other factors, the degree of attraction that each geographic location exerted decreases. This suggests that their competitive edge or attractiveness could be related to cost-of-living. When the economic-base composition and wages are held constant they lose that edge and once it disappears, the coefficients for these regions dropped, and in occasion became negative.

When migration enters the supply and wage models its explanatory power changes significantly. Differences in migration patterns seem to be, at least partially, responsible for the wage losses and inequality in wages for both college and high-school graduates that come from an increasing proportion of college graduates. If migration could be held constant, wages across skill levels would tend towards convergence.

The models provide further evidence of an uneven distribution of the benefits from economic growth in a region with an economic development policy that is based on maintaining a more-educated workforce. Although high-tech activity attracts immigration of both college graduates and high-school graduates increasing their supply and affecting their wages, holding all else constant (cost-of-living and migration, particularly), an increase in that activity, on its own, does not result in physical displacement. Furthermore, it allowed us to confirm that migration plays an important role in determining who wins and who loses, at least on relative terms, between high- and low-skill labor, when a region follows an education-intensive economic development policy. High-school graduates not only earn lower wages in regions of high-concentration of college graduates, but also are in the presence of a larger wage gap between their wage rate and that of college graduates in their region of residence.

In this study I have also found that an increasing proportion of college graduates in the long-run also affects college graduates in a negative way. The clustering of more-educated workers crowds working families out of the region of both skill-levels, reducing the availability of the primary input needed for these development-path choices, which are more-educated workers. Thus, clustering could hinder the capacity of knowledge-intensive sectors to sustain growth in the long run. This clustering effect has a larger impact over low-skill workers than on college

graduates, though, since high-school graduates exhibit low mobility and cannot adapt to labor-demand shocks through migration as college graduates most often are able to.

The next and last chapter puts together the pieces of the puzzle laid out in Chapters 4, 5 and 6. I illustrate the composite of findings through two simulations and an analysis of the wage-bill for high-tech regions (vis-à-vis non-high-tech regions) and more-educated regions (as compared to regions of low proportions of college graduates). The wage bill allows the consideration of both the depth and spread of benefits from economic growth in knowledge-intensive sectors. Finally, in response to my findings in this study, I identify areas for potential policy intervention in the interest of economic growth and social equity in regional development.

Chapter 7. Conclusions and Policy Implications

This study found evidence of skill-based exclusion in the Boston Metropolitan Area of the 1990s. When considering the impact of cost-of-living differences between the Nashville Metropolitan Area and that of Boston, high-school graduates earned lower wages in Boston than in Nashville. This was due not only to a drop in demand for low-skill labor but also to their inability to respond to demand-shocks through migration. Furthermore, the wage gap between college and high-school graduates grew increasingly larger in Boston relative to Nashville. Surprisingly, once cost-of-living differences were taken into account college graduates in Boston also performed worse than workers of similar skill level in Nashville. This appears to be due not only to cost-of-living differences between regions but also to migration patterns that throughout the decade changed the composition of the workforce increasing competition for the available jobs.

Furthermore, the important role that cost-of-living and migration seemed to play in determining how college and high-school graduates performed in Nashville and Boston questioned the ability of a high-tech region to sustain long-term growth. On the one hand, although the case study successfully established a relationship between high-tech concentration and cost-of-living, it became necessary to test whether high-tech activities inherently are responsible for the employment and wage trends observed in Boston or if its *ex ante* characteristics predisposed its low-skill residents to exclusionary patterns, even if it had taken a different development path. On the other hand, the fact that college graduates performed badly in terms of their wage rate in Boston, after cost-of-living adjustments, challenged the idea of increasing returns to scale in the clustering of high-tech activities. Furthermore, in an area of large mobility (i.e., large in-migration and out-migration flows) it was possible that migration flows could compete out any benefits that resident workers of a high-tech region could have enjoyed from increases in direct or indirect

demand, this taking the region back to a level of equilibrium prior to the demand shock. Finally, it questioned whether the observed exclusion and inequality phenomena could be common to any economic development strategy that is dependent on highly educated, specialized labor as its primary input.

The 50-region regression analysis confirmed that a direct relationship exists between the fraction of high-tech jobs in a regional employment base and costs-of-living, particularly their housing component, as was the case in the Boston-Nashville comparative study. Furthermore, an increase in high-tech jobs or in the proportion of high-school graduates would have a worse impact on employment and wages in regions that are already expensive to live in than in regions where costs-of-living were low at the starting point. A 1%-increase in the high-tech job fraction would increase regional housing costs 2% over the national average. Furthermore, I identified a geographic spillover effect in terms of high-tech activity driving housing prices up not only in its own region but also in the surrounding metropolitan areas. This effect is most visible in small states and in regions with large obstacles to urban growth, which would explain the physical displacement of working families into neighboring states observed in Boston.

The cross-regional analysis allowed me to discern between the effects of a high-tech path to development and that of an increasingly large concentration of highly educated labor, as a proxy for a broader set of economic development initiatives that depend on this labor type as their primary input. According to the employment, wage and migration model results, the 1990 regional high-tech fraction of jobs could predict how regions and their resident workers performed by the end of the decade. Increases in high-tech activity attracts both college and high-school graduates, when all else is held constant. The models also tell us that the larger the concentration of college graduates that a region had in 1990 the fewer workers it would be able to attract during the

decade. The coefficient for this portion of the migration model is negative indicating that, all else constant, an increasingly high proportion of college graduates would repel workers, especially college graduates who are more mobile than high-school graduates. This suggests that striving to maintain large concentrations of a more educated labor force, first, has a stronger effect than increases in demand from high-tech growth alone, and, second, that increasing that concentration would slow down growth in this input (i.e., highly educated labor) and growth in an economy that is based in this input as a whole.

Regions that had a larger concentration of high-tech jobs not only offered higher wages for college graduates in 1990 than regions with lower concentrations of high-tech jobs but also experienced slower wage growth for that group during the decade. Regions that had a larger concentration of high-tech jobs not only offered lower wages for high-school graduates in 1990 than regions with lower concentrations of high-tech jobs but also experienced significant wage losses for that group by 2000. By the end of the decade high-school workers in regions with high high-tech fractions of jobs earned \$0.75/hr less than regions of low fractions of high-tech jobs, on average.

Regions with higher proportions of college graduates offered higher college graduate wages than regions with lower proportions of college graduates throughout the decade. Nonetheless, wage growth was much slower in the former than in the latter region type. While regions with high proportions of college graduates offered higher high-school graduates wages in 1990 than regions of low proportions of college graduates, by the end of the decade the former offered lower low-skill wages than the latter because of slower growth in that indicator. When cost-of-living differences and migration patterns are considered, as a region's workforce composition becomes more-educated, it can create greater income inequality, especially for male workers.

Table 27 shows that even when other factors are allowed to vary the benefits from growth, as measured by the wage bill (i.e., the product of the average wage and supply for each category), are smaller in regions that follow a high-tech path to development than in regions that maintained smaller high-tech fractions of jobs. The increase in wage bill is also smaller when a region follows an economic development strategy that is based on the availability of a large proportion of college graduates, than in regions with a relatively smaller number of high-skill workers. Even though the latter strategy offered a larger increase in the wage bill than did the high-tech alternative, in absolute terms a region with a high proportion of college graduates had the lowest wage bill across the four categories considered in Table 27.

The estimated coefficients of these effects that I present should inform the decision of economic developers, so that they understand how are the benefits and costs of these strategies distributed between the less- and the more-educated. Furthermore, these findings also help identify potential areas of intervention in order to minimize any negative impacts that could come from growth. Given these findings I identify three areas of intervention that could better distribute the impacts from growth (negative or positive) in either of the two alternatives explored above.

First, governments should look at the composition and diversity of their economic base and how those compare to their regional skill pool. Economic developers should keep in mind that following economic development strategies that disproportionately are based on exploiting a relatively high-concentration of college graduates could be self-limiting, especially if that region already has a relatively high cost-of-living, as compared to national averages, and if migration is easily possible (as it is the case in the 48 contiguous states). As the proportion of college graduates increases in a region, growth in the supply and wages of this skill group are bound to slow down, discouraging immigration of high-skill workers and thus hampering the long-term

growth capacity of industry sectors that use that labor type as the primary input, as it is the case in high-tech and finance sectors, among others. Furthermore, high proportions of college graduates tend to displace native low-skill workers out of a region. These workers get trapped between fewer employment opportunities and higher costs-of-living. Thus, economic developers should foster a more diverse set of economic activities that would employ its residents at the level of skill that they possess. Activities that employ a higher level of skill become an alternative only when the educational infrastructure, that is, public and private education and training programs, can increase the skill pool of that labor force to match the needs of industry. Otherwise, immigrants would take those jobs slowing down growth and competing out any foreseeable benefits from growth.

The second area that requires attention is that of costs-of-living, particularly housing prices. In regions of relatively high cost-of-living, immigration within state or from other states or countries would be further discouraged not only for college graduates but also for high-school graduates. In addition, the number and proportion of workers who stay in the region (i.e., who do not migrate out of the region) would be expected to decrease significantly. Consequently, the growth capacity of the regional economic structure could be further impaired; that is, a boom in industry sectors that depend on more-educated labor would last a short time under these conditions. Regions that are expensive places to live in, even before a high-tech or a more-educated labor strategy is in place, are bound to loose in the long-run unless an aggressive affordable housing program for working families is implemented simultaneously.

Table 27. Labor Supply and Wage Comparison Across Skill Groups and Region Types: 1990-2000

Average Region According to Relative Workforce Composition	College Graduates						High-School Graduates							
	1990 Wage		2000 Wage		Supply		1990 Wage		2000 Wage		Supply		Wage Bill	
	\$	# of Regions in Category	\$	# of Regions in Category			\$	# of Regions in Category	\$	# of Regions in Category			\$	% Change
High Proportion of Coll Grads Average Wage/hr and Average # of Regions in Category	21.10 15	21.34 15	112,549 15	189,850 15	16.36 15	15.09 15	137,468 15	147,302 15	4,623,420	6,273,290	35.69%			
Low Proportion of Coll Grads Average Wage/hr and Average # of Regions in Category	20.03 26	20.66 26	146,936 26	304,506 26	14.64 26	15.21 26	314,083 26	309,950 26	7,541,953	11,006,274	45.93%			

NOTE: Regions w/ medium/moderate proportions of college graduates excluded.

Average Region According to Economic-Base Composition	College Graduates						High-School Graduates							
	1990 Wage		2000 Wage		Supply		1990 Wage		2000 Wage		Supply		Wage Bill	
	\$	# of Regions in Category	\$	# of Regions in Category			\$	# of Regions in Category	\$	# of Regions in Category			\$	% Change
High Fraction of High-Tech Jobs Average Wage/hr and Average # of Regions in Category	22.80 13	21.79 13	128,192 13	242,231 13	15.17 13	14.41 13	248,434 13	226,569 13	6,691,745	8,542,165	27.65%			
Low Fraction of High-Tech Jobs Average Wage/hr and Average # of Regions in Category	19.95 30	20.81 30	123,838 30	231,538 30	15.43 30	15.64 30	197,483 30	220,964 30	5,518,140	8,273,084	49.93%			

NOTE: Regions w/ medium/moderate fractions of high-tech jobs excluded.

Both tables assume that college and high-school graduates would work the same amount of hours per week, on average.

Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

The third area of intervention is migration patterns. While I have demonstrated that stabilization through migration-controls is possible (i.e., both the negative and the positive impacts are milder when migration patterns are held constant), given the boost in costs-of-living that results from increases in the economic activities of sectors that are dependent in a more-educated labor force and the limited mobility of high-school graduates, especially females, these would be bound to suffer from fewer job opportunities and lower wages (from both a decrease in demand and small increases in supply) as well as fewer living/housing options within the metropolitan core of a region. While it would be unrealistic to close the borders, sort of speak, of a region, governments could require from employers in knowledge-intensive sectors a minimum proportion of jobs that must be provided to resident labor. Alternatively, local and regional governments, either through multi-state consortia or federal-level programs with support from employers, could increase the mobility of low-skill workers and women by assisting them with the economic and social costs of relocation. This assistance could vary from transportation services or subsidies, job search and job matching programs, day care, as well as orientation and financial aid for relocation.

Minimizing the negative costs-of-living and migration effects could improve the outcomes of both college graduates and low-skill workers in regions that choose to follow a development strategy that is dependent on a highly educated workforce. Furthermore, it could allow those regions to enjoy the benefits from employment and wages for a longer time before long-term migration bring these to a level of equilibrium.

Appendix A

Model 1. 1990-2000 Changes in Inflation-Adjusted Wages

Model 1A 1990-2000 Change in College Equivalent Inflation-Adjusted Wages as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

Dependent variable: 1990-2000 Change in College Equivalent Wage

R Square: .68931

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 College Equivalent Wage	-.771137	.114063	-.934474	-6.761	.0000
1990 Proportion of College Graduates	7.015951	5.291940	.152242	1.326	.1928
1992 Fraction of High-Tech Jobs	3.827061	6.446989	.079255	.594	.5563
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-1.586541	1.051200	-.270148	-1.509	.1395
Middle Atlantic	.498565	1.279878	.079673	.390	.6991
East North Central	-.412673	1.103586	-.065317	-.374	.7105
West North Central	-2.967729	1.258141	-.314787	-2.359	.0236
East South Central	-.481956	1.462566	-.043847	-.330	.7436
West South Central	-.558006	1.118128	-.073151	-.499	.6206
Mountain	.003263	1.259750	.000351	.003	.9979
Pacific	-.288612	1.003525	-.048764	-.288	.7752
(Constant)	13.773343	2.595889		5.306	.0000

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

Model 1B 1990-2000 Change in High-School Equivalent Inflation-Adjusted Wages as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

Dependent variable: 1990-2000 Change in High-School Equivalent Wage

R Square: .55451

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 High-School Equivalent Wage	-.814558	.182852	-.790915	-4.455	.0001
1990 Proportion of College Graduates	7.359840	4.166943	.240814	1.766	.0854
1992 Fraction of High-Tech Jobs	-5.899637	5.199655	-.172562	-1.135	.2636
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	.612347	1.014564	.161086	.604	.5497
Middle Atlantic	.943538	1.088330	.222068	.867	.3914
East North Central	1.086956	.992142	.268641	1.096	.2802
West North Central	1.269781	1.129930	.186996	1.124	.2682
East South Central	.098688	1.291597	.012463	.076	.9395
West South Central	-.302253	1.025446	-.062749	-.295	.7698
Mountain	2.112132	1.098411	.332767	1.923	.0620
Pacific	1.048069	.939010	.264656	1.116	.2714
(Constant)	8.513252	2.675715		3.182	.0029

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

Model 1. 1990-2000 Changes in Inflation-Adjusted Wages (continued)

Model 1C 1990-2000 Change in Male College Equivalent Inflation-Adjusted Wages as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

Dependent variable: 1990-2000 Change in Male College Equivalent Wage

R Square: .70092

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Male College Equivalent Wage	-.837948	.120448	-.779868	-6.957	.0000
1990 Proportion of College Graduates	8.760829	4.853193	.175387	1.805	.0790
1992 Fraction of High-Tech Jobs	-.343675	9.529164	-.004798	-.036	.9714
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-1.184241	1.537001	-.132848	-.770	.4458
Middle Atlantic	-.055026	1.769095	-.005866	-.031	.9753
East North Central	.287232	1.585823	.030739	.181	.8572
West North Central	-4.847388	1.868615	-.323366	-2.594	.0134
East South Central	-.517282	2.160320	-.032172	-.239	.8120
West South Central	.418892	1.657515	.038033	.253	.8018
Mountain	.666328	1.862897	.049397	.358	.7226
Pacific	-1.114077	1.464245	-.130046	-.761	.4514
(Constant)	16.425230	3.478701		4.722	.0000

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

Model 1D 1990-2000 Change in Male High-School Equivalent Inflation-Adjusted Wages as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

Dependent variable: 1990-2000 Change in Male High-School Equivalent Wage

R Square: .44083

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Male HS Equiv. Wage	-.852454	.190444	-.704086	-4.476	.0001
1990 Proportion of College Graduates	1.307422	4.375164	.041534	.299	.7667
1992 Fraction of High-Tech Jobs	-5.552301	9.365850	-.091697	-.593	.5568
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	.131435	1.415066	.021472	.093	.9265
Middle Atlantic	.813092	1.576790	.103168	.516	.6091
East North Central	1.182805	1.429148	.172529	.828	.4130
West North Central	.432134	1.502993	.050047	.288	.7753
East South Central	-.032211	1.692208	-.003257	-.019	.9849
West South Central	-.225907	1.575141	-.027334	-.143	.8867
Mountain	1.642536	1.478919	.207762	1.111	.2737
Pacific	1.179347	1.403171	.161379	.840	.4059
(Constant)	12.385798	3.340446		3.708	.0007

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

Model 1. 1990-2000 Changes in Inflation-Adjusted Wages (continued)

Model 1E 1990-2000 Change in Female College Equivalent Inflation-Adjusted Wages as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

Dependent variable: 1990-2000 Change in Female College Equivalent Wage

R Square: .74711

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Female College Equiv. Wage	-.901239	.136727	-.767295	-6.592	.0000
1990 Proportion of Female Coll. Grads	9.254183	4.917637	.167583	1.882	.0675
1992 Fraction of High-Tech Jobs	.495022	9.713684	.006252	.051	.9596
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-1.311875	1.581866	-.133121	-.829	.4121
Middle Atlantic	-.386699	1.815819	-.037288	-.213	.8325
East North Central	.058428	1.598847	.005656	.037	.9710
West North Central	-5.425400	1.841970	-.327382	-2.945	.0055
East South Central	-1.209606	2.138141	-.068050	-.566	.5749
West South Central	.041377	1.669710	.003398	.025	.9804
Mountain	.325339	1.901493	.021817	.171	.8651
Pacific	-1.444287	1.472159	-.152501	-.981	.3328
(Constant)	18.265734	3.308637		5.521	.0000

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

Model 1F 1990-2000 Change in Female High-School Equivalent Inflation-Adjusted Wages as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

Dependent variable: 1990-2000 Change in Female High-School Equivalent Wage

R Square: .33243

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Female HS Equiv. Wage	-.568691	.239266	-.412690	-2.377	.0226
1990 Proportion of Female Coll. Grads	-.197389	4.248601	-.007083	-.046	.9632
1992 Fraction of High-Tech Jobs	-4.459247	9.080010	-.083184	-.491	.6262
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	.343162	1.334916	.063322	.257	.7985
Middle Atlantic	.723707	1.525460	.103721	.474	.6379
East North Central	1.597822	1.406081	.263254	1.136	.2629
West North Central	1.183609	1.522715	.154832	.777	.4418
East South Central	.821836	1.715006	.093862	.479	.6345
West South Central	-.018039	1.478179	-.002465	-.012	.9903
Mountain	2.309119	1.488486	.329909	1.551	.1291
Pacific	1.252598	1.357858	.193604	.922	.3621
(Constant)	9.826184	3.191090		3.079	.0038

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

Model 2. 1990-2000 Changes in Supply, considering inflation-adjusted wages

Model 2A 1990-2000 Change in College Equivalent Supply as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

Dependent variable: 1990-2000 Change in College Equivalent Supply

R Square: .75925

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 College Equivalent Wage	179.072388	298.439063	.112437	.600	.5521
1990 College Equivalent Supply	.973758	.120765	.917571	8.063	.0000
1990 Proportion of College Graduates	-59758.803376	16576.80981	-.371416	-3.605	.0009
1992 Fraction of High-Tech Jobs	90255.942413	32042.39847	.722699	2.817	.0077
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	9857.396575	4595.780713	.269334	2.145	.0386
Middle Atlantic	-701.610505	43091.61881	-.001396	-.016	.9871
East North Central	-46386.991459	15052.80174	-.293006	-3.082	.0039
West North Central	8327.707623	2856.444331	.470102	2.915	.0060
East South Central	9770.895719	7999.526278	.110269	1.221	.2296
West South Central	236.859294	5772.233982	.003882	.041	.9675
Mountain	10765.442220	3295.863998	.762161	3.266	.0024
Pacific	16377.407762	4995.622156	.524140	3.278	.0023
(Constant)	3581.700871	8107.802346		.442	.6612

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

Model 2B 1990-2000 Change in High-School Equivalent Supply as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

Dependent variable: 1990-2000 Change in High-School Equivalent Supply

R Square: .25771

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 High-School Equivalent Wage	71.498878	1632.869204	.013080	.044	.9653
1990 High-School Equivalent Supply	-.079458	.067871	-.220438	-1.171	.2492
1990 Proportion of College Graduates	-4253.398457	30178.32334	-.025598	-.141	.8887
1992 Fraction of High-Tech Jobs	43882.128053	52136.77460	.254815	.842	.4054
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	143.819866	6534.939148	.005683	.022	.9826
Middle Atlantic	-16485.452596	41183.23238	-.063904	-.400	.6912
East North Central	-2901.505283	22051.69543	-.021233	-.132	.8960
West North Central	-1022.480304	5771.006683	-.048601	-.177	.8603
East South Central	-2276.011806	10882.91823	-.035883	-.209	.8355
West South Central	10538.060726	11181.27979	.157554	.942	.3521
Mountain	8188.717180	5778.391442	.316309	1.417	.1648
Pacific	5087.615382	7575.064182	.196614	.672	.5060
(Constant)	-4232.424960	21627.25064		-.196	.8459

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

Model 2. 1990-2000 Changes in Supply, considering inflation-adjusted wages (continued)

Model 2C 1990-2000 Change in Male College Equivalent Supply as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

Dependent variable: 1990-2000 Change in Male College Equivalent Supply

R Square: .66802

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Male College Equivalent Wage	116.184107	137.463094	.221997	.845	.4034
1990 Male College Equivalent Supply	.708752	.128905	.699396	5.498	.0000
1990 Proportion of Male College Grads	-40422.666868	9583.819864	-1.094413	-4.218	.0002
1992 Fraction of High-Tech Jobs	84087.054826	19689.57471	1.447326	4.271	.0001
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	3668.904313	2313.029613	.214867	1.586	.1212
Middle Atlantic	-1771.020017	24755.48726	-.007231	-.072	.9434
East North Central	-13164.652964	8655.272201	-.163735	-1.521	.1368
West North Central	969.752711	1684.906648	.139618	.576	.5684
East South Central	5218.697565	4778.097206	.115442	1.092	.2818
West South Central	-1600.268226	2707.888865	-.076599	-.591	.5581
Mountain	4079.997824	2042.603232	.589224	1.997	.0532
Pacific	10178.678003	2648.499390	.550884	3.843	.0005
(Constant)	5484.566233	4568.518718		1.201	.2376

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

Model 2D 1990-2000 Change in Male High-School Equivalent Supply as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

Dependent variable: 1990-2000 Change in Male High-School Equivalent Supply

R Square: .55811

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Male High-School Equiv. Wage	-398.062064	295.146144	-.244103	-1.349	.1856
1990 Male High-School Equiv. Supply	-.140991	.074176	-.281866	-1.901	.0651
1990 Proportion of Male College Grads	-12142.064401	8034.440636	-.309625	-1.511	.1392
1992 Fraction of High-Tech Jobs	27991.287298	17624.10892	.440218	1.588	.1207
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-2083.089359	1924.092868	-.249683	-1.083	.2860
Middle Atlantic	-8949.713382	27110.04827	-.039229	-.330	.7432
East North Central	-5405.546994	12770.75816	-.051878	-.423	.6745
West North Central	-2578.002404	1851.209795	-.393068	-1.393	.1721
East South Central	1235.827870	4248.411830	.035918	.291	.7728
West South Central	1404.433301	4060.457269	.042723	.346	.7314
Mountain	2848.529579	1828.631938	.250330	1.558	.1278
Pacific	2727.811610	2314.354860	.260033	1.179	.2461
(Constant)	9372.438832	5969.965507		1.570	.1249

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

Model 2. 1990-2000 Changes in Supply, considering inflation-adjusted wages (continued)

Model 2E 1990-2000 Change in Female College Equivalent Supply as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

Dependent variable: 1990-2000 Change in Female College Equivalent Supply

R Square: .67532

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Female College Equivalent Wage	144.739502	115.812024	.160606	1.250	.2192
1990 Female College Equiv. Supply	.706338	.127164	.697004	5.555	.0000
1990 Proportion of Female Coll. Grads	-40303.795301	9472.985948	-1.090586	-4.255	.0001
1992 Fraction of High-Tech Jobs	96416.451568	18480.23058	1.659360	5.217	.0000
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	3288.720515	2323.840208	.192595	1.415	.1654
Middle Atlantic	-2387.916387	24457.40684	-.009750	-.098	.9227
East North Central	-13222.282153	8548.690348	-.164446	-1.547	.1304
West North Central	742.359378	1575.333287	.106876	.471	.6402
East South Central	5919.897891	4787.317627	.130949	1.237	.2240
West South Central	-1863.556975	2560.177702	-.089202	-.728	.4713
Mountain	3837.273458	1864.353778	.554199	2.058	.0467
Pacific	10018.271876	2609.792826	.542209	3.839	.0005
(Constant)	5306.596725	4158.889869		1.276	.2099

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

Model 2F 1990-2000 Change in Female High-School Equivalent Supply as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

Dependent variable: 1990-2000 Change in Female High-School Equivalent Supply

R Square: .36376

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Female HS Equiv. Wage	-220.575995	679.397265	-.078691	-.325	.7473
1990 Female HS Equiv. Supply	-.029217	.070161	-.076827	-.416	.6795
1990 Proportion of Female Coll. Grads	-12231.937096	11969.20207	-.218885	-1.022	.3134
1992 Fraction of High-Tech Jobs	37972.313874	28065.15501	.393445	1.353	.1843
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-1042.216921	2997.788453	-.088119	-.348	.7301
Middle Atlantic	-28048.509107	20495.63264	-.206985	-1.369	.1794
East North Central	-14655.735808	11177.08999	-.202124	-1.311	.1979
West North Central	-1849.856589	2608.815816	-.191759	-.709	.4827
East South Central	-2207.778876	5147.088485	-.067494	-.429	.6705
West South Central	1828.127619	5086.967706	.054661	.359	.7214
Mountain	3385.369873	2726.281473	.233435	1.242	.2221
Pacific	2675.720485	3359.672359	.188206	.796	.4309
(Constant)	4356.296393	7785.780994		.560	.5792

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

Model 3. 1990-2000 Changes in Cost-of-Living-Adjusted Wages

Model 3A 1990-2000 Change in College Equivalent Cost-of-Living-Adjusted Wages as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

Dependent variable: 1990-2000 Change in College Equivalent Wage

R Square: .53653

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 College Equivalent Wage	-.762792	.141728	-.662714	-5.382	.0000
1990 Proportion of College Graduates	8.071105	6.578747	.158862	1.227	.2274
1992 Fraction of High-Tech Jobs	1.204204	9.758161	.017724	.123	.9024
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-.135272	1.349634	-.019119	-.100	.9207
Middle Atlantic	1.028460	1.676348	.115655	.614	.5432
East North Central	1.082753	1.503751	.134100	.720	.4759
West North Central	-1.748801	1.507009	-.187001	-1.160	.2531
East South Central	1.801640	1.716342	.162772	1.050	.3005
West South Central	1.270890	1.532278	.127600	.829	.4121
Mountain	.235468	1.470944	.025023	.160	.8737
Pacific	-.595610	1.414722	-.070580	-.421	.6761
(Constant)	11.977903	3.160046		3.790	.0005

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

Model 3B 1990-2000 Change in High-School Equivalent Cost-of-Living-Adjusted Wages as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

Dependent variable: 1990-2000 Change in High-School Equivalent Wage

R Square: .43812

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 High-School Equivalent Wage	-.595504	.182149	-.513451	-3.269	.0023
1990 Proportion of College Graduates	5.289100	4.127868	.194833	1.281	.2078
1992 Fraction of High-Tech Jobs	-8.493025	5.184149	-.279673	-1.638	.1096
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	2.062031	.955236	.610692	2.159	.0373
Middle Atlantic	1.511204	1.086821	.400421	1.390	.1725
East North Central	2.125940	1.025331	.591533	2.073	.0450
West North Central	2.053540	1.190587	.340466	1.725	.0927
East South Central	1.796488	1.236325	.255411	1.453	.1544
West South Central	1.457000	.985398	.340536	1.479	.1475
Mountain	2.556493	1.081072	.453452	2.365	.0233
Pacific	.437502	.950303	.124377	.460	.6479
(Constant)	5.385695	2.363439		2.279	.0284

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

Model 3. 1990-2000 Changes in Cost-of-Living-Adjusted Wages (continued)

Model 3C 1990-2000 Change in Male College Equivalent Cost-of-Living-Adjusted Wages as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

Dependent variable: 1990-2000 Change in Male College Equivalent Wage

R Square: .64827

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Male College Equivalent Wage	-.815357	.135890	-.641059	-6.000	.0000
1990 Proportion of Male Coll. Grads	9.157500	5.556829	.173142	1.648	.1076
1992 Fraction of High-Tech Jobs	-4.931985	10.944149	-.065034	-.451	.6548
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	1.890703	1.733605	.200314	1.091	.2823
Middle Atlantic	1.432249	2.029314	.144194	.706	.4846
East North Central	3.025175	1.809087	.305763	1.672	.1027
West North Central	-2.295810	2.083057	-.144642	-1.102	.2773
East South Central	3.265060	2.274783	.191783	1.435	.1594
West South Central	4.479400	1.790284	.384103	2.502	.0168
Mountain	2.532415	2.031887	.177307	1.246	.2203
Pacific	-.897456	1.665261	-.098940	-.539	.5931
(Constant)	13.466455	3.607583		3.733	.0006

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

Model 3D 1990-2000 Change in Male High-School Equivalent Cost-of-Living-Adjusted Wages as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

Dependent variable: 1990-2000 Change in Male High-School Equivalent Wage

R Square: .42421

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Male HS Equivalent Wage	-.790350	.176920	-.652051	-4.467	.0001
1990 Proportion of Male Coll. Grads	.652233	4.084306	.022147	.160	.8740
1992 Fraction of High-Tech Jobs	-6.048120	8.870367	-.106765	-.682	.4995
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	1.376602	1.274446	.240377	1.080	.2869
Middle Atlantic	.896612	1.496676	.121602	.599	.5527
East North Central	2.151183	1.387819	.335394	1.550	.1294
West North Central	1.313329	1.502003	.162577	.874	.3874
East South Central	1.600791	1.561443	.173011	1.025	.3118
West South Central	1.518019	1.415551	.196324	1.072	.2903
Mountain	2.032154	1.411129	.274750	1.440	.1580
Pacific	.557925	1.339221	.081604	.417	.6793
(Constant)	10.771177	2.795743		3.853	.0004

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

Model 3. 1990-2000 Changes in Cost-of-Living-Adjusted Wages (continued)

Model 3E 1990-2000 Change in Female College Equivalent Cost-of-Living-Adjusted Wages as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

Dependent variable: 1990-2000 Change in Female College Equivalent Wage

R Square: .64769

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Female College Equiv. Wage	-.921380	.154560	-.644326	-5.961	.0000
1990 Proportion of Female Coll. Grads	10.695104	6.369843	.173626	1.679	.1014
1992 Fraction of High-Tech Jobs	-1.477980	14.692018	-.012816	-.101	.9204
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	.190716	1.977304	.015713	.096	.9237
Middle Atlantic	-.392324	2.429189	-.025899	-.162	.8726
East North Central	1.496083	2.158440	.109752	.693	.4924
West North Central	-3.673474	2.243339	-.225137	-1.638	.1098
East South Central	.952857	2.471357	.051148	.386	.7020
West South Central	2.404862	2.257435	.142324	1.065	.2935
Mountain	.460631	2.193800	.029219	.210	.8348
Pacific	-2.632394	2.068401	-.187092	-1.273	.2109
(Constant)	16.771019	3.694607		4.539	.0001

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

Model 3F 1990-2000 Change in Female High-School Equivalent Cost-of-Living-Adjusted Wages as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

Dependent variable: 1990-2000 Change in Female High-School Equivalent Wage

R Square: .30669

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Female HS Equivalent Wage	-.622704	.223506	-.411033	-2.786	.0083
1990 Proportion of Female Coll. Grads	-.025750	4.033560	-.000977	-.006	.9949
1992 Fraction of High-Tech Jobs	-5.411067	8.726127	-.106721	-.620	.5389
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	1.175143	1.258593	.229263	.934	.3564
Middle Atlantic	.794217	1.471053	.120346	.540	.5924
East North Central	2.266520	1.336662	.394817	1.696	.0981
West North Central	1.688591	1.402154	.233544	1.204	.2359
East South Central	1.948641	1.530753	.235304	1.273	.2108
West South Central	1.210499	1.409323	.174912	.859	.3958
Mountain	2.282916	1.359183	.344849	1.680	.1012
Pacific	.558485	1.311865	.091265	.426	.6727
(Constant)	9.889444	2.691935		3.674	.0007

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

Model 4. 1990-2000 Changes in Supply, considering cost-of-living-adjusted wages

Model 4A 1990-2000 Change in College Equivalent Supply as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

Dependent variable: 1990-2000 Change in College Equivalent Supply

R Square: .76240

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 College Equivalent Wage	298.654981	323.098095	.125143	.924	.3613
1990 College Equivalent Supply	.965902	.120486	.910168	8.017	.0000
1990 Proportion of College Graduates	-59668.965531	16461.49275	-.370858	-3.625	.0009
1992 Fraction of High-Tech Jobs	82697.215688	32714.10345	.662175	2.528	.0159
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	8668.502504	4863.484751	.236849	1.782	.0829
Middle Atlantic	-243.354355	42811.69270	-.000484	-.006	.9955
East North Central	-46906.136901	14937.43721	-.296285	-3.140	.0033
West North Central	7067.203624	3054.912867	.398946	2.313	.0264
East South Central	8782.952409	7993.224601	.099119	1.099	.2790
West South Central	-801.540641	5782.258680	-.013138	-.139	.8905
Mountain	9713.612903	3475.370240	.687695	2.795	.0082
Pacific	16093.028169	4622.775780	.515038	3.481	.0013
(Constant)	2910.205248	7657.938350		.380	.7061

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

Model 4B 1990-2000 Change in High-School Equivalent Supply as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

Dependent variable: 1990-2000 Change in High-School Equivalent Supply

R Square: .27035

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 High-School Equivalent Wage	1366.730849	1704.836099	.242488	.802	.4279
1990 High-School Equivalent Supply	-.088224	.067995	-.244757	-1.298	.2025
1990 Proportion of College Graduates	-17290.414039	32180.09066	-.104059	-.537	.5943
1992 Fraction of High-Tech Jobs	53377.870185	49681.36096	.309955	1.074	.2896
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-1922.444392	6953.183141	-.075966	-.276	.7837
Middle Atlantic	-16883.176319	40794.12006	-.065446	-.414	.6814
East North Central	-5995.658506	22197.99381	-.043875	-.270	.7886
West North Central	-3894.902045	6454.673925	-.185133	-.603	.5499
East South Central	-6698.875577	12117.03799	-.105613	-.553	.5837
West South Central	8762.693066	10908.31300	.131010	.803	.4269
Mountain	4316.556129	7477.221292	.166738	.577	.5672
Pacific	5239.437302	6952.099180	.202482	.754	.4558
(Constant)	-13971.428550	17821.55393		-.784	.4381

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

**Model 4. 1990-2000 Changes in Supply, considering cost-of-living-adjusted wages
(continued)**

Model 4C 1990-2000 Change in Male College Equivalent Supply as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

Dependent variable: 1990-2000 Change in Male College Equivalent Supply

R Square: .67251

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Male College Equivalent Wage	166.536328	150.006394	.226310	1.110	.2741
1990 Male College Equivalent Supply	.700854	.128499	.691602	5.454	.0000
1990 Proportion of Male Coll. Grads	-39862.764554	9516.100303	-1.079254	-4.189	.0002
1992 Fraction of High-Tech Jobs	80302.776247	20243.91461	1.382190	3.967	.0003
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	3161.767145	2378.459668	.185167	1.329	.1919
Middle Atlantic	-1300.100511	24594.96676	-.005308	-.053	.9581
East North Central	-13570.602159	8579.133656	-.168784	-1.582	.1222
West North Central	256.560993	1577.554324	.036938	.163	.8717
East South Central	4720.762387	4676.413575	.104428	1.009	.3193
West South Central	-2142.053398	2547.796435	-.102532	-.841	.4059
Mountain	3657.868485	1850.657206	.528261	1.977	.0556
Pacific	10261.145111	2595.926387	.555347	3.953	.0003
(Constant)	5024.661649	4424.017017		1.136	.2634

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

Model 4D 1990-2000 Change in Male High-School Equivalent Supply as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

Dependent variable: 1990-2000 Change in Male High-School Equivalent Supply

R Square: .53655

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Male HS Equiv. Wage	-38.380894	331.927203	-.019798	-.116	.9086
1990 Male HS Equiv. Supply	-.155894	.075577	-.311660	-2.063	.0462
1990 Proportion of Male Coll. Grads	-11586.585220	8228.249128	-.295460	-1.408	.1674
1992 Fraction of High-Tech Jobs	31346.539519	18149.71713	.492986	1.727	.0925
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-1841.720395	1965.737829	-.220752	-.937	.3549
Middle Atlantic	-7028.462534	27738.72696	-.030807	-.253	.8014
East North Central	-3888.164592	13028.66706	-.037316	-.298	.7670
West North Central	-1481.708984	1751.750797	-.225916	-.846	.4031
East South Central	1166.735893	4573.496171	.033910	.255	.8001
West South Central	2559.127394	4082.002067	.077850	.627	.5346
Mountain	2682.792580	2196.555984	.235765	1.221	.2297
Pacific	1992.750358	2312.492156	.189962	.862	.3944
(Constant)	3309.234843	5616.309619		.589	.5593

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

**Model 4. 1990-2000 Changes in Supply, considering cost-of-living-adjusted wages
(continued)**

Model 4E 1990-2000 Change in Female College Equivalent Supply as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

Dependent variable: 1990-2000 Change in Female College Equivalent Supply

R Square: .67869

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Female College Equiv. Wage	166.933934	119.053672	.183800	1.402	.1692
1990 Female College Equiv. Supply	.705154	.126460	.695836	5.576	.0000
1990 Proportion of Male Coll. Grads	-40180.865515	9422.861334	-1.087259	-4.264	.0001
1992 Fraction of High-Tech Jobs	96626.200401	18303.62829	1.662970	5.279	.0000
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	3090.904661	2332.651700	.181011	1.325	.1933
Middle Atlantic	-2280.490248	24330.84008	-.009311	-.094	.9258
East North Central	-13568.292751	8498.137547	-.168749	-1.597	.1189
West North Central	237.991360	1560.012877	.034263	.153	.8796
East South Central	5702.625533	4705.916116	.126143	1.212	.2333
West South Central	-2322.800746	2517.020221	-.111185	-.923	.3621
Mountain	3510.621381	1814.371529	.507022	1.935	.0607
Pacific	10472.068147	2551.153381	.566769	4.105	.0002
(Constant)	5270.121540	4058.910723		1.298	.2022

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

Model 4F 1990-2000 Change in Female High-School Equivalent Supply as a Function of 1990 Workforce Composition, 1992 Economic Base Composition, and Ex Ante Regional Traits

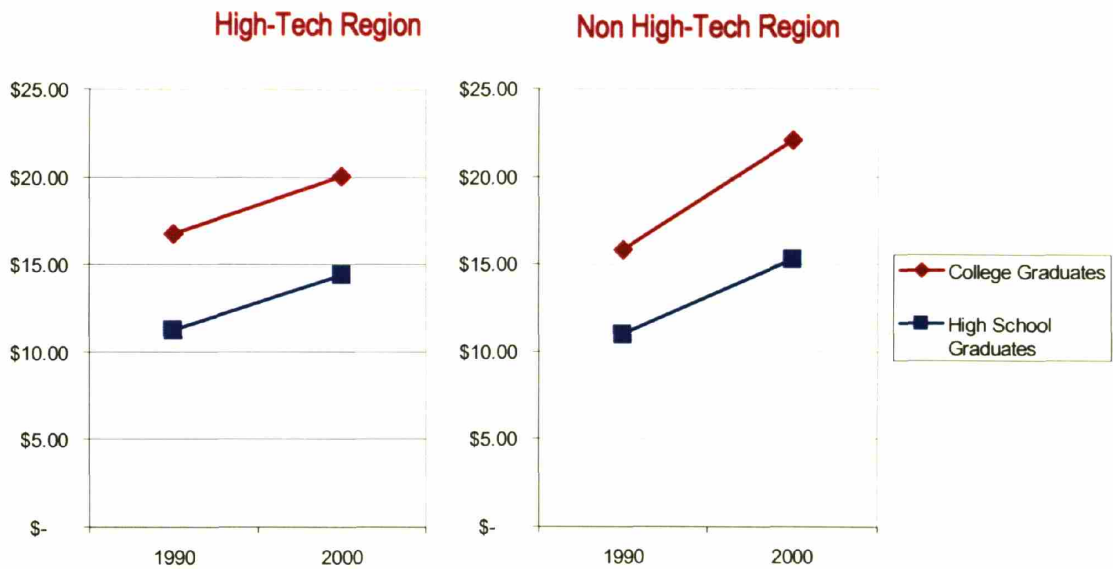
Dependent variable: 1990-2000 Change in Female High-School Equivalent Supply

R Square: .54513

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Female HS Equiv. Wage	415.336747	491.473776	.172359	.845	.4035
1990 Female HS Equiv. Supply	-.178705	.078609	-.357275	-2.273	.0289
1990 Proportion of Female Coll. Grads	-14835.879690	8983.186119	-.378198	-1.652	.1071
1992 Fraction of High-Tech Jobs	36901.958185	18684.80674	.580338	1.975	.0558
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-2756.455770	2217.494056	-.330391	-1.243	.2217
Middle Atlantic	-4889.222153	27565.36615	-.021432	-.177	.8602
East North Central	-3751.573992	12907.76075	-.036007	-.291	.7729
West North Central	-2144.366293	1854.036907	-.326949	-1.157	.2549
East South Central	590.896866	4333.852048	.017175	.136	.8923
West South Central	2073.046028	4067.468756	.063066	.510	.6133
Mountain	1802.364562	2040.975717	.158402	.883	.3829
Pacific	2170.196252	2293.043193	.206898	.946	.3501
(Constant)	212.907754	4657.593291		.046	.9638

Source: Author's calculations on 1990 and 2000 Current Population Survey Data (U.S. Bureau of Labor Statistics)

Figure 26. Cost-of-Living-Adjusted Average Hourly Wages for Female Workers:
High-Tech vs. Non High-Tech Regions, 1990-2000



Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

Figure 27. Cost-of-Living-Adjusted Average Hourly Wages for Male Workers:
Regions with Above-Average Proportions of College Graduates vs. Regions with Above-Average
Proportions of College Graduates, 1990-2000



Source: Current Population Survey 1990 and 2000. U.S. Department of Labor, Bureau of Labor Statistics.

Appendix B

Table 28. Average Regional Labor Supply and Average Wages According to Migration Status and Skill Level: High-Tech vs. Non High-Tech Regions, 1990-2000

	Workers who are in the Labor Force (25-to-45 Years Old)										Cost-of-Living-Adjusted Average Hourly Wages										
	Non-High-Tech Region					High-Tech Region					Non-High-Tech Region					High-Tech Region					
	1990	2000	%Δ	1990	2000	%Δ	1990	2000	%Δ	1990	2000	%Δ	1990	2000	%Δ	1990	2000	%Δ	1990	2000	%Δ
All College Graduates	357,363	626,829	0.75	148,590	262,769	0.77	21.56	23.73	0.10	22.96	25.31	0.10	20.74	23.49	0.13	20.89	22.96	0.10	19.05	21.51	0.02
Non-Migrant	347,030	627,626	(0.32)	179,591	262,996	(0.36)	20.43	20.14	(0.01)	21.15	21.26	0.00	19.63	20.19	0.03	19.05	21.51	0.02	19.05	21.51	0.02
Migrant from Non-Metropolitan Area	223,595	78,703	(0.65)	115,431	47,753	(0.59)	20.23	13.69	(0.32)	21.43	16.78	(0.22)	19.40	14.08	(0.27)	19.15	15.14	(0.21)	19.30	22.21	0.15
Foreign and Domestic Migrant	123,435	158,923	0.29	64,160	78,644	0.23	20.79	23.33	0.12	20.65	23.97	0.16	20.05	23.21	0.16	18.88	22.16	0.17	16.78	21.99	0.31
Foreign Migrants	16,124	29,433	0.83	9,985	15,500	0.58	19.00	23.71	0.25	18.94	24.43	0.29	17.98	23.29	0.30	18.26	24.77	0.36	18.26	24.77	0.36
Domestic Migrants	107,311	129,490	0.21	54,375	63,144	0.16	21.07	23.25	0.10	20.97	23.87	0.14	20.36	23.18	0.14	19.30	22.21	0.15	19.30	22.21	0.15
All High-School Graduates	438,277	641,963	0.46	149,826	244,313	0.63	15.09	16.14	0.07	16.04	17.40	0.08	14.58	16.08	0.10	14.77	15.99	0.08	14.77	15.99	0.08
Non-Migrant	438,277	641,963	0.46	149,826	244,313	0.63	15.09	16.14	0.07	16.04	17.40	0.08	14.58	16.08	0.10	14.77	15.99	0.08	14.77	15.99	0.08
Migrant from Non-Metropolitan Area	193,026	57,644	(0.70)	90,161	30,908	(0.66)	15.38	15.32	(0.00)	17.15	16.92	(0.01)	14.78	15.46	0.05	15.41	15.60	0.01	15.41	15.60	0.01
Foreign and Domestic Migrant	80,197	87,399	0.09	36,338	38,108	0.05	14.23	15.13	0.06	14.40	15.74	0.09	13.84	15.26	0.10	13.24	14.57	0.10	13.24	14.57	0.10
Foreign Migrants	16,212	17,429	0.08	6,741	8,106	0.20	13.56	14.35	0.06	12.86	14.90	0.18	13.08	14.22	0.09	11.28	13.45	0.19	11.28	13.45	0.19
Domestic Migrants	63,985	69,971	0.09	29,597	30,003	0.01	14.42	15.31	0.06	14.80	15.97	0.08	14.02	15.52	0.11	13.73	14.92	0.09	13.73	14.92	0.09
Male College Graduates	190,131	306,308	0.61	79,685	132,895	0.67	24.83	27.03	0.09	26.66	28.77	0.08	23.89	26.78	0.12	24.24	26.11	0.08	24.24	26.11	0.08
Non-Migrant	190,131	306,308	0.61	79,685	132,895	0.67	24.83	27.03	0.09	26.66	28.77	0.08	23.89	26.78	0.12	24.24	26.11	0.08	24.24	26.11	0.08
Migrant from Non-Metropolitan Area	195,173	129,775	(0.34)	101,963	68,546	(0.33)	22.83	22.05	(0.03)	23.45	23.30	(0.01)	21.98	22.16	0.01	21.12	21.41	0.01	21.12	21.41	0.01
Foreign and Domestic Migrant	121,474	40,960	(0.66)	63,861	24,403	(0.62)	22.50	13.27	(0.41)	23.80	16.96	(0.29)	21.61	13.84	(0.36)	21.29	15.32	(0.28)	21.29	15.32	(0.28)
Foreign Migrants	73,700	88,815	0.21	38,102	44,143	0.16	23.39	26.10	0.12	22.84	26.81	0.17	22.59	25.99	0.15	20.83	24.78	0.19	20.83	24.78	0.19
Domestic Migrants	10,426	17,971	0.72	6,202	9,507	0.53	20.35	26.71	0.31	20.63	27.62	0.34	19.35	26.27	0.36	18.28	24.89	0.36	18.28	24.89	0.36
Domestic Migrants	63,273	70,844	0.12	31,900	34,636	0.09	23.88	25.95	0.09	23.27	26.58	0.14	23.12	25.93	0.12	21.35	24.76	0.16	21.35	24.76	0.16
Male High-School Graduates	228,246	343,024	0.50	77,652	130,396	0.68	17.48	17.84	0.02	18.57	19.33	0.04	16.90	17.76	0.05	17.05	17.74	0.04	17.05	17.74	0.04
Non-Migrant	228,246	343,024	0.50	77,652	130,396	0.68	17.48	17.84	0.02	18.57	19.33	0.04	16.90	17.76	0.05	17.05	17.74	0.04	17.05	17.74	0.04
Migrant from Non-Metropolitan Area	146,528	80,892	(0.45)	70,515	39,059	(0.45)	16.83	16.61	(0.01)	18.06	17.72	(0.02)	16.21	16.72	0.03	16.33	16.42	0.01	16.33	16.42	0.01
Foreign and Domestic Migrant	103,167	31,808	(0.69)	49,357	17,099	(0.65)	17.21	16.88	(0.02)	19.02	18.39	(0.03)	16.54	16.96	0.03	17.12	16.97	(0.01)	17.12	16.97	(0.01)
Foreign Migrants	43,360	49,084	0.13	21,157	21,960	0.04	15.93	16.43	0.03	15.82	17.20	0.09	15.43	16.56	0.07	14.49	15.99	0.10	14.49	15.99	0.10
Domestic Migrants	7,202	10,421	0.45	4,230	4,885	0.15	13.81	15.59	0.13	13.56	16.97	0.22	13.01	15.46	0.19	12.14	15.01	0.24	12.14	15.01	0.24
Domestic Migrants	36,159	38,663	0.07	16,928	17,075	0.01	16.36	16.64	0.02	16.39	17.40	0.06	15.92	16.85	0.06	15.15	16.30	0.08	15.15	16.30	0.08
Female College Graduates	168,840	320,521	0.90	68,905	132,700	0.93	17.94	20.60	0.15	18.73	22.00	0.17	17.24	20.34	0.18	16.96	20.07	0.18	16.96	20.07	0.18
Non-Migrant	168,840	320,521	0.90	68,905	132,700	0.93	17.94	20.60	0.15	18.73	22.00	0.17	17.24	20.34	0.18	16.96	20.07	0.18	16.96	20.07	0.18
Migrant from Non-Metropolitan Area	151,857	107,851	(0.29)	77,628	57,078	(0.26)	17.36	17.81	0.03	18.09	19.20	0.06	16.62	17.83	0.07	16.39	17.73	0.08	16.39	17.73	0.08
Foreign and Domestic Migrant	102,121	37,743	(0.63)	51,570	22,324	(0.57)	17.55	14.08	(0.20)	18.40	16.63	(0.10)	16.77	14.35	(0.14)	16.57	15.22	(0.08)	16.57	15.22	(0.08)
Foreign Migrants	49,736	70,108	0.41	26,058	34,754	0.33	16.97	19.82	0.17	17.49	20.84	0.19	16.31	19.70	0.21	16.04	19.35	0.21	16.04	19.35	0.21
Domestic Migrants	5,698	11,462	1.01	3,583	6,041	0.69	20.59	26.68	0.30	20.70	27.54	0.33	19.42	26.15	0.35	18.26	24.77	0.36	18.26	24.77	0.36
Domestic Migrants	44,038	58,647	0.33	22,475	28,713	0.28	17.02	19.98	0.17	17.74	21.08	0.19	16.41	19.69	0.21	16.35	19.74	0.21	16.35	19.74	0.21
Female High-School Graduates	211,232	312,185	0.48	72,174	114,969	0.59	12.50	14.28	0.14	13.36	15.32	0.15	12.08	14.22	0.18	12.24	14.13	0.15	12.24	14.13	0.15
Non-Migrant	211,232	312,185	0.48	72,174	114,969	0.59	12.50	14.28	0.14	13.36	15.32	0.15	12.08	14.22	0.18	12.24	14.13	0.15	12.24	14.13	0.15
Migrant from Non-Metropolitan Area	122,036	64,151	(0.47)	55,984	29,621	(0.47)	12.89	13.49	0.05	14.15	14.57	0.03	12.41	13.60	0.10	12.87	13.47	0.05	12.87	13.47	0.05
Foreign and Domestic Migrant	89,858	25,835	(0.71)	40,803	13,386	(0.67)	13.27	13.44	0.02	14.81	15.38	0.04	12.75	13.62	0.07	13.38	14.22	0.06	13.38	14.22	0.06
Foreign Migrants	32,178	38,316	0.19	18,058	16,235	0.07	11.83	13.44	0.14	12.39	13.90	0.12	11.45	13.59	0.19	11.49	12.85	0.12	11.49	12.85	0.12
Domestic Migrants	4,351	7,008	0.61	2,511	3,209	0.28	13.98	15.69	0.12	13.66	16.72	0.22	13.10	15.54	0.19	12.17	15.09	0.24	12.17	15.09	0.24
Domestic Migrants	27,827	31,308	0.13	12,669	13,026	0.03	11.92	13.67	0.15	12.68	14.23	0.12	11.56	13.85	0.20	11.84	13.27	0.12	11.84	13.27	0.12

Source: Public Use Microdata Samples, U.S. Census of Population 1990 and 2000. U.S. Department of Commerce, Bureau of the Census.

Note: This table only considers workers between 25 and 45 years of age. All wage rates are stated in 2000\$.

Table 29. Total Regional Labor Supply and Average Wages According to Migration Status and Skill Level: High-Tech vs. Non High-Tech Regions, 1990-2000

	Workers who are in the Labor Force (25-to-45 Years Old)				Inflation-Adjusted Average Hourly Wage				Cost-of-Living-Adjusted Average Hourly Wages									
	Non-High-Tech Region		High-Tech Region		Non-High-Tech Region		High-Tech Region		Non-High-Tech Region		High-Tech Region		Non-High-Tech Region		High-Tech Region			
	1990	2000	%Δ	1990	2000	%Δ	1990	2000	%Δ	1990	2000	%Δ	1990	2000	%Δ	1990	2000	%Δ
All College Graduates	7,861,993	13,790,235	0.75	4,309,119	7,620,306	0.77	\$ 21.56	\$ 23.73	0.10	\$ 22.96	\$ 25.31	0.10	\$ 20.74	\$ 23.49	0.13	\$ 20.89	\$ 22.96	0.10
Non-Migrant	7,634,670	5,227,765	(0.32)	5,208,139	3,665,491	(0.30)	\$ 20.43	\$ 20.14	(0.01)	\$ 21.15	\$ 21.26	0.00	\$ 19.63	\$ 20.19	0.03	\$ 19.05	\$ 19.51	0.02
Migrant from Non-Metropolitan Area in State	4,919,096	1,731,461	(0.65)	3,347,505	1,384,827	(0.59)	\$ 20.23	\$ 13.69	(0.32)	\$ 21.43	\$ 16.78	(0.22)	\$ 19.40	\$ 14.08	(0.27)	\$ 19.15	\$ 15.14	(0.21)
Foreign and Domestic Migrant	2,715,575	3,496,304	0.29	1,660,634	2,280,664	0.23	\$ 20.79	\$ 23.33	0.12	\$ 20.65	\$ 23.97	0.16	\$ 20.05	\$ 23.21	0.16	\$ 18.68	\$ 22.16	0.17
Foreign Migrants	354,730	647,519	0.83	283,765	449,490	0.58	\$ 19.00	\$ 23.71	0.25	\$ 18.94	\$ 24.43	0.29	\$ 17.98	\$ 23.29	0.30	\$ 16.78	\$ 21.99	0.31
Domestic Migrants	2,360,845	2,848,785	0.21	1,576,869	1,831,175	0.16	\$ 21.07	\$ 23.25	0.10	\$ 20.97	\$ 23.87	0.14	\$ 20.36	\$ 23.18	0.14	\$ 19.30	\$ 22.21	0.15
All High-School Graduates	9,642,100	14,123,177	0.46	4,344,944	7,085,066	0.63	\$ 15.09	\$ 16.14	0.07	\$ 16.04	\$ 17.40	0.08	\$ 14.58	\$ 16.08	0.10	\$ 14.77	\$ 15.99	0.08
Non-Migrant	6,010,902	3,190,952	(0.47)	3,668,472	2,001,474	(0.45)	\$ 15.04	\$ 15.20	0.01	\$ 16.36	\$ 16.27	(0.01)	\$ 14.50	\$ 15.34	0.06	\$ 14.79	\$ 15.03	0.02
Migrant from Non-Metropolitan Area in State	4,246,565	1,268,165	(0.70)	2,614,662	866,335	(0.66)	\$ 15.38	\$ 15.32	(0.00)	\$ 17.15	\$ 16.92	(0.01)	\$ 14.78	\$ 15.46	0.05	\$ 15.41	\$ 15.60	0.01
Foreign and Domestic Migrant	1,764,338	1,922,787	0.09	1,053,910	1,105,139	0.05	\$ 14.23	\$ 15.13	0.06	\$ 14.40	\$ 15.74	0.09	\$ 13.84	\$ 15.26	0.10	\$ 13.24	\$ 14.57	0.10
Foreign Migrants	356,662	383,427	0.08	198,492	235,062	0.20	\$ 13.56	\$ 14.35	0.06	\$ 12.66	\$ 14.90	0.18	\$ 13.08	\$ 14.22	0.09	\$ 11.28	\$ 13.45	0.19
Domestic Migrants	1,407,676	1,539,360	0.09	855,318	870,078	0.01	\$ 14.42	\$ 15.31	0.06	\$ 14.80	\$ 15.97	0.08	\$ 14.02	\$ 15.92	0.11	\$ 13.73	\$ 14.92	0.09
Male College Graduates	4,182,865	6,738,763	0.61	2,310,878	3,853,960	0.67	\$ 24.83	\$ 27.03	0.09	\$ 26.66	\$ 28.77	0.08	\$ 23.89	\$ 26.78	0.12	\$ 24.24	\$ 26.11	0.08
Non-Migrant	4,293,816	2,855,043	(0.34)	2,856,928	1,987,845	(0.33)	\$ 22.83	\$ 22.05	(0.03)	\$ 23.45	\$ 23.30	(0.01)	\$ 21.98	\$ 22.16	0.01	\$ 21.12	\$ 21.41	0.01
Migrant from Non-Metropolitan Area in State	2,672,426	901,123	(0.66)	1,851,970	707,697	(0.62)	\$ 22.50	\$ 13.27	(0.41)	\$ 23.80	\$ 16.96	(0.29)	\$ 21.61	\$ 13.84	(0.36)	\$ 21.29	\$ 15.32	(0.28)
Foreign and Domestic Migrant	1,621,391	1,953,921	0.21	1,104,958	1,280,149	0.16	\$ 23.39	\$ 26.10	0.12	\$ 22.84	\$ 26.81	0.17	\$ 22.59	\$ 25.99	0.15	\$ 20.83	\$ 24.78	0.19
Foreign Migrants	229,392	395,361	0.72	179,858	275,696	0.53	\$ 20.35	\$ 26.71	0.31	\$ 20.63	\$ 27.62	0.34	\$ 19.35	\$ 26.27	0.36	\$ 18.28	\$ 24.89	0.36
Domestic Migrants	1,392,009	1,558,560	0.12	925,101	1,004,453	0.09	\$ 23.88	\$ 25.95	0.09	\$ 23.27	\$ 26.58	0.14	\$ 23.12	\$ 25.93	0.12	\$ 21.35	\$ 24.76	0.16
Male High-School Graduates	5,021,414	7,546,534	0.50	2,251,903	3,781,480	0.68	\$ 17.48	\$ 17.84	0.02	\$ 18.57	\$ 19.33	0.04	\$ 16.90	\$ 17.76	0.05	\$ 17.05	\$ 17.74	0.04
Non-Migrant	3,223,609	1,779,623	(0.45)	2,044,928	1,132,698	(0.45)	\$ 16.83	\$ 16.61	(0.01)	\$ 18.06	\$ 17.72	(0.02)	\$ 16.21	\$ 16.72	0.03	\$ 16.33	\$ 16.42	0.01
Migrant from Non-Metropolitan Area in State	2,269,679	699,786	(0.69)	1,431,362	485,673	(0.65)	\$ 17.21	\$ 16.88	(0.02)	\$ 19.02	\$ 18.39	(0.03)	\$ 16.54	\$ 16.96	0.03	\$ 17.12	\$ 16.97	(0.01)
Foreign and Domestic Migrant	953,931	1,079,838	0.13	613,566	636,826	0.04	\$ 15.83	\$ 16.43	0.03	\$ 15.82	\$ 17.20	0.09	\$ 15.43	\$ 16.86	0.07	\$ 14.49	\$ 15.99	0.10
Foreign Migrants	158,444	229,252	0.45	122,660	141,653	0.15	\$ 13.81	\$ 15.59	0.13	\$ 13.56	\$ 16.97	0.22	\$ 13.01	\$ 15.46	0.19	\$ 12.14	\$ 15.01	0.24
Domestic Migrants	795,487	850,586	0.07	490,907	495,173	0.01	\$ 16.36	\$ 16.64	0.02	\$ 16.39	\$ 17.40	0.06	\$ 15.92	\$ 16.85	0.06	\$ 15.15	\$ 16.30	0.08
Female College Graduates	3,714,477	7,051,452	0.90	1,898,241	3,848,309	0.93	\$ 17.94	\$ 20.60	0.15	\$ 18.73	\$ 22.00	0.17	\$ 17.24	\$ 20.34	0.18	\$ 16.96	\$ 20.07	0.18
Non-Migrant	3,340,854	2,372,722	(0.29)	2,251,211	1,655,262	(0.26)	\$ 17.36	\$ 17.81	0.03	\$ 18.09	\$ 19.20	0.06	\$ 16.62	\$ 17.83	0.07	\$ 16.39	\$ 17.73	0.08
Migrant from Non-Metropolitan Area in State	2,246,670	830,339	(0.63)	1,495,536	647,391	(0.57)	\$ 17.55	\$ 14.08	(0.20)	\$ 18.40	\$ 16.63	(0.10)	\$ 16.77	\$ 14.35	(0.14)	\$ 16.57	\$ 15.22	(0.08)
Foreign and Domestic Migrant	1,064,164	1,542,364	0.41	755,676	1,007,871	0.33	\$ 16.97	\$ 19.82	0.17	\$ 17.49	\$ 20.84	0.19	\$ 16.31	\$ 19.70	0.21	\$ 16.04	\$ 19.35	0.21
Foreign Migrants	125,349	252,159	1.01	103,907	175,196	0.69	\$ 20.59	\$ 26.68	0.30	\$ 20.70	\$ 27.54	0.33	\$ 19.42	\$ 26.15	0.35	\$ 18.26	\$ 24.77	0.36
Domestic Migrants	968,836	1,290,225	0.33	651,769	832,676	0.26	\$ 17.02	\$ 19.98	0.17	\$ 17.74	\$ 21.08	0.19	\$ 16.41	\$ 19.89	0.21	\$ 16.35	\$ 19.74	0.21
Female High-School Graduates	4,647,097	6,868,078	0.48	2,093,041	3,334,092	0.59	\$ 12.50	\$ 14.28	0.14	\$ 13.36	\$ 15.32	0.15	\$ 12.08	\$ 14.22	0.18	\$ 12.24	\$ 14.13	0.15
Non-Migrant	2,684,798	1,411,329	(0.47)	1,623,544	859,004	(0.47)	\$ 12.89	\$ 13.49	0.05	\$ 14.15	\$ 14.57	0.03	\$ 12.41	\$ 13.60	0.10	\$ 12.87	\$ 13.47	0.05
Migrant from Non-Metropolitan Area in State	1,976,886	568,390	(0.71)	1,183,301	388,180	(0.67)	\$ 13.27	\$ 13.57	0.02	\$ 14.81	\$ 15.38	0.04	\$ 12.75	\$ 13.62	0.07	\$ 13.38	\$ 14.22	0.06
Foreign and Domestic Migrant	707,912	842,950	0.19	440,244	470,824	0.07	\$ 11.83	\$ 13.44	0.14	\$ 12.39	\$ 13.90	0.12	\$ 11.45	\$ 13.59	0.19	\$ 11.49	\$ 12.85	0.16
Foreign Migrants	95,724	154,176	0.61	72,832	93,059	0.28	\$ 13.98	\$ 15.69	0.12	\$ 13.66	\$ 16.72	0.22	\$ 13.10	\$ 15.54	0.19	\$ 12.17	\$ 15.09	0.24
Domestic Migrants	612,189	688,774	0.13	367,412	377,766	0.03	\$ 11.92	\$ 13.67	0.15	\$ 12.68	\$ 14.23	0.12	\$ 11.56	\$ 13.85	0.20	\$ 11.84	\$ 13.27	0.12

Source: Public Use Microdata Samples, U.S. Census of Population 1990 and 2000. U.S. Department of Commerce, Bureau of the Census.
 Note: This table only considers workers between 25 and 45 years of age. All wage rates are stated in 2000\$.

**Table 30. Proportions of Regional Labor Supply According to Migration Status and Skill Level:
High-Tech vs. Non High-Tech Regions, 1990-2000**

Proportion of Workers who are in the Labor Force (25-to-45 Years Old)						
	Non-High-Tech Region			Non-High-Tech Region		
	1990	2000	%Δ	1990	2000	%Δ
All College Graduates						
Non-Migrant	0.51	0.73	0.43	0.45	0.68	0.49
Migrants	0.49	0.27	(0.44)	0.55	0.32	(0.41)
Migrant from Non-Metropolitan Area in State	0.32	0.09	(0.71)	0.35	0.12	(0.65)
Foreign and Domestic Migrant	0.18	0.18	0.05	0.20	0.20	0.03
Foreign Migrants	0.02	0.03	0.49	0.03	0.04	0.34
Domestic Migrants	0.15	0.15	(0.02)	0.17	0.16	(0.02)
All High-School Graduates						
Non-Migrant	0.62	0.82	0.32	0.54	0.78	0.44
Migrants	0.38	0.18	(0.52)	0.46	0.22	(0.52)
Migrant from Non-Metropolitan Area in State	0.27	0.07	(0.73)	0.33	0.10	(0.70)
Foreign and Domestic Migrant	0.11	0.11	(0.01)	0.13	0.12	(0.08)
Foreign Migrants	0.02	0.02	(0.03)	0.02	0.03	0.06
Domestic Migrants	0.09	0.09	(0.01)	0.11	0.10	(0.11)
Male College Graduates						
Non-Migrant	0.49	0.70	0.42	0.44	0.66	0.50
Migrants	0.51	0.30	(0.41)	0.56	0.34	(0.39)
Migrant from Non-Metropolitan Area in State	0.32	0.09	(0.70)	0.35	0.12	(0.66)
Foreign and Domestic Migrant	0.19	0.20	0.06	0.21	0.22	0.04
Foreign Migrants	0.03	0.04	0.52	0.03	0.05	0.38
Domestic Migrants	0.16	0.16	(0.01)	0.18	0.17	(0.02)
Male High-School Graduates						
Non-Migrant	0.61	0.81	0.33	0.52	0.77	0.47
Migrants	0.39	0.19	(0.51)	0.48	0.23	(0.52)
Migrant from Non-Metropolitan Area in State	0.28	0.08	(0.73)	0.33	0.10	(0.70)
Foreign and Domestic Migrant	0.12	0.12	0.00	0.14	0.13	(0.09)
Foreign Migrants	0.02	0.02	0.28	0.03	0.03	0.01
Domestic Migrants	0.10	0.09	(0.05)	0.11	0.10	(0.12)
Female College Graduates						
Non-Migrant	0.53	0.75	0.42	0.47	0.70	0.49
Migrants	0.47	0.25	(0.47)	0.53	0.30	(0.43)
Migrant from Non-Metropolitan Area in State	0.32	0.09	(0.72)	0.35	0.12	(0.67)
Foreign and Domestic Migrant	0.16	0.16	0.06	0.18	0.18	0.03
Foreign Migrants	0.02	0.03	0.51	0.02	0.03	0.30
Domestic Migrants	0.14	0.14		0.15	0.15	(0.01)
Female High-School Graduates						
Non-Migrant	0.63	0.83	0.31	0.56	0.80	0.41
Migrants	0.37	0.17	(0.53)	0.44	0.20	(0.53)
Migrant from Non-Metropolitan Area in State	0.27	0.07	(0.75)	0.32	0.09	(0.71)
Foreign and Domestic Migrant	0.10	0.10	0.05	0.12	0.11	(0.05)
Foreign Migrants	0.01	0.02	0.43	0.02	0.02	0.13
Domestic Migrants	0.08	0.08	(0.00)	0.10	0.09	(0.09)

Source: Public Use Microdata Samples, U.S. Census of Population 1990 and 2000. U.S. Department of Commerce, Bureau of the Census.
Note: This table only considers workers between 25 and 45 years of age. All wage rates are stated in 2000\$.

Table 32. Total Regional Labor Supply and Average Wages According to Migration Status and Skill Level: Regions with Above-Average Proportions of College Graduates vs. Regions with Below-Average Proportions of College Graduates, 1990-2000

	Workers who are in the Labor Force (25-to-45 Years Old)			Inflation-Adjusted Average Hourly Wage			Cost-of-Living-Adjusted Average Hourly Wages		
	Region with Below Average Proportion of College Graduates	Region with Above Average Proportion of College Graduates	%Δ	Region with Below Average Proportion of College Graduates	Region with Above Average Proportion of College Graduates	%Δ	Region with Below Average Proportion of College Graduates	Region with Above Average Proportion of College Graduates	%Δ
All College Graduates	1990	2000	%Δ	1990	2000	%Δ	1990	2000	%Δ
Non-Migrant	4,790,026	8,225,527	0.72	7,381,076	13,185,015	0.79	22.92	20.38	0.10
Migrants	4,541,662	3,219,287	(0.29)	8,301,147	5,673,969	(0.32)	21.27	19.29	0.01
Migrant from Non-Metropolitan Area in State	1,015,165	1,015,165	(0.63)	5,508,367	2,101,124	(0.62)	21.37	18.96	(0.28)
Foreign and Domestic Migrant	2,783,428	2,204,123	0.24	2,792,780	3,572,846	0.28	21.07	19.80	0.12
Foreign Migrants	185,631	345,732	0.86	452,864	751,277	0.66	19.57	17.13	0.29
Domestic Migrants	1,597,797	1,858,391	0.16	2,339,917	2,821,569	0.21	21.37	20.14	0.10
All High-School Graduates	1990	2000	%Δ	1990	2000	%Δ	1990	2000	%Δ
Non-Migrant	6,433,068	8,932,723	0.39	7,563,976	12,275,521	0.63	16.04	14.38	0.09
Migrants	3,787,650	2,066,896	(0.45)	5,891,724	3,125,530	(0.47)	16.18	14.22	0.05
Migrant from Non-Metropolitan Area in State	2,496,524	746,204	(0.70)	4,364,703	1,416,297	(0.68)	14.77	14.38	0.04
Foreign and Domestic Migrant	1,291,126	1,318,693	0.02	1,527,021	1,709,234	0.12	14.42	13.92	0.08
Foreign Migrants	241,091	218,078	(0.10)	311,063	400,411	0.29	13.14	13.37	0.05
Domestic Migrants	1,050,035	1,100,615	0.05	1,215,959	1,308,823	0.08	14.34	14.03	0.08
Male College Graduates	1990	2000	%Δ	1990	2000	%Δ	1990	2000	%Δ
Non-Migrant	2,546,422	4,028,785	0.58	3,547,341	6,563,959	0.86	23.86	25.63	0.07
Migrants	2,563,298	1,745,199	(0.32)	4,687,446	3,097,689	(0.34)	22.26	21.40	(0.04)
Migrant from Non-Metropolitan Area in State	1,493,677	513,467	(0.66)	3,030,718	1,095,353	(0.64)	21.70	23.17	(0.39)
Foreign and Domestic Migrant	1,069,621	1,231,733	0.15	1,656,728	2,022,337	0.21	23.04	24.83	0.08
Foreign Migrants	120,529	211,425	0.75	286,710	459,651	0.59	25.14	20.86	0.33
Domestic Migrants	949,092	1,020,308	0.08	1,368,018	1,542,706	0.13	23.48	24.76	0.25
Male High-School Graduates	1990	2000	%Δ	1990	2000	%Δ	1990	2000	%Δ
Non-Migrant	3,336,342	4,828,263	0.43	3,636,975	6,499,752	0.85	17.03	17.34	0.02
Migrants	2,008,403	1,150,321	(0.43)	3,260,134	1,762,000	(0.46)	16.38	16.28	(0.01)
Migrant from Non-Metropolitan Area in State	1,324,343	406,812	(0.69)	2,376,697	788,847	(0.67)	16.62	16.37	(0.01)
Foreign and Domestic Migrant	684,060	743,510	0.09	863,437	973,154	0.10	15.92	16.24	0.02
Foreign Migrants	87,400	131,398	0.50	193,703	239,506	0.24	12.65	14.79	0.17
Domestic Migrants	596,660	612,112	0.03	669,734	733,648	0.06	16.42	16.54	0.01
Female College Graduates	1990	2000	%Δ	1990	2000	%Δ	1990	2000	%Δ
Non-Migrant	2,278,983	4,278,705	0.88	3,643,735	6,621,056	0.93	17.32	19.10	0.10
Migrants	1,978,365	1,451,704	(0.27)	3,013,701	2,576,280	(0.29)	16.45	17.14	0.04
Migrant from Non-Metropolitan Area in State	1,264,557	471,959	(0.63)	2,477,649	1,005,771	(0.59)	16.70	13.87	(0.17)
Foreign and Domestic Migrant	713,808	979,746	0.37	1,136,052	1,570,509	0.38	17.02	18.72	0.17
Foreign Migrants	65,102	135,709	1.08	164,154	291,646	0.78	15.01	25.03	0.28
Domestic Migrants	648,706	844,037	0.30	971,899	1,278,864	0.32	16.20	18.95	0.17
Female High-School Graduates	1990	2000	%Δ	1990	2000	%Δ	1990	2000	%Δ
Non-Migrant	3,096,726	4,426,401	0.43	3,643,412	5,775,769	0.59	12.02	13.49	0.12
Migrants	1,676,753	906,803	(0.46)	2,631,590	1,363,530	(0.48)	12.33	13.13	0.06
Migrant from Non-Metropolitan Area in State	1,172,181	329,110	(0.72)	1,988,006	627,450	(0.68)	12.68	13.08	0.03
Foreign and Domestic Migrant	504,572	577,694	0.14	643,584	736,090	0.14	11.62	13.15	0.14
Foreign Migrants	51,196	86,330	0.69	117,360	160,905	0.37	12.68	14.79	0.17
Domestic Migrants	453,376	491,364	0.08	526,225	575,176	0.09	11.60	13.27	0.14

Source: Public Use Microdata Samples, U.S. Census of Population 1990 and 2000. U.S. Department of Commerce, Bureau of the Census. Note: This table only considers workers between 25 and 45 years of age. All wage rates are stated in 2000\$.

**Table 33. Proportions of Regional Labor Supply According to Migration Status and Skill Level:
Regions with Above-Average Proportions of College Graduates vs. Regions with Below-Average Proportions of College Graduates,
1990-2000**

Proportion of Workers who are in the Labor Force (25-45 Years Old)						
	Region with Below Average Proportion of College Graduates			Region with Above Average Proportion of College Graduates		
	1990	2000	%Δ	1990	2000	%Δ
All College Graduates						
Non-Migrant	0.51	0.72	0.40	0.47	0.70	0.49
Migrants	0.49	0.28	(0.42)	0.53	0.30	(0.43)
Migrant from Non-Metropolitan Area in State	0.30	0.09	(0.70)	0.35	0.11	(0.68)
Foreign and Domestic Migrant	0.19	0.19	0.01	0.18	0.19	0.06
Foreign Migrants	0.02	0.03	0.52	0.03	0.04	0.38
Domestic Migrants	0.17	0.16	(0.05)	0.15	0.15	0.00
All High-School Graduates						
Non-Migrant	0.63	0.81	0.29	0.56	0.80	0.42
Migrants	0.37	0.19	(0.49)	0.44	0.20	(0.54)
Migrant from Non-Metropolitan Area in State	0.24	0.07	(0.72)	0.32	0.09	(0.72)
Foreign and Domestic Migrant	0.13	0.12	(0.05)	0.11	0.11	(0.02)
Foreign Migrants	0.02	0.02	(0.16)	0.02	0.03	0.12
Domestic Migrants	0.10	0.10	(0.03)	0.09	0.08	(0.06)
Male College Graduates						
Non-Migrant	0.50	0.70	0.40	0.46	0.68	0.49
Migrants	0.50	0.30	(0.40)	0.54	0.32	(0.41)
Migrant from Non-Metropolitan Area in State	0.29	0.09	(0.70)	0.35	0.11	(0.68)
Foreign and Domestic Migrant	0.21	0.21	0.02	0.19	0.21	0.08
Foreign Migrants	0.02	0.04	0.55	0.03	0.05	0.42
Domestic Migrants	0.19	0.18	(0.05)	0.16	0.16	0.01
Male High-School Graduates						
Non-Migrant	0.62	0.81	0.29	0.55	0.79	0.44
Migrants	0.38	0.19	(0.49)	0.45	0.21	(0.53)
Migrant from Non-Metropolitan Area in State	0.25	0.07	(0.73)	0.33	0.10	(0.71)
Foreign and Domestic Migrant	0.13	0.12	(0.03)	0.12	0.12	(0.04)
Foreign Migrants	0.02	0.02	0.34	0.03	0.03	0.08
Domestic Migrants	0.11	0.10	(0.08)	0.10	0.09	(0.07)
Female College Graduates						
Non-Migrant	0.54	0.75	0.39	0.49	0.72	0.48
Migrants	0.46	0.25	(0.45)	0.51	0.28	(0.45)
Migrant from Non-Metropolitan Area in State	0.30	0.08	(0.72)	0.35	0.11	(0.69)
Foreign and Domestic Migrant	0.17	0.17	0.02	0.16	0.17	0.06
Foreign Migrants	0.02	0.02	0.55	0.02	0.03	0.36
Domestic Migrants	0.15	0.15	(0.03)	0.14	0.14	0.01
Female High-School Graduates						
Non-Migrant	0.65	0.83	0.28	0.58	0.81	0.39
Migrants	0.35	0.17	(0.52)	0.42	0.19	(0.54)
Migrant from Non-Metropolitan Area in State	0.25	0.06	(0.75)	0.32	0.09	(0.72)
Foreign and Domestic Migrant	0.11	0.11	0.02	0.10	0.10	0.01
Foreign Migrants	0.01	0.02	0.51	0.02	0.02	0.21
Domestic Migrants	0.09	0.09	(0.03)	0.08	0.08	(0.04)

Source: Public Use Microdata Samples, U.S. Census of Population 1990 and 2000. U.S. Department of Commerce, Bureau of the Census.
Note: This table only considers workers between 25 and 45 years of age. All wage rates are stated in 2000\$.

Model 5. College and High-School Graduate Migration, considering inflation-adjusted wages

Model 5A. Impact of workforce composition, economic base composition, and *ex ante* regional traits on immigration of college graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (All College Equivalent Migrants)

Dependent variable: College graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (All College Equivalent Migrants)

R Square: .87664

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional College Equivalent Wage and National Average for Skill Group	1366.283290	620.372288	.295407	2.202	.0339
1990 College Equivalent Supply	3.044310	.251038	.987819	12.127	.0000
1990 Proportion of College Graduates	-14868.611433	34458.60377	-.031822	-.431	.6686
1992 Fraction of High-Tech Jobs	41667.135512	66607.28605	.114888	.626	.5354
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	21430.908580	9553.357277	.201636	2.243	.0310
Middle Atlantic	-72050.793704	89575.55981	-.049364	-.804	.4263
East North Central	-64998.465779	31290.61241	-.141378	-2.077	.0448
West North Central	16161.216733	5937.757900	.314153	2.722	.0098
East South Central	6811.101058	16628.80310	.026469	.410	.6845
West South Central	15958.560026	11998.87831	.090071	1.330	.1917
Mountain	17174.643212	6851.189881	.418700	2.507	.0167
Pacific	1623.526705	10384.51707	.017892	.156	.8766
(Constant)	-3435.973047	14405.48381		-.239	.8128

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 5B. Impact of workforce composition, economic base composition, and *ex ante* regional traits on non-migrant college graduates supply

Dependent variable: Non-migrant college graduates

R Square: .96698

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional College Equivalent Wage and National Average for Skill Group	457.058010	673.883935	.047067	.678	.5018
1990 College Equivalent Supply	6.457099	.272691	.997907	23.679	.0000
1990 Proportion of College Graduates	-338380.531853	37430.91036	-.344928	-9.040	.0000
1992 Fraction of High-Tech Jobs	19475.709836	72352.65161	.025576	.269	.7893
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-29695.316734	10377.40421	-.133070	-2.862	.0069
Middle Atlantic	142428.732450	97302.10697	.046477	1.464	.1517
East North Central	-18149.057160	33989.65658	-.018802	-.534	.5966
West North Central	8672.651298	6449.932945	.080294	1.345	.1869
East South Central	-21714.881924	18063.15899	-.040192	-1.202	.2369
West South Central	3334.033312	13033.86932	.008962	.256	.7995
Mountain	17232.031327	7442.155114	.200085	2.315	.0262
Pacific	11120.598866	11280.25762	.058371	.986	.3306
(Constant)	117210.168761	15648.06214		7.490	.0000

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 5. College and High-School Graduate Migration, considering inflation-adjusted wages (continued)

Model 5C. Impact of workforce composition, economic base composition, and *ex ante* regional traits on immigration of high-school graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (All High-School Equivalent Migrants)

Dependent variable: High-school graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (All High-School Equivalent Migrants)

R Square: .83933

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional High-School Equivalent Wage and National Average for Skill Group	4017.868489	1719.375481	.408339	2.337	.0250
1990 High-School Equivalent Supply	.912835	.102607	.782085	8.896	.0000
1990 Proportion of College Graduates	-13433.931696	29560.77024	-.040930	-.454	.6522
1992 Fraction of High-Tech Jobs	65310.458404	49546.80581	.229641	1.318	.1956
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	15720.897483	6705.714524	.328137	2.344	.0245
Middle Atlantic	-101338.399141	77020.24271	-.092517	-1.316	.1964
East North Central	-44100.262861	35672.69759	-.088701	-1.236	.2242
West North Central	11161.126645	5520.028385	.287007	2.022	.0505
East South Central	3948.622118	13346.24387	.022654	.296	.7690
West South Central	27734.293203	12787.59152	.161156	2.169	.0366
Mountain	8405.535596	5993.422983	.165872	1.402	.1691
Pacific	-1512.481677	8162.926634	-.032873	-.185	.8540
(Constant)	3657.079329	13420.65686		.272	.7868

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 5D. Impact of workforce composition, economic base composition, and *ex ante* regional traits on non-migrant high-school graduates supply

Dependent variable: Non-migrant high-school graduates

R Square: .95498

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional High-School Equivalent Wage and National Average for Skill Group	-274.873931	2926.729689	-.008688	-.094	.9257
1990 High-School Equivalent Supply	3.468955	.174658	.924272	19.861	.0000
1990 Proportion of College Graduates	-113463.941767	50318.49345	-.107508	-2.255	.0301
1992 Fraction of High-Tech Jobs	-85251.621920	84338.82485	-.093220	-1.011	.3187
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-35987.871552	11414.50137	-.233600	-3.153	.0032
Middle Atlantic	-61745.147838	131104.2489	-.017530	-.471	.6404
East North Central	57795.191725	60722.24727	.036151	.952	.3474
West North Central	-2198.721100	9396.220392	-.017583	-.234	.8163
East South Central	-2452.969895	22718.04419	-.004376	-.108	.9146
West South Central	47479.026911	21767.10332	.085797	2.181	.0356
Mountain	10314.442995	10202.03508	.063298	1.011	.3186
Pacific	-5315.224456	13894.97523	-.035926	-.383	.7043
(Constant)	57456.961121	22844.71036		2.515	.0164

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 5. College and High-School Graduate Migration, considering inflation-adjusted wages (continued)

Model 5E. Impact of workforce composition, economic base composition, and ex ante regional traits on immigration of male college graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (Male College Equivalent Migrants)

Dependent variable: Male college graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (Male College Equivalent Migrants)

R Square: .85761

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional and National Male College Equivalent Wages	892.142134	411.540435	.346210	2.168	.0367
1990 Male College Equivalent Supply	3.042779	.276353	.913090	11.010	.0000
1990 Proportion of Male Coll. Grads.	-34317.713529	21756.81364	-.282546	-1.577	.1232
1992 Fraction of High-Tech Jobs	37438.233796	40589.68600	.195960	.922	.3623
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	7524.396231	5327.860451	.134004	1.412	.1662
Middle Atlantic	-46937.020491	53257.90213	-.058281	-.881	.3838
East North Central	-18378.938643	18602.35450	-.069513	-.988	.3296
West North Central	4632.443848	3445.305741	.202817	1.345	.1870
East South Central	-3922.619422	10169.86698	-.026387	-.386	.7019
West South Central	8727.064713	5606.684645	.127031	1.557	.1281
Mountain	6788.733027	4042.119514	.298142	1.679	.1015
Pacific	266.347044	5996.863637	.004384	.044	.9648
(Constant)	9969.278971	8740.433019		1.141	.2614

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 5F. Impact of workforce composition, economic base composition, and ex ante regional traits on non-migrant male college graduates supply

Dependent variable: Non-migrant male college graduates

R Square: .95897

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional and National Male College Equivalent Wages	189.081882	467.637690	.027758	.404	.6883
1990 Male College Equivalent Supply	5.958701	.270070	.932952	22.064	.0000
1990 Proportion of Male Coll. Grads.	-166587.254352	29906.86978	-.358257	-5.570	.0000
1992 Fraction of High-Tech Jobs	223042.115059	67248.63578	.283268	3.317	.0020
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-12142.609577	7975.029955	-.074714	-1.523	.1364
Middle Atlantic	48726.939448	45459.66913	.039385	1.072	.2907
East North Central	10988.061260	20547.95254	.020739	.535	.5960
West North Central	-1048.730605	5998.488073	-.011725	-.175	.8622
East South Central	-10693.342015	13120.03362	-.031394	-.815	.4203
West South Central	2467.220237	9239.883621	.011983	.267	.7909
Mountain	4444.628629	7071.111124	.048983	.629	.5335
Pacific	11110.897365	9250.288432	.058968	1.201	.2373
(Constant)	54592.730689	11940.87793		4.572	.0001

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 5. College and High-School Graduate Migration, considering inflation-adjusted wages (continued)

Model 5G. Impact of workforce composition, economic base composition, and ex ante regional traits on immigration of male high-school graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (Male High-School Equivalent Migrants)

Dependent variable: Male high-school graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (Male High-School Equivalent Migrants)

R Square: .85129

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional and National Male High-School Equivalent Wages	1002.898066	449.850634	.234081	2.229	.0319
1990 Male HS Equivalent Supply	1.065079	.113056	.810441	9.421	.0000
1990 Proportion of Male Coll. Grads.	3969.532037	12245.79175	.038527	.324	.7476
1992 Fraction of High-Tech Jobs	27518.115298	26862.00290	.164722	1.024	.3123
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	10767.163447	2932.629868	.491212	3.672	.0008
Middle Atlantic	-69550.297905	41320.11431	-.116032	-1.683	.1008
East North Central	-30513.380390	19464.70851	-.111461	-1.568	.1255
West North Central	6086.559140	2821.544232	.353219	2.157	.0376
East South Central	2281.814071	6475.269270	.025242	.352	.7265
West South Central	13052.662705	6188.796008	.151130	2.109	.0418
Mountain	5777.715027	2787.131914	.193258	2.073	.0452
Pacific	2794.545462	3527.452493	.101394	.792	.4333
(Constant)	-3664.657606	5281.451948		-.694	.4921

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 5H. Impact of workforce composition, economic base composition, and ex ante regional traits on non-migrant male high-school graduates supply

Dependent variable: Non-migrant male high-school graduates

R Square: .94496

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional and National Male High-School Equivalent Wages	572.389733	829.728045	.044067	.690	.4946
1990 Male HS Equivalent Supply	3.713498	.208526	.932040	17.808	.0000
1990 Proportion of Male Coll. Grads.	-32318.438872	22586.77897	-.103465	-1.431	.1609
1992 Fraction of High-Tech Jobs	-22468.544142	49545.68348	-.044363	-.453	.6528
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-26638.978203	5409.095953	-.400864	-4.925	.0000
Middle Atlantic	-20712.895931	76212.98056	-.011398	-.272	.7873
East North Central	-3481.158285	35901.72670	-.004194	-.097	.9233
West North Central	-3428.906252	5204.203796	-.065636	-.659	.5141
East South Central	-9534.529349	11943.32541	-.034790	-.798	.4298
West South Central	21835.363329	11414.93913	.083392	1.913	.0635
Mountain	-2410.046715	5140.731916	-.026590	-.469	.6420
Pacific	-10084.609058	6506.217923	-.120690	-1.550	.1297
(Constant)	27496.038103	9741.386281		2.823	.0076

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 5. College and High-School Graduate Migration, considering inflation-adjusted wages (continued)

Model 5I. Impact of workforce composition, economic base composition, and *ex ante* regional traits on immigration of female college graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (Female College Equivalent Migrants)

Dependent variable: Female college graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (Female College Equivalent Migrants)

R Square: .82436

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional and National Female College Equivalent Wages	67.691372	236.115323	.027097	.287	.7760
1990 Female College Equiv. Supply	2.544528	.259259	.905825	9.815	.0000
1990 Proportion of Female Coll. Grads.	-.9630.126082	19313.34115	-.094007	-.499	.6210
1992 Fraction of High-Tech Jobs	45147.759122	37677.13787	.280311	1.198	.2384
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	11551.456646	4737.800620	.244045	2.438	.0197
Middle Atlantic	-.37535.281880	49863.28960	-.055289	-.753	.4564
East North Central	-.15705.271036	17428.90509	-.070466	-.901	.3734
West North Central	2871.915185	3211.759138	.149159	.894	.3770
East South Central	-.3627.155536	9760.290895	-.028945	-.372	.7123
West South Central	4658.152454	5219.640948	.080438	.892	.3779
Mountain	4329.246178	3801.008545	.225564	1.139	.2620
Pacific	1851.180361	5320.795307	.036144	.348	.7299
(Constant)	758.441874	7503.570597		.101	.9200

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 5J. Impact of workforce composition, economic base composition, and *ex ante* regional traits on non-migrant female college graduates supply

Dependent variable: Non-migrant female college graduates

R Square: .95237

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional and National Female College Equivalent Wages	405.066964	465.899613	.040221	.869	.3902
1990 Female College Equiv. Supply	6.029895	.302680	.909263	19.922	.0000
1990 Proportion of Female Coll. Grads	-178615.748358	33358.75200	-.369796	-5.354	.0000
1992 Fraction of High-Tech Jobs	230428.873120	70898.41488	.281832	3.250	.0025
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-.16281.536504	9141.529619	-.096483	-1.781	.0831
Middle Atlantic	51358.182216	50861.07893	.039980	1.010	.3192
East North Central	9938.085521	22981.47306	.018065	.432	.6679
West North Central	-.4403.006996	6384.998911	-.047412	-.690	.4948
East South Central	-.3923.579222	14869.60456	-.011094	-.264	.7933
West South Central	5543.263832	10001.00185	.025930	.554	.5827
Mountain	-.615.326062	7416.970100	-.006531	-.083	.9343
Pacific	4231.465016	10414.08155	.021629	.406	.6868
(Constant)	64690.719489	13308.23997		4.861	.0000

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 5. College and High-School Graduate Migration, considering inflation-adjusted wages (continued)

Model 5K. Impact of workforce composition, economic base composition, and *ex ante* regional traits on immigration of female high-school graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (Female High-School Equivalent Migrants)

Dependent variable: Female high-school graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (Female High-School Equivalent Migrants)

R Square: .86305

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional and National Female High-School Equivalent Wages	1819.263037	584.940812	.428068	3.110	.0036
1990 Female HS Equiv. Supply	.756567	.092977	.697823	8.137	.0000
1990 Proportion of Female Coll. Grads	-8679.417253	10442.00255	-.102077	-.831	.4112
1992 Fraction of High-Tech Jobs	30329.433257	22110.78850	.220053	1.372	.1784
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	5730.329650	2560.330566	.316875	2.238	.0313
Middle Atlantic	-47843.833640	32762.47649	-.096755	-1.460	.1526
East North Central	-22902.260254	15402.06404	-.101410	-1.487	.1455
West North Central	3961.076357	2095.349476	.278629	1.890	.0666
East South Central	3708.325773	5164.219087	.049727	.718	.4772
West South Central	11198.460404	4850.703844	.157173	2.309	.0267
Mountain	4239.944633	2190.172512	.171913	1.936	.0605
Pacific	-590.109990	2823.796351	-.025955	-.209	.8356
(Constant)	4317.325630	4623.815471		.934	.3565

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 5L. Impact of workforce composition, economic base composition, and *ex ante* regional traits on non-migrant female high-school graduates supply

Dependent variable: Non-migrant female high-school graduates

R Square: .95102

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional and National Female High-School Equivalent Wages	-1824.920159	1153.187656	-.130250	-1.583	.1220
1990 Female HS Equiv. Supply	3.499003	.183300	.978948	19.089	.0000
1990 Proportion of Female Coll. Grads	-16606.910128	20585.99468	-.059244	-.807	.4250
1992 Fraction of High-Tech Jobs	-39229.592999	43590.54428	-.086336	-.900	.3740
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-18707.173385	5047.590361	-.313786	-3.706	.0007
Middle Atlantic	-43365.465686	64589.92551	-.026602	-.671	.5061
East North Central	-10936.523841	30364.55958	-.014689	-.360	.7208
West North Central	-7518.193237	4130.898549	-.160414	-1.820	.0769
East South Central	-7599.915104	10181.05351	-.030913	-.746	.4601
West South Central	15895.391535	9562.970615	.067672	1.662	.1049
Mountain	-1766.660117	4317.838410	-.021728	-.409	.6848
Pacific	-6298.207677	5567.002728	-.084028	-1.131	.2652
(Constant)	17664.367336	9115.669169		1.938	.0603

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 6. 1990-2000 Changes in Inflation-Adjusted Wages in the presence of migration

Model 6A 1990-2000 Change in college equivalent inflation-adjusted wages as a function of 1990 workforce composition, 1992 economic base composition, ex ante regional traits and college graduates migration patterns

Dependent variable: 1990-2000 Change in College Equivalent Wage

R Square: .75156

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1985-1990 Migrant College Equivalent Supply	8.272722E-006	3.0005E-006	1.256209	2.757	.0091
1985-1990 Non-Migrant College Equivalent Supply	-2.828713E-006	1.2307E-006	-1.105471	-2.298	.0275
1990 College Equivalent Wage	-.762858	.111351	-.924441	-6.851	.0000
1990 Proportion of College Graduates	7.168131	5.031073	.155544	1.425	.1628
1992 Fraction of High-Tech Jobs	11.430258	7.082247	.236710	1.614	.1153
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-2.421555	1.008201	-.412330	-2.402	.0216
Middle Atlantic	.998424	1.194258	.159553	.836	.4087
East North Central	.147724	1.036494	.023382	.143	.8875
West North Central	-2.485867	1.167261	-.263676	-2.130	.0401
East South Central	-.261881	1.345926	-.023825	-.195	.8468
West South Central	-1.320054	1.084911	-.173050	-1.217	.2316
Mountain	-.778676	1.191798	-.083770	-.653	.5177
Pacific	-.872132	1.099982	-.147354	-.793	.4331
(Constant)	12.924182	2.412927		5.356	.0000

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 6B 1990-2000 Change in high-school equivalent inflation-adjusted wages as a function of 1990 workforce composition, 1992 economic base composition, ex ante regional traits and high-school graduates migration patterns

Dependent variable: 1990-2000 Change in High-School Equivalent Wage

R Square: .56188

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1985-1990 Migrant High-School Equivalent Supply	-1.962109E-006	3.0999E-006	-.244177	-.633	.5308
1985-1990 Non-Migrant High-School Equivalent Supply	3.272020E-007	8.6544E-007	.163424	.378	.7076
1990 High-School Equivalent Wage	-.811812	.200142	-.788248	-4.056	.0003
1990 Proportion of College Graduates	6.856680	4.360756	.224351	1.572	.1246
1992 Fraction of High-Tech Jobs	-6.685312	5.787662	-.195543	-1.155	.2557
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	.798934	1.063797	.210170	.751	.4575
Middle Atlantic	.846743	1.156502	.199287	.732	.4688
East North Central	.983650	1.059036	.243109	.929	.3592
West North Central	1.172286	1.160954	.172638	1.010	.3193
East South Central	.036603	1.326412	.004622	.028	.9781
West South Central	-.148109	1.122241	-.030748	-.132	.8957
Mountain	2.220788	1.130386	.349886	1.965	.0572
Pacific	1.203761	1.139090	.303971	1.057	.2977
(Constant)	8.756175	2.852720		3.069	.0041

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 6. 1990-2000 Changes in Inflation-Adjusted Wages in the presence of migration (continued)

Model 6C 1990-2000 Change in college equivalent inflation-adjusted wages as a function of 1990 workforce composition, 1992 economic base composition, ex ante regional traits and college graduates migration patterns (males only)

Dependent variable: 1990-2000 Change in Male College Equivalent Wage

R Square: .75339

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1985-1990 Migrant College Equivalent Supply (males only)	1.533056E-005	8.3626E-006	.889626	1.833	.0750
1985-1990 Non-Migrant Male College Equivalent Supply	-4.473136E-006	3.6799E-006	-.609653	-1.216	.2321
1990 Male College Equiv. Wage	-.853428	.114217	-.794275	-7.472	.0000
1990 Proportion of Male Coll. Grads	10.744941	4.624520	.215107	2.323	.0259
1992 Fraction of High-Tech Jobs	5.176528	10.507441	.072274	.493	.6252
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-2.068227	1.505650	-.232013	-1.374	.1780
Middle Atlantic	.159611	1.705665	.017014	.094	.9260
East North Central	.705469	1.515296	.075499	.466	.6443
West North Central	-4.275921	1.760327	-.285244	-2.429	.0203
East South Central	-.105017	2.024325	-.006531	-.052	.9589
West South Central	-1.078203	1.639748	-.097894	-.658	.5150
Mountain	.140876	1.795075	.010444	.078	.9379
Pacific	-2.818728	1.651296	-.329031	-1.707	.0964
(Constant)	15.180836	3.293399		4.609	.0000

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 6D 1990-2000 Change in high-school equivalent inflation-adjusted wages as a function of 1990 workforce composition, 1992 economic base composition, ex ante regional traits and high-school graduates migration patterns (males only)

Dependent variable: 1990-2000 Change in Male High-School Equivalent Wage

R Square: .44680

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1985-1990 Migrant High-School Equivalent Supply (males only)	4.906230E-006	1.0101E-005	.183874	.486	.6301
1985-1990 Non-Migrant Male High-School Equivalent Supply	-1.706838E-006	2.8367E-006	-.248182	-.602	.5511
1990 Male HS Equiv. Wage	-.828661	.198393	-.684434	-4.177	.0002
1990 Proportion of Male Coll. Grads	.969825	4.513340	.030809	.215	.8311
1992 Fraction of High-Tech Jobs	-3.970048	9.907576	-.065566	-.401	.6910
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	.085773	1.478705	.014012	.058	.9541
Middle Atlantic	1.293504	1.786474	.164125	.724	.4737
East North Central	1.485663	1.539737	.216705	.965	.3410
West North Central	.500711	1.542873	.057989	.325	.7474
East South Central	.040115	1.733815	.004056	.023	.9817
West South Central	-.081159	1.660876	-.009820	-.049	.9613
Mountain	1.483501	1.538835	.187646	.964	.3415
Pacific	1.525128	1.628300	.208695	.937	.3552
(Constant)	12.097045	3.463144		3.493	.0013

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 6. 1990-2000 Changes in Inflation-Adjusted Wages in the presence of migration (continued)

Model 6E 1990-2000 Change in college equivalent inflation-adjusted wages as a function of 1990 workforce composition, 1992 economic base composition, ex ante regional traits and college graduates migration patterns (females only)

Dependent variable: 1990-2000 Change in Female College Equivalent Wage

R Square: .78832

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1985-1990 Migrant College Equivalent Supply (females only)	1.677801E-005	1.0020E-005	.697965	1.674	.1027
1985-1990 Non-Migrant Female College Equivalent Supply	-3.729156E-006	3.6636E-006	-.440668	-1.018	.3155
1990 Female College Equiv. Wage	-.940136	.131781	-.800411	-7.134	.0000
1990 Proportion of Female Coll. Grads	11.413133	4.733019	.206679	2.411	.0211
1992 Fraction of High-Tech Jobs	4.244849	10.847463	.053610	.391	.6979
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-2.078593	1.538385	-.210922	-1.351	.1851
Middle Atlantic	-.057046	1.759818	-.005501	-.032	.9743
East North Central	.605703	1.553657	.058635	.390	.6989
West North Central	-4.721013	1.754304	-.284877	-2.691	.0107
East South Central	-.782866	2.023284	-.044042	-.387	.7011
West South Central	-1.184922	1.646339	-.097316	-.720	.4763
Mountain	-.163284	1.849080	-.010950	-.088	.9301
Pacific	-3.108675	1.638777	-.328243	-1.897	.0659
(Constant)	17.271476	3.152360		5.479	.0000

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 6F 1990-2000 Change in high-school equivalent inflation-adjusted wages as a function of 1990 workforce composition, 1992 economic base composition, ex ante regional traits and high-school graduates migration patterns (females only)

Dependent variable: 1990-2000 Change in Female High-School Equivalent Wage

R Square: .34411

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1985-1990 Migrant High-School Equivalent Supply (females only)	5.086069E-007	1.1512E-005	.016487	.044	.9650
1985-1990 Non-Migrant Female High-School Equivalent Supply	-1.142984E-006	2.8424E-006	-.162965	-.402	.6900
1990 Female HS Equiv. Wage -	-.520156	.253996	-.377469	-2.048	.0479
1990 Proportion of Female Coll. Grads	-.801397	4.401300	-.028756	-.182	.8565
1992 Fraction of High-Tech Jobs	-3.204602	9.560035	-.059779	-.335	.7394
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	.528920	1.418126	.097598	.373	.7114
Middle Atlantic	1.111187	1.703083	.159254	.652	.5183
East North Central	1.895705	1.511893	.312332	1.254	.2180
West North Central	1.274590	1.556438	.166734	.819	.4182
East South Central	.962226	1.755328	.109896	.548	.5870
West South Central	.343954	1.579553	.047007	.218	.8289
Mountain	2.332890	1.551100	.333306	1.504	.1413
Pacific	1.854350	1.576470	.286612	1.176	.2472
(Constant)	9.502939	3.284418		2.893	.0064

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 7. College and High-School Graduate Migration, considering cost-of-living-adjusted wages

Model 7A. Impact of workforce composition, economic base composition, and *ex ante* regional traits on immigration of college graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (All College Equivalent Migrants)

Dependent variable: College graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (All College Equivalent Migrants)

R Square: .87483

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional College Equivalent Wage and National Average for Skill Group	1402.899936	681.015484	.202425	2.060	.0465
1990 College Equivalent Supply	3.020617	.253957	.980131	11.894	.0000
1990 Proportion of College Graduates	-15783.272402	34696.99025	-.033780	-.455	.6518
1992 Fraction of High-Tech Jobs	40766.008219	68953.70583	.112404	.591	.5580
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	19100.318055	10251.09239	.179709	1.863	.0704
Middle Atlantic	-69791.233285	90237.07066	-.047816	-.773	.4442
East North Central	-68701.460684	31484.63637	-.149433	-2.182	.0355
West North Central	9714.123876	6439.044356	.188830	1.509	.1399
East South Central	1704.134569	16847.85459	.006622	.101	.9200
West South Central	10342.970623	12187.65371	.058376	.849	.4015
Mountain	12309.466893	7325.270508	.300092	1.680	.1013
Pacific	5239.257202	9743.733976	.057739	.538	.5940
(Constant)	282.833245	14991.23093		.019	.9850

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 7B. Impact of workforce composition, economic base composition, and *ex ante* regional traits on non-migrant college graduates supply

Dependent variable: Non-migrant college graduates

R Square: .96729

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional College Equivalent Wage and National Average for Skill Group	658.948392	730.943070	.045285	.902	.3732
1990 College Equivalent Supply	6.441324	.272576	.995469	23.631	.0000
1990 Proportion of College Graduates	-338340.021158	37240.74590	-.344887	-9.085	.0000
1992 Fraction of High-Tech Jobs	6881.126999	74008.93907	.009037	.093	.9264
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-31934.540492	11002.63521	-.143104	-2.902	.0062
Middle Atlantic	143452.441358	96852.66056	.046811	1.481	.1470
East North Central	-19443.668791	33792.88331	-.020143	-.575	.5685
West North Central	5829.430742	6911.112836	.053971	.843	.4044
East South Central	-23949.672501	18083.02873	-.044328	-1.324	.1935
West South Central	955.870212	13081.17250	.002570	.073	.9421
Mountain	14920.218133	7862.311274	.173242	1.898	.0656
Pacific	11077.358708	10458.08061	.058144	1.059	.2964
(Constant)	119731.243695	16090.28961		7.441	.0000

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 7. College and High-School Graduate Migration, considering cost-of-living-adjusted wages (continued)

Model 7C. Impact of workforce composition, economic base composition, and *ex ante* regional traits on immigration of high-school graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (All High-School Equivalent Migrants)

Dependent variable: High-school graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (All High-School Equivalent Migrants)

R Square: .82469

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional High-School Equivalent Wage and National Average for Skill Group					
1990 High-School Equivalent Supply	.925125	.107524	.792615	8.604	.0000
1990 Proportion of College Graduates	-16065.128979	36040.64765	-.048947	-.446	.6584
1992 Fraction of High-Tech Jobs	47706.037422	50775.33531	.167741	.940	.3535
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	14724.797823	7780.489370	.307345	1.893	.0663
Middle Atlantic	-101842.168017	80450.55902	-.092977	-1.266	.2135
East North Central	-51024.998731	37550.86309	-.102629	-1.359	.1824
West North Central	1647.317683	7439.702038	.042361	.221	.8260
East South Central	-3060.137522	15987.94156	-.017556	-.191	.8493
West South Central	17794.396128	13440.01553	.103398	1.324	.1936
Mountain	3721.437115	8998.715581	.073437	.414	.6816
Pacific	7484.122181	7293.829248	.162663	1.026	.3115
(Constant)	7460.678668	17847.21687		.418	.6783

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 7D. Impact of workforce composition, economic base composition, and *ex ante* regional traits on non-migrant high-school graduates supply

Dependent variable: Non-migrant high-school graduates

R Square: .95511

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional High-School Equivalent Wage and National Average for Skill Group					
1990 High-School Equivalent Supply	3.455135	.174959	.920590	19.748	.0000
1990 Proportion of College Graduates	-128185.678151	58643.63350	-.121457	-2.186	.0352
1992 Fraction of High-Tech Jobs	-78704.413054	82619.21882	-.086061	-.953	.3470
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-38512.766394	12660.04350	-.249989	-3.042	.0043
Middle Atlantic	-61615.574799	130905.3362	-.017494	-.471	.6406
East North Central	55193.412530	61100.98448	.034524	.903	.3722
West North Central	-4760.142374	12105.53051	-.038067	-.393	.6964
East South Central	-7285.387244	26014.82067	-.012998	-.280	.7810
West South Central	46183.867154	21868.95621	.083456	2.112	.0415
Mountain	6142.319729	14642.28345	.037695	.419	.6773
Pacific	-6417.068776	11868.17322	-.043374	-.541	.5920
(Constant)	65535.252424	29040.14533		2.257	.0300

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 7. College and High-School Graduate Migration, considering cost-of-living-adjusted wages (continued)

Model 7E. Impact of workforce composition, economic base composition, and ex ante regional traits on immigration of college graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (Male College Equivalent Migrants)

Dependent variable: College graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (Male College Equivalent Migrants)

R Square: .85673

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional and National					
Male College Equivalent Wages	687.866205	326.266140	.284259	2.108	.0418
1990 Male College Equivalent Supply	3.000380	.279487	.900367	10.735	.0000
1990 Proportion of Male Coll. Grads	-18175.653545	20697.65975	-.149644	-.878	.3855
1992 Fraction of High-Tech Jobs	19322.378319	44030.81548	.101138	.439	.6633
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	8717.591376	5173.185166	.155254	1.685	.1004
Middle Atlantic	-40056.459237	53494.41866	-.049737	-.749	.4587
East North Central	-18165.722220	18659.74335	-.068707	-.974	.3366
West North Central	2497.848263	3431.204128	.109361	.728	.4712
East South Central	-4964.610917	10171.26911	-.033397	-.488	.6284
West South Central	7335.352380	5541.495155	.106774	1.324	.1937
Mountain	6402.025202	4025.206958	.281159	1.590	.1202
Pacific	3450.236749	5646.178516	.056785	.611	.5449
(Constant)	4963.368141	8128.234390		.611	.5452

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 7F. Impact of workforce composition, economic base composition, and ex ante regional traits on non-migrant college graduates supply (males only)

Dependent variable: Non-migrant college graduates (males only)

R Square: .95888

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional and National					
Male College Equivalent Wages	149.760649	514.133698	.016019	.291	.7725
1990 Male College Equivalent Supply	5.956481	.270662	.932604	22.007	.0000
1990 Proportion of Male Coll. Grads	-165715.020753	29840.11381	-.356381	-5.553	.0000
1992 Fraction of High-Tech Jobs	224345.053382	69674.45155	.284923	3.220	.0027
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-12416.163316	8275.584658	-.076397	-1.500	.1420
Middle Atlantic	48775.490221	45516.26528	.039425	1.072	.2908
East North Central	10450.472511	20605.40081	.019725	.507	.6150
West North Central	-2036.811116	5729.965047	-.022773	-.355	.7243
East South Central	-11588.482730	12920.23237	-.034022	-.897	.3756
West South Central	1497.891873	8900.611370	.007275	.168	.8673
Mountain	3572.674184	6622.804540	.039373	.539	.5928
Pacific	11457.395884	9180.001383	.060807	1.248	.2198
(Constant)	54738.289143	12097.56416		4.525	.0001

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 7. College and High-School Graduate Migration, considering cost-of-living-adjusted wages (continued)

Model 7G. Impact of workforce composition, economic base composition, and *ex ante* regional traits on immigration of high-school graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (Male High-School Equivalent Migrants)

Dependent variable: High-school graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (Male High-School Equivalent Migrants)

R Square: .83955

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional and National					
Male High-School Equivalent Wages	707.268685	513.130992	.138859	1.378	.1764
1990 Male HS Equivalent Supply	1.085282	.116836	.825814	9.289	.0000
1990 Proportion of Male Coll. Grads	1850.649501	12720.16756	.017962	.145	.8851
1992 Fraction of High-Tech Jobs	25374.677009	28057.90631	.151891	.904	.3717
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	9960.882651	3038.862118	.454429	3.278	.0023
Middle Atlantic	-72528.674602	42881.69322	-.121001	-1.691	.0992
East North Central	-34497.710145	20141.20203	-.126016	-1.713	.0951
West North Central	2692.317502	2708.056515	.156242	.994	.3266
East South Central	-157.707693	7070.232892	-.001745	-.022	.9823
West South Central	9580.907586	6310.425154	.110932	1.518	.1374
Mountain	4042.153352	3395.687192	.135205	1.190	.2415
Pacific	4943.192789	3574.914571	.179353	1.383	.1750
(Constant)	-1588.679944	5526.853497		-.287	.7754

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 7H. Impact of workforce composition, economic base composition, and *ex ante* regional traits on non-migrant high-school graduates supply (males only)

Dependent variable: Non-migrant high-school graduates (males only)

R Square: .95304

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional and National					
Male High-School Equivalent Wages	459.738220	1275.548300	.017743	.360	.7206
1990 Male HS Equivalent Supply	3.716408	.188596	.962268	19.706	.0000
1990 Proportion of Male Coll. Grads	-28172.048110	30615.88057	-.049655	-.920	.3634
1992 Fraction of High-Tech Jobs	-19744.732926	72652.03366	-.020146	-.272	.7873
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-25351.036393	7968.206001	-.211068	-3.182	.0030
Middle Atlantic	-25104.634492	56510.62014	-.018242	-.444	.6595
East North Central	-9485.350390	30849.51209	-.012881	-.307	.7602
West North Central	-5056.773203	6857.798619	-.051618	-.737	.4655
East South Central	-9955.281104	14636.10851	-.029968	-.680	.5006
West South Central	17529.177961	13838.87493	.051610	1.267	.2132
Mountain	-3071.333110	8349.811415	-.020854	-.368	.7151
Pacific	-8557.730055	9304.068726	-.059270	-.920	.3636
(Constant)	26123.254378	13268.10404		1.969	.0565

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 7. College and High-School Graduate Migration, considering cost-of-living-adjusted wages (continued)

Model 7I. Impact of workforce composition, economic base composition, and *ex ante* regional traits on immigration of college graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (Female College Equivalent Migrants)

Dependent variable: College graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (Female College Equivalent Migrants)

R Square: .82401

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional and National					
Female College Equivalent Wages	23.228640	244.233926	.009227	.095	.9247
1990 Female College Equiv. Supply	2.549468	.259428	.907583	9.827	.0000
1990 Proportion of Female Coll. Grads	-9558.668667	19330.62948	-.093309	-.494	.6239
1992 Fraction of High-Tech Jobs	43268.777813	37549.17367	.268645	1.152	.2566
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	11730.612297	4785.343233	.247830	2.451	.0191
Middle Atlantic	-37638.002732	49913.76164	-.055440	-.754	.4556
East North Central	-15887.667187	17433.59500	-.071284	-.911	.3680
West North Central	2710.744576	3200.305071	.140789	.847	.4024
East South Central	-4120.039548	9654.001858	-.032878	-.427	.6720
West South Central	4433.551556	5163.568005	.076559	.859	.3961
Mountain	4116.155111	3722.111843	.214461	1.106	.2759
Pacific	2119.340655	5233.590841	.041380	.405	.6878
(Constant)	758.595341	7518.277116		.101	.9202

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 7J. Impact of workforce composition, economic base composition, and *ex ante* regional traits on non-migrant college graduates supply (females only)

Dependent variable: Non-migrant college graduates (females only)

R Square: .94166

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional and National					
Female College Equivalent Wages	685.029699	334.360698	.114438	2.049	.0476
1990 Female College Equiv. Supply	5.745398	.355161	.860212	16.177	.0000
1990 Proportion of Female Coll. Grads	-144881.584853	26463.98424	-.594826	-5.475	.0000
1992 Fraction of High-Tech Jobs	159043.019756	51405.50342	.415305	3.094	.0037
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-23968.103229	6551.222142	-.212968	-3.659	.0008
Middle Atlantic	67581.345388	68332.84982	.041867	.989	.3291
East North Central	17890.490396	23866.90944	.033760	.750	.4582
West North Central	-8129.755900	4381.275996	-.177584	-1.856	.0715
East South Central	-5092.993430	13216.50458	-.017093	-.385	.7022
West South Central	3299.746418	7069.018751	.023965	.467	.6434
Mountain	-5786.041838	5095.638982	-.126791	-1.135	.2635
Pacific	-1407.229784	7164.881291	-.011556	-.196	.8454
(Constant)	60536.704655	10292.65846		5.882	.0000

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 7. College and High-School Graduate Migration, considering cost-of-living-adjusted wages (continued)

Model 7K. Impact of workforce composition, economic base composition, and *ex ante* regional traits on immigration of high-school graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (Female High-School Equivalent Migrants)

Dependent variable: High-school graduates who came into a metropolitan region from a non-metropolitan area of the state, different state, or country (Female High-School Equivalent Migrants)

R Square: .84089

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional and National					
Female High-School Equiv. Wages	1122.486799	630.040706	.214904	1.782	.0830
1990 Female HS Equivalent Supply	.787916	.100772	.726738	7.819	.0000
1990 Proportion of Female Coll. Grads	-5198.765362	11515.92048	-.061142	-.451	.6543
1992 Fraction of High-Tech Jobs	22737.998851	23952.83207	.164974	.949	.3486
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	6712.780894	2842.697999	.371202	2.361	.0236
Middle Atlantic	-50395.090342	35337.19110	-.101914	-1.426	.1622
East North Central	-26425.167415	16546.99618	-.117009	-1.597	.1188
West North Central	596.173996	2376.767141	.041936	.251	.8033
East South Central	551.278444	5555.745465	.007392	.099	.9215
West South Central	7726.609667	5214.257626	.108445	1.482	.1469
Mountain	2244.583332	2616.411787	.091009	.858	.3965
Pacific	2227.057982	2939.547585	.097954	.758	.4535
(Constant)	3492.110125	5419.584207		.644	.5233

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 7L. Impact of workforce composition, economic base composition, and *ex ante* regional traits on non-migrant high-school graduates supply (females only)

Dependent variable: Non-migrant high-school graduates (females only)

R Square: .95319

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1990 Difference between Regional and National					
Female High-School Equiv. Wages	-2345.680377	1126.569552	-.136223	-2.082	.0443
1990 Female HS Equivalent Supply	3.531364	.180190	.988002	19.598	.0000
1990 Proportion of Female Coll. Grads	-10680.761730	20591.50347	-.038103	-.519	.6071
1992 Fraction of High-Tech Jobs	-46828.625503	42829.82204	-.103060	-1.093	.2813
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-17046.970678	5083.000168	-.285938	-3.354	.0019
Middle Atlantic	-46747.719965	63186.08179	-.028676	-.740	.4641
East North Central	-7834.857412	29587.52015	-.010523	-.265	.7926
West North Central	-2317.287402	4249.873809	-.049444	-.545	.5888
East South Central	-3228.767995	9934.173501	-.013133	-.325	.7470
West South Central	20697.808013	9323.562474	.088117	2.220	.0326
Mountain	2418.962471	4678.380031	.029751	.517	.6082
Pacific	-9595.678151	5256.175954	-.128021	-1.826	.0760
(Constant)	12623.757124	9690.704902		1.303	.2007

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 8. 1990-2000 Changes in Cost-of-Living-Adjusted Wages in the presence of migration

Model 8A 1990-2000 Change in college equivalent cost-of-living-adjusted wages as a function of 1990 workforce composition, 1992 economic base composition, ex ante regional traits and college graduates migration patterns

Dependent variable: 1990-2000 Change in College Equivalent Wage

R Square: .59454

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1985-1990 Migrant College Equivalent Supply	1.005466E-005	4.4345E-006	1.024306	2.267	.0295
1985-1990 Non-Migrant College Equivalent Supply	-3.915338E-006	1.8288E-006	-1.036952	-2.141	.0391
1990 College Equivalent Wage	-.727517	.137813	-.632068	-5.279	.0000
1990 Proportion of College Graduates	6.292061	6.412770	.123846	.981	.3331
1992 Fraction of High-Tech Jobs	9.533403	10.261868	.140317	.929	.3591
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-.925996	1.343088	-.130878	-.689	.4950
Middle Atlantic	1.948556	1.694306	.219124	1.150	.2577
East North Central	1.752132	1.480399	.217003	1.184	.2443
West North Central	-1.405872	1.458124	-.150331	-.964	.3414
East South Central	1.870114	1.651519	.168958	1.132	.2650
West South Central	.879352	1.505899	.088289	.584	.5629
Mountain	-.536373	1.459524	-.057000	-.367	.7154
Pacific	-.471827	1.516172	-.055912	-.311	.7574
(Constant)	11.473561	3.048002		3.764	.0006

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 8B 1990-2000 Change in high-school equivalent cost-of-living-adjusted wages as a function of 1990 workforce composition, 1992 economic base composition, ex ante regional traits and high-school graduates migration patterns

Dependent variable: 1990-2000 Change in High-School Equivalent Wage

R Square: .47609

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1985-1990 Migrant High-School Equivalent Supply	-4.924263E-008	2.9986E-006	-.006899	-.016	.9870
1985-1990 Non-Migrant High-School Equivalent Supply	-5.399927E-007	8.1010E-007	-.303637	-.667	.5093
1990 High-School Equivalent Wage	-.593257	.183610	-.511514	-3.231	.0026
1990 Proportion of College Graduates	4.621559	4.119480	.170243	1.122	.2693
1992 Fraction of High-Tech Jobs	-6.711989	5.604277	-.221024	-1.198	.2389
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	2.192724	.979499	.649398	2.239	.0315
Middle Atlantic	1.766699	1.118324	.468119	1.580	.1229
East North Central	2.296628	1.039390	.639026	2.210	.0336
West North Central	1.978197	1.183164	.327974	1.672	.1032
East South Central	1.711697	1.228635	.243356	1.393	.1721
West South Central	1.893298	1.016877	.442510	1.862	.0708
Mountain	2.447273	1.102134	.434080	2.220	.0328
Pacific	1.395658	1.121765	.396770	1.244	.2215
(Constant)	5.745374	2.420473		2.374	.0231

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 8. 1990-2000 Changes in Cost-of-Living-Adjusted Wages in the presence of migration (continued)

Model 8C 1990-2000 Change in college equivalent cost-of-living-adjusted wages as a function of 1990 workforce composition, 1992 economic base composition, ex ante regional traits and college graduates migration patterns (males only)

Dependent variable: 1990-2000 Change in Male College Equivalent Wage

R Square: .68146

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1985-1990 Migrant College Equivalent Supply (Males Only)	1.871747E-005	1.0057E-005	1.025818	1.861	.0709
1985-1990 Non-Migrant Male College Equivalent Supply	-7.276105E-006	4.4024E-006	-.936576	-1.653	.1071
1990 Male College Equivalent Wage	-.790595	.133480	-.621590	-5.923	.0000
1990 Proportion of Male Coll. Grads	9.794071	5.522705	.185177	1.773	.0846
1992 Fraction of High-Tech Jobs	5.426966	12.624651	.071561	.430	.6699
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	.792683	1.797151	.083982	.441	.6618
Middle Atlantic	2.108498	2.045757	.212276	1.031	.3096
East North Central	3.622649	1.801773	.366152	2.011	.0519
West North Central	-1.796583	2.054786	-.113190	-.874	.3877
East South Central	3.693780	2.241406	.216965	1.648	.1081
West South Central	3.429702	1.857271	.294093	1.847	.0730
Mountain	1.606229	2.082572	.112460	.771	.4456
Pacific	-1.276762	1.942753	-.140756	-.657	.5152
(Constant)	11.990019	3.640074		3.294	.0022

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 8D 1990-2000 Change in high-school equivalent cost-of-living-adjusted wages as a function of 1990 workforce composition, 1992 economic base composition, ex ante regional traits and high-school graduates migration patterns (males only)

Dependent variable: 1990-2000 Change in Male High-School Equivalent Wage

R Square: .45319

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1985-1990 Migrant High-School Equivalent Supply (Males Only)	8.019133E-006	9.3491E-006	.321239	.858	.3967
1985-1990 Non-Migrant Male High-School Equivalent Supply	-3.187509E-006	2.6061E-006	-.495402	-1.223	.2292
1990 Male High-School Equiv. Wage	-.774035	.178795	-.638591	-4.329	.0001
1990 Proportion of Male Coll. Grads	.147303	4.107185	.005002	.036	.9716
1992 Fraction of High-Tech Jobs	-3.141335	9.160525	-.055453	-.343	.7337
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	1.257864	1.318202	.219644	.954	.3463
Middle Atlantic	1.836983	1.654765	.249139	1.110	.2743
East North Central	2.684701	1.444787	.418576	1.858	.0713
West North Central	1.351457	1.504738	.167297	.898	.3751
East South Central	1.615861	1.563522	.174640	1.033	.3083
West South Central	1.763407	1.460919	.228060	1.207	.2353
Mountain	1.666541	1.454962	.225318	1.145	.2596
Pacific	1.378603	1.519308	.201639	.907	.3702
(Constant)	10.756832	2.842652		3.784	.0006

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 8. 1990-2000 Changes in Cost-of-Living-Adjusted Wages in the presence of migration (continued)

Model 8E 1990-2000 Change in college equivalent cost-of-living-adjusted wages as a function of 1990 workforce composition, 1992 economic base composition, ex ante regional traits and college graduates migration patterns (females only)

Dependent variable: 1990-2000 Change in Female College Equivalent Wage

R Square: .67483

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1985-1990 Migrant College Equivalent Supply (Females Only)	2.503108E-005	1.4725E-005	.676039	1.700	.0978
1985-1990 Non-Migrant Female College Equivalent Supply	-8.338994E-006	5.4723E-006	-.647455	-1.524	.1363
1990 Female College Equivalent Wage	-.894792	.153981	-.625733	-5.811	.0000
1990 Proportion of Female Coll. Grads	10.927768	6.324855	.177403	1.728	.0926
1992 Fraction of High-Tech Jobs	7.977208	16.061841	.069174	.497	.6225
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	-.535598	1.996150	-.044128	-.268	.7900
Middle Atlantic	.673028	2.557539	.044430	.263	.7939
East North Central	2.425955	2.217107	.177966	1.094	.2811
West North Central	-3.134286	2.236877	-.192092	-1.401	.1697
East South Central	1.539913	2.462738	.082660	.625	.5357
West South Central	2.105466	2.276264	.124605	.925	.3611
Mountain	-.274590	2.225471	-.017418	-.123	.9025
Pacific	-2.694236	2.275762	-.191487	-1.184	.2442
(Constant)	15.503385	3.721722		4.166	.0002

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

Model 8F 1990-2000 Change in high-school equivalent cost-of-living-adjusted wages as a function of 1990 workforce composition, 1992 economic base composition, ex ante regional traits and high-school graduates migration patterns (females only)

Dependent variable: 1990-2000 Change in Female High-School Equivalent Wage

R Square: .33857

<u>Independent Variables</u>	<u>B</u>	<u>SE B</u>	<u>Beta</u>	<u>T</u>	<u>Sig. of T</u>
1985-1990 Migrant High-School Equivalent Supply (Females Only)	3.955737E-006	1.0967E-005	.135574	.361	.7204
1985-1990 Non-Migrant Female High-School Equivalent Supply	-2.387960E-006	2.7148E-006	-.359974	-.880	.3849
1990 Female HS Equiv. Wage	-.611972	.227913	-.403949	-2.685	.0109
1990 Proportion of Female Coll. Grads	-.527187	4.079377	-.020000	-.129	.8979
1992 Fraction of High-Tech Jobs	-3.232051	9.039016	-.063745	-.358	.7228
New England (Reference Category for Ex Ante Regional Characteristics)					
South Atlantic	1.273886	1.292646	.248527	.985	.3310
Middle Atlantic	1.518603	1.620899	.230111	.937	.3551
East North Central	2.717844	1.417127	.473436	1.918	.0631
West North Central	1.718158	1.415851	.237633	1.214	.2328
East South Central	1.990527	1.537895	.240362	1.294	.2038
West South Central	1.607538	1.450825	.232282	1.108	.2752
Mountain	2.101344	1.386493	.317421	1.516	.1384
Pacific	1.466930	1.486438	.239719	.987	.3303
(Constant)	10.050225	2.708807		3.710	.0007

Source: Author's calculations on 1990-2000 Current Population Survey Data and 1990-2000 Public Use Micro Sample Data.

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